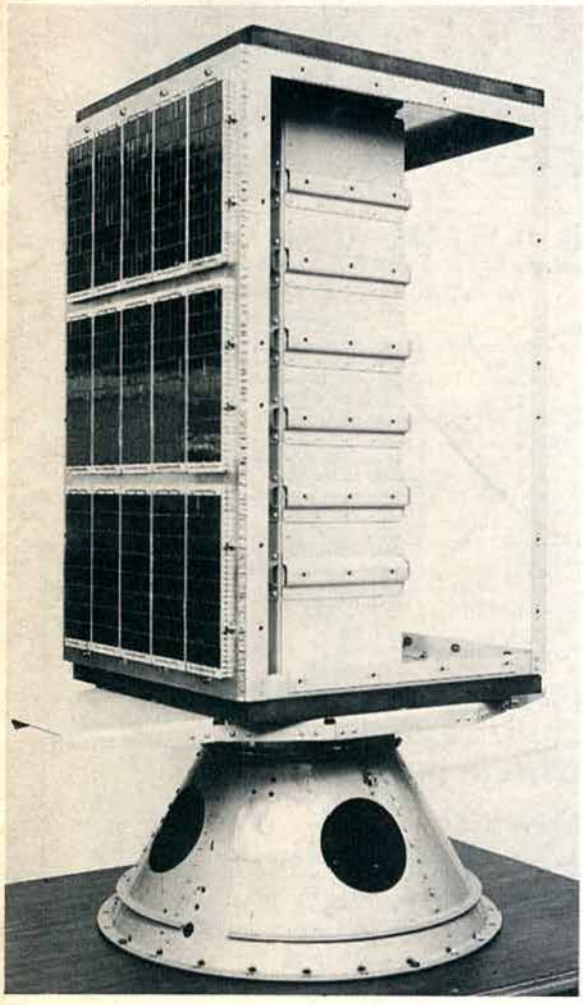
RADio COMmunication

February 1981

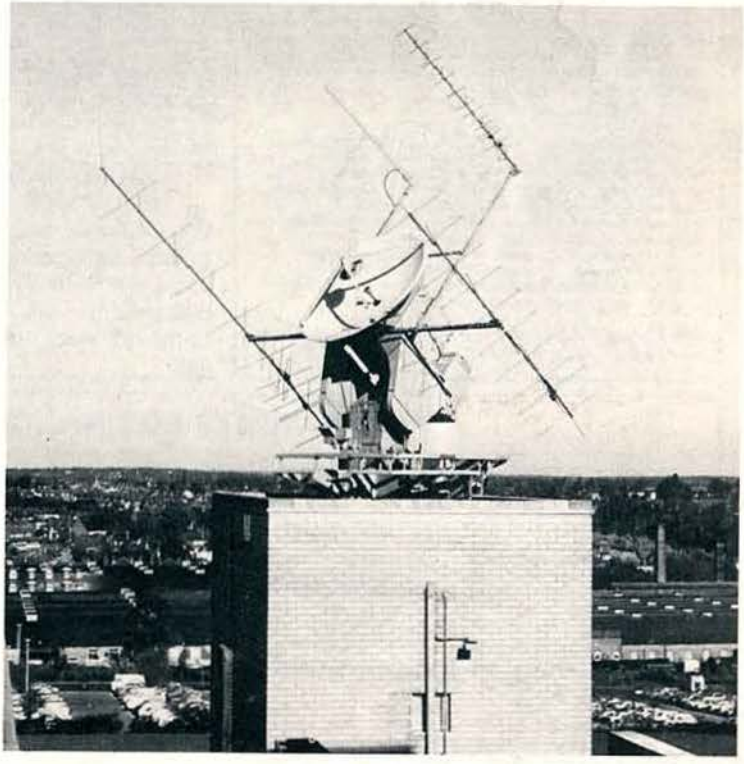


UOSAT under construction. The antennas are not shown

UOSAT

The AMSAT amateur scientific and educational spacecraft

Martin Sweeting provides more information in this issue



The University of Surrey AMSAT telecommand centre antennas mounted above the university radio room

Journal of the Radio Society of Great Britain

Catronics

your one-stop shopping centre for complete equipment from 'Trio' and 'Philips', accessories from 'Jaybeam' and 'Microwave Modules', components, kits and the 'Video Genie' Microcomputer system

Now available from Catronics—real value for money in microcomputers

video genie system

Advanced features are:

1. **Built-in TV interface, the user's TV set may be used as the display terminal, thus saving money.**
2. **Main Control Unit contains the CPU plus,**
   i) **51 key typewriter keyboard, with 10 key rollover.**
   ii) **High quality cassette recorder, enables recording and playback of programs, data and the use of pre-recorded tapes.**
3. **Built-in audio cassette interface for connecting another cassette recorder to serve as cheap and compact storage for large amounts of data on tapes.**
4. **16k user RAM included, expandable to 48k.**
5. **Fully TRS 80 level II software compatible so a huge range of software is already available.**
6. **Full 12k Microsoft BASIC in ROM.**
7. **Full expansion capability to Discs and Printer, a small system with big possibilities.**
8. **Self-contained, all in one attractive case.**
9. **The system uses the powerful Z80 processor.**

Our Cash and Carry Price only £365.00 inc VAT.

Also available 9" Monitor—built to full professional specification (NOT a converted television) Model CVM600: £130.00.

Full range of supporting programs and accessories available, including Amateur Radio packages.

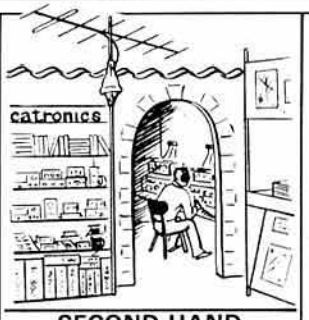
70cm SYNTHESIZED TRANSCEIVER PHILIPS TYPE FM321

Catronics are proud to announce the availability of the world's first 70cm 40 channel FM mobile transceiver in the UK. Especially made to our own specification by Philips—Europe's largest manufacturer of Radiotelephone equipment.

Just look at its star packed features:

- ★ Full 40 channel coverage RBO to SU39
- ★ Direct LED display of channel number
- ★ Electronic channel change up or down from front panel
- ★ Remote Control channel change on microphone
- ★ 3 position squelch control for ease of operation
- ★ "Nominated Repeater Position" may be preprogrammed to your local Repeater channel for instant access
- ★ Crystal controlled Toneburst operates in Repeater Mode
- ★ Receiver sensitivity 0·3μV for 12dB SINAD
- ★ Transmitter output power 5W minimum, gives typically 25W e.r.p. with Jaybeam U5 mobile antenna
- ★ Supplied complete with mobile bracket, microphone with P.T.T. and channel change, operating manual etc.

The Philips FM321—We want you to have the best even better value now at £197 + VAT = £226.50.



SECOND-HAND EQUIPMENT

We always have a good selection of second-hand equipment—ask for a copy of our current list.

THINK JAYBEAM—THINK CATRONICS

We generally have the full range of 'Jaybeam' aerials in stock as follows:

FOR 2m Band:		
C5/2M	5dB colinear	**£44.25**
5Y/2M	5 ele yagi	**£11.25**
8Y/2M	8 ele yagi	**£14.45**
10Y/2M	10 ele yagi	**£31.05**
PBM10/2M	10 ele Parabeam	**£36.80**
PBM14/2M	14 ele Parabeam	**£44.85**
5XY/2M	Cross 5 ele yagi	**£22.75**
8XY/2M	Cross 8 ele yagi	**£28.40**
10XY/2M	Cross 10 ele yagi	**£37.70**
Q4/2M	4 ele quad	**£23.65**
Q6/2M	6 ele quad	**£31.35**
D5/2M	Double 5 yagi	**£20.10**
D8/2M	Double 8 yagi	**£27.10**
UGP/2M	Unipole	**£10.10**
HO/2M	Mobile 'halo'	**£4.50**
HM/2M	'Halo' + mast	**£5.40**
TAS X6/2M/X12/ 70cm	¼ wave whip Dual Band	**£15.25** **£38.50**
LR1/2M	4½dB vertical	**£24.15**

FOR 70cms Band:		
D8/70cm	Double 8 yagi	**£20.70**
PBM18/70cm	18 ele Parabeam	**£25.30**
MBM48/70cm	48 ele Multibeam	**£28.75**
MBM88/70cm	88 ele Multibeam	**£39.30**
12XY/70cm	Cross 12 ele yagi	**£42.30**
8XY/70cm	Cross 8 ele yagi	**£34.15**
C8/70cm	8dB colinear	**£50.00**
X6/2M/X12/70cm	Dual Band	**£38.50**
FOR 23cms Band:		
D15/1296	Double 15 yagi	**£34.00**
PHASING HARNESSES:		
PMH/2C	2m circular	**£7.45**
PMH/2M	2m stacking	**£9.85**
PMH/70	70cms stadking	**£8.50**
MASTS and ROTATORS, etc:		
SPM	16' portable mast	**£15.10**
PME	4' extension	**£2.53**
SVMK	Vertical mount	**£7.20**
9502	Rotator	**£55.75**
9523	Alignment bearing	**£11.70**
KR400	H. Duty Rotator	**£105.80**

ALL PRICES INCLUDE VAT, but please **ADD CARRIAGE** as follows: Harnesses, halos, and UGPs—£1.00. Other aerials and masts—UK Mainland, £4.00.

COMPONENTS FOR RADCOM (AND OTHER) PROJECTS

G3PLX RTTY VIDEO DISPLAY (April 1977 Rad Com)

Kit (excluding modulator and keyboard), **£107.00.**
Set of printed circuit boards, **£34.10**; 2513, **£8.50**; AY5-1013, **£5.35**; 2102-1, **£1.57**; SN74188, **£2.40** each or ready programmed **£6.60** per pair; 7MHz xtal, **£3.00.**
Also available: Cabinet to match CT100 T.U. **£8.70.**
Flashing cursor kit, £7.95. **Diode Matrix kit, £16.35**
NOTE regarding PROM program: The PCBs and programmed PROMs supplied by us make use of a slightly different program sequence resulting in different pin connections to those published in the 'Rad Com' article. Whilst constructors buying PROMs and PCBs from us will have no difficulty, those producing their own PCBs or having PROMs programmed elsewhere should note this important difference. A detailed modification sheet is available with the PCBs.

MULTIMODE 1600 TRANSCEIVER

(Oct/Nov 1977 Rad Com)
Special price for component kit, **£275.10.**
Receive only kit also available, **£243.30.**
PCB, **£16.45**; 8545kHz xtal, **£2.90**; 400ns delay line, **£2.27**; MD108, **£8.95**; RS 12V Relay, **£3.80**; Toroid, **85p**; **Minikit 3** (Rs and Cs), **£24.05.**

40 WATT 2M PA KIT

For boosting power output of '10-15 Watt' FM mobile rigs.
Auto Transmit/Receive switching. Requires 12-16V d.c. supply.
Complete with cabinet and full instructions.
Kit £28.85 + £1.25 post. Also ready-built at **£38.85.**

10 WATT 2M PA KIT

A 10 watt output version of our famous 40 watt 2M PA kit is available, for boosting the output of 1-2 watt 2M FM transmitters.
Kit £21.75 inc VAT + £1.25 post. Also ready-built at **£31.75.**

G3TDZ FM TRANSCEIVER (March 1978 Rad Com)

PCBs: Audio, **£2.40**; RX, **£5.90**; TX, **£5.75**; xtal Osc, **£1.60.**
KITS: Receiver (less 455kHz coil), **£39.10**; Transmitter, **£31.95.**

G3ZVC SSB TRANSCEIVER (Sept 1974 Rad Com)

PCB **£5.35**; Toroid, **85p**; MD108 Ring Mixer, **£8.95**; QC1246 AX Filter, **£29.65.**
SPECIAL PRICE FOR COMPONENT KIT, £99.95.
Also available—but not included in kits: *Reprint of article,* **15p** plus SAE, Min. 50Ω coaxial connectors—PCB mount socket, **£1.29** and plug, **£2.19.**

We are 300 yards from Wallington Railway Station (London Bridge or Victoria). Frequent buses from Croydon and Sutton. Three large car parks within 100 yards. **Hire purchase facilities available on all equipment. Credit cards accepted.** Mail orders—normally dealt with on day of receipt. Securicor delivery arranged. All prices include VAT.

APPROVED TRIO DEALER

BARCLAYCARD VISA

CATRONICS LTD, DEPT 102, COMMUNICATIONS HOUSE,
20 WALLINGTON SQUARE, WALLINGTON, SURREY SM6 8RG. Tel: 01-669 6700.
Shop/showroom open Monday-Friday: 9.00-5.30, closed for lunch: 12.45-1.45. Saturdays: 9.00-1.00.

Access

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CONTENTS

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

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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HF EQUIPMENT FROM TRIO

TRIO *pacesetter in amateur radio*

PS 30 SP 120 TS 130 AT 120

TS-130S/V *processor, N/W switch, IF shift, DFC option*

An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 30MHz (including the three new Amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130V is a low-power version for QRP applications.

TS-130 SERIES FEATURES:

- **80-10 metres, including three new bands**
  Covers all Amateur bands from 3.5 to 30MHz, including the new 10, 18, and 24-MHz bands. Receives WWV on 10MHz. VFO covers more than 50kHz above and below each 500-kHz band.
- **Two power versions . . . easy operation**
  TS-130S runs 200 W PEP/160 W DC input on 80-15 metres and 160 W PEP/140 W DC on 12 and 10 metres. TS-130V runs 20 W PEP/20 W DC input on all bands. Solid-state, wideband final amplifier eliminates transmitter tuning, and receiver wideband RF amplifiers eliminate preselector peaking.
- **Built-in speech processor**
  Increases audio punch and average SSB output power, while suppressing sideband splatter.
- **CW narrow/wide selection**
  "N-W" switch allows selection of wide and narrow bandwidths. Wide CW and SSB bandwidths are the same. Optional YK-88C (500Hz) or YK-88CN (270Hz) filter may be installed for narrow CW.
- **SSB narrow selection**
  "N-W" switch allows selection of narrow SSB bandwidth to eliminate QRM, when optional YK-88SN (1.8kHz) filter is installed. (CW filter may still be selected in CW mode).
- **Sideband mode selected automatically**
  LSB is selected on 40 metres and below, and USB on 30 metres and above. SSB REVERSE position is provided on the MODE switch.
- **Built-in digital display**
  Six-digit green fluorescent tube display indicates actual operating frequency to 100Hz. Also indicates external VFO or fixed-channel frequency. RIT shift, and CW transmit/receive shifts. Also analog subdial for backup frequency indication.
- **IF shift**
  Allows IF passband to be moved away from interfering signals and sideband splatter.
- **Single-conversion PLL system**
  Improves stability as well as transmit and receive spurious characteristics.
- **Built-in RF attenuator**
  For optimum rejection of intermodulation distortion.
- **Built-in VOX**
  For convenient SSB operation, as well as semi break-in CW with sidetone.
- **Effective noise blanker**
  Eliminates pulse-type interference such as ignition noise.
- **Built-in 25kHz marker**
  Accurate frequency reference for calibration.
- **Compact and lightweight**
  Measures only 94mm high, 241mm wide, and 293mm deep, and weighs only 12.3 pounds. It is styled to enhance the appearance of any fixed or mobile station.

TS 130S	200 WATT PEP TRANSCEIVER	£491.05 inc VAT
TS 130V	20 WATT PEP TRANSCEIVER	£404.34 inc VAT
DFC 230	DIGITAL REMOTE CONTROL	£163.13 inc VAT
MB 100	MOUNTING BRACKET	£17.25 inc VAT
VFO 120	EXTERNAL VFO	£89.70 inc VAT
SP 120	EXTERNAL SPEAKER	£25.30 inc VAT
PS 30	AC POWER SUPPLY	£85.10 inc VAT
MA 5	5 BAND MOBILE AERIAL	£74.75 inc VAT

All Trio equipment is available from the following authorised Trio dealers
LOWE ELECTRONICS LTD. Chesterfield Road, Matlock, Derbys. Tel: 0629 2430 or 2817

LANCASHIRE
Stephens-James Ltd
47 Warrington Rd
Leigh
0942 676790

BIRMINGHAM
Ward Electronics
Soho House, 362-364 Soho Rd
Birmingham B21 9QL
021 554 0708

SOUTH LONDON
Catronics Ltd
20 Wallington Square
Wallington SM6 8RG
01-669 0700

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Waters & Stanton Electronics
Warren House 18-20 Main Rd
Hockley Essex. 0702 206835

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Bredhurst Electronics
High St Handcross
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0222 616936

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London NW6 3AY
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27 Cookridge St
Leeds LE2 3AG
0532 452657

EAST SCOTLAND
Jay-Cee Electronics
20 Woodside Way
Glenrothes
Fife KY7 5DE. 0592-756962

TRIO **IMPORTANT INFORMATION** TRIO

As the appointed distributors for Trio, we recommend that you purchase your Trio equipment from an approved stockist (list above). Any stockist *not* on this list has no connection with the Trio UK sales and service organisation and cannot, despite claims to the contrary, offer any meaningful guarantee of backup service on Trio equipment.

LOWE ELECTRONICS

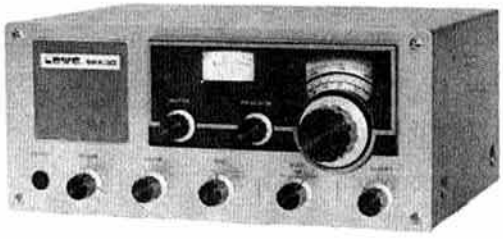
CHESTERFIELD ROAD MATLOCK TEL 0629 2817

FROM THE JAPAN RADIO CO Ltd

The NRD 515 is a PLL-synthesised communications receiver of the highest class featuring advanced radio technology combined with the latest digital techniques.
The new NRD 515 is full of performance advantages including general coverage, all modes of operation, PLL digital VFO for digital tuning, 24-channel frequency memory (option), direct mixing, pass-band tuning, etc. JRC's 65 years of radio communications experience will give you "the world at your fingertips".
The NRD 515 is but a single item from the JRC product range which extends all the way to full marine radio installations for supertankers.

NRD-515 receiving for the discerning few

NRD 515 SYNTHESISED HF RECEIVER	£948.75 inc VAT	NVA 515 LOUDSPEAKER	£27.60 inc VAT
NHD 515 MULTI CHANNEL MEMORY UNIT	£161.00 inc VAT	CFL 260 600Hz CW FILTER	£34.50 inc VAT



LOWE SRX-30

THE SRX-30 IS THE MOST IMPRESSIVE MID-PRICE RECEIVER AVAILABLE TO THE KEEN DX-ER.
500kHz–30MHz CONTINUOUS COVERAGE. DRIFT CANCELLING SYSTEM.
£158 inc VAT. Securicor carriage £4.50

TS-770E The TS-770E dual bander is another successful result of Trio's advanced engineering capability and represents the peak of RF engineering for VHF/UHF. This is the world's first transceiver to combine the high activity 2-metre band with the 70 cm band of tomorrow in a single unit. Featuring Trio's renowned reliability, two-in-one design and compact dimensions, the TS-770E offers versatility in fixed station, mobile or portable operation.

TRIO

TS-770E 2 METRE & 70 cm MULTIMODE

£730.25 inc VAT. Carriage by Securicor £4.50

TR-9000 The exciting TR-9000 2-metre all-mode transceiver combining the convenience of FM with long distance SSB and CW in a very compact, very affordable package. Because of its compactness the TR-9000 is ideal for mobile installation; add on its fixed station acessories and it becomes the obvious choice for your shack.

TRIO

TR-9000 2 METRE MULTIMODE

£345.00 inc VAT. Carriage by Securicor £4.50

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TRIO

R-1000

RECEIVER WITH DC KIT FITTED £285 inc VAT.
SP-100 MATCHING EXT. SPEAKER £26.45 inc VAT.
CARRIAGE BY SECURICOR £4.50

"Hear there and everywhere"
easy tuning, digital display

SP-100

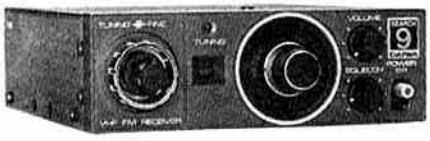
R-1000

The R-1000 is an amazingly easy-to-operate, high-performance, communications receiver, covering 200kHz to 30MHz in 30 bands. This PLL synthesized receiver features a digital frequency display and analog dial, plus a quartz digital clock and timer.

R-1000 FEATURES:

- Covers 200kHz to 30MHz continuously.
- 30 bands, each 1MHz wide.
- Five-digit frequency display with 1kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock with timer to turn on radio for scheduled listening or control a recorder through remote terminal.
- Step attenuator to prevent overload.
- Three IF filters for optimum AM, SSB, CW. 12kHz and 6kHz (adaptable to 6kHz and 2.7kHz) for AM wide and narrow, and 2.7kHz filter for high-quality SSB (USB and LSB) and CW reception.
- Effective noise blanker.
- Terminal for external tape recorder.
- Tone control.
- Built-in 4-inch speaker.
- Dimmer switch to control intensity of S-meter and other panel lights and digital display.
- Wire antenna terminals for 200kHz to 2MHz and 2MHz to 30MHz. Coax terminal for 2MHz to 30MHz.
- Voltage selector for 100, 120, 220, and 240 VAC.

FOR THE HF RECEIVERS USE THE TRIO HEADPHONES HS5 OR HS4
HS5 £21.85 inc VAT. HS4 £10.35 inc VAT



XTLS £2.50/CH

AR22 FLEXIBLE ANTENNA £3.00

SR9 DAIWA

2mtr FM TUNABLE/XTAL RECEIVER
£46.00 inc VAT carriage £1.50

SL-1600A

16 CHANNEL 2mtr SCANNING RECEIVER
£39.50 inc VAT carriage £1.50

AOR AR22

2mtr FM SYNTHESISED RCVR
£83.00 inc VAT carriage £1.50

TR-7800 Trio's remarkable TR-7800 2-metre FM mobile transceiver provides all the features you could desire for maximum operating enjoyment. Frequency selection is easier than ever, and the rig incorporates new memory developments for repeater shift, priority, and scan. The TR-7800 by Trio, the only FM mobile.

TRIO

THE ULTIMATE 2 METRE MOBILE **TR-7800**

£268 inc VAT. Carriage by Securicor £4.50

TR-2300 The remarkable TR-2300 is a compact 80 channel FM transceiver designed for use in the 2-metre band. The TR-2300 is engineered with the latest techniques in all solid state construction. The small and lightweight design of the TR-2300 offers you versatile use.

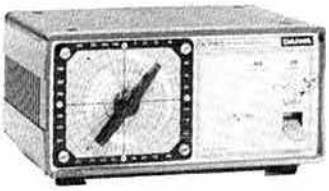
TRIO

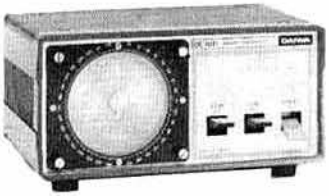
THE VERSATILE 2 METRE PORTABLE **TR-2300**

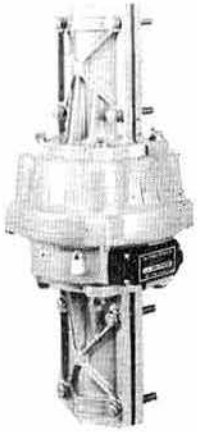
£166.75 inc VAT. Carriage by Securicor £4.50

LOWE ELECTRONICS

CHESTERFIELD ROAD MATLOCK TEL 0629 2817







The Daiwa range of rotators are probably the best amateur rotators available. The quality of construction is up to the high standards we have come to expect from Daiwa and the rotator system is of a completely new design which eliminates "out of sync" operation and for the first time gives a true 360° indication on a circular scale based on a great circle map centred on the UK.

Both the DR7500 and DR7600 can be supplied with either of the controllers available, and both upper and lower mast clamps allowing mounting inside a standard tower or on the top of a pole. The DR7500 will handle beams up to and including 3-element tribanders, whilst the DR7600 will handle up to and including a 2-element 40 metre beam.

Each rotary system is supplied complete with rotator unit, control unit, and upper and lower mast clamps.

The rotators can be ordered as either "R" or "X" versions. The "R" suffix denotes the controller with the back lit scale and control by switches marked "left" and "right" to drive the rotator round. The controller pointer then smoothly indicates the direction in which the rotator is pointing. However, as an alternative, the "X" suffix unit is of the preset type where the controller pointer is turned by the operator to the beam heading required. The rotator then turns to this heading and stops. Correct operation of the rotator is indicated by a discreet flashing light on the control unit. With this type of control unit, you can go into the shack, set the rotator turning to the direction you need and then do something else whilst the rotator comes round.

Either control unit can be specified with either of the two rotators, ie DR7500R is the smaller rotator with the round control whilst DR7500X is the same rotator, but with the preset control unit.

DAIWA ROTATOR SYSTEMS

DR7500X £98 inc VAT
DR7500R £108 inc VAT
DR7600X £135 inc VAT
DR7600R £144.90 inc VAT

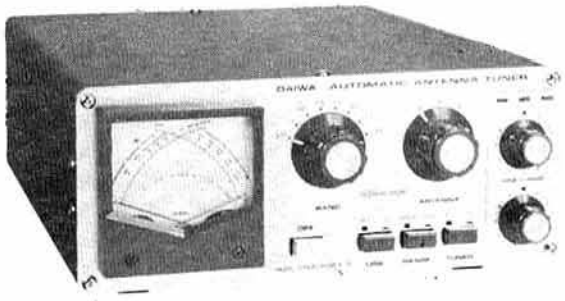
The new CNA1001A antenna tuner from Daiwa has already changed the whole concept of antenna tuning in the amateur radio station. No longer do you have to fiddle with this control and that control in order to reach a match condition, simply push a button and let the tuner do it for you.

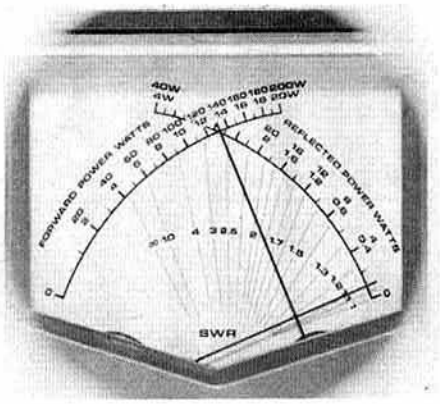
The CNA1001A incorporates a sensitive reflected power detector which monitors SWR all the time. At the first push of the operate button, a motor driven gearbox drives the load and match variable capacitors through their entire range in overlapping small increments seeking a correct match. When matching is achieved, the motor drive stops and that's that. The CNA1001A needs only a small sniff of RF to work on (typically 5 watts) so you needn't worry about blowing up your PA, and it covers all the current and future amateur bands from 3–30MHz, includes switching for two antenna systems, a 10 watt (50 watt 1 minute) dummy load and best of all includes a cross needle power and SWR meter.

This section measures power from 0–200W in two ranges and reflected power from 0–40W together with the unique Daiwa cross pointer SWR system. All this in one compact unit requiring only 12V dc to drive the tuning motors.

DAIWA CNA1001A ANTENNA TUNER

£129.95 inc VAT. HIGH POWER MODEL CN2002 £190 inc VAT





WHAT DO YOU KNOW ABOUT DAIWA CROSS POINTER POWER METERS?

Until recently, the in-line measurement of RF power and SWR involved calculation or the use of two instruments. Now, DAIWA have introduced a range of power meters which provide an elegant solution to the whole problem of RF measurements. Utilising two toroidal current transformers to detect true forward and reflected power, and feeding the outputs to a twin movement meter with crossed pointers, it is now possible to measure forward power (LH scale), reflected power (RH scale) and SWR (where the pointers cross) at a single glance. The photograph shows 130W forward power, 1W reflected, and an SWR of about 1·2 to 1. The DAIWA CN series power meters represent the ultimate power meter for the professional and amateur alike, and are indispensable in the fully equipped station. Three models are currently available covering frequencies right up to 2·5GHz so there's one for you whatever your interests.

CN620A	1·8–150MHz up to 1kW	£52.81 inc VAT
CN630	140–450MHz up to 200W	£71.00 inc VAT
CN650	1·2–2·5GHz up to 20W	£95.00 inc VAT

SENSOR

CORDLESS MICROPHONE

CONTROLLER & CHARGER

DAIWA INDUSTRY CO., LTD.

DAIWA INFRA-RED MOBILE MIKE £45.00 inc VAT carr £1.00

DISTRIBUTED IN THE UK BY LOWE ELECTRONICS LIMITED

LOWE ELECTRONICS

CHESTERFIELD ROAD MATLOCK TEL 0629 2817

TRIO *the new synthesized 430 MHz FM mobile transceiver.*

TR-8400 *70 cm is on the move*

SYNTHESIZED DESIGN
Covers 430-440MHz in 25kHz steps. Channel bandwidth is 10MHz.

FIVE MEMORIES
Four of the five memories may be operated in simplex mode or the transmit frequency may be offset ± 1.6 MHz with the offset switch to access most repeaters. The fifth memory stores both receive and transmit frequencies independently, for operation on repeaters with non-standard splits (as well as standard repeater and simplex operation). A memory back-up terminal is provided on the rear panel.

TWO VFO'S
Convenient for switching quickly from repeater to simplex portions of the band, or to any particular frequency selected by either VFO.

OFFSET SWITCH
Allows four of the five memory frequencies and both VFO frequencies to be offset ± 1.6MHz (or operated simplex) during transmit mode, for repeater access.

MEMORY SCAN
Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone push-to-talk switch cancels the scan function.

AUTOMATIC BAND SCAN
Scans 430-440MHz in 25kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone push-to-talk switch cancels the scan function.

UP/DOWN MICROPHONE PROVIDED
Included with the TR-8400 is an UP/DOWN microphone for manually scanning 430-440MHz in 25kHz steps, allowing easy frequency changes while driving.

VERY COMPACT AND LIGHTWEIGHT
Truly a "miniature" mobile transceiver, the TR-8400 measures only 147.5 (5.9)W, 51.5 (2.1)H and 193 (7.7)D and weighs only 1.5kg (3.3lbs). Such a small package is easy to mount in any car.

FOUR-DIGIT FREQUENCY DISPLAY
A four-digit LED display indicates receive and transmit frequencies.

S/RF LED BAR METER
Received signal level and relative RF output are indicated on a multicoloured, eight-segments, LED bar meter.

LED MODE INDICATORS
Three front-panel LEDs indicate BUSY channel, ON AIR, and REPEATER offset.

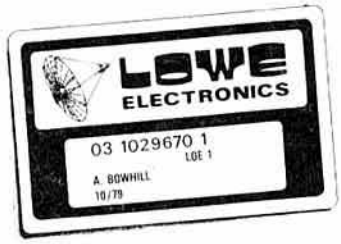
TONE BURST SWITCH
The TONE BURST switch activates the accurate 1750Hz repeater access tone oscillator.

HI/LOW POWER SWITCH
RF output power can be switched from 10W to 1W.

TR-8400 £279.00 inc VAT
CARRIAGE BY SECURICOR £4.50

THE WAY TO HAVE TOMORROW'S EQUIPMENT TODAY

WRITE FOR FULL DETAILS TODAY



FOR ALL THAT'S BEST IN AMATEUR RADIO CONTACT US AT MATLOCK

HEAD OFFICE AND SERVICE CENTRE
CHESTERFIELD ROAD, MATLOCK, DERBYS. TEL: 0629 2817 or 2430. TELEX: 377482. OPEN TUES-FRIDAY 9-5.30, SAT 9-5
CLOSED FOR LUNCH 12.30 TO 1.30

For personal attention on the South Coast contact John, G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Ringmer 812071.
For equally helpful attention in Scotland contact Sim, GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771 0364.

SEND 48p IN STAMPS FOR COMPLETE CATALOGUE AND ANTENNA BOOK.
PLEASE SPECIFY ANY PARTICULAR INTEREST AND WE WILL SEND FULL INFORMATION

Thanet Electronics
for ICOM
the amateur's professional friends

This month we are showing you:

IC-451 UHF Base Station
IC-720A – ICOM's new 9 band HF Transceiver.
Theta 7000E – An outstanding communications computer.
IC202S – A pair of magnificent sideband portables.
IC402

On these, and all our other products:

* we offer a full year's warranty on all parts and labour
* Free delivery for all transceivers, using registered first class post

IC2E – Probably the smallest made, extra sensitive handy talkie.
IC251E – Must be the best value in 2M base stations.
IC255E – A great value 25W mobile transceiver.
IC260E – The ideal choice for multimode mobile.

* All prices including V.A.T.
* H.P. and Part Exchange welcome.

IC-451 UHF Base Station

£579 inc. V.A.T.

ICOM are proud to announce the introduction of the 70cm version of their famous 2m base station – the IC-251. Of course, it is engineered to the usual high ICOM standards and includes such features as:-

* 3 memory channels
* Automatic repeater shift on switch-on
* Additional selectable shift for European DX
* Selectable channel steps for FM (supplied with 25KHz – others are diode programmable)
* Full power control on SSB/CW/FM
* Superb receiver performance using MOSFETS
* Multipurpose scanning
* Covers 430-440 MHz
* Xtal controlled Toneburst
* Cool running chopper power supply

Also available from our shop in Herne Bay are:

* MICROWAVE MODULES
* J-BEAM
* RSGB PUBLICATIONS
* WESTERN
* G-WHIP
* BEARCAT
* ANTENNA SPECIALISTS
* YA ESU MUSEN
* VIDEO GENIE COMPUTERS

IMPORTANT

We would like you to phone, or write to us so that we can give you as much detailed information as possible on any particular product. Use our 24 hour ansafone when calls are cheap.

SEND FOR TECHNICAL DETAILS

Thanet for ICOM

143 RECULVER RD., BELTINGE, HERNE BAY, KENT. Tel: 02273/63859

BARCLAYCARD VISA

All over the World they haven't been able to get enough!

(But things are getting better)

ICOM's new 9-band HF Transceiver – the IC-720A beats the lot!

IC-720A
£795 incl

Some features.

- 9 Bands Top to Ten including new ones!
- General Coverage Receiver – 100KHz to 30MHz.
- Tuning down to 10Hz steps – YES! 10Hz – yet stable as a rock!
- Built-in Speech Compressor which really gets excellent reports.
- The famous ICOM Band Pass Tuning.
- Memory – it even does all the band changing for you.
- Self cancelling RIT.
- 3 rates of Tuning.
- Two Independent VFOs (in band duplex possible).
- 100 W Output.
- Modes AM, SSB, CW and RTTY.

A lot in a small packet for £795 inc. VAT (13.6V operation – matching mains PSU £100)

- Solid State 500W linear available shortly.

FOR ONLY £640.00 INCL.

Tono Theta 7000E A great computer on offer from Thanet

The new THETA 7000E means that every Amateur can enjoy the visual display of CW, RTTY and ASCII in both transmit and receive modes. Just connect the TONO to any TV set via the antenna terminals or to a page printer from the parallel port provided. Bring up your CW speed in receiving or sending by either watching receiver sent or from recorded cassettes. Connection to the transceiver is via the key, phone and mic sockets.

Some of the Outstanding Features
COMMUNICATIONS COMPUTER THETA 0-7000E

UHF and Composite Video Output * Printer interface * Wide range of transmitting and receiving speeds – 10CW speeds + 8RTTY * Built-in demodulator for high performance for 170, 425 and 820 Hz shift * Crystal controlled modulator for ASFK – Hi or Lo tone * Convenient ASCII key arrangement * Large capacity display memory – 2 pages 32chr x 16 lines split screen for Rx & Tx if required * Automatic transmit/receive switch * Anti-noise circuit * Battery backed-up memory 7 channels of 64chrs * Send function * Buffer memory – 53 character type ahead, rub out function * Simultaneous access of the memory – 53 character type ah
LF (line feed) cancel function * Cursor control function * Word mode operation * Automatic CR/LF (72, 60 or 80 chrs per line) * Echo function * Word Wrap around function * Transmit/receive in ASCII mode or RTTY * CW indentification function * Mark and break (space and break) system * Monitor circuit & CW practice function * Variable CW weights * Cross pattern checking output terminal * Log computer output provided * Test message function (Ry and QBF).

Phone or write for the price list of accessories for this unit.

IC-202S
£169 INCL.

What a tremendous pair

The IC-202S is a very well designed 2m SSB portable. It offers: 3W pep output on USB, LSB and CW. * Large Battery capacity (HP11 type) or Nicads if you wish * A special VXO circuit to provide smooth tuning and crystal stability needed for SSB operation on 2m * Each of the four 200kHz band positions allows operation anywhere in 2m. (Supplied with 144-144.2 and 144.2-144.4) * Top of the band Oscar xtals available for "cross-pond-working" * It has a DC socket and SO239 sockets for mobile or base station working, barefoot or as a prime mover * Mobile mounting brackets, Nicad packs, chargers, cases all available options. You must agree, a very versatile well proved rig.

Their versatility is well worth an enquiry.

IC-402
£242 INCL.

The 70cm twin of the 202S having very similar features, covering the frequency range of 432-435.2 MHz.

SEND FOR TECHNICAL DETAILS

Thanet for ICOM

TELEX: 965179

ICOM in small packages

IC-2E Handy Talky £159 INCL.

CHECK THE FEATURES

FULLY SYNTHESIZED – covering 144-145.995 in 400 5kHz steps.
POWER OUTPUT – 1.5W with the 9V rechargeable battery pack as supplied – but lower or higher output available with the optional 6V or 12V packs.
BNC ANTENNA OUTPUT SOCKET – 50 ohms for connecting to another antenna or use the Rubber Duck supplied.

SEND/BATTERY INDICATOR – Lights during transmit, but when battery power falls below 6V it doesn't light indicating the need for a recharge.
FREQUENCY SELECTION – by thumbwheel switches, indicating the frequency.

+5kHz SWITCH – adds 5kHz to the indicated frequency.
DUPLEX SIMPLEX SWITCH – gives simplex or plus 600kHz or minus 600 kHz Transmit.
HI-LOW SWITCH – reduces power output from 1.5W to 150mW reducing battery drain.
EXTERNAL MICROPHONE JACK – If you do not wish to use the built-in electret condenser mic an optional microphone/speaker with PTT control can be used. Useful for pocket operation.
EXTERNAL SPEAKER JACK – for speaker or earphone.
This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck.

IC2E OPTIONS

BATTERY PACKS

ICBP3	9 VOLT PACK (AS FITTED) REPLACEMENT	£15.50
ICBP2	(7.2 VOLT) (1 WATT)	£22.00
ICBP4	EMPTY CASE (WILL TAKE SIX 'AA' SIZE NI-CADS)	£5.00
ICBP5	11 VOLT PACK (2-3 WATTS)	£30.50

CHARGERS ETC

IC-DC1	9 VOLT REGULATOR PACK	£7.50
IC-CP1	CAR CHARGER LEAD WITH CIGAR PLUG	£2.75
IC-BC25	CHARGER FOR BP3 AS SUPPLIED	£3.70
IC-BC30	DESK TYPE FAST CHARGER FOR ALL NI-CAD PACKS	£34.00

It will seduce you in its own way the ICOM IC 251E

only £479 INCL.

SEND FOR TECHNICAL DETAILS

Thanet for ICOM

for only £255 INCL.

IC-255E An experts mobile choice

NOW WITH IMPROVED FRONT-END

25 Watts — 5 Memories — Scanning — 600kHz
AND User Selectable Repeater Shift — Full Coverage in 5kHz or 25kHz Steps.

- Crystal controlled Tone Burst
- Full band coverage — extendable to 148MHz if required
- Four digit LED display
- 25 Watts output or 1W low power
- A superb receiver using grounded gate FET front end
- Scanning over a user programmable range
- Memory scan
- Stop on empty or busy channels
- Tuning in 25kHz or 5kHz steps
- 5 Memories — retained while the power is connected to the rig
- Built-in 600kHz Repeater Shift
- Alternative programmable shift
- Reverse Repeater facilities
- RIT (± 3kHz for those off channel stations)
- Scan control from the microphone (optional mic available)
- Good loud audio
- Optically coupled tuning between control knob and CPU
- Multiway 24 pin socket on back for touchpad, computer, or external control
- Rugged modular PA (Guaranteed of course!)
- Mobile mount which can be padlocked
- Up-down scanning microphone available

CAN YOU RESIST SUCH A TEMPTATION

Enjoy VHF mobile at its best-IC-260E

The IC-260E offers such extras as full frequency read out, upper and lower sideband, and scanning as well as FM and CW. Thus, it makes an ideal base station, when used with a DC power supply, as well as a mobile. Now supplied with up-down scanning mic.

£339 INCL.

SEND FOR TECHNICAL DETAILS

AGENTS (PHONE FIRST — All evenings and weekends only, except Burnley)

Scotland	Jack GM8GEC (031-665-2420)	Midlands	Tony G8AVH (021-329 2305)
Wales	Tony GW3FKO (0874 2772)	North West	Gordon G3LEQ (Knutsford (0565) 4040)
Burnley	(0282 38481)		

BARCLAYCARD VISA

DATONG ELECTRONICS LIMITED

...and the beauty isn't just skin deep!

Multi-mode Audio Filter — Model FL2

Adds variable selectivity to existing communications receivers without internal modifications. Gives extremely sharp pass-band edges for truly exceptional filtering performance on all modes but especially for SSB. Its 10 poles of fully variable low and high pass filtering **give sharper filter edges even than normal crystal filters**. A separate manually tuned notch filter is also fitted. In "cw" mode all 12 poles of filtering are combined to give exceptional skirt selectivity.
Connects in series with loudspeaker.

General Coverage Converter — Model PC1

Model PC1 converts any good two metre SSB receiver or transceiver into a **superb general coverage communications receiver.** Coverage is 0 to 30 MHz in thirty synthesised bands of 1 MHz and no receiver modifications are required.
Advanced **parametric mixer** and **LS1 frequency synthesiser** ensure that the overall performance is limited only by that of the main receiver.
Also usable with 28-29 MHz receivers via a conventional 2-metre converter.

Automatic r.f. Speech Processor — Model ASP

Makes your transmitted speech louder and clearer for a given transmitter power. The 'Rolls-Royce' of r.f. speech processors Model ASP **adjusts itself to suit your voice level** and your microphone. Simply select the degree of r.f. clipping in steps of 6 dbs. Connects in series with microphone.

The Answer to the Morse Test. Model D70
The Datong Morse Tutor (Model D70) is your passport to a full licence. Compact, with internal battery and speaker plus personal earphone it provides unlimited random morse for practice.
With Model D70 you can practice morse anywhere, anytime, and at your own pace.
With the Morse Tutor practice becomes a pleasure because you get results quickly.

Active Receiving Antennas — **Models AD270, AD370**
Ultra-compact receiving antenna systems giving wideband coverage from 200kHz to over 30MHz at high sensitivity.
Models AD270 and AD370 give **similar receive performance to large conventional antenna systems yet are only 3 metres in overall length.** The balanced dipole configuration also gives good rejection of local interference.

Model AD270 (an upgraded version of Model AD170) is for indoor mounting.
Model AD370 is waterproofed for outdoor use. Model AD370 & AD270 head units only are also available separately for upgrading earlier AD170 systems.

Model D75 RF Speech Processor
Model D75 uses the same method of r.f. clipping as in Model ASP but features manual adjustment of input level rather than the automatic system used in Model ASP.

Like all our r.f. clippers the unit helps your speech signals stand out from the next under DX conditions. Many users consider the use of our r.f. clippers more effective than a linear.

MODEL FL1 Frequency-agile Audio Filter
As unique now as when we first invented it, model FL1 is still the only audio filter which is able to automatically notch out an interfering heterodyne from SSB speech signals. This ability provides the perfect answer to those who "tune up" on occupied channels. As a cw filter it is surpassed only by our new Model FL2. Independent control of bandwidth and centre frequency gives beautifully smooth adaptability to varying conditions.

INGENIEURBÜRO ULRICH HANSEN

VHF & UHF PREAMPLIFIERS: A new range from Ulrich Hansen of West Germany
Everyone agrees that VHF receivers should have a low noise figure, and converter and receiver makers compete to announce the lowest possible figure. But really the most important thing is not the noise figure of the receiver but that of the receiving system as a whole.
If your coaxial feeder has a loss of 3 dbs, for example, your overall noise figure is automatically increased by the same factor. This makes the search for the last fraction of a db at the receiver look a bit academic.
Ingenieurbüro Ulrich Hansen in Germany has introduced a range of in-line preamplifiers which allow you to put a very low noise preamplifier right at the antenna. This way feeder loss does not degrade the system noise figure.
The improvement on weak signals can be dramatic.
All the products in the Hansen range are built to very high standards and no compromises are made which would degrade the achievable noise figure.
The top-of-the-line units use gallium arsenide FET's to give remarkably low over-all noise figures (as low as 0.3 dbs at 2 m and 0.5 dbs at 70 cms).
In addition most units incorporate relay switching to bypass the preamplifier while transmitting.
Our new short form data sheet on these products is available free on request.

Products not shown in this advertisement
Model Datest 1 Transistor Tester
Model Datest 2 Transistor Tester
Model RFC/M.R.F. Speech Processor PCB Module
Model MPU, Mains Power Unit.
Accessory Leads.

Very Low Frequency Converter Model VLF
If your communications receiver gives poor results below 500 kHz Model VLF is the answer. It also adds MW and LW coverage to amateur bands – only receivers for news, time checks etc. It connects between antenna and receiver input, and converts signals from 0 to 500 kHz to the range 28 to 28.8 MHz with low noise and high sensitivity. Useable to 1 MHz with reduced sensitivity.

NEW PRODUCT — **Available shortly** – a dual purpose 2 metre converter with 3SK88 input stage and high level Schottky mixer. Designed for full compatibility with Model PC1, the new unit makes an excellent stand-alone 2 metre converter for 28-30 MHz receivers, or, when used with Model PC1 (see above), it adds full 0-30 MHz general coverage reception to a 28-29 MHz receiver.

PRICES: All prices include delivery in U.K. basic prices in £ are shown with VAT-inclusive prices in brackets.

FL1	59.00 (67.85)	AD270	33.00 (37.95)
FL2	78.00 (89.70)	AD370	45.00 (51.75)
PC1	105.00 (120.75)	AD270 + MPU	
ASP	69.00 (79.35)		37.00 (42.55)
VLF	22.00 (25.30)	AD270 + MPU	
D70	43.00 (49.45)		49.00 (56.35)
D75	49.00 (56.35)	MPU	6.00 (6.90)
RFC/M	23.00 (26.45)		

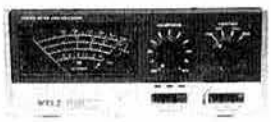
DATONG ELECTRONICS LIMITED

Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE, England. Telephone: (0532) 552461

WATERS & STANTON ELECTRONICS

18/20 MAIN ROAD, HOCKLEY,
ESSEX. Tel: (0702) 206835

WELZ PROFESSIONAL POWER/SWR METERS 1·8MHz–500MHz



All that you could wish for in a meter. 2·5 watts F.S.D., a completely flat response and a directional characteristic of over 30dB. We reckon it's better than the "BIRD".

Model SP200 Price £49.95 1·8 160MHz
Dual antenna selector
Power range 20W/200W/1kW

Model SP300 Price £69.95 1·8 500MHz
Triple antenna selector
Power range 20W/200W/1kW

Model SP400 Price £49.95 130MHz 500MHz
Single antenna selector
Power range 5W/20W/150W

SIMPLY THE BEST!

SR9 VHF RECEIVER AMATEUR/ MARINE £46 inc. VAT

The SR9 must be one of the most popular monitors for 2 metre amateur radio enthusiasts. (Also available as a marine version at the same price). It is fully tuneable across the band with the option of also installing up to 11 xtal controlled channels. Power requirements are 12V DC negative earth at 200ma approx. The unit comes complete with mobile mounting kit and built-in speaker.

PROFESSIONAL AIRCRAFT MONITOR R517 £49.50 inc VAT

(as supplied to pilots, ground crew etc.)

The R517 is a professional aircraft monitor receiver, having superb sensitivity and capable of tuning across the entire aircraft band 118-143MHz. For easy tuning there is both a coarse and fine tuning control. In addition there is a 3 position switch for selecting xtal controlled channels (xtals £3.00 extra) for your local airport. The unit is completely portable running off self-contained batteries.

AR22 VHF FM MONITOR OUR PRICE £83 inc. VAT

Truly amazing! The AR22 tunes across the 2 metre FM band 142 to 148MHz (also includes Police and Fire Brigade) in 5kHz steps. So small it will fit into a shirt pocket and yet nothing is sacrificed in terms of performance. Price includes rechargeable batteries, mains charger, fly serial etc. You won't find a smaller monitor anywhere.

FDK MULTI-700EX 2m 25W OUTPUT FM.

FULLY SYNTHENSIZED **£199 inc VAT**

Here's a no nonsense 2M FM transceiver that's ideal for both base or mobile operation. Although costing less than £200 it has features to match any of its competitors in performance and yet it's up to £60 cheaper! 1 to 25 watts power out, 25/12½kHz steps, crystal controlled tone-burst, reverse repeater, priority channels, and plug in modules are just some of its features. Fully synthesized across the band 144-146MHz this is the rig that gives you everything you could ever need on 2M FM. It comes complete with mobile mic, bracket, DC leads etc and a 12-month guarantee.

FDK MULTI-750E 2m 10W ALL-MODE

144–146MHz or 144–148MHz **£299 inc VAT**

Five years ago it would have been impossible, but today it's here—a self contained, all mode 2 metre station in a box the size of an FM mobile. The M750E offers the very best value in multi-mode equipment, having all the features of its competitors but at a very attractive price. Fully synthesised, it covers 144-146MHz (144-148MHz optional) in either 5kHz or 100Hz steps with programmable dual vfos for instant QSY. Repeater shifts are front panel selectable and the tone burst is crystal controlled. A remote control microphone is included together with mobile mounting bracket, DC leads, etc and a 12-month guarantee.

FDK PALM II HAND-HELD

£89.95 inc VAT

1 watt FM 6 channels

The FDK Palm II must surely represent the very best value in 2 metre hand helds. A complete station that fits in the palm of the hand for just £89. And this price includes aerial, ni-cads, charger, DC cables, etc. plus channels S20 and S22. Over 1 watt output and with 6 channel capability, it is ideal for the man on the move. The BNC aerial socket enables an external aerial for base or mobile to be fitted and the cigar lighter cable enables it to be plugged directly into the car 12V system. For repeater operation, a 600kHz is built-in and an optional tone-burst module is available for £10. We can't think of a better deal!

PS134 4 AMP 13·8V POWER SUPPLY. STABILISED & SHORT CIRCUIT PROOF £23 plus £1.50 p&p inc. VAT

This is the power supply that we've been advertising and selling for several months. It really is a robust little unit with a transformer 50% larger than its competitors. Some cheap power supplies get hot, hum and even go bang! This one stays silent and keeps on working. It is fully protected against short circuit and overload and is capable of delivering 4 amps continually at 13·8V DC. Ideal for transceivers.

SWR/POWER/FIELD STRENGTH MEASURING METER SPECIAL OFFER

£11.50 inc VAT + 50p p&p

As used by CB and Amateur radio operators. The YW3 is used by amateur radio and CB operators around the World. It's offered to you at a really low price because we import them direct from Japan. It tells you the VSWR, power output and field strength and covers 3·5 to 150MHz. If you want the strongest signal in town—you'll find the YW3 the sure answer.

AZDEN PCS-3000 144MHz FM
PCS-2800 28MHz FM

FITS IN PLACES OTHERS WON'T

144MHz £199 inc VAT
28MHz £169 inc VAT

A new name in the UK but not in Japan. Since 1953 Azden have been producing products for their home market but now their new range includes products for Europe. The first to arrive is their 2m FM transceiver model PCS3000. This covers 144-146MHz in 25 or 12½kHz steps. Power output to 25 or 5 watts but here its similarity with its competitors ends. If you have a space problem, the PCS3000 should fit the bill. The detachable control head measures "2½" deep, enabling the main unit to be tucked away out of sight. The computer linked key pad has up to 8 memories and features memory scan, band scan, repeater shift and priority channel select. Included in the package is an up/down microphone plus optional remote volume control. All in all a really versatile transceiver at a most realistic price.

STOP PRESS—SEND 14p STAMP FOR NEW 1981 CATALOGUE ON RADIO COMMUNICATIONS

MAIL ORDER SLIP to: Waters & Stanton Electronics, Warren House, Main Road, Hockley, Essex.

Name ..... **Goods required** .....
Address .....
.....
.....

Please rush me the above. Cheque enclosed for £ ..... **/Please charge to credit card No** .....

AMATEUR RADIO CENTRE OF THE SOUTH—well worth a visit

MAIL ORDER SLIP ON PAGE 109

Base mount single hole fixing + 3m cable	4.50(.50)
AERIAL ROTATORS (complete with control boxes)	
CDE AR30 (5 core cable)	47.00(1.50)
CDE AR40 (5 core cable)	59.80(1.50)
Channelmaster 9502 (3 core)	42.00(2.00)
Sky King SU4000 (6 core)	75.00(2.50)
Jaybeam KR400 (6 core)	105.00(2.00)
CDE alignment bearing	7.75(1.00)
Channelmaster alignment	11.75(1.00)
HF ANTENNAS (various manufacturers)	
Mini-Products HQ-1 20/15/10m 2 el	96.50(2.50)
Mini-Products C4 20/15/10m vert dipole	48.50(2.00)
Mosley TD3JR 20/15/10m wire dipole	34.50(1.50)
Mosley "Mini-Beam" 20/15/10m 2 el. 600W	99.00(2.00)
Mosley "Mini-Beam" 20/15/10m 2 el. 2kW	129.00(2.00)
Mosley TA32 20/15/10m 2 el.	89.70(2.00)
Mosley TA33 20/15/10m 3 element	133.40(2.50)
Mosley Mustang 20/15/10m 3 element 2kW	166.75(4.00)
Hy-Gain 12AVQ 20/15/10m vertical	43.00(2.00)
Hy-Gain 14AVQ 40-10m vertical	60.00(2.00)
Hy-Gain 18AVT/WB 80-10m vertical	87.00(2.50)
HF5 80-10m vertical 200 watts	48.00(2.00)
Radial Kit for HF5	28.00(2.00)
Sagant EL40X 80-40 Balun fed dipole (79')	36.00(1.50)
Jaybeam TB3 HF 3 element Tribander	167.90(4.50)
Jaybeam VR3 HF Vertical Triband	42.50(3.00)
DENTRON	
MLA2500B 6 band 160-10m 2kW linear	695.00(n.c.)
Clipperton-L 6 band 160-10m 2kW linear	459.00(n.c.)
DTR-1200L 5 band 80-10m 1·2kW linear	t.b.a.(n.c.)
GLA-1000B 5 band 80-10m 1kW linear	295.00(n.c.)
DTR-3KA 1·8-30MHz ATU/2kW	t.b.a.(n.c.)
MT-3000A 1·8-30MHz ATU/3kW	275.00(n.c.)
AT-1K 1·8-30MHz ATU/1kW	99.00(n.c.)
HF200A 80-10m transceiver 10W AC PSU	399.00(n.c.)
Spare set of D50A tubes	24.00(n.c.)
All band Doublet 1·8-30MHz + 470Ω feeder	22.50(2.00)
100ft 470Ω semi-air spaced feeder	22.00(2.00)
ADONIS MICROPHONES	
AM202G Mobile safety mic	20.95(n.c.)
AM202S Mobile safety mic	20.95(n.c.)
AM202H Mobile safety mic	29.00(n.c.)
AM502G Base station compressor mic	39.00(n.c.)
AM802G Base station compressor mic	59.00(n.c.)
SEM	
2m power amplifier/pre-amplifier 5/30W	50.00(1.00)
2m power amplifier/pre-amplifier 16/50W	66.70(1.50)
2m power amplifier/pre-amplifier 16/100W	126.50(1.50)
2m converter	23.00(.35)
2m Auto switching pre-amplifier	21.73(.35)
70cm Auto switching pre-amplifier	24.73(.35)
2m pre-amplifier	14.95(.35)
70cm pre-amplifier	17.73(.35)
2-40MHz pre-amplifier auto switching	18.66(.35)
2-40MHz pre-amplifier	11.73(.35)
PA3 miniature 2m pre-amplifier	8.00(.35)
PA70 miniature 70cm pre-amplifier	10.00(.35)
Z Match Aerial tun unit 1·8-30MHz 500W	47.15(1.50)
EZITUNE Aerial tuning aid	30.48(.75)
IAMBIC Keyer	34.50(.75)
2 METRE PORTABLES	
SB2M 2m SSB portable	99.00(1.50)
AR245 2m FM synthesized handheld, 5W	178.00(1.50)
AR245 carrying case	4.10(.50)
AR245 optional helical	4.10(.50)
AR245 12V DC car adaptor/charger	4.10(.50)
VHF/UHF MONITORS	
TM56B FM Scanner 4 + 12 channels	79.00(n.c.)
Sound Air 008 8 channel FM monitor	69.00(n.c.)
Sound Air M161 16 channel FM monitor	59.00(n.c.)
MF083 Marine or Amateur + 3 FM broad.	85.00(n.c.)
BEARCAT 220FB VHF/UHF	258.00(n.c.)
SX200 VHF/UHF	240.00(n.c.)
SR9 Tuneable 144-148 or 156-162MHz	46.00(n.c.)
AR22 2m FM pocket synthesized handheld	83.00(n.c.)
AR22 flexible antenna	3.00(n.c.)
VHF/UHF MOBILE AERIALS	
ASP201 2m ¼ wave with base	3.50(1.25)
ASP2009 2 5/8th wave with base	9.25(2.00)
ASP3009 2m 5/8th wave with base	9.75(2.00)
ASP462 70cm co-linear with base	8.25(1.25)
Magnetic base adaptor	8.50(.75)
ASP677 2m 5/8th wave	14.95(2.00)
ASP667 70cm co-linear	17.95(1.25)
ASPM125 27MHz ¼ wave	18.50(2.00)
Magnetic base adaptor	8.50(.75)
ASP 'no hole' boot mount adaptor	3.75(.50)
2NE 2m 7/8th mobile whip	13.00(2.00)
RG4M Base for above aerial	3.50(.75)
GSS Heavy duty gutter/boot mount	3.15(.50)
MB5 Magnetic mount with 5m coax	7.95(1.00)
10SE 28MHz whip 1·72m long	11.50(1.25)
15SE 21MHz whip 1·72m long	11.50(1.25)
20SE 14MHz whip 1·72m long	13.80(1.25)
WELZ PROFESSIONAL POWER/SWR METERS	
SP200 1·8-160MHz 20W-200W-1kW	49.95(n.c.)
SP300 1·8-500MHz 20W-200W-1kW	69.95(n.c.)
SP400 130-500MHz 5W-20W-150W	49.95(n.c.)
SHORT WAVE LISTENER AERIALS	
3-30MHz Inverted "L"	9.95(1.00)
3-30MHz Broad band dipole	29.00(1.00)
Mosley RD5 all-band dipole	40.00(1.00)
AIR BAND PORTABLE MONITORS (see also VHF/UHF Monitors)	
SHARP FX213 tuneable receiver	13.50(.75)
INGERSOLL MW/FM/Airband monitor	12.95(.75)
R517 Tuneable + 3 Xtal controlled chan's	49.50(.75)
NAIGAI	
500W pep 2m amplifier	429.00(n.c.)
MISC STATION ITEMS	
SEIF 13·8V 4 amp AC power supply	22.95(1.50)
PS125 6 amp AC power supply	28.00(2.00)
EK121 Katsumi Electronic Keyer	29.00(.75)
EKM12 Matching side tone monitor	10.95(.50)
CW2A general purpose morse oscillator	6.95(.50)
Telegraph CW key (manual)	10.50(.75)
YW3 Twin SWR/Pwr/Field strength meter	11.50(.50)
MF210 Self powered 2M FM monitor	12.95(.50)
FX1 d/l station w/meter 700kHz-250MHz	28.00(1.00)
DM801 700kHz-250MHz dip meter	51.75(1.00)
Station log books	1.95(.50)
12BY7A driver valves	2.75(.50)
6146B/S2001A P.A. valves	8.70(.50)
6JS6C P.A. Valves Matched pairs	9.95(.50)
PL259 plugs	.63(n.c.)
PL259 reducers	.17(n.c.)
SO239 chassis sockets	.60(.10)
PL259 joiners	.85(.10)
N. Plugs. Silver plated UR67	2.00(n.c.)
N. Plugs. Silver plated UR43	2.00(n.c.)
4 pin mic plugs	.85(.10)
3 pin mic plugs	.85(.10)
6 pin mic plugs (FDK 750)	1.00(.10)
3 pin chassis socket	.85(.10)
4 pin chassis socket	.85(.10)
BNC plugs (bayonet)	.90(.05)
Pen Cell Ni-cads (HP7 size)	1.20(.05)
Cigar lighter plugs	.55(.10)
UR67 cable 50Ω per metre	.69(.10)
UR43 cable 50Ω per metre	.23(.05)
5 core rotator cable per metre	.30(.05)
BL40X balun 50Ω	11.25(.35)
3 core rotator cable. Per metre	.22(.05)
Ferrite rings 1⅛" diameter	.35(.05)
Mosley aerial insulators	.30(.05)
KX2 SWL aerial tuner 0·5-30MHz	29.90(1.50)
APM1 Audio Peak and notch filter	33.00(1.00)
HP3A TVI high pass filter (UHF T.V.)	3.50(.50)
Drake TV3300 LP Low Pass Filter	18.40(1.20)
Shure 444D high impedance desk mic	27.50(1.50)
Shure 201 high impedance hand mic	11.75(1.00)
Trio HCM10 Digital World Clock	55.20(1.50)

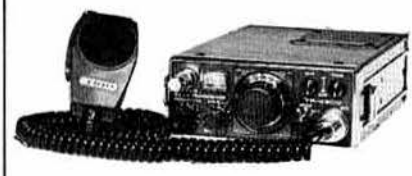
TRIO TS830S £639.52

A brand new model having all nine bands fitted and providing 200 watts input SSB/CW. Built-in 230V ac supply, 6146B tubes and full digital and analogue display. Plus a really comprehensive variable selectivity and notch filtering system. The DX'ers dream.

