

Amateur

# RADIO

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On test: Trio TS440S mobile HF transceiver

AMRAD 10GHz SYSTEM

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FT203R-FBA5	2mtr H/H 1.5W	172.50
FT203R-FNB3	2 mtr H/H 2.5W	189.00
FT203R-FNB4	2 mtr H/H 3.5W	195.00
FT209RH-FBA5	2 mtr H/H C/W empty b/case	220.00
FT209RH-FNB3	2 mtr handheld 3.7W	239.00
FT209RH-FNB4	2 mtr handheld 5W	245.00
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FT690R	6 mtr multimode transceiver	249.00
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FT703R-FNB4	70cm H/H 3.5W	235.00
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AT150	Matching automatic ATU for IC735	
BC35E	Desk-top charger for all nicads	59.00
BP3	Standard Nicad pack	26.00
BP4	Empty battery box for cells 6X	8.50
BP5	High capacity q/charge 10.8V Nicad	49.50
DC1	12V mobile regulator pk (2E)	13.25
EX243	Curtis keyer unit for IC735/745	53.00
EX257	FM unit for IC735	35.50
EX310	Speech synth. unit for 271 etc	39.00
HP1	Mono headphones	28.50
HS10/HS	Headset and boom MIC assy + switch	37.50
IC-AHI	3.5-30 MHz mobile ant.	189.00
IC-AT10	100W auto ATU	299.00
IC-AT50	500W automatic ATU	435.00
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IC-PS30	Power supply unit 25A cont.	275.00
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IC271E	2 mtr all mode 25W b/stn	699.00
IC271H	High power 100W version of IC271E	875.00

IC27E

IC27H

IC290D

IC290E

IC2E

IC2KL

IC3200E

IC471E

IC471H

IC4E

IC505

IC735

IC745E

IC751E

IC04E

ICR71

LC11/14

LC12/3

PS15

PS20

PS25

PS35

PS55

SM6

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25W 2 mtr FM mobile 9 memories	359.00
45W version of IC27E	389.00
25W version of IC290E	469.00
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All band all mode l'ceiver	
32 mem	1250.00
70cm LCD keyboard entry	
handheld 2W	265.00
All band short wave l'ceiver	
32 mem	699.00
Leatherette case assy for IC02/4E	6.50
Leatherette case for IC2/4/E	4.99
External power supply 20A	139.00
External PSU l/speaker	
20A	175.00
Internal PSU for IC751E	95.00
IC751 int. switch mode PSU	169.00
Matching power supply unit for IC735	165.00
Desk for microphone	39.50

**RWC TOP 100**

AM303G	Base stn FM/SSB m'phone	39.95
AM503G	Base stn FM/SSB comp. mic	52.50
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ALM-203E	2 mtr H/H transceiver 3.5W	239.00
ALR-206E	2 mtr 25W mobile l'ceiver	295.00
EDH-25	DC/DC 12V converter	13.50
EMS-20	Speaker MIC for ALM203	18.50
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DM301N	600 OHM replacement noise can. MIC	7.50
10FM-HW	10FM-portable 'HOT-WIRE' ant.	7.99
TRAV-JIM	Travelling Jim portable 2 mtr ANT	7.99
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572B	PA valve	54.00
LS88B	8.OHM replacement ext. loudspeaker	6.60
SA450M	2 way 2.5KW coax switch 0-900MHZ	17.50
FDK 725X	2 mtr 25W FM mobile transceiver	269.00
FDK	2 mtr multimode transceiver	389.00
750XX		
2MTR	Gamma twin slim Jim type ant.	9.50
S-JIM	3-5 AMP power supply unit	19.50
3-5A PSU	Straight key	29.25
HK703	Straight key	19.95
HK704	Straight key	16.65
HK706	Straight key	15.50
HK807	Deluxe straight key	49.95
MK708	Squeeze key c/w base	28.95
MK705	Squeeze key	25.65
MK706	Squeeze key	23.50
HI-Q	2X coil/formers/insulators (pat-pend)	7.50
70N2DX	Dual band 6/8 + 3X 5/8 mobile	23.75
70N2M	144/432 dual band 1/2W+2* 5/8 mobile	26.95
70N2V	Dual b/base ant. 3.6" long	36.80
HS-358	430MHz tripple 5/8 3dB	30.95
HS-770	144/432 duplexer 50W 30dB isolation	19.55
HS-78F	2 mtr 7/8 fold over 4.5dB	16.95
HS-88F	2 mtr 8/8 fold over 5.2dB	19.96
SMC15SE	15 mtr 130W PEP mobile ant. 1.72m long	16.85
SMC20SE	20 mtr 100W PEP mobile ant. 1.72m long	21.50
AMT-2	AMTOR/RTTY/CW/ASCII terminal unit	245.00
RM-1	L-cost AMTOR/RTTY/CW/ASCII modem	69.00
8XY-2M	2 mtr 8E crossed ant.	41.50
LR1-2M	2 mtr omni-directional colinear	39.00
LW10-2M	2 mtr 10 element YAGI	27.25
MBM48	70cm 48E antenna	40.75
Q4-2M	2 mtr 4 element quad	33.95
10-12A	10-12A 13.8V power supply	62.50

MuTek	BBBA	20-500MHZ low noise wide band preamp	34.90
MuTek	SLNA	2 mtr low noise RF switched preamp	39.95
MuTek	SLNA	Optimised preamplifier for FT290R	39.00
MuTek	TVVF50c	High performance 2M-6M transverter	189.90
RAYCOM	7.1MHZ	7.1 MHz traps. c/w instructions	8.95
TRAP	6146B	PA valve	12.85
RCA	2044/5	Nest of dipoles w/band ant	69.00
REVCO	Revcone	Wide band discone ant 30-500MHZ	29.95
RWC-ANT	2M HB9	2 mtr 2E directional beam antenna	6.99
RWC-ANT	70CM	70cm 2E directional beam antenna	5.99
SUN-ANT	KG208	10 mtr loaded 1/4W tilt-over	12.50
SUN-ANT	SE10	5/8 mtr tilt-over ant	13.50
SUN-ANT	KG309	5/8 mtr tilt-over ant	13.50
SUN-ANT	SE2	Cast/chrome SO239/gutter mount assy.	4.75

**RAYCOM MOD KITS**

Raycom	757	FT757GX fast tuning mod kit	29.50
Raycom	modkit	modkit	
Raycom	FBX-RWC	LC7136-7 10 mtr FM mod kit	22.50
Raycom	MOD	kit c/w ins.	12.95
Raycom	LCL DNT	LCL/DNT 10FM mod kit	

**RAYCOM ANTENNAS**

Raycom	1/1 G5RV	Full size G5RV m/band ant.	14.95
Raycom	1/2 G5RV	1/2 size G5RV m/band ant.	13.95
Raycom	1/4 wave	145MHz 1/4 wave PL259 fitting	2.99
Raycom	25	145MHz 1/4 s/steel whip 3/8 fitting	2.99
Raycom	1/4wave3/8	3/8 thread mag mount c/w cable PL259	9.25
Raycom	3/8-mag	145MHz 5/8 spring type s/steel whip	3.75
Raycom	5/8 whip	Magnetic mount SO239 c/w cable PL259	9.50
Raycom	SO239-MAG		

# Amateur RADIO



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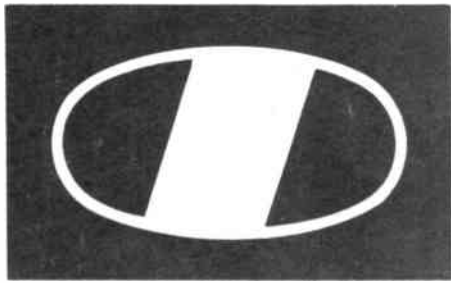
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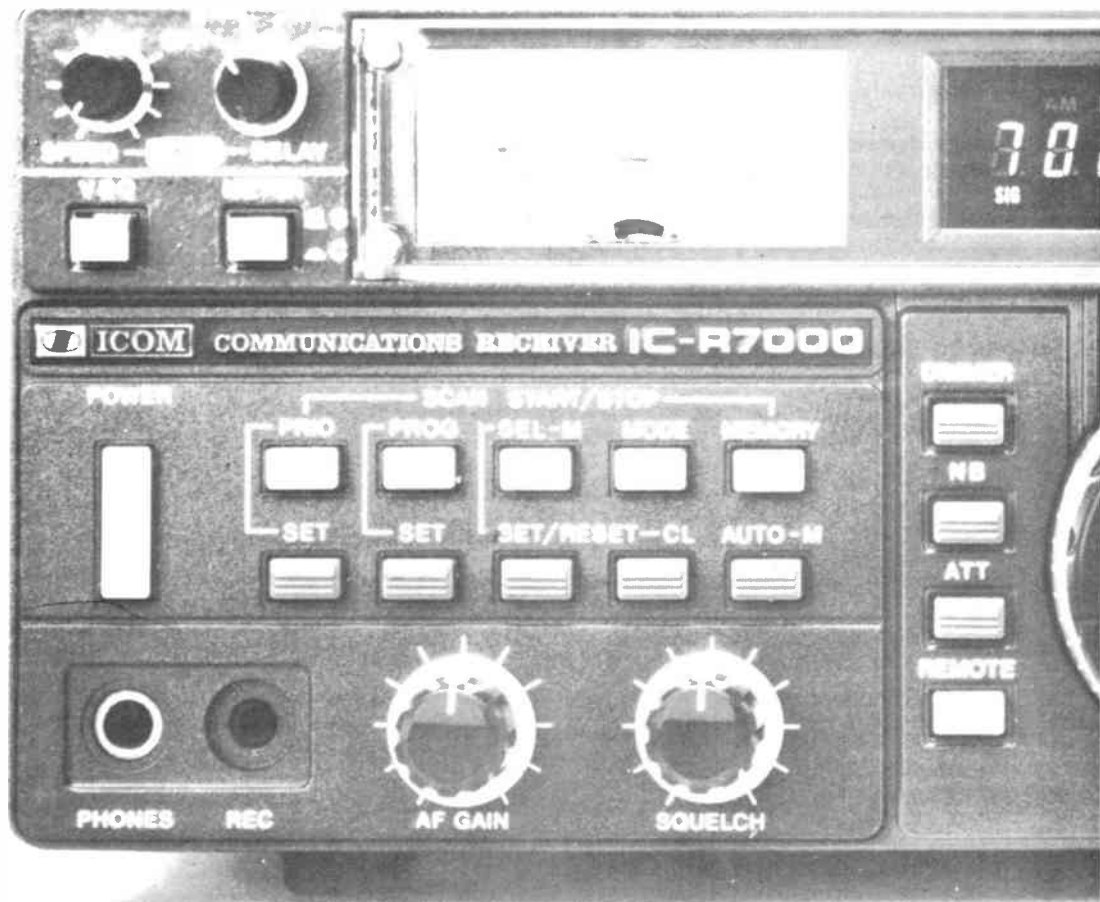
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# ICOM

## 25-2000MHz, Commercial Above and beyond



ICOM introduces the IC R7000, advanced technology continuous coverage communications receiver. It covers Aircraft, Marine, F.M., Broadcast, Amateur Radio, Television and Weather Satellite bands. The IC R7000 incorporates FM wide/FM narrow, A, M, upper and lower SSB modes of operation with six tuning speeds: 0.1, 1.0, 5, 10, 12.5, 25KHz. Frequency coverage 25-1000MHz and 1025-2000MHz (25-1000MHz and 1260-1300MHz guaranteed specification).

With the IC-R7000 you have normal tuning capability with the front panel tuning knob or for quick tuning of a desired frequency by using the front panel key pad. A total of 99 memory channels are available for storage of received frequencies and operating mode.

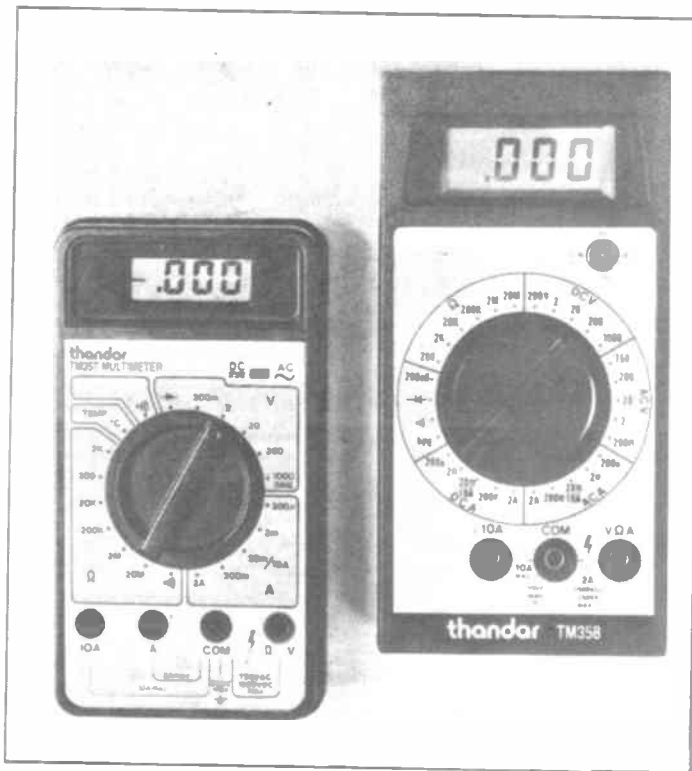
Memory channels can be called up by pressing the memory switch then rotating the memory channel knob or by direct keyboard entry.

A sophisticated scanning system provides instant access to specific frequency ranges. By depressing the Auto M switch, the IC R7000 automatically memorises frequencies that are in use whilst in the scan mode and can be recalled later. The scanning speed is adjustable and the scanning system includes memory selected frequency ranges or priority channels. All functions including memory channel readout are clearly shown on a dual colour fluorescent display with dimmer switch. Other features include dual lock, noise blanker, S meter and attenuator.



Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM





### DIGITAL MULTIMETERS

Thandar Electronics has announced the addition of two further digital multimeters to their range, designated the TM357 and TM358.

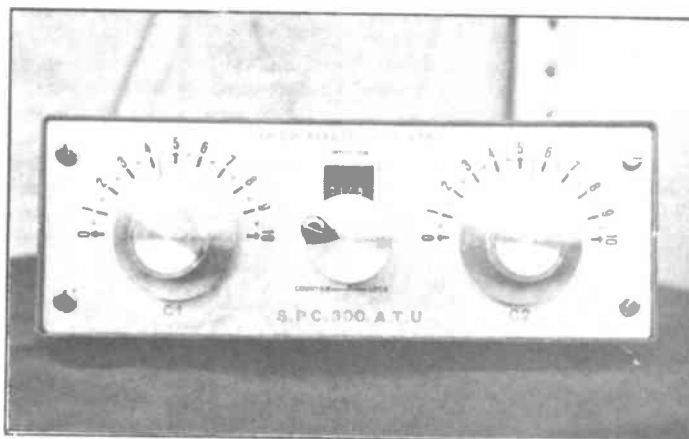
The TM357 is a 3.5 digit LCD multimeter with facilities to read ac/dc voltage, current, resistance and diode test. A continuity buzzer is also provided.

A temperature probe is available as an optional accessory and reads in centigrade and fahrenheit. The TM357 is housed in a rugged

yet compact handheld case, and costs £39 excluding VAT. Probes are supplied.

The TM358 is a 3.5 digit LCD multimeter which, besides incorporating similar features to the TM357, has the capability of conductance and transistor HFE measurement. It costs £69 excluding VAT and is also supplied complete with probes.

For further information contact: *Thandar Electronics Ltd, London Road, St Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646.*



### SPC300 ATU

Amcomm/ARE have been appointed as the world-wide distributors of the British made range of CAP Co antenna couplers, which handle levels of up to 3kW. (See review in *Amateur Radio*, January).

The current SPC300 antenna coupler is only 12x3x12<sup>3</sup>/<sub>4</sub>in with a cabinet constructed in steel, with a robust body and virtually unscratchable surface.

The stator and rotor blades of the capacitors are constructed from high grade NS4 alloy, all other components being made of solid brass. Controls are via two slow motion drives for each of the two capacitors, with a calibrated scale over 100 degrees. The inductor has a digital turns counter controlled by an aluminium knob 35mm in diameter.

The components are constructed in a special mainframe, thus ensuring that the 'Tr' of the conductor (which is of the 'roller-coaster' type) is of a high order. The inductor's range is from a maximum of 28 $\mu$ H to very low levels.

The circuit is designed to provide substantial harmonic rejection, which is often a problem with other couplers, in addition to allowing a wide range of resistances and reactances to be matched into a transmitter/receiver.

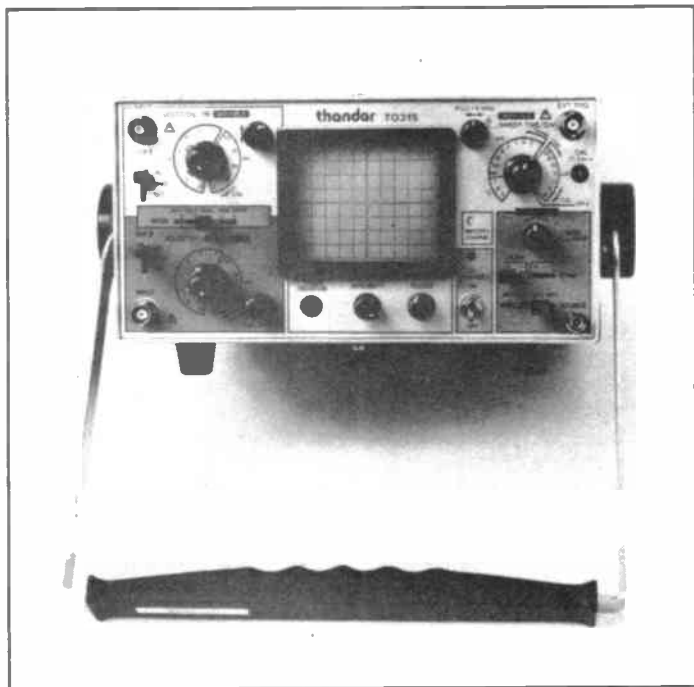
SPC stands for Series/Parallel Capacitance but the unit can be connected into 6 other configurations by altering the links on the front and rear to match almost any antenna.

The ATU covers 1.8-29.7MHz, the input and output impedances are 50-75 $\Omega$  and 2 $\Omega$ -2.5k $\Omega$  respectively, and it's not too difficult to obtain that elusive 1:1 SWR across all bands, even 160m.

There are four models: the SPC300C, 1kW ATU in a cabinet; the SPC3000C, 3kW ATU in a cabinet; the SPC300M, 1kW ATU module; and the SPC3000M, 3kW ATU module.

Further details are available from: *Amcomm/ARE, 373 Uxbridge Rd, Acton, London W3 9RN. Tel: 01-992 5765.*

# All the latest news, views, comment and developments on the amateur radio scene



## FETs BEYOND 1GHz

Gold metallisation has now been developed for silicon FETs to provide a high performance and low-cost alternative to bipolar devices operating up to 1GHz and beyond.

The importance of gold metallisation is its superiority to the standard aluminium metallisation. Gold allows fabrication of the very narrow line widths required at high frequencies (ie 1GHz and beyond). Until recently, gold metallisation was only available for GaAs devices because of considerable difficulties in using this technique with production silicon parts.

However, this limitation has been solved by a new technique developed by Polycore RF Devices. The Polyfet series of gold-metallised FETs can be produced with higher transconductance (gm) values than other silicon FETs. High stable gain can be achieved without complex additional circuitry to provide impedance matching and stabilisation.

The reliability and versatility of this new range of FETs makes them ideal for use in radar systems, mobile com-

munications equipment, broadband, diathermy and medical research, and most applications where reliability is necessary for RF generation and amplification.

Silicon devices produced by this process have many advantages at these frequencies, and can be manufactured at more competitive prices than GaAs, due to the higher yields possible for operation at 1GHz.

Through Anglia Microwaves Ltd, the UK representative for Polycore RF Devices, engineers have access to a range of devices covering frequency ranges from 1MHz to 2GHz with power levels from 1W to 300W in Class A, B and C. The devices can be gate-modulated using pulse signals, permitting very simple and efficient pulse modulation design.