TRIO TS130S £491.05

Base or mobile this solid state HF transceiver covers eight bands SSB/CW with a genuine 100 watts output. No tune up, IF tuning and speech processing are just a few of its features. 12V dc operation with full digital display plus optional PS30 for 230V AC operation.

TRIO TR2300 £166.75



KING OF THE PORTABLES!

TRIO R1000 £285.20

The receiver that revolutionised short wave listening. Full 30 band coverage 200kHz to 30MHz SSB/CW/AM. Both digital and analogue readouts are provided together with 230V or 12V dc operation facilities. Trio engineering at its best and at a very competitive price.

TRIO TR9000 £345.00

An all mode 2 metre transceiver that serves the dual roll of mobile and base station. Features include digital readout, 12½ or 25kHz steps in FM, five memories band scanning and a lot more! Send for coloured leaflet.

TRIO TR7800 £268.00

The latest Trio 25 watt FM transceiver with a host of features that makes mobile operating a real pleasure. Built-in keypad, digital readout, 14 memories—the list of features is endless. Send a SAE for full details.

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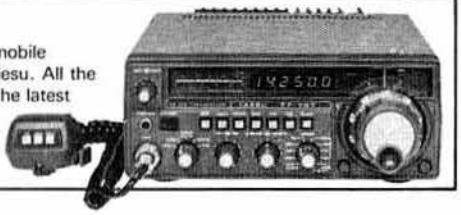
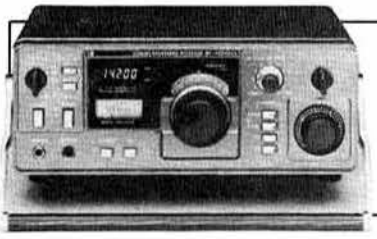
FT-707
The ultimate in HF mobile transceivers from Yaesu. All the new bands, and all the latest technology.
£499 inc. VAT



FT-101
Yaesu's '101' series HF base stations have earned an outstanding reputation for reliability over the years, and our 101s come complete with cooling fan and mic.
FT-101Z **£488** inc. VAT
FT-101ZD **£569** inc. VAT

FRG-7
Still the finest value-for-money communications receiver on the market at only
£185 inc. VAT and free Heliscan aerial worth **£15**



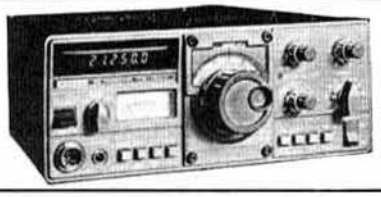
R-1000
Trio/Kenwood's successful new receiver with the PLL system that has proved so popular
£285 inc. VAT and free Heliscan aerial worth **£15**

FT-107M
Yaesu's solid state, broad band tuned HF transceiver, will operate into a 3-1 SWR and still bring in the DX
£690 inc. VAT

FRG-7700
Yaesu's latest receiver with FM right across the band and optional memory facility plus excellent filtering
£299 inc. VAT and free Heliscan aerial worth **£15** (Memory extra)

IC-720A
Icom's superb new HF rig with general coverage receive 100kc-30MHz plus transmit facility across its entire range for commercial purposes
£795 inc.VAT

TS-830S
Another Trio/Kenwood development of an existing best-seller . . . the TS-820 gives way to the TS-830S, now with all the new bands, notch filter, IF shift, etc
£625 inc. VAT



TS-130S
Trio/Kenwood take up where the successful TS-120 models left off with this new mobile HF transceiver with the new WARC bands
£479 inc. VAT

BEARCAT 220FB
The super scanner which brings you all the excitement of the VHF and UHF frequencies . . . aircraft, marine, amateur, plus so much more
£258.75 inc. VAT

FT-480R
Yaesu's new 2m all-mode mobile, already acclaimed as the pace-setter in its class
£359 inc. VAT **and FREE 5A POWER SUPPLY**

TR-9000
Trio/Kenwood's long-awaited entry into the 2m all-mode mobile field with 5-channel memory, twin VFOs etc
£342 inc. VAT

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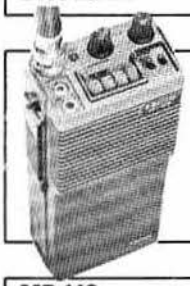
IC-202S
Still the most popular portable 2m SSB rig on the market, now up-rated by Icom to include USB and LSB
£169 inc. VAT

IC-240
Icom's ever-popular mobile FM transceiver, so simple to use with its 24-channel selection options
£169 inc. VAT

IC-255E
A really superior 2m synthesised mobile transceiver with 25W output, 5 memories, 2 VFOs, scanner, normal and reverse repeater, etc
£255 inc. VAT



IC-2E
About the smallest hand-held on the market, but with simplex and duplex over the full 144-146MHz range in 5kc steps, and giving a full 1·5W out
£159 inc. VAT

MR-1000A
The finest value pocket VHF scanning receiver ever offered. 10 channels, with scan or manual tune across selected crystal-controlled channels. Complete with Nicads and charger
£39 inc. VAT
(2m amateur band crystals **£2** per channel)

MR-110
VHF scanning receiver. 10-channel capability, with lock-out facility. Superb sensitivity. 12V only so ideal for mobile work
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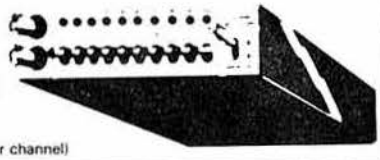
(2m amateur band crystals **£2** per channel)



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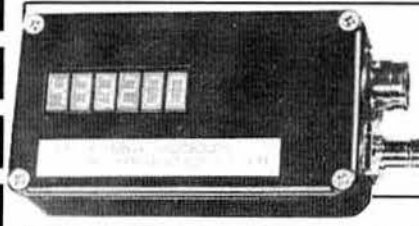
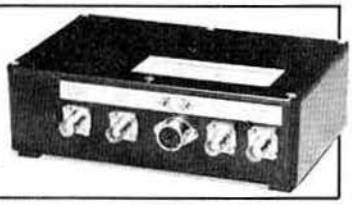


MMD 050/500
Pinpoint accuracy from this frequency counter covering from 0·050-500MHz in 2 ranges. 6 digit readout
£69.00 inc. VAT

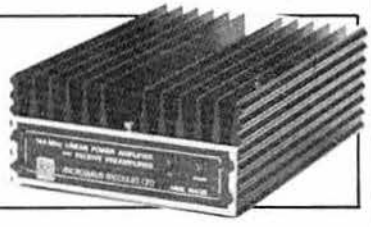
MMA-144V
Low-noise RF switched pre-amp for use in straight-through mode with up to 100W input.
£34.90 inc. VAT

MMT 432/144 2-70 Transverter **£184.00** inc. VAT
MMT 144/28 10-2 Transverter **£99.00** inc. VAT
MMT 28/144 2-10 Transverter **£99.00** inc. VAT



MML 144/25
RF amp for 2m. 2W in/25 out
£59.00 inc. VAT

MML 144/40
RF amp for 2m. 10W in/40 out
£77.00 inc. VAT



MML 144/100
A really powerful RF amp with pre-amp. 10W in/100 out
£142.60 inc. VAT

MM-2000
RTTY to TV converter. This complete terminal unit and TV interface only requires audio from receiver to display RTTY on TV
£169 inc. VAT

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AMATEUR ELECTRONICS UK

KEEP AHEAD WITH YAESU

FT902DM

YES INDEED, WHEN YOU BUY YAESU MUSEN EQUIPMENT YOU ARE BUYING THE VERY LATEST THAT TECHNOLOGY CAN OFFER IN THE FIELD OF AMATEUR RADIO AND THIS MONTH WE FEATURE BRAND NEW MODELS FROM YAESU WHICH INCORPORATE THE NEW WARC BANDS

THE FT-901DM HAS LONG BEEN CONSIDERED THE ULTIMATE IN HF TRANSCEIVERS AND NOW THE NEW FT-902DM MAKES ITS APPEARANCE, BRINGING ALL THE SUPERB FEATURES FOUND ON THE 901 AND GIVING THE ADDED BONUS OF THE NEW BAND FACILITIES. NO OTHER EQUIPMENT AVAILABLE ON THE MARKET TODAY CAN OFFER YOU THE PERFORMANCE OF THE 902DM—JUST LOOK AT THE FOLLOWING CONDENSED SPECIFICATION:

FT-902DM SPECIFICATIONS

GENERAL

Frequency coverage:
1·8–2·0MHz, 3·5–4·0MHz, 7·0–7·5MHz, 10·0–10·5MHz, 14·0–14·5MHz, 18·0–18·5MHz, 21·0–21·5MHz, 24·5–25.0MHz, 28·0–29·9MHz

Power requirements:
AC 100/110/117/200/220/234V, 50/60Hz; DC 13·5V, negative ground

Power consumption:
AC 117V: 70 watts receive (45 watts HEATER OFF), 320 watts max transmit; DC 13·5V: 5A receive (1·1A HEATER OFF), 21A max transmit

Size: 342(W) × 154(H) × 324(D) mm

Weight: Approx 18kg

TRANSMITTER

Emission:
LSB, USB, AM, CW, FM, FSK

PA input power:
SSB—180 watts PEP
CW—180 watts DC
AM, FM, FSK—80 watts DC

Carrier suppression:
Better than 40dB

Unwanted sideband suppression:
Better than 50dB @ 1,000Hz

Spurious radiation:
Better than 40dB below rated output

Transmitter frequency response:
300–2,700Hz (−6dB)

3rd order distortion products:
Better than 31dB below rated output

Stability:
Less than 300Hz drift from a cold start; less than 100Hz drift over a 30 minute period after warm-up

RF negative-feedback:
6dB at 14MHz

Modulation type:
SSB—balanced modulator; AM—amplitude modulation of a low power stage; FM—variable reactance frequency modulation, maximum deviation ±5kHz

Antenna output impedance:
50–75 ohms unbalanced

Microphone impedance:
500–600 ohms (low impedance)

RECEIVER

Sensitivity:
0·25μV for S/N 10dB

Image rejection:
1·8 21MHz—better than 60dB; 28MHz—better then 50dB

IF rejection:
Better then 70dB

Selectivity:
WIDTH control at "0"
SSB 2·4kHz (−6dB), 4·0kHz (−60dB); CW/FSK (with optional CW filter installed) 0·6kHz (−6dB), 1·2kHz (−60dB); AM (with optional AM filter installed) 6kHz (−6dB), 12kHz (−60dB); FM 12kHz (−6dB), 24kHz (−60dB)

Passband tuning:
Continuous from 300Hz to 2·4kHz

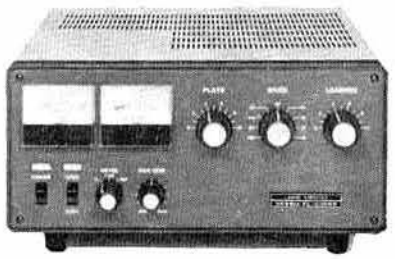
Audio output:
Better than 3 watts @ 10%
THD, audio output impedance 4–16 ohms

Access

Access or attractive H.P. terms readily available for on-the-spot transactions. Full demonstration facilities. Free Securicor delivery.

THE BRAND NEW FL-2100Z LINEAR AMPLIFIER, MATCHING IN STYLE OF COURSE TO THE FT-101ZD and FT-902DM, AND NOW INCORPORATING THE NEW WARC BANDS ALSO.

FL-2100Z ▶



HOW TO REACH US (EASY PRIVATE PARKING ON OUR 90ft FORECOURT)

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ¼ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.
FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.
FROM THE WEST AND SOUTH WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively leave M5 at junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

Hours: 9.30–5.30 Continuous including Saturdays—Early closing Wednesday, 1 p.m.

AMATEUR ELECTRONICS UK

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YAESU FT-101ZD (WARC)

HERE IS THE BRAND NEW FT-101ZD WHICH NOW COMES COMPLETE WITH THE NEW WARC BANDS AND RETAINS ALL THE SUPERB FEATURES WHICH HAVE MADE THIS THE FINEST VALUE FOR MONEY HF TRANSCEIVER EVER AVAILABLE TO THE DISCERNING AMATEUR

FT-101ZD SPECIFICATIONS

GENERAL
Frequency coverage:
160m 1·8-2·0MHz, 80m 3·5-4·0MHz, 40m 7·0-7·5MHz, 30m 10·0-10·5MHz, 20m 14·0-14·5MHz, 17m 18·0-18·5MHz, 15m 21·0-21·5MHz, 12m 24·5-25.0MHz, 10m 28·0-29·9MHz
Operating modes:
LSB, USB, CW, AM
Power requirements:
100/110/117/200/220/234 volts AC, 50/60Hz; 13·5 volts DC (with optional DC-DC converter)
Power consumption:
AC 117V: 75VA receive (65VA HEATER OFF), 285VA transmit; DC 13·5V: 5·5 amps receive (1·1 amps HEATER OFF), 21 amps transmit
Size: 345(W) × 157(H) × 326(D) mm
Weight: Approx 15kg

TRANSMITTER
PA input power:
180 watts DC (SSB/CW), 50 watts DC(AM)
Carrier suppression:
Better than 40dB
Unwanted sideband suppression:
Better than 40dB @ 1,000Hz, 144MHz
Spurious radiation:
Better than 40dB below rated output
Third order distortion products:
Better than −31dB
Transmitter frequency response:
300-2,700Hz (−6dB)
Stability:
Less than 300Hz in first 30 minutes after 10min warmup; less than 100Hz after 30 minutes over any 30min period
Negative-feedback: 6dB @ 14MHz
Antenna output impedance:
50-75 ohms unbalanced
Microphone input impedance:
500-600 ohms

RECEIVER
Sensitivity:
0·25μV for S/N 10dB (SSB/CW)
0·5μV for S/N 10dB (AM)
Selectivity:
2·4kHz at 6dB down, 4·0kHz at 60dB down (1·66 shape factor); Continuously variable between 300 and 2,400Hz (−6dB); CW (with optional CW filter installed); 600Hz at 6dB down, 1·2kHz at 60dB down, (2:1 shape factor)
Image rejection:
Better than 60dB (160-15 metres);
Better than 50dB (10 metres)
IF rejection:
Better then 70dB (160, 80, 209-10m);
Better than 60dB (40m)
Audio output inpedance: 4-16 ohms
Audio output power:
3 watts @ 10% THD (into 4 ohms)

LAST BUT NOT LEAST, HERE IS THE VERY LATEST IN RECEIVERS BY YAESU MUSEN—THE BRAND NEW FRG-7700 WHICH SETS NEW STANDARDS FOR GENERAL COVERAGE RECEIVERS, AND HAS FEATURES NOT FOUND ON ANY COMPETITIVE PRODUCT REGARDLESS OF COST. THIS IS TRULY A NEW BREAKTHROUGH IN RECEIVER TECHNOLOGY.

A NEW BREAKTHROUGH IN RECEIVER TECHNOLOGY!

Frequency coverage 150KHz-29·999MHz

The exciting new FRG-7700 GENERAL COVERAGE RECEIVER from YAESU MUSEN, the world's largest manufacturer of Amateur Radio equipment, will satisfy the demands of the most critical Short Wave Listener or Licensed Operator with its superb performance and incredible specification—just consider the following details:

MODES:
AM (fitted Narrow, Medium and Wide Filters). USB, LSB, CW and FM.
Memory option with 12 channels and automatic band selection.
CPU Digital Clock and Timer.
State-of-the-Art Noise Blanker.
FM Squelch Control.
Mains or Battery operation.
Digital and Analogue read-out.

FOR FULL DETAILS OF THESE NEW AND EXCITING MODELS, SEND TODAY FOR THE LATEST YAESU CATALOGUE AND LEAFLETS. ALL YOU NEED TO DO TO OBTAIN THE LATEST INFORMATION ABOUT THESE EXCITING DEVELOPMENTS FROM THE WORLD'S NO. 1 MANUFACTURER OF AMATEUR RADIO EQUIPMENT IS TO SEND 36p IN STAMPS AND AS AN ADDED BONUS YOU WILL GET OUR CREDIT VOUCHER VALUE £3.60—A 10 TO 1 WINNING OFFER

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REPUTATION

KWM-380

THE LATEST FROM THE
FAMOUS FIRM THAT
HAS CONTRIBUTED SO
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RADIO

TRIO'S ENTIRE RANGE
OF HF, VHF & UHF
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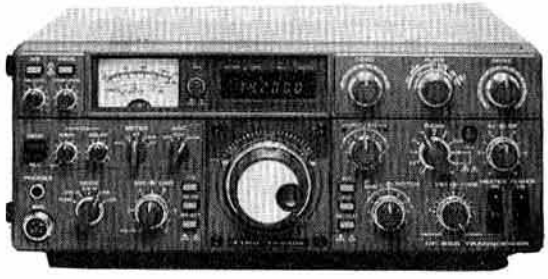

HUSTLER ★ HY-GAIN ★ TEN-TEC ★ MACROTRONICS ★ AVANTI ★ CDE ★ HAL
J-BEAM ★ FDK ★ KDK ★ TRIO ★ TRS-80

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Access

DRAKE ★ SALES ★ SERVICE

RADIO SHACK LTD. 188 BROADHURST GARDENS, LONDON NW6 3AY

BARCLAYCARD VISA

Giro Account No. 588 7151 Telephone 01-624 7174 Cables: Radio Shack, NW6. Telex: 23718

Whether you are just starting, taking an RAE course, just licensed, or an old-timer, SMC have something for you. Check out the new FT720 prices below and enquire about our sale items: FRG7000 and pre-WARC models of the FT101 and 901. Remember—our Yaesu prices INCLUDE A TWO-YEAR WARRANTY (and as Yaesu Musen UK Distributors our guarantee is factory-backed), include manufacturers serial numbers; and include Securicor Delivery of major items.

We take ACCESS and BARCLAYCARD over the 'phone, provide HP written quotations, upon application and offer a FREE FINANCE SCHEME on many regular priced items and have branches and agents conveniently situated across the country—plus the biggest mail order department right here in Totton.

SWL CORNER

FRG7 £199 inc.

0·5-30MHz General Coverage Receiver. 230V ac. 12V dc, + Battery pack. AM/SSB

FRG7000 £259 inc.

0·25-30MHz General Coverage Receiver. 230V ac Timer, Digital, AM/SSB

FRG7700 £309 inc.

0·15-30MHz General Coverage Receiver AM/SSB/CW/FM (Memory Version £389)

HF EQUIPMENT

		Net £	inc Vat £
FT7B			
FT7B	Transceiver mobile	346.96	399.00
YC7B	Digital readout	59.00	67.85
FP12	Power Supply	68.00	78.20
FT101Z			
FT101Z	Transceiver Analogue	425.00	488.75
FT101ZD	Transceiver Digital	495.00	569.25
DIG101Z	Readout module	75.00	86.25
DCT101Z	Invertor Kit	30.00	34.50
FV101Z	External VFO	106.00	121.90
FV901DM	Synthesized VFO	203.00	233.45
YD148	Desk Microphone	16.65	19.15
YE7A	Hand Microphone	5.00	5.75
XF89HC	CW Filter 600Hz	20.00	23.00
XF89HCN	CW Filter 350Hz	20.00	23.00
FC902	Antenna Tuner	110.00	126.50
YR901	CW/RTTY Reader	369.00	424.35
YK901	CW/RTTY Keyboard	100.00	115.00
MODR901	VHF TV Modulator	8.00	9.20
60MAR901	60mA loop kit	15.00	17.25
YVM1	Video Monitor	124.00	142.60
FV901(2)	Transvertor c/w 2m	229.00	263.35
430V107V901	70cm Module	153.00	175.95
50V107V901	6m Module	60.00	69.00
70V107V901	4m Module	75.00	86.25
YD901P	Monitorscope c/w pan	263.00	302.45
YD901	Monitorscope	230.00	264.50
PAN0901	Panadaptor kit	45.00	51.75
SP901P	Speaker c/w patch	45.00	51.75
SP901	Speaker external	25.00	28.75
FL2100Z	Linear Amplifier	315.00	362.25
FT707			
FT707S	Transceiver 10W	460.00	529.00
FT707	Transceiver 100W	395.65	455.00
FP707	Power Supply	95.00	109.25
FC707	Antenna Tuner	70.00	80.50
FV707DM	Digital VFO	162.00	186.30
MR7	Rack Unit	13.00	14.95
MMB2	Mobile Bracket	14.00	16.10
FRB707	Switching Box	19.00	21.85
XF89HC	CW Filter 600Hz	20.00	23.00
XF89HCN	CW Filter 350Hz	20.00	23.00
YM34	Desk Microphone	16.35	18.80
YM35	Tuning Microphone	11.00	12.65
YM36	Noise Cancel Mic	10.35	11.90
YM37	Fist Microphone	5.35	6.15
YM38	Desk tuning Mic	19.65	22.60
FTV107	Transvertor Frame	96.00	110.40
FTV107(2)	Transvertor cw 2m	180.00	207.00
144V107V901	2m Module	88.00	101.20
50V107V901	6m Module	60.00	69.00
430V107V901	70cm Module	153.00	175.95

		Net £	inc Vat £
FT107			
FT107M	Transceiver Digital	600.00	690.00
DMST107	Memory Module	76.65	88.15
FV107	External VFO	80.00	92.00
FC107	Antenna Tuner	89.00	102.35
FP107E	PSU/Speaker	93.00	106.95
FP107	Internal 12V PSU	85.00	97.75
FTV107	Transvertor Frame	96.00	110.40
FTV107(2)	Transvertor c/w 2m	180.00	207.00
144V107V901	2m Module	88.00	101.20
50V107V901	6m Module	60.00	69.00
430V107V901	70cm Module	153.00	175.95
SP107P	Speaker c/w patch	50.00	57.50
SP107	External speaker	24.00	27.60
XF89GA	AM Filter 6kHz	20.00	23.00
XF89HC	CW Filter 600Hz	20.00	23.00
XF89HCN	CW Filter 350Hz	20.00	23.00
YM34	Desk Microphone	16.35	18.80
YM35	Tuning Mic. Fist	11.00	12.65
YM36	Noise cancel mic	10.35	11.90
YM37	Fist Microphone	5.35	6.15
YM38	Tuning Mic. Desk	19.65	22.60
FT902			
FT902DM	Transceiver Deluxe	695.00	799.25
FT902D	Transceiver	630.00	724.50
FT902DE	Transceiver	620.00	713.00
FMV901	FM Module	23.00	26.45
KEYT901	Keyer Module	18.00	20.70
MEMT901	Memory module	71.00	81.65
DCT901	Invertor kit	28.00	32.20
FV901DM	Synthesized VFO	203.00	233.45
FC902	Antenna Tuner	110.00	126.50
YR901	CW/RTTY Reader	369.00	424.35
60MAR901	60mA Mod kit	15.00	17.83
MODR901	VHF Modulator	8.00	9.20
YVM1	Video Monitor	124.00	142.60
YK901	CW/RTTY Keyboard	100.00	115.00
FTV901(2)	Transvertor c/w 2m	229.00	263.35
430V107V901	70cm Module	153.00	175.95
50V107V901	6m Module	60.00	69.00
70V107V901	4m Module	75.00	86.25
YO901P	Monitorscope c/w pan	263.00	302.45
YO901	Monitorscope	230.00	264.50
PAN0901	Panadaptor kit	45.00	51.75
SP901P	Speaker c/w patch	45.00	51.75
SP901	Speaker external	25.00	28.75
FL2100Z	Linear Amplifier	315.00	362.25
MMB1	'Universal' Bracket	16.00	18.40
YP150Z	Power meter/load	73.00	83.95
YH55	Headphones	8.65	9.95
FF501	Low Pass Filter	19.35	22.25
QTR24D	Quartz time clock	22.35	25.70
FP12	12A PSU	68.00	78.20
FP4	4A PSU	36.00	41.40

VHF EQUIPMENT

		Net £	inc Vat £
FT202R			
FT202R	Handheld 1w 6Ch	94.78	109.00
YM24	Ext Speaker/mic	14.65	16.85
NC1	Mains charger	16.65	19.15
PA1	12V Battery Eliminator	16.65	19.15
FLC1	HD Leather Case	18.00	20.70
Xtals	Xtals Stock (Pair)	4.35	5.00
NiCDS	"AA" size 500mA (Each)	0.87	1.00
FT207B			
FT207R	Handheld 12½kHz Synth	169.57	195.00
NC1A	Mains Charger	16.65	19.15
NC2/3	Fast Charger/Eliminator	34.50	39.68
NC3A	Deluxe Charger/Eliminator	37.00	42.55
NC9	Small Charger	6.65	7.65
NBP9	NiCd pack	14.65	16.85
FLC2	HD Leather Case	18.00	20.70
FBA1	Battery Charger/adaptor	2.35	2.70
PA2	12V Battery Eliminator	14.65	16.85
YM24	Ext Speaker/mic	14.65	16.85
FT225			
FT225R	Transceiver multimode	452.17	520.00
FT225RD	Transceiver 2m Digital	491.30	565.00
MEMT225	Memory Module	80.00	92.00
DIST225	Digital Display module	50.00	57.50
FT227			
FT227RXS	Tx/Rx 2m c/w scanner	250.00	287.50
FT227RBST	Tx/Rx 2m c/w stepper	245.00	281.75
FT480R			
FT480R	2m SSB/FM/CW	312.17	359.00
FP80	Power Supply	51.00	58.65
FT720			
FT720R	Control Box	104.35	120.00
S72	Switching Box	48.70	56.00
E72S	Extension Cable 2m	20.00	23.00
E72L	Extension Cable 4m	24.35	28.00
720RV	Deck 2m 10W	115.65	133.00
720RVH	Deck 2m 25W	124.35	143.00
720RU	Deck 70cm	135.65	156.00
MMB3	Mounting Bracket	4.35	5.00
FT780			
FT780R	70cm SSB/FM/CW	TBA	
FP80	Power Supply	TBA	
CPU2500			
CPU2500R	Tx/Rx 2m 25W	273.91	315.00
CPU2500RSt	Tx/Rx 2m 25W step	300.00	345.00
CPU2500RS	Tx/Rx 2m 10W	252.17	290.00
CPU2500RSt	Tx/Rx 2m 10W step	278.26	320.00
CPU2500RK	Tx/Rx 2m 25W key	286.97	330.00
CPU2500RKSt	Tx/Rx 2m 25W keystep	313.04	360.00
CPU2500RKS	Tx/Rx 2m 10W key	265.22	305.00
CPU2500RKSSt	Tx/Rx 2m 10W keystep	291.30	335.00

SOUTH MIDLANDS COMMUNICATIONS LIMITED

S. M. HOUSE, OSBORNE ROAD, TOTTON, SOUTHAMPTON, SO4 4DN, ENGLAND

Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton

G-GW-GI-GM-GJ AGENTS

Stourbridge	G3ZUL	(03843) 5917
Edinburgh	GM8GEC	(031665) 2420
Tandragee	GI3WWY	(0762) 84056
Bangor	GI3KDR	(0247) 55162
Pontybodkin	GW3TMP	(035287) 846/324
Swansea	GW8EBB	(0792) 872525
St. Saviour	GJ41CD	(0534) 26788

LEEDS

S.M.C. (Leeds)
Colin Thomas, G3PSM
257 Otley Road,
Leeds 16, Yorkshire.
Leeds (0532) 782326
9-5.30 Monday-Saturday

CHESTERFIELD

S.M.C. (Jack Tweedy) LTD
Roger Baines, G3YBO
79 Chatsworth Road,
Chesterfield, Derbyshire.
Chesterfield (0246) 34982
9-5; Tuesday-Saturday

WOODHALL-SPA

S.M.C. (Jack Tweedy) LTD
Jack Tweedy, G3ZY
150 Horncastle Road,
Woodhall Spa, Lincolnshire.
Woodhall Spa (0526) 52793
9-5: Tues-Sat (+appointments)

VERSATOWER

TELESCOPIC & TILTOVER RADIO TOWERS

Twelve years of continuous development has produced a range of over 50 models, all of which, being made in England, conform to the current B.S.S., requiring minimum designed wind speeds of 85mph and up to 117mph.

Before purchasing a Tower, we strongly recommend consulting one of our engineers for advice regarding the most suitable combination for an installation. *It would be incorrect to nominate a specific headload as this is dependent upon load distribution, geographical location and siting.*

25–120ft, post, base plate, wall, fixed base or mobile (on high-speed trailer) versions. 20ft sections (FB version does not tilt over).

Supplied complete with all Tower section(s), Luffing Gear Mount, Guys, Head Unit, Winch(es) and Telescopic Gear, as appropriate for any particular model.

Alternative head unit or winch(es) may be specified at order time. Standard item will be credited in full.

STANDARD TYPES			HEAVY DUTY		
Post mounting			**Post Mounting**		
13M20P25	25'	£259	16M20P40	40'	£525
13M20P40	40'	£355	16M20P60	60'	£595
13M20P60	60'	£429	16M20P80	80'	£899
13M20P80	80'	£815	16M20P100	100'	£1,079
Fixed Base			**Fixed Base**		
13M20FB25	25'	£175	16M20FB40	40'	£420
13M20FB40	40'	£269	16M20FB60	60'	£490
13M20FB60	60'	£349	16M20FB80	80'	£765
13M20FB80	80'	£735	16M20FB100	100'	£939
Socket Types			**Socket Types**		
13M20SP25	25'	£299	16M20SP40	40'	£579
13M20SP40	40'	£329	16M20SP60	60'	£649
13M20SP60	60'	£475	16M20SP80	80'	£955
13M20SP80	80'	£859	16M20SP100	100'	£1,140
Base plate			**Base plate**		
13M20BP25	25'	£305	16M20BP40	40'	£545
13M20BP40	40'	£399	16M20BP60	60'	£619
13M20BP60	60'	£475	16M20BP80	80'	£919
13M20BP80	80'	£859	16M20BP100	100'	£1,100
Wall Mounting			**Wall Mounting**		
13M20W25	25'	£209	16M20W40	40'	£429
13M20W40	40'	£305	16M20W60	60'	£495
13M20W60	60'	£379	**Mobile Type**		
Mobile Type			16M20M40	40'	£1,795
13M20M25	25'	£1,395	16M20M60	60'	£1,875
13M20M40	40'	£1,520	16M20M80	80'	£2,280
13M20M60	60'	£1,615	16M20M100	100'	£2,355
13M20M80	80'	£2,025			

'T' Series Towers (20' sections)

13M20T85	85'	£0,000.00	13M20T120	120'	£0,000.00

'30ft': 10ft SECTION "MINITOWER"

Capable of supporting a HF beam or several VHF Ants. The head unit accepts 2" tube and provides for a rotator. Operation is easy with single winch system.

10M10P30 Post mount	£305
10M10W30 Wall mount (LG1013W extra)	£295
10M10BP30 Base Plate (HD Bolts extra)	£325
10M10FB30 Fixed base (HD Bolts extra)	£285

NB. PRICES ARE BUDGETARY AND EXCLUDE VAT

DELIVERY EXTRA (distance dependent)

HANSEN

IN LINE POWER/SWR BRIDGES P.E.P., R.M.S. 1·8–440MHz

The Hansen range covers 20 quality models with top-of-the-line the FS710. These are flat frequency response, peak envelope power and R.M.S. in-line wattmeters with many novel features. Most notable being the 'power independent' SWR scale—no forward power calibration knob, just direct reading SWR.

GET THE HANSEN HABIT TODAY!

FT710; PEP AUTO-SWR RMS LEVEL
FS710 £68

FS710H: 1·8–60MHz. 15,150, 1·5kW
FS710V: 50–150MHz. 15,150W
V.S.W.R: 4:1 and to 20:1
Accuracy: ±7% of FSD
Impedance: 50–52 Ohms
Connectors: SO239
Power: 240 Volts AC 50Hz
Weight: 3·lbs (1·5Kgs)
Size overall: 8 × 4 × 5½"
Size Meter: 2 × 3½"
Time Const: PEP follow 4 second

FS500 £53

PEAK READING LEVEL RESPONSE
FS500H 1·8–60MHz 20, 200 & 2kW
FS500V 50–150MHz 20 & 200W
Power ±7% FSD. SWR 1:1-5:1
Size: 8 × 4 × 5½"

FS600 £39

PEAK READING LEVEL RESPONSE
FS601M 1·8–30MHz 20 & 200W
FS601MH 1·8–30MHz 200 & 2kW
FS602M 50–150MHz 20 & 200W
FS603M 430–440MHz 5 & 20W
Power ±10% FSD. SWR 1:1–3:1
Size: 6½ × 2½ × 4½"

FS300 £35

LEVEL RESPONSE, LARGE METER
FS300H 1·8MHz 20, 200 1kW,
FS300V 50–150MHz 20, 200W FSD
Power ±10% SWR 1:1–3:1 ±10%
Size: 8 × 4 × 5½"

FS7 £31

VHF/UHF WATTMETER & BRIDGE
FS7 145MHz & 432MHz 5, 20, 200W
Power RMS ±10%. SWR 1:1–3:1
Power Max: 144MHz, 200W
432MHz 20W
Size: 6½ × 2½ × 4½". 'N' type sockets

FS711 £28

REMOTE INDICATOR TYPE
FS711H 1·8–30MHz 20 & 200W
FS711V 50–150MHz 20 & 200W
FS711U 430–440MHz 5 & 20W
Power ±10%. SWR 1:1–3:1 ±3%
Indicator 5 × 2½ × 1½"
coupler 3½ × 2½ × 1½"

FS5E £28

INDEPENDENT TWIN METER
FS5E 3·5–150MHz 20, 200 & 1kW
Power RMS ±10%. SWR 1:1–5:1
Power Max: 1kW 3·5–30MHz
50W 50–150MHz
Size: 7 × 3 × 3½". 'On the Air' LED

FS300M £27

LEVEL RESPONSE, POWER & SWR
FS301M 1·8–30MHz 20, 200W
FS301MH 1·8–30MHz 200, 2kW
FS302M 50–150MHz 20, 200W
Power ±10%. SWR 1:1–3:1 ±3%
Size: 6½ × 2½ × 4½"

SWR3S £20

WIDE RANGE POWER & SWR
SWR3S 3·5–150MHz 20 & 200W
Power RMS ±10%. SWR 1:1–3:1
Power Max: 200W 3·5–30MHz
50W 50–150MHz
Size: 6 × 2½ × 2½". Antenna/switch

SWR50B £20

TWIN METER, RELATIVE POWER
SWR50B 3·5–150MHz Scaled 1kW
Power RMS ±20%. SWR 1:1–3:1
Power Max: HF 1kW 1:1. 300W 3:1,
VHF 50W
Size: 6 × 2½ × 2½". 'On the Air' LED

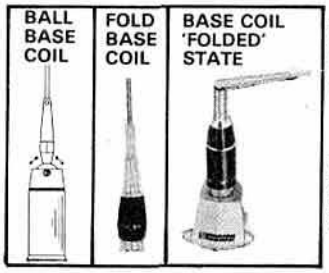
NB: PRICES EXCLUDE VAT (15%)
BUT INCLUDE POST AND PACKING

SMC-HS

INTERCHANGEABLE ELEMENT MOBILE ANTENNAS

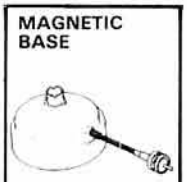
SMC HS Mobile antennas, tabulated below, feature an in-built PL259M connector which mates with the SO239M of the cable assembly (fits a ⅜" hole in car body or the cast chromed gutter mount) or the magnetic base (recommended for smaller antennas only). This arrangement is ideal for easy removal (element change, car wash and anti-vandal), tests and portable operation.

MODEL	BAND	GAIN	TYPE	POWER	LENGTH
20SE	14MHz		(½λ)	100W	1·72m
15SE	21MHz		(½λ)	130W	1·72m
10SE	28MHz		(½λ)	100W	1·27m
4E	70MHz	0dB	¼λ	150W	1·03m
2VF	144MHz	3dB	½λ	50W	1·06m
2NE	144MHz	3dB	⅝λ	150W	1·30m
78F	144MHz	4·5dB	⅞λ	100W	1·75m
78B	144MHz	4·5dB	⅞λ	150W	1·72m
258	432MHz	5·5dB	2 × ⅝λ	100W	0·94m
358	432MHz	6·3dB	3 × ⅝λ	100W	1·36m



PRICES

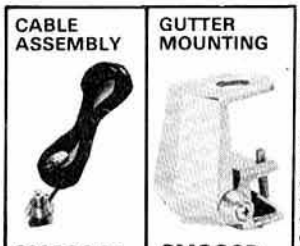
20SE	£12.00
15SE	£10.00
10SE	£10.00
4E	£6.50
2VF	£9.00
2NE	£5.50
78F	£10.00
78B	£11.00
258	£10.00
358	£12.50



Models have either a locking fold-over joint (for easy garage entry) or an in-built ball (in case the cable assembly is fitted askew).

The cable assembly (SOCA) is available in two versions—4 or 6 metres of cable. The magnetic base SMC50MM is also supplied complete with 4m of RG58/U cable.

The ⅜'s are particularly recommended as the actual system gain, if the antenna is poorly sited, is usually very substantial.



PRICES

SOMM	T.B.A.
SOCA	£3.00
SOCAL	£3.35
GCD	£3.00

CARRIAGE
Complete antennas £1.00, or £0.50 for accessories, any quantity.

NB: PRICES EXCLUDE VAT (15%)
CARRIAGE EXTRA AS INDICATED

SOUTH MIDLANDS COMMUNICATIONS LIMITED

S. M. HOUSE, OSBORNE ROAD, TOTTON, SOUTHAMPTON SO4 4DN, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton

KDK KYOKUTO

SYNTHESIZED TRANSCEIVER

144MHz – 25W – 12½/25kHz

KDK 2025

- ★ Custom designed microprocessor control
- ★ 25kHz *and* 12·5kHz synthesizer steps!!
- ★ 'Instant QSY', 10 times rate button
- ★ 25 Watts of reliable RF output
- ★ Band scan between any 'easy set' limits
- ★ 10 write-in non-volatile memory channels
- ★ Memory scanning with hold facility
- ★ Standard ± 600kHz or any repeater split

The KDK FM2025E is a 12V dc two-metre FM transceiver for mobile or base station use. Although feature packed, operational ease is assured by use of a "custom microprocessor".

Digital frequency synthesis provides full band coverage in 12·5kHz or 25kHz steps. "Single knob" frequency selection is by an optically coupled encoder. A dialling speed switch (increases tuning steps) facilitates rapid QSY's.

A 10 slot memory with Ni-Cad back-up, provides 10 simplex (with ±600kHz shift) and/or 5 semi-duplex channels, making the 2025 as easy to use mobile as a crystal controlled transceiver. One memory is semi-dedicated to "priority" and programmable when the 2025 is dial controlled.

The 2025 embodies the best non-lockout scanner. It scans occupied or empty channels and a flick switch enables immediate transmission. The scanner works on the memories and across any selected portion of the band (scan limits are defined by two of the memories).

Dual gate UHF MOSFETS in the RF and mixer provide superior intermodulation performance with high sensitivity maintained over the band by auto-varicap tuning. A monolithic crystal filter in the first IF and a 15 pole ceramic filter in the second provides excellent selectivity.

The single conversion transmitter uses a balanced mixer and a VCO on the signal frequency (directly modulated for superb FM) and a hybrid power module for 25W (or 3W) RF. The PA is impervious to breakdowns under infinite VSWR.

Necessary control function instructions are programmed into the microprocessor itself. But by re-arranging a diode matrix, the lower frequency transceive limit, the high frequency receive limit and the high frequency transmit limit may be altered to allow for changes of band plan or location.

Switchable auto-tone-burst, RF attenuator, squelch, microphone, microphone clip, power lead, mounting bracket, handbook are, of course, part of the package.

"What's the catch?" "None!" Compare the specifications, the features, the construction, the quality and the price.

£225 INC. VAT AT 15%
INC. SECURICOR

The 2025 is available from the importers or selected dealers

MICROWAVE MODULES LTD

L144/25 £51 — **2 METRE, 25W LINEAR AND PRE AMP**

1W drive, (e.g. FT202R) 10W out, 3W drive (e.g. FT207R) 30W out. RF sensing with override. 10dB pre amp gain. Around 2·8A at 13·8VDC (@ 25W).

L144/40 £67 — **2 METRE, 40W LINEAR AND PRE AMP**

10W drive (e.g. FT480R) 40W output. RF sensing with override. 10dB pre amp gain. Around 5A at 13·8VDC (@ 40W).

L144/100 £124 — **2 METRE, 100W LINEAR**

10W drive, 80W minimum (100W typical) output Thermal and VSW shutdown. Excessive and reserve polarity protection 12A max. at 13·8VDC (@ 80W).

L432/20 £67 — **70 CMS 20W LINEAR AND PRE AMP**

3W drive (e.g. FT404R) for 20W output RF sensing with override. 12dB pre amp gain. About 3A at 13·8V (@ 20W).

L432/50 £103 — **70 CMS 50W LINEAR AND PRE AMP**

10W drive (e.g. FT780R) for 50W output. RF sensing with override. 10dB pre amp gain. Around 8A at 13·8VDC (@ 50W).

L432/100 £198 — **70 CMS 100W LINEAR**

10W drive for 100W RMS output (−1dB compression). Thermal−VSWR−Excessive voltage and reverse polarity protection. 20A @ 13·8V for 100W.

T28/144 £86 — **10 METRE, 10W TRANSVERTER**

10W on 10 meters output, from 2 metres. 2dB noise figure. RF sensing. 30mW or 10W drive (c/w 15dB pad).

T144/28 £86 — **2 METRE, 10W TRANSVERTER**

10W on 2 metres from 10 metre source 5–500mW (on board attenuator). Current 2·1A peak, 0·3A quiescent.

T432/28S £129 — **70 CMS TRANSVERTER (SATELLITE)**

10W on 70 cms from 10 metres (5–500mW drive). Dual crystal local oscillator chain, for 2MHz offset (434 up).

T432/144R £160 — **70 CMS TRANSVERTER (REPEATER)**

10W on 70 cms from 2 metres. (10 watt drive). Double conversion. Dual crystal local oscillator chain for 1·6MHz offset.

T1296/144 £160 — **23 CMS 1·3W TRANSVERTER**

1·3W on 23 cms from 2 metres (5–500mW or 10W drive). 2·9dB Noise figure.
T1296/144LN 1·5dB NF at £175.

PRICES EXCLUDE VAT (15%) P&P £1.50 WORLDWIDE

SOUTH MIDLANDS COMMUNICATIONS LIMITED

S. M. HOUSE, OSBORNE ROAD, TOTTON, SOUTHAMPTON SO4 4DN, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton

SOUTH MIDLANDS

SMC FOR ALL YOUR STATION ACCESSORIES

2m LINEAR AMPLIFIERS
12V SSB/FM, Low noise pre-amp
B108 80W out 10W drive **£105.00**
B3016 160W out 30W drive **£142.50**
B1016 160W out 10W drive **£165.00**
RC1 Remote unit, 18' cable **£15.00**

70cms LINEAR AMPLIFIER
45W out. 10W drive. 12VDC.
All modes: RF switching—c/w mounting bracket. Full band coverage without tuning.
Size 2½ × 5½ × 7½"
APB57A .. (List £102.29) **£86.09**

2m LINEAR AMPLIFIER
160W out. 10W drive. 12VDC at around 18A. RF or manual switching, SSB and FM. Excellent heat sinking, over temperature trip, etc.
PA15/160BL **£171.30**

HF/VHF SWR METER
Twin Meter. 3·5 to 170MHz. SWR calibrated to 3:1. 50 ohms. Relative Power. SO239 sockets
T3-107L .... (p&p £0.60) **£10.30**

HF/VHF SWR METER
1·8–150MHz, 10 & 100W FSD power. VSWR calibrated 3:1. Field strength measurement. SO239 connectors. 50 ohms.
JD110 ..... (p&p £0.90) **£10.70**

VHF/UHF SWR METER
Power 10W on 50, 144, 432MHz VSWR. Calibrated to 3:1 50 ohms. Detachable RF-head/indicator unit
UH74 ..... (p&p £0.60) **£12.65**

COAX SLIDE SWITCH
2 times 1 in 2 out. Ganged (removable). 50 ohms. SO239 sockets
TWS220..... (p&p £0.40) **£9.35**

COAX SWITCH
50 ohms 2 in 1 out. Shorting type. 60dB @ 300MHz isolation. SO239's. Low VSWR. High power.
SMCS2 ..... (p&p £0.70) **£6.95**

COAXIAL SWITCHES
High quality rotary units, earths unused posts. Skeleton SO239s.
KSW3 1 in 2 out **£10.30**
KS23 1 in 3 out **£19.35**
KS24 1 in 4 out (illus) **£25.65**

POWER SUPPLY
12V DC regulated supply. 240V 50/60Hz input. 3 amps cont. 5 Amp peak. 3 × 4½ × 6". 3½lb
ODR123C .(Post free) **£13.65**

POWER SUPPLY
12V DC @ 200mA. 240V 50Hz. 1·8m cord with 2·1mm plug (+Ve centre). 4·5 × 7 × 60cms. 250gms. 3 pin 13 amp style.
P12002 .(p&p £0.60) **£4.35**

DUMMY LOAD
30W peak, 15W continuous. Load mounted on PL259 (UHF male) connector. Low VSWR on 145MHz
DL20..... (p&p £0.35) **£4.35**

DUMMY LOAD
52 ohms. 1kW for 3min. 300W continuous. Oil filled, 1·2:1 VSWR @ 500MHz
SMCDL1000 (p&p £1.95) **£34.65**

HF BALUN
1:1 Ratio. 3–40MHz. SO239 Socket. 5½ × 1½" D. 7½ oz. "Hang up type" High power
H1Q ..... (Post free) **£8.70**

FM BOOSTER
88–108MHz FM band pre-amp. Typically 20dB gain, with 4·5dB noise figure. c/w flying leads (car plugs)
T203 ..... (list £8.91) **£6.96**

RF SPEECH PROCESSOR
Audio to audio via SSB, Bar LED display of clipping 4-pin socket c/w power unit
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CRYSTAL FILTERS YF & TF
For FT101 Mkl through FT101E. Centre frequency 3·18MHz. Widths: 0·35 or 0·6 or 12kHz.
6 pole **£17.00**
8 pole **£19.00**

CRYSTAL FILTERS YF & TF
Centre freq; 9MHz or 10·7MHz. Width: 0·6 or 2·4 or 12kHz (specify CF, BW and poles)
6 pole **£16.00**
8 pole **£18.00**

COAXIAL RELAYS
50 ohms. 1kW PEP @ 30MHz. 50dB isolation @ 1GHz. 0·2dB loss @ 0·5GHz.
CX520D 3 'N' connectors £18.00
CX530D 2 BNC + 1 N... **£18.00**
CX540D 3 BNC **£18.00**

COAXIAL RELAYS
50 ohms. 150W PEP @ 200MHz. 1·5:1 VSWR @ 1·5GHz. 0·2dB loss & 40dB isolation @ 0·5GHz
CX120A Cable entry .**£7.65**
CX120P PC mount .**£7.65**

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20K ohms/volt.1000X overload on ohms. Plug in range selection
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690G 'Super' 48 ranges **£24.50**
680R 'Super' 80 ranges **£32.00**

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100kHz–30MHz, to 10Hz. 12VDC. 5 off 7 segment display
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500MHz COUNTER
500–50MHz–200mV RMS. 50–0·5MHz–50mV RMS. 12V DC. 6 off 11mm digits
MMD050/500 (p&p £0.50) **£60.00**

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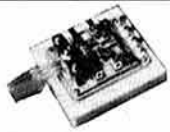
1–1000 scale. 10MΩ. AC (V/mA) DC (V/mA). Auto zero and polarity.
ME521 ..... (p&p £0.50) **£38.26**

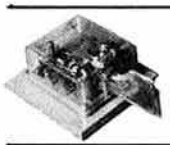
HAND MORSE KEYS
HK703 1·0kg 73/84/154mm **£16.65**
HK704 0·9kg 73/84/154mm.. **£11.30**
HK706 0·5kg 50/76/150mm... **£8.65**
HK808 Marble base **£32.35**

BUG KEY
Manual semi-automatic 1·2kg 60, 75, 175mm. Adjust speed and tension
BK100 ..... **£15.00**



SQUEEZE KEYS
1·1kg 33, 75, (88 × 145)mm
MK703 Silver ABS..... **£17.00**

0·7kg 56, 71, 129mm
MK705 Marble base..... **£14.65**



SINGLE PADDLE KEYS
1kg 64, 84, 154mm
MK701 ABS base **£16.65**
1·2kg 38, 80, (103 × 168)mm
MK702 Marble base..... **£17.65**

RF NOISE BRIDGE
1–100MHz resistance to 250 ohms, Xc to 150, Xl to 150 ohms.
MFJ202..... **£43.30**

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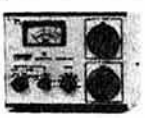
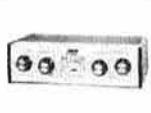
202 Hi z, cer. noise cancl.. **£17.35**
401A Hi z, mag..... **£13.65**
444 Desk, Hi z..... **£26.00**



ANTENNA COUPLER
3·5–30MHz. R & X tune & bandswitch. 200W RMS @ 50 ohms. 20 & 250W FSD, SWR to 10:1
LAC895 .... (list £92.00) **£77.39**

200W ANTENNA TUNERS
16010 1L + 1C **£25.00**
900 1L + 2C **£33.35**
901 inc 4:1 balun..... **£41.70**



300W ANTENNA TUNERS
940 Switch/SWR..... **£58.30**
941B Switch/SWR/Balun ... **£66.65**
943 Balun 4:1 ..... **£50.00**
944 Switch/Balun **£58.35**

OSCILLOSCOPES
10mV–50V/cm. 1μS–100mS/cm. Always calibrated. Good trig.
CS6 6MHz Single..... **£162.00**
CS10 10MHz Dual **£219.00**

VHF CONVERTORS
15mm Models stocked e.g.
MMC70/28..... (p&p £0.50) **£24.25**
MMC144/28.... (p&p £0.50) **£24.25**
MMC432/28/S . (p&p £0.50) **£30.35**

LIGHTNING ARRESTORS
Spark type. Adjustable gap. Line fitting.
SMC566 SO239/PL259... **£2.95**
SMC567 2 off SO239..... **£2.95**

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COMMUNICATIONS LTD

SMC FOR ALL YOUR ANTENNA REQUIREMENTS

HF ANTENNAS

GEM QUAD PRODUCTS		
GQ2E	2 Ele antenna	£124.00
GQ3E	3 Ele antenna	£187.00
GQ4E	4 Ele antenna	£249.00
GQCK 1	Con kit 1 ele	£63.00
GQCK 2	Con kit 2 ele	£125.00
GQSPIDER	Centre piece	£26.25
GQSPIDER	Spreader arm	£9.85
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12AVQ	Vertical 10-20m	£37.50
14AVQ/WB	Vertical 10-40m	£52.50
18AVT/WB	Vertical 10-80m	£76.00
14RMQ	Roof mount kit	£19.50
18V	Vertical 10-80	£27.80
18HT	"HY Tower"	£225.00
103BA	3 Ele Yagi 10m	£51.00
105BA	5 Ele Yagi 10m	£92.00
153BA	3 Ele Yagi 15m	£62.75
155BA	5 Ele Yagi 15m	£117.50
203BA	3 Ele Yagi 20m	£117.50
204BA	4 Ele Yagi 20m	£155.00
205BA	5 Ele Yagi 20m	£205.00
402BA	2 Ele Yagi 40m	£158.00
DB10/15A	3 Ele 10-15m	£115.00
TH3JNR	3 Ele 10-20m	£113.50
TH2MK3	2 Ele 10-20m	£109.75
TH3MK3	3 Ele 10-20m	£157.00
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TH6DXX	"Thunderbird 6"	£205.00
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BN86	Balun ferrite 1:1	£13.50
LA1	Lighting arrestor	£39.50
JAYBEAM HF ANTENNA		
VR3	Vert. 10-20m	£34.00
TB3	3 Ele 10-20m	£135.00
MINIBEAM ANTENNA		
C4	Vert. miniature	£42.15
HQ1	"Mini" quad	£83.85
MOSLEY HF ANTENNA		
TA32JRE	2 Ele beam	£78.00
TA33JRE	3 Ele beam	£116.00
TA33JRHPE	3 Ele c/w balun	£132.00
Mustang 2	2 Ele beam	£117.00
Mustang 3	3 Ele beam	£145.00
RD5	Dipole ham	£35.00
SWL7	Dipole B.C.	£35.00
SMC TRAPPED DIPOLE		
SMCTD/S	Standard 14swg	£26.50
SMCTD/HP	Hi power 14swg	£29.50
SMCTD/P	Portable ant	£32.50
SMC-HS ANTENNA		
SMCHF5V	Vertical 10-80m	£35.00
SMCHF5R	Radial kit loaded	£25.65
G WHIP HF MOBILE		
Tribander	Antenna 10-20m	£21.50
LF40-160	Loading coil each	£5.70
LFWHIP	Telescope whip	£2.90
Multimobile	Antenna 10-20m	£25.00
MM40-160	Loading coil each	£5.70
MMWHIP	Telescopic whip	£2.90
Flexiwhip	Antenna 10m	£15.00
FF15 160	Loading coil each	£5.70
GW BASE	Base Standard	£3.90
HY GAIN MOBILE ACCS.		
415	Bumper strap	£10.80
499	Body mount	£10.80
511	Spring H.D.	£9.50
417	Spring medium	£8.20
SMC–HS MOBILE		
SMC20SE	Ele 20m 1·72m	£12.00
SMC15SE	Ele 15m 1·72m	£11.00
SMC10E	Ele 10m 1·27m	£10.00
SMC10SE	Ele 10m 1·72m	£11.00
SMCSOCA	Cable assembly	£3.00
SMCGCD	Gutter clip	£3.00
MX913/M	Dust cover	£0.40

VHF ANTENNAS

HIDDAKA VHF ANTENNA		
LT606	50-500MHz log	£75.95
JAYBEAM 4 METRE		
4Y/2M	Yagi, 4 element	£18.00
PMH2/4M	Harness, 2 way	£10.60
JAYBEAM 2 METRE		
HO/2M	Halo, head only	£3.95
HM/2M	Halo, with mast	£4.70
UGP/2M	Ground plane	£8.80
C5/2M	Colinear glass fibre	£38.50
LR1/2M	Colinear aluminium	£21.00
5Y/2M	Yagi, 5 element	£9.80
8Y/2M	Yagi, 8 element	£12.60
10Y/2M	Long Yagi 10 ele	£27.00
14/2M	Long Yagi 14 ele	£39.00
D5/2M	Yagi, 5 over 5 slot	£17.50
D8/2M	Yagi, 8 over 8 slot	£23.60
PMB10/2M	10 Ele parabeam	£32.00
PMB/14/2M	14 Ele parabeam	£39.00
Q4/2M	Quad, 4 element	£20.00
Q6/2M	Quad, 6 element	£27.30
5XY/2M	Yagi, 5 ele crossed	£19.80
8XY/2M	Yagi, 8 ele crossed	£24.70
10XY/2M	Yagi, 10 ele cross	£32.80
PMH2/C	Harness circular	£16.50
PMH2/2M	Harness, 2 way	£8.60
PMH2/2ML	Harness, 2 way	£9.60
PMH4/2M	Harness, 4 way	£20.10
JAYBEAM 2M/70CM		
X6/2M/X12/70	6 ele 2, 12 ele, 70	£33.50
JAYBEAM 70CM		
C8/70	Colinear, vert.	£43.50
D8/70	Yagi, 8 over 8	£18.00
PBM18/70	18 Ele parabeam	£22.00
MBM48/70	Multi, 48 ele	£25.00
MBM88/70	Multi, 88 ele	£34.20
8XY/70	Yagi, 10 ele X	£29.70
12XY/70	Yagi, 12 ele X	£36.80
PMH2/70	Harness 2 way	£7.40
PMH4/70	Harness 4 way	£15.70
JAYBEAM 1296MHz		
D15/23	Yagi, 15 over 15	£29.60
PMH2/23	Harness 2 way	£22.10
SMC VHF ANTENNA		
GP2U	Ground plane	£4.35
SMC-HS VHF ANTENNA		
SMCGDX1	80-480MHz 3dB	£36.00
SMCGDX2	50-480MHz 3dB	£41.70
SMCVHFL	65-520Hz Rx only	£14.65
SMCGP144W	2m Colinear 6dB	£21.70
SMCGP432X	70cm Colinear 7dB	£24.35
SMC-HS MOBILE ANTENNA		
SMC2HPL	Helical 2m PL259	£3.00
SMC4E	Ele 70MHz $\frac{1}{4}\lambda$	£6.50
SMC2E	Ele 144MHz $\frac{1}{4}\lambda$	£6.50
SMC2NE	Ele 144MHz $\frac{1}{2}\lambda$	£7.50
SMC2VF	Ele 144MHz $\frac{1}{4}\lambda$	£9.00
SMC78F	Ele 2m, $\frac{1}{4}\lambda$ 'fold'	£10.00
SMC78B	Ele 2m, $\frac{1}{4}\lambda$ 'ball'	£11.00
SMC258	Ele 70cm $2\times\frac{1}{4}\lambda$ col	£10.00
SMC358	Ele 70cm $3\times\frac{1}{4}\lambda$ col	£12.50
SMCGCD	Gutter clip adjust	£3.00
MX913/M	Dust Cover	£0.40
SMCSOCA	Cable Assem 4m	£3.00
SMCSOCAL	Cable Assem 6m	£3.35
SMCBSD	Bumper strap	£6.70
SMC118M	Colinear 11/8λ	£24.65
SMC-HF PORTABLE ANTENNA		
SMC2HPL	Helical 2m PL259	£3.00
SMC2HBNC	Helical 2m BNC	£3.85
SMC6P2TBL	Telescopic PL	£3.00
SMC6P2TBNC	Telescopic BNC	£3.45
TELAWAND/432MHz QUAD LOOPS		
12 ele	15·5dB 7·9'	£44.95
18 ele	18·0dB 11·5'	£59.35
25 ele	20·5dB 16·1'	£82.35

CABLES & CONNECTORS R.F.