The Polyfet family can be supplied in the vast majority of standard RF packages, including new microstrip, single-ended and push-pull types.

For further information contact: *Anglia Microwaves Ltd, Radford Business Centre, Radford Way, Billericay, Essex CM12 0BZ.*

## PORTABLE OSCILLOSCOPE

A new mains/battery oscilloscope has been introduced by Thandar Electronics, designated the TO315.

It offers true portability with 15MHz bandwidth, a dual trace display and an input sensitivity of 2mV/div. Selection of chopped or alternate mode and line or frame synchronization is automatic.

The portability and performance provided by the TO315 makes it suitable for field use.

It has a weight of 6kg and measures 113 x 223 x 310mm. The oscilloscope costs £655 excluding VAT.

For further information contact: *Thandar Electronics Ltd, London Road, St. Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646.*

## POWERCLEAN

Masterplug Powerclean could be of use in either the home or the office when a number of small electronic appliances employing low power digital techniques are being used.

These appliances are susceptible to voltage fluctuations in the mains supply which can be caused by ordinary domestic appliances containing motors or thermostatic switches (such as washing machines and fridges). The voltage spikes caused are problematic.

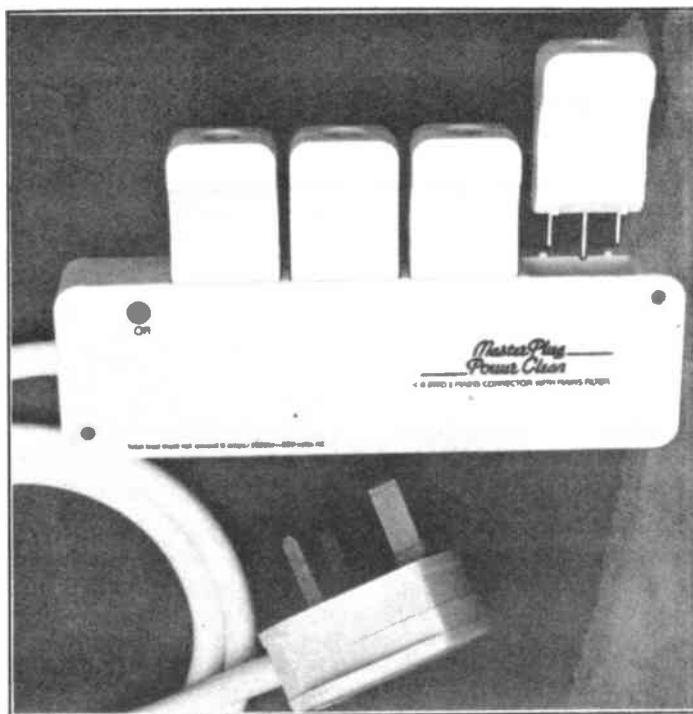
In industrial environments, where very heavy electrical equipment is used, these spikes can be far worse and it may be very difficult to pro-

tect computer systems.

Powerclean can protect equipment and increase its immunity to interference. Powerclean is a 4-way adapter incorporating a passive filter network designed to provide attenuation of voltage spikes in the most susceptible (30MHz) frequency range.

The unit comes complete with mains cable and 13 amp plug, and four miniature plugs incorporating 3.15 amps fusing. Its maximum current rating is 6 amps. The retail price is less than £20.

Further information is available from: *Masterpiece Products, Masterpiece Cabinets Ltd, Annscroft, Shrewsbury SY5 8AN. Tel: (0743) 860512.*





## VARTA'S GOT IT TAPED

Varta Ltd has announced a national radio advertised promotion for its range of Energy 2000 batteries.

During June, consumers purchasing any Energy 2000 blister pack can claim a free recorded cassette from Varta as part of a Britannia Cassette and Record Club introductory offer. Consumers can keep the free Varta cassette tape,

whether or not they finally elect to join the club.

Energy 2000 batteries are ideal for such high-drain usage as radio cassettes, so trial in this growing sector is important, and Energy 2000 has the added bonus of a leak-proof guarantee.

For more information contact: Varta, Varta House, Gatwick Road, Crawley, West Sussex. Tel: (0293) 547631.

## NEW TERMINAL STRIPS

A F Bulgin & Company plc has introduced a new series of space-saving barrier terminal strips for PC board applications. The products are manufactured by the Beau Products Division of Vernitron Corporation, Lacombe, New Hampshire, USA.

The new closed-side, single-row strips have terminals spaced on .325in centres. They are rated at 20A, the same as larger strips with terminals on 3/8in centres. The strips also take 13% less space, allowing greater PCB design flexibility. In addition, they are the smallest strips recognised by UL for field wiring.

The new Beau 69000 series terminal strips have a barrier height of .50in and width of .60in. They are the low-cost, directly interchangeable alternative to series 4PCV and 4PCR.

The closed-side design provides increased protection by acting as a wire stop. Wires cannot pass through the closed side, or contact other wires or PC board components, so shorts are virtually eliminated. The closed-side also allows components to be positioned close to the terminal strip, resulting in a more compact PC board.

Made of break resistant thermoplastic, these strips are available in closed back or feed through styles and can be furnished with a variety of terminals.

For further information contact: A F Bulgin & Company plc, Bypass Road, Barking, Essex. Tel: 01-594 5588.

## JAYBEAM ANTENNAS

Jaybeam are now producing a compact four-element yagi duobander for 4 and 6 metres costing £100 excluding VAT.

The Duobander DB4, which has a boom length of 3.06m and a turning radius of 2.1m, is suitable for use by amateurs with restricted space. It is manufactured from high quality aluminium tubing with 1in elements incorporating 'high Q' traps rated at 2kW. It is made to withstand severe climatic conditions, but weighs only 9.5kg.

Jaybeam have also improved their Tribanders, models TB1, TB2, TB3 and VR3. They will now be fitted with aluminium block saddles, stainless steel jubilee clips and stainless steel bolts and 'U' bolts as standard. Stainless steel kits will also be available to upgrade existing models.

## NEWNES REVISIONS

Newnes have just published revised editions of two books on their radio and electronics list. The first is in the Beginner's Guide series, this one entitled the *Beginner's Guide to Amateur Radio* by F G Rayer G3OGR, which has been revised by Gordon King G4VJV. More information has been included in many areas, with an extra chapter on hints and tips for the 'enthusiastic beginner'.

The Beginner's Guide series can be a little variable with regard to ease of understanding. For instance, *Beginner's Guide to Radio*, another Newnes publication, although quite sound technically, has a text that I am sure would leave many absolute beginners struggling. This book for prospective radio amateurs, however, is fine in this respect and should give no problems. Naturally it covers propagation, short wave listening, amateur bands and licence conditions, equipment and aerials etc.

It covers the basics well, with useful diagrams and examples of circuits (many with component values), and I believe it's a better book for beginners than any of the RSGB publications.

*Beginner's Guide to Amateur Radio* is published by Newnes Technical Books and is priced at £4.95 (ISBN 0 600 33368 X).

The other revised publication from Newnes is Ian Sinclair's *Practical Electronic Handbook*. This isn't essentially a book for beginners, although there is much of use to beginners here. It contains a multitude of reference circuits and explanatory diagrams, with fairly brief outlines of the relevant theory (and the minimum of maths).

It begins with passive components, and besides the obligatory colour codes includes such subjects as resistivity and conductivity, Thévenin's theory, permittivity (with relative permittivities of various materials listed), impedance and phase angle calculations for tuned circuits, etc.

The subsequent chapters are similarly broad in their scope (and therefore necessarily brief), and cover active discrete components, discrete component circuits, linear ICs, and digital ICs (with a wealth of TTL and CMOS pinouts).

*Practical Electronics Handbook* is priced at £5.95 (ISBN 0 408 00447 9).



For further details contact: Jaybeam Ltd, Kettering Road North, Northampton NN3 1EX. Tel: (0604) 46611.

## ALUMINIUM SOLUTION

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For further information or quotations please contact: Chris Clark, Eastern Aluminium Co Ltd, Unit 77A, Cowdray Centre, Colchester, Essex. Tel: (0206) 577698.



## STRAIGHT & LEVEL



### CAPACITANCE METER

Levell Electronics has introduced an accurate digital capacitance meter, type 7705. Capacitance values between 0.1pF and 2,000 $\mu$ F may be measured on a 3½ digit liquid crystal display, with 0.5in high characters, to a basic accuracy of 0.5%. The test voltage is 3.2V peak and the unit has an input protection fuse. Measurement rate is 2 per second. The 7705 is powered by an internal PP3 type battery.

The cases are moulded in high impact ABS plastic, 180 × 87 × 42mm and only weigh 350gms. The 7705 costs £49 excluding VAT, test leads and a soft plastic carrying case are supplied.

More information is available from: *Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD. Tel: 01-449 5028.*

### AUDIO POWER METER KIT

A complete audio power meter, including an attractive front panel, can be easily constructed with an inexpensive, high quality kit from Electronic and Computer Workshop Ltd (ECW).

The kit (K2606) is easy to assemble and connects dir-

ectly to the loudspeaker outputs of an audio amplifier. Output power is indicated by a bargraph of seven LEDs.

No power supply is required as the output levels are sufficient to drive the LEDs directly. The kit can be used with a range of medium to high power amplifiers and operates in four ranges: 2-40W at 8 ohms, 4-80W at 4 ohms, 5-100W at 8 ohms and 10-200W at 4 ohms.

The kit includes all necessary parts for successful completion, including a well finished PCB, engraved metal bezel, LEDs and all other electronic components.

ECW offers the K2606 audio power meter kit at a price of £14.67 including VAT and post and packing.