COAXIAL 50 OHM CABLE (Metres)		
URM95	Solid centre 2·3mm	£0.20
UR43	Solid centre 5·0mm	£0.20
UR76	Stranded 5·0mm	£0.22
RG58U	Stranded 5·0mm	£0.22
RG213	Low loss 10·2mm	£0.48
UR67	Low loss 10·2mm	£0.52
COAXIAL 75 OHM CABLE (Metres)		
307EP	Economy type	£0.16
UR70	Stranded 5·7mm	£0.24
UR39	Medium duty 7·8mm	£0.36
UR57	Low loss 10·2mm	£0.57
BALANCED TWIN CABLE (Metres)		
302	75 Ohm Light duty	£0.14
306	300 Ohm Ribbon	£0.15
2X21	240 Ohm Dual foam	£0.11
BNC COAXIAL PLUG 50 OHM		
UG88	Stranded 5·5mm	£0.64
UG959	Large Type 11·2mm	£2.60
BNC COAXIAL SOCKET 50 OHM		
UG90	Standard, 4 hole	£0.66
UG1094	Nut fixing type	£0.62
UG89	Cable end 5·5mm	£0.82
BNC COAXIAL COUPLER 50 OHM		
UG914	Back to back female	£0.93
UG491	Back to back male	£0.93
UG274	"T" 2 female 1 male	£1.44
SM83FBNC	Rustless 3mm/D 150m	£16.30
UG306	Elbow male/female	£1.62
BNC CABLES 50 OHM		
BNC18BNC	1·5' RG58 BNC ends	£2.22
BNC38BNC	3·0' RG58 BNC ends	£2.30
BNC36CROC	3·0' RG58 BNC clip	£2.17
UHF COAXIAL PLUG		
PL259	Std. type 11·2mm	£0.48
PL259P	Push on 11·2mm	£0.69
UG175	Reducer 5·0mm	£0.12
UG176	Reducer 5·6mm	£0.12
PL259R	Reduced 5·0mm	£0.58
PL259A	De-luxe 11·2mm	£0.98
PL259B	De-luxe type 5·0mm	£0.98
PL259SS	Solderless 11·2mm	£0.55
PL259SL	"Solderless" 5·0mm	£0.55
PL259E	Angle type 5·0mm	£0.83
PL259M	Metric type standard	£0.65
PL259PM	Panel mount 4 hole	£0.93
UHF COAXIAL SOCKET		
SO239F	Standard 4 hole fix	£0.42
SO239F31000	4 Hole ptfe Ag plate	£0.84
SO239T	2 Hole fixing type	£0.42
SO239NI	Nut fix inside type	£0.51
SO239NO	Nut fix outside type	£0.51
SO239E	Free angle type 5·0mm	£0.88
UHF COAXIAL ADAPTORS		
PL258	Back to back female	£0.79
PL274	Back to back chassis	£0.93
PL258M	Back to back male	£1.20
M359	Elbow male/female	£0.93
M358	"T" 2 female 1 male	£1.20
M358AF	"T" 3 female	£1.48
M458	"X" 3 female 1 male	£1.85
UG255	UHF socket/BNC plug	£1.53
UG273	UHF plug/BNC socket	£1.53
SO/FP	UHF socket/F plug	£0.60
SO/35	UHF sckt 3·5mm jack	£0.69
UHF CABLES		
PL36PL	3·0' RG58 PL259 ends	£1.61
N COAXIAL PLUG 500 OHM		
UG536	Small type 5·6mm	£2.35
UG21	Std. type 11·2mm	£1.15
N COAXIAL SOCKET 50 OHM		
UG58	Standard 4 hole fix	£0.82
UG1052	Free cable end 5·5mm	£2.49
UG23	Free cable end 11mm	£1.48
MX913	Dust cap metric	£0.35
MX913	Dust cap with chain	£0.40

ANTENNA PARTS

ANTENNA WIRE (in metres)		
CU14SWG	Hard Drawn Copper	£0.15
CU14SWG108	HD Copper 40m coil	£4.78
CU14SWG132	HD Copper 33m coil	£5.87
CU7/029H	Hard Drawn Strand	£0.16
CU7/036	CAD Copper Strand	£0.22
CU7/044	CAD Copper Strand	£0.29
CU/TER	CU/Terylene Braid	£0.14
CU7/029S	Soft Copper Strand	£0.15
BALUN TRANSFORMER		
BN86	HY-Gain 1 to 1	£13 50
HIQ1	Van Gorden 1 to 1	£8.70
HIQ4	Van Gorden 1 to 4	TBA
DIPOLE CENTRE PIECE		
CCJ2BNC	Standard c/w fittings	£4.35
CCJ2UHF	Standard c/w fittings	£4.35
CCJ1N	HD type c/w fittings	£8.25
CCJ1UHF	HD type c/w fittings	£6.35
AJU	Polyprop. clamp & lug	£0.85
PARCT	Porcelain "T" shaped	£0.48
INSULATOR END STRAIN		
SMCP2	Polypropylene 3"	£0.37
PORC3	Porcelain 3"	£0.48
SMCP1	Polypropylene 8·5"	£1.85
EG38	Porcelain Egg 1·5"	£0.35
EGG51	Porcelain Egg 2·1"	£1.85
LIGHTNING ARRESTOR		
SMC566	Spark SO239/PL259	£2.60
SMC567	Spark SO239/SO239	£2.60
NSK7S	Gas discharge type	£7.35
LA1	Gas discharge type	£39.50
WIGHTRAPS (per pair)		
IMXST	Standard (White)	£6.25
IMXHP	High Power (Blue)	£9.40
IMXTB	Top Band spacesaver	£9.40

RIGGING AND FITTINGS

BRACKET, STAND-OFFS (pairs)		
W12	12" c/w 2" U bolts	£6.50
W18	18" c/w 2" U bolts	£8.50
W21	21" c/w 2" U bolts	£8.75
W21HD	21" HD c/w 2" U	£10.95
W24	24" c/w 2" U bolts	£11.50
D SHACKLE, pin size		
DS6	6mm ($\frac{1}{4}$") galv	£0.24
DS8	8mm ($\frac{5}{16}$") galv	£0.28
DS10	10mm ($\frac{3}{8}$") galv	£0.36
DS11	11mm ($\frac{7}{16}$") galv	£0.54
DS13	13mm ($\frac{1}{2}$") galv	£0.63
GUY ROPE (metres)		
HTS3	HT steel 3mmD 1×19	£0.19
HTS4	HT steel 4mmD 1×19	£0.24
HTS5	HT steel 5mmD 1×19	£0.28
HTS6	HT steel 6mmD 1×19	£0.36
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RSGB SUNDAY NEWS BROADCASTS

These broadcasts are made every Sunday morning on hf and vhf, giving almost complete coverage of the British Isles. All stations broadcasting these news bulletins use the callsign GB2RS, and information regarding them is given in the table below.

The purpose of these news broadcasts is to provide an outlet for amateur radio news items which, by virtue of their topicality or urgency, cannot wait for the next issue of *Radio Communication*. The bulletins are compiled on Wednesday mornings, and items for inclusion should reach RSGB HQ by letter (marked "GB2RS news") or telephone before 10am on Wednesday. No guarantee can be given of inclusion, in whole or in part, of any item submitted and, once broadcast, items are not usually repeated.

INTENDED RECEPTION AREA	NORMAL READER	RESERVE READER	LOCAL START TIME
Frequency: 3·640MHz. Mode: ssb			
NE Scotland	GM3HGA	GM3VEY	1130
Frequency: 3·650MHz. Mode: ssb			
SE England	G2MI	G4ARZ	0900
Midlands	G2CVV	G8QZ	0930
SW England/Wales	G8ML	G3JFH	1000
Northern Ireland	GI3GAL	GI3SXG	1030
NE England	G5VO	G3MCF	1100
E Scotland	GM4CUZ	GM4FLP	1430
Frequency: 3·660MHz. Mode: ssb			
Central Scotland	GM3TCW	GM3ULP	1130
Frequency: 7·0475MHz. Mode: a.m.			
UK (from Northern Ireland)	GI3GGY	GI2DHB	0900
UK (from N Midlands)	G3LEQ	G2CVV	1100
Frequency: 144·250MHz. Mode: ssb (horizontal polarization)			
SW from the Midlands	G3BA	G3KQF	0930
NE from S Devon	G3CHN	G3PBV	1000
NW from Manchester	G3SMT	G4IAL	1000
NNW from Cleveland	G4JJB	G8FTZ	1000
W from Carlisle	G8DVD	G8OAU	1030
SE from Lincoln	G8OFQ	(Vacancy)	1030
SW from London	G3FZL/G3VAG	G3IIR	1030
S from Aberdeen	GM8GHV	GM3ZBE	1030
W from Bristol	G4CJZ	G3ZWY/G8NNU	1100
W from Bangor, Co Down	GI3TLT	GI3SXG	1130
Frequency: 145·525MHz. (S21) Mode: fm (vertical polarization)			
Cornwall	G2ABC	G3NPB	0930
Hampshire, north	G8CKN	G3PZN	0930
Suffolk	G3ZNU	G4FSG	0930
Leeds	G3SPX	G8XGN	0930
Co Down	GI3WEM	GI4DOR	0930
Edinburgh	GM4EHO	GM4JFS	0930
E Cornwall/S Devon	G3ZYY	G4GWJ	1000
Londonderry	GI2DHB	GI4AHD	1000
London	G3FZL/G3VAG	G3IIR	1000
Birmingham	G3PWJ	G3BA	1000
Lincolnshire	G8OGQ	(Vacancy)	1000
Tyneside	G4FUT	G3WNR	1000
Glasgow	GM4HCO	GM4CXM	1000
Elgin	GM4ILS	(Vacancy)	1000
Southampton	G8LVC	G8ADM	1030
E Sussex coast	G8SC	G3ZFE	1030
Bristol	G4CJZ	G3ZWY/G8NNU	1030
Manchester	G3LEQ	G3JWK	1030
Jersey	GJ8KNV	GJ4ICD	1100

QTC
Amateur radio news

IARU Region 1 Conference

The twelfth triennial conference of the IARU Region 1 division will be held at the Hotel Metropole, Brighton, between 27 April and 1 May 1981. So far some 120 delegates from 32 countries have indicated their attendance, together with representatives from IARU headquarters and IARU Region 3.

An end-of-conference dinner/dance will be held on the evening of Friday 1 May, and there will be a limited number of places available for RSGB members who may wish to attend. The cost of the dinner will be in the region of £10. Members who would like to attend this function are asked to write to RSGB-headquarters (attention Miss D. Beisiegel) giving name, address and number of tickets required. There will be no immediate acknowledgement of the request, but further information will be provided at least four weeks before the date of the dinner.

Overnight accommodation can be arranged at the Hotel Metropole, or alternatively at one of the numerous nearby hotels.

Ham Radio Publishing Group

The group has announced that *Ham Radio Horizons* ceased publication with the issue of December 1980. The reason for this is that advertising support for *Horizons* has never reached the amount which it was hoped the magazine would attract. Subscriptions to *Horizons* will be transferred to *Ham Radio Magazine* on an issue-for-issue basis for the balance of subscription. If you receive both magazines then your *HRM* subscription will be extended on the same basis.

Ham Radio Magazine will have a new editor in the person of Alf Wilson, W6NIF, and the magazine will contain a number of new features. Popular columns in *Horizons* were those by Bill Orr entitled "Ham radio techniques" and "DX forecaster", and these will be transferred to future issues of *HRM*. It is planned to continue the "Questions and answers" feature, together with the "Owner's survey" which is compiled from reader responses to questions about popular pieces of amateur equipment. Reader response will determine the future of the articles by W9KNI entitled "DXers diary".

The stated intentions of the publisher are that with the combination of features *HRM* will be a most interesting and well-balanced magazine. Information concerning subscriptions appear on page 180 of this issue of *Rad Com*—please note subscription requests should not be sent to RSGB headquarters.

Partly because of the escalating cost of air mail postage, it has been decided to reduce the frequency of *Ham Radio Report* to fortnightly issues, for which the subscription (for the UK) is $35 per year.

RAE abroad

British subjects residing abroad who wish to take the RAE are reminded that it is often possible to arrange to be examined locally.

Most British Council and British Armed Forces bases are prepared to invigilate the RAE for a reasonable fee. However, it is important that the approach to the City & Guilds of London Institute is made by the official organization which is prepared to invigilate, and in good time for each examination. For instance, under the present regulations entries from overseas candidates must reach the C & G of LI via the invigilating body by 7 February for the May examination and by 1 October for the December examination.

May 1981 RAE

The next Radio Amateurs' Examination will take place on Monday 11 May 1981. RSGB examination centres are again being arranged in London and Derby, and candidates wishing to enter at either centre should write for an application form to "The local examination secretary" at RSGB HQ, and enclose an sae. Early application is advised, and the final date for receipt of completed application forms at RSGB HQ is Monday 2 March.

INTERNATIONAL YEAR OF DISABLED PEOPLE

The United Nations has named 1981 "International Year of Disabled People", and it is hoped that amateur radio will be able to make a significant contribution to the objectives of IYDP because of the unique facilities it can offer to disabled people.

One major contribution by the RSGB will be that of making available suitable literature on amateur radio to disabled people. In addition it is suggested that all RSGB regional and area representatives contact their local county community liaison officer and offer to help or supply information to local disabled people who are unaware of amateur radio.

Individually, all amateurs can help in a practical way by contacting disabled people, singly or in groups, and putting them in the picture where amateur radio can be of help to them.

One member has proposed an international "Weekend on the air" for disabled people on 1-3 August to coincide with the opening of the International Sports for the Disabled to be held at St Layes College, Exeter, Devon, where the special callsign GB2IYD is expected to be in use.

QSL Bureau

The following amendments should be made to the list of QSL Bureau submanagers published on page 51 of January *Rad Com:*

G3UAA-VZZ—change of address: Mr M. J. Newton, G3UKW, 11 Chestnut Close, Rushmere St Andrew, Ipswich IP5 7ED.

G8UAA-VZZ. This should now read **G8UAA-ZZZ**; Mr C. Lennox, G8NVP, continues as sub-manager for this extended series.

Raynet

Members who wish to have an application form to join Raynet, or who want to be put in touch with their local group, should send a large sae to Graham Cluer, G4AVV, the Raynet publicity officer, whose address is now 12 Bingham Road, Addiscombe, Croydon CR0 7EB, marking the envelope "Raynet information".

Licence fee

The Home Office advises that the Amateur Radio Licence fee was increased to £8 per year from 1 January 1981. The licence fee has remained unchanged for three years, and similar increases have been made to all other Home Office radio licences.

RSGB diary of events

This diary is once again operational on the RSGB computer at HQ. Information on all forthcoming local events such as rallies would be welcome for inclusion, so that all concerned can be made aware of potential conflicts of date.

Particulars of mobile rallies and special event stations for inclusion in *Rad Com* should continue to be sent, in writing, direct to the editor in Chelmsford.

Stolen equipment

From a vehicle parked in Nottingdean, East Sussex, on 3 December: Trio 7200G 144MHz transceiver, serial number 311077. Information to Mr A. G. Still, tel Newhaven 4991, or Brighton police station.

From a car parked in Leicester on 1 January: Trio 2200GX fm 144MHz transceiver, serial number 351170, modified with red LED backlight to channel switch and fitted with Ch S0, 17, 20, 21, 22, R0, 3, 4, 5, 6, 7 and reverse R6; 80-channel synthesizer in Eddystone die-cast box, and grey-cased Murphy hand ptt microphone. Information to D. H. Myers, G8AYG, tel 0509 53984, or Leicester CID.

The RX80 Mk2

A 3·0 to 4·0MHz ssb/cw receiver and tunable i.f. for a complete hf receiver

(Part 2)

by A. L. BAILEY, G3WPO*

This part deals with the construction of the CV80 hf bands converter. Further parts will deal with additional modules to build a huff and puff type vfo stabilizer, a dc-controlled rf attenuator, a mains power supply, vhf converters, fm i.f., and a suitable case to house the complete receiver.

THE CV80 HF BANDS CONVERTER

In order to extend the frequency coverage of the main RX80 receiver, a converter module with an output in the range 3·0–4·0MHz is required. The CV80 converter performs this function, providing extra bands, each 1MHz wide, using the concept of a separate converter for each band. This approach was adopted—rather than that of a single pcb with switched transformers etc—in order to provide tailor-made characteristics for each band, and to avoid fixing the number of bands covered.

The converter features a cascode rf stage, with agc-controlled gain, crystal oscillator and rf tracking across the full 1MHz range, controlled by the main receiver tuning. Bandspreading of each amateur band at the i.f. is possible, as will be shown later, with the ability to recover the full 1MHz coverage at any time with a single pushbutton control.

Circuit description

To reduce the signal path switching requirements, which can be considerable with a multiband converter, the input transformer is preceded by a diode switch, forward biased during operation but presenting a high impedance when the converter has no power applied. This allows the antenna inputs to be paralleled, the signal only reaching the converter to which power is applied. A double-tuned, top capacitance coupled input stage (T1, T2, C3) provides the initial selectivity; tracking being by padding capacitors C2,4 together with varicap diodes D4,5 and C1,5. Two different types of diode are used (Fig 14), dependent on the capacitance required for the band in use. The tuning voltage for these diodes is derived from the main receiver tuning control RV5, via the inverter circuit TR7 which provides the correct sense voltage; mid-range voltage being set by RV5 on the converter pcb. The circuitry associated with TR5 is only needed on one of the converters, as its output can be connected in parallel with all the converters in use.

The cascode rf amplifier TR1,2 provides a stable low-noise amplification source. The input transistor TR1 has a pnp bipolar transistor, TR6, in its source to give agc-controlled gain, with the base of TR6 driven by the RX80 agc line. The degree of control can be preset by RV3.

Output from TR2 is passed to the mixer (TR3, a dual-gate mosfet) via T3, a further tuned circuit at signal frequency tracked by C10, 11 and D6. The mixer converts to the tunable i.f. of 3·0–4·0MHz by mixing with the output of an oscillator on the low side of signal frequency. The circuit is slightly unusual in that no fixed bias is applied to gate 2. This keeps the overall gain of the converter low, and assists in reducing third- and fifth-order products from the mixer.

Signals at i.f. from the mixer are developed across L3, finally taking output from the converter via source follower stage TR4. Again, to reduce switching, outputs from all converters are connected in parallel and taken to the tunable i.f..

The crystal oscillator TR5 is fairly conventional, with L4 tuned to the crystal frequency; D3 assists in reducing harmonic content of the output. Crystals are either fundamental or third overtone types, dependent on the frequency, and are low in frequency of the signal input. This preserves the tuning direction on all bands, which is necessary when using the digital

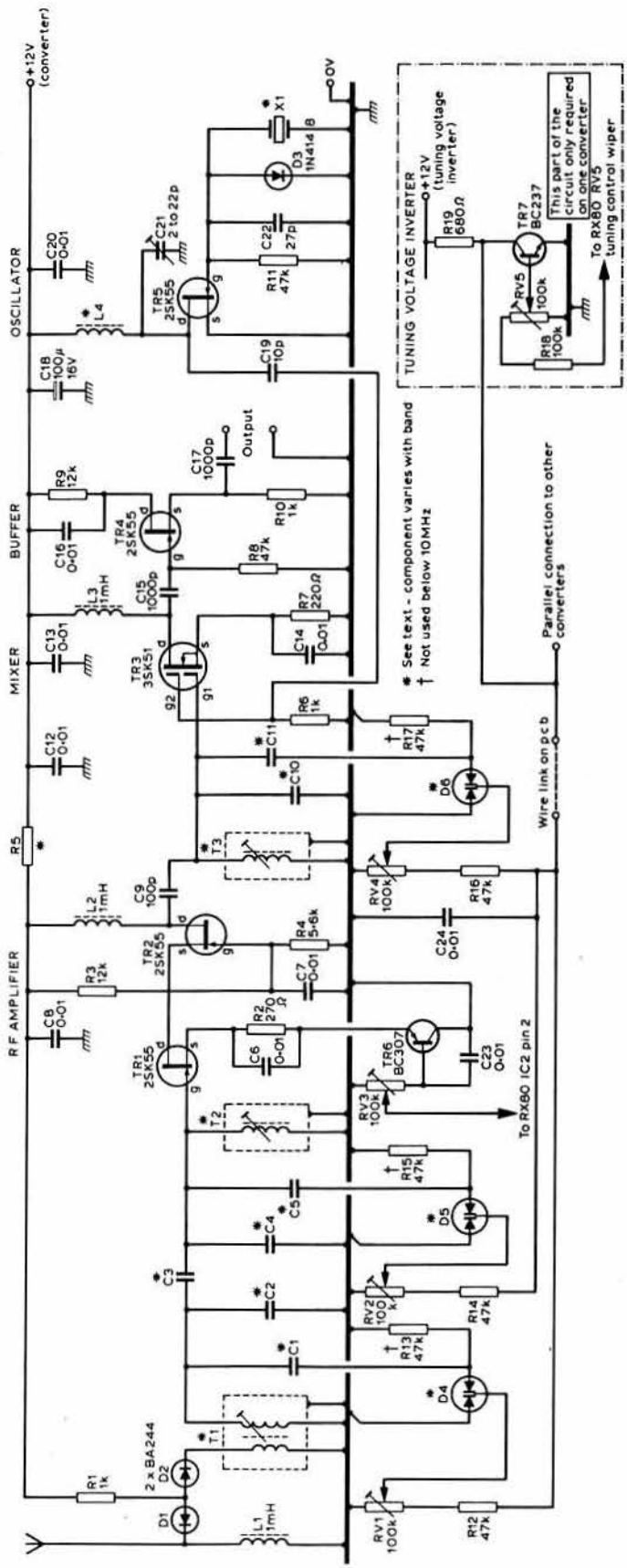

Fig 10. CV80 hf converter circuit diagram

*9 Alberta Walk, Worthing, West Sussex BN13 2SG.

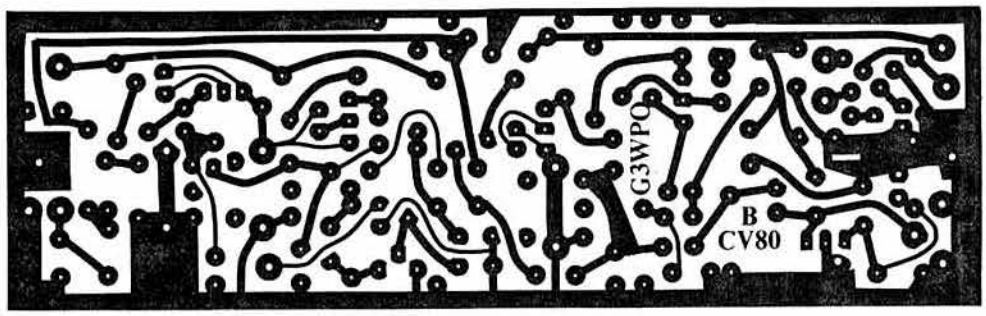

Fig 11. CV80 printed circuit board

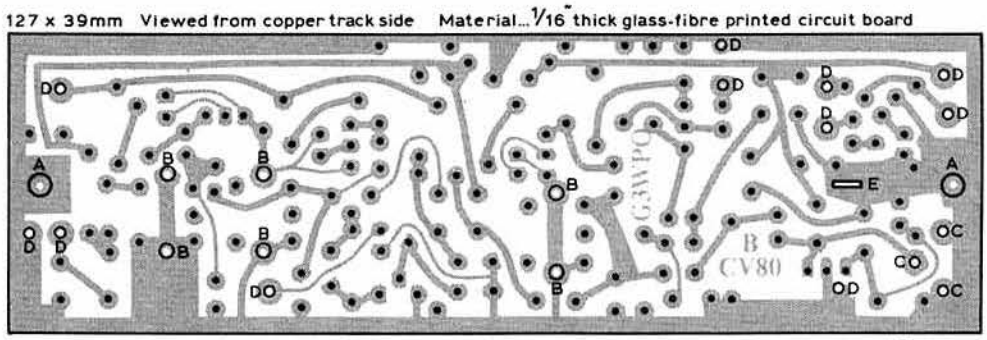

Fig 12. CV80 pcb drilling details

frequency meter accessory. As top band (1·8–2·0MHz) obviously presents a problem with this method, the output of the 1MHz converter is at 10MHz instead, and this is fed to the 10MHz converter and then to the i.f..

Spurious signals

Inevitably with a low-frequency i.f. and multiple conversion, a number of spurious signals are present across the frequency ranges of interest. While the tunable i.f. is free of such problems, a number of "birdies" appear in the various bands. Those within the amateur segments of the bands are likely to be the most troublesome and are generally at low levels. However, two are notable at S9+. The first is at 2·0MHz and will occur whichever combination of conversions is used; it is due to the closeness of the signal frequency to the tunable i.f.. The other, at approximately 7·095MHz, is due to an image response where the converter crystal beats with the i.f. image frequency. It can be reduced to a very low level by inserting a series trap tuned to the crystal frequency (4MHz) in the converter output coaxial cable. An extra 1mH rf choke in the +12V line to the converter will also help.

Screening the tunable i.f. will assist generally in reducing such problems, and details of a suitable enclosure will be given with the cabinet description. All leads carrying signal frequencies should be run in miniature screened coaxial cable with both ends of the screening braid earthed.

Converter construction

Each converter is built on a separate pcb type CV80 (Fig 11), drilling details for which are given in Fig 12. Refer to Part 1 of this article for general construction notes, and to Fig 13 for component positioning. Note that certain components vary in value with each band and that others are omitted.

1. Insert and solder the 10 pcb connection pins at the positions indicated by the solid black circles.
2. Insert and solder all fixed resistors. R5 is 470Ω for the 7MHz converter only. R13,15 and 17 are not used on the 7 and 1MHz converters, while R18 and 19 will only be required on the first converter to be built.
3. Insert and solder all fixed capacitors, taking care that the appropriate values for each band are used. C2,4 and 10 are not used on some bands.
4. Insert and solder D1 and D2 (blue), taking care that the polarity is correct, and then D3.
5. Insert and solder D4,5 and 6. Where BB204 diodes are specified, these are in a TO92 case and are inserted directly into the pcb as shown. With the KV1235 diodes (snap the diode package into three before using) the procedure is different, as follows:

D4 into holes 1 and 2 with the legend facing C3. Link holes 2 and 3 on the underside of the pcb using the excess lead from hole 2.
D5 into holes 4 and 5 with the legend facing RV2. Link holes 5 and 6.
D6 into holes 7 and 8 with the legend facing RV4. Link holes 8 and 9.

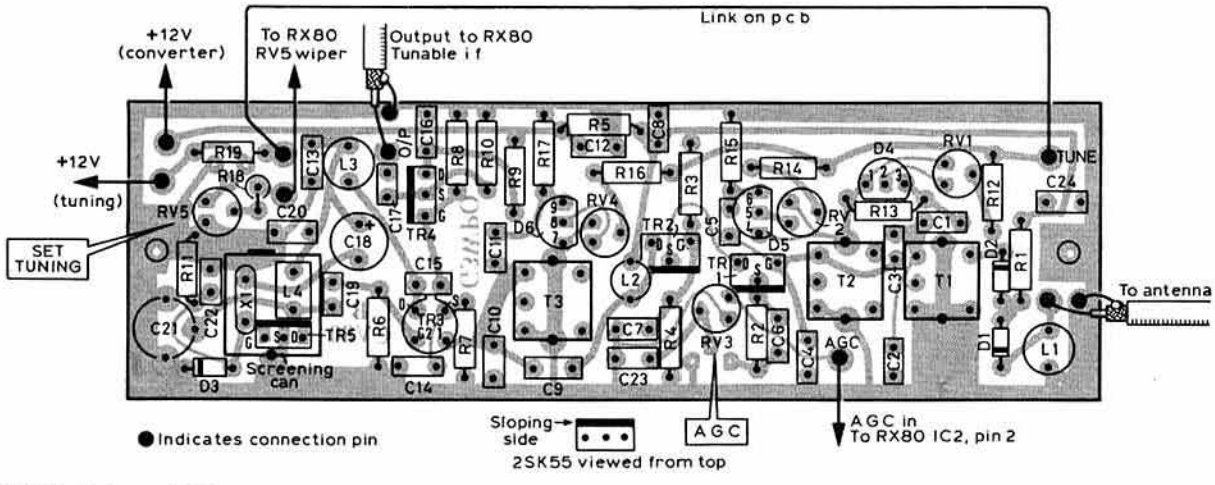

Fig 13. CV80 component layout and wiring

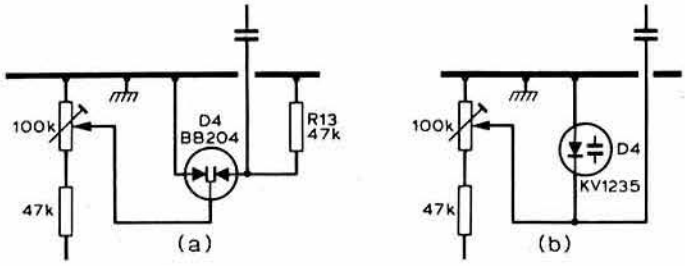

Fig 14. CV80 varicap diode details. (a) Circuit for 10MHz up (only D4 circuit shown, D5/D6 are similar). (b) Circuit for below 10MHz.

6. Insert and solder TR1-6, ensuring correct orientation. TR7 is only required on the first converter to be built.
7. Insert and solder the three 1mH rf chokes (black), and the correct value inductor (green) for L4.
8. Insert and solder trimmer capacitor C21.
9. Insert and solder RV1-4. RV5 is only required on one converter.
10. Insert and solder T1-3. It is important that all the can earthing lugs are soldered to the pcb for earthing continuity.
11. Insert and solder the correct crystal, with the bottom of the crystal can against the pcb upper surface.
12. DOUBLE CHECK positioning of all components, and look for solder bridges etc.
13. Insert and solder the screening can over L4,TR5,X1.

Alignment

1. Link points A and B (tuning voltage). On converters without TR7 circuit, link point B to point A of the converter which does have the circuit, and point C on the appropriate converter to +12V.
2. Link point D to the wiper of RV5 tuning control on the RX80 board.
3. Temporarily earth point E (agc) and turn RV3 fully anticlockwise.
4. Connect the output of the converter to the RX80 antenna input with miniature coaxial cable.
5. Preset RV1,2 and 4 to mid-travel, and C21 to half-capacitance.
6. Connect an antenna, and +12V to point E.
7. Tune the i.f. to 3·5MHz, and adjust RV5 until the voltage at point A is approximately 5·5V.
8. Tune to 3·0MHz and couple a signal generator at low level to the input of the converter. The generator output should be at the low-frequency end of the converter being aligned.
9. Peak T1,2 and 3 for maximum signal, reducing generator output as required. Retune to the high end of the band and peak RV1,2 and 4. Repeat the preceding adjustment until no further improvement can be obtained.
10. If no signal generator is available, it is possible to align the converter using amateur signals on the various bands. Some experimentation will be necessary to avoid tuning an image frequency.
11. If no signals are received, it is likely that the crystal is not oscillating, and C21 should be adjusted for reliable oscillator starting.

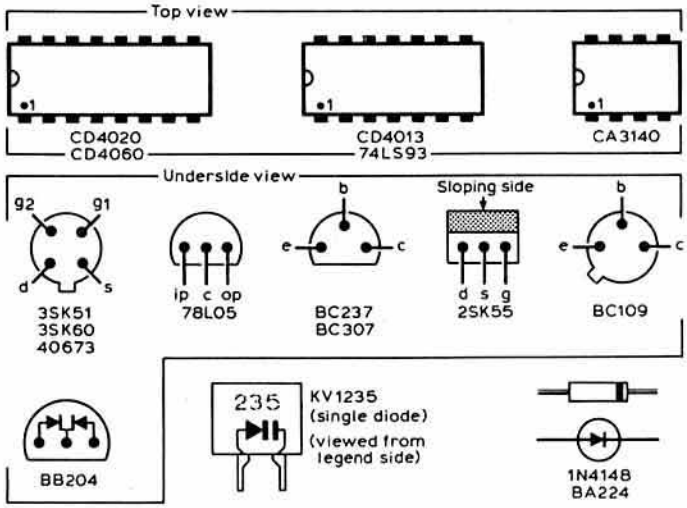

Fig 15. Component pin-outs for CV80/ST80 modules

CV80 converter components

R1,6,10	1kΩ	**C18**	100μF 16V electrolytic
R2	270Ω	**C21**	2—22pF film dielectric trimmer
R3,9	12kΩ		
R4	5·6kΩ	**C22**	27pF ceramic
R7	220Ω	**RV1,2,3, 4,5**	100kΩ Alps preset
R8,11,12, 13,14,15, 16,17	47kΩ	TR1,2,4, **5**	2SK55/BF256
R18	100kΩ	**TR3**	3SK51/3SK60/40673
R19	680Ω	**TR6**	BC307
C6,7,8,12, 13,14,16 20,23,24	0·01μF disc ceramic	**TR7**	BC237/BC107
		D1,2	BA244
C9	100pF ceramic	**D3**	1N4148/1N914
C15,17	1,000pF ceramic	**L1,2,3**	1mH choke type 8RB (black)

	Band (MHz)								
	1	**7**	**10**	**14**	**18**	**21**	**24**	**28**	**29**
L4 (μH)	10	18	15	4·7	2·2	2·2	1·5	1·5	1·5
T1,2,3	A	B	B	B	C	C	C	C	C
C1 (pF)	0·01(μF)	150	330	22	100	47	39	12	12
C2 (pF)	56	22	27	12	47	22	2·2	—	—
C3 (pF)	3·3	100	27	47	47	47	12	22	22
C4 (pF)	56	22	27	12	47	22	2·2	—	—
C5 (pF)	0·01(μF)	150	330	22	100	47	39	12	12
C10 (pF)	56	22	—	—	22	12	2·2	—	—
C11 (pF)	0·01(μF)	150	330	22	100	47	27	22	22
D4,5,6	1235	1235	204	204	204	204	204	204	204
R5 (Ω)	150	470	150	150	150	150	150	150	150
X1 (MHz)	9	4	7	11	15	18	21	25	26

A = Toko KANK 3333R (red core)
B = Toko KANK 3334R (yellow core)
C = Toko KXNK 3335R (pink core)

Also required
One screening can type S18
Ten 0·1in pcb connection pins
Miniature screened coaxial cable (UR95 or similar)

Notes
All resistors are 0·25W carbon film; ceramic capacitors are miniature plaquette type. R13, 15, 17 are not used on converters with KV1235 diodes. TR7, R18, 19 and RV5 are only required on one converter.
Only one KV1235 diode package is required per converter, as this contains three diodes which may be snapped apart for use singly.
Crystals are 30pF parallel resonant HC/25-U below 20MHz, and series resonant third overtone above 20MHz. L1-L3 are Toko type 8RB. L4 is Toko type 7BA (green).
Toko and Alps components are available from Ambit International, as is a printed circuit board and a complete set of parts, including the crystals, for each converter. An sae is essential with all enquiries.
Please note that the author is unable to assist with the supply of components or kits, and all such enquiries must be addressed to Ambit International.

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12. Once aligned, the agc can be set up. Connect point E to a wire taken from pin 2 of IC2 on the RX80 module. A spare hole adjacent to C23 is provided for this purpose.
13. The setting of RV3 will vary with the band in use, but it is likely to be about one quarter of its travel clockwise, and should be such as to reduce the gain adequately on strong signals. Over-advancing the setting will cause pumping of the agc.

Multiple converters

With more than one converter in use, the antenna input connections and the i.f. output connections can be connected in parallel with the other converters using short lengths of screened miniature coaxial cable. The only exceptions are for 1·8MHz where the output has to be switched to the 10MHz converter input, and 7MHz where the presence of the trap requires another switched connection. The trap should be connected as close as possible to the converter output. Details of all the switch wiring will be given in a subsequent part of the article.

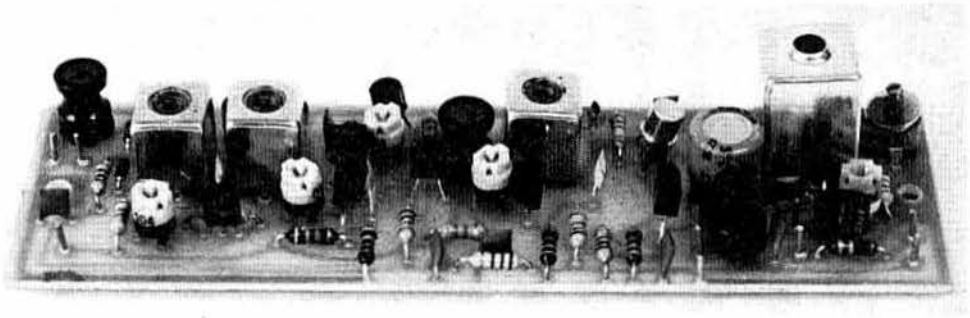
Other connections requiring paralleling are the agc and tuning. In most cases this reduces the switching between converters to the +12V line only.

Where combinations of converters are used, ie 1·8/10MHz and 144/28MHz, the converters should be stacked one above the other with an aluminium screening plate, the same size as the pcb, inserted between.

The DFM7B digital frequency display

It is strongly recommended that if the complete receiver is being constructed with multiple converters, the digital frequency display is used for frequency determination. This option allows a much more versatile receiver, without the need for fabrication of a dial assembly and multiple calibration scales. Also the ability to bandspread as desired can be fully realized, and finding a station again is easy. Not only that, but the finished receiver will appear much more professional.

The DFM7B comes as a ready-built module, in a very compact form designed around the Toko MSM5527 lsi chip, with an interface board



The CV80 hf bands converter.
Photo: **G8SUU**

specifically designed for the RX80 (although it can be used with any receiver with similar vfo frequency) and only requires connection to + 12V and the RX80 vfo buffer output.

As the dfm monitors the vfo frequency, a correction has to be applied to deduct the i.f. offset of approximately 455kHz. This is done with an internal rom (read-only memory) within the chip. Due to the variation in the centre frequencies of the various filters available for the RX80, the absolute accuracy of the display will vary with a particular filter. By use of the various offsets in the rom, the final displayed frequency will usually be no worse than 1kHz in error on lsb/usb. If using the Toko MFL455 filter, the display should be accurate on lsb, and 1kHz out on usb. This is considerably better than, say, the Trio R1000, which only displays the nominal centre frequency at all times, with no variation between filters and usb/lsb. Development of a modified interface board which will display the correct frequency to 100Hz at all times is underway, and details of this will be published later. As supplied the DFM7B is wired to display to 1kHz resolution, but this may be changed to 100Hz by those who wish to do so by removal of a link on the board. Full instructions are supplied with the module.

2MHz marine-band receiver

The RX80 module, although optimized for coverage of 3–4MHz, can be persuaded to operate on 2–3MHz by lowering the vfo coverage and changing the appropriate padding and tracking capacitors around the front end, to give a small 2MHz marine-band receiver. This could be contained in a small case if required. Details of the component changes will be given in a subsequent part of the article.

Bibliography

[1] The RX80 Mk2 (Part 1), A. L. Bailey, G3WPO. *Rad Com* January 1981.
[2] *Ambit International Catalogue*, part 4.
[3] *Radio Data Reference Book*. RSGB.

(**Apologies** to Frank Harrop, G3DVL, for the transposition error in his callsign in Part 1—*Ed*)

TO BE CONTINUED

TWO NEW SOLDERING INSTRUMENTS

Zaerix miniature soldering irons

These British-made miniature soldering irons from Zaerix Electronics, rated at 16–18W, have relatively large copper bits which almost totally enclose the heating element. Therefore heat transfer from the element to the iron is excellent, and their large thermal storage capacity helps them to maintain their operating temperature better than many other similar types available. The patented bit-securing method and fitting are so designed that flux will not normally enter the gap between the bit and the heating element, thereby reducing the likelihood of the bit corroding into position.

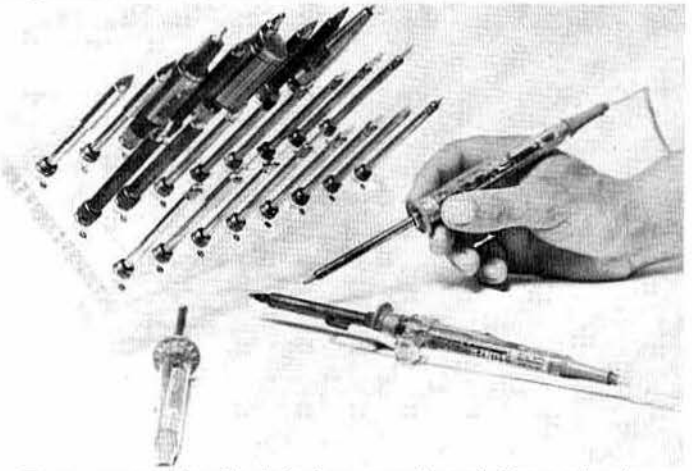
A 3mm diameter bit is supplied with each iron, and five other types are available, including a long-life iron capped type of 2mm diameter and a de-soldering bit. Three models of the iron are offered, rated at 220/240V, 110/120V and 11/12V; Zaerix replacement heating elements are available for all types.

This slim lightweight iron's design complies with the British Electrical Equipment Safety Regulation 1975. Body diameter is 17mm maximum, and total length with bit fitted is 190mm approximately. Further information from Zaerix Electronics Ltd, 46 Westbourne Grove, London W2 5SF. Tel 01-727 5641/7774. Telex 261306.

Edsyn Loner soldering instrument

Now available for the first time in the UK is a new soldering instrument made by Edsyn Inc, of California. Backed by a five-year guarantee, the Loner is a 50W, temperature-controlled instrument with a range of tops and desoldering accessories.

The instruments are static free, with zero voltage switching of the closed-loop differential amplifier circuit, and third-wire grounded tip, so they can safely be used with mos devices. They offer a fast (60s) warm-up, with thermistor temperature control to within 30°F of the required setting. When placed in one of the Edsyn soldering stations between soldering cycles, the instrument automatically idles at a 9W consumption, to prolong the life of the tip and conserve energy.



The transparent handle of the instrument is made from polycarbonate resin, and the jacket containing the temperature sensor is made of continuous stainless steel. Weight of the iron is 3oz, and an optional burn-resistant industrial line cord is available.

These instruments are available in the UK only from Circuit Plating Equipment Ltd, Cheapside House, Buckhurst Hill, Ascot, Berkshire. Tel 0990 25049/25939. □

VFOs investigated

by N. D. N. BELHAM, G2BKO*

THE two main troubles with vfos, whether they are in a transmitter or a receiver, are frequency shift when the "load" is applied, and a slow drift in frequency after switching on. This article describes the author's efforts to identify the causes and to assess their relative importance, so that intelligent use could be made of remedies already suggested.

An accurate and stable digital frequency meter was a prerequisite, and the Droitwich carrier clocked digital frequency meter developed for the purpose has already been described [1]. By means of this it was possible to read a frequency, averaged over 4s, to ±1Hz. The other necessary piece of equipment was a proportional temperature controlled oven and this has also been described [2].

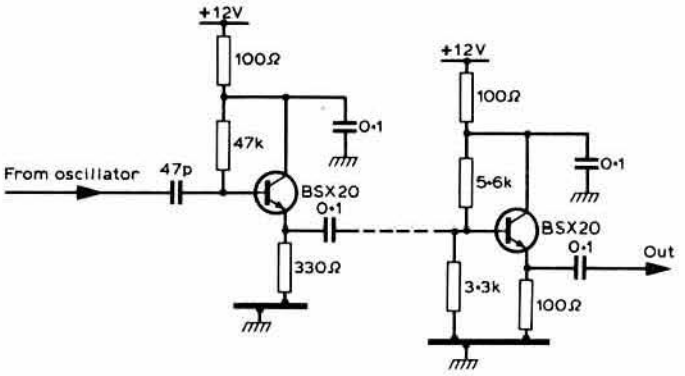


Fig 1. Buffer stages

Frequency pulling

The project started almost 10 years ago, when fm first became widely used on 144MHz. A 72MHz vfo, of the push-pull transistorized type, was made to drive a small a.m. transmitter which normally used a 72MHz crystal drive. The mechanical construction of the tuned circuit was particularly rigid, as the coil was in the form of a hairpin, anchored to a pin board at several places, with the pair of transistors mounted on a bridge. A small single-turn coupling coil took the output to a coaxial cable leading to the first stage of the transmitter, whose 72MHz stages could be switched on independently of the 144MHz stages. The figures show what happened to the vfo frequency when each of two lengths of cable was used:

Cable length	All transmitter off	72MHz stages on	Whole transmitter on
λ/4 cable	72·1745MHz	72·1909	72·1904
λ/2 cable	72·2278MHz	72·2151	72·2150

In each case the vfo frequency took about 0·5min to settle, and it was clear that the shift with "load" could be almost 20kHz. Rather than thinking of the shift being due to "loading" it is more enlightening to think of it as being due to energy being reflected back to the vfo from other parts of the transmitter. The figures show that the energy causing the trouble came from the 72MHz stages. This is not really surprising as the vfo generated at 72MHz, so the reflected and generated energy could readily combine to produce a continuing phase shift, until limited by the circuit constants.

Further simple experiments with the vfo alone confirmed the idea. Measurements made, when the vfo connecting cable was terminated in different ways, were as follows:

Termination	Open circuit	Short circuit	75Ω	No cable
λ/4 cable	72·1920MHz	72·2510	72·2067	72·0485
λ/2 cable	72·2188MHz	72·1454	72·1919	72·0477

These were just the type of results to be expected if the reflected wave was responsible for the frequency shift.

Buffer stages

The function of buffer stages is to allow energy to flow from the vfo as freely as possible, and to attenuate as much as possible the energy reflected back to the vfo. One way of judging their effectiveness is to measure the frequency of the vfo when the last buffer stage is loaded in different ways. For this experiment the two stages, whose circuit is shown in Fig 1, were used with a vfo in the 30MHz region. The resulting changes in vfo frequency were as follows:

Load	After one stage only Frequency change (MHz)	After two stages
10kΩ	29·7123 to 29·7068 (−0·0055)	+0·0009
2pF	29·7116 to 29·6980 (−0·0036)	+0·0190
12t coil 0·5in diam + core	29·7117 to 29·7592 (+0·0475)	+0·0061
Crystal nom 29·6200MHz	29·7124 to 29·6161 (−0·0963)	+0·0283

These results show that in the cases of the resistor and inductor, a second emitter follower reduced the disturbing effect of the load. It is also clear that one buffer stage is not enough to prevent a high-Q tuned circuit, such as a crystal, from pulling the vfo towards crystal resonance. The effect of the capacitor is surprising, and this was investigated in more detail. The results were as follows:

Load	VFO frequency change (two buffer stages)
2pF	29·6582 to 29·6761 (+0·0179)
39pF	29·6576 to 29·6748 (+0·0172)
100pF	29·6576 to 29·5686 (−0·0890)
Trimmer adjusted to 68pF	29·6754 to 29·6754 no change

Thus there is a particular value of capacitance which, when added as a load, made no change in the vfo frequency. In general, however, even two buffer stages do not adequately protect the vfo from reflected energy.

FET buffer stage

The circuit of the source follower used is shown in Fig 2, together with peak-to-peak voltage measurements. Since the input capacitance of the 2N3819 is given as under 8pF, the voltages shown in the figure are to be expected at 30MHz. The stage was then used in reverse and the 7V p/p input applied to the source load via the 0·01μF capacitor. The resulting output across the gate resistor was 0·1V p/p, an attenuation of some 37dB. The second emitter follower stage previously used was then replaced by the fet stage and varying load measurements repeated as follows:

Load	VFO frequency shift (MHz) (two stages)
10kΩ	29·6895 to 29·6892 (−0·0003)
2pF	29·6889 to 29·6892 (+0·0003)
Coil	29·6889 to 29·6831 (−0·0058)
Crystal	29·6897 to 29·6894 (−0·0005)
33pF	29·6884 to 29·6861 (−0·0023)

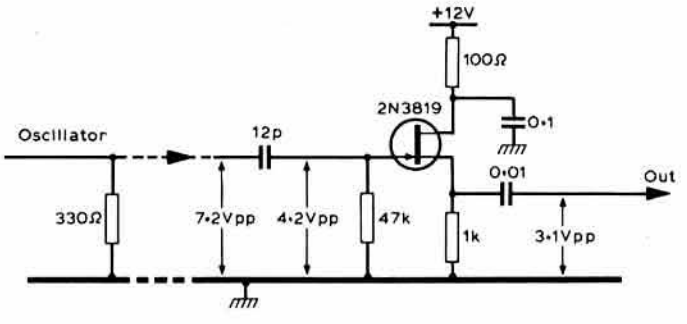


Fig 2. FET buffer

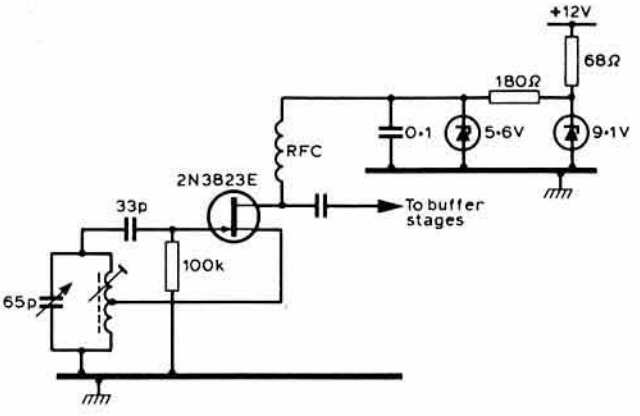


Fig 3. 12MHz fet oscillator

*7 Binyon Close, Badsey, Evesham, Worcs WR11 5EY.

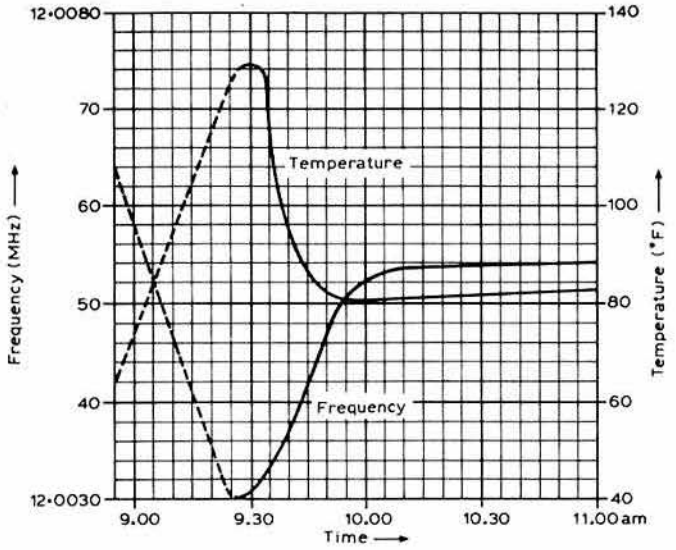


Fig 4. Temperature and frequency change with time

The fet buffer stage was obviously more effective. It is interesting to note that the coil disturbed the frequency most. One must conclude that a string of buffer stages is needed for any worthwhile protection for the vfo.

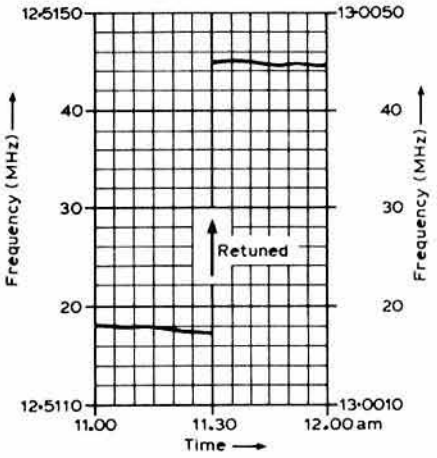


Fig 5. Retuning

Synthetic vfo

The next step was to make up a 72MHz vfo in which the two component frequencies, whose sum came to 72MHz, were not related in any harmonic way to 72MHz. A crystal oscillator, having a frequency of 66·7000MHz, was added to the output of an oscillator tuning from 6·3000 to 5·3000MHz. The unwanted difference frequency was filtered out and the filter followed by a buffer stage. When the small a.m. transmitter was coupled to the final output of the vfo by means of a $\lambda/4$ cable the results were as follows:

	All transmitter off	72MHz stages on	Whole transmitter on
VFO frequency	72·0020MHz	72·0039MHz	72·0039MHz

showing that the "pulling" had been reduced to 1 or 2kHz.

The effect of temperature change

A fet oscillator in the 12MHz region, the circuit of which is given in Fig 3, was placed in the proportional temperature-controlled oven. The temperature was raised to 129°F, and the controls then set for an equilibrium temperature of 80°F. The results are shown in Fig 4. It will be seen that the increase in frequency began with the drop in temperature but continued for a while after the oven temperature had stabilized, until the temperature of the unit had also reached 80°F. The change in frequency was only 2·3kHz for a temperature change of 49°F. A violent change of 20°F was needed for a shift of 1kHz.

However, the effect of temperature change was very rapid when it was brought about by radiation falling on the oscillator, but in general only long term drift can be put down to temperature change.

The effects of retuning and supply voltage variation

Since the oscillator was fitted with a tuning capacitor, the shaft of which could be brought out through a hole in the oven, the effect of retuning was tested. The result is shown in Fig 5 and indicates that retuning had no measurable effect on the stability of the oscillator.

While the oscillator was still in the oven the supply voltage was varied slightly. (The oscillator had two stages of regulation: the first by a 9·1V zener, and the oscillator stage itself by a 5·6V zener.) The following results were obtained:

Supply volts	12·3	12·6
Frequency (MHz)	13·00362	13·00383
5min later	13·00377	13·00383
10min later	13·00380	13·00375

As there is no obvious logical connection between supply volts variation and frequency in this case, it can be discounted as a cause of drift.

Oscillator types

Three oscillators were tested for stability in the oven. The first was a single BSX20 stage, built on a large heatsink and operating at 80MHz. The change in frequency with time is shown in Fig 6. During 4h the maximum drift was about 7kHz or 0·087 per cent when the oven was at 75°F.

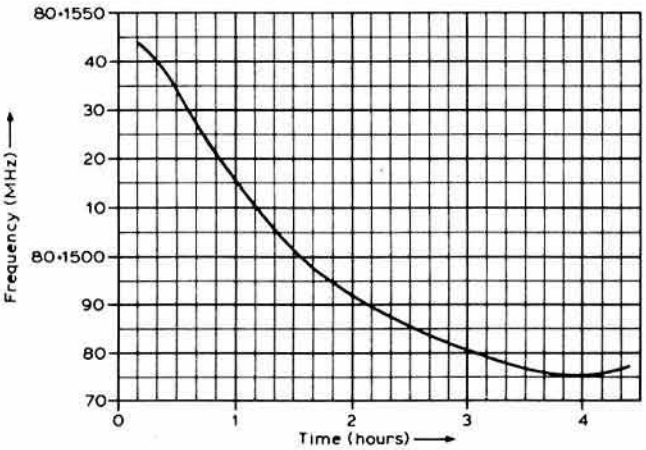


Fig 6. 80MHz BSX20 oscillator

The second oscillator, operating in the 12MHz region and built in a cast-metal box, consisted of a fet with two buffer stages. The results are shown in Fig 7. While the oven was at 77·5°F the maximum drift in 2h was 1·24kHz or 0·104 per cent—comparable with the first but settling down in a much shorter time. It is interesting to note that the drift was in the opposite direction to that of the bipolar device.

The third oscillator was a modification of the second. A source resistor of 400Ω was fitted between the fet source and the coil tapping point, its value being chosen to reduce the amplitude of oscillation to a very low value. The results, shown in Fig 8, indicate a drift of only 360Hz, and settled later to about 80Hz or 0·00067 per cent. Even a momentary switch-off created little change in frequency once the oscillator had "settled".

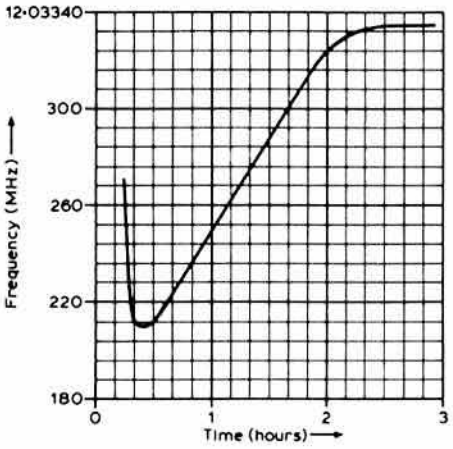


Fig 7. 12MHz fet oscillator

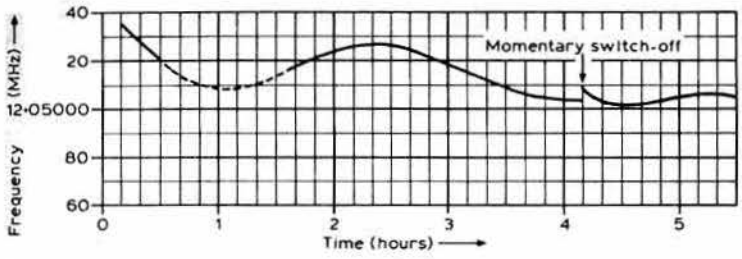


Fig 8. FET oscillator with source resistor

The source resistor would tend to stabilize the operating point and to reduce the loading on the tuned circuit.

The effect of tuned circuit Q

Oscillators using crystals as tuned circuits are well known as being much more stable than LC types, due, it is said, to their much higher Q. This suggests that oscillation can only be maintained over a small range at the "nose" of the resonance curve. The sharper the "nose", the smaller the permitted range of oscillation frequency to be expected. This suggests that short-term drift is often just movement within the "permitted" range. Limits may be set by both amplitude and phase changes.

To get some idea of the permitted range, two oscillators operating in the 180kHz region were used. The circuit is shown in Fig 9 and was the same for both. The output of oscillator A was monitored by a scope and the source resistance set so that no self-oscillation took place although near the oscillation point. The output of oscillator B, its frequency measured by the dfm, was fed to the tuned circuit of A by a small coupling coil several inches from the tuned circuit of A. By alternate warming and cooling, the frequency of B was made to drift through the resonant frequency of A. As shown in Fig 10, oscillator A was induced into its full amplitude of oscillation over a range of only 50Hz or 0·0026 per cent, and the amplitude induced fell very rapidly on each side. If this curve is treated as part of a resonance curve and compared with the universal resonance curve, a value of 3,650 for the Q is suggested—much higher than the measured Q of 100 when the supply to A was cut off. The increase could only be due to the positive feedback, which was just short of that needed for self-oscillation.

If the injection is reduced, the range over which full oscillation can be induced is much reduced. The converse is also true. These results would seem to confirm a "nose" theory of short-term drift.

If the Q of a crystal—having a Q of, say, 2,000—is increased by positive feedback in a similar proportion, we should expect the "nose" to be as narrow as 50/20Hz, say 2·5Hz. To test this, a 455kHz crystal was placed in the positive feedback loop of a suitable amplifier whose gain could be varied. When set to oscillate the frequency was 455·204kHz. When the system was set just below the self-oscillation point, and a small voltage injected from another variable 455kHz oscillator, it was found that the circuit only "fired" over a range of some 2Hz. This test had to be carried out slowly to allow time for the oscillation initiated to build up. At resonance a circuit can store very much more energy than at other frequencies but, if the rate at which energy is being supplied is low, it takes time for the resonant circuit to "fill up". The higher the Q the longer it takes.

If the frequency drift of an oscillator is to one side or other of the "nose" of a resonance curve, enhanced by positive feedback, it is to be expected that the amplitude of oscillation would fall as the frequency

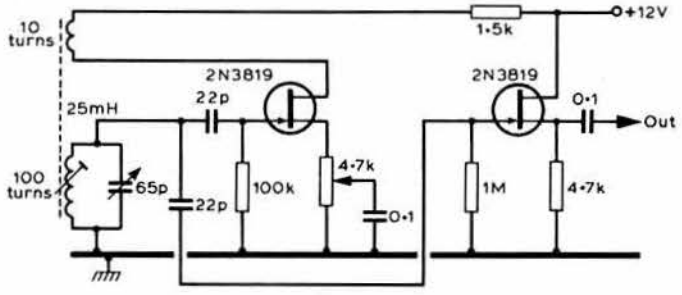


Fig 9. 180kHz fet oscillator

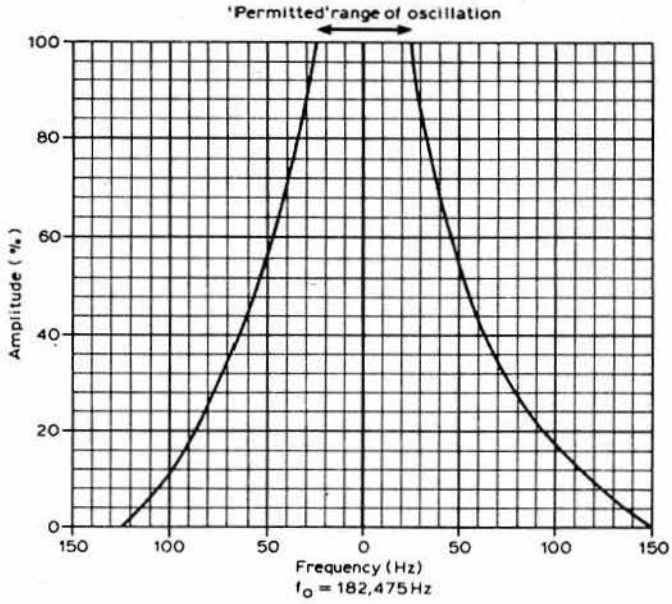


Fig 10. "Permitted" range of oscillation

"settled". This indeed happened, as shown in Fig 11, where the amplitude fell to 66 per cent of its starting value. It is interesting to note from the universal resonance curve that for such a fall the phase change is 45°. When two sine curves, having the same frequency but differing in phase by 45°, are added graphically it is quite obvious that the waveform is no longer a sine curve. More and more energy goes into harmonics and the amplitude falls. The "nose" theory does seem to fit the facts!

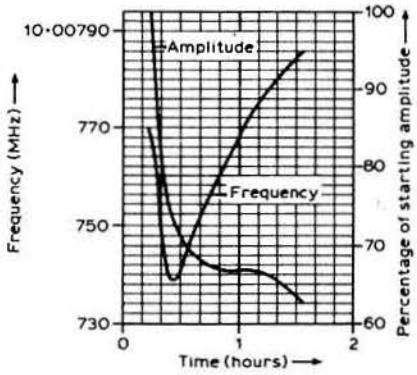


Fig 11. Amplitude of oscillation and frequency drift

Conclusions

1. The overriding requirement for stability in an oscillator is a very high Q tuned circuit.

2. To make the best use of such a circuit the amplitude of oscillation should be kept to a minimum consistent with reliable oscillation.

3. The resonant frequency of the high Q circuit needs to be undisturbed by mechanical or temperature change.

4. Energy reflected back to the oscillator, or introduced from an external source of near frequency, needs to be drastically reduced by several well-designed buffer stages.

5. If, as in the case of a transmitter, it is impossible to avoid the return of energy to the oscillator drive, a vfo of the synthetic type in which none of the generated frequencies is harmonically related to the final vfo output frequency, is advisable.

6. Changes due to temperature variation can be eliminated by an oven, large enough to house the complete unit, with quite simple proportional temperature control, provided that the unit is screened from radiation.

References

[1] "How accurate is a digital frequency meter?", N. D. N. Bellham, G2BKO. *Radio Communication*, April 1980, p368.
[2] "A proportional temperature-controlled oven", N. D. N. Belham, G2BKO. *Radio Communication*, November 1980, p1151.

Comment

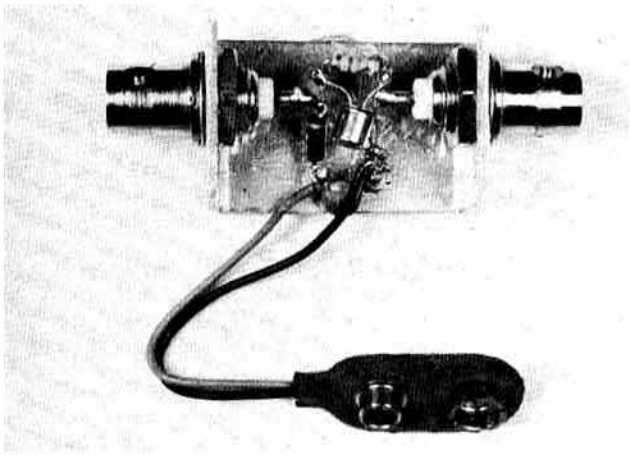
Now back to our programmable dividers with their associated phase locked loops all packed up into convenient black boxes by nifty† Nippons, and yet, convenient as they are, they only cater for a part of amateur radio. A great deal of enjoyment can come from rediscovering for oneself. It does not matter if what you find is already known to the professionals, the enjoyment is yours. There is always the chance that your imagination, able to roam free of current trends and fashions, may light on something so simple that it has been overlooked by professionals. By all means leave the black boxes undisturbed to conserve their value, but do keep a selection of components near the soldering iron! □

†Nifty = spruce, smart, stylish.—*Concise Oxford Dictionary.*

Simple wideband preamplifier

by G. J. JESSOP, G6JP*

MANY preamplifiers have been described from time to time, and generally these have had low noise, high gain, high selectivity or a combination of these features. For many purposes an amplifier having wide-band characteristics with a reasonable noise factor can be a worthwhile addition to a commercial or home-built transceiver or receiver which itself has adequate selectivity.