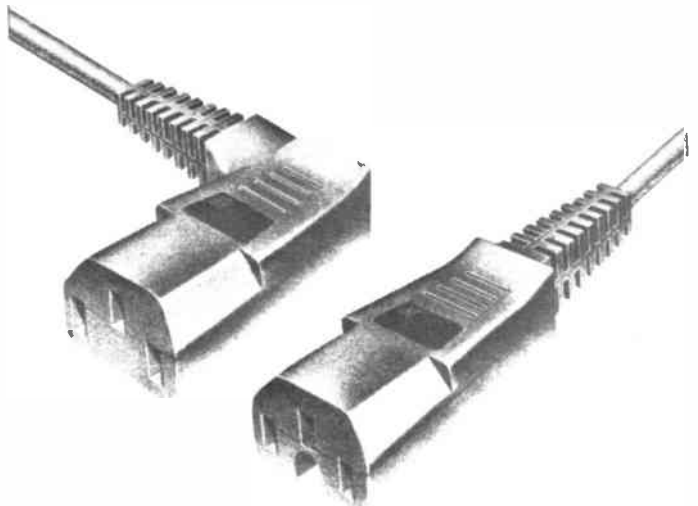
For further details contact: *Electronic and Computer Workshop Ltd, 171 Broomfield Rd, Chelmsford, Essex.*

### AUTO-TEST RECEIVER

The Grundig ME90 test receiver and field-strength meter, now available from Electronic Brokers, is a microprocessor controlled, fully automatic antenna measuring system which provides level measurement in all the VHF and UHF television bands as well as the long, medium, short and ultra-short wave radio broadcasting bands.

The unit employs simple front panel keypad control to carry out a wide variety of intelligent measurement functions. Selection of the transmitted signal is by push-button, and fully automatic level measurement with built-in error correction eliminates the need for an ancillary calibration curve.

Frequency, channel and



### IMPROVED CONNECTORS

AF Bulgin & Company plc have introduced a new range of improved IEC320 style, 6A/10A connectors and cords.

Produced by sonic-welding techniques, the improved non-rewirable connectors are available in end and side-entry styles with a full choice of cordsets to UK, European and American standards and

cord lengths of 1, 2, 2.5 and 3.5 metres.

Fully interchangeable with Bulgin's P589 series, the new Bulgin connectors can be supplied with push-fit, screw-mount, filtered, fused or switched mating inlets and retaining clips.

For further information contact: *AF Bulgin & Co plc, Bypass Road, Barking, Essex IG11 0AZ. Tel: 01-594 5588.*

level indication is provided by a bright 20-digit alphanumeric display, while maximum adjustment is aided by LED indicators.

The instrument can store up to 100 preselected frequencies by channel number or other designation, and the stored data can be collated and processed prior to hard-copy print out on a built-in thermal matrix printer.

The integral printer lists all transmitted level measurements, together with frequency, time and date, either sequentially or according to pre-programmed instructions.

Other features of the ME90 include a TV/IF input at 38.9MHz, the capability to measure separate sound channels in stereo signals, a built-in VHF/FM stereo decoder with LED indication, a headphone socket for evaluation of received quality, a switch for picture enlargement and a switch for picture offset.

The Grundig ME90 is equally suited to mains or battery operation, and has its own built-in charger.

For more information contact: *Electronic Brokers Ltd, 140-146 Camden Street, London NW1 9PB. Tel: 01-267 7070.*

### FUNCTION GENERATOR

The new low price type TG302 function generator from Levell Electronics provides sine, square, triangle, pulse, sawtooth, ramp and asymmetrical sine waveforms over the wide frequency range of 0.02Hz to 2MHz. It is possible to sweep the frequency over three decades by applying an external voltage to the VCF input.

The main output amplitude can be varied from 20mV to 20V p-p from a 50 ohm source. A TTL output of rise time <3ns is also available. This output

is capable of driving up to 20 TTL loads or triggering an oscilloscope. A dc offset control enables up to  $\pm 10$ V dc to be superimposed on the main output signal.

The TG302 is housed in a high impact ABS plastic case with internal screening. Its size is 85 x 235 x 280mm and its weight is under 2kg.

The retail price is £136 + VAT including UK mainland delivery.

For further information contact: *Levell Electronics Ltd, Moxon St, Barnet, Herts EN5 5SD. Tel: 01-449 5028.*



## CLUB NEWS

### Scarborough Rally

Scarborough Amateur Radio Society is holding its annual rally on 27 July at The Spa, Scarborough, opening at 11am.

The RSGB have elected this rally to be a Morse testing station for the day, and anyone wishing to take the examination should apply to the Rally Secretary (address below).

There will be talk-in on 144MHz (S22), 432MHz (SU8) and RB0 by GB3NY, and there will be a large number of traders attending the rally.

This should be an enjoyable family day out, with the many attractions of this large seaside resort and fine beaches on hand.

If you would like further information contact: *The Rally Secretary, Ian Hunter G4UQP, 46 Station Road, Scalley, Scarborough, North Yorkshire YO13 0QA. Tel: (0723) 376847.*

### Sussex Mobile Rally

The Sussex Mobile Rally is an annual event for radio amateurs and their families where the amateur is able to view and purchase the wares of over 50 companies specialising in amateur radio and electronics, all under one roof. The family can also enjoy a day by the seaside and the entertainments specially organised for their pleasure at the rally.

The 1986 rally will take place at the Brighton Racecourse, which is easily found by visitors and has almost unlimited free car parking (under the control of rally marshals). The 1986 rally will be held on Sunday the 13th July and entrance charges remain at last year's price of £1 per adult with children under 14 years entering free of charge.

The large racecourse buildings allow all the stands to be under shelter from the British weather and refreshments are available in the bars and cafeteria on site. For the family a free minibus service runs regularly to and from the seafront throughout the day, and a number of other diversions are available on the rally site.

Disabled visitors are not charged for entry, and ramps lifts and wide gangways ensure freedom of wheelchair access.

Local clubs, societies and specialist groups are all represented and a special event station, call sign GB2SMR, is on air to talk mobile visitors in from far afield.

The rally is organised by members of six amateur radio societies from Sussex, and it is hoped that the support from radio amateurs will ensure success in 1986, and the future of the rally in years to come.

For further details contact: *the Secretary, Mr Mark Spillett G4UAW, 26 Westlands, Rustington BN16 3NW. Tel: (0903) 782594.*

### Elvaston Castle Rally

Nunsfield House Community Association Amateur Radio Group will be holding the 17th Elvaston Castle Mobile Radio Rally on Sunday 8 June. Attendance this year is expected to be in the region of 20,000 visitors.

The rally should be of interest to the whole family, with numerous attractions including a free-fall parachute display (weather permitting), mini motorbike rides, and a bouncing castle.

In addition, 90 radio and electronics trade stands will be present, full catering facilities will be available and, as this event coincides with the English Folk Dance and Song Society National Folk Day, teams of dancers will be demonstrating their skills in the castle grounds.

Elvaston Castle Country Park is located 5 miles south-east of Derby on the B5010 and is well signposted.

Admission is free and those requiring further information should contact: *John Robson G4PZY. Tel: (0332) 767994.*

### Hamfest '86

The Flight Refuelling Amateur Radio Society (FRARS) and the Radio Amateur Invalid and Blind Club (RAIBC) will be holding the fourth annual Hamfest Rally on 10 August, from 11am to 5pm.

The site, which is approximately 3 acres, will have marquee accommodation for radio traders, and there will be plenty of room on the field for displays, other activities or additional traders. Adjacent free parking for the public is extensive; handicapped visitors will, of course, be able to park on site.

Facilities for traders include refreshments, tele-

phone, and on-site parking. For more information contact: *Mr Ashley Hulme, 71 Victoria Gardens, Ferndown, Wimborne, Dorset BH22 9JQ. Tel: (0202) 872503.*

### Radio Conference

The Institution of Electronic and Radio Engineers will be holding their fourth International Conference on radio receivers, at the University College of North Wales in Bangor, from 1-4 July this year. Attendance at the conference is open to both members and non-members of the Institution.

Digital techniques and receiver integrated circuits, two of the most important areas challenging radio systems designers, will be covered in depth, as will ICs for telemetry and navigation systems.

Complete sessions will be devoted to a further three important areas: mobile radio, radio systems in general and receiver design.

A complete day of tutorial sessions, which will precede the main conference, will cover the most important areas of modern radio receiver design.

Six speakers, each of whom is renowned in his particular field, have accepted invitations to present tutorial lectures on six 'leading edge' subjects: digital signal processing, spread spectrum techniques, frequency synthesis and phase locked loops, modulation and coding, cryptography and gallium arsenide applications in receiver design.

For further information and registration forms contact: *The Conference Secretariat, Institution of Electronic and Radio Engineers, 99 Gower Street, London WC1E 6AZ. Tel: 01-388 3071.*

### The US Connection

Are you interested in visiting the biggest junk sale in the world? A group of EI-GI amateurs will be going to Dayton, Ohio in April 1987, to visit Hamvention, the largest sale of ham gear ever to be displayed at one place at any one time.

They also hope to include at least 5 other large cities anywhere from Florida to San Francisco. As this is a group undertaking the whole group will decide the destinations. Meetings will be held at major

locations, and there will be nets on 2m and 80m for further discussion.

For further details contact: *Charlie EI2EM, Irish Radio Transmitter's Society, PO Box 462, Dublin 9.*

### Sheffield junk sale

Sheffield Amateur Radio Club (SARC) meets at the Firth Park Pavilion on the first two Mondays and last two Wednesdays of the month.

Forthcoming events include a minority group night on 25 June and a summer junk sale on 7 July. RAE classes, starting at 7.30pm are held every week. Other meetings start at 8.15pm.

For further details contact: *Peter Cardwell, 223 Chesterfield Road, Meersbrook, Sheffield, South Yorkshire S8 0PR. Tel: (0742) 581766.*

### Super sale

Aberdeen Amateur Radio Society will be holding a super sale of good equipment on 13 June, and on 20 June the winners of the building competition will be giving away a few secrets in a lecture.

The society meets at 7.30pm each Friday in their club room at 35 Thistle Lane, Aberdeen. Ideas for talks and lectures are always appreciated and speakers who wish to give a talk, lecture or demonstration to the society will be made most welcome.

For further details phone Don Travis GM4GXD on Pitcable (04676) 251.

### Scottish Convention

This year the Glenrothes and District Amateur Radio Club will be organising the Scottish Amateur Radio Convention.

The provisional date for the convention is Saturday, 13 September. For further details contact: *Ken Riddoch GM3ZSP. Tel: (0334) 53336.*

### Interference Forum

A 'DTI Interference Forum' led by Mr Raymond Brooks will be held on 24 June by the Verulam Amateur Radio Club.

The club meets every second and fourth Tuesday of the month at the RAF Association Headquarters, New Kent Road, off Marlborough Road, St Albans. All visitors are welcome.