Interior view of the preamplifier

In most urban locations very low noise preamplifiers are of little practical value, because of the relatively high ambient noise generated by various items of electrical equipment, almost universal use of discharge lamps for street lighting, and the gross noise produced by some cars and motor cycles. A preamplifier that will provide significant voltage gain with reasonable low noise may be built with an absolute minimum of simple components and substantially no adjustments, as detailed below.

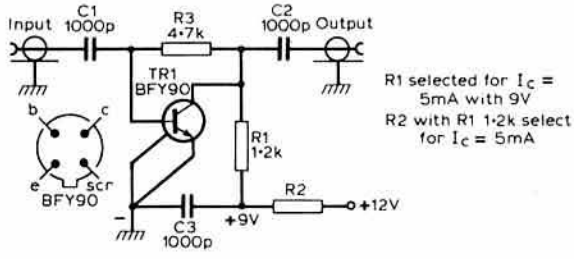


Fig 1. Circuit diagram

Fig 1 shows a circuit which consists simply of two isolating capacitors joined together by a resistor; a transistor connected across the resistor, its base to the input end and the collector to the other end of the resistor; the collector load resistor is connected to this point, and a bypass capacitor connected to the remote end. The most suitable collector current is 5mA for a BFY90 transistor; in its simplest form a 9V battery is all that is required. If the amplifier is to be connected into equipment with a 12V supply, an additional resistor will be needed to set the collector current to the correct value.

An approximate gain/frequency curve for the amplifier is given in Fig 2. This naturally shows some fall-off of gain as the frequency is increased, due to the shunt capacitance effects across the collector load.

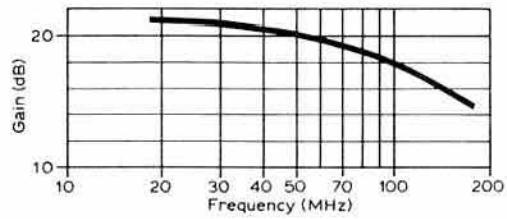


Fig 2. Approximate gain/frequency characteristic

Fig 3 shows the component arrangement. Although BNC connectors were in the original, any alternative may be used. If the amplifier is to be "built-in", the connector can be dispensed with, and one of the isolating capacitors may not be needed, depending on the transceiver's own circuit. The components used were 1,000pF 30V disc ceramic capacitors, 0·25W film-type resistors, and a BFY90 transistor.

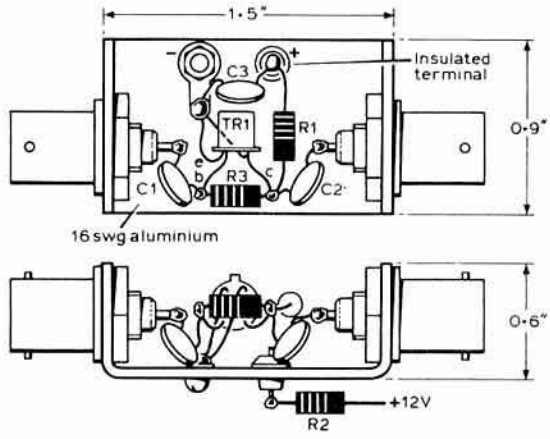


Fig 3. General arrangement of preamplifier

In use on 144MHz, signals that are Q3-4 are improved so that they become a good Q5. Noise is lower than with a standard FT221 alone, but of course car ignition can be heard from a greater distance. The author has several preamplifiers with tuned circuits, but this simple unit gives an adequate signal gain for most purposes. □

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A two-element three-band beam

by W. G. BORLAND, G3NXM*

EXPERIMENTS have recently been carried out to determine whether it would be possible to construct a simple two-element three-band beam with a performance equal to commercially constructed ones, and then to see whether it could be shortened from the usual 26ft long elements without any noticeable reduction in efficiency. Traps are required for three-band working, so, first of all, a word about the theory.

A dipole with traps is shown in Fig 1. The centre portion is cut to length to resonate at the highest frequency F1, say 28MHz. Traps T1 also resonate at this frequency, thereby cutting off the outer portion of the antenna. The antenna is then extended to resonate at frequency F2, say 21MHz. Traps T2 also resonate at 21MHz, cutting off the outer portion of the antenna. At this frequency, however, the capacitance in traps T1 "disappears", leaving only the inductance which provides inductive loading [1]. As a result the overall length for frequency F2 is less than that required for a dipole. The antenna is then further extended to resonate at frequency F3, say 14MHz. At this frequency the capacitance in both traps T1 and T2 "disappears", leaving only inductive loading. This results in an antenna about 26ft overall, compared with the 33ft required for a 14MHz dipole. To complete the theory, if the antenna was fed with a higher frequency than F1, say 54MHz, the inductance in the traps would disappear, resulting in capacitive loading.

The LC product for traps to resonate at 28·8MHz is 30·5 (pF × μH), so there is quite a choice for the values of the capacitor and the inductor. The larger the value of the inductor the greater will be its loading effect on the next lower frequency, tending to shorten the antenna. However, the greater the inductance the greater will be the losses. So it is a question of trying to obtain a happy medium.

Construction

The first operation is to construct the traps. An attempt was made to use aluminium tubing for the capacitors. This was abandoned due to lack of workshop facilities, and high voltage capacitors were used instead. The coil former was a piece of 21mm o/d plastic overflow pipe, which was a reasonable fit inside the 1in o/d aluminium tubing used for the antenna. This former was strengthened by a piece of 0·75in dowelling painted with polyurethane lacquer and pushed inside the pipe. Two holes 2in apart were drilled through the formers. The wire, 16swg enamelled, was pushed through one hole, the required number of turns wound on the former and then pushed through the other hole. The wire was terminated with solder tags and the capacitor was connected across the inductance. Using a gdo the traps were then adjusted to the required frequency by expanding or compressing the turns. (Although not necessary, a dfm connected to the gdo makes the adjustments easier.) After the turns were adjusted they were fixed in position by spraying with at least two coats of ignition sealer. The traps were fixed to the aluminium tubing by means of 0·5in No 6 rustproof self-tapping screws. (If necessary the ends of the traps can be wrapped with pvc insulating tape to make a tighter fit inside the aluminium tubing.) Fig 2 shows the construction of the traps.

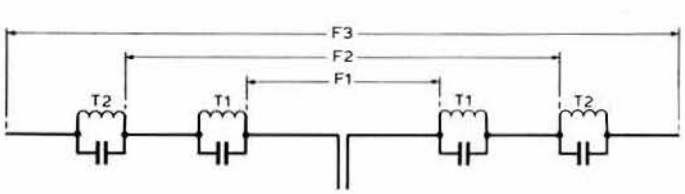

Fig 1. Electrical diagram of three-band antenna with traps

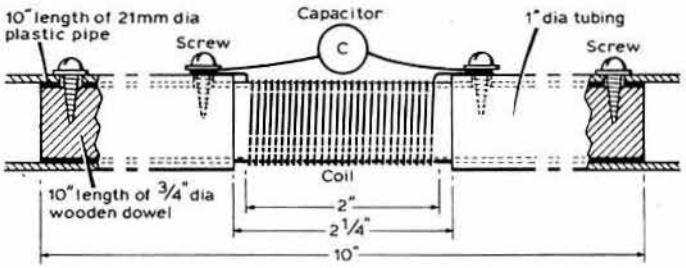

Fig 2. Construction of traps; see text for number of turns and value of C

The 28MHz traps were wound with 17 turns, and the capacitors were 10pF. Two traps were resonated at 28·8MHz for the driven element, and two at 27·4MHz (approximately five per cent lower) for the reflector. The 21MHz traps for the driven element were wound with 16 turns, the capacitor was 22pF and they were resonated at 21·2MHz; the reflector traps required 17 turns and with the 22pF capacitor were resonated at 20·2MHz.

The elements were constructed of 1in o/d aluminium tubing. (If it is necessary to join two lengths together, Fig 3 shows one method.) The length of the driven element constructed of tubing was obtained from the formula 475/f, and for 28·8MHz was 16·5ft. To allow for trimming, two lengths 8·5ft long were joined together by means of an insulated rod, leaving a 0·75in gap between. This rod is essential for structural stability and relieves the insulators of some of the strain. This dipole was mounted about 6ft above ground and the 28MHz traps were fitted. The antenna was then "dipped" by means of the gdo and a one-turn link, and the tubing was gradually shortened by cutting small pieces equally off each half until the resonant frequency of 28·8MHz was obtained. A piece of tubing about 2ft long was added to each end, followed by the 21MHz traps. This tubing was then trimmed until the antenna resonated at 21·2MHz. Finally a piece of tubing about 3ft long was added to each end and trimmed until the whole of the element resonated at 14·2MHz.

The reflector element was first of all constructed as if it was a dipole, in exactly the same manner as for the driven element except that two 9ft lengths of tubing were used, and the reflector traps fitted. After this element was adjusted for 27·4, 20·2 and 13·5MHz, the two halves were joined together by means of the splice shown in Fig 3. Finally the traps were covered with several layers of pvc insulating tape and painted with two coats of polyurethane paint.

The boom was a 7ft length of 1·5in o/d aluminium tubing, this being $\lambda/10$ at 14MHz and $\lambda/5$ at 28MHz. The driven element was mounted on four insulators which were bolted to a 2·5ft length of aluminium angle which in turn was fixed with "U" bolts to the boom. The reflector was fixed directly to the boom.

Some difficulty may be experienced in obtaining the insulators and aluminium angle and the following has been used successfully. Four pieces of 21mm overflow piping about 1in long were cut open lengthwise and clipped round the 1in tubing. This increases the diameter so that it can be clipped into 28mm plastic pipe clips of the type used by plumbers for fixing pipes to walls, and are bolted or screwed to the support. Instead of an aluminium angle, the support can be a piece of 4 by 1in polyurethane lacquered hardwood (not softwood) which can be "U" bolted to the boom, and to which the pipe clips are screwed or bolted.

Unfortunately at the author's QTH the turning radius had to be limited to 11·33ft which for a two-element beam with a 7ft boom meant that the elements could not exceed 21·5ft, so the last section had to be shortened and some form of end loading added. An article by G6XN [2] advocated

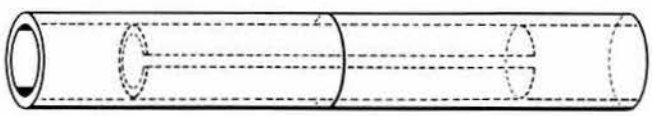

Fig 3. Method of joining tubing. A piece of tube 1ft long has a 0·5in slot cut lengthwise, compressed, and forced into the lengths to be joined as a splice

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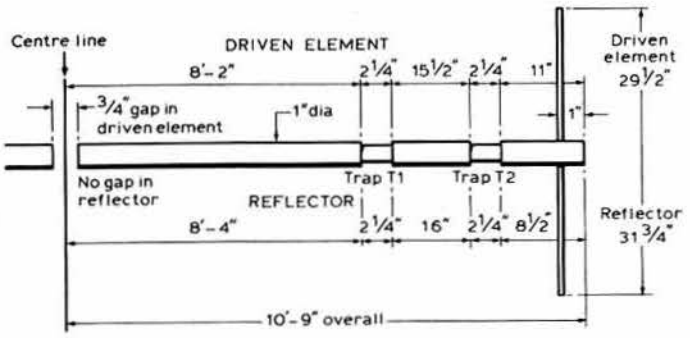

Fig 4. One half of the antenna; see text for dimensions

vertical rods as end loading and, as it was felt there would be some radiation from these rods, this method was adopted in preference to capacitance hats. A 0·25in hole was drilled through the shortened outer length of tubing about 1in from the end, and a 3ft length of 0·25in rod pushed through this hole and centred on the 1in tubing. These were joined together with a self-tapping screw. The 0·25in rods were then trimmed so that the whole of the driven element resonated at 14·2MHz, and the reflector at 13·5MHz. Fig 4 shows the layout of the antenna, but it must be emphasized that these dimensions are likely to vary due to tolerances in the construction, diameter of tubing, type of laps etc, and the procedure outlined should be followed.

If space is available there is no reason why a director could not be added, either full size or shortened. The resonant frequencies for the director would be 30·3, 22·2 and 14·9MHz. However, the two-element shortened beam at 26ft is giving very good results, at least equal to that of a commercial beam, and at a cost of less than a quarter of the latter.

The distance between the driven element and the reflector is 7ft, this being $\lambda/10$ at 14MHz and $\lambda/5$ at 28MHz. If a director is added this should be 5ft in front of the driven element. The antenna is fed with 92ft of 50Ω coaxial cable; this length, taking into account the velocity factor, being two, three and four wavelengths on 14, 21 and 28MHz respectively. The impedance presented to the transmitter is about 55Ω.

It has recently been announced that by about 1982 amateurs will have two additional frequencies within the range of this antenna, namely 24·9 and 18·1MHz. Certain preliminary experiments are being carried out and it would appear that this antenna can be modified to accommodate these new frequencies. By sheer chance an impedance meter and a gdo were connected to the end of the coaxial cable and, to the very great surprise of the author, the antenna dipped at 24·9 and 18·1MHz, but the impedance dropped to about 37Ω. The reason for this still remains a puzzle, and any test transmissions will have to wait until these bands are available for amateur use.

References

[1] *The ARRL Antenna Book.*
[2] "High performance small beams". *Ham Radio* March 1979. □

Amateur radio in the USSR

by D. ANDERSON, HB9BRQ*

The author of this article provides summary translations of issues of Radio, *the USSR monthly amateur radio magazine, and extracts from these translations have appeared in* Rad Com, IARU Region 1 News *and* QST.

DOSAAF

DOSAAF is the organization which sponsors amateur radio in the USSR; the acronym standing for Vsesoyuznoye ordena Lenina i ordena Krasnogo Znameni Dobrovol'noye Obshchestvo Sodeystviya Armii, Aviatsii i Flotu (All-Union Order of Lenin and Order of the Red Banner Voluntary Society for Co-operation with the Army, Air Force, and Navy). The organization conducts military training for pre-draft-age youth, and sponsors sports such as motorcycle-racing and amateur radio, which are considered to have military applications.

The Central Radio Club of the USSR, named after E. T. Krenkel (Ernst Krenkel was a famous Arctic explorer, philatelist and radio amateur) is itself a DOSAAF institution. DOSAAF has a major role in publicizing amateur radio: jointly with the USSR Ministry of Communication it publishes the monthly magazine *Radio*, and the DOSAAF Central Committee puts out the twice-weekly newspaper *Sovetskiy Patriot*. *Radio* carries extensive news about amateur radio (although it covers a wide range of electronics hobbies as well), and roughly every other issue of *Sovetskiy Patriot* includes an article or groups of articles about amateur radio.

Geographical units in the USSR

The summary translations of Soviet articles on amateur radio frequently contain what may initially be bewildering references to krays, oblasts, rayons, RSFSR, SSRs, ASSRs, etc. A basic understanding of the geographical breakdown of the USSR is useful, since the two organizations regularly mentioned in connection with the amateur service—DOSAAF and radio sport federations—are organized on the basis of the larger geographical units. The geographical units used in the USSR are unique and do not match up with ones used in other countries: to avoid ambiguity in cases where straightforward English translations do not exist and where a single English term might be used to translate different Russian terms, eg "region" for both "oblast" and "rayon", the Russian term—with anglicized plural—has been preserved.

In Soviet usage, "nationality" refers to ethnic origin, not country of allegiance. The union republics themselves constitute the top level of nationality-based units, being based on the dominant ethnic group residing within their borders. Each SSR has its own language, flag, and council of ministers. Constitutionally, the USSR is a Union of Soviet Socialist Republics. The highest level, that of the country as a whole, is indicated by terms such as "all-union," "of the USSR," or "of the Soviet Union". The 15 soviet socialist republics are what are normally thought of as the constituent parts of the USSR: Russia itself (the RSFSR), the Ukraine, Belorussia (White Russia), Georgia, Uzbekistan, etc. They are termed union republics to differentiate them from autonomous SSRs (see below). Any given location in the USSR lies within one union republic or another. The Russian Soviet Federated Socialist Republic—the RSFSR—occupies roughly three-quarters of the land mass of the USSR; as its title suggests, the RSFSR has a federated substructure and indeed is sometimes referred to as the "Russian Federation".

The union republics are divided into variously named units, the most common being the oblast and the next-most-common the kray. Krays are usually more extensive in area and sparser in population than oblasts. Some of the smaller union republics lack the oblast/kray level entirely, and break down directly into rayons (see below).

If a portion of a union republic is inhabited principally by a distinct ethnic group, it may be designated an Autonomous Soviet Socialist Republic, ASSR, instead of an oblast or kray; ASSRs have a more complex governmental structure than do oblasts or krays. Lower down on the "nationality" scale are autonomous oblasts and autonomous okrugs (okrug = district), the former subordinate to a union republic and the latter to an oblast or kray. The Soviet amateur press occasionally reports dxpeditions to remote nationality-based units.

Rayons, literally "regions" (but "region" is sometimes used to translate oblast), are, along with the union republics, the most pervasive units in the country. A comparable unit in Canada, the UK or the USA would be the county. Large cities such as Moscow have rayons within their borders, a reversal of the normal hierarchal relationship.

At the local level there are cities and towns (the Russian word gorod meaning both), villages (selo, or in the Caucasus aul), settlements, and "rural populated points". □

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UOSAT—the AMSAT scientific and educational amateur spacecraft

by M. SWEETING, BSc, PhD, FBIS, G3YJO*

Introduction

The amateur satellite programme, born in 1961, has witnessed a total of 10 amateur spacecraft launched into earth orbit—of which five may be considered experimental (Phase 1) and five developmental (Phase 2). The first amateur spacecraft to be considered fully operational emerged from the AMSAT Phase 3 programme early last year; however, a failure of the European Ariane launch vehicle has delayed the realization of this operational stage until, probably, mid-1982.

The early experimental satellites (Oscars 1 to 5) were managed by Project Oscar Inc (USA), while the development satellites Oscars 6, 7 and 8 were constructed under the auspices of the Radio Amateur Satellite Corporation—AMSAT, based around Washington DC. Two further development spacecraft have been launched successfully by the USSR (RS 1 and 2).

Although the amateur satellite programme has reflected a substantial educational flavour, the emphasis during Phases 2 and 3 has been on producing amateur communications satellites primarily intended for increasing vhf and uhf communication range between amateur radio operators. Amateur radio is very much a self-learning and training activity even in its simplest manifestation and, as with other amateur off-shoots of professional activities (such as amateur astronomy), has by its peculiar resources contributed much to the overall understanding of its field. In recent years amateur radio has perhaps developed stronger communication skills at the expense of experimental skills, largely due to the impact of relatively cheap, mass-produced, high-technology equipment, and has in turn limited its appeal away from the broader audience of amateur scientists, technicians and dabblers who could so enrich the fraternity.

In an attempt to redress this imbalance, AMSAT-UK is constructing an amateur scientific and educational spacecraft (UOSAT) specifically aimed at generating interest among a wide range of imaginative individuals in an important but now largely neglected aspect of amateur radio.

UOSAT is being constructed at the University of Surrey (UK) and is supported by AMSAT, RSGB, British industry and research organizations.

Mission objectives

The mission objectives may be summarized as follows:

1. To provide radio amateurs with a readily available tool for the study of the propagating medium through which they communicate from hf to microwave frequencies.
2. To stimulate a greater degree of interest in space sciences among schools, colleges and universities by active participation.
3. To broaden the scope of the amateur satellite programme and to encourage the interests of amateur scientists.
4. To establish an active body in the UK with the necessary resources to contribute flight hardware to the amateur satellite programme.
5. To study and evaluate the suitability of novel methods and new frequencies for use in subsequent amateur spacecraft.

Spacecraft systems

The spacecraft systems may be considered as three components—service modules, experiment modules and the mechanical structure.

The service modules comprise all the functions fundamental to the basic operation of the spacecraft, such as the power sources, power conditioning, telemetry system, telecommand system, the general data beacon and the engineering data beacon.

Power source

Four body-mounted solar array panels will each provide 27W dc when fully illuminated. The average power available from the arrays per orbit will be approximately 17W dc, allowing for sun angle and eclipse.

Battery charge regulator and power conditioning module

The bcr regulates the solar array power supplied to the 6Ah 14V dc nicad battery pack with an efficiency around 90 per cent. The pcm delivers regulated power supplies at +10V, −10V and +5V for the spacecraft's electronic systems with an overall efficiency of around 87 per cent.

The average power available to the spacecraft electronic systems per orbit is around 11·5W dc.

General data beacon

A 450mW beacon operating on 145·825MHz will provide the prime interface from the spacecraft to the outside world. This beacon has been specifically designed to provide a healthy satellite-to-ground transmission link, enabling reliable reception by the simplest of amateur ground stations. The modulation form will be nbfm and, in order to minimize doppler tracking, data will be transmitted by afsk. The transmissions will be compatible with standard, unmodified, amateur nbfm receivers, and only a small, fixed, crossed-dipole antenna should suffice for all but the lowest-elevation orbits. A low-cost audio data demodulator will be required to interface with the printer/display, details of which will be published. The beacon will also be modulated by speech from the synthesized speech telemetry experiment and data from the earth-pointing camera.

The data sources available to this beacon are: 1,200 baud ASCII telemetry; 300 baud ASCII telemetry; 110 baud ASCII telemetry; 45·5 baud rtty telemetry; 12/20wpm morse code telemetry; synthesized speech telemetry; spacecraft computer asynchronous interface; and earth imaging system data.

Engineering data beacon

A 400mW beacon operating on 435·025MHz is the primary spacecraft engineering data and high speed experimental data channel intended for advanced amateur ground stations, advanced scientific experimenters and the ground command station network. The modulation form will be biphase psk with the following data sources available: 1,200 baud ASCII telemetry; 300 baud ASCII telemetry; 110 baud ASCII telemetry; 45·5 baud ASCII telemetry; spacecraft computer synchronous interface; spacecraft computer asynchronous interface; spacecraft computer output port; earth imaging system data; direct magnetometer data; and direct radiation counter data.

Telecommand system

Direct and positive control over the spacecraft's on-board systems is essential for efficient mission management and to minimize potential interference both within the spacecraft and to external services. The complexity of the spacecraft and its operating modes are such that manual real-time control alone would present an irksome chore for telecommand station operators, and necessitate a comprehensive network of stations for maintaining day-to-day schedules. Two modes of control over the spacecraft are therefore available;

1. Direct, real-time control by the ground station network for: unscheduled command status changes; command status initialization; loading initial and modified software into the on-board microcomputer; positive control of the spacecraft when in a partial failure mode; and simple command changes.

2. Indirect, stored-program control of the spacecraft executed by an on-board microcomputer upon predetermined schedules or telemetry performance analysis, for: day-to-day scheduled operation; spacecraft mode changes out of range of ground telecommand stations; and surveillance of on-board telemetry and executive control in event of spacecraft emergency.

Positive control over the spacecraft is assured by allowing over-riding precedence to control data emanating from direct ground telecommand. This includes total shut-down of the on-board microcomputer.

The spacecraft computer will employ the same command decoding and distribution system as the direct command mechanism and will behave as a

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local "ghost" telecommand station feeding scheduled commands into the command decoder according to a programmed "diary".

Telemetry system

Knowledge of the status and performance of the spacecraft systems is similarly essential for efficient mission management and to ensure longevity of the spacecraft's operation. Sensors located around the spacecraft will monitor parameters such as temperature, voltage and current, which are then encoded and made available, in addition to various other processed data, to a downlink beacon via a telemetry module. The basic philosophy of the telemetry system is to provide both a comprehensive surveillance of the on-board systems for engineering purposes and a wide selection of data formats to cater for differing ground station facilities.

Telemetry will be available at the following data rates:

1,200 baud ASCII 600 baud ASCII 300 baud ASCII 110 baud ASCII	asynchronous, seven-bit code
45·5 baud rtty	asynchronous, five-bit code
12/20 wpm cw (morse)	
Synthesized voice	

Any combination pair may be transmitted by the two data beacons upon command.

The telemetry frame comprises 60 uniquely addressed analogue channels with 40 status flags and an identifier. The analogue channels have a range from 000 to 999 thus giving a maximum data resolution of 0·1 per cent. At the highest data rate (1,200 baud) each telemetry frame takes some 8s to be transmitted, which is somewhat less frequent than the experimental instrument sample rate, thus instrument data is time-averaged and presented within the telemetry frame. (High time-resolution experimental data is available via the spacecraft computer for more detailed analysis.)

The telemetry frame format will be as follows:

AMSAT	00000	00000	00000	00000	00000	00000	00000	00000	00000
AMSAT	00000	00000	00000	00000	00000	00000	00000	00000	00000
00000	01000	02000	03000	04000	05000	06000	07000	08000	09000
10000	11000	12000	13000	14000	15000	16000	17000	18000	19000
20000	21000	22000	23000	24000	25000	26000	27000	28000	29000
30000	31000	32000	33000	34000	35000	36000	37000	38000	39000
40000	41000	42000	43000	44000	45000	46000	47000	48000	49000
50000	51000	52000	53000	54000	55000	56000	57000	58000	59000

In line with the mission objectives, UOSAT will have the following experiment complement:

Propagation studies experiments

1. Phase referenced hf beacons on 7·001, 14·001, 21·001 and 28·001MHz, enabling simple aos observation to indicate ionospheric paths or more complex calculations yielding ionospheric electron densities.

2. A three-axis, wide-range, flux-gate magnetometer for the examination of the fine structure of the earth's magnetic field and any disturbances to it and their relationship to radio wave propagation. This data will be available on the general data beacon (145·9MHz) and with higher resolution on the engineering data beacon (435MHz).

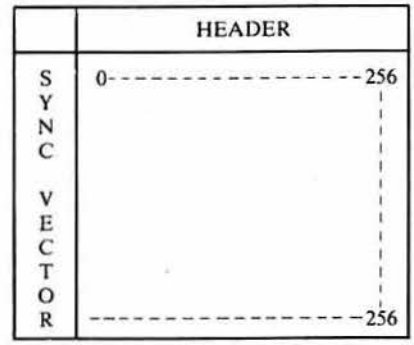
3. Two particle radiation detectors and counters (detecting particles with energies >20keV and >60keV) providing real-time information on solar activity and auroral events. This data will be available on the general data beacon (145·9MHz) and with higher resolution on the engineering data beacon (435MHz).

4. Two microwave beacons on 2·4 and 10·47GHz to study shf propagation and the problems associated with inexpensive microwave satellite ground equipment.

Education experiments

1. An earth-pointing, solid-state, charge-coupled-device (ccd) camera will provide land and sea image data for transmission to simple and inexpensive ground stations via the general data beacon (146MHz) using fm synchronous afsk at 1,200 bps—line synchronous. The image format will be presented as a 256 by 256 pixcel digital array with each pixcel having 16 possible digital grey levels. The entire image will be transmitted to the ground in around 3·5min, stored in a solid-state memory and displayed on a domestic television. The ground image area will be approximately 500 by 500km, providing a resolution of some 2km on the earth's surface. The cost of the data demodulator, image memory and display electronics is around £100 and it is anticipated that modules and kits will be made commercially available.

Format:



It may be possible to use this visual display experiment to present processed telemetry and experimental data in a graphical format.

2. Telemetered data from the spacecraft and its experiments will be available at a variety of speeds and formats to cater for a wide range of ground-station complexity.

3. A limited repertoire of telemetry will also be available in synthesized speech for transmission on the general data beacon (145MHz fm) intended for direct reception by the simplest standard nbfm equipment employing no more than a crossed dipole antenna.

Future systems experiments

1. A combination of active and passive attitude control mechanisms based on gravity gradient stabilization and two-axis electromagnetic (magnetorquer) attitude adjustment will be evaluated. The spacecraft is designed to "fly" with the −z facet (bottom) always pointing towards the geocentre. This facet will support the camera and the vhf, uhf and microwave antennas.

2. The 2·4 and 10·47GHz beacons will be used to evaluate the usefulness of these frequencies for future amateur spacecraft in conjunction with relatively simple and inexpensive ground stations.

3. A powerful on-board cmos microcomputer will have access to the s/c experiments, telemetry and command systems enabling: telemetry surveillance; command and status management; experiment data store and processing (eg: image processing, data reduction); orbit data, operational schedules and general news dissemination; and attitude control.

The spacecraft computer is based around the RCA cmos CDP 1802 microprocessor and has direct data links with the magnetometer and radiation detectors experiments. This enables fast sampling of experimental data yielding fine time-resolution structure of these fields. The s/c computer also interfaces directly with the speech synthesizer experiment which can be fed with processed telemetry, experiment data or plain text. Analysis of navigation information from the magnetometer (using it as a coarse sensor) and correlating with an existing model of the earth's magnetic field will allow closed-loop attitude control employing the two-axis magnetorquers.

The spacecraft computer will have access to the telecommand decoder input in parallel with, but on a secondary basis to, the direct ground command receiver. Control data emanating from ground command stations will have priority over locally generated control data at all times, and the s/c computer will have positive shut-down upon ground command in the event of computer malfunction. The s/c computer will be capable of generating the appropriate command repertoire locally as directed by software resident in its memory. This software is loaded from the ground by command stations using the telecommand uplink channel. The entire software library resident in the spacecraft computer can be modified or replaced during flight by ground telecommand stations, in order to accommodate changes in the mission profile and to allow for the rectification of possible software or hardware failures.

Orbit

UOSAT is currently scheduled for launch by NASA into a sun-synchronous, polar, earth orbit in September 1981 as a secondary payload upon a Delta 2310 launch vehicle accompanying the Solar Mesosphere Explorer spacecraft. The programmed orbital elements are as follows:

Altitude: 530km **Period:** 95min
Inclination: 97·5°, sun-synchronous, 3pm descending node.

The expected orbital life-time of the spacecraft at this altitude is around 4·5 years before re-entry. □

LED indicating wavemeter

for 1·5–190MHz

by F. G. RAYER, TEng (CEI), G3OGR*

AS is well known, an indicating wavemeter is used to check the order of harmonics in multiplier stages, and for various general purposes such as the approximate determination of frequency of crystal oscillators or vfos, converter frequencies, and so on. The wavemeter shows the band or approximate frequency, not the exact frequency in a narrow band, and other means should be used to determine the latter.

The circuit here replaces the more general moving coil meter with a light emitting diode, and after various trials the method in Fig 1 was adopted. The LED is normally lit, thus acting as a "battery on" indicator, and dips on resonance. It will be completely extinguished if the rf induced in L1 is moderately strong, but only dims, without going out, when coupling is reduced, so that correct tuning is easily seen.

With no rf present, TR1 does not conduct, so current through R1 lights the LED. With L1 tuned to resonance by C1, D1 produces positive base current for TR1, so TR1 conducts, shunting the LED. So the latter dims, or is extinguished.

A check of sensitivity shows the LED extinguished with about 10μA shown on a 100μA meter temporarily replacing TR1 (corresponding to about 5cm between L1 and GD-1U gdo coil), and dimming with about 5μA indicated on the meter. So the single amplifier is considered adequate. The supply is from two HP7 or similar cells in series, making 3V, and sensitivity is not improved by increasing the voltage.

Construction

Fig 2 shows layout in an insulated box approximately 105 by 70 by 45mm. Smaller boxes do not allow much space for the scales. S1 fits in a slot, and one bolt holds a four-way tagstrip. The other bolt clamps a metal bracket keeping the two cells in position.

As LED polarity indications unfortunately vary, check the LED with R1 and 3V in series. Correct connections are those lighting the LED. The LED is a push fit in a rubber grommet, or can be cemented in.

Coils make use of tags 1 and 6. Tag 7 supports the junction of D1 and C1.

Battery drain is small. Two cells are taped together, positive and negative joined, and positive and negative leads in Fig 2 soldered to the remaining centre cap and outer case respectively.

Inductors

Six are used, five basically as in Fig 2. Cut off the unwanted top plastic thread. Drill small holes near pin 6 and the former top. Thread the wire down through, solder to pin 6, and make the winding. Secure the bottom end with a turn or two of cotton, finishing at pin 1. It is wise to avoid lengthy heating of the pins, and to have the coil inserted in a holder while soldering.

Turns of the four smaller coils are side by side, as follows: 190–60MHz 1·5 turns; 80–28MHz 6·5 turns; 34–13MHz 21·5 turns; 15–5·5MHz 65·5 turns, all of 32swg enamelled wire. The next coil has 90 turns of 34swg wire, in a compact pile, and is for 5–2·6MHz. The final coil is the Denco Range 2 Aerial (valve) type, with core removed, for 3–1·5MHz.

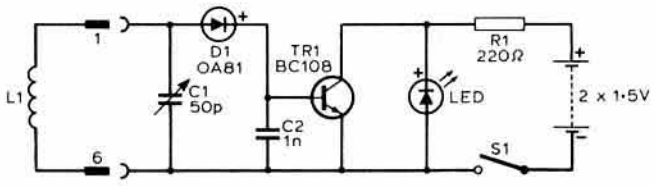


Fig 1. Circuit diagram

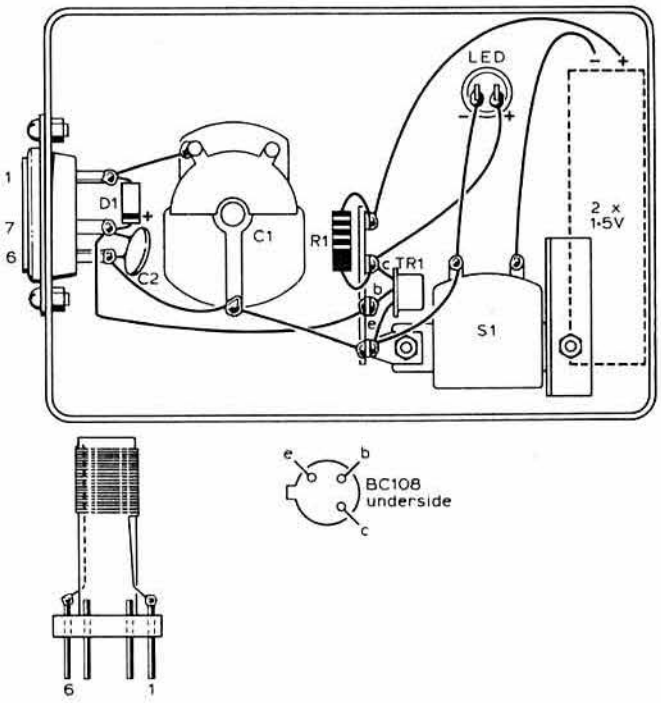


Fig 2. Component layout in case

The formers are 9·5mm (0·375in) diameter, available from Denco (Clacton) Ltd, 355/9 Old Road, Clacton on Sea, Essex CO15 3RH, and are available in blue, yellow, white, green and red. This allows ready identification of bands on the scales. Cement turns in place (clear Bostik is suitable). Leave to dry completely before calibration (recalibration of one range was found necessary after forgetting this).

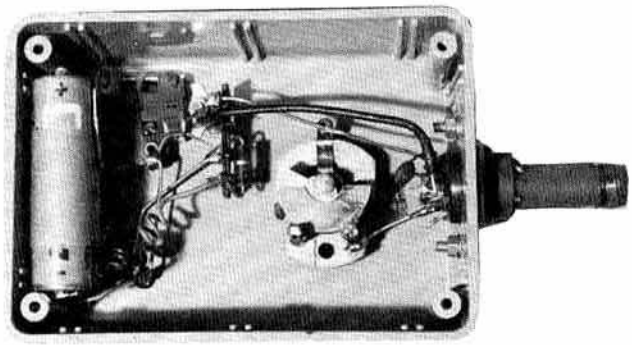
Dial and calibration

A thin card dial 2·5in in diameter and with circles of 2·125in, 1·75in and 1·375in diameter drawn on it is cemented at C1. A *calibration cursor* is most easily a *half* cursor of Perspex fitted to a knob so that its straight edge is the marking line. Set for the lower frequency band end with C1 closed. After calibration, the half cursor was replaced by a 2·5in Perspex disc, with hair line, fitted to a knob with adhesive and self-tapping screws. This protects the scales.

Actual calibration is most easily done from a gdo, keeping coupling fairly loose. Tune C1 for maximum dip in LED brightness, and run a mark on the appropriate scale, and write the frequency from the gdo. The gdo can, if wished, be checked for frequency by a counter, or communications type receiver over frequencies available. With a counter, one turn near the gdo coil should suffice for coupling the counter input, and frequencies are taken from the counter display, not gdo.

Calibration from receiver

Some receivers have coils so arranged that the wavemeter coil may be brought near them without any disturbance to the receiver, other than probably having to remove it from its cabinet. Where this is so, calibration



Interior view of the wavemeter

*Reddings, Longdon Heath, Upton on Severn, Worcs WR8 0RJ.

Components list

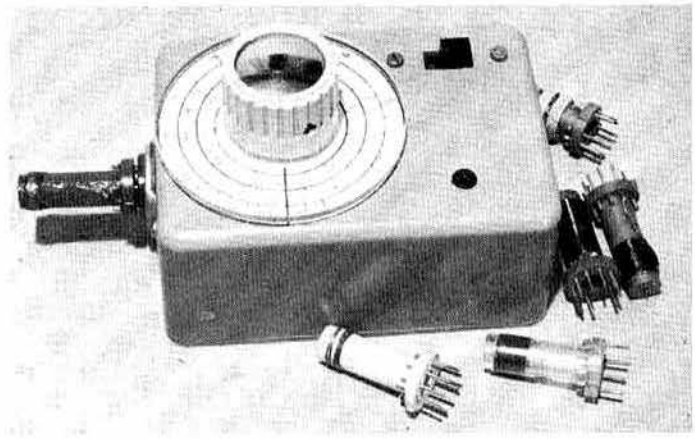
C1 Jackson C804, 50pF variable
C2 1nF ceramic disc
D1 OA81 or other point-contact diode
TR1 BC108
R1 220Ω 0·25W
S1 Slide switch
Light emitting diode
Miniature nine-pin plug-in formers (no cores), different colours (5-off); range 2 antenna coil (valve type). Nine pin non-skirted holder.

points can be obtained from oscillator or antenna, rf amplifier, or mixer signal-frequency circuit coils.

Where the oscillator coils are used, sufficient rf can be expected with the wavemeter coil beside or in line with the coil in the receiver, using loose coupling so that the LED dips in brightness, as described. Allow for the fact that the oscillator frequency will differ from the receiver reception frequency by the intermediate frequency (or first i.f. if double conversion). This difference will generally be around 450 to 470kHz, or about 1,600kHz. The oscillator is generally hf of the signal frequency. Information on these points can be sought in the receiver data, if necessary. The receiver can then be tuned to the required frequencies, which can most conveniently be lf of the required calibration points by the i.f. when these conditions apply; eg, to obtain a 5MHz point, with 470kHz i.f., tune the receiver to 4,530kHz, which places the oscillator on 5MHz, dip the LED, and mark the wavemeter scale.

To calibrate from signal-frequency circuits, tune in a signal, preferably stable, and couple the wavemeter coil to one of the receiver coils. Resonance is then shown by a drop in receiver signal strength, shown by its S-meter. This can be an easy means of checking calibration points obtained from the oscillator coils.

Where the receiver coils are not accessible, or could only be exposed by work it is preferred to avoid, which will be so with many receivers, the wavemeter can be coupled into the antenna circuit. A temporary coupling coil will be needed to do this, and about five turns can be used for the



The wavemeter, complete with coils

ranges up to 30MHz or so, with rather more turns for frequencies towards 1·8MHz. This coil is fairly closely coupled to the wavemeter coil, and is in series with the antenna lead to the receiver, preferably near the antenna socket. When the wavemeter is tuned to resonance, this will cause a fall in the S-meter reading of a signal tuned in, a reduction in volume (avc preferably off) or a drop in background noise. In this way calibration points can be obtained.

When used as an absorption meter in this way there is of course no LED indication, and the instrument need not be switched on.

Choice of LED

A red 0·125in LED was fitted as showing up best, and took about 5 to 6mA. Various other LEDs, including other colours, and 5mm LEDs, acted in a similar manner. Current off resonance depends on the series resistor and voltage, and is in any case very small. □

NEW PRODUCTS

Microwave Modules transverters

Microwave Modules Ltd have recently introduced a new series of their popular all-mode transverters for the 70MHz band. Originally only the MMT70/144 was available to down-convert from 144 to 70MHz, but this new series of 70MHz equipment now includes the MMT70/28, which allows 28MHz transceivers to be used on 70MHz.

These new transverters feature the usual high quality construction techniques, with the following features:
10W rf output from rugged pa transistor
Linear all-mode operation
Low-noise receive converter—2·0dB noise figure
RF vox changeover.

The development of the MMT70/144, which was originally a single-conversion device, has resulted in an improved design, built around a double-conversion principle, which down-converts the 144MHz signal to 28MHz before the second conversion up to 70MHz. This development has also formed the basis for the MMT70/28, and all-in-all this range of products has rather taken away the excuse for not being active on 70MHz.

The MM 70MHz ssb transverter

To complement this transverter range, Microwave Modules have also announced two linear power amplifiers for 70MHz, which will provide 40W output (MML70/40) and 100W output (MML70/100), both for 10W input. (Prospective fm operators please note 50W power restriction on this band.)

The MMT70/28 and MMT70/144 both cost £115 incl VAT, plus £1.75 p&p.

The MML70/40 costs £69 incl VAT plus £1.75 p&p, and the MML70/100 costs £142.60 incl VAT plus £2.75 p&p.

Further details and advice regarding these units may be obtained by contacting Microwave Modules directly at Brookfield Drive, Aintree, Liverpool L9 7AN. Tel: 051 523 4011.

Sony ICF-2001 receiver

This equipment covers 150kHz–29·999MHz on a.m., and 78–108MHz on fm. The wide frequency coverage is achieved with a dual pll synthesizer. The lcd frequency readout allows a.m. tuning to 1kHz. The receiver embodies an autoscan tuning system as an alternative to the down or up manual tuning buttons. The frequencies of up to six stations can be stored in the memory and instantly recalled.

Other features of the receiver are said to be 1·6W output to a 10cm diameter speaker; telescopic antenna for both a.m. and fm; fet front-end for a.m. reception; three-step rf gain control; and ssb/cw compensator.

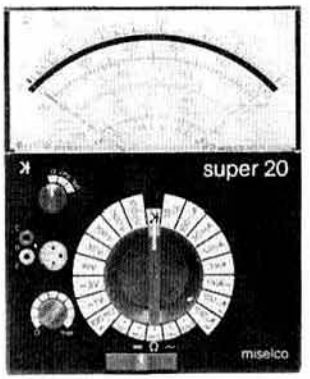
The retail price of the ICF-2001 is around £150. Detailed information is available from Sony (UK) Limited, Pyrene House, Sunbury Cross, Sunbury-on-Thames, Middx TW16 7AT.

Alcon pocket multimeters

Following their introduction of the quality *Tester* range of multimeters with modular construction and "do-it-yourself" repair facilities, Alcon now present the Super 20 and Super 50 testers from the same Miselco stable. These new instruments not only carry on the construction and repair tradition of their predecessors, but now include cut-out protection and semiconductor test facilities all provided in a package small enough to be called "pocket-sized" without exaggeration.

As their names imply, the two are similar in almost all aspects but have different basic movements offering sensitivities of 20kΩ/V and 50kΩ/V ac and dc respectively. Each instrument has 39 ranges covering from 100mV (150mV for the Super 50) to 1kV dc, and from 10V to 1kV ac. Current ranges extend from 100μA to 10A (3A for the Super 50) dc and 3mA to 10A (3A for the Super 50) ac. The resistance ranges are five, covering from 5kΩ to 5MΩ fsd. An optional high-voltage probe extends the upper limit of the dc ranges to 30kV for tv and the like.

Accuracy figures are 2 per cent of fsd for dc, 3 per cent for ac, and 1 per cent of centre scale for resistance. These values, coupled with the figures noted, make the Super 20 a useful general-purpose multimeter, and the Super 50 well suited to specialist electronic measurement for which it was designed.



The Super 20 pocket multimeter

Both instruments are provided with fuse protection, a novel neon discharge system and a new electronic high-speed cut-out system. The latter serves to disconnect the instrument from external circuits should an overload voltage appear at the movement. The module is itself detachable from the circuit board, in line with the *Tester* practice, simply inserted on five pins. The cut-out operates when the applied energy exceeds that which the meter range identifies by a factor sufficient to prevent movement damage. This action releases the reset button to indicate activation. The system is resettable manually by depression of a button, and can be tested simply by pressing a TEST black button to indicate battery and circuit state.

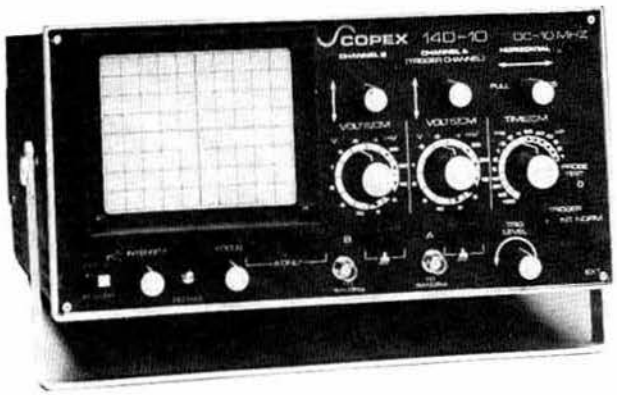
A simple semiconductor test facility is also provided which is capable of effecting basic function tests on most discrete devices swiftly and easily In addition both instruments may optionally include a universal signal injector capable of generating a signal rich in harmonics and detectable to 500MHz for radio and tv test purposes.

Currently these instruments are available off the shelf at £56.81 and £59 incl VAT and complete with case, leads and instructions. For further information contact Alberto Coniglio, 19 Mulberry Walk, London SW3. Tel: 01-352 1897.

Scopex 14D10 oscilloscope

Scopex Instruments Ltd, an independent British company, has announced a significant replacement for one of its range of low cost, high performance oscilloscopes. Designated the 14D10, it is a 10MHz dual-trace, high sensitivity oscilloscope and supersedes the 4D10B. This oscilloscope has been designed after extensive market research into the 10MHz–15MHz market area and, by incorporating the latest solid-state devices, has provided features not usually associated with instruments of this bandwidth.

While still retaining the standard Scopex format, the display and associated controls have been moved to the left and the two input channels to the centre of the instrument. All the function switches are push-button and are in line across the lower half of the front panel. The two states of each switch are picked out in red and white on a black background. The unique Scopex trigger control has been replaced by a potentiometer and a ± push-button switch to give the ability to trigger positive and negative edges of digital pulse trains without re-adjustment.



The Scopex 14D10

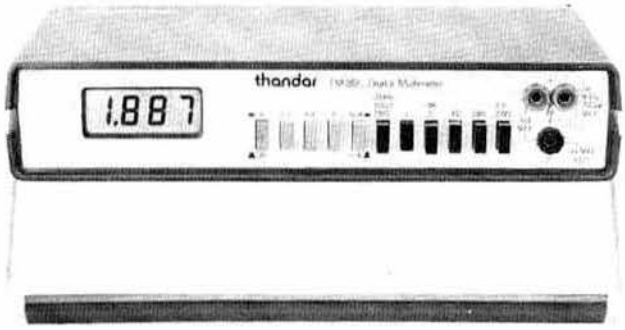
A 14cm rectangular tube retaining the renowned Scopex trace sharpness achieves 10MHz (−3dB) over the full 10 by 8cm display. The sensitivity of both channels is 2mV/cm to 10V/cm in the internationally approved 1-2-5 sequence over the full bandwidth. The timebase ranges from 100ms/cm to 1μs/cm, once again in the 1-2-5 sequence with the option of the ×5 expansion to give 200ns/cm.

The conventional power supply has been replaced by a modern switched mode version which, by the removal of the large transformer has reduced the weight to 5kg, making the 14D10 a truly portable oscilloscope. With the introduction of solid-state devices into the power supply, even greater stability and reliability have been achieved.

The price of £230 plus VAT includes two high impedance probes, carriage (UK mainland) and the usual comprehensive Scopex one-year guarantee. Further information from Scopex Instruments Ltd, Pixmore Industrial Estate, Pixmore Avenue, Letchworth, Herts SC6 1JJ. Tel 04626 72771.

Thandar TM351 multimeter

The TM351 is a laboratory-quality 3·5-digit bench/portable multimeter, using lcd and low power lsi circuitry to give up to 4,000 hours battery life. The TM351 has a full measurement capability of ac and dc volts and current, together with resistance and diode check. The ranges covered are voltage from 100μV to 1,000V (750V ac), and current from 100nA to 10A, and resistance from 100mΩ to 20mΩ. The basic accuracy of the TM351 is within 0·1 per cent.



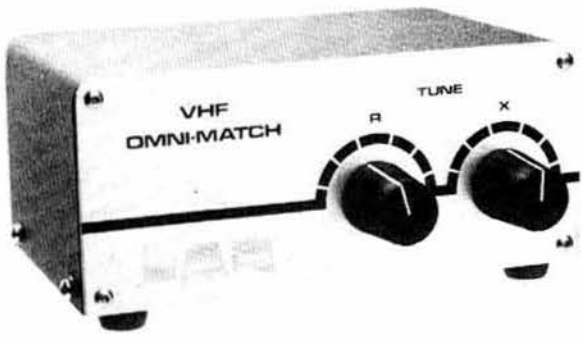
The Thandar TM351

The TM351 is supplied complete with test lead set, alkaline batteries, and a full one-year warranty, at £99 + VAT. Further information from Sinclair Electronics Ltd, London Road, St Ives, Huntingdon, Cambs PE17 4HJ.

LAR vhf omni-match matching unit

Today's solid-state transmitters often have in-built protection circuits which automatically reduce power when they are faced with a load other than their required non-reactive 50Ω. As it is impractical to optimize the antenna for each discrete frequency, a moderate vswr is usually present. This is sufficient to prevent full power being achieved.

The LAR vhf omni-match is designed to provide a transmitter with the required load. This new British-made unit spans 144–174MHz covering 144MHz amateur, marine and private/mobile radio bands. Frequency



The LAR vhf omni-match

range—144–174MHz; through power—750W p.e.p.; input from antenna—between 17 and 150Ω, together with reactance within a total vswr of 3:1; output to transceiver—50Ω non-reactive; connectors—uhf sockets type SO239 take plugs type PL259; overall dimensions—150mm wide, 130mm deep, 75mm high; weight—565 grammes.

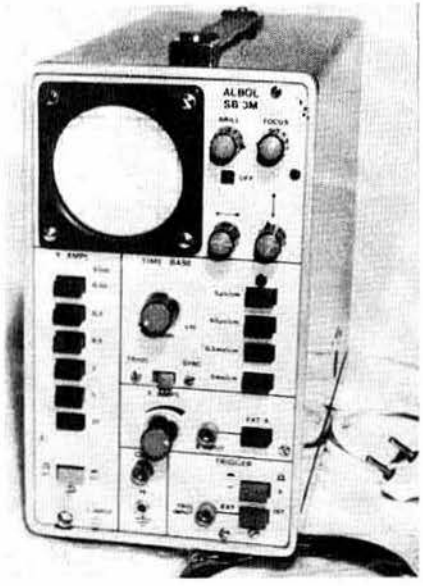
Price £34.90 incl VAT, plus £1.50 p&p. Further information from LAR Modules Ltd, 60 Green Road, Leeds LS6 4JP. Tel 0532 782224.

Albol SB3M oscilloscope

The new SB3M oscilloscope from Albol Electronic will serve most purposes required by industrial and service and hobby engineers, and yet manages to keep on the right side of the significant £100 basic price barrier. With a bandwidth of 0 to 3MHz at −3dB (extending to 6MHz at −6dB), the SB3M breaks new ground, in its class, by offering time-base automatic triggering by ic comparator control of the type usually fitted only to luxury 'scopes. A 10mV signal is all that is needed for a firmly locked and triggered time-base.

The measuring field on the crt is 50 by 60mm, and the deflection sensitivities are selectable (by push-button) from 0·05 to 20V/cm. Calibration accuracy is within ±5 per cent. Albol say that the input characteristics are 1MΩ ±5 per cent, and 30pF ±10 per cent. The timebase can be either automatically triggered or synchronized, and it has four switch selectable calibration speeds, from 1μs/cm to 5ms/cm. A six-range attenuator, from ×1 to ×10, can be applied to each.

Triggering, which can be either internal or external, can be polarized positive or negative, in the range 10Hz to 500kHz. If internal synchronization is used, the range extends from 10Hz to 3MHz. The internal trigger threshold is 5mV, and the external 100mV.



The Albol SB3M oscilloscope

The SB3M takes about 20W from the 240V mains, weighs 4·5kg, and measures 150mm wide by 340mm deep by 280mm high. Price £99 plus VAT, delivery ex-stock. Further information from Electronic & Mechanical Products Ltd, 3 Crown Buildings, Crown Street, London SE5 0JR. Tel 01-703 2311.

TECHNICAL TOPICS

Pat Hawker, G3VA

THIS month a few, possibly pertinent, limbering-up thoughts drawn from others before getting down to circuitry: "The first question should be not 'what technology?' but 'technology for what?' " . . . "We users of the new technology are looking for a practical marriage of technology and the real world of telecommunications. Exotic state-of-the-art designs that do not address the whole problem are unacceptable" . . . "Most people have their own opinions about how things work. These opinions may differ widely, but each seems eminently logical to its originator" . . . "Nothing dates faster than people's fantasies about the future" . . . "In Bulgaria you nod your head for 'no' and shake it for 'yes' " . . . "The man who makes no mistakes does not usually make anything" . . . "The world is divided into two sorts of people—those who agree with you, and the blind ignorant fools" . . . "Dead fish float down the stream, live ones swim against it."

Fuse blown?

A useful-looking fuse failure indicator (Fig 1) has been published in the "Ingenuity unlimited" feature of *Practical Electronics* January 1981, p72, and ascribed to K. A. Rochfort. This is designed to show: whether mains voltage is present on the input line of a piece of fuse-protected mains equipment by producing a steady glow of a miniature neon; then, should the fuse blow, the neon immediately changes to flashing on and off. A similar circuit could be used across a switch rather than a fuse; this would then indicate that the mains supply is connected but the switch "off" (flashing) or, alternatively, that the equipment is turned "on" (steady glow).

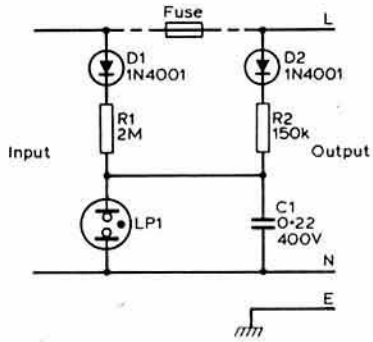


Fig 1. Fuse-failure/mains-connected indicator (*Practical Electronics*)

With the fuse intact the neon is supplied through the 150kΩ resistor, but when open-circuit the higher value of the 2MΩ resistor, in conjunction with the 0·22μF capacitor, forms an RC oscillator, since the capacitor charges via the 2MΩ resistor until the neon fires, so discharging the capacitor and also producing the flash of light.

With suitable modification of component values, the system could be adapted to 110V mains.

Car radio with 144MHz antenna

G. Wynja, PA0GWF, in *Electron* December 1980, shows how both a 144MHz transceiver and a standard broadcast a.m./fm car radio can be safely connected to the same λ/4 or 5λ/8 antenna: Fig 2. The two miniature 24V 30mA lamps act as resistors and are of the type used in decorative strings of "fairy lights". Input to the car radio is limited by the lamps and the back-to-back connected diodes (alternative types BA135 and AA119). A test point between L and C could facilitate adjustment to series-resonance on 144MHz with the aid of a neon bulb while the 144MHz rig is on "transmit": the trimmer must be capable of withstanding the rf voltage.

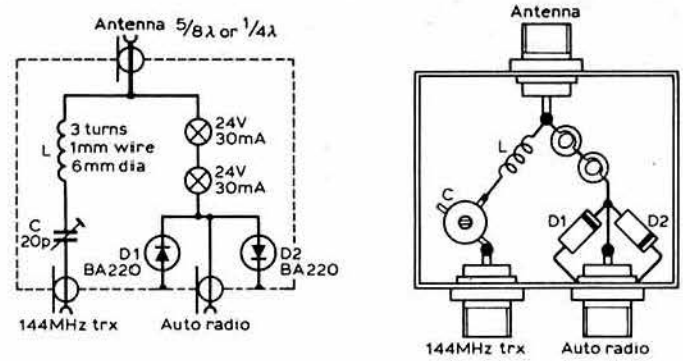


Fig 2. PA0GWF's method of feeding a broadcast car radio from his 144MHz transceiver antenna

Simple ac frequency checker

Years ago I remember participating in an NFD where we ran into considerable equipment problems. These were eventually traced to the fact that we were attempting to run standard 50/60Hz power supply units from a petrol-electric generator that was delivering ac but *not* at (or even near) 50Hz. I suspect that even today not every p/e generator can always be relied upon to deliver the right number of hertz.

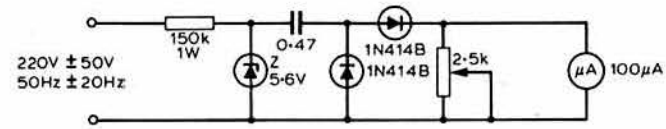


Fig 3. DL1FN's simple ac frequency indicator suitable for checking field day petrol-electric generators etc

The simple check meter shown in Fig 3 comes from the Swiss *Old Man* No 9/80, p19, but apparently stems from DL1FN (*CQ-DL*). The zener diode ensures that a small fixed amount of pulsating voltage is applied across a voltage-doubler rectifier in such a way that the output will depend upon the frequency of the supply. A simple check calibration point can be established from the household ac mains. If the deflection, with the meter on the p/e generator supply, is significantly different, then it will be advisable to adjust the generator. In this form, without full calibration, the unit is essentially a "confidence generator" even if the actual generator frequency cannot be accurately determined without precalibration of the meter.

Improving low-cost microphones

When R. H. Roling, GW6WM, acquired a Japanese low-cost microphone of the type commonly supplied with inexpensive tape recorders, the response sounded muffled and inadequate for communication purposes. To investigate further he removed the head, inspected the insert and then left this hanging while another test recording was made. The results showed a remarkable improvement: the "muffle" had gone and the response now appeared crisp and clean.

He concluded that an air space at the rear of the microphone insert was the primary cause of the improvement and set about devising a new "head" to the microphone that would be both secure and neat. The answer was soon found in the junk box, a B7G valve screen that would just fit over the threaded end of the microphone "stick" with a little pressing, yet without enough force to damage the thread. Two sets of four 5mm holes were drilled equally around the screen, the second set being off-spaced as shown in Fig 4. As this was a brass valve screen, it was not necessary to insert a dowel in the screen in order to achieve clean drilling, though this would be necessary if an aluminium-type screen were used.

A small piece of fine mesh aluminium sheeting was cut to form a disc fitting the top of the valve screen, and kept in place by cutting and shaping a ring of 1·5mm plastic flex. Two leads were soldered to the insert, then

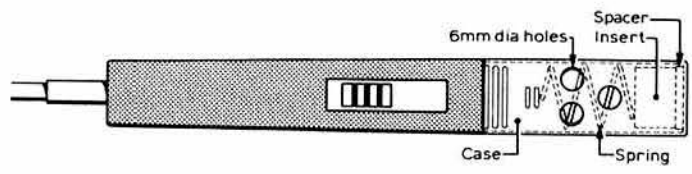


Fig 4. Use of valve shield as a microphone head to improve response of low-cost insert

carefully pushed up to the ring or spacer. The leads were passed through the valve retaining spring, which was pushed up to the base of the insert to hold it so that the insert was held in place.

The microphone was retested and the results were similar to those achieved with the insert free.

Polygonal loop antennas

Although the term "polygonal loop" may not immediately strike many amateurs as familiar, it is the generic term covering a number of popular and practical antennas of increasing importance to amateurs. These include, for example, the apex-fed or base-fed triangular ("delta") loops, either as single-element antennas or as part of arrays (a design first made familiar by H. R. Halig, K8ANV, in *QST* January 1969); it also includes the traditional square quad element and the various rectangular loops etc.

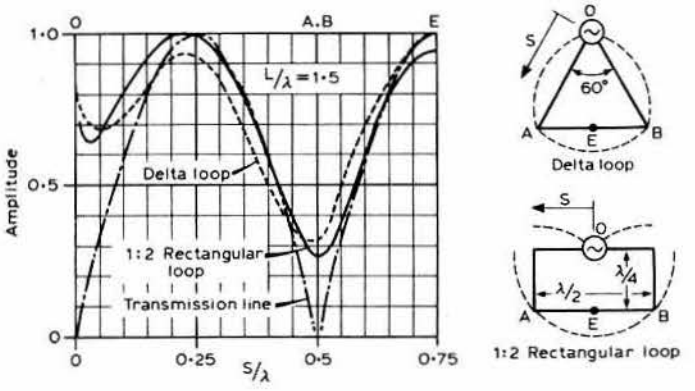


Fig 5. Current distribution of 1·5λ (voltage-fed) delta and rectangular loop antennas showing "fill-in" of voltage nulls that results from these being located at the corners and provides broadband characteristics

A recent paper by two Japanese engineers, Takehiko Tsukiji and Shigehumi Tou of Fukuoka University (*IEEE Trans on Ant & Prop*, Vol AP-28, No 4, July 1980, pp571-4) provides some new insight into the way the basic characteristics of such loops depend on the shape of the loop. They show, for example, that some configurations are appreciably more broadband than others, a factor that can be useful to an amateur since it means that the adjustment becomes appreciably less critical. They also indicate that, for most polygon loops, the first resonance of a 1λ loop occurs when the perimeter is *greater* than the physical wavelength by 10 to 20 per cent, a factor that sometimes gets overlooked.