For more information contact: *Gerry Wimpenny G4OBH, 30 Failcross Way, St Albans. Tel: 52003.*

## MARS Microwaves

On 17 June, the Midlands Amateur Radio Society (MARS) will be holding a talk on microwaves presented by Glen Ross G8MWR. This is a repeat of 'Frozen Out' held at the February meeting.

The MARS night on the air is Thursday, the Morse class is on Wednesday and the open night has moved to Monday.

If you would like further information about MARS please contact: *Tom Brady G8GAZ, 57 Green Lane, Great Barr, Birmingham B43 5LE.*

## CQ

CQ, the newsletter of Denby Dale (Pie Hall) and District Amateur Radio Society, includes an extremely interesting article on the part played by amateur radio enthusiasts in the relief operation after the Mexico Earthquake.

There are also diagrams of a 'dirty' dc charger, details of forthcoming events, and a 'ladies corner'. For more information about CQ contact: *Geoff Band G4GJB, Wolvelay House, Woolley, Wakefield WF4 2JJ.*

## Radio Scouting

We have just received Radio Scouting's UK report which includes several reports on the 28th international jamboree on the air which took place on 19 and 20 October last year. Reading the reports it is clear that the event was a great success and everybody enjoyed themselves. Countries worked included China, USA, Canada and Zimbabwe.

The report also includes newspaper cuttings publicising scout radio exploits, dates for your diary and letters from scouts. It makes for lively and interesting reading.

The UK scout net on or around 3740kHz at 0900 local time on Saturdays, is still flourishing after almost 25 years.

## 10m FM Group

Enthusiasts in the south of England have formed the Southern 10m FM Group. Their prime objective is to keep this band active during sunspot minimum.

They will be producing a newsletter six times a year, which will include information on propagation, technical tips, CB radio conversion information, and availability

## Ham record

A licensed radio ham has set a new record for the run from John O'Groats to Land's End.

Mile Butler (38) from Basildon in Essex completed the trip on an ELVA, the new all-British electric vehicle which promises to transform the lives of elderly or disabled people with a mobility problem.

The three-wheeled ELVA becomes the smallest powered vehicle to complete the 825-mile trip and has done so without a single hitch – confirming the designer's claims that it is totally maintenance-free.

Mike undertook the run to raise funds for research into the disease from which he and two of his daughters suffer. From birth, he has been a victim of neurofibromatosis, a genetic disorder which affects one in every 3000 people in the UK, and which was brought to the public's attention in the film *The Elephant Man*. Although Mike's symptoms are comparatively mild, his 13 year old



daughter has already suffered the loss of a leg through the disease.

At present there is neither treatment nor cure for the disease, and Mike's effort has helped to raise funds for the charity LINK which plans to establish a central clinic for sufferers and encourage vitally needed research.

Mike carried a hand-held

FM transceiver on the ELVA and CB equipment was installed in the support van, so he was not short of company on the lonelier stretches of the road. As well as making many new friends, he received invaluable help from amateur radio enthusiasts along the route and would like to thank all concerned for their assistance and support.

of radios, linears and antennas etc.

Thursday evenings between 8 and 10pm will be activity nights along the south coast. If you want to hear more about the group contact: *Jim Hicks G4XRU, 33 Hayling Rise, Worthing.*

## BARC

Brian Coleman G4NNS will be presenting a talk on packet radio to the Basingstoke Amateur Radio Club (BARC) on 7 July.

In addition, a 2m DF foxhunt is scheduled for the last Sunday in every month starting at 2.30pm, but this is subject to weather conditions and support. Normally a 2m net is held at 1pm to decide whether to 'go/no go'.

Meetings are held at the Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke, starting at 7.30pm.

An informal, *ad-hoc* meeting is held on a Tuesday in every month, but this is only arranged a month ahead. Non-members are welcome.

For more information contact: *Dave Burleigh G4WIZ, 14 Winchfield Gardens, Tadley, Basingstoke, Hampshire RG26 6TX. Tel: (07356) 5185.*

## Wimbledon space shot

A talk entitled 'Space Exploration of the Solar System' will be presented to Wimbledon and District Amateur Radio Society (W&DARS) by Dr Gary Hunt on 27 June.

On 13 June a club construction competition will be held and on 11 July David Kinsella will be presenting a talk on the Great Western Railway.

Society meetings are held on the second and last Friday of the month at 8pm in the St John's Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19.

For further details contact: *George Cripps G3DWW, 115 Bushey Road, Raynes Park, London SW20. Tel: 01-540 2180.*

## South Bristol

South Bristol Amateur Radio Club meets every Wednesday at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol, Avon. On 4 June John G4TRN will present a talk on modifying CB radios for 10 metres, and on 11 June the society will hold an HF activity night.

Contact Len Baker G4RZY on Whitchurch 834282 for further details.

## Mystery Lecture

G3MGX will be presenting a mystery lecture to Worksop Amateur Radio Society (WARS) on 17 June. Other events on their agenda include a visit from Scunthorpe Club on 3 June, and a visit to Newark Radio Club on 3 July. If you would like more details contact: *Mrs C S Gee, 100 Plantation Hill, Worksop, Notts. Tel: 486614.*

## Edgware and District

Edgware and District Radio Society meets on the second and fourth Thursdays of the month at 8pm at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.

A club net is held every Monday at 22.00hrs on 1.875MHz, and the Edgware 80m net will be operating on 3.775MHz±QRM at 09.15hrs on 29 June.

In addition, the club releases a monthly newsletter entitled the *Edgware Ham News*. Reviews of recent club events and general items of club news are included, as is a list of forthcoming events.

For more information contact: *John Colby G4RMD, 4 Briars Close, Hatfield. Tel: Hatfield 64342.*



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# L·E·T·T·E·R·S

```

10 REM
20 REM MORSE CODE GENERATING PROGRAMME
30 REM
40 REM WRITTEN BY A.P. GRIGG G0BRN AMATEUR RADIO JANUARY 1986
50 REM ADDED TO BY G4TQB 7 JAN 1986
60 CLS
70 CLEAR
80 PRINT "RANDOM MORSE CODE GENERATION"
90 PRINT "....."
100 PRINT
110 PRINT
120 INPUT "Letters, Numbers, or Both (L/N/B)";TYP$
130 PRINT
140 IF TYP$="L" OR TYP$="1" THEN ST=1: F1=26
150 IF TYP$="N" OR TYP$="n" THEN ST=27: F1=36
160 IF TYP$="B" OR TYP$="b" THEN ST=1: F1=36
170 IF TYP$("<"N" AND TYP$("<"n" AND TYP$("<"L" AND TYP$("<"1"
    AND TYP$("<"B" AND TYP$("<"b" THEN 120
180 PRINT
190 INPUT "ENTER WORD SPEED";SP
200 REM
210 PRINT
220 INPUT "INTERNAL SPEED";IS
225 REM CALCULATE PERIOD BETWEEN LETTERS
230 TIMO=7*(14-SP)
240 IF IS=0 THEN LT=INT(TIMO/7) ELSE LT=(14-IS)
250 PRINT:INPUT "RANDOMIZATION SEED";PDN
260 RANDOMIZE RDN
270 DIM A$(36)
280 DATA "01", "1000", "1010", "100", "0", "0010", "110", "0000", "00", "0111",
    "101", "0100", "11", "10", "111"
290 DATA "0110", "1101", "010", "000", "1", "001", "0001", "011", "1001",
    "1011", "1100"
300 DATA "01111", "00111", "00011", "00001"
310 DATA "00000", "10000", "11000", "11100", "11110", "11111"
320 REM READ THE DATA INTO ARRAY A$
340 FOR Q=1 TO 36
350 READ A$(Q)
360 NEXT Q
370 FIVES = 0: REM INITIALISE GROUPING COUNT
375 SIXES = 0: REM INITIALISE NUMBER OF GROUPS PER LINE
380 REM GET RANDOM NUMBER
390 R=INT(RND*37)
400 IF R<ST OR R>F1 THEN 390: REM OUT OF LIMIT
410 DON = R
420 GOSUB 480: REM SOUND MORSE CHARACTER
425 IF DON<27 THEN PRINT CHR$(64+DON): ELSE IF DON<36 THEN PRINT CHR$(32+DON):
    ELSE PRINT "0":
430 REM WAIT
440 SOUND 1.0,TIMO,0
450 FIVES = FIVES + 1
460 IF FIVES = 5 THEN FIVES = 0: SOUND 1.0,2*TIMO,0: PRINT " ":
    SIXES = SIXES + 1
465 IF SIXES >5 THEN SIXES = 0: PRINT:PRINT
470 GOTO 390: REM LOOP BACK FOR NEXT CHARACTER
478 PRINT: GOTO 375
480 REM SOUND MORSE CHARACTER
490 FOR LQ = 1 TO LEN(A$(DON)):
500 IF MID$(A$(DON),LQ,1) = "0" THEN GOSUB 530 ELSE GOSUB 570
510 NEXT LQ
515 RETURN
520 REM SOUND DIT
530 SOUND 1.156,LT,7
540 SOUND 1.0,LT,0
550 RETURN
560 REM
570 REM SOUND DASH
580 SOUND 1.156,LT*3,7
590 SOUND 1.0,LT,0
600 RETURN

```

## Random Morse code generation program sample

Letters, Numbers, or Both (L/N/B)?	b	U7HG5 U66ZW CQ40E QFRDU 60UPP DQJE3
ENTER WORD SPEED?	6	A5HWX EP9P6 NR6YJ RQNEJ J8GA0 6C8YE
INTERNAL SPEED?	8	9005J Y92KE R0STU NXLEB YGVS4 RRVPQ
RANDOMIZATION SEED?	3	8EQYZ 6SBCY DSI3P ET96W SF4IT 0905Y
J5FXX V8TB0 EAFMM LLSVW F8X5D FMN89		YA3MH 5R8B0 YLV8M F67GR UUBW9 1PDKE
D8PUU K63FL UFDUS CIUX5 59C1E P9G11		F9BXG XRY8N 081AL I80DR 7HPAX TX61M
AKFZ5 Y8VEU 41RQX LTL7M POXZ8 080DF		4H368 6ZEVL G26PA IY58H CQ53B U9APH
MSYMH 8FQU6 HCA0Q VSSND 0ZUFX W78MM		DFYKU 54P64 AYKQ8 A74HP K5Y5R WEDVY
T9DZ5 5RE0C LPQ2Y YNLB6 AXW0J 035PW		8YLSJ PDLG4 BUGRV 5VJK0 DWT28 30W8E
QCH6M 4CMG5 P8NXC 9DN85 TYA2N W5OKW		08BA5 8NRZF PYPJW 2PH5I 6095T H6GWU

## MORSE PROGRAM

In the January 1986 issue of *Amateur Radio*, G0BRN described a very useful random Morse code generating program for the Amstrad CPC464 and CPC664 computers. He invited readers to make improvements and alterations, and I felt your readers may be interested in the following changes I made to this program.

These alterations cause the random five-character groups to be printed on the screen, six groups to a line. I have found this very useful in checking the accuracy of my copy.

The new and altered program lines are: 375, 425, 460, 465 and 478. A full listing of the modified program is shown in the Table.

The instructions for using the program remain as those given by G0BRN. A sample output obtained on my CPC464 is shown left - this was actually sent to a printer by directing all PRINT and INPUT instructions to stream 8. Execution is halted by ESC.

I hope those interested in the program find these changes a useful addition in practice.

**PK Grannell G4TQB,  
Staffordshire.**

## SHORT AND SNAPPY?

I have a suggestion and a grizzle, both of which I shall try to express in a constructive way. The suggestion was born of an idea coming to me after reading the media for signs of the VHF rig construction project that didn't presuppose the possession of an MSc and a test equipment lab.

This doesn't merely apply to VHF, the whole fabric of amateurism seems to me to be under threat from 'Takeaway Radio'. How about initiating a set of graded constructional projects in *Amateur Radio* which describe the most primitive techniques for getting on the air?

As an amateur, temperamentally as well as occupationally, I dislike the awareness that if I were to be

# L·E·T·T·E·R·S

cast away on some island, little of what I know about radio now could help in getting me off it. Yet I can't help feeling also that there seems to be an underlying trend towards technological simplicity which one day will allow those in similar plight to do as ET did, 'phone home', with the aid of driftwood, seashells, and some lengths of wet string.

The grizzle I promised earlier is as follows. Why don't responsible amateurs (an RSGB group?) concentrate a little more on raising standards of phone on 2 metres? Some of it is as bad as Citizen Band!

I could go on to cite a lot of examples, and so could my readers I'm sure. What is needed is a kind of conversational Q-code, only far more flexible, with built-in signals to the other guy(s) that you do or don't want to rap. Allied with it should be heavy emphasis on limiting every transmission, and the introduction of standard pauses to allow newcomers to a net to make contact.

I was an army signaller, trained to net onto cycles and to converse as if words cost a Krugerrand each, but I am not pleading for a return to these Victorian values, and even less am I urging Austere Rapping. I am not suggesting much interference with most of what exists. The actual standard of politeness and camaraderie I have found to be unfailingly high whenever and wherever I switch on my personal black box.

What is missing, and

surprisingly so for an amateur body penetrated by as many professionals as is our fine hobby, is the aim to keep it sort and snappy unless specific signals are given to make it otherwise.

**TM Artingstoll G1RRP, Essex**

## LACK OF INTEGRITY

Just what has happened to the integrity of a growing number of radio dealers? During the past four months I have written many letters to various dealers requesting information on their products prior to an intended purchase. Although in each case an sae was enclosed, less than 10% of the dealers troubled to reply—a cost to me of well over three pounds in lost postage stamps.

Sad to say, this lack of business acumen was not just limited to the growing number of glorified scrap merchants who have attached themselves to the hobby, as several of the well established companies behaved in a similar manner. The only conclusion I can come to is that business must be so good that they are in a position to ignore potential custom if any real effort is required to make a sale.

As one of them said to me when tackled on the subject at a recent rally, 'when I'm sat on my bottom writing to you, I'm probably losing a thousand pound sale'. As my letter to him had been about the purchase of a new HF transceiver, I'm still trying to work that one out!

**Nev Kirk G3JDK, Rotherham**

## UP THE ORGANISATION

Although I shall continue to read your magazine, I should like to comment on the letters that you print in connection with the RSGB.

I object strongly to the sniping letters that have been included in these pages over recent months, as I feel that although the RSGB has faults, we are all guilty in that respect.

I have been a member of the society since 1943, when times were hard for all of us, and unfortunately I have suffered from poor health since 1976. Nonetheless, the RSGB has continued to support me through the years.

I would be most grateful if you would print my letter to illustrate that there are two sides to every story.

I would also like to express my thanks to the RAOTA and the RAIBC for their support and encouragement.

**Roy Williams RS6072, Lincs**

## TEST FIASCO

The RSGB took over the responsibility for administering the amateur Morse test from 1st April 1986. They have known for two years that they were almost certain to get the franchise because they tendered at a very low price, which was far below that which a commercial organisation would consider economic.

Despite this they appear to have done little preparation before the franchise was in the bag. The net result of this is that testing facilities will not be available

for several months.

Contrast this with the situation in the USA where the amateur community, led by the ARRL, took over the running of all Morse tests and the technical exams from the FCC at fairly short notice. Whilst there have been some minor hiccups, the volunteer examiner programme has generally gone very smoothly.

Also note that all the exams are free and the candidate has to pay a maximum of \$4.25 in out of pocket expenses, regardless of how many exam elements he takes!

Why can't our national society give a similar service?  
**Peter L Crosland G6JNS, Worcs**

## THANKS!

I would like, on behalf of the Wisbech and District ARC to thank you very much indeed for the splendid cover you have given to the club as regards the St George's Day Award.

We hope that the event will go well and we feel that the publicity given in your magazine will certainly contribute to that success.  
**Dave Wilkinson G4KHF, Lincs**

*Not at all! If you are involved in the organisation of a club event or a special station, just send us the details and we will make sure that it's well publicised. Please ensure that the information reaches us six weeks before the occasion to avoid disappointment.*

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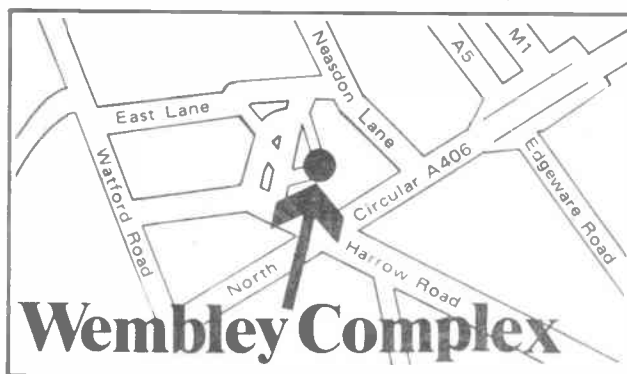
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# SHORT WAVE LISTENER

TREVOR MORGAN GW40XB

What a funny period we're going through! If you go by the rule book, the low sunspot level and general conditions should rule out DXing on the higher frequencies and leave us searching the lower bands for whatever scraps we can find.

Instead, listeners are reporting some excellent conditions and some really choice DX is being found, with fifteen metres coming to life on occasions to give our award hunters something different to listen to.

## Catching stations

On 13th March Philip Davies found his QTH in Market Drayton ideal for catching a dozen or so Indonesian stations, with TA2 and 9J2 amongst the crowd. The next day brought his first DU7 from the Philippines. Dropping down to twenty brought 3D6 (Swaziland), VE5, 3V8 (Tunisia), S79 (Seychelles), 9K25 (Kuwait Anniversary call), and to put the cream on the cake, NL7 in Alaska!

March 15th saw another opening on twenty and ten JAs were logged in quick succession, with JA8 and JJ1 being new ones for the log. Forty metres yielded 5N4, HG8, VK2, RO5 (Moldavia), UD7 (Azerbaijan), and P40 (Aruba Island). Philip now has over 400 prefixes on forty!

Dave Howes from Rochester did very nicely with his claim for the Gold plaque. He also heard those Indonesians on fifteen, plus S79CW in Mahe, which Dave had visited only a couple of years ago with the Royal Navy. His 1000th prefix was YC3 caught on fifteen; only a few minutes before the Mahe was found on changing gear to twenty.

The broadcast bands have attracted Dave and he's doing some DXing on that ground. He has had his first QSL cards back, but unfortunately none from the amateurs so far.

Colin Blunn from Stoney Stanton, Leicestershire put in his claim for Silver with the comment that his 'highlight' was XT2BR (Burkina Faso),

who had been on a couple of times before he managed to log him. Patience obviously pays dividends!

Colin also managed the RAE and received his G1RFL callsign between listening sessions. Consequently he is now busy scanning the CW ends of the bands for new prefixes, while getting his Morse up to scratch.

Now to F G Garraway of Keynsham who claims his Bronze for CW only! Using the Yaesu FRG8800 and a 40ft end-fed via an ATU, he has been into CW since the days of the spark transmitter. He remembers the times when big brass keys were the norm and the bands were a whole lot quieter! Wavering a bit from the short waves, he logged 56 beacons between 300 and 350kHz, ranging from Ireland to the Baltic. At times these maritime beacons can clearly be heard far beyond their theoretical 50 mile range. Yet another dimension to the listeners' hobby.

## Double dealer

Frank Brown RS88124 of Redcar put in a 'doubler' for Bronze and Silver, including A4X, A71, AP2, C30, HZ1, J28, J37, KY7, PP2, SW2, T77, V85 and many other nice catches. Frank uses the Panasonic RF3100L with an end-fed 16m wire through a homebrew ATU at only 12 feet above ground!

Frank also managed to find those YB/YC stations on fifteen plus some ZSs, but as his listening time is restricted he hopes to try some of the early morning stuff shortly as a change from the afternoons – could be fruitful, Frank.

DJ Tyler G1PEF of Poulshot claimed his Bronze after logging 250 prefixes on eighty metres using the super little Howes DCRX. With a 120ft end-fed through an ATU by Cambridge kits, prefixes like A35, CX1, DU9, J37, PT7, T32, VK7, XE1, 5B4 and 9Y4 came to the net amongst a fine list. However, not satisfied with working the HF bands with the DCRX, he also has the

Bronze microwave award tucked away!