Of considerable interest is their conclusion that two particular configurations have unusually interesting and attractive properties. Both have a total perimeter of 1·5λ and are operated in their "anti-resonance" mode (by which I take it to mean they are voltage rather than current fed, as for example when a 14MHz (1λ) loop is used at 21MHz, as can be done by using open-wire resonant feeders).

These are the top-driven delta loop with an apex angle of 60° and a rectangular loop in which the two vertical sides are λ/4 and the top and (centre-fed) lower elements are both λ/2: Fig 5. In both cases it is claimed that broadband characteristics result from having current nulls located at the corners of a loop, the sharp anti-resonance current distribution being damped by the presence of the corner. The authors state: "This is just like the travelling wave linear dipole antenna where its anti-resonance is damped by impedances loaded on the antenna element to realize broadband impedance characteristics."

They also indicate that delta loop antennas fed at the apex have rather different directivity characteristics to a similar loop fed at the centre of the base: Fig 6.

Another point is that a single loop 1λ element with an apex angle of about 40° provides a more accurate match to 50-70Ω coaxial cable than an equilateral loop with an apex angle of 60°.

D-C receivers on vhf/uhf

In my notes on the Plessey "Groundsat" single-channel vhf repeater (*TT* December 1980) reference was made to work on the use of direct-conversion (alternatively called "zero i.f.") techniques for commercial vhf mobile applications, at Standard Telecommunications Laboratories (STL). This project has been carried out by Ian Vance, G3WMS, and has been described in a paper given at the IERE Conference on Land Mobile Radio, at Lancaster in September 1979, and also in *The Radio and Electronic Engineer*, Vol 50, No 4, April 1980, pp158-64.

In this case the main motivation for developing d-c receivers is the belief that the large-scale integration needed to produce virtually a complete receiver on a silicon chip can be achieved only "if equipment architectures can be found which eliminate the inherently non-integrable elements of inductors and capacitors, especially the variable variety. Even without the benefits of integration the elimination of these elements would be worthwhile."

G3WMS points out that many forms of direct-conversion receivers have been proposed over the years for professional applications but have not found general acceptance, due either to their complexity or to the presence of a difficult to control critical element. He adds: "The integrated circuit approach allows a measure of complexity, and it will be shown that the critical elements can be controlled for the system to be considered. The overall concepts here are not new, but further development is required to give acceptable receiver performance."

In essence, the STL approach has been to integrate the major part of a vhf two-phase nbfm direct-conversion receiver in the form of two chips:

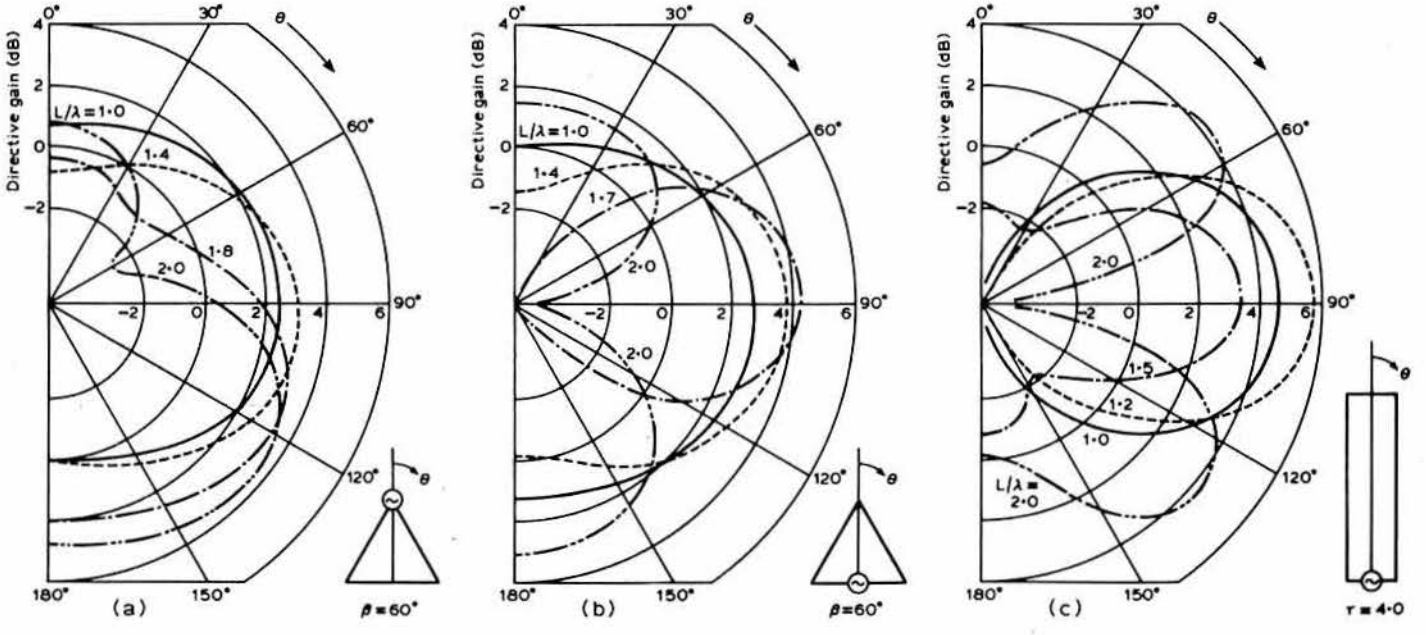


Fig 6. Radiation patterns of: (a) top-driven delta loops; (b) base-driven delta loops; and (c) rectangular loops for various ratios of perimeter length/wavelength (L/λ) (after Takehiko Tsukiji and Shigehumi Tou, *IEEE Trans on Ant & Prop*)

one for rf circuitry; the other for signal processing. The two low-pass filters are not integrated but are of the passive LC type, with a five-section filter providing some 80dB adjacent channel rejection; it is claimed that good filter characteristics are more easily achieved with such a filter than would be the case for a conventional mobile receiver crystal filter at i.f. The 90° (quadrature) rf phase shift is maintained to within 10° over the range 30 to 88MHz, and some 80dB of on-chip isolation between antenna and local oscillator is achieved by careful design, including cross-neutralization of the differential rf stages.

The form of phase-quadrature nbfm demodulation is basically similar to that briefly described in the December *TT* for the Groundsat repeater, although in this case the local oscillator is not modulated. One can well foresee that if, eventually, such ic devices become readily available for operation at 50, 70 or 144MHz it could result in further simplification of mobile and hand-held transceivers. However, it should be appreciated that there are still problems in achieving really high standards of performance, as noted by G4DGU below.

"Trimming" antennas

Sometimes it is difficult for those of us who have been amateurs for longer than we care to remember to appreciate that newcomers often puzzle over those odd little bits of antenna lore that never seem to get into print. For example, in *Ham Radio Report* October 1980, one finds an American newcomer seeking advice on how to go about trimming a wire antenna. In other words should he cut the wire to the calculated length or should he add on an extra length for attaching the wire to the insulator?

The answer of course is that wire folded back on itself in close proximity to the element proper does *not* count as part of the resonant length: Fig 7. The usual procedure is to measure the correct length, making a kink in the wire to show where it should be bent round the insulator, and then leave initially not only enough wire to wrap round but also an extra amount in case it subsequently turns out that the antenna resonates at too high a frequency. In fact "trimming" the length of wire antennas need not involve any snipping off or (more difficult) adding on lengths of wire. Remember calculated lengths cannot be relied upon in all cases, since surrounding objects etc may lower the frequency of resonance, while "bends" in the element will raise it.

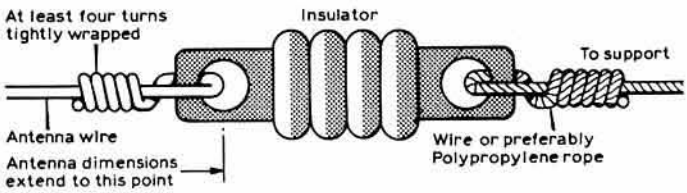


Fig 7. The resonant "length" of a wire antenna does *not* include the length of wire looped back through the insulator to form the wrap. This length can be dimensioned initially to provide a means of "trimming" the antenna to resonance without snipping the wire (*Ham Radio Horizons*)

It may also be worth remembering, particularly on the higher frequency bands, that a single insulator tends to look like a low-value capacitor to rf so that the "support wire" should either be broken up by further insulators or, preferably, consist of polypropylene rope—as recommended in the classic article by Michael Gale, G3JMG, "Ropes and rigging for amateurs—a professional approach" (*Rad Com* March 1970, pp144-52).

Oscillator phase noise in d-c receivers

Chris Bartram, G4DGU, was interested in the comments on sensitivity of d-c receivers and doubly-balanced mixers by Dick Rollema, PA0SE, in the December *TT*. However, he feels that (particularly at vhf/uhf) there are other important factors limiting sensitivity that are seldom mentioned in the amateur radio literature. He writes:

"The main limitation to the sensitivity of d-c receivers at higher frequencies is not the mixer noise factor as such, but results from the noise contribution of the oscillator sidebands. These are not (as often assumed in the literature) comprised of just an amplitude-modulated component but are a mixture of amplitude and phase noise, with the phase noise predominant. In well-designed vhf (and indeed hf) crystal oscillators the amplitude component of the oscillator noise is usually some 15 to 20dB below the phase component. This implies that considerations of mixer balance (to suppress the amplitude component) are not too important. The quality of the oscillator is!

"Oscillators are usually characterized for their noise performance in terms of the noise power in one sideband referenced to carrier power in a 1Hz bandwidth at a given frequency offset from the carrier. For example,

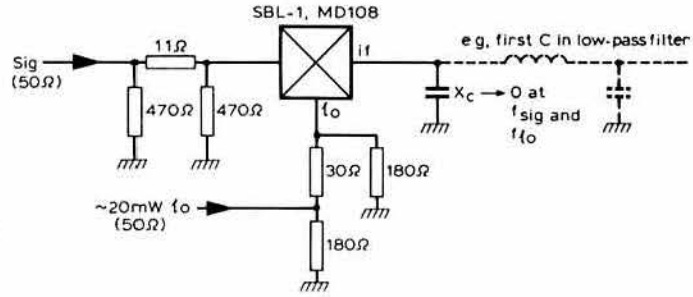


Fig 8. G4DGU's reminder of a method of correctly terminating a doubly-balanced mixer in a direct-conversion receiver. Incorrect termination may reduce sensitivity

this might be expressed as -136dB Hz^{-1} at 20kHz offset. At vhf, an excellent crystal oscillator might achieve -142dB Hz^{-1} at 20kHz (a *good* vco/vfo may be 15 to 20dB worse) and may be around -125dB at 1kHz offset. This would mean that with, say, 0dBm local oscillator injection, the noise sideband power in a single 0·3 to 2·3kHz sideband would be of the order of -92dBm. This would correspond to a noise figure of around 48dB! To this would have to be added the mixer conversion loss and any contribution from noise sources within the mixer (eg 1/f noise from the diodes). Yet nobody seems to mention this.

"My firm, for a professional application, has been able to achieve noise figures in the region of 30dB without premixer amplification, but all our signal processing is about 50kHz. To put this in perspective, this is about equal to a 2μV sensitivity in 20kHz noise bandwidth.

"As I understand the problem, the main reason for recommending the use of a balanced mixer in a d-c receiver is to cancel undesired responses to a.m. signals (especially on 7MHz!). It would seem to me that the primary limitation to sensitivity thus comes from close-in local oscillator phase noise (which cannot be cancelled in a balanced mixer) and from noise contributions from the mixer diodes due to effects such as 1/f noise. It is possible to build hf d-c receivers without an rf stage that give entirely satisfactory performance up to 28MHz. However, above this frequency it becomes very difficult to obtain adequate oscillator performance, as indicated above, and relatively high gains at low noise become necessary for a high-performance receiver.

"Finally, some caution is always necessary when using switching mixers (such as diode rings) since improper termination can upset their operation. It could be that the improvement in the sensitivity noted by PA0SE when he added the two additional capacitors may have resulted from an improvement in termination of his home-made mixer rather than necessarily from an improvement in balance. Fig 8 shows one way in which a diode ring mixer can be correctly terminated for direct-conversion applications."

Power supply philosophy (1)

An impressive number of readers continue to show sustained interest in questions relating to the design and construction of low-voltage, high-current power supply units—an area in which home construction can still provide a more flexible approach at significantly lower cost than the black-box people.

But as Jan Martin Noeding, LA8AK (who has built over 25 solid-state psus during the past 15 years) comments: "It is easy to construct a psu, but it is not just 'straight down the road' if you wish to develop a unit just that little bit better than everybody else's". His own design philosophy is aimed at achieving: *(1)* high efficiency in terms of watts output to watts input; *(2)* use of readily available components; *(3)* reducing heat problems by such measures as mounting transistors directly on the chassis (calling for 'inversion' of conventional circuitry); *(4)* ease of construction; *(5)* minimizing the risk of self-oscillation and other forms of spurii and/or rf interference; and *(6)* lowest possible cost in relation to output power and stability.

Fig 9 shows some of the ways in which LA8AK sets about achieving these design aims. This particular unit was designed to provide 12V at 10A and has been in daily use for some months powering a load drawing 8A. Since the transistors are mounted directly on the chassis, two are on the front and two on the back; no additional heatsink is required and the unit can be quite compact. He prefers to use two 2N3053 devices rather than a single 2N3771 on the grounds of lower cost and easier heat dissipation, while current gain and saturation voltage are kept within acceptable limits.

Although LA8AK has made several units which use the well-known 723 device as the regulator, he has found this has a strong tendency towards self-oscillation, and he prefers to use a 741 device as a control element.

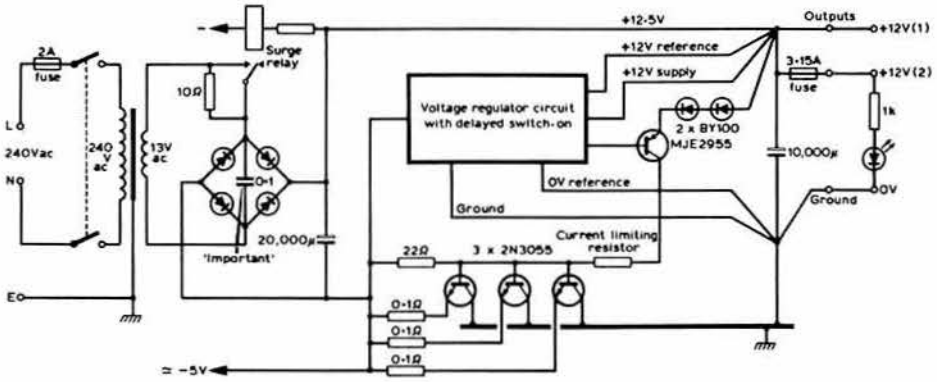


Fig 9. Design philosophy recommended by LA8AK for 12V 10A psu. Note the "inversion" of the pass transistors and regulator to enable the 2N3055s to be mounted directly on the chassis which then forms the heatsink

An important point that many constructors appear to overlook is the need to reduce rfi by adequately decoupling the ac input to the bridge rectifier which otherwise will cause long- and medium-wave rfi.

LA8AK has not incorporated electronic shut-down in his supply, since it is unlikely that there will be frequent short-circuiting of the output; instead a current limiting resistor is felt to be adequate. Since the thermal design is more than adequate, a short-circuit will not cause the transistors to break down, only the fuse will blow. Since the output voltage cannot rise above 15–16V, crowbar protection has not been found necessary either.

To obtain good regulation and good filtering of the output, wiring connections should be made as indicated in the diagram. All voltage sensing terminals at the voltage regulator circuit should have their own wires to the output terminals.

To allow the use of the lowest-possible fuse rating, the switch-on surge has to be reduced; this is accomplished by means of a relay which delays the rate of charging of the 20,000μF input capacitor. However, if the regulator is loaded when power is switched on, the 10Ω resistor will burn out; to prevent this a 100μF electrolytic capacitor is connected across the zener diode, and this provides about 1s delay of the output voltage, sufficient to delay the voltage until after the relay has switched.

In practice, LA8AK uses four 2N3055 pass transistors in parallel, and at 8A these run only barely warm. The regulator circuit is fairly conventional (but "upside down") consisting of 741, BC557 and 2N3053 (BFY51) devices. The output voltage remains stable at 12·4V from very low drain up to 8A. However, constructors should note that the phase change between the input to the 741, through the regulator and back to the same point, must not represent 360° at any frequency where the loop gain is larger than unity; otherwise self-oscillation may occur at a frequency somewhere between 500 and 1,000kHz (ie in the medium-wave broadcast band) may occur. LA8AK has since provided more detailed circuit diagrams to which we may refer on another occasion.

Power supply philosophy (2)

A number of useful thoughts and comments relating to power-supply design have come also from Rick Sterry, G4BLT, based on experiences in both the amateur and professional fields of units of various sizes and types. It will be noted that, unlike LA8AK, he recommends the use of LM723 regulators. He writes as follows:

"(1) I thoroughly recommend the ancient but excellent LM723 regulator ic. It is simple, untemperamental and performs very well. The voltage stability of my large psu is vastly in excess of normal requirements, yet few components are used.

"(2) Although 'switch-mode' supplies have been used in computer and some other power units for a number of years, they are only just beginning to appear in amateur equipment. The reason for this is that they are difficult to design, demand costly fast-switching transistors and diodes, and critical inductor design. My advice to amateurs would be not to attempt to build one (for high output currents) even using custom-designed ic devices, unless they have professional experience of this type of unit. Stick to linear regulators, keep it simple, and think *big*.

"(3) A high-current psu using simple capacitive smoothing requires the use of enormous-value capacitors, typically 100,000μF for a 12V, 10A design. This means that the peak currents drawn from the rectifiers are also extremely large, typically some 30 or 40A for such a 10A unit, or even more. The old-style choke-capacitor smoothing filter is preferable, provided one can find a suitable choke; the capacitor can be a lot smaller, the rectifiers need not be so hefty, and the current through them will be nearer constant and roughly the same as the output current.

"(4) Radio frequency interference from nearby transmitters can cause ic regulators to do all sorts of strange things, including letting the voltage output rise above the correct potential. Therefore never try out a psu on an expensive or critical piece of equipment until you are quite sure that it will not be affected by a local transmitter (this can pose problems if the psu is essential to power the transmitter, although in most cases this can be run, if only temporarily, from a car battery). A few 500pF non-inductive capacitors sprinkled here and there seem to cure the problem in most cases. Makers' specifications for ic devices usually suggest a suitable compensation capacitor of some 100 to 500pF and, when using an LM741 as a regulator, it will probably be necessary to put a capacitor of such value between the output pin and the inverting-input pin (note that if the external 'booster' transistors cause an inversion of the 741 output, then the non-inverting input pin would be applicable). It should be appreciated that much depends on the individual design of the psu and that, if no capacitor is fitted, the unit may well oscillate or 'hoot' with unfortunate results."

Fig 10 shows the 12V 10A psu used by G4BLT for a considerable number of years. This has an LM723 regulator driving a ZT211 with a pair of 2N3772 pass transistors (2N3771s would be adequate) and a "huge" heatsink on the back. Constant current limiting at 10·5A is used, as he considers foldback limiting is too easily "fooled" by capacitive loads or

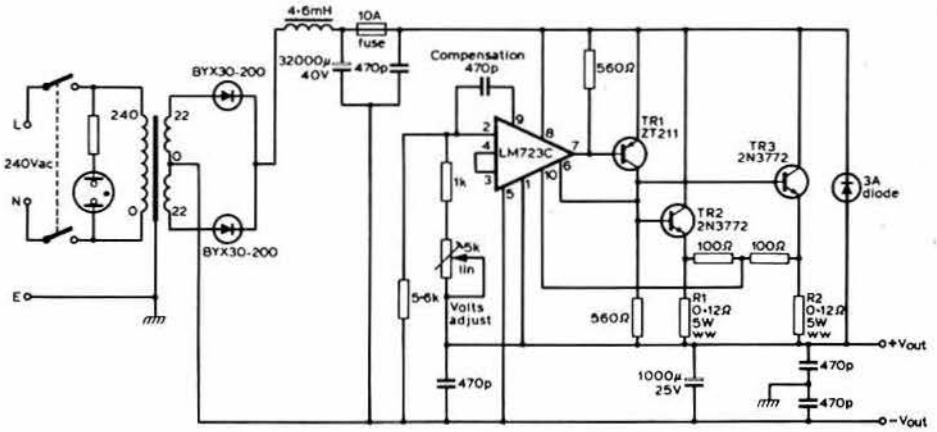


Fig 10. G4BLT's 9–14V, 10A power supply. Note that pin numbers of the LM723c are for the can and not the dil version. TR1 on small heatsink. TR2, TR3 (and possibly R1, R2) on large heatsink. Current limit is about 1·2/R1, with R1 = R2 in all cases. Originally built 1974 and still going strong

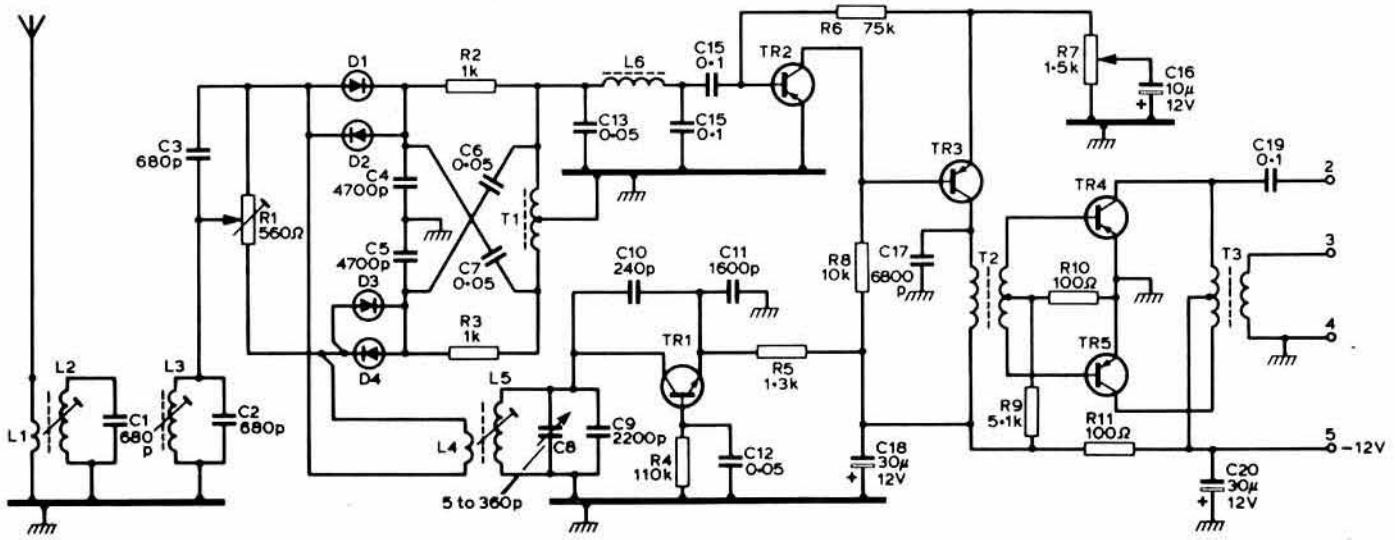


Fig 11. RA3AA's 1·8MHz direct-conversion receiver using anti-parallel harmonic mixer

anything that takes an initial surge from the psu. In some cases the components are over-rated, since they happened to be available, although—as mentioned by LA8AK—there is considerable merit in designing a psu for higher-power loads than those used in practice.

Harmonic mixer 1·8MHz receiver

A number of references have been made in *TT* to the back-to-back (anti-parallel) harmonic diode mixer that has been used by the Russian amateur V. Polyakov, RA3AAE, in various d-c receivers (and which is also capable of providing a very effective form of microwave mixer).

This arrangement turns up again in the form of a 1·8MHz receiver described by RA3AAE in *Radio* (Moscow), No 6, 1980, which is clearly intended to provide a reasonable standard of performance. The oscillator tank circuit (L5, C8) tunes 925 to 975kHz for the receiver tuning range of 1,850 to 1,950kHz, and the receiver has a fixed-tuned bandpass input circuit. The circuit diagram, Fig 11, has been extracted from a detailed Russian text and is intended more as a source of ideas than as a constructional guide, particularly since I have no information on the characteristics of the Russian semiconductor devices specified etc. It would also be necessary for experimenters to develop suitable coils etc.

Small heatsink psu correction

TT October 1980 included (Fig 4, p1036) the circuit diagram of a high-current, small heatsink 12V, 10A psu stemming from Giles Humpston, G4GYO, which featured a low-dissipation regulator. Unfortunately the diagram was incorrect and Fig 12 shows the amended version. G4GYO has checked that the earlier diagram, while not providing regulation, at least should not have resulted in any component damage. Apologies to all who have struggled to make it work!

Julian Pedley, G4CKL, comes up with a novel suggestion for overcoming the problem of the 3V or so voltage differential that is inescapable with ic regulators. His solution is to use a separate section in his psu, with its own low-wattage transformer, to supply the ic regulator and the associated drivers for the series-pass regulators. In this way the main heavy-current transformer need have a voltage rating roughly equivalent to the required output voltage, while the transformer feeding the regulator might be, say, 24V, 0·5A. He has successfully adopted this approach for a psu used with an Atlas 180 transceiver that needs a peak of about 17A at 12V. It may sound a cumbersome technique, but in practice the regulator psu can be very compact and it saves all the problems that can arise from having to dissipate several volts at very heavy current, as well as reducing the risks of a short-circuited series regulator transistor resulting in excessive voltage being applied to expensive equipment.

VMOS dc–dc converter

While, as noted by G4BLT, the heavy-current switched-mode power supply (see notes on such systems in *TT* December 1979, p1145) is not something to be tackled lightly, there continues to be a need for dc voltages greater than those available from a 12V car battery, often fortunately at quite modest current. The higher the switching frequency of a power oscillator used in a switched-mode system (ie what we used to call a dc–dc converter) the smaller can be the associated transformer, the ripple-filter components, and the higher the overall efficiency. In all switched-mode supplies it should be regarded as essential to ensure the minimum harmonic (rfi) output, but a high fundamental frequency is not necessarily a disadvantage since the rfi filters can be made more effective.

Some professional designs are now using switching frequencies between about 100 and 250kHz instead of the much lower frequencies formerly adopted. In *Electronics* 4 December 1980, Bill Roehr of Siliconix shows that vmos devices, because of their very fast turn-on, turn-off times (typically only a few nanoseconds), can readily be used in this application up to at least 250kHz. Fig 13 shows his arrangement for providing a few

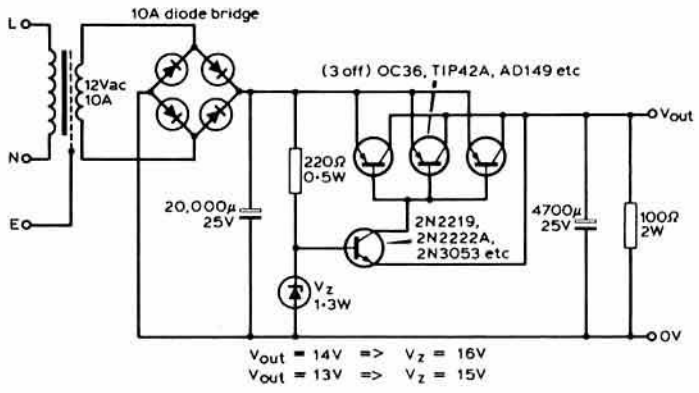


Fig 12. Amended circuit diagram for G4GYO's high-current, small-heatsink psu (*TT* October 1980, Fig 4, p1036)

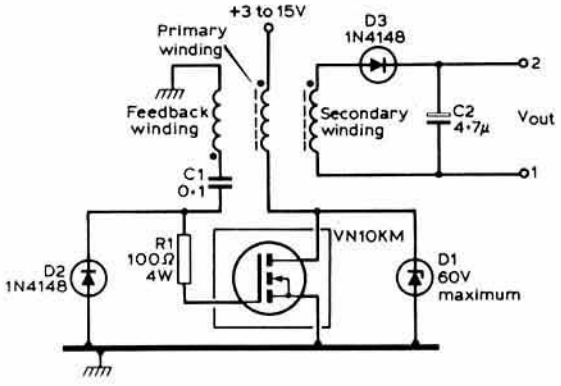


Fig 13. VMOS dc–dc converter with switching speeds up to 250kHz or so. The trifilar-wound transformer on Indiana general core F626-12-92 or roughly equivalent (26 turns, 28-gauge wire, trifilar wound)

watts of dc at up to 60V (voltage determined by selection of the zener diode); other (higher) voltages could be achieved by changing the turns ratio between primary and secondary windings of the trifilar-wound toroidal transformer.

Bill Roehr describes the mode of operation as follows:

"When the circuit is first energized, a positive voltage is capacitively coupled to the gate, turning on the device. Enhancement voltage is maintained by the potential across the transformer's primary, and this is reflected on to its feedback winding. The device continues to conduct until the core saturates, whereupon the feedback voltage collapses and turns the vmos fet off.

"With the device off, energy stored in the magnetic field surrounding the primary winding is transferred to the secondary winding. The zener diode clamps the primary winding voltage to the desired potential and limits the voltage across the vmos gate to some value below its 60V breakdown rating. The energy transferred to the feedback winding has the proper polarity to hold the fet to cut-off. When the transformer comes out of saturation, the operating cycle repeats. Diode D2 prevents negative spikes from damaging the gate of the fet. R1 suppresses any parasitic oscillations caused by the switching.

"Energy transferred to the secondary winding delivers power to C2 via the rectifying diode D3. A single 4·7μF capacitor provides sufficient filtering at 250kHz. The dc output voltage may be made positive with respect to the main rail by grounding terminal 1, and negative to the main rail by grounding terminal 2."

Physical size of such a converter can be minimal.

Capacitance and the ohmmeter

An ordinary analogue-type ohmmeter, such as those incorporated in most high-sensitivity test meters, can be used to measure, with sufficient accuracy for many purposes, the capacitance of an unknown capacitor within the range roughly 0·1 to 300μF (best results in the range 0·5 to 100μF), according to J. Mingrone (*Electronic Design*, December 6, 1980): Fig 14. He describes the procedure as follows: Select a high-resistance scale (eg R by 10,000) and zero the meter at fsd in the usual way. Tape a semicircular piece of paper to the face of the meter to provide an additional scale.

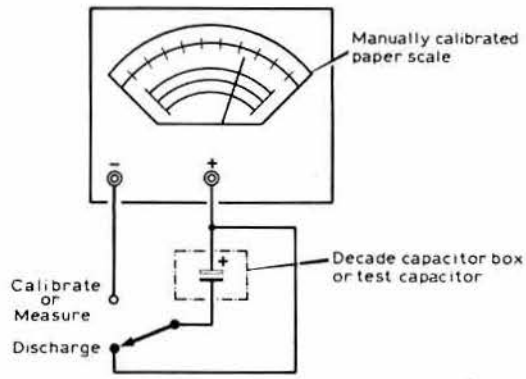


Fig 14. Use of multitest ohmmeter to measure capacitances of from about 0·1 to 300μF

Then experiment with a large-value, initially discharged, capacitor. Connect it directly across the meter leads; it will normally be found that the meter pointer will deflect almost to fsd and then drop back; the lower the value of the capacitor the less will be the initial kick of the pointer. The paper scale can then be calibrated, preferably from a decade capacitance box but, failing this, from a selection of known-value capacitors. For electrolytic capacitors observe the correct polarity of the leads (it may be necessary to check whether or not the "positive" (red) lead carries a positive potential when the meter is used as an ohmmeter).

Tips and topics

Gordon Pheasant, G4BPY, still feels (see *TT* June/July 1980) that a 200kHz crystal filter can prove useful for Droitwich off-air frequency standards, more especially if the requirement is for vhf/uhf applications where there is a real need to reduce the amount of fm on the marker signals to a minimum. In fact he ended up using a three-crystal filter and achieved excellent results. A pll design for a general-purpose design (no crystal filter) in *Wireless World* January 1981, indicates how it will be possible to modify a 200kHz unit when Droitwich changes to 198kHz in a few years' time by using a crystal filter to select a 2kHz (200kHz) sideband.

Several years ago, in his survey of the four-way (polyphase) phasing method of ssb generation, A. Gschwindt, HA5WG (*Rad Com* January 1976) pointed out that this technique could be used also for ssb demodulation, though little use has so far been made of this idea. In *EBU Review—Technical* No 181, June 1980, Dr R. C. V. Macario and I. D. Mejallie, of the University College of Swansea, describe a receiver incorporating a polyphase network and suitable for domestic use if and when ssb broadcasting comes into general use. While they agree a four-path phasing demodulator would inevitably be more expensive to mass produce (because of the need for more components) than a two-path system, they show that a polyphase approach would reduce phasing errors, etc "by an order of magnitude".

Publications relating to recent communications-type Plessey ic devices now include a booklet *New synthesizer circuits from Plessey Semiconductors* with advance information on applications of the SP8901, SP8906 and NJ8811 (which together can form a general-purpose frequency synthesizer) and the SP8793 and NJ8812 (for a low-power synthesizer). Also worth noting is an "owner's manual" on the SL560c low-noise wideband amplifier device which can form a low-noise rf preamplifier of good dynamic range (features though not simultaneously gains up to 40dB, noise figure less than 2dB; bandwidth 300MHz and based on 50Ω input impedance).

Several explanations have been received on just how the negative resistance oscillators using bipolars or fets (*TT* October, November) would appear to work. My apologies by the way to G3MYM for mis-spelling his name, which is R. W. Micklewright.

If you are interested in really long feeders with the antenna possibly several hundred or more feet away from the shack, seek out *Ham Radio* (October 1980, pp12–25) for an article by Henry G. Elwell, N4UH, on "Long transmission lines for optimum antenna location" containing details of balanced four-wire open line as used at many commercial hf stations.

On sealing coaxial cables (*TT* June/July 1980) Jim Foster, K7ZFG, comments in *Ham Radio* (October 1980) that neither silicone seal nor pvc electrical tape should be considered adequate in extreme climates, and that cable tends to "breathe" in moist air. He adds: "The best way of preventing this is to use rubber, self-vulcanizing electrical splicing tape. A good seal is provided with one coat of tape; over this, to protect it from sunlight, there should be a layer of pvc electrical tape, as rubber tape will decay if exposed to sunlight . . . . Before installing electrical splicing tape, stretch it from 1½ to 2 times its original length. Then wrap the entire coaxial fitting, leaving no gaps or open spaces. In winter it may be necessary to cover the wrapped connector with your hand for 3 or 4min to warm it and initiate vulcanizing action; then cover it with the pvc tape." There has also been a lively correspondence on the topic of fitting PL259 plugs, but that must be left for another time. □

BOOK REVIEWS

Practical Electronics Handbook by Ian Sinclair. First published November 1980 by Newnes Technical Books; 186 + vi pages (216 by 138mm). Price £3.95 (limp covers).

Questions & Answers on Transistors by Ian Sinclair. Fourth edition 1980 published by Newnes Technical Books; 104 + vi pages (165 by 112mm). Price £1.75 (limp covers).

These two books by (or revised by) the same author are both intended for the general electronics enthusiast or student-technician rather than specifically for those interested in amateur radio. The compact *Q & A* first came out in 1966 and, although additional information on recent discrete devices has been added, its age shows through. Certainly, however, it provides a reasonably clear, non-mathematical outline of the principles and practice of transistors. But look before you buy, it may not be the right book for you.

The *Practical Electronics Handbook* is a decidedly more substantial, worthwhile and up-to-date book and includes some useful data such as pin-outs for popular ttl and cmos ic devices. Although emphasis is more on electronics (including brief mention of microprocessors) than radio communication, the book represents good value for money with its many clear drawings, and it is worthy of a place on the bookcase unless you are already well endowed with manufacturers' data books. Chapters include: Passive components; Active discrete components; Discrete component circuits; Linear ics; and Digital ics. *G3VA*

MICROWAVES

Charles Suckling, G3WDG*

More on the G3JVL 10GHz transverter

Since the full design of the G3JVL 10GHz transverter was published (*Rad Com*, April 1980) a number of these units have been built and are operating successfully. However, one area which has caused difficulties in some cases concerns the tuning up of the device. This is due to the large ratio of the mixer diode impedance to that of the waveguide, which makes the settings of the six matching screws between the diode and the waveguide filters rather critical. In response to this, G3JVL has produced a modification which eliminates the need for these matching screws and thus makes this unit very much easier to tune up.

The modification entails removing one of the broad walls of the waveguide in the centre section of the mixer, and replacing it with a specially bent-up piece of metal, as shown in Fig 1. The tapering sections of the waveguide thus produced perform the impedance matching between the full height waveguide and the mixer diode.

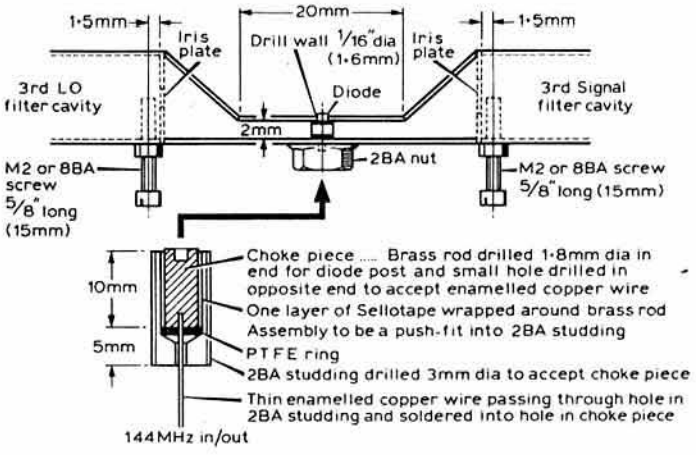


Fig 1. Modification to the G3JVL 10GHz transverter

The material used for the tapering section is made from a piece of brass or copper of similar thickness to the waveguide wall, ie 0·048 or 0·050in. The broad wall of the waveguide on the underside of the mixer (ie the side carrying the 2BA nut as originally specified) should be removed, eg by drilling a number of small holes close to each other and then using a needle file to remove the metal between them, followed by filing down the rough edges. The tapered section should then be inserted (it will hold itself in position if left slightly oversize on the 0·9in dimension). Prior scribing of lines on the inside narrow walls of the waveguide using a suitable thick piece of metal as a guide, held against the remaining broad wall, will act as an alignment aid for determining the correct position for the tapered section. Turn the unit upside down, and mark the position for the 0·063in hole in the tapered section by drilling *very slightly* into the metal using a 0·094in drill (in a vertical drilling stand) fed into the waveguide through the 0·094in hole in the opposite wall of the waveguide. Remove the tapered section, drill out the 0·094in hole in the waveguide to 4mm diameter, and tap this hole 2BA. The tapered section should then be drilled 0·063in in the marked position. Drill and tap the M2 (or 8BA) holes next to the iris plates in the waveguide cavities, and be careful to remove the swarf as far as possible by tapping the metal out of the iris holes into the centre section.

Refit the tapered section into the waveguide and assemble a 2BA brass nut on to a 2BA tap or an old brass screw (which will not take solder easily), and jig the 2BA nut hard up against the wall of the waveguide.

The whole waveguide assembly is then heated on a hotplate to just *below* solder melting temperature, and the tapered section and 2BA nut soldered into position using an iron to provide the final heat. Be careful not to overheat the unit, or some of the previously-assembled pieces may fall off!

When the unit has cooled down, the diode may be placed into the newly-made choke/choke-holder assembly and fitted into position. The thin enamelled copper wire is connected to the changeover relay in the preamplifier box. Try to keep this wire as short as possible.

The tuning-up of the unit is carried out exactly as described previously, except that no matching screws should be needed in the centre section. The newly-fitted M2/8BA screws are adjusted for maximum power transfer through the cavities when the cavities have been tuned to resonance. Their presence will affect the tuning of the cavities slightly, and some small degree of cavity retuning will probably be necessary as they are adjusted. Final adjustments of all screws should be made for best noise figure or maximum power output (or a compromise between them) as originally described.

As an alternative to bending up the metal for the tapered centre section, G3JVL suggests that, if milling facilities are available, the centre section would usefully be made from a solid piece of metal. The fixing for the 2BA choke/diode-holder assembly would then be simply a tapped hole. The block of metal could be either soldered or screwed into position. This would enable the modification to be carried out without the need for any further soldering.

A changeover system for use with the IC202 transceiver

In cases where it is intended to use the IC202 cw/ssb transceiver both as a transmit rf source and as a receiver, in conjunction with microwave transverters (such as the G3JVL 10GHz transverter), advantage may be taken of the dc switching voltage present on the IC202 rf output socket to control a suitable changeover system. A typical circuit is shown in Fig 2, in which the IC202 is switched directly to a transverter receive output, or to the transmit input via an attenuator. The values shown are suitable for use with the G3JVL transverter. The circuit will also drive a second relay, from the emitter of the BFY50 transistor, which would be used to switch the mixer diode between the rf input port (for transmit) and the i.f. preamplifier (see *Rad Com* April 1980).

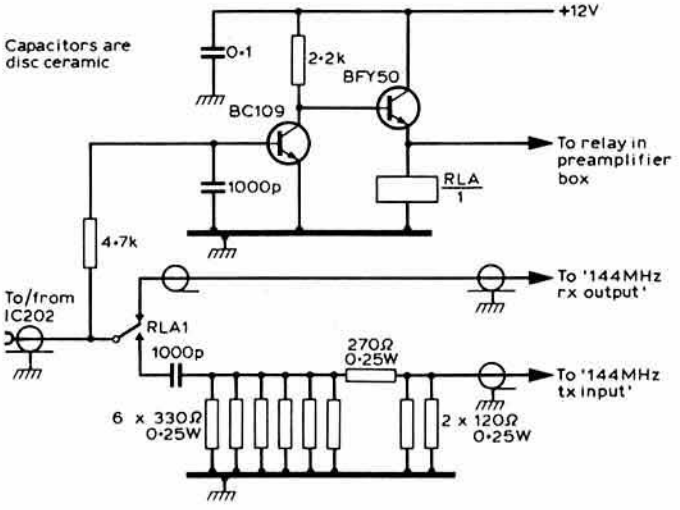


Fig 2. Circuit diagram of transverter changeover system for use with IC202 transceiver. RLA is an RS type 349591

1·3GHz eme news

Poor weather affected activity on 1·3GHz eme over the November 29/30 sked weekend, but nevertheless some interesting contacts were made. Members of the SK2GJ group were active for the second time with their 32m dish, and made a number of contacts including G3LTF, G3WDG, G4KGC, G4CNV, G3YGF, SM0DFP, SM6CKU, DJ8QL, LX1DB, K4QIF, K2UYH and VK5MC. During the contacts with the Oxford group, their signal exhibited a peculiar rapid, scintillation-type fading quite unlike the normal, slower, libration fading always experienced on the

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eme path. They reported that they were beaming through an aurora at the time, which seemed to be responsible for the effect. Signal strengths were also lower than expected.

One station was also reported active using 16 homemade F9FT Yagis; this is almost certainly the first time that Yagis have been used successfully on 1·3GHz eme. Apparently this station contacted SK2GJ (using 150W), and was heard (weakly) by G3LTF and LX1DB.

The growth in 1·3GHz eme activity continues, with new stations SM6CKU and SM0DFP and DJ8QL appearing in November. The excellent results now being achieved by stations with 20–30ft dishes on 1·3GHz, with the advent of very low noise figure gasfet preamplifiers and higher power amplifiers, suggest that successful contacts can be made with considerably smaller antennas; certainly dishes 12–15ft in diameter should be capable of good results. Such antennas are more practicable for the average home station site than 20ft dishes! Such dishes are to be recommended, compared with Yagi arrays of similar gain, as they may be used on circular polarization with full efficiency. Circular polarization is standard on 1·3GHz, since it can eliminate the need for a high-power antenna changeover relay, and effectively eliminates the problems of Faraday rotation which are common on lower frequencies with fixed linearly-polarized antennas.

The existence of regular activity periods and skeds for 1·3GHz eme, details of which are given in the monthly *432 and above* eme newsletter by K2UYH, provides an excellent opportunity for anyone interested in starting on 1·3GHz eme to hear signals. Early copies of the sked list are available (transatlantic post permitting!) from J. Gannaway, G3YGF, Dept of Engineering Science, Parks Road, Oxford, on receipt of an sae.

Power amplifiers for 1·3GHz

With the advent of commercial, low-power, transverters for 1·3GHz, it is worth reviewing the need for "high power" on this band. For many years, a few watts output used to be deemed acceptable, but this was in the days when any contacts over about 50km were considered real dx! Nowadays most stations run at least 20–30W output and, as a result, contacts over much longer distances are considered routine, even from home stations. The general use of higher power levels is certainly one of the key factors contributing to success on 1·3GHz.

Unfortunately semiconductors capable of this level of power are still prohibitively expensive, and most amplifiers in use employ valves, such as the 2C39 or one of its variants (2C39A, 3CX100A5, 7289 etc). Two designs for single-valve power amplifiers have been published in RSGB literature (*Rad Com* January 1976, *VHF/UHF Manual* p5.74). Some modifications to the latter design by G4DGU to improve its performance have been published in *Microwaves* (April 1979). G4FZL has noted an error in Fig 3 of this item—the position of the output socket as shown is incorrect; it should be located further to the right (in the hole marked C3 in Fig 5.154, *VHF/UHF Manual*).

G4FZL has also found one or two further modifications to be necessary. The input circuit to the 2C39 required a 6pF trimmer in parallel with CB (*VHF/UHF Manual* Fig 5.159), and the 0·375in dimension of the anode tuning capacitor C2 (Fig 5.154) had to be increased to 0·5in. The gap between the fins of the 2C39 anode cooler and the diecast box was found to be critical (0·06–0·13in) in order to get the amplifier to tune. G4FZL confirms G4DGU's observation that a gasket is necessary to ensure a good rf seal between the main chassis plate and the diecast box. He also notes that with some types of 2C39, the conducted heat from the heater and cathode tended to melt the soldered connections; reducing the heater voltage to 5·5V cured the problem.

It is also possible to modify some commercial cavities for use as 1·3GHz power amplifiers. GM8BJF has had considerable success with the surplus UPX-6 cavity. This is a coaxial device, intended for use at slightly lower frequencies, and requires modification to raise its resonant frequency to 1,296MHz. The modification consists of filling the lower part of the cavity with solder as shown in Fig 3. GM8BJF suggests the following procedure for doing this.

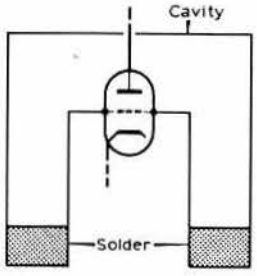

Fig 3. Position of solder in the modified UPX-6 cavity

First, strip down the unit to the bare cavity, taking care to remove all the moving parts, insulators etc. Next, heat the cavity and tin the bottom of the inside of the cavity with Multicore solder, having first plugged the spare tapped hole in the base with a 4–40 screw. Continue to fill the cavity with plumber's (stick) solder—this is much cheaper than using Multicore—to a depth of 12mm. To ensure that the solder tins the walls and forms a meniscus to the cavity walls, it is important to maintain a film of flux on the molten solder. A useful way of knowing when the correct depth of solder has been reached is to note the distance from the surface of the melt to the screw holes in the inside wall of the cavity, as shown in Fig 4.

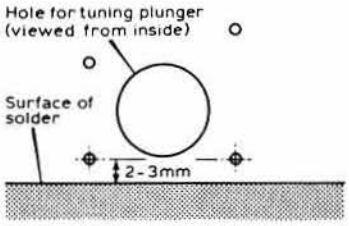

Fig 4. Correct level of solder

Allow the solder to cool, and thoroughly clean the casting, chemical paint stripper such as Nitromors is ideal for this, but it should be used with care as it is corrosive to the skin. Reassemble the cavity to its original form after washing away the cleaning agent with water and drying it. The spring-loaded valve retainer should be removed (three 4–40 UNC nuts and bolts).

The cavity should now tune to 1,296MHz with the two tuning adjustments. Different valves may require slightly different settings. GM8BJF has managed to achieve 80W from such a cavity, using a good 7289, with 10W drive.

Sighting compasses for antenna alignment

A home-made sighting compass was described recently in *Microwaves* (November 1980). This is a very useful piece of equipment for calibrating antenna directions. G3NAQ writes that he has recently obtained a similar item ready-made from an outdoor-sport shop; this was sold as a "marching compass". It was only slightly more expensive than the Silva compass recommended for the home-made sighting compass.

He also notes that any compass obtained for outdoor use should be liquid damped. Although a non-damped compass may seem quite stable in the shop, it may be very difficult to use outdoors in any sort of wind (a common occurrence during microwave tests!), due to the inevitable unsteadiness of the hand.

New IARU Region 1 1·3GHz record

More information has arrived about the 1·3GHz dx worked during the phenomenal opening of 3 October, 1980. At about 2000gmt G3GNR in South Devon worked OK1KIR/P at 1,204km, and established a new IARU Region 1 record for 3·5h until his fellow Devonian G3AUS worked OK1AIY/P to lift it to 1,353km.

Recent possible firsts

The following contacts on the microwave bands may well be "firsts". Are there any prior claims?

26 September	G3PBV–GU3KFT	1st G–GU on 1·3GHz
3 October	GJ8KNV–PA0	1st GJ–PA on 1·3GHz
3 October	GJ8KNV–DL	1st GJ–DL on 1·3GHz
23 August	EI2VDE/P (G8AFC)–GW8DIF/P	1st EI–GW on 10GHz

Recent Microwave Awards

G5UM has supplied the following list of recent Microwave distance and QTH Squares Awards.

1·3GHz distance award: No 22 to G8ART.

10GHz distance award: No 47 to G3YJH/P, No 48 to G2DSP/P, No 49 to G4ETU/P, No 50 to GW8NBK/P, and No 51 to EI2VDF/P.

Microwave QTH Squares Award: 1·3/5 No 9 to G8KAX, 1·3/15 No 4 to G8ART, 1·3/20 No 2 to G3XDY, 1·3/30 No 1 to G4BEL, and 10/5 No 11 to F0AKD/P, No 12 to G3YJH/P, No 13 to G2DSP/P, and No 14 to G4ETU/P. □

4 - 2 - 70

John Morris, G4ANB*

50/70MHz transatlantic crossband

A piece of amateur radio history was made at 1627gmt on 17 November 1980 when Gordon Pheasant, G4BPY, in Walsall, and Andy McLellan, VE1ASJ, in Saint John, New Brunswick, completed the first-ever transatlantic 50–70MHz crossband contact. The calculated great circle distance between the two stations is 4,591km.

Amateur signals from Europe on 70MHz were actually detected in North America on the previous day. At 1335gmt on 16 November VE1ASJ heard marginal signals from ZB2BL on 70·1MHz, but no contact was completed. At 1620gmt on 17 November G4BPY set the keyer going and asked VE1ASJ to listen on 70·1MHz. At that time the 50MHz signals from the Canadian station were being received at S7 in Walsall. VE1ASJ reported hearing the 70MHz signals from G4BPY, and initially sent a 2/2/9 report. He eventually copied the 5/9 report being sent on 70·1MHz, and his final report to G4BPY was 3/3/9. The contact was completed at 1627gmt, by which time the transmissions from VE1ASJ on 50·105MHz were being received at well over S9 by G4BPY.

At the time of this remarkable contact 50MHz signals from the W1, 2, 3 and 4 call areas of the USA were coming in strongly, but by about 1645gmt they had all faded out. G4BPY notes with interest that a similar set of circumstances prevailed on the previous day—soon after VE1ASJ heard ZB2BL on 70·1MHz, all signals faded on 50MHz.

Following this initial success, three more UK amateurs have made 50–70MHz transatlantic crossband contacts. The 70MHz band was open on 7 December for short periods between 1445 and 1515gmt, and during that time G4ENB, G4ENA/A and G3COJ all worked VE1ASJ. G3UUT also tried to make a contact, but was unsuccessful.

The propagation mode for these contacts is not yet clear, but several theories are being propounded. VE1ASJ has suggested that double-hop sporadic-E was responsible; G3COJ believes it was F2; and G3UUT believes it was ionospheric scatter, as he was hearing a rough tone on signals from G4ENA/A. No doubt this subject will be the topic of friendly argument for some time.

Whatever the propagation mode, congratulations are due to all these operators, in particular VE1ASJ, who had what was probably the hardest task of digging weak signals out of the noise. One cannot help but admire the dedication of someone who is prepared to set up an antenna system and receiver for a vhf band not in use by any amateur within 4,000km!

Two make 28/50MHz crossband WAC

Seemingly not content with merely making the first 50–70MHz crossband transatlantic QSO, G4BPY also became the first UK amateur to have worked all continents using 28–50MHz crossband, when he completed a contact with VK6OX, in Caernarvon, West Australia, at 0936gmt on 27 November 1980. The contacts making up this achievement were with VE1AVX, in Bridgewater, Nova Scotia, on 21 October 1979; 5B4AZ in Cyprus on 30 October 1979 (the first UK–Cyprus crossband contact); HC1JX in Equador on 2 November 1979 (the first UK–South America crossband contact); ZB2BL in Gibraltar on 30 November 1979; ZS6PW in Pretoria on 1 March 1980; and VK6OX as described above—for yet another crossband "first", from the UK to Australia.

Shortly after completing the contact with G4BPY, VK6OX went on to work Brian Bower, G3COJ, and Ken Ellis, G5KW, so making G5KW the second UK amateur to achieve WAC for 28–50MHz crossband operation. The contacts comprising the G5KW WAC were with VE1AVX on 20 October 1979; HC1JX on 2 November 1979; ZS3E on 14 March 1980; 15TDJ on 10 May 1980; 5B4AZ on 25 October 1980; and VK6OX on 27 November 1980.

For several months preceding the VK6OX contacts, quite a few 50MHz enthusiasts had been alive to the possibility of hearing 50MHz amateur signals from the Antipodes, and had been making appropriate preparations. G4BPY used a five-element Yagi fixed towards VK, and cut and matched to 52·3MHz (the lower-band edge is at 52MHz in Australia). A homebrew mosfet converter was mounted at the masthead, feeding 28MHz down the coaxial cable to a JR599 in the shack. The receiver's internal 50MHz converter was used to listen on the lower frequencies.

These preparations first bore fruit on 26 November at 0959gmt, when G4BPY identified the VK6RTT beacon on 52·320MHz. Signals peaked at S8 before fading out at 1010gmt. VK6RTT is run by VK6OX, who was alerted to its reception in the UK, but too late for a crossband contact to be made. A signal which was later identified as coming from VK5RO was also heard on 52·02MHz.

On the following day, at 0924gmt, VK6RTT once again became audible, and on this occasion VK6OX was available, and so the contacts were made. VK6OX was using 52·005MHz, and both his cw and ssb transmissions received R5/S9 reports from G4BPY. VK6RTT finally became inaudible at 1001gmt. The UK stations who made crossband contacts with VK6OX were all transmitting on 28·885MHz.

Once again, congratulations are in order to G4BPY and G5KW, whose perseverance in the difficult art of 28–50MHz crossband working has at last been rewarded by contacts with each of the six continents.

F2 propagation at 144MHz?

John Branegan, GM4IHJ, has been continuing his satellite monitoring activities. A feature of major interest revealed by these observations has been the very high ionization levels reached during certain days in November. Following a report in the January 1980 *4-2-70* several American amateurs have been keeping GM4IHJ informed of possible F2 propagation at 144MHz. Others have seen the report by G3IOR in *Orbit* June 1980, which gave data from G3IOR and GM4IHJ for predicting the possibility of 144MHz F2. These effects were present again on 5, 9 and 14 November. So far GM4IHJ has received only a secondhand report via AA6I and WB2TNC/3 that someone had some success on 9 November using high power density eme gear, and he is obviously interested in hearing more. Certainly satellite results on 9 and 14 November suggested that transatlantic F2 propagation might have been possible on 144MHz. On 5 November the same conditions were present to the south of GM4IHJ.

The high ionization levels present on 9 November coincided with the observation by G8PON (AM35g) of the ZS6PW beacon on 144·17MHz between 1030 and 1045gmt. The signals heard by G8PON were weak but fully readable, and peaked at a beam heading of 120°E of N, with the callsign being given every 30s.

It is a sad fact that there are a few misguided people who apparently get enjoyment out of transmitting spurious signals with exotic callsigns. The past activities of this small band inevitably cast doubt on the origin of the signal heard by G8PON, but the evidence so far indicates that the observed transmission did indeed come from the ZS6PW beacon. If so, this report could well prove to be a landmark in the continuing investigation and exploitation of various vhf propagation modes by amateurs.

144MHz eme experiments from Yorkshire

Several members of the Yorkshire EME Group (G4CMV, G4DZU, G4HZN, G4IDR and G5CSZ) have written to *4-2-70* with details of their recent moonbounce experiments on 144MHz, including a series of tests with K1WHS and his monster array of 24 14-element CushCraft boomer Yagis. Path-loss calculations indicated that with a single Yagi antenna and UK power levels it would just be possible for an eme contact to take place between the UK and K1WHS. During a sked on 18 October 1980, Dave Redman, G4IDR, succeeded in working K1WHS via the moon with "O" reports. K1WHS peaked at 1dB over noise in a 500Hz bandwidth with G4IDR, who was using only 14 elements of a 19-element CushCraft boomer. The receiver used by G4IDR consisted of a 3SK48 preamp driving a U310 into an SRA1H balanced mixer. A Drake R4C with bandwidths of 2·4, 1·5 and 0·5kHz was available. Subsequent conversation with K1WHS revealed that G4IDR peaked at RST429 at times during the sked. Other stations able to hear K1WHS during the sked were G4HZN, G4DZU, G8MJD and swl Mike Allmark.

Walter Hopkins, G5CSZ, is a leading 144MHz personality in this country, and in the USA where he is better known as W4FAY. He was due to return to the other side of the Atlantic in December, and so had taken down the normal eme array and was using only a single nine-element Tonna Yagi at 25ft asl. The first sked with K1WHS from 0300 to 0400gmt on 20 November produced no result, and so a further test was arranged for the following morning at 0420gmt. After an initial frequency error had been discovered and corrected, the QSO was completed without any difficulties; the signal from K1WHS reaching a good 5/9 on several sequences. The equipment used by G5CSZ comprised an FT301D with an Autek audio filter, MMT144-28 transverter and a 3SK48 preamp with 0·9dB nf in the shack. On transmit the transverter was used to drive a pair

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of 4CX300As at 800W to 65ft of Andrews 0·5in heliax FSJ450 with 1·02dB loss. Power at the antenna was 632W. G5CSZ made a special bracket for the nine-element Tonna to fix the elevation at 8°, allowing him to hear eme signals from 2h before moonset. K1WHS commented that this was the smallest antenna he had ever worked off the moon! The moon was at perigee during the contact, and the excellent winter conditions on eme certainly helped make it possible.

Doug Parker, G4DZU, uses an array of four 19-element boomers with full azimuth and elevation control, fed by 50ft of 0·675in heliax for 144MHz eme. In the shack an Icom IC251 is used with an Autek audio filter and a homebrew pa. The preamp uses a 3SK48. He worked K1WHS at 0050 on 19 November 1980 and, as would be expected with the somewhat larger antenna system, was able to send a 5/5/9 report. Over the next few days G4DZU also worked W7FN, WA1JXN at 5/2/9, K1FO, K0KE at 5/2/9, W6PO at 5/3/9, VE2DFO at 5/3/9, and WA9KRT at 5/2/9, despite the handicap of having to get up at such times as 0300gmt.

Calculations by the Yorkshire group show that anybody with a preamplifier of 1dB noise figure and a combined antenna gain minus feeder loss of about 10dB should be able to work K1WHS via the moon. Indeed, in a series of tests organized by G4DZU with various stations throughout the country, K1WHS could be heard by people using only eight-element Yagis. G4DZU cautions that the definition of an eme station is one which can receive echoes from the moon of its own transmissions. In particular, most operators who succeed in making contacts with K1WHS will be relying more on the unusually large, carefully optimized 336-element antenna system used by the distant station than on their own equipment!

EME operators occasionally find problems with local stations causing QRM. G4DZU recounts one incident which took place at 4am, after he had been calling "CQ eme" on very slow cw. A G station, who shall remain anonymous, replied to the call, saying that if nobody wanted to talk with G4DZU, he would! Readers are reminded that the bottom 10kHz of both 144 and 432MHz are reserved for moonbounce operation only.

Other activities by members of the Yorkshire EME Group include the development of a data base which will work with existing moon location software to give the noise temperature of the area of sky surrounding the moon. A high sky temperature around the moon can often mar any chance of making a contact, and so this data base should be a useful aid in planning future tests.

Aurora

In between his moonbounce activities, G5CSZ (ZO73e) found time for a little auroral operation on 31 October. Coming from southern California, G5CSZ had never experienced operating in auroral conditions before arriving in England, and now regrets not having listened for auroral signals since arriving in the country. Auroral conditions were first noticed at 1627gmt, when UR2RQT was heard at S5 for 15min. After 20min of hectic activity connecting cables, G5CSZ was on the air and made contact with OZ5IQ, SM5CHK, SM6DYK, SM6GFS, SM4CFL, SM6DZE, LA1TV, LA2PT, SM4PG, LA8AK, LA3VU, SM6DHD, LA6ZW, LA3UU, LA8YB and several G and GM stations. The auroral conditions dropped below 144MHz at 1759gmt.

The Propagation Studies Committee of the RSGB is always interested in reports of auroral contacts, with the aim of eventually being able to explain fully and predict the occurrence of auroral phenomena. To be of most use, reports should contain the locator references of the stations worked, and the beam headings used. Special log sheets are available to ease the reporting of contacts by anomalous propagation modes. They may be obtained from your scribe in exchange for an sae.

Charlie Newton, G2FKZ, chairman of the Propagation Studies Committee, has suggested that auroral activity may be expected to pick up by the spring of this year as we enter the post-solar maximum magnetic phase. An auroral calendar, as described in the *Amateur Radio Operating Manual*, would therefore be a useful thing to have. G2FKZ sends regular predictions for the GB2RS news service, but some auroral openings will always arrive unexpectedly. As the sun restructures itself there is a period of uncertainty until a new pattern emerges, but, in the main, patterns can last for four or five solar rotations. For those interested in propagation prediction, the 1981 solar rotation base map is available from Mike Hawkins, G3ZNI, at RSGB HQ on receipt of an sae.

50MHz

In addition to the outstanding results described elsewhere, 50MHz also produced copious quantities of less exotic but nevertheless interesting dx during October and November. GM4IHJ in Fife found conditions very variable, and much less consistent than in 1979, but still improving through November. The days with high planetary magnetic index Kp were all dead for GM4IHJ, but all other days produced something, with the openings lasting longer each day, until by 16 November there were good signals from the east coast of the USA and weak signals from the west coast until 1720gmt. The dead days were 30 and 31 October, and 1, 10, 11, 12 and 13 November. In the three weeks up to the middle of November, GM4IHJ made crossband 28–50MHz contacts with 41 stations in six countries and seven of the USA call areas, and heard many more.

The patient monitoring activities of Trevor Brook, G3WBQ, in Surrey, were rewarded on 15 November with very good conditions to central and southern America. Among the stations heard were FY7THF, DL3ZM/YV5, TI2NA, TI2HL, HI8DAF and KC4CI, with W1, W5, W2 and VE1 audible most of the time. Initially there was some doubt about the location of KC4CI, as the map on the front cover of the October 1980 *Rad Com* shows the KC4 prefix being used in Antarctica. However, the scoop was not to be, as a little further investigation revealed that KC4 is also used by Nevassa Island in the Caribbean.

A letter from W6ABN in California to G5KW reveals that dx stations wanting to work into the UK by 28–50MHz crossband can suffer from QRM around 28·885MHz. On 25 November W6ABN began calling G5KW, along with several other operators. By the time propagation allowed the 50MHz signals to get across the long path from California to the UK, 28·885MHz was completely blotted out by QRM. When this eventually cleared, conditions had faded on 50MHz! On the following day W6ABN was listening around while writing a letter to G5KW describing his frustrating experience of the previous day, when he once more heard G5KW working crossband. On this occasion W6ABN had rather more success in getting through the pile up, and for once the 28MHz transmissions from G5KW were in the clear.

EL2FY has produced the following summary of the reliability of 50MHz propagation from Liberia to various parts of the world during late 1980:

		Percentage reliability		
Region	Time (gmt)	September	October	November
North America	1300–1600	–	25	25
Caribbean	0000–0200	–	50	25
South America (north)	2300–0100	25	75	25
South America (south)	2100–0200	50	99	95
East Africa	2030–2200	–	50	25
South Africa	1300–1500	–	25	–
North Africa	1100–1400	–	99	90
North Africa	2300–0200	50	99	90
Europe	1100–1400	25	99	90
Japan	2300–0200	–	25	10

G3JHK has passed on information from H44PT about a new 50MHz beacon which is operational in the Solomon Is. The callsign is H44IR, and the frequency 50·005MHz. The beacon came on the air from a remote location on 6 November 1980, and H44PT would greatly appreciate reports. H44PT also works crossband, using 28·885MHz on receive.

Local working on 144MHz ssb

The VHF Committee of the RSGB recently discussed the problems encountered by those wishing to make local and semi-local conversational contacts on 144MHz ssb when the band is very busy, such as during openings and particularly contests. The ssb portion of 144MHz runs from 144·15 to 144·5MHz, but contest and dx activities tend to be concentrated in the bottom 250kHz of this segment. The VHF Committee has therefore recommended that frequencies between 144·4 and 144·5MHz should be used for local operation during periods of high activity.

During the frenetic activity of brief openings and major contests it is perhaps unrealistic to expect that the calling frequency, 144·3MHz, should be kept completely clear. For this reason it has been suggested that when the area around 144·3MHz is congested an alternative "local and mobile" calling frequency should be adopted; 144·4MHz was originally put forward for this. However, in a recent edition of the vhf/uhf dx magazine *Dubus*, F1JG proposed that 144·4MHz should be used as an alternative frequency for random ssb meteor scatter calling, with the aim of reducing the problems encountered on 144·2MHz during the August 1980 Perseids shower. This proposal has received considerable support, and so it looks likely that a different frequency will be nominated as an alternative for local and mobile calling; 144·45MHz has been mooted, but the matter is still under discussion.

Whatever recommendation eventually emerges, the use of the top 100kHz of the ssb sub-band for short-range and mobile operation when the band is crowded is certainly an idea worth trying. Those wishing to make such contacts during openings and contests are therefore urged to use this relatively quiet part of the band. It is also eminently sensible that regular long skeds and club nets should be arranged to run above 144·4MHz, so reducing the chance of interference both to and from other stations.

Midlands VHF Convention

Early application is advised for a new entry to the amateur calendar, the Midlands VHF Convention 1981, which is being organized for 10 October. Features planned for the convention include a trade show specializing in hard-to-get components for the home constructor; a series of lectures of particular interest to vhf operators; a "measurements room" containing high-performance test gear and with expert advice available; and, of course, an ever-welcome opportunity to meet fellow vhf enthusiasts. The lecture programme has yet to be finalized, as the organizers wish to avoid any overlap with the RSGB National VHF Convention, but the provisional programme includes some intriguing titles, such as "How to do *quite* well in vhf contests". Rooms will also be made available at cost for specialist groups to hold exhibitions or discussions.

The convention will be held at Wolverhampton Polytechnic, which is in the town centre, 5min walk from the station and with ample parking space reasonably close. Snacks and bar facilities will be available. Attendance for lectures will be limited by the accommodation available to 400, on the basis of "first come, first served". At a cost of £1 per person, the convention has all the makings of an interesting and enjoyable day out for all vhf operators. Further details may be obtained from G3UBX, QTHR.

SSB repeater proposal

Several more correspondents have provided contributions to the continuing debate on the proposal by Tony Whitaker, G3RKL, for an experimental ssb repeater, GB3SF. It would be impossible to reproduce in full all of these letters, but the following extracts are representative of the points made:

"I feel that it is an interesting experiment, and harmless enough in small numbers but, if they became popular, it could be rather difficult to position them in such a way as to avoid interference to themselves and the existing fm repeaters—especially during lifts. Repeaters are essentially local devices, and since fm has been shown to work I do not see any reason why other modes need to be used"—*G8GGG.*

". . . if we carry on erecting repeaters all over the place, we are going to arrive at the stage, eventually, where operators who are interested in doing their own thing direct will find the free space left to them is ever diminishing"—*G3TDG.*

"SSB is the most effective and efficient form of telephony under weak signal conditions currently used by amateurs, and artificial aids such as repeaters are unnecessary. Why not a linear transponder from 1,296MHz to some microwave band, incorporating beacon facilities in order to promote activity on these bands?"—*G4IDR.*

"An ssb repeater will not help to further the knowledge of the amateur"—*G8RAE.*

". . . as A3A transmissions are bad news on amateur bands I suggest G3RKL applies for a G9 licence and leaves the most crowded vhf amateur band clear. It took 50 years to get carrier heterodynes out of the bands, and it would be madness to bring them back"—*G3RAU.*

"SSB repeaters are not required and certainly not wanted. The idea of unbalancing the balanced modulator in order to run carrier with only 16dB suppression is feasible, but what will happen? Ham-fisted fix-it-yourselfers will just give the pot a quick tweak and, if it works, never mind the heterodynes on the band. Will they re-adjust when they use the dx end of the band?"—*G4DEZ.*

"I was dismayed to read of the revamped ssb repeater proposal, as I thought it had been established that such devices were unnecessary. If, however, this project must go ahead, I should prefer a more ambitious approach: *(1)* single frequency operation, retransmitting on lsb; *(2)* accurate demodulation by maintaining the harmonic relationship of two subcarriers (or even speech components), ratios being easier than absolute values to set up"—*G8DLQ.*

"I would not object if the proposal were for a band like 1,296MHz or 10GHz, but the use of 144MHz is just asking for trouble. How about making it two-fold as a 1,296MHz or 10GHz beacon/repeater with outputs on 1,296MHz and 10GHz? Now that *is* leading the way"—*G4DZU.*

"I am of the opinion that . . . the proposed repeater should be established and allowed to operate for a trial period of not less than six months, and that after a trial period there would be a lot more enthusiasm for this proposal than has been shown in the past. I feel sure that if the proposed repeater were established and put into operation it would not be long before requests were made for similar repeaters to be installed in other parts of the country. I would suggest that the proposed station should be operated in the ssb section of 144MHz and kept separate from the fm section"—*G8MAT.*

"It would seem that the proposal trades simplicity at the repeater for a great deal of co-operation from the users. With access to spectrum analysers or other laboratory equipment, it is reasonably simple to introduce carrier at any desired level in an ssb transmitter. I suggest that this is not so easy with the average amateur's equipment. Surely a better solution would be to introduce rather more complexity at the repeater in exchange for no modification of the user's equipment. A paper which Pat Hawker brought to our attention some time ago (O. G. Villard Jr, *IEEE Transactions on Communications Technology*, 1971, p729) presents a very comprehensible method of achieving the afc function by signals derived from the audio characteristics of speech. I feel that the introduction of such a novel technique would more satisfactorily accord with the experimental nature of amateur radio than would the mere repetition of a well-known technique"—*G3YAC.*

In his capacity as Cambridge Raynet group controller, G3YAC has also expressed concern over the proximity of the proposed input frequency to 145·2MHz, which is in extensive use by many Raynet groups.

It is clear that there is no general consensus on the desirability of ssb repeaters *per se*, nor on the particular implementation proposed by G3RKL. Further contributions to this debate would be welcome. Next month's *4-2-70* will contain a reply from G3RKL to the points raised in this issue.

All letters on this subject will also be forwarded for consideration by the VHF Committee and Repeater Working Group of the RSGB.

Repeater news

The Home Office has issued licences for 11 of the 16 433MHz repeaters proposed in uhf Phase 5. The callsigns, locations and channels allocated are:

GB3CW	Near Newtown, Powys	RB6
GB3GR	Grantham, Lincs	RB11
GB3GY	Grimsby, Humberside	RB11
GB3LS	Lincoln, Lincs	RB2
GB3MT (rtty)	Bolton, Greater Manchester	RB12
GB3NF	Near Southampton, Hants	RB11
GB3PU	Perth, Tayside	RB0
GB3SW	Salisbury, Wilts	RB6
GB3TD	Swindon, Wilts	RB13
GB3VS	Glastonbury, Somerset	RB13
GB3WG	Near Port Talbot, W Glamorgan	RB6

The remaining units in this phase, GB3HZ, GB3OS, GB3SM, GB3VH and GB3YL, are still with the Home Office at the time of writing. Note that the proposed channel for GB3OS is RB2, and not as stated in the November *4-2-70.*

Two of the newly-licensed units were due to come on the air soon after being licensed, and if all has gone well should now be operational. These are: GB3CW, which is intended to cover central Wales; and GB3LS, located in the tower of Lincoln Cathedral. The builders of GB3LS at one time had thoughts of fitting it with a microphone, so that the tintinabulations of the cathedral bells could be heard as a melodious background to contacts through the repeater. Sadly, these ideas had to be abandoned when it was realized that this arrangement would allow the conversations of any visitors to the tower to be transmitted all over the city!

Bill Jarvis, G8APX, has expressed his thanks to all those who have written with support, comments and advice for his Wigtown repeater proposal. In view of progress with other nearby projects, the idea is to be shelved, at least for the time being.

Awards

The top two awards in the 432MHz Squares series have recently been claimed for the first time, and both by the same operator! Mike Lee, G3VYF, in Essex, has been issued with sticker No 1 for working 13 countries and 50 squares, and, simultaneously, No 1 for working 15 countries and 60 squares on 432MHz. Mark Marment, G8ABP, has earned award No 5 in the 432MHz 6 + 30 category, and would indeed have been able to claim the next class up but for the familiar problem of getting the QSL cards in.

In the 144MHz Squares series a 15 + 60 sticker has gone to G4CUS to affix to award No 22, while certificates 32, 33 and 34 for working 10 countries and 40 squares have gone to G4FSG in Suffolk, G8VR in Kent, and G4KMH (ex G8FTR) in Harrogate, respectively. The claim by Ken Willis, G8VR, was unusual in that it included eight cards for contacts by meteor scatter, all on cw, and some taking over two hours to complete before the final "RRRR" was received.

An enthusiastic portable operator who has given many collectors contacts with rare counties is Richard Marshall, G4ERP, of Gloucester, who has now himself won 144MHz FMD Senior award No 156. Sue Firth, G8SFI, of York, also took a certificate No 156, in this case the 432MHz FMD Standard. Sue does a lot of portable work, and hopes to achieve the Senior as G8SFI/P before the end of the year.

(Continued on page 152)

DX operating—an introduction

by D. I. FIELD, G3XTT*

HAVE you ever wondered how it is that some stations seem to work all the dx that is going, while you think yourself lucky to work even the occasional dx station? This was certainly the author's experience for some years after first being licensed. There seemed to be a certain mystique to dxing; a secret shared by the chosen few. There also seemed to be other prerequisites, such as a high-power linear, a TH6 atop a 60ft tower and, of course, the necessity of being retired in order to be able to spend all day tuning the bands waiting for that rare station to turn up.

Certainly there are some very real problems preventing many of us from aspiring to the pinnacles of dx: family commitments, lack of space for antennas, and so on. However, it is surprising just what can be achieved, even with such constraints, and it is the purpose of this article to suggest some hints and tips which may be of use. Much of what will be said could be classified under the heading of "common sense" and perhaps this is why it so rarely finds its way onto paper. After all, it is second nature to those who top the dx listings, and they probably assume that the rest of us share their knowledge.

The lack of printed information on the subject has recently been alleviated somewhat by the publication of the excellent *Amateur Radio Operating Manual*[1], but it was felt that there was still a need for an article to help and encourage those who despair of achieving even mediocre results in the dx line. For the author, with a 30ft square of rear garden on a suburban housing estate, and with a job that keeps him out of the house for 11½ hours a day, application of the general ideas presented in this article has resulted in working over 230 DXCC countries in the last 18 months, and getting within striking distance of the Five-band DXCC Award in the same period of time.

There are two basic stages in working a dx station. The first is to locate the station on the band, and the second is actually to make the QSO. For best results, careful attention has to be paid to both aspects. Starting with the second part first, how should you go about working the dx in the face of competition from all your better-equipped rivals? This in itself has two aspects. First, ensure that your station has been honed to perfection within the constraints (cash, space, etc) that apply. Second, **think** about your operating technique, rather than simply shouting as loudly as possible on top of the dx station in the vain hope that he will hear and reply.

The dxers station

Given that you cannot manage that tower and full-size beam, just what can be achieved in terms of putting out a reasonably competitive signal? Certainly, all other things being equal, expenditure of cash, time and effort on the antenna will yield greater rewards than a similar expenditure on any other aspect of the station. A decibel of gain in the antenna will improve not only the transmitted signal but the received signal too. In the author's case it was the improvement of band conditions with the approach of the sunspot maximum which prompted some serious thinking about antennas. The author's garden was far too small to accommodate a full-size 14MHz beam, but what about one for 28MHz? After all, there seemed to be increasing dx activity on that band as the sunspot situation improved, and the greater bandwidth on 28MHz generally means that it is less of a rat-race.

With these thoughts in mind a 28MHz quad was constructed from some garden canes and set atop a 20ft mast. The choice of a quad was made mainly because it had only half the "wingspan" of a Yagi for the same band. Even without the benefit of a rotator (other than the hand variety!) results were very encouraging, with stations being worked that could not even be heard on the vertical dipole which had previously been used on the band. Several brand-new countries were entered into the log in just a few days. However, a few days proved to be all that was available, as the neighbours failed to appreciate the aesthetic qualities of a quad and it had to come down. What next? Thought was given to wire beams and, indeed, such antennas as the ZL-Special and a two-element wire Yagi have since been tried with reasonable results. Clearly, though, if worldwide coverage were to be achieved, a rotatable antenna was required.

A number of excellent articles on the subject of reduced-size antennas have appeared over the years, and G3VA has covered many types in "Technical topics". Any of them could prove acceptable where space is a problem. In the author's case it was felt advisable to opt for an antenna which looked fairly respectable and which would not be objected to by the neighbours. With this in mind the well-known HQ-1 mini-quad was purchased and erected at about 30ft. Results with this antenna have been much as one would expect. Its 28MHz performance is very good; 153 countries worked on that band in 1979, mostly without the aid of a linear, testify to the antenna's effectiveness. The performance on 21MHz is also quite reasonable, but on 14MHz signal reports are slightly down on a delta-loop antenna which the author now tends to prefer on that band. On 14MHz the narrow bandwidth of the antenna can also be an inconvenience if it is wished to operate throughout the band.

As for the 7 and 3·5MHz bands, verticals and dipoles have been tried, and best all-round results have been obtained with inverted-V dipoles. Having made this discovery, inverted-Vs were erected for these two bands, supported by a mast attached to the house and using a common coaxial feeder. The ends of the 3·5MHz dipole just fit into the front and rear gardens, albeit with some slight bending, the apex of the V being at about 40ft. For those with space for $\lambda/4$ radials, vertical antennas for these bands may well yield better results. The moral of the story seems to be that, as far as antennas are concerned, each situation needs to be tackled from first principles, and the most suitable antenna, or system of antennas, devised or perhaps arrived at by a process of trial and error. For information on the basic principles of antennas, a very informative publication is the *ARRL Antenna Handbook*[2], though the chapters of the *Radio Communication Handbook*[3] relating to antennas are also very valuable.

What about the station itself? If only cw is to be tackled, then a basic transceiver may be regarded as adequate, preferably with the addition of a cw filter. Remember, however, that many dx stations listen away from their own frequency, so rit is essential, and a separate vfo can also be very useful. Select a rig with a good receiver, particularly if operation on 3·5 and 7MHz is contemplated. Chasing a new country on 3·5MHz can be most frustrating if the receiver suffers badly from cross-modulation, a problem quite common on the first generation of transistorized equipment. Many top dxers prefer separates. Not only does this mean that transceive or split-frequency operation can be selected at the flick of a switch, but custom-designed receivers often have a far superior performance to their transceiver counterparts.

When choosing your rig, bear in mind that for the price of that brand-new all-digital transceiver you could buy a pair of secondhand Drake or Heathkit separates, or something similar, and end up with a rig much more suited to dx operating.

Now, what other considerations apply if ssb is to be used? Well, in terms of putting out the most effective signal, your best investment beyond the basic rig will be a speech processor, which can make a significant difference to the readability of the signal at the far end. Only then, and if you can afford it, purchase a linear amplifier.

All the above assumes, of course, that you are going to be able to operate your station without tvi or rfi problems. Since the widespread acceptance of uhf tv, things have got a lot easier in this respect, but you are still likely to experience one or two problems. The important point is not to give up, but to persevere, probably with the aid of your local Post Office radio interference officer, and overcome these problems. In difficult cases the RSGB Interference Committee is only too pleased to offer its assistance.

Having now equipped yourself with an efficient station and antenna system, and having cleared any potential tvi problems, you are now able to put out the most effective signal possible given the constraints which apply in your particular circumstances. So how, then, should that dx be worked?

Operating technique

Much has been written about general operating technique, particularly aimed at minimizing interference with other stations on the bands. However, there are some points which have particular relevance to dx working and which are often forgotten:

(1) The vital key to working dx is to have up-to-date information at your fingertips. To this end a subscription to at least one of the weekly dx bulletins (such as that compiled by Geoff Watts and published by the RSGB) is a must. Information may also be carried by the GB2RS news bulletins, though it is even better to monitor some of the regular dx nets which meet on the hf bands for the exchange of dx information. Information may also be obtained from other dx enthusiasts; many of the most successful dxers work in groups, taking it in turn to monitor the bands and

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to telephone one another (or relay on 144MHz) when a wanted station appears.

(2) It is not always realized that dxpeditions tend to use a few well-known frequencies for their operations. This makes them easier to find, and saves considerable time which might otherwise be spent tuning the bands. The commonly used frequencies on the higher frequency bands are 28,595, 21,295 and 14,195kHz on ssb, and 25kHz above the band edges on cw. Usually, in fact, groups taking part in an expedition will announce beforehand the frequencies they intend using.

(3) Another key to making best use of your time is to be fully conversant with the vagaries of hf propagation, paying attention to the predictions which appear in *Radio Communication* and on GB2RS. You will then be able to select your operating times to coincide with a likely opening to the part of the world in which you are interested.

(4) A further point arises with regard to operating times, which is that, aside from dxpeditions and contests which produce activity throughout the 24h period, it makes more sense to look for a given part of the world at a time when the locals are likely to be at home, rather than at work or in bed. In this respect remember that Friday is the day of rest in Muslim countries, and that foreign public holidays do not necessarily coincide with their UK counterparts.

(5) If you intend to take dxing seriously, then it is of little use restricting yourself to one mode, or deciding to avoid, say, contests or list operations. For those with a small signal, cw is often invaluable in getting through where you might not with ssb and, of course, it gives you a chance to pick up new ones in the various cw contests. Contests are, in fact, a very useful way of collecting new countries, particularly on the lower frequency bands, because expeditions often go out (especially to the Caribbean) to participate in the multi-band categories of these contests. With regard to list and net operations, a storm of controversy has raged in recent years, and it is not the intention of this article to discuss the pros and cons. Certainly there has been severe abuse of these types of operation, but when used sensibly they do enable an operator to discover the true capabilities of his station without having to compete with the multi-kilowatt stations.

(6) It has already been emphasized that listening on the bands is a key method of obtaining dx information. Listening is equally important when you actually locate that much-wanted dx station. Too many operators call incessantly without first checking to discover on what frequency the dx station is operating or whether he is following some sort of pattern, for instance by listening for callers from specified call areas. Careful listening enables you to use your calls most effectively. It is not always the strongest signal that makes the contact, but rather the one who times his call to the best advantage (which is not, of course, the same thing as "breaking" during someone else's QSO).

(7) One useful way of working dx on the lower frequency bands is, of course, to arrange schedules with stations you work on 14, 21 and 28MHz. Many dx stations are only too willing to assist in this way, as it makes a change from the rubber-stamp contacts they are often forced to make on the higher bands.

5BDXCC?

Having now covered many aspects of the dx game, it is reasonable to ask just what kind of results might be achieved. Is the DXCC Honor Roll (309+ current countries confirmed) a possibility, or perhaps the Five-band DXCC Award?

To answer the first question, at the present time there are 319 countries on the DXCC list. However, there has been no operation in recent years from China, Albania, Burma, Afghanistan and a few other countries, so even the top dxers have their work cut out. However, other awards such as the Worked All Zones and Worked All States should be feasible, as should the 5BDXCC. For this latter, let us consider how those magic 100 countries might be obtained.

It will be assumed for the purposes of this discussion that you will find it relatively easy to work the required countries on 14, 21 and 28MHz. This may seem wishful thinking at the moment, but if you put into practice some of the techniques outlined in this article you should have no real difficulties. However, 3·5 and 7MHz may prove more troublesome, if only that those more distant countries—even the relatively common ones like Japan and Australia—are quite difficult to work. Do not be dismayed. Firstly, there are 61 countries on the DXCC list for Europe (or 62 if the European part of Turkey is included). Most of these should be workable; the main exception, of course, being Albania. Of the other rare European countries (eg Svalbard, Mt Athos and Andorra) you are likely to be able to work some, if not all, by virtue of the expeditions that visit them from time to time.

With regard to the remainder of the world, the Caribbean is likely to yield the greatest rewards, many of the islands being activated on a regular basis by casual holidaymakers and, more particularly, by multiband expeditions, especially at the times of the major international contests. Of the 30 or so countries in that part of the world, you should be able to work at least 20 without a great deal of difficulty. Asia is another continent which should provide some easy pickings, principally in the form of the various USSR republics—UA9, UD, UF, UG, UH and UI—all falling within Asia; 4X, 5B and the occasional other Asian country should also be workable. Africa is also likely to yield some fairly easy ones: CN, CT3, EA8, EA9, ZD8, 3V, 6W, 7X and others having been on the lower frequency bands fairly regularly in recent years. North and South America, other than the Caribbean, should be well represented, with countries such as FP, VE and W being workable in North America, and LU, PY, YV and ZP in South America. The three PY0 countries are also the subject of fairly frequent dxpeditions. Oceania is the only continent likely to be sparsely represented in your lower frequency country scores, though the presence of VK stations sporting rhombics or other large antennas makes this one at least a possibility.

QSLing

If you are going to end up with those much coveted certificates on the shack wall it will be necessary to collect the required QSL cards. Hopefully the majority will come in via the bureau, but more and more dx stations and dxpeditions are making use of QSL managers. While you may not approve of this practice, it is often the only sensible solution. Without a manager, a dx station may find all his time and money going on QSLing, thereby reducing the time he can spend operating, and possibly making it impossible for him to QSL at all. Imagine how much the postage alone would cost if you were mailing 5,000 cards or more a year, a situation made even worse if you operated from a country with no outgoing bureau. So take care to check QSL information, and send off your card with self-addressed return envelope and appropriate ircs. Most QSL managers will return cards via the bureau if requested, but even this costs money, so at least one irc is appropriate to cover the cost of the card together with a contribution towards postage. For a direct reply at least two ircs will be required for airmail postage. DX stations will normally announce the call of their QSL manager at regular intervals, and addresses are published in "MOTA" in *Radio Communication*. More complete lists, updated regularly and containing details of thousands of QSL managers, are available from a number of sources.

Conclusions

This article has not been intended to exhaust all aspects of dx operation. However, it is to be hoped that it will encourage those of you who have previously fought shy of dx operating, or who have tried but without success. There is a dearth of G calls appearing in international contest results and in DXCC listings, and it is this author's hope that this situation will change. Happy hunting!

References

[1] *Amateur Radio Operating Manual*, RSGB, 1979.
[2] *The ARRL Antenna Book*, ARRL, 1977.
[3] *Radio Communication Handbook*, RSGB, 1976–7.
All obtainable from RSGB Publications (Sales). □

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(Continued from page 150)

Locator systems

Several more correspondents have provided comments on the proposal to change from the QRA to a new locator system (*Rad Com*, November 1980). Of the comments received to date, 60 per cent are in favour of making the change, 20 per cent prefer to keep the present QRA locator system, and most of the rest are opposed to the use of any locator, and would generally prefer to use latitude and longitude.

The subject of locator systems in general, and the proposed system in particular, was discussed at the IARU Region 2 (the Americas) conference in Lima, Peru, in October. Most countries in Region 2 have little or no experience with locator systems in any form, and so the conference adopted a proposal to defer any decision.

A full discussion of the points made for and against the proposed change will appear in a future *4-2-70*. All comments on this topic will also be forwarded for consideration by the VHF Committee of the RSGB. □

SWL NEWS

Bob Treacher, BRS32525*

Newcomers

Several "new boys" to welcome this month. They include Anthony Cross, BRS44982, who writes from Bath and comments on how interesting and educational he finds his new hobby. From the list of dx stations enclosed, he is achieving good results with his existing equipment, but is hoping to add an antenna tuning unit soon. He also mentions that he has trouble in obtaining USA postage stamps for sending with cards to stations and dx station managers residing in the USA. The most popular way of QSLing direct is to include international reply coupons (ircs). These are obtainable from post offices, price 25p, and two will cover airmail replies from the USA. It is well-worth using this method, as the dx stations appreciate the coupons, which they can use for obtaining the cards they need. A further point he raised concerned U4W; this callsign is understood to be in use in European USSR.

Kevin Cooke, RS45466, wants to know how to claim awards once he has the necessary cards. This could take the rest of this column to answer fully! However, the easy way out is to suggest that anyone interested in award-collecting purchases the Society's excellent publication *Amateur Radio Awards*. This lists many awards available throughout the world and explains how to claim them and how much they cost.

Michael Butler, RS44664, only has equipment for 144MHz at present. He took the RAE in December. RS44759 was in the throes of trading-in his Kenwood R300 receiver for an FRG7000. He has a 100ft long wire and has spent most of his available time listening to the USA on 14MHz. The many different prefixes available over there baffle a lot of listeners. These were explained in an earlier *SWL News*, but the main prefixes are W, N and K, with any number of variations available for those with a two-letter prefix.

Norman Painting, RS44786, uses a Trio R1000 receiver, Mizuho KX2 atu and a Datong FL2 filter. He has an end-fed 60ft wire in the loft, a 28MHz–14MHz dipole, also in the loft, and a 14AVQ vertical in the garden; all of which are switchable. Quite a well-equipped station. Norman has well-and-truly caught the bug and regularly finds himself at the rig at 0200. He has logged 900 QSOs since June 1980. His new score has been included in the 1980 table because it was received before the "deadline", but was omitted last time.

Robert Long, RS44370, uses an SRX30 to 30ft of wire, and hoped to purchase an atu to improve the set-up. To date his best dx has been 5V and A35 on 14MHz.

Dave Inns, RS44551, started listening with a CR100 into a long wire, progressed to a Codar CR70A, then to an AR88LF, and now has a Trio R1000 and an HF5 vertical. He also has equipment for 144MHz in the shape of an FDK TM56B, fitted with 16 crystals, and a 5/8λ colinear. On the higher bands he has been logging many JAs on 28MHz.

Rhys Thomas, ARS45717, had a super Christmas present—his father bought him an FRG7 receiver on which he promptly logged VK4NIC/3X—an impressive start!

Lower frequency dx to date . . .

As at the middle of December, the lower bands were showing continued signs of good propagation, in particular 7MHz. On 3·5MHz little dx had been heard of note during the grey-line time around our sunset. The best dx reported was FR0FLO, logged at 1723gmt. The Scandinavian stations have really good conditions of course, and they take advantage of this by working many west coast USA stations from 1400. This year it has been noticed that the YU stations have also experienced some good conditions and have worked the west coast of the USA at around 1530. J20CN had also been reported on this band, and he too had worked many west coast USA stations from 1430. No reports of early morning dx on the band, but hopefully we can remedy that next time. However, VKs had been reported on 3·695kHz at 1830. The Abu Ail expedition, J20/A, was also mentioned by several reporters as being heard on both bands around 2130.

Turning to 7MHz, the band seemed in far better shape, even allowing for the sometimes heavy broadcast QRM.

Late reports have updated the dx situation on both 7 and 3·5MHz. Conditions seem to have remained good throughout December. 7MHz continued to provide the greater choice of dx, with signals from the American east coast still audible at 1050 and stations in the Far East being heard as early as 1410. Here is a sample of the better dx reported during morning hours: FK8CR, FM0FJE, HK0FBF, H44DX, JAs, TI2CF, N6YK/VP2A, VE5DX, UK0QAA and 8P6OR. Between 1600 and 1930 the following were reported: FK8CR, FR0FLO, HM4LF, HS4AMI, JD1AMA (Ogasawara Is), OD5MR, VK2WC, VU2RAK and YB0WR.

On 3·5MHz some interesting dx had been heard during the early evening: AP2SA, KP4KK/DU2, FR0FLO, N2KK/ST2, VK2AVA, ZD7HH, 6U0KK, 7X4MD and 9M0FF. Although the eastern Europeans and Scandinavians have worked dx around the "grey-line" time (around sunset) there have as yet been no reports of G successes.

The Christmas mail

Apart from letters from Paul Tittensor, A8808, and Robert Small, BRS8841, whose contributions swelled the lower frequency news, table updates were received from Larry Hoult, BRS42559, Mark Mullins, RS42604, Brad Bradbury, BRS1066, and Harold Moss, BRS18529. Your scribe also thanks Andrew Cook, ARS42195, for forwarding a 1·8MHz QSL from EA5TD. There is also news of John Doughty, BRS40705, who listened during the ARRL 28MHz Contest, and gained a bonus with TJ1GH. Also heard were A4XIH, FG0EAR, HH2MC, 4V2B (also Haiti) and TF3IRA. He reflects that with conditions as they were, he was confronted with either getting up early to catch the dx on 14 or 21MHz, or late-night listening on 1·8 or 3·5MHz. However, it is this sort of "choice" which eventually pays off when new countries are heard.

John Goodrick, BRS44395, was looking forward to the 1981 round of contests and was hopeful of submitting worthwhile entries to a number of cw events. The majority of contests now tend to have an swl section to cater for the growing number of listeners interested in that side of the hobby. Even if the rules do not specifically indicate a listener section, it is well-worth sending an entry or check log which may even be rewarded with a certificate of merit.

Lastly, your scribe welcomes back Keith Kerr, BRS35943, but as he now holds the callsign GM8YJU it is unlikely that he will report to this piece again. Keith has provided much useful material in the past which has been accurate and informative and your scribe would like to wish him luck as a GM8. He reports that his second contact was with GM8TKA, Crosbie Rodgers, another old stalwart from this page.

Latest QSLs reported include CE9AF, CR9AK, FM7AV (very quick response from F6BFH), FR0DZ/J, HK0AB, ST2FF/ST0 and 3Y1VC.

Please ensure that your RS number appears on all correspondence. Deadline for **April** is **Monday 23 February**, with late news to be with your scribe by **3 March.** □

* 79 Granby Road, Eltham, London SE9 1EH

THE MONTH ON THE AIR

John Allaway, G3FKM*

IN an open letter to all dx writers, Rag, LA5HE, raises some pertinent questions concerning the way in which some of the rarer stations are worked these days. He says "Is almost anybody on the west coast (of the USA) incapable of working their own dx these days? One Sunday I heard W——, who used to be a well-known dxer. As it had been several years since I had talked to him I gave him a call and asked him to come five down with me for a chat. Much to my surprise he declined because he was too busy . . . The reason proved to be that this old-timer in fact was nursing others into QSOs with some Asian stations.

"If this kind of contact is supposed to be dxing, I for one fail to see any point in maintaining a prestigious certificate like DXCC. What happened that day had more resemblance to a telephone service than dxing—let alone dx-hunting. If QSLs from contacts of this kind are submitted for DXCC and other certificates, I suppose that some of us must feel that we cannot be as proud of our wallpaper as we used to be. DXCC used to signify a certain level of operational standard. I guess that it still does on cw. However, it seems to me that the time has come to abandon phone DXCC altogether. On the decline of certain old-timer dxers, perhaps this subject is best left in silence."

A further supply of ircs is available from G3FKM. The price is 20p each—redemption price at the Post Office now being 18p (the current price of posting a letter up to 20g in weight to an overseas address). Please enclose a stamped, self-addressed envelope.

DX news

VK9ZG closed down on 3 December and returned to Australia. His replacement is Dave Shaw, VK9ZD, who only received his first amateur radio licence in November and is still a little inexperienced. He has a Collins KWM2A and TH3Jr, and will work on all bands 3·5 to 28MHz. He also has an IC551 loaned by VK3OT, with which he will operate on 52MHz. Frequencies to be watched for Dave are 21,202kHz at 0500 (with VK3PA), 14,265kHz on Tuesdays and Fridays at 0630 (with the Pacific DX Net), 14,220kHz at 0700 (with the P29JS group), and 14,175kHz at 1000 (with VK9CP). He may also be found near 7,095, 14,195, 21,295 and 28,595kHz.

Anyone still needing confirmation of a contact made with BV1US between September 1960 and September 1962 is advised to contact N4CNL (Box 336, Woodville, Fla, 32362).

G5DCU advises that he has received a QSL from T3LAB via W7OK, and it would appear that the latter acts as QSL manager for T3LA and T3LAB.

QRZ DX says that KA calls are still being issued to USA servicemen in Japan. This is causing confusion as KA1 calls are also being issued in the USA first call area!

5N6ATT is now active and asking for QSLs via HB9WU. He has been found on 21 and 14MHz ssb. Botswana now has an incoming QSL bureau, the address of which will be found in "QTH Corner".

Canadx reports that the K5LBU/ST0 logs for the period from 6 to 24 June 1980 have been mislaid. Confirmations will be sent out if and when they are found. Frosty may be found quite often from 1130 on 28,530kHz, and another contact by those affected may be wise. 5V7HL, who will probably be in Togo for a few more months, keeps a schedule with 11KFB at 0400 on 14,220kHz. There are indications that 9U5DL does not have legal permission to operate. Over the border in Rwanda, ON5TV should by now be using a 9X5 call—he will be there for five years and will take some pressure off 9X5MH who sometimes comes on 21MHz ssb after 1800.

JW5CI and JW5IJ are now back on the air from Svalbard and will be there for the rest of the winter. JW5CI is believed to prefer cw operation.

QSL cards from UA1PAA, UA1PGO and UA1PAL are only being accepted by ARRL for DXCC credit when signed by UA1OSM. Some other UAs have been sending out cards but these will not be considered as official. All requests must be sent via Box 88.

ITU is said to have withdrawn permission for the use of the prefixes S8, T4 and H5 by stations in the South African homelands. T4 is allocated to Cuba, T5 to Somalia, and T6 to Afghanistan. Other changes involve the use of HM by North Korea and HL by South Korea. West Germany now has the prefix block DA-DR, and DS and DT now belong to South Korea.

OX3PT expects to be on 7,085kHz or thereabouts some nights from 0100. IA0KM has been active on 14, 21 and 28MHz ssb, and claims to be a station of the Knights of Malta in Rome. DXCC status is being sought, and QSLs should be sent via I0MGM.

A9XCE has a mid-winter schedule which finds him on 3,505kHz from 0200, and moving to 7,012kHz if conditions are poor. This is repeated from 1415 to 1530. On Fridays he starts at around 0100. According to VS6CT, A4XGI has closed down as a result of bci problems.

LU1AF/Z and LU1DZ/Z should now be on the Isla 25 de Mayo in the South Shetland group. LU1AF, LU1DZ and LU7XP will be the operators, and frequencies to be used are around 3,505, 7,005, 14,025, 21,025 and 28,025kHz on cw, and 3,750, 7,090, 14,250, 21,300 and 28,600kHz on ssb. QSLs go to LU1DZ.

KH3AB is now on from Johnston Is. He operates according to the following pattern: 7,245kHz at 0800, 21,370kHz at 0100, 14,325kHz at 0315, and 28,600kHz at 0300; 3·5MHz should be in use soon.

9K2KA will be K1FMP/6, who will be in the Middle East for one or two months. He will also visit A4, A6, A7 and A9, and will try to operate if permission can be obtained. Operation will be mostly around 14,250, 21,300 and 28,600kHz, and QSLs should be sent via I8YCP.

As well as acting as QSL manager for TA2TAT, WA4JQS performs the same task for KG4DS, VP8s, PU, QG, QJ, NJ, WA and ZV, and ZS1DM. His address will be found in "QTH Corner".

Dxpeditions

The Heard Is expedition was still a possibility at the time this was being written, and attempts were being made to locate and hire cheaper transport.

W4GSM and W4PRO will be leaving Miami on 22 February bound for Easter Is. They should arrive on the 24th and then remain until 20 March. They hope to be active on all bands from 1·8 to 28MHz. After leaving Easter Is W4GSM will probably visit St Martin and activate FG0DYM/FS for a while.

Bob, WA4SKE, should be in Malawi on 27 February and is attempting to get permission to operate for two days, possibly from 7Q7RM's home. In view of previous information from Malawi this seems to be rather unlikely, but conditions may have changed. On his way to Africa Bob will be in Cyprus from 23 to 27 February, and after leaving Malawi will visit ZE1BP from 2 to 6 March, and ZS5UU from 7 to 13 March. His operating frequencies will be mostly 14,195, 21,290 and 28,590kHz.

News from overseas

G3DQL has received a note from Barclay, KE2C (formerly KB2DF) to say that the station using the callsign KB2DF/VP9 is a pirate.

Further confirmation of the situation in Turkey has been received. The owner of a well-known callsign has written to say that no Turkish amateur has a licence, as any kind of radio amateur activity has been forbidden since 1937, and it is felt that no improvement is to be expected yet. QSLs sent via bureaux, open QSL cards, envelopes mentioning callsigns etc are all dangerous for the recipient, and everything should be sent under cover to the appropriate post office box number.

A publicity sheet from IARU Region 3 announces that the Hong Kong ARTS will be holding the next "VS6 Activity Days" on Saturday and Sunday, 4 and 5 April. As many VS6s as possible will be active on all bands—including 50MHz. HARTS invites amateurs worldwide to help make these days a success by working as many VS6 stations as possible.

A second sheet from the same authority says that NZART has been advised by the New Zealand Post Office that ZLs may continue to use 7,100 to 7,300kHz provided that they cause no interference to broadcasting services.

G3RUR received a letter from Dennis Gamble, who visits all the VE8 weather stations in turn during the course of a year. These are VE8s MA (Eureka), MB (Resolute Bay), MC (Mould Bay), MTB (Baker Lake), MTC (Coral Harbour), ML (Alert), and HB (Hall Beach), and it is possible to contact him from each. QSLs for Dennis go to VE4TZ, but there are problems when applying for some cards as other operators are often only at the station for a short time and gone by the time QSLs arrive. All the stations are club stations, and personnel are often allowed on the air even though they are not licensed.

As well as supplying information on licensing, ZF1AK has also listed the 16 amateurs normally resident in Grand Cayman—ZF1s AK, AP, EJ,

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GC, HJ, MA, MT, NR, PP and RR, and ZF2s AT, AB, AE, CS, CX and DM—many of whom are not active. The Cayman Is Radio Society was incorporated in January 1979 and now has 18 full members—including Noel Eaton, ZF1BP (President of IARU) and Colin Dumbrille, ZF1XX, from Bermuda. Alan comments on the QSL problem, which is quite difficult as most activity is by visitors who are in the area for a few days only. He looks after QSLs for locals but cannot forward them to non-residents unless they have made special arrangements with him. Attempts are being made to persuade the *Callbook* to list visitors' home addresses. Another problem is the repeated arrival of cards from the USSR for VP5 stations—there is no connection with the Turks and Caicos Is, where QSLs are handled by Bob Libby, VP5BL.

Amateur radio in the Cayman Islands

Alan Kimble, ZF1AK, has provided details of the current set-up in the Cayman Islands. Formerly associated with Jamaica, the area used the VP5 prefix until some 17 years ago when that country became independent. Cayman calls then began with a ZF1 prefix, but in January 1977 non-Commonwealth amateurs operating under reciprocal arrangements were required to use their own home callsigns with the /ZF1 suffix. Following representations it was agreed that ZF2 prefix calls would be issued to this group. With occasional exceptions these have been issued in alphabetical order and not re-issued. However, ZF1s appear to be allowed some choice of callsign.

Licensing follows the UK pattern with some added similarities to that in the USA. There are three classes: Class A requires a minimum age of 18 years, code speed of 15wpm and knowledge of advanced theory and practice—it also must follow at least one year's operation as a Class B station. Power input allowed is 1kW, except on top band (1,800–1,825, 1,875–1,925, 1,975–2,000kHz) where it is limited to 75W. The Class B licence is issued at 15 years of age and requires 10wpm of cw and a basic knowledge of theory and practice. Holders are limited to 250W input—reduced to 20W on 1·8MHz. Class C is a novice licence and requires a minimum age of 12, a code speed of 5wpm and an elementary knowledge of theory and operating practice. Operation is limited to crystal-controlled cw—limited to 75W on 3·5, 7, 21 and 28MHz, and 150W of phone or cw on bands above 50MHz. In addition to the normal Region 2 hf band allocations, operation is allowed in the 50–54MHz, 144–148MHz, 220–225MHz, 420–450MHz and higher bands, and A5 and F5 operation is permitted to A and B operators by special endorsement where the postmaster is satisfied as to the knowledge and capability of the operator in respect of sstv.

Diploma Fiera Internazionale di Milano

For QSOs with members of the Milan RC during April each year. Any modes or bands, but not cross-band or via repeaters. Each station may be worked once per band, but the special station IZ2IFM may only be worked once. Each QSO counts one point with ordinary members, two points if with the club HQ station I2IZK, and five if with IZ2IFM. Stations in *CQ* Zones 14, 15 and 16 need 20 points. Applications must include log data and US$4 or 12 ircs, be postmarked no later than 31 May, and be addressed to ARI, Sezione di Milano, PO Box 10931, 20100 Milano, Italy.

Awards

CQ Magazine Awards

Ed Hopper, W2GT, has advised that from 1 March 1981 all *CQ* awards will require a fee of US$10 if the applicant does not subscribe to *CQ*. Subscribers need only pay US$4—but proof that they are subscribers (eg a mailing tab from their magazine) must be enclosed with the application.

The VK1 Award

This is being issued by the ACT Division of WIA to promote Canberra and Australia internationally. It is available to those who submit details of contact (for non-VK applicants) with 10 VK1 stations after 31 December 1977. Listeners may also apply. A fully-detailed log extract showing date and time of QSO, band, mode, callsign and reports exchanged, plus five ircs should be sent to: The Awards Manager, WIA (ACT Division), PO Box 46, Canberra, ACT 2600, Australia. Listeners should give details of stations being worked by their VK1 loggings and reports being given. Band/mode endorsements are available if requested.

WAB Winter Activity Award

Issued on a points basis for QSOs made between 0000 1 December 1980 and 2400 on 28 February 1981. The award will also be available for similar dates in future years. A total of 250 points is required—each county, area, district and bookholder worked counts once. A specially-produced claim sheet is available (sase please) from G3ABK, 11 Turpins Close, Welwyn, Herts AL6 0QZ. Claims, with £1 fee, must be sent to K. Draycott, G3UQT, 175 Oliver Road, Kirk Hallam, Ilkeston, Derbys DE7 4JW. Note that profits will go to RAIBC. WAB nets on lower frequencies will be found around 1,930, 3,760 and 7,060kHz.

SARL Highveld Branch 21st Anniversary DX Award

A special award will be issued to celebrate this event. It will be in two sections—one for dx stations, who need to contact three members of the branch between 0001 11 April and 2359 20 April 1981. Applicants should send log details, their own QSL card, and three ircs (or US$1) to: Awards Manager, Highveld Branch SARL, PO Box 10188, Johannesburg 2000, Rep of South Africa. The first dx station to work 10 members during the period (including at least one on cw) will receive a special award plus one year's free membership of SARL including the *ZS* magazine and *Shacknews*. Stations eligible to be worked for the award will use the suffix /HVB during the relevant period. Closing date for applications to be received is 30 May 1981.

Hornby & Districts RC Garden City Hamfest

The Hornby & District RC Branch of NZART is holding a hamfest in Christchurch on 7 March. ZL3VV will operate simultaneously on 14,285, 21,285 and 28,585kHz from 0500 to 0700 on 5 March; 0500 to 0700 and 2000 to 2400 on 6 March; and from 0000 to 0300 on 7 March. Those making contact should send their QSL, plus four ircs or US$1 to: Hamfest Award, PO Box 31095, Christchurch, New Zealand, and they will receive a special certificate confirmation.

VERON Awards

PA0BN has kindly drawn attention to the fact that his address is not as printed in *Amateur Radio Awards*, but is as follows: J. Lourens, Keerweer 13, 6862 CD Oosterbeek, Netherlands. PA0BN deals with vhf award applications only—the hf award particulars are still as printed.

YU DX WW Contest

2100 14 February to 2100 15 February.

CW only on 3·5 and 7MHz. Confine activity to segments 3,520–3,590kHz, and 7,010–7,040kHz. Exchange RST plus serial number (from 001). QSOs with YU count 10 points on 3·5 and five on 7MHz, with other stations in same continent two and one points respectively, and with others five and two points. The multiplier is the number of DXCC countries and YU prefixes worked on each band. Entries may be single- or multi-operator, or listener; the first mentioned must spend at least 30min on any band before QSYing. Use one log for both bands and enclose summary sheet showing multipliers and details of score claimed. Enclose usual declaration and mail to SRJ, YU DX C, PO Box 48, 11001 Beograd, Yugoslavia, postmarked before 15 March. In the 1980 contest G3ESF scored 24,608 points.

Contests

In the **1980 SP-DX Contest (CW)** UK entrants fared as follows: G3ESF (48,682 points), GW3INW (18,000), G2WQ (15,120), and G3XTT (10,815) (in the multiband category), and on 14MHz G8PR (14,136), G3KKQ/A (10,881), and G6NK (8,874). In the ssb section G4FRV was the only multiband entrant, on 14MHz G4CVZ scored 32,250 points, and G3XTT 10,296. G4JJE was the only 21MHz representative, with 792 points.

Results of the **1980 CQ 160 Meter DX Contest** show G3SZA as UK leader with 125,611 points. Others listed were G3XWZ/A (60,582), G3VRW (38,815), GW3KOR (11,640), GW3GWX (3,152), and G3VPS (1,980). In the multi-operator section GM3ZSP scored 139,594 points and GM3IGW/A 38,874.

1981 Bermuda Contest

0001 21 March to 2400 22 March

Actual operation not to exceed 36 hours maximum, and off periods to be clearly logged—each period to be of not less than three consecutive hours. All entrants must be single-operator only and must operate from their own private residence or property. Top winners of the 1977–78–79 and 1980 contests shall be eligible for the area awards only. Bands 3·5 to 28MHz—no cross-band or cross-mode QSOs permitted, and no phone contacts may be made with USA stations operating above 7,100kHz. Stations in Bermuda, USA, Canada, UK and West Germany will take part, and UK and West German stations will contact as many VP9/W/VE stations as possible for points. Exchanges consist of RS/T plus state, province, parish or county, and each counts five points—only one contact may be made with a station on each band, either on cw or phone but not both. The multiplier is the total number of VP9 stations worked on each band added together. Separate log sheets should be used for each band, and a photocopy of the official log sheet and summary form may be

Four happy amateurs—l to r: W3MA, DK9WB, VE5RA, and G4DSE—who had just collected their winners' certificates in Bermuda for their success in the 1980 Bermuda Contest

obtained from G3FKM (sase please). Duplicate sheets must be submitted for each band where more than 200 QSOs have been made, Claimed duplicates may mean disqualification. Each page of the log must be clearly numbered and marked with the contestant's call, year, and band to which it refers. All entrants must sign a statement that they have complied with the rules and terms of their licences. Logs must reach the Contest Committee, Radio Society of Bermuda, Box 275, Hamilton 5, Bermuda, no later than 31 May 1981. Air mail postage is recommended. The top scorer in each country taking part will be awarded with a trophy at the society's annual dinner in October, and round trip transportation and hotel accommodation (at the Stonington Hotel) will be provided. Other top scorers will receive certificates.

The Canadian ARF Phone Commonwealth Contest

1200 21 March to 1200 22 March 1981.

Eligible entrants are those licensed to operate within the British Commonwealth or mandated territories. Bands 3·5 to 28MHz ssb only, and suggested QRGs are 3,600, 3,780, 7,080, 14,180, 21,200 and 28,480kHz ±20kHz. UK stations may not work each other for points. Exchanges consist of report and serial number (from 001) and each QSO counts five points. In addition, a bonus of 20 points may be claimed for each of the first three QSOs with each Commonwealth call area on each band (all UK stations count as one call area). There is no multiplier. Separate logs should be submitted for each band and should be totalled and include a checklist of call areas worked on that band. Add band totals on a summary sheet. Entries may be single- or multi-band and must be single-operator. The usual signed declaration should accompany the entry, which should reach CARF Contests & Awards Committee, PO Box 2172, Station D, Ottawa, Ont, K1P 5W4, Canada, no later than 1 June 1981.

ARRL International DX Contests

0000 21 February–2400 22 February (cw).

0000 7 March–2400 8 March (phone).

Single-operator single- or multi-band, multi-operator, single- and multi-transmitter, and QRP (less than 5W output) categories. Exchange RS/T and power input. W/VE stations give state or province. Each QSO counts three points, and the multiplier is the number of contiguous USA states and Canadian provinces worked on each band added together (a total of 48+9 on each band). Certificates will be awarded to country leaders and also to those making more than 500 QSOs. There are several disqualification rules and it is suggested that application is made to ARRL for a copy of the full rules (please enclose sae and several ircs). Post all entries by 7 April to: ARRL DX Contest, 225 Main St, Newington, Ct, 06111, USA.

Beacons

The listing of 28MHz beacons in January *MOTA* has been up-dated by G3USF. It appears that the Florida beacon, listed as WD4MSN on 28,207kHz, has been replaced by W4ESY on 28,207·5kHz; and a new beacon, VE2TEN, has been heard on 28,125kHz. Both stations have been following irregular schedules, and it is understood that VE2TEN will be moved to a normal frequency in the beacon segment.

G4AXD reports that VK5WI is now active from the Burleigh Griffith Building of the WIA in Adelaide. It runs 100W input to a 0·64λ vertical on the roof of the building and sends "VK5WI Adelaide" on A1 followed by 20s of carrier. Reports would be appreciated and should be sent to WIA, (SA Division), GPO Box 1234K, Adelaide 5001, South Australia.

QTH CORNER

A2 QSL Bureau	BARS QSL Bureau, Box 1873, Gaberone, Botswana.
A35VU	(see ZK2VU).
CN8AN	via WB3DNA, T. R. Fanus, 6140 Chambers Hill Rd, Harrisburg, Pa, 17111, USA.
CR9CT	via G3KDB, P. Miles, Box 73, Lichfield, Staffs, WS13 6UJ.
FG0FOK	via YASME Foundation, Box 2025, Castro Valley, Calif, 94546, USA.
FG0FOL	
FG0FOK/FS	
FG0FOL/FS	
H5AK	Box 147, Mafeking, Bophuthatswana, South Africa.
J20A/A	via K6LPL, 415 Dabney Lane, Beverley Hills, Calif, 90210, USA.
J20CN	via K2FV, D. J. Franklin, 65 Ganung Drive, Ossining, NY, 10562, USA.
TA1UA	Dr Unal Akbal, PO Box 787, Istanbul, Turkey.
TA2TAT	via WA4JQS, A. W. De Prato, 205 Cherokee Trail, Somerset, Ky, 42501, USA.
VE1AI/1	R. Grantham, 8 Orkney Rd, Dartmouth, NS, B2X 1J9, Canada.
VP8SSI	via G3BZU, HQ Stn, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.
ZK2VU	via DL2RM, R. Wolf, Alta Waldmuenchener Str 32, Regensburg, D 8400, West Germany.
1A0KM	via I0MGM, M. Gallavotti, Via Cassia 929, I-00189, Rome, Italy.
6Y5YL	via N2MM, H. Miller, 61 Mill Rd RR2, Vincentown, NJ, 08088, USA.
8Q7BD	via DL1KS, K. Sauer, M-Praetoriousstr 14, 6534 Stromberg, West Germany.

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

Radio Amateurs' Conversation Guide

G3UML has a small quantity of this book available, price £5, incl p&p to addresses in the UK. He expects more stock soon, and he is able to pass on to Finland any requests for the book, supplements or cassettes. The prices are subject to variation. Enquiries should be addressed to L. Margolis, 52 Park View Gardens, Hendon, London NW4 2PN.

QRP

A reminder that the G-QRP Club has an activity weekend on 28 February and 1 March. Full details were given in January *MOTA*.

Invicta Net

This net was founded by VE3KAS, VE7CEW and G4AXD, and is primarily for anyone who has a connection with the county of Kent. At present it meets on 28,395kHz at 1700 on Sundays. Other callers are welcome, even if they have no Kentish connection.

Band reports

G8KG's report reads as follows: "1980 ended on a high note as far as solar activity was concerned. The 2,800MHz solar flux averaged over three months October to December was almost identical with that of the corresponding months in 1979, while average activity in December was in fact higher than a year ago—about 220sfu as against 197. This meant that conditions on the hf bands were, for the most part, very similar to autumn 1979, although those on 50MHz were not quite as good but with some very good openings on better days.

"Preliminary data suggests that the provisional sunspot number for December will be about 160 as compared with 182 a year ago. This would lead to a yearly average for 1980 of about 154—which is just below the 1979 figure. On the other hand the corresponding figure for solar flux is likely to be about 198 as against 192 in 1979, indicating that the mean flux is declining distinctly more slowly than the number of sunspots. What seems to have happened is that around the peak of the cycle the mean solar flux was rather lower than might have been expected from the level of sunspot activity, whereas more recently the reverse has been the case.

"It is likely that 1980 will prove to have been the 'flat top' of the cycle, and the most likely outlook for 1981 is a slow decline in activity which will, nevertheless, still be above the peak of Cycle 20 at the end of 1980. At the same time the incidence and severity of geomagnetic disturbances and consequent disruption of hf communication will probably increase as the year progresses."

Prof Martin Harrison, G3USF, (of Keele University), has also written concerning hf propagation and says: "I do not recall, though memory is fallible, having seen any reference to hf auroral working, and in my experience a good many hf operators are unaware of this possibility. Listening on 28MHz during the magnetic storm of 19 December I heard a number of signals with the characteristic auroral garble for a good two hours. GB3SX was fully auroral here from 1700 to 1900, while good strength signals were received from G, GM, GI, GW, OZ, SM and DL. Quite a few Gs were making QSOs. Interestingly though, I did not note a single cw QSO—the phone men seemed to have it all to themselves. I also heard signals with auroral characteristics from UK3QAE and UA9FAE.

Often during magnetic storms I have copied strong hf signals with normal characteristics, usually from northern Europe, but sometimes at relatively low strength from North America. These I have attributed to 'storm' type or 'auroral' Es. However, on 19 December the indications were rather of auroral backscatter with the exception of the two Russians who might well have been forward scatter.

"This is of course purely speculative—the main thing is to note that these possibilities exist and that hf operators can get in on an act which is usually thought to be the preserve of the vhf men! Incidentally, though E-W paths naturally went out during the storm, the path to ZE, ZS, YV and CX remained normal."

Many thanks to the following for sending information from which this section has been prepared: G3HB, G5JL, G2s AMV, HKU, G3s GIQ, GVV, IMW, KSH, NWG, G4AXD, GM4CHX, G4EHQ, GW4KGR, and RSs 1066, 25429, and 36928.

Stations listed in italics were using cw.

1·8MHz. 0000 *LA9SC, UA1DZ, UC2ACA, UL7PBI, UO5ODB, UR2FFK.* **2300** *EA5HM, R5GG, UL7CAD, YU3TAA, 4N3P.*

3·5MHz. 0000 *OY7ML,* 7X5AH. **0100** *3B8DB.* **0200** *VP9BK.* **0600** *CN8AD,* CT2CH, HI8GGL, *OH0NF,* W0MJ, 9Y4XX (QSL to WA6KZI), 7X2MA. **0700** K5UC (Ark), W6KUT, K9BWQ, N6YK/VP2A, ZL2AHD. **0800** AC0A (Ks), KA2AA (Nr Tokyo—LP signals), KL7Y, TG9AL, K3OX/VP9, ZL1BUS, ZL2BT, ZL4AP. **1900** VK2AVA, VK2AZX, VK3BM, VK3XI, ZD7HH. **2000** J20/A, JA6s BJT, BSM, K2BT, N2KK/ST2, VK3CR. **2100** JA. **2100** AP2KS. **2200** CT3AB, TF. **2300** J20/A, HS4AMI.

7MHz. 0000 *KP2AT, TA2TAT, YV.* **0600** *N6YK/VP2A,* FK8CR, H44DX. **0700** *KP2A* (QSL to WB2VFT), *OY7ML, W6.* **0800** *JA7YAA, VK3XB,* VK9NS, *VP2MFL, ZL1AMO/C,* ZL1BO. **1700** FR0FLO, JD1AMA. **1800** VU2RAK, 3A2EE, 9H1FN. **2000** *HZ1AB.* **2200** *FP8AA, 1A0KM.* **2300** *OX3AX, VE1AI/1, VP2KAA.*

14MHz. 0700 T3AT, VK, ZL. **0800** *KH6, KL7,* VK9NS, ZL. **0900** *HC5CN,* JT1AO, KH2HJ, *KH6, VK,* VS5DX, *ZL.* **1200** *KL7MF.* **1700** C6ADW, CR9CT, 5T5AY. **1800** *KH6WW,* SU1ER. **1900** A7XD, J28AZ, *W6QL/SV5, PY0PO/0* (Fernando de Noronha). **2000** VP8PP. **2100** C6ANU, DF3NZ/ST2, *VE1AI/1, VK,* ZS1ANT. **2200** *KA5BPE/VP2A* (QSL to WB5UEP). **2300** C5AAP, *VU2BK,* 4S7EA.

21MHz. 0700 JA, VK, ZL. **0800** JA, VK, ZL. **0900** JA, KC4AAD, VK, ZL1HV. **1000** J20/A, YJ8NPS, 1A0KM. **1100** FK8DH, *HS, JA,* VK2NUC/VK9, VQ9AA, *VU.* **1400** FG0FOL/FS, *TR8IG, VE1AI/1, VP2KAC.* **1500** W6-W7. **1600** W6-W7. **1700** C6ACV, 3B8DB. **1800** VP2PP, W6, ZF2AC (QSL to N8AG). **1900** D68AM, *VK1PG.* **2000** J3AAC, *KV4AD/PJ6.* **2100** VP5GT. **2200** W6.