Next over to Barningham, where Stuart Field has upped his score to Silver level. Amongst the crowd lurked 5R8AL (Madagascar – QSL via WA4VDE), ZP5AR (Paraguay), JW0A (Svalbard), KP2AH (Virgin Isles), 7P8CM (Lesotho) and a cracker in a QSO between J88BIC in St Vincent and HP1ABB in Panama City! Stuart hopes to have his RFI problems sussed shortly, as a visit to the Ely Raynet group during an exercise put him in touch with a G6 who had the same computer.

Jon Baker G1PGH of Selsey, sent in his Bronze claim. Generally he used his KW Marconi Atlanta fed to a five metre whip about five metres agl, but he admits to having had the use of a Sony ICF7600D during the latter stages. Naturally, with the nice new ticket Jon is saving his brass for a shiny new rig. The lads at the local club pulled a fast one on him during a special event where he'd gone to help with the donkey work. Some nice chap shoved a mike in his hand and chucked him in the deep end!

Last, but certainly not least, comes Jane Mullany from Birmingham who claimed her Silver award only a couple of weeks after the Bronze. Keen gal this one! Using her Philips D2935 and its built-in telescopic aerial, Jane has heard Alaska and Pakistan coming in like continentals. Having the receiver portable has its drawbacks as she has no excuse for dodging the washing up when she can take the thing into the kitchen (we men have it all worked out with the shack down the garden, Jane).

## Congratulations

Congratulations go out to Charles Morgan of Addiscombe who is now G0EIW! Charles is a member of the Spectrum Amateur Radio Users Group and has been trying the G1FTU Morse program. He finds it extremely useful too: I would recom-

mend it to those listeners who want to learn Morse as well as just receive it, as the memories can hold practice passages that you can change as frequently as you like; and it sends at any speed too.

## Useful program

Talking about useful programs for listeners, I must mention the super program by Technical Software of Caernarfon. This is a program developed with the listener in mind. Called the RX4, it is not cheap at £25 but has facilities that leave other receive only programs standing.

Loading only takes a few seconds, after which you are presented with the first of the modes. This is RTTY at 50 baud and the bottom frame line gives the details of the baud rate and mode. Pressing keys 1 to 4 changes the baud rate to 45, 50, 75 and 110, while keys 9 and 0 alter the shift from normal to reverse.

In use the program translated most signals quite easily, although an attempt to receive via my AF606K filter resulted in a mash of random letters – obviously it didn't like it one bit.

Pressing the C key puts the program into CW mode at 20wpm. There is a filter system built into the program which is preset at 700Hz, but by pressing the 9 key you get a 1360Hz filter and on pressing the 0 key the filter cuts out. The copying speed goes up to an amazing 250wpm and is selectable in three ranges that are automatically tracked using the 1 to 4 keys. I found that the 1360 filter performed quite adequately for general reception, but tuning had to be very precise when using the 700Hz filter.

If you are interested in SSTV, the program goes into this mode by simply pressing the T key. This presents you with a clear screen with the scan adjustment to the bottom left. It can be set to give 256 or 128 pixels per line, either horizontally or vertically, and the grey scale can be adjusted to taste.

Pictures can be stored to memory, dumped to a printer, saved to tape, or you can photograph the image as it is frozen on the screen during operation.

Pressing the A key gives you Amtor mode with the same facilities as RTTY, with shift and tone adjustments. This program is superb in use when changing quickly from one mode to another.

As the instructions run to three A4 sheets it's difficult to detail all the facilities available in this program, but with all the essentials dealt with, printer dumps and full memories available in all modes, it has to be an essential piece of software for the serious listener with a computer. The program is available for Spectrum, Commodore 64, Vic 20 (expanded) and BBC-B, from Technical Software, Upper Llandwrog, Caernarfon LL54 7RF. The price includes postage and packing.

While on the subject, some people have had problems with the G1FTU program after upgrading their Spectrum to the plus model. When pressing the keys to break out of the transmit mode, with the upgrade you have to use symbol shift/space. G1FTU has also come up with an upgraded program with screen dump facility for RTTY.

Priced at £10, my previous comments on this excellent transceiver program still apply. By the way, this one works with my AF606K filter. Write to John Pearson, 42 Chesterfield Road, Barlborough, Chesterfield.

### Complementary callsign

I received a very nice letter from Laurence Knott of London who uses the Trio R2000 with an indoor end-fed wire. Despite his limitations, Laurence has managed to pull in SU3, HB0, VK9 and XX9 during the short time he's had the receiver. He sat the RAE in December and has a new G1SWL callsign which is complementary to his hobby!

J Stuart Seymour G4CPJ wrote in to ask if computer print-outs are valid for the Prefix Awards. Yes indeed Stuart. Providing the print-out contains the essentials, ie prefix (or callsign), date and frequency, you can submit the claim.

Stuart is one of those who

have problems with the little things most of us take for granted, which gives me an excuse (if one were needed) to mention the RAIBC. This organisation caters for those who have disabilities of one sort or another and can make special arrangements for examinations or Morse tests. If you would like to help, please contact Mrs C Clark G1GQJ, 9 Conigre, Chinnor, Oxford OX9 4JY.

### One foot on the ladder

Peter Oliver got his Bronze claim in just as I was writing this piece. He has over 1500 prefixes logged since 1983 and is on the 'HPX Ladder'. Using the Realistic DX200 with a 40 metre end-fed, Peter is a keen DXer and award hunter. Incidentally, if anyone has a 1985 *Foreign Callbook*, Peter has a 1986 *World Radio TV Handbook* to swap.

Tony Blackburn of Stratford on Avon wrote to mention that I am a *persona non grata* as far as his XYL is concerned. Apparently Tony spends so much time chasing prefixes that the housework is suffering badly. Well, what do you expect when the lad is glued to the box of tricks from 10pm to 4am - he's got to sleep at some point!

Scott Marshall, who is in Berlin at present with the RE, uses a DX300 for his listening as well as an SX200N scanner. At the moment, however, he is QRV on 2 metres with an FT290R, using the call DA2QZ. He also works FM CB into the United Kingdom.

Angela Sitton from Stevenage wrote to say that a local SWL had been round to help with her aerials, as she was not receiving as well as others in the area. Some quick adjustments improved the situation somewhat, but she says her receiver is 'flat'. Sometimes a pre-amp or a preselector can be helpful in these cases as the selectivity can be a bit shy on some older sets, especially the 'general purpose' receivers. Preselectors can often be found at rallies, while pre-amps are obtainable complete or as kits from many sources.

The trouble with pre-amps is that they tend to amplify the noise as much as the signals.

Another latecomer in the mail is Nigel Marston G0ASM of Sunderland, who just squeezed in with his Silver claim. Nigel was under the

impression that the Premier award was not available to him as he had now got his licence. This is not so Nigel, you can still claim as before providing you keep within the rules. You still have to log the 2000 prefixes!

Following my enquiries at the Blackwood Rally last year, Barenco of 27 Park Road, Barnstone, Nottingham NG13 9JF, are producing the 'spreaders' for the centre of the 'OXB' mast. This unit, catalogued as Mast Brace Bracket No BE506, does away with the need to make spreaders from separate pieces and produces an even stronger mast that incorporates clamps for the straining wires to prevent any slip due to spreaders working loose. Priced at only £10, they save a lot of work. Barenco also stock a large range of other mast accessories and antennas.

Many listeners begin with the simplest of receivers, such as a five or six band portable. With this sort of set it is quite possible to get a great deal of pleasure from listening to the many foreign broadcast stations that literally swamp the frequencies throughout the day and night. At any given time there are hundreds of stations sending transmissions to all parts of the world, in every known language.

### Common language

Fortunately for us in the UK, English is the most commonly used language and it is not very difficult to find a broadcast beamed either to the UK or other English speaking countries.

As an example, broadcasts in English can be heard at various times from Israel, USA, Czechoslovakia, Russia, Japan, Korea, Nigeria, Kuwait, Poland, South Africa, Finland, Nigeria, Holland, Bulgaria, Norway, Sweden, Romania, Indonesia and many others too numerous to list here.

Some programmes are designed to attract regular listeners, including pop music, stamp collecting, or art features. Very often, comments on the programme content are invited and sometimes 'inducements' are offered to senders of correct answers to simple questions asked during the programme, obviously to see if you were

really listening!

Most of these stations have Listeners' Clubs to which you are invited to write with comments on the programmes. Membership of the club ensures you of a regular post if nothing else. Some of the more useful clubs do send propagation forecasts, DX hints, and other useful material.

After a period on the broadcast bands you may wish to progress to the amateur bands, in which case you will find your receiver either doesn't cover the amateur allocated frequencies or, if it does, it lacks the necessary system needed to receive single-sideband, which is the mode used by amateurs on the frequencies above 3.5MHz (there are still some amateurs using AM in the 1.8MHz band). The device used to resolve these signals is a Beat Frequency Oscillator (BFO), which can be made as an add-on from a number of designs in various books.

### A different matter

The communications receiver is a different matter. This type of receiver is made for the job and has the BFO fitted as standard, allowing you to tune into the amateur transmissions. It is recognised that on frequencies above 10MHz the upper sideband is used and the lower sideband is used below 10MHz. There are, of course, exceptions to the general rule and you will frequently find stations on the 'wrong' sideband (and Morse being sent on the sideband 'end' of the band).

If you did not pay much for your receiver, or if it is one of the older ones, you may find that it lacks sensitivity on the higher frequencies. Also, if the receiver is of the 'superheterodyne' type there may be a problem with what is known as image response.

Superhet radios are notorious for this problem. They usually have at least two spurious responses, one at the intermediate frequency and the other, known as the image response, at a frequency equal to double the IF, and usually above the main response. Although the tuned circuits of the receiver are peaked to reject the image response, the attenuation is not always sufficient.

A significant improvement

can be made by using a preselector. This is an RF amplifier which includes circuitry to reduce spurious responses while increasing sensitivity. Although the preselector will not provide any appreciable improvement with some of the more modern receivers, it is certainly worth trying.

**Noise limiter**

Once you have the signal as far as the output stages of the receiver, you can improve

your reception by manipulating the audio output. One of the simplest devices is the noise limiter, which prevents noise peaks from reaching ear piercing levels with the use of silicon rectifiers. In this way, the noise spikes will be limited to the peak level of the desired signal.