28MHz. 0800 J20/A, JT0KAI, N2KK/ST2, *ZL1AMO/C.* **0900** A51PN, FK8CR, *KG6DX,* J20CN, JT1KAI, JT0YFU, ST2FF, VK9NYG (Cocos Keeling Is—QSL to VK6NE). **1000** CR9CT, FR0FLO, FY7BC, JD1AEV, KG6RT, N2KK/ST2, TA1HY, *VP2KAG,* VS6FI, *ZD8TC,* 1A0KM, 5N3ALE, *9X5AB.* **1100** CP8AL, HH2VP, UK0SAT/U0T (Obl. 174), VK6, YK1AA, 6U0KK (QSL via K2FV). **1200** H31LR, HK0FBF, S8AAP. **1300** *A7XG, FG0DYM/FS,* HH2MC, W5JMM/SU. **1400** FG0FWK/FS7, TU4AT, VE1AI/1, VU2IF, 3B8AE/3B9, 5N0RMJ (QSL to W4FRU). **1500** VU2DK, W6-W7. **1600** *HC4WA,* KH6AP, TA4A, *VP2MFL* (QSL to K5BDX), W6-W7, *5N0DOG.* **1700** VE6-VE7, *VP2SS,* VR6TC, W6-W7, *ZF2DW,* VK4NIC/3X. **1800** N6BK (NM), 4V2B. **1900** W5NUT/PJ7. **2000** CE3RC.

Many thanks to the following for items extracted: *CQ Magazine* **(W1WY)**, the *Ex-G Radio Club Magazine* **(W3HQO)**, the *DX Bulletin* **(K1TN)**, the *Long Island DX Bulletin* **(W4UL/W2IYX)**, *DX News Sheet* **(Geoff Watts)**, *Long Skip* **(VE3FRA)**, *QRZ DX* **(K5FUV)**, and *DX'press* **(PA0TO)**.

All items for **April** issue **to reach G3FKM by 6 March** please—and for **May** by **29 March.** □

HF propagation study

Predicted hpf + luf in megahertz for February 1981

	00	02	04	06	08	10	12	14	16	18	20	22
Suva (s)	1812	1712	1410	1406	2206	3308	3809	3909	3107	2506	1910	1712
Wellington (s)	1612	1512	1311	1808	3006	3909	4009	3609	3406	2306	1809	1611
Osaka	1509	1411	1411	2210	3706	3609	2409	1909	1806	1804	1402	1605
Hong Kong	1507	1310	1412	2912	4610	5009	4409	3309	2406	2103	1602	1403
Sydney (s)	1512	1312	1412	2911	4607	4109	4009	4209	3806	2303	1606	1610
Moscow	1201	1102	902	1904	3705	4506	4606	4506	3704	2402	1501	1301
Bangkok	1605	1310	1512	3212	5111	5609	5510	5109	4006	2403	1702	1602
Singapore	1607	1411	1512	3312	4312	4509	4410	4609	4106	2503	1702	1703
New Delhi	1602	1406	1509	3412	5212	5310	5110	4409	2906	1803	1702	1702
Perth	1809	1512	1612	3512	4711	4509	4110	3909	3707	2803	1902	1805
Teheran	1802	1503	1606	3509	5411	5611	5410	5209	4107	2603	1902	1802
Colombo	1703	1507	1611	3512	5512	5711	5510	5309	4307	2803	1902	1802
Bahrain	1902	1603	1606	3610	5612	5512	5210	5209	4107	2903	2202	1902
Cyprus	1701	1501	1303	2906	5208	5409	5108	5007	4405	3103	2102	1802
Aden	2102	1802	1706	3510	5712	5712	5311	5309	4707	3504	2602	2303
Seychelles	2102	1904	1708	3511	3912	4012	4411	4209	3607	3604	2702	2302
Mauritius	2202	2005	1709	3512	4312	5112	5011	4809	4707	3803	2902	2402
Nairobi	2402	2102	1705	3310	4712	4412	4612	4710	4307	4004	3202	2702
Malta	1401	1401	1101	1703	3905	4506	4306	4206	4004	3002	2001	1501
Salisbury	2602	2302	1805	3010	4012	4312	4512	4611	4607	4404	3602	3002
Cape Town	2902	2502	1905	2509	4111	4312	4812	4912	4909	4705	3902	3302
Lagos	2903	2702	2002	2205	5109	5912	5612	5312	5409	4805	4002	3402
Suva (l)	2912	2712	2010	2107	3707	3409	3210	2810	2607	3106	4010	3512
Gibraltar	1201	1301	1001	1102	2904	4005	4006	3806	3705	3003	2101	1501
Ascension	2902	2702	2102	1803	4308	5011	4312	4212	4312	4008	3604	3402
Wellington (l)	2812	2712	2110	1808	3506	3109	2810	2410	2208	2506	3210	3411
Dakar	2702	2603	2102	1703	4006	5910	5812	5312	5411	4907	4004	3302
Adelaide Is	2706	2605	2104	1704	3006	3609	4210	4410	4611	4611	4010	3308
Las Palmas	1901	1902	1701	1402	3605	5207	5208	4809	4907	4305	3202	2401
Falklands	2604	2502	2202	1603	3206	4009	4710	5012	5412	5011	3910	3207
Rio de Janeiro	2502	2402	2102	1603	2706	4309	4311	3912	4012	4212	3908	3104
Buenos Aires	2403	2302	2102	1503	3206	3809	4610	4312	4712	5012	3910	3107
Sydney (l)	2212	2112	2112	1510	2907	3109	2710	2410	2108	2204	2907	2910
Lima	2104	2002	2002	1403	2306	2209	5110	5511	5412	5012	3912	2808
Barbados	2102	2002	2003	1403	1606	3509	5710	5512	5312	5012	3910	2805
Bogota	2003	2002	2002	1403	1606	2109	5210	5511	5412	5012	3811	2807
Jamaica	2003	2002	1902	1403	1806	2109	4710	5511	5412	4912	3711	2707
Bermuda	2002	2002	1902	1403	1706	3008	5010	5411	5412	4811	3709	2705
New York	2003	2002	1902	1403	1606	2308	4109	5109	5211	4611	3509	2605
Mexico	2006	2002	1902	1403	1906	1708	2309	4809	5211	4612	3512	2610
Montreal	2003	2002	1802	1403	1606	2308	4009	5009	5110	4510	3408	2505
Denver	2006	1903	1802	1303	1706	1408	1609	3109	4309	4111	3110	2409
Los Angeles	2008	1904	1702	1303	1706	1608	1309	2209	4008	4011	3011	2310
Vancouver	1907	1904	1703	1303	1706	1508	1309	1909	2807	3609	2709	2109
Iceland	1101	1101	901	802	1703	2905	3605	3705	3504	2603	1702	1201
Honolulu	1912	1910	1506	1303	1806	1808	1909	1509	2007	3107	2311	1912
Fairbanks	1907	1906	1504	1303	1906	1908	1909	2109	2207	2505	2207	1907

First two digits are hpf, last two luf; luf 00 indicates data not available.

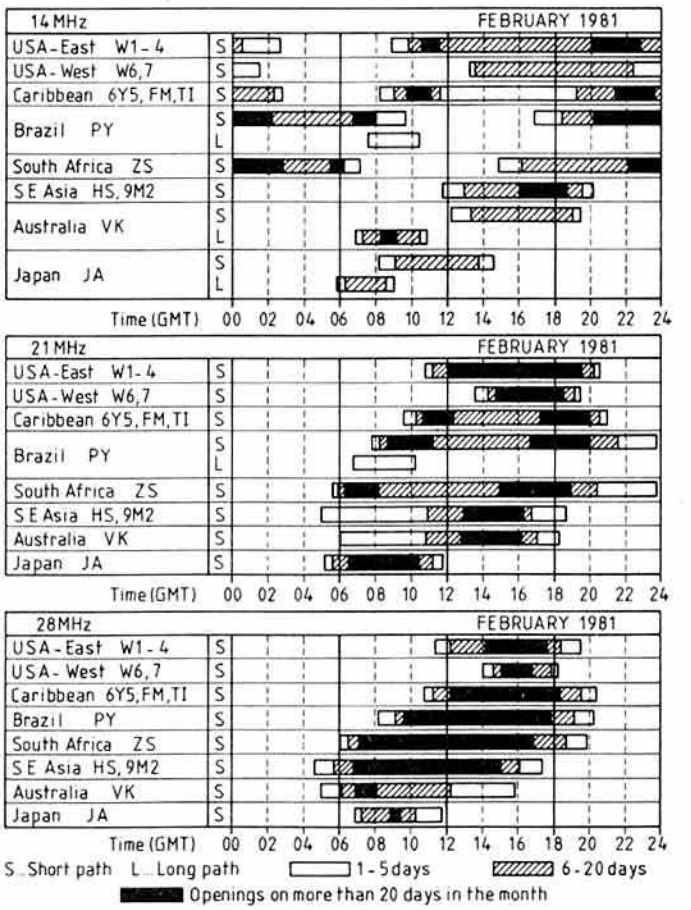
Propagation predictions

The end of winter approaches during February, days lengthen and, especially towards the end of the month, the **14** to **28MHz** bands will remain open longer than in previous months. Solar activity compared with February 1980 has only decreased slightly, so conditions will be similar to those of February 1980. Traffic with all continents will be possible on **28** and **21MHz**, even if sometimes only very briefly.

The improving spring-time conditions will be most noticed on **14MHz** during the second half of the night, when conditions will be noticeably better than during the previous months. However, only in April will this band revert to being the main night-time dx band. If, during the coming ARRL-DX-Contest, the f2 mufs are above the mean average for the month traffic with the USA may be possible for the first two to four hours in the second half of the night. Stations in the south will have more chance of contact than stations based further north.

Conditions on **7** and **3·5MHz** will differ little from those of the previous month. USA traffic will probably be possible from a few hours before midnight on **7MHz**, and on **3·5MHz** from about three to four hours before sunrise until dawn.

The mean provisional sunspot number for November 1980 from the Swiss Federal Observatory was 146·5. The period of greatest solar activity took place during the first nine days of the month, when daily numbers between 172 and 218 were recorded. The predicted smoothed numbers for March, April and May are 133, 131 and 128 respectively.



Why the *French* "R" valve?

by GERALD GARRATT, G5CS*

THE author bought his first "R" valve in September 1920 from Leslie McMichael (2MI) who was then running an ex-government disposals outfit—one could not give it the dignity of calling it a "shop"—in the yard of a defunct garage off the Quex Road in West Hampstead. The author was only 13 at the time, and Leslie's store was for him an Aladdin's Cave of priceless treasure—what happy days! This was, of course, several years before Leslie started up as a serious manufacturer as McMichael & Co Ltd—as other old-timers may remember.

For the benefit of those too young to remember, the French "R" valve was a bright-emitter triode whose filament took about 1A at 4V. They were the valves nearly all of us used from 1920 to 1922, when the Mullard ORA arrived. But why were they called *French* "R" valves when everyone knew they had been made in England—by BTH at Rugby, by Ediswans at Ponders End, and by the Osram-Robertson Works at Hammersmith (later to be known as Marconi-Osram)?

No-one was ever able to answer the question. One presumed, of course, that the design had first been produced in France during the first world war—but *how* had the French "got in on the act"? They certainly had no history of being involved before the war in what we now call electronics, and so it remained a mystery. The story has only quite recently come to light. Involving an element of "cloak and dagger", it is a story so fascinating in human interest and technical history that it deserves to be more widely known.

We all know, of course, that it was Ambrose Fleming who invented the "oscillation valve" in 1904, and that it was Lee de Forest who invented the three-electrode Audion in 1907. But the early Audions were poor performers, erratic and unstable, and de Forest did not properly understand how they worked and did not realize the potential value of his invention. In 1912 he sold the patent rights in the Audion, for all purposes other than wireless, for a mere $50,000 to the Western Electric Company who were looking for a good amplifier for use as a repeater on long-distance telephone lines.

Dr Harold D. Arnold of Western Electric realized the potential value of the Audion, but he also realized that it would take a long and sustained programme of research and development to convert it into a device suitable for practical use in the telephone service. At an early stage Dr Arnold realized that the presence of gas in the bulb—which de Forest believed to be essential to its operation—was, in reality, a liability rather than an asset. He firmly believed, that in order to make an Audion which would operate consistently it was essential that the vacuum should be as perfect as possible, and by 1914 the Western Electric Audions were working well as amplifiers. But by this time the clouds of war were gathering in Europe, and it was at this stage that fate played a joker.

During the summer of 1914, a certain Paul Pichon had been touring the USA on an assignment from his employers, the Telefunken Company of Germany, to gather samples of all the latest wireless equipment he could find and to return to Germany with his samples for assessment. In the course of his tour he visited the Western Electric Company, and was given samples of the latest high-vacuum Audions together with full information on their use.

Pichon was a Frenchman, but he had deserted from the French Army in 1900 and, emigrating to Germany, he had earned his living teaching French. Among his pupils were the children of Count von Arco, one of the founders of the Telefunken Company, by whom he was subsequently recruited as a technical representative.

On his way back to Germany at the end of his American tour he travelled by Atlantic liner to Southampton and he found himself in London on 3 August 1914, the very day upon which Germany declared war on France. The poor chap was in a fix, a French deserter yet an alien in Germany; what was he to do? In his hesitation, he called on Godfrey Isaacs, the managing director of Marconi's, to seek his advice. He explained that he was still a French subject but that he would face immediate arrest if he returned to France. Whether or not Isaacs regarded him as a "hot potato" is not clear; what is certain is that Isaacs failed to appreciate the importance of the samples Pichon carried in his baggage and which thus lay virtually within his grasp. He advised Pichon to return to France and offer his services to the French authorities.

Pichon crossed to Calais where he was promptly arrested. Protesting that he had brought back vital samples and information from America, he persuaded the authorities to communicate with the commandant of the French Military Telegraphic Service, Colonel Gustav Ferrié, who ordered that Pichon be immediately brought before him with all his baggage and papers.

Convinced of the reliability of Pichon's information, Colonel Ferrié immediately submitted the samples to a panel of eminent physicists for further assessment and, simultaneously, he ordered arrangements to be put in hand for manufacture at the works of Messrs E. C. & A. Grammont at Lyons. The design was substantially modified by French engineers, Michel Peri and Jacques Biguet, but within 12 months valve production was in full swing at the Grammont works. Known as the Type TM in France, samples were sent by the French to the Admiralty in London and to the Royal Naval Signal School at Portsmouth early in 1916, and it very quickly became evident that these French valves were vastly superior in every way to the soft-vacuum Round valves and the earlier model Audions in use hitherto.

Arrangements were begun almost immediately for valves of similar design to be produced in this country by BTH, Ediswan and Osram-Robertson, but it was late in 1916 before significant production commenced of what was to become generally known as the French "R" valve.

And that was how the French "R" valve got its name!

Even today, British-made "R" valves manufactured between 1917 and 1920 are not so very uncommon. Genuine French-manufactured valves, however, are decidedly rare but they can be identified by their markings. Those made by the Grammont Company are marked "TM Métal", while those made by the second producers, the Compagnie Gènèral des Lampes, are marked "TM Fotos". □

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Fifty-fourth RSGB AGM

The 1980 annual general meeting of the RSGB took place at the IEE, London, on 6 December in the presence of 120 members of the Society. The President, Peter Balestrini, G3BPT, took the chair, and was accompanied on the platform by the President-elect, Basil O'Brien, G2AMV; immediate past-President John Bazley, G3HCT; hon treasurer David Cornish, G3COR; and general manager/secretary David Evans, G3OUF.

The following is a brief report on the formal proceedings and presentation of awards. Official minutes of the meeting and a report on the informal session after the meeting will be published later.

Formal agenda items

The meeting approved the minutes of the fifty-third agm and then considered the accounts for the year ended 30 June 1979 and the reports of the Council and the auditors thereon.

The President announced the names of the members elected to serve on Council for the three years commencing 1 January 1981.

It was resolved to reappoint Messrs Edward Moore & Sons as auditors of the Society for the ensuing year and Council was authorized to fix their remuneration.

Founders Trophy

Before presenting the trophy, the President gave the following biographical details of the recipient:

"In 1949 the Society acquired a new member whose callsign was to become well known and a by-word in Society affairs. I refer of course to, G3IIR, Eric Yeomanson. Research reveals, among other things, that Eric started out as a trainee carpenter, had ambitions to join the teaching profession, but finally entered electrical/electronic engineering via Siemens, and spent many years stalking traffic light controllers before joining Reliant.

"Eric was elected zonal member of Council in 1958, becoming executive vice-President in 1964, and President in 1965. After his year as immediate past-President he was elected an ordinary member of Council in 1967, and was again executive vice-President in 1969. He retired from Council at the end of 1972 after 15 years' service.

"The callsign G3IIR has made a regular appearance on the committee and working party lists of the Society over the years; notably on the Raynet Committee from its beginning to the present – a total of 23 years, and the Rally & Exhibition Committee, formerly the Mobile & Exhibition Committee, for 21 years – when he retired for a short period, but rejoined when asked to do duty as stand manager at the Leicester Exhibition. Eric has also served for many years on the BARTG Committee, both as member and chairman, and he has edited and produced the BARTG news bulletin for the past five years. "I have known G3 Item Item Roger for many years, he is a true amateur and (though critical at times) a true supporter of our Society.

"Eric, it gives me great pleasure, both personally and on behalf of Council, to present you with the Founders Trophy in recognition of your many years' service to the Radio Society of Great Britain and to amateur radio."

Honorary vice-President

In introducing a "grand old man of amateur radio", the President said "My archivist tells me that in 1913 A. W. Gamage Ltd published a directory of experimental wireless stations, and among the 405 listed stations appeared the callsign TXK, the callsign of Kenneth Alford, now G2DX. He was first licensed in 1912 while living at Kendal, and his first contact with the Society – then the Wireless Society of London – was when he attended a meeting in this building (IEE) in November 1913 in company with Leslie McMichael.

"After the first world war he received the callsign 2DX, being among the first issued. He came into the Society in 1923 when the Wireless Society of London, which had been renamed the Radio Society of Great Britain in November 1922, amalgamated with the British Wireless Relay League, forming the T & R Section. This was essentially the communicating section of the Society, its members not necessarily being members of the parent RSGB. Ken Alford and Bill Corsham, 2UV, were appointed joint traffic managers of the T & R Section, which also absorbed another growing organization, the Radio Transmitters Society, thus combining these important separate societies under the one Radio Society of Great Britain.

"In 1924 the RSGB was transmitting weekly talks from 2LO, and during this period Ken Alford was twice asked to broadcast on its behalf. A successful transatlantic operator, he first contacted Australia in November 1924 on 86m, and was one of the best-known British stations of the early years. During the second world war he was approached by G6CL with a view to his becoming President, and since the war he has been continuously active, and is still to be heard on

The Founders Trophy being presented to Mr Eric Yeomanson, G3IIR

Mr Ken Alford, G2DX, with his honorary vice-President's certificate which he had just received from the President

Mr R. Ferguson, G4VF, (left) presenting the Marconi Medal to Dr C. Suckling, G3WDG

The Norman Keith Adams prize to Mr P. H. Jones, G3DRE (left); the National Field Day Shield to a representative of the Swansea ARS (centre); and the 1930 Committee Cup to C. Henderson, G4FAX (right)

80m on most days. Ken is currently president of the Radio Amateurs Old Timers Association.

"Ladies and gentlemen, it is now my honour and great pleasure to announce on behalf of the Council the appointment of Kenneth Alford, G2DX, as an honorary vice-President of the RSGB."

Marconi Medal 1981

Council had recommended to the Marconi Company that this award be made to Dr Charles Suckling, G3WDG, for his achievements in experimental and development work on microwave techniques.

The presentation was made by Mr Ronald Ferguson, OBE, G4VF, who was introduced to the audience by Mr Basil O'Brien. He gave a brief resumé of Mr Ferguson's long association with the Marconi Company: from his early days as a radio officer on passenger liners before the first world war; various commercial and management appointments at home and overseas; until his retirement in the 'sixties as managing director of the Marconi Marine Company.

In making the presentation, Mr Ferguson congratulated G3WDG on his achievements, which he had followed with close interest and which had been made in the same pioneering way as those of the first "radio amateur", Marconi.

Other awards

At the conclusion of the formal business of the meeting, the President then presented Society awards for the year to those recipients who were present.

The Metcalfe Trophy to R. Treacher, BRS32525 (left); the Whitworth Trophy to D. J. Andrews, G3MXJ (centre), and the Frank Hoosen Trophy to members of the Southgate RC (right)

The Gravesend Trophy to a representative of the Guildford & DARS (left); the Edgware Trophy to a representative of the Stockport RS "A" Team (centre); and the Houston-Fergus Trophy to E. C. Hudson, G3XTJ, and C. J. Kellaway, G3RTE

Left: the Raynet Trophy being presented to Mrs Jane Balestrini

Right: members of the Oxford EME Group who received the Mullard Award

All photographs by Mrs P. Evans

COUNCIL PROCEEDINGS

A brief report on the Council meeting held on 25 September 1980

Present: Mr P. Balestrini (President, in the chair), Dr E. J. Allaway, Messrs J. Anthony, R. Bellerby, R. G. Barrett, J. Bazley, P. F. D. Cornish, T. P. Douglas, Dr D. S. Evans, K. A. M. Fisher, L. N. G. Hawkyard, G. R. Jessop, W. F. McGonigle, B. O'Brien, D. M. Pratt, G. M. C. Stone (members of Council), D. A. Evans (general manager), A. W. Hutchinson (editor).

Apologies for absence were received from Messrs G. I. Knight and D. J. Andrews.

Citizens band
The President reported that the Telecommunications Liaison Committee had submitted the Society's views on the green paper on "Open Channel" to the Home Secretary. A discussion on the subject of "Open Channel" took place.

Raynet Limited
Mr Cornish reported on a meeting he had had with Mr Lundegard and Mr Crane, and on related correspondence. The subject of Raynet Ltd and the Raynet organization in general was discussed at length, during which members of Council made several recommendations regarding the future of the organization.

Mr Ken Alford, G2DX
Mr Jessop proposed that Mr Ken Alford, G2DX, be appointed a vice-President of the Society. This was seconded by Mr Hawkyard and carried unanimously.

Financial report
The honorary treasurer made detailed comments on the financial year 1979-80 arising from the annual report and accounts. Generally the Society continued to be in a satisfactory state, and initial forecasts for 1980-1 showed a break-even for the year.

Mr Cornish commented that the delay by three months in putting up the subscriptions would probably cost the Society some £14,000, and he again had in mind the idea of exploring a common renewal date for all members.

General manager's report
The general manager reported that the Scottish Convention on 13 September had been very successful from the Society's point of view. Book sales had been good, and the "open forum" had provided a useful opportunity for an exchange of views.

The President and general manager had also attended the Region 15 ORM in Belfast, and once again the main subject of comment and discussion had been citizens band.

Cash with orders during the first two months of the 1980-1 financial year had been approximately one third up on the previous year, while trade orders had been in excess of 50 per cent up. Membership also continued to increase satisfactorily.

Review of committee business
Education (5.6.80)
Mr Anthony gave information on a questionnaire intended for RAE instructors attending the discussion group at the Leicester exhibition. The type of question being put would refer to size of classes and other statistics of this nature.

Finance & Staff (31.7.80)
Dr Allaway raised the question of a £1,000 donation to the Phase 3 satellite project; it was suggested that this donation be sent to AMSAT-DL for use in purchasing hardware. A proposal that this donation be made was carried unanimously.

Dr Allaway introduced the subject of future planning within the Society which had been discussed by the Finance & Staff Committee in several recent meetings. A proposal for a forward-planning group to be formed was approved unanimously. If any changes to the Articles of Association were required, it was hoped that these could be raised in time for the 1981 AGM.

A short discussion took place on attendance at the AGM by non-members. It seemed acceptable to Council as a whole that non-members should not be excluded, and a suggestion by the general manager that all members attending be given a voting card, to display at the time of any vote, was accepted.

HF (14.8.80)
A recommendation that the ROTAB Trophy be awarded to Mr Rourke, GI3IVJ, was carried unanimously.

HF Contests (31.7.80)
Dr Allaway referred to the viability of the Tonbridge School Radio Club, previously discussed. There had been a misunderstanding in the committee and some comments incorrectly recorded.

IARU (29.7.80)
Mr Bellerby reported on receptions to be held during the Region 1 Conference. The IARU Committee had not considered possible changes in the organization of the IARU in detail but the President would be writing to the IARU president at a later date.

Interference (4.7.80)
Mr Anthony said that in his opinion this committee was on the decline and could do with some positive strengthening.

Membership & Representation (10.7.80)
Mr Hawkyard asked about the Dud Charman video tape. Mr Anthony said that in his opinion it was acceptable and was now available for general use by the library.

Microwave (7.9.80)
The minutes of the meeting were accepted without comment.

Rally & Exhibition
Mr Hawkyard and the general manager gave details of the 1981 Alexandra Palace Exhibition. Two dates were available to the Society, one in April and one in May. Discussions had taken place between the President, the chairman of the committee, Mr Stevens and the general manager and the consensus view was that the Society's best interests would be served by opting for the May date in 1981, with a full option with Alexandra Palace to utilize the April dates from 1982 onwards.

Propagation Studies (31.7.80)
Mr Bellerby said he was pleased to note that the Civil Aviation Authority had recognized the work of the committee. Mr Stone added that RAE Farnborough had also acknowledged work done by the committee. Council members generally noted these comments with pleasure.

Raynet (26.7.80)
The President said he wished to discuss some important changes in the structure of the Raynet Committee which may well help the current situation.

Considerable discussion took place, after which a proposal that from 1 January 1981, the Raynet Committee consist of the emergency communications manager, one Council member, three members appointed by Council and one elected member from each RSGB zone (these to be elected by Raynet controllers resident in the appropriate zone) with the proviso that the Raynet controller elected to the committee be a member of the Society, was carried unanimously.

A discussion on Raynet group finances took place and Mr Cornish volunteered to draft some financial recommendations.

On the subject of the *Raynet Manual* currently being prepared, Council accepted that they should see the copy of the final draft.

Technical & Publications (11.6.80/15.9.80)
Recommendations for awards made by the committee were approved unanimously.

Dr Evans said that sales of books so far this financial year were substantially up on the previous year. Sales of the 1980 Call Book had necessitated a reprint of 2,000 copies. Sales of the *RAE Manual* had been phenomenal and another reprint of 8,000 copies was in hand.

Dr Evans reported that the IERE Conference on receivers, to be held in Leeds during 1981, had attracted three papers from the Society. They were on 1·3GHz gasfets, 10GHz ssb and receiver performance. Mr Jessop would probably be the chairman of the amateur radio session if it took place.

Telecommunications Liaison (24.7.80)
The President reported that he had received a letter of authority from the Home Office stating that there were no objections to Raynet using manned talk-through in emergencies, and no amendment to the licence was being considered at present.

VHF
Mr Douglas said that he regretted having to stand down from Council and resign as vhf manager for health reasons.

Mr Stone reported that the 1981 VHF Convention was to take place at Sandown Park. The committee had decided that it would be an excellent venue for such an event, and recommended this change of venue, as did the Rally & Exhibition Committee. Council accepted the proposed change of venue.

VHF Contests (23.7.8/10.8.80)
The minutes were accepted without comment.

Membership
Council approved the waiving of subscription in respect of five members.

Affiliation of the following was approved: Waltham Forest College Amateur Radio Group, Motorola Radio Club, Waterside UHF Repeater Group, St Neots & District Amateur Radio Society, and Wharfedale Repeater Group.

OBITUARIES

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

Mr F. W. Boulton, G3JZB
Fred Boulton died on 28 October 1980, aged 55. In the 'fifties and 'sixties he had been a keen mobile operator, mainly on 1·8MHz. He was noted as a "rag-chewer" by his local friends, and belonged to his local club, the Cannock Chase ARS. He was always proud of his RSGB membership.

Mr R. A. Minter, G5RM
Mr Minter, who died on 5 October 1980, had been a member of the Society for many years, and continued transmitting until shortly before his death.

Mr R. Webb, G6XY
Roger Webb's interest in amateur radio dated back to the 'twenties. He was a keen hf operator and a good technician. Roger's help was always available to newcomers and he took a particular interest in the Radio Fraternity Lodge.

We have also been advised of the death of:
Mr G. Thompson, G8KLI, who died on 14 November 1980.

Special event stations

GB4SLS 22-28 February
This station will commemorate the centenary of the founding of the Simon Langton Grammar School, Canterbury. Operation will be on 1·8MHz through 144MHz, and they are anxious to arrange skeds with former pupils who are now licensed. Details from G4BBW, QTHR, or G3LCK, care of the school.

GB2SDD, 1 March
A station to celebrate St David's Day will be operated by the Port Talbot Sports & Social Club ARS. Operation mainly on 14MHz, but also on other bands if conditions permit. There will be an award for those working this station plus five other GW calls during March 1981. Specially designed QSL cards will be available to callers, and Welsh amateurs are particularly encouraged to take part. Details from GW4ESV, 56 Greenwood Road, Baglan, Port Talbot, West Glamorgan.

YOUR OPINION

PROBLEMS WITH KITS

The Editor
Radio Communication

Sir—I am a life-long constructor of radio and electronic equipment—in fact I am more interested in making equipment than using it when completed. Because of this and because of the increasing complexity of modern equipment I have made use of many of the available kits.

Unfortunately, with the exception of the largest international company, I find that all the kits lack consideration for the user, and neglect the fact that the kits may be bought to do a job of work, perhaps with other equipment, and that the kits should lend themselves to fit into cases and on to panels. The latest kit which I bought from an advertiser in *Rad Com* consists of four boards (which have to be fitted in a plastic box about 2 by 3 by 5in) and in which there are over 100 interboard connections—one colour of wire was supplied, and no board pins. The diagram shows 127 interconnections; investigation revealed that some are not used for normal operation.

From another advertiser I bought a 144MHz receiver kit, a 1W transmitter kit, a synthesizer consisting of two boards and a voltage regulator board. All these together were to make a 1W hand-held transceiver for 144MHz. Incredible as it may seem there are no common dimensions between the five boards (except the thickness!), which makes it impossible to produce a small tidy unit. There are also very few mounting holes, which is another common failing.

This disease—incompetence, lack of ergometric consideration or whatever phrase comes to mind at the time—is not limited to amateur radio. I also play at microcomputers, having a Nascom 2; the non-Nascom kits to extend the facilities of this are in the same category—good components, well-made boards, but no consideration for the end use.

As for documentation—I can only assume that the writers know the equipment they are describing so well that they miss out information which is obvious to them but not to me.

Please, kit-makers, help to keep amateur radio going—look to your ergometrics and documentation.

Ralph C. Taylor, GW2HCJ

EQUIPMENT COSTS

The Editor
Radio Communication

Sir—I am a regular cw operator on the hf bands. Little, if any, ready-built "cw only" equipment is available, and why should I pay for ssb facilities I do not need?

Recently a 100W five-band cw transmitter has been advertised, as a kit. Now, I have no doubt that this is an excellent piece of gear, but the price! Around £350, with power supply.

It is clear from a study of *Rad Com* that many amateurs are now prepared to spend as much on their station as they would on a car . . . or even on a London Underground ticket. Seriously though, prices are too high. Does a frequency counter add anything useful to a set? I doubt it, but it certainly adds to the price, and so do many more of the gimmicky innovations which are undoubtedly clever but help the operator very little. Simplicity and lower prices would help many of us much more.

Certainly if a manufacturer wants my custom he will have to lower his prices or I will continue to manage with the contents of the junk box.

I would suggest that even with the present iniquitous rate of VAT a decent 100W transmitter for little more than £100 should not be impossible.

J. J. Maling, G5JL

CB INVASION

The Editor
Radio Communication

Sir—I am becoming increasingly disturbed by what appears to be an attempted "take-over" of the cw end of 28MHz by Continental cb operators. In one evening I counted no less than 15 of these illegal stations, acting as though they had every right to be there and having the audacity to complain about amateur QRM.

At times I could hear UK and other European amateurs tuning up, calling test or CQ on top of the cb QSOs until the cb stations could no longer communicate and they had to QSY back to their own band.

I would like to suggest to all 28MHz operators that they follow this example. Next time you hear one of these intruders, treat the frequency he is using as the ideal place to tune up, or perhaps to conduct some tests, or better still call CQ and start a nice long CW QSO.

If we do not defend our hard-won territory we will find that one day the "invasion" of cb is an "occupation".

Ken Gray, G3WNR

OPERATING IN VP8

The Editor
Radio Communication

Sir—Until the end of last year I was licensed as VP8VN but I left the island of South Georgia before then and it is very doubtful that I will return—as is the case with most of the VP8s from there and the Antarctic. Most of us work there on one- or two-year contracts, and then return to the UK.

During my stay on South Georgia I took up amateur radio for the first time, and am glad to say I thoroughly enjoyed it. At first I was able to enjoy long chats with other "hams", but once my callsign became known it became increasingly difficult to do this without breakers trying to get in. A lot of these were from South America who, when finding they could not break in, started deliberate QRM. Very annoying. Unfortunately I was unable to work as many "G" stations as I would have liked, mainly due to the fact that the openings into the country were very limited and during the southern hemisphere winter almost non-existent. This was to the point where I hardly had a chance to pass log information. Work load of course creates a problem, as the commercial side of things limits our operating time as well. One or two comments on QSLs amused me. One of these was "Thanks, it was well worth staying up until two in the morning for the contact"—he did not realize that it was five in the morning with me and I had been operating since 10 the previous night.

Could I say through your magazine, please, that operators in VP8-land try their best to give as many operators as possible the contact they want, and our managers do their best to get the replies to you as soon as possible. Replies would be quicker direct to the QSL manager, and also if postage is included, as it becomes a very expensive business. If you could point out some of the difficulties that I have outlined I would be grateful.

In closing I would like to say thank you to other amateurs who have helped with the odd list operation, although I tended to work alone in that respect.

J. D. Ainge, VP8VN

COMPUTER STANDARDS

The Editor
Radio Communication

Sir—Messrs Dollery and Kemmis have launched an appeal (August 1980) for the adoption of the CCITT frequency shifts which, on first reading, is admirable in view of the proliferation of this standard in professional application systems. One does not need a crystal ball to be reassured that many CCITT compatible devices will become available which the amateur radio fraternity could adopt and adapt for its purposes. But, by way of a counter appeal, I would like to sound a note of caution in this matter.

Arguments based solely on the compatability of this, that and, no doubt very soon, the other "chip", are not strictly in accordance with the experimental nature of amateur radio. An engineering standard is a convention; an agreed way of doing things, and is by no means the only possibility. Therefore, to assume that the emergence of chips to CCITT (or any other) specification points the only direction to a successful future is akin to having assumed (20 or 30 years ago) that hf was the only viable propagation because of the availability, then, of suitable active devices and circuits. As we all know, amateurs collectively shunned that latter assumption and, with circuits of their own design, opened the door to the vhf and uhf spectral bands, the present prolific use of which is now a testimony to that early foresight (or was it cussedness?).

Your correspondents are right to remind us that personal computing is rapidly enhancing the performance of amateur communication systems and, I would add, opening many new horizons for development and innovation in the short and medium term future of the hobby. However, for better or worse, many amateurs have a "black box" attitude towards some aspects of the communication side of the hobby and, with stronger justification, this attitude is emerging in the computing aspects too. But in the interface between the two and in the investigation of alternative approaches (so obviously still in its infancy as an endeavour), should we not make recourse to designs and conventions which are peculiar to ourselves? If a single chip is not available for some function, the amateur will be compelled to design his own circuits and so to think deeply about them. *Ipso facto*, his design options will be kept open and free of any received opinion of the directions along which to proceed. Frustrating though some individuals may find this, the corporate knowledge acquired by the whole fraternity will be all the better enriched.

By all means, let us adopt a convention but let it be one which we are not compelled to retain simply because the weight of manufacturing forces is our burden.

P. J. Best, G8CQH

Sir—I am pleased that G3GAF and G8NFS have pointed out in their letter in *Rad Com* (August 1980) the problems that are beginning to arise as UK amateurs start to take advantage of their personal computers and their unique licences. UK amateurs can use any CCIR rtty code. What UK amateurs do could set the standards for amateurs worldwide. It may be best for BARTG and RSGB to produce a policy document in the near future to avert confusion and resentment.

My thoughts are confined to computer transmitted codes on the hf and vhf bands. The possibilities on uhf are much wider and do not have the immediate international repercussions that could arise if new codes suddenly appear on 14MHz.

There is no place for ASCII coded transmission at 300 baud using 200Hz frequency shift on amateur bands. Indeed, is there a place for ASCII at all?
Here are my reasons:

1. Telephone line and radio links are different mediums, and that implies that different techniques are necessary.
2. Not all ASCII is ASCII. For instance the PET computer has its own version.
3. No advantage would be gained by using a seven-bit code at high speeds. The error rate would probably be unacceptable. One does not need all the ASCII characters to communicate. To send programs all one needs is 16 characters, by using Hexadecimal. This way a received program can be run without much ado, assuming no errors.
4. It would be bad-mannered of us to start using a system which is totally unintelligible to other amateurs. The advantage of any new system would have to be very great before we could excuse ourselves and add to those noises that sound and look like rtty but print rubbish. Very great advantages are only obtained by using error correcting techniques such as Amtor. Similarly the proposed landline 200Hz frequency shift would be very frustrating to attempt to tune with ordinary rtty gear, as it sounds too much like conventional rtty frequency shift.

There is no need to be so dismissive of five-bit Baudot code rtty. It is more efficient. The slow speed of amateur rtty may be a little frustrating for those who think in kilobauds, but as most programs are relatively short I think the present baud rate should be maintained, unless Amtor is being used (the baud rate then depends on the conditions, up to 100 baud).

I suggest we use our computers and give up 0·5k of memory or less for a baudot rtty sub-routine for hf and vhf use. Alternatively we go the whole way and give up 1k of memory to run an Amtor error correcting system advocated by G3PLX.

It would be ill-mannered and bad amateur radio practice to use ASCII, or a different frequency shift on amateur bands. What is more we would not be using our computers fully if we took the lazy way out and assumed that the amateur bands were an extension of the telephone system.

Gerard Bulger, G3WIP

Sir—I agree with G3GAF and G8NFS that "Kansas City", and other tape cassette standards, are unsuitable for use on radio circuits, for a variety of reasons, but I do not see why they should ignore existing rtty standards. The IARU narrow-shift tones of 1,275 and 1,445Hz, used by all 144MHz rtty enthusiasts, are quite suitable for data formats other than Murray code, and at speeds other than 45 baud. I have used these tones up to 200 baud, and 300 baud should be possible. The IARU wide-shift tones of 1,275 and 2,125Hz, although not much used for rtty these days, are ideal for faster data rates up to the limit posed by the use of a voice channel. I have used this tone standard myself for transmission at 1,200 baud, both through ssb and fm transmitters, including repeaters, with excellent results.

The wide-shift tones are sufficiently close to the 1,300/2,100Hz used over telephone lines in the

(Continued on page 164)

CONTEST NEWS

National Field Day 1981 rules

The only change to Field Day rules for 1981 has been made following last year's results, when the station with the highest points total was operating in the restricted section. In view of this the HF Contests Committee has amended rule 11 so that the overall winner will receive the NFD Shield.

1. The general rules for RSGB hf contests, published in the January 1981 issue of *Radio Communication,* will apply.
2. **Applications.** Each group intending to compete must submit an application on form HFC 10/81 to Mr D. Lawley, G4BUO, 24 Glen View, Gravesend, Kent DA12 1LP, not later than 22 April 1981. Form HFC 10/81 can be obtained from RSGB HQ, or direct from G4BUO on receipt of an sae.
3. **When.** From 1700gmt Saturday 13 June to 1700gmt Sunday 14 June 1981.
4. **Eligible entrants.** Any group of RSGB members within the prefix zones, G, GD, GI, GJ, GM, GU and GW. NFD is a multi-operator contest.
5. **Operation** must be from a portable station not located in a permanent building and not using a mains supply. No equipment or antennas may be installed on the site prior to 24 hours before the start of the contest. This does not apply to the storage of equipment.
6. **Mode.** CW(A1) only, in the 1·8, 3·5, 7, 14, 21 and 28MHz bands.
7. **Sections.**
   (a) Open section. The station shall consist of a transceiver (or transmitter and receiver) with an additional receiver if desired, which may only be used for monitoring purposes. There is no restriction on the number or type of antennas, but the maximum height above ground must not exceed 60ft (18·5m).
   (b) Restricted section. The station shall consist of a transceiver (or transmitter and receiver) with one antenna which must be a single element such as a dipole, vertical, long wire, inverted-V, etc, having not more than two elevated support points, and not exceeding 35ft (11·5m) above ground at its highest point.
   Both sections. Standby equipment may be at hand but not powered or connected in any way simultaneously with the main equipment. The presence on the site of additional amplifiers or modified commercial equipment capable of excess power, may result in the entry being disallowed.
8. **Scoring.** Points will be scored as follows:
   (a) Fixed stations in Europe (including the British Isles).....2 points
   (b) Fixed stations outside Europe.....3 points
   (c) Portable and mobile stations in Europe (including the British Isles)....4 points
   (d) Portable and mobile stations outside Europe.....6 points
   The contacts on 1·8MHz and 28MHz should be scored as above and the totals multiplied by two to obtain the claimed score.
9. **Group contacts.** Points must not be claimed for contacts made by a competing station with members of its own group.
10. **Entries.** These are to be in accordance with General Rule 6, with the following exceptions:
   (a) The normal cover sheet will not be used. Special cover and summary sheets will be sent to the person responsible for the entry.
   (b) Points must be totalled separately for each band.
   (c) Entries must be postmarked no later than Monday 29 June 1981, the address to which they must be sent will be notified when cover and summary sheets are sent out. Logs sent direct to RSGB headquarters will not be accepted.
11. **Trophies.**
   (a) The National Field Day Trophy to the station having the highest checked score, regardless of section.
   (b) The Bristol Trophy to the station in the other section having the highest checked score.
   (c) The Gravesend Trophy to the group having the second highest checked score, in the section with the largest number of entries.
   (d) The Scottish NFD Trophy to the Scottish group having the highest checked score.
   (e) The Frank Hoosen Trophy to the group having the highest checked score on the 14MHz band.
   (f) Certificates of merit to the groups in the Open section with the highest checked scores on the 1·8, 3·5, 7, 14, 21 and 28MHz bands.
   (g) Certificates of merit to the groups in the Restricted section with the highest checked scores on the 1·8, 3·5, 7, 14, 21 and 28MHz bands.
12. **Check logs.** While overseas stations are not eligible to enter NFD, check logs are very welcome. A certificate will be awarded to the overseas station in each continent whose check log shows the most points contributed to competitors.
13. **Inspections.** All stations are subject to inspection by nominated representatives of the HF Contests Committee. The inspector's brief will be to ensure that the rules and spirit of the contest are being observed. Should the inspector be unable to locate the site due to inadequate or incorrect information given on the application form, the entry will be disallowed. In the event of a last-minute change of site, it is the responsibility of the members of the group to make suitable arrangements for the inspector to find the new site.

Low Power Contest 1981 rules

1. **Aim of contest.** To encourage QRP operation.
2. **Eligible entrants.** Single-operator stations only. UK entrants must be fully paid-up members of the RSGB.
3. **When.** Sunday 12 April 1981, 0700 to 1700gmt with one break of at least one hour. The start and finish of the break must be clearly shown in the log.
4. **Sections.**
   (a) British Isles stations using 1W input or less.
   (b) British Isles stations using over 1W but not more than 5W input.
   (c) Overseas stations using not more than 5W input.
5. **Frequencies.** 3·5MHz and 7MHz only.
6. **Mode.** CW (A1) only.
7. **Contest call and exchange.** CQ QRP. Exchange RST and serial number starting at 001, plus input power group. eg 569 001 5W.
8. **Scoring.** 15 points for each completed contact with another QRP station. 5 points for each completed contact with all other stations.
9. **Logs.** Log sheets to be headed: Date/time gmt; callsign of station worked; RST, serial number and power group sent; RST, serial number and power group received; claimed score for the contact. Separate logs must be submitted for each band.
10. **Declaration.** Each entry must be accompanied by the following declaration: "I declare that my station was operated in accordance with the rules of the contest and in accordance with the terms of my licence, and in the event of any dispute the decision of the Council of the RSGB will be final." The declaration must be signed and dated.
11. **Address for logs.** RSGB HF Contests Committee, c/o Mr D. S. Booty, 139 Petersfield Avenue, Staines, Middlesex TW18 1DH, England.
12. **Closing date for logs.** Logs must be postmarked no later than 4 May 1981.
13. **Awards.** The 1930 Committee Cup will be awarded to the leading station in section (a) or (b), whichever section has the highest number of entries. Certificates of merit will be awarded to the top three stations in each section.
14. **Special conditions.** British Isles stations using less than 1W on one band and more than 1W input on the other, must enter section (b). Stations using equipment normally operated at much higher inputs must give details of how the reduced power input is achieved.

144MHz CW Contest November 1980 results

This contest received enthusiastic support from cw enthusiasts, and the fixed station entry was over double that of the 1979 contest. As usual the contest was arranged to be within the agreed IARU Region 1 contest time-limits – 1600 to 1600gmt – this year the last 6h being chosen. Unfortunately, conditions were well above average for the first 15-20h but were falling off quickly at the start of the RSGB contest, and many entrants commented on this. Some asked why the RSGB does not follow the full IARU-agreed time-limit. Others thought that the contest should have been held during the evening and night hours rather than in daytime as conditions are usually better at these times. Whatever the choice the compromise will not satisfy everybody.

Many entrants commented favourably on the rules. Other comments include: "It seems a complete waste of time transmitting full QTH details", *G3LCH;* "On the whole I found this contest rather more civilised than ssb/cw vhf contests", *G4ILW;* "Stations were superb – so patient with my slow and shaky cw. They sent slowly and repeated information where necessary", *G4KGC* (Petra Suckling, licensed six weeks).

The winners of the two sections will be awarded certificates. Thanks for check logs to G3BPM, G3FXA, G3KZR.

SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3NNG	962	100	ZL23f	DL1KS/A	680
2	G4IYA	495	65	AL43f	DL1BU	614
3	GM4CXM	378	28	XP09g	F6EMT/P	882
4	G4ERG	370	52	ZN28b	F6KNO	720
5	G3EMU/A	365	41	AL76b	HB9AMD/P	617
6	G4ILW	315	38	ZO03j	GJ3YHU/A	632
7	G4BRK	313	45	ZM68b	F6KNO	558
8	G4ARI	304	44	ZM24j	F6FHP/P	894
9	G5UM	298	49	ZM35b	F6EMT/P	480
10	G3XWZ	264	38	ZN64d	F6CJG/P	956
11	G4EUE	228	44	ZM33g	PA0NIE/A	432
12	G4IBZ	226	42	ZI16b	F6EYM/P	483
13	G3VIP	216	34	ZJ76d	F6EMT/P	528
14	G4APL	183	36	ZL60j	HB9AMD/P	718
15	GW3INW	182	16	ZE17b	F9YZ	825
16	G3RWL	145	37	ZL30e	F6KNO	514
17	G4FKI	144	34	AL31a	F6CJG	690
18	G4KGC	125	32	ZM65c	F6BBQ	278
19	G3UFY	122	28	ZL50e	PA0NIE/A	335
20	G3UYM	109	25	ZL09c	ON5FF/P	275
21	G4BLX	94	27	ZL30e	PA2VIT	346
22	G3PSM	58	16	ZN13a	G3NNG	245
23	G2WS	50	12	YL56h	F6EMT/P	277
24	G4GGV	46	18	ZL37g	F6EMT/P	260
25	G4BUO	28	12	AL42c	G4ARI	182

MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	GW3UCB	739	84	YN75f	HB9AMD/P	976
2	G3LCH/P	656	78	AL66f	HB9AMD/P	630
3	G3ILO/A	545	60	YL39b	F5VP/M	920
4	G4AYM/P	503	65	YL08d	F6AUC	934
5	G4GYE/A	176	40	AL23a	G3BW	421
6	G4IDC	123	25	ZN22b	F6EMT/P	123

October 1980 70MHz Fixed Contest results

Conditions for this event were nicely described by G5UM as "impossibly normal" but, despite this, activity was slightly up on last year, although the number of contacts made by the leaders was lower, and the number of entries received was unchanged. It seems some stations, from which no entries were received, might have been able to claim quite high scores and it is a pity that the results of their activity could not be included in the table.

There were comments in the logs which indicated that contestants would have liked either a slightly longer event or a move of perhaps an hour to catch some more of the stations that came on the band in the late morning and early afternoon. Signal quality also came in for more criticism and it was suggested that more care could be taken to avoid the overdriving of transverters.

Although making fewer contacts than in last year's event, GD2HDZ repeated his win, with G2AMV making 10 more QSOs and gaining second place. Congratulations and certificates go to both of them.

G3LCH

Posn	Callsign	Points	QSOs	QTH	Best dx	Km
1	GD2HDZ	273	27	XO68	G4IYA/A	441
2	G2AMV	255	37	YN55	G4IYA/A	318
3	G3FDW	246	40	ZN56	GM4IGS	348
4	G3WHK	239	47	ZL49	GD4IOM	427
5	G3PWK	216	34	AM42	GD4IOM	382
6	G3IKR	212	33	YM70	GM3YOR	435
7	G3JYP	194	28	YO38	G3SHK	403
8	G4APL	185	39	ZL60	—	—
9	G4IYA/A	176	38	AL52	GD2HDZ	441
10	G3UEY	168	30	YM80	GD4IOM	280
11	G8GP	166	36	ZL50	GD4IOM	418
12	G3LVP	148	37	AL33	G4HEV	309
13	G3WMR	143	34	AL41	GD4IOM	445
	G3BPM	143	33	ZL48	GD4IOM	412
14	G4FRO	137	19	YL37	GD4IOM	317
15	G5UM	123	25	ZM35	GD4IOM	280
16	G4HLX	107	23	ZM41	GD4IOM	265
17	G4PSP	97	31	ZL29	GD4IOM	420
18	G4FKI	96	34	AL31	GD4IOM	420
19	G3PGN	65	21	AL22	GD4IOM	430
20	G3VIP	52	10	ZN40	GD4IOM	304
21	G4HZC	49	13	ZM25	G3JYP	236
22	G5DF	39	10	ZO51	G4IDG	220
23	GM3YOR	29	7	YO65	G3IKR	435
24	GM3TAL	20	6	YO73	G3JYP	174

Check log gratefully acknowledged from G4HEV/P.

Cray Valley SWL Contest results

Entries showed a 50 per cent increase over 1979 and included seven entries from overseas. The standard of logging showed an improvement over recent years and it is hoped that an even bigger number of entries will be received for the 1981 event.

SINGLE-OPERATOR CW

Station	QSO's	Mult	Points	Station	QSOs	Mult	Points
BRS44395	396	145	57,420*	J. Alley			
BRS15822	260	178	46,280*	W5-SWL	270	68	18,360*
VE3-9094	254	146	37,084*				

SINGLE-OPERATOR PHONE

Station	QSOs	Mult	Points	Station	QSOs	Mult	Points
RS42604	846	273	230,958*	J. Weston	279	134	37,385
C. Addison				BRS25209	263	132	34,716
W2-SWL	1,002	202	202,404*	BRS32525	333	83	27,639
BRS43475	665	211	140,315	BRS40292	260	103	26,780*
BRS43752	514	159	81,726*	W. Milner			
BRS40293	468	144	67,392	VE1-SWL	216	120	25,920*
BRS40634	360	175	63,000	RS44404	195	101	19,695
BRS44000	347	135	46,845	BRS42501	167	77	12,859
ARS43457	328	134	43,952	WDX 9IIK	117	78	9,126*
ARS42876	274	152	41,648	ARS44715	25	22	500*
OE-109976/W3	366	109	39,894*	BRS18529	30	14	420
T. Land				ARS42296	12	2	24
W8-SWL	343	112	38,416*	BRS44906 disqualified because of excessive			
BRS43716	282	133	37,506	duplicates.			

MULTI-OPERATOR PHONE

Station	QSOs	Mult	Points
BRS25429/ G5218	741	286	211,926*

*Certificate winner

Contests calendar

8, 16, 24 February, 4, 12, 20 March	
7-8 February	7MHz (Phone) *(Rules in August/September issues)*
8 February	432MHz Fixed *(Rules in December issue)*
14, 15 February	PACC 1981 *(Rules in January issue)*
14, 15 February	First 1·8MHz *(Rules in January issue)*
14-15 February	YU DX WW *(Rules in February issue)*
21-22 February	ARRL DX (CW) *(Rules in February issue)*
28 February-1 March	7MHz (CW) *(Rules in August/September issues)*
28 February-1 March	French 1981 (Phone) *(Rules in January issue)*
7-8 March	ARRL DX (Phone) *(Rules in February issue)*
***7, 8 March**	March 144/432MHz and SWL *(Rules in January issue)*
14-15 March	Commonwealth *(Rules in December issue)*
21-22 March	Bermuda 1981 *(Rules in February issue)*
21-22 March	Canadian ARF Phone Commonwealth *(Rules in February issue)*
21-23 March	BARTG Spring RTTY
28-29 March	CQ WW WPX SSB
4 April	1,296MHz Trophy & SWL
5 April	432MHz Trophy & SWL
5 April	Ropoco 1
12 April	Low Power *(Rules in February issue)*
26 April	144MHz CW
***2-3 May**	144/432/1,296MHz & SWL
17 May	Region Round-up (CW)
24 May	144MHz Low Power & SWL
7 June	70MHz & SWL
13-14 June	HF NFD *(Rules in February issue)*
27, 28 June	Summer 1·8MHz
4-5 July	VHF NFD & SWL
19 July	3·5MHz Field Day
2 August	144MHz QRP & SWL
11-12 August	Meteor Scatter
16 August	70MHz Trophy & SWL
30 August	Ropoco 2
5, 6 September	SSB FD
***5-6 September**	144MHz Trophy & SWL
	IARU VHF (144MHz)
***3-4 October**	RSGB UHF/SHF
	IARU UHF/SHF
October/November	432MHz Cumulatives
	1,296MHz Cumulatives
11 October	21/28MHz (Phone)
18 October	21MHz (CW)
25 October	70MHz Fixed
***8 November**	144MHz CW
14, 15 November	Second 1·8MHz
6 December	144MHz Fixed

* IARU co-ordinated date

YOUR OPINION

(Continued from page 162)

Viewdata service that these two slightly different standards would be compatible, enabling ics designed for Viewdata to be used on the air.

I would therefore suggest to computer enthusiasts that they should consider using the existing IARU rtty tone standards, if only so that they, in their moves into the field of radio communication, can communicate with the rtty enthusiasts, who are increasingly moving into the field of computers.

J. P. Martinez, G3PLX

Sir—I was pleased to see the letter in *Rad Com* (August 1980) about computer data transmission standards, because with the rapidly-growing number of personal computers, a standard "standard" needs to be decided upon quickly.

The suggestion of Messrs Dollery and Kemmis worries me, however. Frequencies of 980Hz and 1,180Hz seem very odd frequencies which would be hard to regenerate were it not for that wonder ic, the MC14412, (which could be deleted by the manufacturer). From a technical point of view, they are talking about fsk with a 200Hz shift, but suggest a data rate of 300 baud. I was always led to believe that the frequency shift had to exceed the baud rate to be reliably detectable, limiting them to 200 baud at the most.

I am not convinced that the "Kansas City" standard tones of 1,200 and 2,400Hz are "impractical for amateur radio because of its wide frequency spectrum", or see any problems because of the harmonic relationship (provided it is not fed through an af (of rf) clipper designed as a speech processor). Additionally, a large number of people already have this type of interface in use with cassettes, and would therefore require no modification, and programs could be transmitted off tape directly if they did not happen to be loaded in the computer at the time. (A longish program can easily take 5min to load (at 300 baud), which represents, I feel, an unacceptable delay before transmission). The two frequencies are also quite easy to generate.

P. Vince, RS35854

OSCAR 8 ORBITAL DATA

The Editor,
Radio Communication

Sir—The article "Correction of Oscar 8 orbital data" by G3RWL (*Rad Com* October) raises interesting questions on anomalous propagation from low orbit satellites. Some of the effects given have now been noted on Mode A on the 10m downlink when low-angle propagation through the F-layer can give rise to anomalous, but repeatable, frequency changes. The study of both modes A and J simultaneously might yield interesting results.

In the final paragraphs, however, it is not clear how one measured result (the tca) can be used to correct both ect and its longitude. On a calendar of predictions both can be slightly in error and the errors can be unrelated. Thus, if neither is presumed correct, a series of measured results, taking for example several successive orbits, is necessary to correct ect and its longitude separately.

R. McEwan Reid, G4GTO

The author replies:

Long-term orbital predictions of space satellites cannot, by definition, be extremely accurate. Atmospheric drag and other unpredictable factors cause perturbations of the orbital parameters and, while these factors are usually very small, an error can build up when the figures are being predicted several months in advance. On Oscar 7 0·1s/orbit adds up to an error in excess of 2 min after three months. (Remember the uncertainty about when and where SkyLab would come down.)

The intent of the article was to provide correction for *amateur* purposes, and the higher in frequency one goes, the more accuracy is achieved. In Fig 1, tca (the peak of the curve) can be seen to be accurate within ±0·5 min which, when one's orbital predictions are 5 min out, is adequate. Stations with caesium clocks and beamwidths of less than 5° are recommended to obtain radar measurements from official sources; the NASA object numbers are 74-89b (Oscar 7) and 78-26b (Oscar 8).

If G4GTO wishes to calculate frequent corrections to existing predictions then Amsat-UK would be delighted to direct enquiries about orbital accuracies to him.

R. W. L. Limebear, G3RWL

AMATEUR RADIO IN HOSPITAL

The Editor
Radio Communication

Sir—If one has the time and energy to fulfil all the sensible requirements that G2BCX outlined in his letter (*Rad Com* September 1980) and operate your transmitter, then you should be seriously questioning your doctors why you need to stay on the ward a moment longer.

I can see that a letter to the "unit administrator" or "district works officer" would cause total confusion and even a refusal—because the nature of our hobby is so often misunderstood. Your rig may be compared to normal hospital equipment with their double isolation standards: can you guarantee that <70μA would flow through you if your transmitter developed a double fault? 144MHz fm is harmful to your health, particularly in London.

Most hospitals admissions are emergencies, so advance permission is often out of the question. If you must get on the air, better produce your black box on the ward-round to your consultant and ward sister, and ask then. If you have a professional-looking box and a pair of headphones you should not have any difficulty, and it would relieve the tedium of the round!

Gerard Bulger, MB, BS, G3WIP

MEMBERS' ADS

CONDITIONS OF ACCEPTANCE

NEW ARRANGEMENTS

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB only. They must be submitted on the Member's Ad form printed on the back of a *recent* address label carrier used to mail *Rad Com* to the advertiser: this will automatically provide proof of membership and should not be more than two months old. No acknowledgment of receipt will be sent, and advertisements not clearly worded or punctuated, or which do not comply with the conditions of acceptance, will be returned. No correspondence concerning this service will be entered into.

Trade or business advertisements, even from members, will not be accepted for "Members' Ads" but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions, or for the quality of goods offered for sale. Advertisements for 27MHz equipment will not be accepted.

Warning. Members are advised that they should, as far as possible, ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement. The "purchase" of goods legally owned by a finance company could result in the "purchaser" losing both the goods and the cash paid.

The current rate is £1 for 40 words or less: advertisements containing more than 40 words will cost an additional £1 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.

No guarantee of inclusion in a specific issue can be given, other than the first possible issue after receipt. Closing dates in 1981 for issues in brackets, are: **26 February** (April), **23 March** (May), **23 April** (June), **20 May** (July), **18 June** (August), **16 July** (September), **27 August** (October), **24 September** (November), **22 October** (December), **19 November** (January 1982), **17 December** (February 1982).

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS
Do not post to RSGB HQ or Advertising representative

FOR SALE

CW filter Trio YK88C, fits TS120S/130/180S/830S, £20. FL8A filter with graphs, offers. G3RAU, QTHR. Tel Crawley 883842.

FT227 rb, as new cond, no mods, boxed, all accessories, hardly used, £190. G8LGE, QTHR. Tel 0924 825025.

KW2000 ac and 12V dc ps, £120. KW600 360W p.e.p. linear, £110. FTDX150 10-80 120W p.e.p., £140. Eddystone 750, exc, £55. IC22A, R3, R3R, R4-7, S0, S20-24, £115. TR2200G, R3, R7, S0, S20-22, S24, charger, rubber duck, £85. G3BKM, QTHR. Tel Huddersfield 45907.

Liner 2 rf preamp, £100 ono. 14-el 70cm Skybeam cw 20m feeder, £15. 4ft dish, £7. Two 4CX250Bs, cw bases, £40. SSB125 12V dc inverter, 800V 1A, etc, £40. El-bug, £8. G4HWA. Tel Camberley (0276) 31573.

FT221RD, prized possession, therefore exc cond, auxiliary 1·6MHz shift xtal fitted, orig packing, £325. GM8LKL, QTHR. Tel 031-449 2096.

Sectional mast, 35ft, 10 section, RAF type, fits in car boot, ideal for portable use, £25. AR88LF and manual, £45. G8RLP, QTHR. Tel 01-574 4622.

KW204 tx, realigned professionally Dec 1979, hardly used since, £100. TW topbander, a.m., tx, rx, – 12VE psu/control unit, hb mains ditto, £35. Buyer collects. G3IXO, QTHR. Tel Winscombe 2360.

Trio rx, amateur bands only, model JR310, perfect, manual, £87.50. G3XBE, QTHR. Tel 0274 28219.

Icom IC245 fm/ssb/cw 2m tx/rx, almost new, boxed, £235 ono. Drake TR3 ssb/cw tx/rx, similar to TR4, incl power supply, exc cond, £185 ono. Tel 0534 54186, after 6pm.

Yaesu FR50B rx, full 10m coverage by Lowe, no other mods, £80. G8XWR. Tel Nottingham (06073) 3953.

Trio TS820, mint cond, £495. Marconi a.m./fm sig gen, TF1066/1M, 10-470MHz, £70. Pye FM10D 6ch, 2m, £35. Cossor scope, £12.50. Solatron scope, £25. Quantity 12/16V, 2 and 3W Plessey SL ics, tested, £1.25. P & P paid on ics. G3CON, QTHR. Tel Cheltenham 580959.

Twin keyer lever, cost £12.50, now £7. New Electrosil 75Ω dummy load resistor, £2.50. G4CJY, QTHR.

Heathkit HW12A 80m ssb tx/rx dc power supply, HP13, handbooks, £60. G3LIS, QTHR. Tel Ormskirk 77960.

Telequipment scope S54AR, six months old, 10MHz bandwidth, £95 ono. Racal RA117, £250. Racal RA218 ssb adapter, £50. Racal MA79 exciter, £200. Telequipment scope S54AR, six months old, £90. HB 120W pa, £80. The lot, £500. G4IUN. Tel Ron, Camberley (0276) 32697, after 5.30pm or weekends.

TR2400 handheld, £180 incl postage. PET 3016, large keyboard, 16k memory, CN2 cassette, comp with books, cassettes, £590. Buyer collects. Dodgson, G8EFQ NOT QTHR. Tel 051-922 4140, office hours.

FT101 Mk2, 160m standard, absolutely as new, incl fan, cw filter, recently serviced, incl new valves, £300. FV101 matching separate vfo, £50. Can demonstrate or will deliver reasonable distance. G3UEG, QTHR. Tel Harlow (0279) 27788.

FR101D, analogue, 2 and 4m, bc bands, 15 months old, comp check, realignment by importers to above maker's spec, £400 ono. Tel Wakefield (0924) 252987.

Clearout: Liner 2, mint, £95. Wilson h/talkie, 6ch, 2m, 2W fm, helical, nicads, charger, £79. Cambridge AM10B 2m, complete, £35. Bantam 2m fm, £40. Trio 9R59D and spkr, £45. Creed 7B, £5. 1702 eproms, £2 each. PF1 tx/rx, RB6, £25. G8DVN. Tel Mansfield 882174, work, Newark 892000.

FT200, FP200, 80-10 tx/rx, all 10m xtals fitted, audio filter, bargain, vgc, £175 for quick sale. G2VJ, QTHR. Tel 021-706 0744.

18AVT/WB, 10-80m vertical antenna, unused, £50. Aluminium poles, 16ft by 2in, 13ft by 1in, unused, £10. Buyer collects. G8AZF, QTHR. Tel Hayling Island 5095.

FT707, brand new, boxed, £400. TR2400, three months old, used little, accessories, boxed, £150. TS120S, six months old, unmarked, boxed, £325. Heavy duty, 75ft westower, £500. Two-element gem quad, £90. TS120V, PS20, brand new, £310. G4GXT. Tel 01-954 1924.

Computer, Compukit UK101, cased, 8k ram, 8k Basic, cassette interface, 2MHz clock, various programs on tape included, uhf modulator, £230. Video monitor, £50. 4 Brunswick Close, Worcester. Tel Steve, Worcester (0905) 423723, evenings or weekends.

Storno Viscount 2m mobile tx/rx, S20-22, R4, R7, preamp, auto-toneburst, lots spares, circuit and info clean, works well, exc rig for beginner to learn on, spare control box, £50. G8RAH, QTHR. Tel Brian, 0865 66466.

Atlas 215X mobile tx/rx, 15/160m, fits into glove box, 200W, comp with separate mobile and battery harness', mic, handbook, £325. Associated 17A ac psu type 220PS, £50. Both latest models. Prefer demonstration and collect. G3IES, QTHR. Tel Bristol 500742.

Gone back to hf. Quartz 16, R3-7, S20-23, £99. IC255E, £199. Both used little, in orig packing. Will deliver Kent, Sussex, part Surrey, or buyer collects. G3TMT, QTHR. Tel Lindfield (04447) 3492.

Spacial movement detectors (microwave), £20 each. GPO autodiallers for home protection, etc, £15. Tandberg recorder, £20. Garex 2m tx/rx, £30. Breaking HQ1 Minibeam for spares. G4GZH. Tel 02406 3460.

FT200, FP200, superb cond, two years old, used little, spares incl 6JS6Cs, £240 ono. Three new PL509s, with bases, £1 each. 40V transformers for same, two, £1 each. MM 144/28LO, £11. 1155 x-over meter, £1. TA32 tribander, £28. Avo auto coil-winder, £20. Please add carr/post or buyer collect. G3ESB, QTHR. Tel Derby 671536.

SB104A digital transistor tx/rx, SB604 spkr cont, hb psu, Osker SWR200, £350. Icom IC215, S0, S20-22, 144·85, R4, orig pack, £80. Microwave Modules MMD050/500 freq counter, £40. G3RZC, QTHR. Tel 0424 892504.

Rotators, CD44, used but good, £65. Brand new 120V Ham 4, £130. IC202E modular 25W pa with preamp, £160. TR2200 fm, R5, R7, S22, S0, £70. R4C, four filters, £350. T4XC MS4, £350. All good cond. Tel Basildon 412435, evenings.

Tower, 24ft in three sections, guyable galvanized steel lattice, unused, £50. Tel Great Easton 250 (Essex).

Murphy B40 hf communications rx in wkg order, cw manufacturers' circuit diagram, many spare valves, components, radio magazines, offers please. Buyer inspects, collects. P. Cambridge, "Shorland", Low Ham, Langport, Somerset TA10 9DT. Tel Langport 250235.

FT101ZD, FC901, Shure 444, all new, boxed, unable to continue with cw, £500, no offers, please. Tel Nettlebed 641261.

Yaesu tx/rx FT101ZD, fan, mic, Yaesu transverter FTV901R, Yaesu antenna tuner FC901, Yaesu extention spkr SP901, Junka morse key, all items as new, comp in boxes with manuals. C. W. Barry, 50 Bayswater Road, Wallasey. Tel 051-638 3639.

AR240, nicads, charger, λ/4 whip, flex ant, case, £120 ono. TR2200G, nicads, charger, λ/4 whip, flex ant, power leads, S20-23, R0-2, 4, 7, £40 ono. G3NPS, QTHR. Tel 0474 67426.

TR2300, nicads, mobile mount, good cond, £135. R. Hiles. Tel Kirton Lindsey 648253, after 7pm.

Trio TR2300, boxed as new, nicads, helical, VB2200GX 10W pa, 5/8λ mag mount, all accessory leads, £200. M. Jay, 102 Nelson Road, Chingford E4. Tel 01-527 6775.

Drake R7/DR7 digital rx, unused, brand new, boxed, £825 ono. R7/TR7 tx/rx cable kit available, £15 ono. Genuine reason for sale. Tel 0602 54047, anytime.

FT101E, 350Hz cw filter, YH55 headphones, £450. ETM2B keyer, £20. 18AVT/WB, repaired 80m coil, hence, £15. Audio filter, £4. PM1X calibrator, £5. Carriage extra. G3VOK, QTHR. Tel 0582 52934, evenings, 0582 23729, daytime.

NAG144 lin amp, £330. IC202S, £130. MEL 202-25 lin amp, £20. G8BWR, QTHR. Tel Paul, Warwick (0926) 498388.

TR2200GX, 14ch, nicads, mains, 12V, chargers, mobile mount, helical, auto toneburst, orig packing, £110. Eddystone EC10 Mk2, mains, battery packs, 0·5-30MHz, Joystick system A, £120. G3TCG, QTHR. Tel Fairseat (0732) 822043.

IC215, 1·5yr old, S18-22, R0-9, nicads, charger, vgc, orig packing, etc, £140. Belcom scanner AMR104H, 8ch, S20-22, R0 i/p, o/p R6-7, rarely used, preamp fitted, mains, 12V, £45. Buyer collects. G8UDH, QTHR. Tel 0626 833337, after 7pm.

Trio TS510/PS510 tx/rx, 10-80m, 2X6146B finals, exc cond, £175 ono. G3SJH, 50 Christopher Road, Birmingham 29. Tel 021-472 8577.

TS520, mint cond, fitted cw filter, £325 ono. KW Vespa Mk2, exc cond, £85 ono. Both with handbooks, G3MKU, QTHR. Tel Shepshed 2611, after 6pm, weekends.

18AVT vertical antenna, used for one month only, £60. G4EGT, QTHR. Tel 0908 510148.

Marconi CR100 rx, 60kHz-30MHz, recently overhauled and aligned, £10. G4DTC, QTHR. Tel Caterham 47667.

FC301 atu, mint cond, 500W, separate meters for swr and power output, switches four antennas, £90. G3VLQ, QTHR. Tel Reading 599591, after 7pm.

Rad Com: 1977-9, all complete. FL2, as new, offers invited. D. Mathews. Tel 01-876 7868.

Miscellany comprising Mullard DP13·2 crt, new, compact commercial, partly wired hf pa chassis for two 4CX350, one base missing, 3×2·7kHz high quality xtal filter units, 1·6MHz carrier xtals, qty miniature 24V multiple dpot relays, one high quality 5MHz frequency standard, stability one part in 10^7, 10× HC6U 1MHz xtals, 21 BNC plugs, five BNC sockets, two right-angle BNC adapters, all new, no reasonable offers rejected. G3OFK, QTHR.

SSTV monitor, MK boards, preamp/filter, £40. W6MXV fast to slow scanverter, £40. Aztec fs camera, comp with manuals, will demonstrate, £60. Complete system, £120. Four 4X150As, two bases, all brand new, £6 each. G4DFU, QTHR. Tel 07737 60334.

Collector's WS No 58 Mk1, comp manuals, Braille set, vintage parts, Storno CQH1ZC valve, no mods, exchange or sell. G8XCQ. Tel 01-720 5839, evenings.

FT200, incl FP200 mains psu/spkr, spare valves incl pa pair, all of 10m, mic, handbook, Sentinel hf preamp powered by FT200, useful for 10m, £200. G4FFY, QTHR Sutton. Tel 01-642 9871.

Datong multimode audio filter FL2, as new, £68.

Oscilloscope, 3in crt CD6-3GP1, with graticole and base, £5. G4CNC, QTHR. Tel 01-363 1653.

FT202R, S17-18, S20-22, R7 fitted, R5, nicads, helical whip, vgc, £90. G8NDL. Tel 01-555 8898.

Datong up-converter model UC1, as new, £90. FT202R, comp with nicads, base charger, as new, £75. Benson, GM8EKF, QTHR. Tel 031-228 5341, office hours, or 031-552 1940, after 6pm.

Drake TR4CW, rit 500Hz filter, ac psu, RV4C remote vfo, Drake 7075 desk mic, £390 ono. Tel 0474 534694.

Trio JR599 Custom Special rx, hf amateur bands, incl 10MHz, 2m, exc cond, orig packing, handbook, £160. Mk123 "spy" tx/rx, 2-20MHz, accessories, spares, xtals, £60. G4HPQ, QTHR. Tel 021-777 6640.

KW2000B, exc cond, recently overhauled by KW, incl mains psu, Shure mic, £195. G4FJJ, QTHR.

Pye Westminster, W15FM, dashmount hi-band, one channel, less loudspkrs, unmodded, used little, vgc, manual, £55. Shure 444T mic, £20. Collect/carriage. G3DVK. Tel Rotherham 522759.

KW Viceroy Mk3 tx, £45. Buyer collects. *Wanted:* for Swan 500, model 410 or 406B. Model 405X. Model 22. G3YOC, QTHR. Tel 0709 873408.

FT101E, £420. IC22A, eight repeater, four simplex, etc, £110. Both as new, no mods, all leads and accessories. Prefer buyer inspect and collect. GM3JOA, QTHR. Tel Edinburgh (031) 669 2284.

TR2200GX, fitted 13 channels, vgc, S16, S20-23, R0-7, λ/4 whip, helical, charger, nicads, soft case, mic, manual, orig packing, £105. G8TQE, c/o 9 Vicarage Terrace, Cambridge CB1 2LU.

Trio R300 communication rx, antenna, Joymatch and Joystick antenna, £95 ono. Tel Looe (Cornwall) 4171.

JR599 Trio Custom Special rx, 250/12V operation, 160/2MT, wwv, a.m., fm, ssb, 100/25kHz calibrator, immac cond, no mods, handbook, £165. G3TRB, QTHR. Tel 09057 4806.

Icom IC700R solid-state, amateur bands, 80-10 rx, exc selectivity, ac, dc, leads, exc cond, ideal rx for swl, £85. *Wanted:* FV101Z. G3UZM, QTHR. Tel Exmouth (03952) 73090.

Icom IC22A, 10 channels fitted, £100. Pioneer TSX6 hi-fi car spkrs, brand new, unused, £45. All brackets and orig packing for both. G8SAS NOT QTHR. Tel Bob, Chertsey 66941, ext 27, days, Sunbury 88665 or Tonbridge 351361, evenings.

18AVT/WB surplus to requirement, comp with manual, approx 14m RG8/U coaxial, £40. Purchaser collect or carriage at cost. G3VPO, QTHR. Tel 0403 60216.

FTDX560, fitted blower, desk mic, KW E-Zee Match, speech processor, SEM auto preamp, PM2000 watt-meter, two spkrs, Yaesu filter, other items, £350 the lot or would split. Property late G4DGH NOT QTHR. Tel Guildford 505321.

FT101E, 350Hz filter, matching spkr, exc, £375. Drake R4B, £160. ACCU memory prog keyer, digital r/out, £45. G3RVM ult keyer, nicad, £17.50. 600Hz filter for FT101B/E, £10. QY4/250 with base, £10. Wilson, G3VMW, QTHR. Tel York (0904) 88464.

FT101E, immac cond, no mods, 350Hz cw filter, fan, £395. FT200/FP200, all 10m xtals, good cond, £195. TR2200GX, S0, S18, S20-24, R1, R3, R6-7, auto toneburst, nicads, charger, case, £110 ono. Brown, 14 Bernard Road, Cromer, Norfolk.

Zygi minibeam, 20m (*Rad Com* July 1973, October 1975), cost £30, £15. BTF 15dB BC221, vgc freq meter, mains psu, charts, £10. *Wanted:* Linear amp, KW1000, FL2100. G3JNY, QTHR. Tel Leeds 863058.

Brand new amplifier, solid-state, 144MHz fm/ssb, 90W out for 10W drive, £80. *Wanted:* Creed 444 or similar, w.h.y? Chris Pedder, G3VBL, Thorncliffe, 5 Royalty Lane, New Longton, Preston, Lancs PR4 4JD. Tel 0772 612289.

Drake R4C, additional xtals, £295. Buyer collects. G8KFR NOT QTHR. 4 Vine Close, Stapleford, Cambridge. Tel 0223 842223, evenings.

TR2300, nicads, charger etc, as new, 10W pa, £150. Awaiting G4, going hf only. G8VAJ, QTHR. Tel Royston (0763) 46472.

Merseyside Jaybeam Q6/2M 6-el quad, £18. Jaybeam UGP/2 ground plane, £5. Both ants exc cond, indoor use only. Two 49 note keyboards (Maplin), vgc, £12 each. Maplin spring reverb unit and driver module, £7. G3MKH, QTHR. Tel 051-334 2313.

FT101E exc cond, LLL fm, orig packing, £400. Disco/pa spkrs, 120W, 8Ω, £120 pair or £200 for four. Cowell model maker's lathe, £225 ono. GW4HDR, QTHR. Tel Rhyl (0745) 31980.

Multi 800D, comp with external readout, RF output, 1-25W, mic freq control, exc cond, £150. Will deliver and demonstrate within 25 miles QTH. G8GAG, QTHR. Tel 0789 4718, evenings, 0789 4646, office hours.

Creed 7B teleprinter, 250V ac 50 baud machine, £18. Elliott ET628 uhf base station, 10W, comp with manual, £30. Bay 96 varactor tripler, 15W in, 9W out, £9. GW8HDH, QTHR. Tel 0792 22287, after 6pm.

Trio TS520S with cw filter, two years old, used little, as new, £365. Yaesu FL200B tx, all hf bands, exc cond, £85 or exch for 2m gear with cash adjustment. G4IBG. Hove. Tel 0273 731391.

Sommerkamp, FL200B ssb/cw/a.m., 80-10m tx, 240W, Shure 201 mic, FR100B rx, double conversion, 80-10m, both items in good clean cond, no mods, spkr, comp station, £190. Prefer buyer collect. G2AQN, QTHR. Tel Scarborough 582493.

Heath SB104A 10-80m tx, 100W matching psu, spkr, external vfo, £375. RF1U sig gen, £20. SB610 monitorscope, £50. 2m SSM Europa FT101 cables, £45. Pye Cambridge 4m, xtals incl, £35. G3CDE, QTHR. Tel 0483 75236.

Trio TS520, perfect immac cond, fitted cw filter, comp with manual, orig packing, £350. Securicor extra. Free delivery within 50 miles. G3AGX, QTHR. Tel 0482 822276.

Yaesu FR50B rx, 10-80m built-in spkr, mint cond, £90 ono. Buyer collects. *Wanted:* Old type heavy brass morse key. Kershaw, 97 Winter Hey Lane, Horwich, Lancs BL6 7PJ. Tel Horwich (0204) 692912.

TH6DXX Thunderbird tribander antenna with balun, offers. *Wanted:* Mosley tribander. G4KDZ, Grays, Essex. Tel 0735 78783.

New Heathkit gdo kit, no assembly started, list price £50, accept £35 ono. LM14 frequency meter, psu, charts, manual, as new cond, £35 ono. Carr extra. G3NJP, QTHR. Tel Cranbrook (0580) 714482.

FLDX500 240 p.e.p., £160 ono. JR310 rx 10-160 ssb filter, calibrator, £80. Codar AT5 tx, 160-80 ac psu, £25. Mobile psu for AT5, £8. *Wanted:* FTDX401 and vfo 220-CS psu for Atlas 210. MFI transformer for Atlas 210. G4HFS, QTHR. Tel 032733 314.

Heathkit single paddle keyer, comp, £15, plus postage. G4AFW, QTHR. Tel 072 885 2464.

Original National Velvet Vernier, slow motion dials, 3in dia, large satin finish cal, skirt, ideal Z Match etc, new, £5 each. USAF, FL8, cw filter, £4.50. Both postage extra. *Wanted: Ham Radio, CQ* 1979-80, *Radio Constructor*, May 1965. 1177B v/tester, complete. G3GUU, QTHR.

KW Vespa Mk2, full o/p on all bands, £80. FR50B rx, 160m, 2kHz Toko filter fitted, both in mint cond, purchaser can air test, £80. *Wanted:* Triband beam and rotator, good cond. G3RXW, QTHR. Tel Hitchin 812611.

Trio TR7500, exc cond, complete as supplied, almost unused, £160. Myford ML7 lathe, motorized on stand, chucks, milling slide, many accessories, hardly used, £450. G3MKH, QTHR Merseyside. Tel 051-334 2313.

Viceroy MK and psu, £35. G3ZVC tx/rx, 1246AX, £55. HRO dial, four gang cap, £10. BC221Q, psu, charts, £25. Collins filter F455N20, £15. Daf rx, quartz B7G xtals, 598 dial, £38. 2XTT21, new, £10. G3PGZ, QTHR. Tel Fillongley 41685.

Trio TR7400A, 800 channel, 30W, 2m tx/rx, as new, in orig carton, originally cost £365, £180. Consider portable rig in part exchange. Microwave Modules MMT28/144 2m to 10m transverter, as new, cost £90, £60. G3SEV. Tel Southend (0702) 585548.

Liner 2, 2m ssb, fitted preamp, piptone, mobile bracket, manual, Belcom, Pye insert mics, switched rx input socket on back panel for use with transverter/linear, tx realigned 1977, £110 with h/b psu, £95 without. G8KYU, QTHR. Tel Luton 415846.

Eddystone 680X rx, £65. Marconi Atalanta rx, £35. No mods, both in good wkg order. G3WPI, QTHR. Tel 0703 734513.

TR2200GX, 12 channels, nicads, charger, orig packing, mobile mount, clean, used little, auto t/b, £115 ono. G4KTZ. Tel Camberley (0252) 879115.

Trio 2300 80 channel 2m fm tx/rx, vgc, comp with case, charger, mic, set of nicads, £140 ono. HF/vhf swr meter, wkg, £8.50. G8VTW, QTHR. Tel Ashburton 53194.

TR2300, 3SK88 preamp, helical, nicads, charger, etc, hb: 12-el ZL Special, 15W pa, spkr/12V charger unit, 1/4 mag mount, 7/8 gutter/bootmount, 12V psu, £220 ono. *Wanted:* Atlas 210/215 or similar 12V hf mobile rig. FT200 12V psu. G4IVF (Leics). Tel 0572 56012, evenings.

Westminster 10-ch bootmount, xtalled 70cm repeaters, good cond, manual, all accessories, £95. Eddystone 70-90MHz a.m./fm rx, clean, £30. FRG7 digital, slow speed tuning, ssb filter, £170. G3VZJ, QTHR. Tel Reading (0734) 413891.

FT202R 2m handheld tx/rx, six channels, used little, perfect cond, £85. G3KZU, QTHR. Tel Oxford (0865) 63000.

FT202R, 6-ch, 5 channels fitted, nicads, charger, £80. FT227R, used little, mobile mount, £180. R1475 plus power supply, £12. G8CZH. Tel 01-859 1852.

Realistic DX302, digital tuning rx, 0-01-30MHz, a.m., ssb, cw, supersedes DX300 analogue, nine months from new, prefer buyer inspect/collect, sae enquiries. Price when new £260, accept £180 for quick sale. McConnell, 415 Charter Avenue, Coventry CV4 8BB.

Heathkit HW101 tx/rx, HP23A power supply, recently realigned by Heathkit, new 6146s, £175. Heathkit HW202 2m fm, six channel scanner, HWA202-1 power supply, toneburst realigned Heathkit, 80m direct conversion rx, £15. G3RDK. Tel 01-856 7478.

Atlas 210X hf tx/rx, with legendary lack of cross-mod, psu, car mount, £295. Kenwood TS180S, 48hr use approx, offers. G4GPL. Tel 01-953 6921 (Elstree).

FT101E, £415. FV101B remote vfo, £50. YC601 digital readout, £75. SSM Europa 2m transverter, £25. Station late G6XY. Contact G3BHT, QTHR Sutton Coldfield. Tel 021-308 4764.

KW2000 cat, ac/psu, mic, £100. Pye four chan hf ssb tx/rx, ac/psu, less mic, £75. 24V dc/psu, £25. Bantam hb/fm, unmodified, £40. Pye a.m. base station, unmodified, £55. Carriage extra. Tel 0892 870479.

Yaesu FRG7, no mods, exc cond, manual, £145. Buyer collects. Tel Leicester 883232.

2m xtals, 8MHz and 45MHz types for many popular fm frequencies, incl repeaters, £1.20 each, sae for full list. Commercial 70-72MHz ground plane antenna, £10. High-power ac mains contactors, 24V coils, £1 each. G3NGK, QTHR. Tel 01-462 2178.

SB101, HP23 psu, SB600 spkr, mic, morse key, handbook etc, vgc, £280 ono. Command rxs, 190-550kHz, top-band, 6-9-1MHz, £4 each or £10 the lot. *Practical Wireless* April 1969 to June 1973, *Short Wave Magazine* January 1973 to July 1975, offers. *Wanted:* Old type computers, ie PDP8 or w.h.y? RX, ie R408, RA117, AR88 etc, or w.h.y? G4BXX, 79 Main Street, Cranswick, East Yorks. Tel Driffield (0377) 70683.

Complete hf station: KW204 ssb/cw tx, 160-10m, 180W input to two 6146Bs just replaced, fitted vox, comp with Shure 201 mic, mint cond, £175. KW202 rx, ssb/cw/a.m., 160-10m, matches above tx, with built-in peak/notch Q-mult, matching spkr, mint cond, £170. *Wanted:* two vhf sockets for 4CX250 with chimneys. G4JQN. Tel Westbury (Wilts) (0373) 864478, evenings.

Microwave Modules transverter, brand new, £130. Type MMT 432/144 70cm Yagi, new, £18. Hudson fm set, £25. FRDX400, £150. Tel 042873 5947.

FT101ZD with 350Hz cw filter, fan, YE7A mic, instruction manual, still under warranty, £495. G3PVA, QTHR. Tel 01-646 3738, after 6pm.

FT101 Mk1, 160m fan, cw filter, G3LLL clipper, G3LLL fm unit, spare pa valves, £330 ono. Jaybeam 4-el 4m Yagi, £12. MM432/28 transverter, £70. Magnum 2, £70. G3XTT, QTHR. Tel 0604 37894, after 6.30pm.

Transistor rx "Perdio", town country PR32, lw, mw, Trawler 1·6-4·7MHz, partly dismantled, does work but broken wavechange control arm, ideal spares or rebuild for 160, 80m, service sheet, circuit, £7 plus postage. G3MBL, QTHR. Tel 01-445 4321.

FTDX401 QRO tx/rx, 600Hz filter, spare pas, good wkg cond, buyer collects or Securicor extra, £200. Have two rigs, can only use one. GW4BNJ, QTHR. Tel Swansea (0792) 27886, after 6pm.

Trio R1000, latest filters, ac/dc, spotless, £235. National Panasonic NV7000B, new generation mains, colour video recorder, eight programmes over 14 days, still frame, half speed etc, used little, £530. JVC G71P TV colour camera, with Canon 1·9 6to 1 zoom lens, large electronic viewfinder, ac power adapter unit, cable, super carrying case, perfect, £500. Eddystone 880/2 rx, 0·5 to 30·5MHz in 30 bands, usb/lsb, cw, £240. Tel Bulls Green 219 (Welwyn, Herts).

Trio 2400, under warranty, orig packing, used very little, as new, £169. Leather case available. Going hf. Datong morse tutor, complete, orig packing, £39. G8TEZ, QTHR. Tel King's Lynn (0553) 841399.

Hallicrafters SX28 rx, 0·5-42MHz bandspread, selectable i.f. phasing, wkg perfectly all functions, spkr, spare valves, £35 ono. Taylor valve tester, £5. G3YYG. Tel 0442 64025, after 6pm.

IC202E ssb/cw, transportable nicads, £130. Microwave Modules 144/25 linear, used with above gives 30W out, £30. Tonna 9-el beam, £10. All in exc cond, plus carriage if necessary. G3KLF. Tel Fareham 236906, weekends or evenings only.

2m fm base station using ste 12 channel modules, 25W pa, £110. Marconi wavemeter TF643A, 20-300MHz (collectors?), £20. Telequipment S54AR scope, minit, £195. Metrawatt multimeter, £10. Various transformers etc. G8ATA, QTHR. Tel 04488 513.

FRG7 in exc cond, no mods, £135. G5VH, QTHR. Tel 0533 783197.

Trio R1000 rx, boxed, as new, £235. SP520, unused, £15. KW107 tuner, £85. Shure 444 mic, £20. LF30 low pass filter, unused, £8. G3MIN, QTHR, Shoreham Sussex, letters please.

KW2000A tx/rx, 160-10m, vfo transistor stabilized, comp with Sentinel hf auto preamp, handbook, immac, £210. Jaybeam C5 2m colinear, as new, £25. Both buyer collects. G3TSL, "The Shaftsbury Private Hotel", 26 Shaftesbury Avenue, Blackpool. Tel 0253 52453, anytime.

Yaesu FT501, FP501, 10-80m 500W, dig readout, vgc, £355. *Wanted:* Europa 2m transverter. G3UFX NOT QTHR. Tel Freshwater (IOW) 3453.

Magnum 2 144MHz transverter, suits FT101 range, £50. Trio MC50 desk mic, £12. Thompson 1in Vidicon

tube TH9828, high sensitivity industrial grade, £25. Poulter, G3WHK, QTHR. Tel 01-330 5795.

16mm reflex cine camera, three lens, two telefoto, one standard, case, filters, exchange for 2m rig, valued around £200 complete, camera recently valued, £250. G3WNM, QTHR. Tel 01-959 4781.

Drake TR4C 300W tx/rx, Drake mains psu, Drake MS4 spkr/case, £365. Labgear 160 twin, £30. Labgear mains psu, £20. Mains psu, 400V, 6·3V, £30. Labgear mobile psu, £30. Buyers inspect, transport at their expense. Tel Bradford 596584.

Single pen recorder, 4mV sensitivity, mains, £15. 0-32MHz wideband amplifiers, 45dB, £15. Record single chart recorder, 1mA, £12. Racal MA350A decade synthesizer, £60. Transformers (10) 117V, i/p, 12·5-0-12·5, 2·8A, £1 each. 115V geared motors, 75p. Tel Cheltenham (0242) 41666.

Computer bargain: must sell the following S100 boards (all are Ithaca pcbs and are well made), vdu, almost complete, eprom, complete, cpu, half-finished, 8k static ram, complete, first £100 secures. SAE G8POO, QTHR. Tel Stocksfield 3449.

FT221, vgc, five xtal channels, preamp, £295, buyer to collect. G8HRT, QTHR. Tel 0625 876970.

Professional stereo tape recorder TRD600, Richardson link, three motors, three heads, ppms, nab spools, line input, output balanced mic, input, monitor amps, xlrs, £165 ono. Moss, Surbiton, Surrey. Tel 01-337 7309.

Drake R4B, MS4 spkr, vgc, several extra xtals, £190. G8TQT. Tel Bournemouth 420666.

Yaesu FV107 external vfo, FC107 antenna tuner, £69 each. 160m antenna traps, unused, £5. All plus postage. G2KF, QTHR. Tel 072-681 2337.

Pye Cambridge, boot mount, all complete, good quality fm, fitted R0, R6-7, R3, S20, S22, vgc, £40 ono. BC221 wavemeter, mains, charts, handbook, £20. Collins TCS12 rx, £10. Class D wavemeter, no charts, £5. All carriage extra, or buyer collects. G3OXG, QTHR. Tel 0767 260462.

FT227R memory, scan, £175. FT221R, exc cond, £255. Home brew 90W linear, £60. Double beam scope, all in wkg order, £80. G8VHK, QTHR. Tel Mike, 09063 63571, after 8.30pm.

HF5 five-band vertical antenna, HF5R radial kit, £40. 6800 micro system, 12k ram, 16k eprom, containing 8k basic/editor/assembler, keyboard, professional monitor, cassette i/f, printer port, psu, documentation, cost over £700, best offer over £300. G3TXQ, QTHR.

TR2300, as new, orig packing, £145. RA17, £125. Pocketfone 70, vgc, RB14, SU8, £49.50. 5/8 mag mount, unused, £7.50. AC30 cassette interface, £8. S14 xtals for standard C146A. Webb, 91 Gallows Hill Lane, Kings Langley, Watford, Herts. Tel Kings Langley 64172.

Lafayette HA600A rx, bandspread, transistors, 150kHz-30MHz a.m., ssb, £50. Eddystone EC10, £70. Both first class order. G4JFE, QTHR. Tel Newbury (0635) 41613.

IRCs, over 500 for sale, post office price 25p, my price, 18p. Send cheque/po plus sae. First come, first served. PO prices rising soon. P. L. Reed, 73 Dudley Road, Brighton, Sussex BN1 7GL.

Icom 211E, all mode 2m 10W digital readout, works off either 240 ac or 12 dc, used few hours only, owner concentrating on hf, £310. G4HQV, QTHR. Tel 0590 77815.

FT101EE, mint, used very little, new driver pas, KW E-Zee Match, £380. Jaybeam phasing harness for large 2m ants, £4.50. 14-el Parabeam, 88 set, psu, B44, class D, £10 each. AM10B on S20, £25. G8NQP, QTHR.

Datong FL2 filter, perfect, £50. G4BRF, QTHR. Tel Polperro 72349.

FT101, £240. HF preamp auto by Sentinel, £11. Tech Assoc compressor, £15. G-whip for 10-15-20, £25. New, can assist delivery. G3RQG, QTHR Sussex. Tel 0444 52452.

TS900, PS900, DC900, unused mobile, used only as second rig, checked, mint cond, £400. VFO900, £100. KW109 Supermatch, £105. GM4AGS, QTHR. Tel 0382 543113.

WANTED

For repeater project: Pye uhf Westminster W15U, or Pye 460. G3YBY, 27 Lockey Road, Shepton Mallet, Somerset. Tel Shepton Mallet 4191.

Decent scope at reasonable price or would exchange uhf Westminster fm. G8BOY. Tel Cholesbury 260.

Radio Communications: January, February, August 1975 to complete a club's set. Price and cond to G3XCS, QTHR. Tel Saltash (075 55) 2082.

Bandspread coils and manual for HRO, MX, or photocopy last. International Radio Tube Encyclopedia (Babani) *circa* 1955. All offers answered. Askey, 4 Keswick House, Lowth Road, London SE5 9NL.

Would technically skilled member consider designing and building two electronic circuits for frequency and level measuring purposes for visually handicapped operator? Expenses paid. G3VWE, QTHR.

Security tv video monitor, National WV411N/B, and camera WV401, by Matsushita, comm circuits and manuals if possible to buy or copy. All costs refunded. GW3SIY, QTHR. Tel Swansea 403527.

32V and 75A series tx/rx circuit of R210. Cabinet for S27. Transformer 7·5V at 51A. *QST* for 1979 and prior 1948. *CQ, T & R Bulletins* for collection. Have approx 150 duplicate *CQ/QST* to sell or exchange. Baker. Bontnewydd, Aberystwyth, Dyfed. Tel 097-421 608.

TR7500, TR7200G, TR2300, MMT432/144R. G8ATA, QTHR.

Redifon marine type h/f tx/rx, 230V. Small swr meter to 170MHz. 5/8 2m bumper mount antenna. *For Sale:* Hi-band Westminster, complete, £50. G3DVF, QTHR. Tel Alnwick 602487.

MK14 micros, preferably new rom, needed for educational purposes. Details/price asked. G8BGW, QTHR. Tel Matlock 3206.

Manuals/circuits, for Redifon GR336 and GR286 rts. Xtals for same. Admiralty handbook, BR1451 (Decca) or similar information. GW8TSP, QTHR. Tel Neath (0639) 820356.

TR2300, comp with all accessories (as new), nicads, any age of equipment considered, must be good wkg order, will also consider Z5800. All offers considered. Alistair Rosser. Tel Chard (04606) 3192, 8-9pm only.

Telford TC10 multimode tx, circuit diagram, any other paperwork applicable, photocopy acceptable, will pay expenses incurred. G8YAL NOT QTHR. 8 White Hart Street, East Harling, Norwich, Norfolk. Tel Peter, East Harling 330.

Honest FC5M freq counter, cct details or UK equivalent of JA ics used. Would also consider US one for spares. Costs refunded. Lockwood, G3XLL, QTHR. Tel Mellis (Suffolk) 596, or Ipswich 57607, daytime.

Service manual for FT101. Solar or wind-driven generator battery charger for boat. GW3VFZ, QTHR.

HF linear using pair 813s, must have spare 813s incl and heavy duty psu for 230V ac, mains-no rubbish. Advise price incl shipping to N. Yorks address. Geoff Smith, VS6GS, c/o 39 Hungate, Brompton, Scarborough, N Yorks.

Round plastic tuning scale, 01-100 for old Hallicrafters rx, S20, S20R. Part 76279 83-004, or scrap rx for spares. Desyn indicator, square front, 2·5in diameter, marked gallons. Potentiometer, 360°, aluminium housing. G3MBL, QTHR. Tel 01-445 4321.

Trio VFO5S, large roller-coaster and wide-spaced split-stator capacitor for hf atu. 10m bandspread coil for HRO or winding details. Whatton, G4DCV, 199 Gladstone Road, Walmer, Deal, Kent. Tel 0304 840671, ext 56 (work).

Codar AT5, 160/80m a.m. tx. G2BKO. Tel Evesham 830525.

12V mobile psu for KW2000A/B, G-whip, multi-mobile or similar hf mobile antenna with lf coils. 12V 3A mains psu. G4IRD, QTHR. Tel Wolverhampton 755468.

P40/60 tower with base, heavy duty preferred. Tribander TH3 Thunderbird or similar. Heavy duty rotator. Prices and details to G8FUO. Tel Windsor 61723.

Handbook for Airmec sig gen type 201. RTTY 5 unit blind perforator. Tel York (0904) 706453, evenings.

Pye Pocketfone PF2AMB low band, must be working or fixable, good price paid. Aberdeen Mountain Rescue Team, c/o A. V. Rae. 18 Turnberry Crescent, Aberdeen. Tel 0224 703745.

Rotator, CD45 or similar, repairable unit considered, will collect reasonable distance Birmingham. G8ZFE. Tel 056 42 3200, anytime.

CW 80-10m tx, about 75W input, need not be working, old a.m. cw tx would be suitable. G4JNG. Tel Bewdley (Worcs) 400295.

Mobile rallies calendar

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

15 March—Pontefract & DARS Components Fair, Carleton Community Centre, Pontefract. Open 11am. Talk-in, on-site parking, licensed bar, bring and buy, RSGB publications. Emphasis on build-your-own. Details from G4AAQ, QTHR, tel 0977 71071.

12 April—White Rose Rally, West Park Girls High School, Spen Lane, Leeds 16, 11am. Usual attractions, good food a speciality. Further details from rally manager R. Hughes, G4DZI, QTHR.

26 April—Drayton Manor Mobile Rally, Drayton Manor Park, on A4091, nr Tamworth, Staffs. Organized by Midland ARS and Stoke-on-Trent ARS. Start 11am. Attractions include trade stands, Post Office, BM/CB Repeater Group, Raynet, flea market and bring and buy sale etc. Radio talk-in on 144 and 432MHz. Further details from N. Gutteridge, G8BHE, QTHR.

26 April—Southend & DRS Mobile Rally, Southend Airport Exhibition Centre, Aviation Way, Southend-on-Sea, Essex. Many attractions, including licensed bar, refreshments, parking for 300 cars, aircraft museum, talk-in station, bring-and-buy stall. Details from F. Thorogood, G8ORV, QTHR, tel Southend-on-Sea (0702) 616239.

24 May—East Suffolk Wireless Revival, Ipswich. Talk-in on 144MHz by GB4SWR. There will be a transceiver clinic and antenna testing range plus all the usual attractions: sideshows, stalls, light refreshments and bring and buy etc. Further details from Jack Toothill, G4IFF, QTHR. Tel 0473 44047.

31 May—Hull & DARS Mobile Rally, Hull University. Further details later. Contact I. B. Carress, G8EAH, 124 Dayton Road, Priory Road, Hull, Yorks.

14 June—RNARS 21st Birthday Mobile Rally. HMS Mercury, 10am-5.30pm. There will be talk-in on 432, 144 and 3·5MHz. Plenty of parking, with on-site space for invalid visitors. The usual trade stands and arena events will be present. Details from G4DIU, QTHR.

21 June—Denby Dale & DARS Mobile Rally. Shelley High School, nr Denby Dale. More details at a later date. Enquiries to J. Clegg, G3FQH, QTHR.

28 June—Longleat Mobile Rally, Longleat Park, Warminster. Preliminary enquiries, G4FRG, QTHR. Tel 0272 848140.

12 July—Worcester & DRS Rally, formerly Upton Rally. **New venue**: Droitwich High School, Droitwich, Worcs, three miles from M5, junction 5. Further information will be announced later. Details from Tony Blisett, G8NSL, QTHR, tel Worcester 620507 or Mike Tittensor, G4EKG, QTHR, tel Evesham 41105.

19 July—Sussex Mobile Rally, Brighton Raceground, Racehill, Brighton, Sussex, 11am. Special event station GB2SMR will be in operation. Many attractions including free minibus trips to Brighton beach. Free parking for 4,000 cars. Further details from A. K. Barker, 38 Elphick Road, Newhaven, Sussex BN9 9SY.

19 July—Cornish RAC Mobile Rally, at the Cornwall Technical College, Pool, Camborne. Details from G2ABC, QTHR.

9 August—Derby & District ARS Mobile Rally. Lower Bemrose School, Littleover, Derby, site as previous years. All usual attractions. Details from hon sec Jenny Shardlow, G4EYM, QTHR, tel Derby (0332) 556875.

20 September—Peterborough Mobile Rally. Venue to be arranged. Details from D. T. Wilson, G4KSW, 4 Conway Avenue, Peterborough. Tel 76238 after 2pm or weekends only.

Looking ahead

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

29 March—Northern Radio Societies Radio and Electronics Exhibition, Belle Vue, Manchester.

11 April—RSGB National VHF Convention, Sandown Park Racecourse, Esher, Surrey.

27 April-1 May—IARU Region 1 Triennial Conference, Brighton.

28-30 May—RSGB National Amateur Radio Exhibition, Alexandra Palace, London.

12 September—Scottish Amateur Radio Convention, Glenrothes.

27 September—Welsh Amateur Radio Convention, Blackwood.

10 October—Midlands VHF Convention, Wolverhampton Polytechnic.

11 October—EI/GI Convention, Ballymascanlon.

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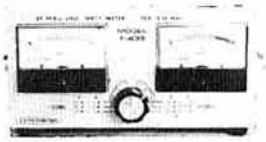
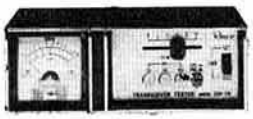
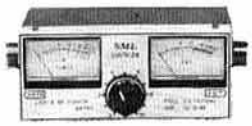


T-435: VHF/UHF swr and power meter with 2/20/120 watt through line power measurement **£34.95** inc. VAT. P&P 75p.



UH74 SWR and power meter switchable HF, 2m and 432MHz with remote head at **£16.39** inc. VAT. P&P 75p.



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MMC432/144-S	(70cm converter)	29.90	A
MMC1296/28	(23cm converter, 10m output)	32.20	A
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MMD050/500	(500MHz digital frequency meter)	69.00	A
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MMA144V	(2m RF switched preamplifier)	29.90	A
MMA1296	(23cm preamplifier)	29.90	A
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MMF144	(2m filter)	6.90	A
MMF432	(70cm filter)	6.90	A
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MMV1296	(70cm to 23cm varactor tripler)	34.50	A
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MMT144/28	(2m linear transverter)	99.00	B
MMT432/28-S	(70cm linear transverter)	136.85	B
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MMT70/28	(4m linear transverter)	115.00	B
MMT70/144	(4m linear transverter)	115.00	B
MMT1296/144	(23cm linear transverter)	184.00	C
LINEAR AMPLIFIERS:			
MML144/25	(2m 25 watt linear amplifier)	48.30	B
MML144/100	(2m 100 watt linear amplifier)	142.60	D
MML144/40	(2m 40 watt linear aimplfier)	69.00	B
MML432/20	(70cm 20 watt linear amplifier)	69.00	B
MML432/50	(70cm 50 watt linear amplifier)	113.85	D
MML432/100	(70cm 100 watt linear amplifier	228.65	D
RECEIVE CONVERTERS:			
MM2000	(RTTY to TV converter)	169.00	B
MMC28/144	(10m converter)	24.90	A
MMC50/28	(6m converter)	24.90	A
MMC50/28LO	(6m converter)	26.90	A
MMC70/28	(4m converter)	24.90	A
MMC70/28LO	(4m converter)	26.90	A

THE ABOVE PRICES ARE INCLUSIVE OF VAT BUT NOT POSTAGE. PLEASE ADD POSTAGE TO THE ABOVE PRICES AT THE FOLLOWING RATES:
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Please add 30p for post and packing, orders over £3 post free.

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KIT A	Complete Kit inc. programmed EPROMS and instructions	**£87.40**
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KIT C	2 × programmed EPROMS	**£19.55**
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rf technology from G4DGU

January is traditionally a time for taking stock and making resolutions for the New Year. 1980, despite all its problems was a good year for muTek. We've learnt a great deal about our strengths and weaknesses, and will hopefully be able to apply these lessons to our activities in 1981.

We try very hard to make sure that no request for date goes unanswered, sometimes though, the sheer complexity of the questions that we've been asked means that a particular query gets put to one side until we've time to answer it properly! The best way of getting any data other than that on our standard data sheets is to 'phone! Give us a jingle!

The "Moonbeam"
Some of you will have seen this at Leicester. Although this 432MHz long-yagi costs substantially less than anything else on the market, its performance isn't compromised. By passing the savings that we make by supplying the elements uncut along to you, we allow you to use the cash for something more useful like better feeder or even another antenna.
1—£16.50 2—£32.00 4—£63.00 8—£116.00
Carriage—£1.50 per antenna

FT221/225GT front-end board
This board will transform the receive performance of most standard '221's and 225's. The 2dB noise figure and excellent dynamic range performance provide a receiver which will be very significantly more 'crunchproof' than most with receive sensitivity essentially limited by external noise. **£53.87**

1·3GHz low-noise amplifier
This preamplifier uses an NE64535 in a very carefully optimised teflon-glass microstripline design giving a *genuine* noise figure of less than 1·8dB (typically 1·65dB) quite reproducibly without tweaks! By adopting this approach, which requires a fairly sophisticated understanding of low noise amplifier design, we are able to keep our manufacturing costs, which directly influence our selling price, very low.

Our noise figure spec. is very much in line with the device-manufacturer's claims, when the inevitable losses in the input matching network are taken into account. Of course other people claim lower noise figures, although these don't stand-up to rudimentary analysis (unless they've developed some completely new technique—superconducting microstrip perhaps?!) We sleep more soundly by avoiding hi-fi style specmanship and sticking to good engineering practice.

Unboxed (with BNC or SMA connectors) **£22.72** Boxed **£30.81**

144MHz preamplifier
Many of our comments regarding specmanship apply to this amplifier. We obtain nf's of less than 1·5dB (this equates with perhaps 1·1dB in black-box land . . . .) with an associated gain of about 15dB. The pass band is flat to better than ±0·5dB over the 144-146MHz band with greater than 50dB rejection at ±12·5MHz.
Boxed **£17.72** Unboxed **£10.79**

Microwave system components
We haven't really the space this month to list these goodies. We've held back in the production of new data, as several new items have been due for introduction and our move slowed this up rather. It should be available in the very near future.

Kungsimport Antenna Combiners
Prices and other details are listed in previous ads. We now have Ben's dish feeds available at £30 for both the 1·3 and 2·3GHz versions: they really are very well made in brass and are fitted with an integral 'N' connector.

TVI filter
This is a bandpass filter covering the 470—860MHz band, synthesised using microstripline techniques. Many people have found it very useful in dealing with TVI from both hf and vhf transmitters. **£1.80**

NEC rf and microwave semiconductors
A large selection available ex-stock. Prices are as before, with the exception of the 3SK88 which has now been reduced to **£1.53**

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FDK 750E 2mtr FM, SSB, CW, Tcvr. Dig. Readout.	**£299.00**
Daiwa SR9 2mtr monitor Rec, VFO + 11 fixed positions	**£46.00**
R517 Aircraft Band monitor Rec. VFO + 3 fixed positions	**£49.75**
REGENCY Digital Flight Scan Air Band Rec. with Memory	**£215.00**
REGENCY M100 Digital FM Scanning Rec. 66-90MHz, 144-174MHz, 440-512MHz	**£199.00**

DM350 50K PTT Mics. **£4.83** + 30p P&P. DL20 Dummy Loads, 15W (30wpk) **£6.04** + 30p P&P. AY3-8500 games chips, **£2.00.** FND500 com. cath. displays **£1.00.** 40kHz Transducers **£4.25** pair. Electrolytics for linears, 400Mfd. 400V, and 700Mfd, 350V, **£1.20** each + 30p P&P. MICROWAVE MODULES 2mtr, 70cm, 23cm converters. 2mtr and 70cm transverters. ASCOT, BANTEX and JAYBEAM AERIALS. VERO Products, Alloy and Plastic Boxes, Resistors, Capacitors, ICs. Transformers, etc. BERNARDS and R.S.G.B. Technical Books.

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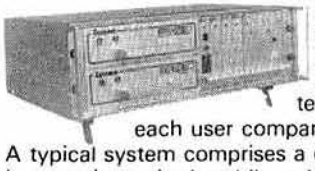
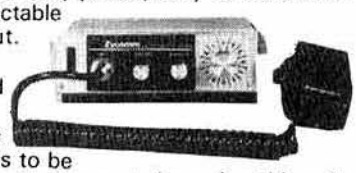
Why details of our PMR equipment?

Firstly, the skills and test equipment necessary for successful operation and development of equipment for use in this field must ultimately benefit the purchaser of both amateur and professional equipment from full time specialists.
Secondly, many amateurs are associated with professional communications, and we hope they may welcome this brief description of our activities and products.
We supply two way radio systems to many local authorities, commercial organisations and emergency services.
The Home Office granted Zycomm the first licence to install a reverse frequency operated community repeater. Sited near GB3DY, the repeater gives extended coverage over difficult terrain, and removes the need for each user company to install a costly base station.

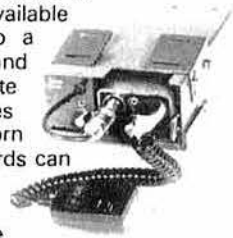


A typical system comprises a desk mounted control unit at base and standard mobiles with tone/logic boards in each vehicle. The repeaters are built by us in the United Kingdom, and use a range of sub audible tones to give privacy to individual users.

The FM2512 mobile is a realistically priced, easy to install unit offering up to 12 switch selectable channels and 25 watts output. The units are beautifully manufactured with pocketed die cast frames for effective screening, and which enable our custom built logic boards to be firmly installed. A mains operated base station using this unit is also available.



For operation on a portable/mobile basis, the rugged FM26 series have proved very popular and reliable. This handheld unit accommodates up to six channels and is provided with interchangeable NiCd battery packs, giving extended service whilst away from a power source. A mobile mount / charger is available to allow rapid connection to a vehicle mounted antenna and battery charging. A remote microphone/speaker facilitates vehicle mount and body worn use. Selcall and CTCSS boards can be installed.



Space prevents detailed mention of several new items which are currently undergoing Home Office approval and due to be announced in the next few weeks.
Full details are available to interested parties on all our professional equipment.

Zycomm Electronics Ltd. G3ZYC G8CNB G3NJX G3ZYD G8ZYC

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G3PSM *G8SMC* *G4JNN*

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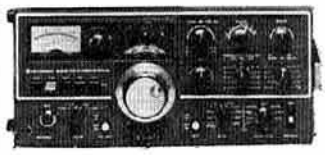

TS520SE 160-10m **£437**

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Including the three new bands

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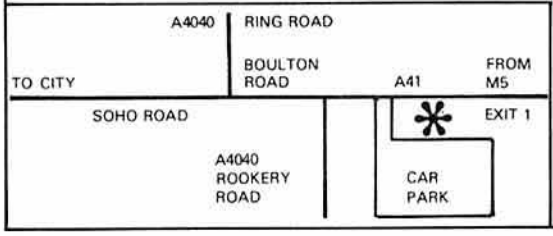
Also evening or weekend, ring Tony G4CLX on Kidderminster 851255



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TIME EXACT?

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LINEAR OKAY? Check it with a Two Tone Oscillator, **£11.70**

MISSING DX? Make them HEAR YOU with a Speech Compressor, between your microphone and transmitter, BOOST your POWER up to four times, FIGHT THROUGH, **£9.90.**

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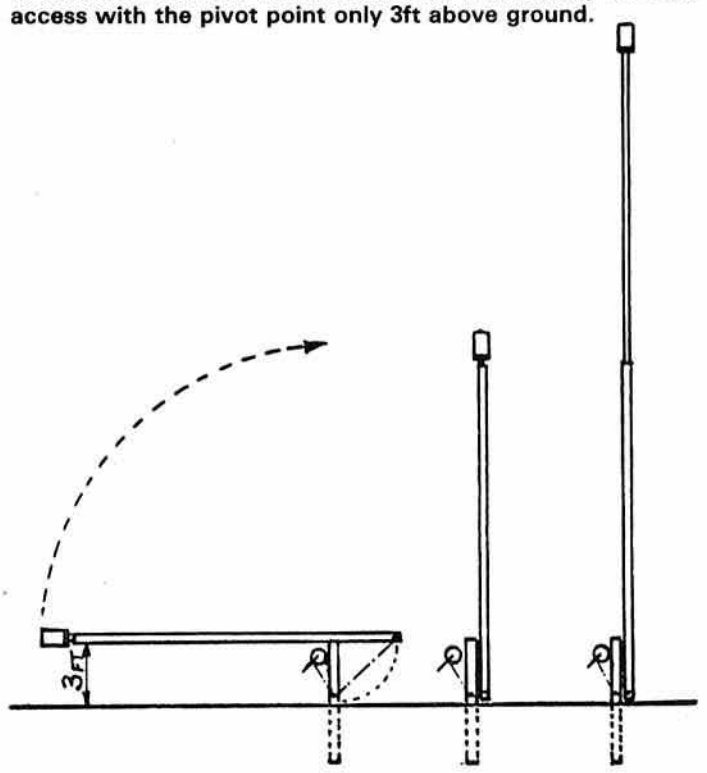

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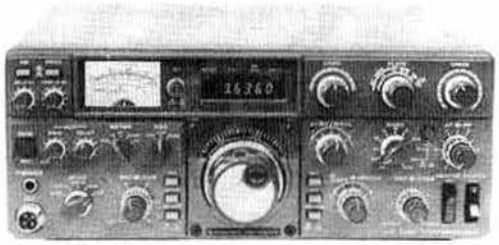

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TS-830S FEATURES

- ★ 160-10 metre coverage, including 3 New Bands
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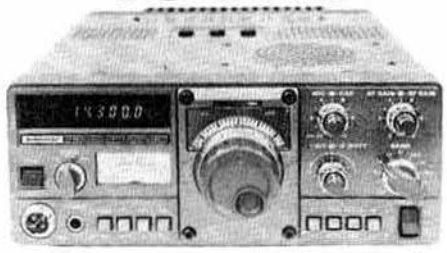

The TS-130S series is an incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3·5 to 29·7MHz (including the three new amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (for both SSB and CW modes), and optional (DFC-230) digital frequency controller.

TS-130S FEATURES

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- ★ 200W PEP input (SSB), 160W dc input (CW) on 80-15m
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DUE IN SHORTLY SWAN ASTRO 103BX 9-Band HF.

Standard C8800 2mtr Standard C7800 70cms
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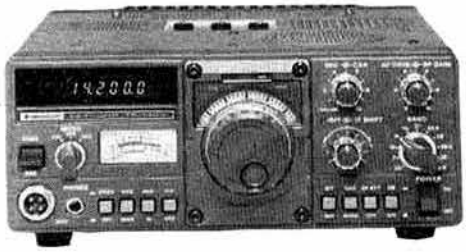

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RX	70FM05R	47.25	38.50
70cms Multi-channel TX	70MC06T	18.10	11.30
RX	70MC06R	26.05	18.60
70cms FM Package (70FM05TR + MC)	70PAC	110.00	82.00
70cms Power Amps 0·05–1W	70FM1	11.25	6.25
0·5–3W	70FM3	16.80	11.80
0·5–5W	70FM5	17.40	12.75
0·5–10W	70FM10	29.35	20.90
3·0–10W	70FM10/3	18.80	13.95
70cms Pre-Amp (Bipolar)	70PA2	6.55	5.10
70cms Pre-Amp (MOSFET)	70PA3	7.25	6.10
70cms Pre-Amp/Power Amp	70PA/FM10	39.80	30.80
2M FM TCVR (1·5W) TX	144FM2T	30.25	21.15
RX	144FM2R	49.80	40.70
2M Synth TX	SY2T	23.10	17.25
2M Synthesiser Mk II	144SY25B	69.70	50.95
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2M Synth Mk II 70cms Adaptor	SY25S70	5.95	3.65
2M Synth Scanner	PROSCAN1	20.10	14.75
2M Synth Display (2 pcbs)	DISP1/2	20.15	15.80

PROJECT	CODE	ASS'MBL'D	KIT
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144FM 10A with full c/o	144FM10B	28.90	22.90
2M Linear Amps 1·5W–10W	144LIN10A	23.35	17.66
144LIN 10A with full c/o	144LIN10B	30.45	24.55
2M Pre-Amp (3SK88/BF981)	144PA3	7.50	6.25
2M Pre-Amp (3N204)	144PA2	7.35	6.07
Toneburst	TB2	6.05	3.10
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Above is a brief listing of the current product range as full kits. These cannot be split and sold in component parts. We do have, however, many components that are hard to get for the average amateur which include 23cms pre-amp boards and devices (NE64535), diecast boxes, chip resistors (51Ω and 100Ω). PTFE trimmers, Mullard thick film amplifiers (OM335, OM361) etc. A large SAE (A4 size) will bring you the latest lists and new projects. The range is constantly expanding and it is worth giving a call if you have a simple query on TADLEY (07356) 5324 or BASINGSTOKE (0256) 24611 during evenings and weekends. The above prices include VAT at the current rate. Please include 60p on your total order for post and packing. The kits include all pcb components except crystals unless stated otherwise. Suitable boxes and external hardware is not supplied in the kit but some suitable stock is held. Any kit purchased from the range will be gladly serviced but a £2.50 cover charge would be appreciated on larger items. All items in kit form are usually ex-stock either with us or our rally agent J. Birkett of Lincoln. Assembled items unless stock will be 10–14 days from receipt of order, and will be tested and aligned to specification.

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An all band (160 to 2m including 4m) all mode transceiver, with a specification to suit the most discerning operator.

VOX and speech processor as standard. 10 watts output SSB/CW/FM – 5 watts AM Mains or Battery, large LED frequency display.

LIST PRICE:
Fitted 2.4 KHz filter £799.00 inc VAT
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432 MHz Transverter (ordered with F850) £100.00 inc VAT

Ci-110 Mk2 POWER AMP

A Solid State, all modes unit covering 1.7 to 38 MHz. Typical power output 130 watts for 215 watts DC input and 4-7 watts drive (15 watts SSB). RF sensing VOX circuit. Switchable receive pre-amp. Supply requirements: 13.8V at 20A, Negative Earth. Size: 5" w x 7" l x 3" h. Weight: 2.5 lbs.

PRICE: £95.00 inc VAT

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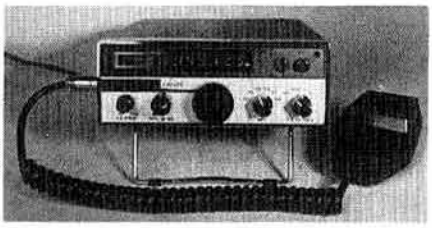

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PRICES: Z5800 £175.00 inc VAT
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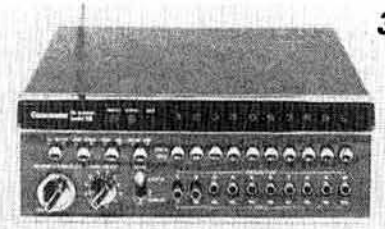

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A compact unit suitable for fixed or mobile service, giving the option of scanning in user programmed order up to 20 channels in the 430-470 MHz, 140-175 MHz or 68-88 MHz frequency ranges.

Manual/automatic and fast/slow scan with channel lockout and delay. Mains or battery operation. Vehicle Mount Supplied.

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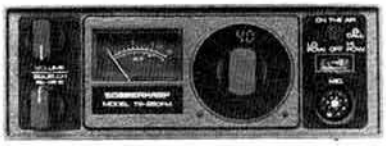

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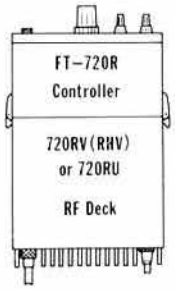

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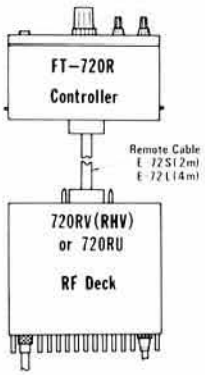

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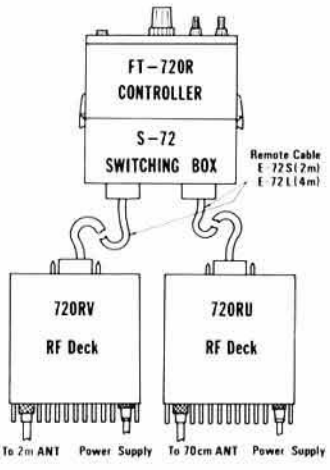

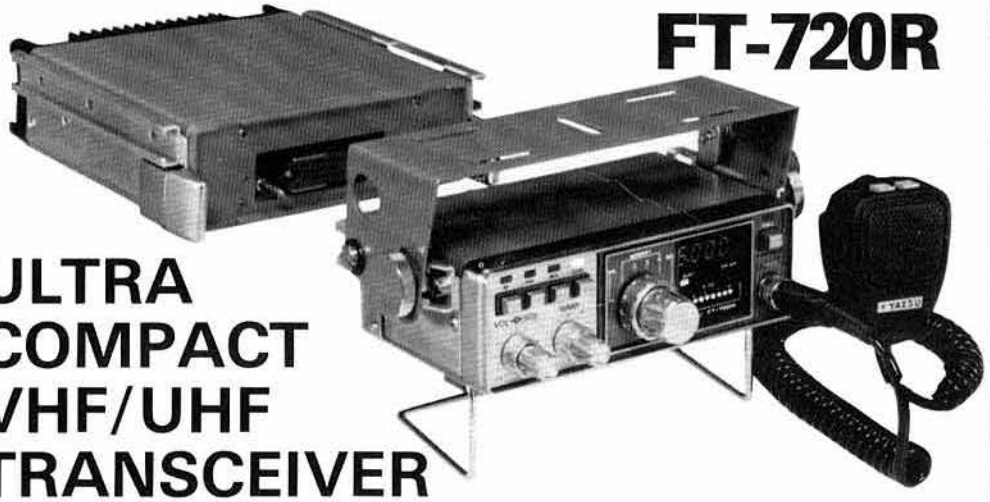

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