Although mainly used in the reception of Morse signals, the audio filter can be most useful on a crowded band. This filter fits between the receiver and the headphones

and provides a narrow pass-band so that adjacent signals are rejected. I have successfully used one of these on eighty metres when trying to hear mobiles on the WAB net.

**Hands-on experience**

Even if your receiver hasn't got all the features mentioned (few have), they are quite easily built, and I would recommend R A Penfold's *Introduction to Radio DXing* as a good start for the keen

listener. It contains circuits for many accessories that can be made quite cheaply, even by a novice to the hobby.

Regardless of which receiver you have, whether it's an old Eddystone, a DX160 or a shiny new R2000, there is no substitute for hands-on experience, which comes from hours at the receiver searching for that elusive station that you just know is there somewhere amongst the pops, cracks and whistles. See you next month Folks!

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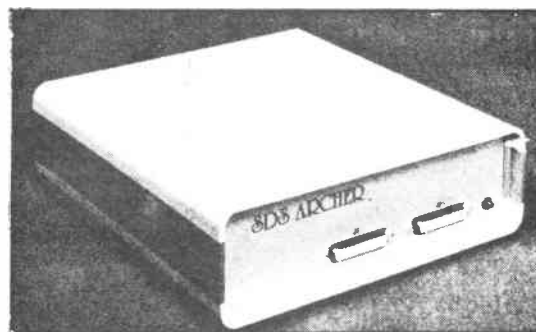
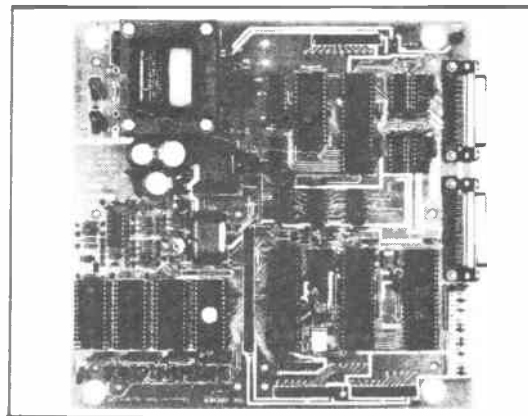
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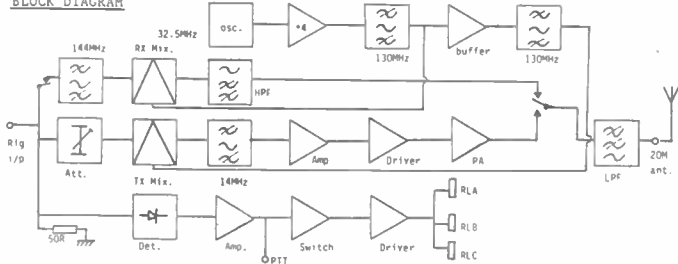
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73 from Dave G4KQH Technical Manager.

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It was just about forty years ago that I first built a piece of radio equipment. If I remember correctly, it was a two valve short wave receiver which used a couple of 2 volt filament battery valves with a 90 volt HT supply. Many of the components were obsolete even then, but it worked. For the first time I was able to listen to radio stations all over the world – and from that moment I was hooked!

Since that time, hardly a day has passed without some construction project or other sitting on the workshop bench.

Luckily, most of the projects over the years have proved to be quite reliable but this has brought its own problems. Very often when a fault has appeared or, alternatively, a modification has been called for to meet some new requirement, I have completely forgotten the original circuitry of the equipment and have had to spend hours tracing the wiring.

#### **A flash of inspiration**

Some years ago, after one particularly irritating afternoon spent tracing the wiring of a quite complicated piece of equipment, the light dawned, I should keep a project book!

Since that time I have faithfully recorded every task I have undertaken, whether it was the construction of a transceiver or merely stripping a piece of surplus equipment and over the years it has become one of the most valuable items in the workshop. From this experience I would recommend that every person interested in radio or electronics should keep one.

Even if construction is rarely undertaken it could be used to record, for instance, VSWRs of aerials on installation so that gradual deterioration can be noticed, wiring details of plugs and sockets (including the colour coding of the wires) or the result of the tests which we all carry out from time to time. As the book fills up its usefulness will increase, saving hours of time tracing wiring, redeveloping circuits, or even answering the question 'Why on earth did I do it that way?'

#### **Notebook selection**

The selection of the notebook in which to record this information is worthy of considerable thought. Firstly, it will be in use for many years and be referred to for long after that. Secondly, the pages must be of sufficient size to include quite comprehensive circuit diagrams, PCB layouts etc, and thirdly, the covers must be sufficiently substantial to stand inadvertent abuse, such as quantities of spilt hot coffee, without defacing the contents.

From these criteria the book should have hard covers and contain at least a hundred pages, preferably far more, each of A4 size or larger. The author has covered the covers of his book with plastic film as additional protection against unintentional misuse. Lastly, it should not be 'loose-leaf', for with such it is only too easy to remove a page for reference, forget to replace it and the information is lost forever.

# KEN WILLIAMS ASKS

*"Do you keep a project book?"*

Having purchased a suitable book, how then should it be used? I suppose that, in time, everyone will develop a system which is suitable to him or herself and therefore the description which follows should only be considered a general guide. It has, however, served the author well for many years so it may be considered a reasonable starting point.

In any reference book, and your project book is your reference book, indexes are almost essential. I use two: one at the beginning, which lists the projects written up in the order in which they appear, and one at the end, which records those which I intend to do. Of course, the latter is far longer than the former and many projects listed may remain for years before they reach the workshop bench. The list does, however, act as an extremely useful *aide-memoire* and I usually scan through it before going to a club junk sale or a rally to remind me of what components I should be looking for.

When an intended project is complete, the entry is annotated with the date and page on which it is written up and a brief title is added to the contents page at the beginning of the book.

For each of these indexes leave plenty of room, for you can never forecast how many projects will be included in the book.

#### **School style**

Writing up each project should follow the style which we were taught to follow in our science lab books at school. Following a title, the reason for the project should be recorded, for in later years, for instance, the reason for developing an amplifier with an input impedance of 30 ohms, an output impedance of 600 ohms but very little gain may seem obscure. However, if it is stated that it was necessary to match a low impedance microphone to the line input of a sensitive commercial amplifier, all becomes crystal clear.

This is then followed by a description of the circuit used. If the design was taken from a magazine state the title of the publication, the month and year. If it is your own say why you chose that particular design. Any peculiarities should be fully explained. For instance, that you used a certain type of transistor because you had one in the junkbox and the nearest one of the more usual type for the purpose was residing on the shelf of the local emporium!

#### **Don't forget the problems**

Do not forget to include the problems in design and construction and their solutions, for these too will have an important influence on the final design.

The equipment description complete, draw a circuit diagram and if appropriate the PCB layout. Include the measured voltages on the various components and any colour coding of the wiring.

With the equipment or modification complete and working, record and test results. If these include graphs, stick these into the book, for if you do not they will show an amazing ability to disappear.

To complete the write up list the connections to any plugs or sockets, base diagrams of unusual ICs or components etc, for this may well save hours of chasing through reference books at a later date.

#### **Finally**

Finally, and very importantly, leave a blank half page or so at the end of the description. Here, in the future, you can describe any modifications, faults or other experiences. Should there be insufficient space when the time arrives there will certainly be room to describe where to find the appropriate write up.

Over the years my project book has proved to be one of the most valuable items in the workshop; open one now, and I am sure that in years to come you will find that it will be just as valuable to you.

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# ANGUS MCKENZIE

## TESTS

A year ago I reviewed the Trio TS940S most favourably, and late last year I began to hear rumours about this new mobile rig developed from many of the ideas designed into the 940S. Its predecessor, the TS430S, is now quite an 'old rig, so it was time that Trio introduced something radically new.

The TS440S can transmit at a power of 100W on all modes on all the amateur bands up to 30MHz. Front panel buttons select LSB, USB, CW, AM, FM and FSK. Although the rig is primarily designed as a mobile, requiring 13.8V dc nominal, an accessory mains power supply is available, type PS50, with which it is perfectly compatible. Most of the facilities are accessed on the front panel, microswitch operating buttons selecting mode (with CW letter bleep, L, U, C, A etc) when depressed.

There are 100 memories which store frequency and mode, memories 90 to 99 inclusive also being capable of storing split frequencies for Rx and Tx. The usual memory write, memory to VFO, VFO to memory and enter buttons complement second functions of the first ten buttons to allow direct entry of any desired frequency within the range of the rig, in addition to memorising it with the appropriate mode in the required channel. Having accessed a memory and pressed M to VFO, you can then tune away from the memorised frequency.

### Separate scans

The rig includes two separate programmable scans, between memories 6/7, and 8/9. In this mode, the receiver sweeps across the selected band between the two memorised channels. 'Memory scan' scans all the memorised frequencies in turn, or allows you to scan any group of ten memories. The 100 memories are actually divided into ten groups, and you may find it convenient to use one group for a particular band, eg 10m FM.

To the left of these controls are normal push-buttons selecting speech frequency read-out (spring loaded and optional), noise blanker on/off, 20dB antenna attenuator, MOX Tx/Rx, auto ATU in/out (optional accessory, tuning from 3.5MHz to 28MHz bands only), and auto ATU tune. A three-position meter switch allows you to read output power level, SWR, and ALC on Tx, but always S-meter on Rx.

On the right side are more micro-processor control buttons selecting RIT, XIT, T-F set (which allows you to set Tx frequency for split operation on the other VFO when you are on Rx), 1MHz (which allows the rig to operate as a general coverage receiver from 30kHz to 30MHz) and up/down stepping buttons which either step from one amateur band



## TRIO TS440S

### Mobile HF transceiver

to the next, or through 1MHz increments when in the general coverage mode. Further buttons select the VFO functions, A=B, split, and A or B. Four in/out buttons select frequency lock, Tx processor on/off, Rx notch filter on/off and AGC fast or slow.

A rotary switch is provided with five positions for selecting the Rx IF filters (position 1, auto, selecting the appropriate filter for the mode in use) including a narrow SSB filter for SSB and narrow CW etc, whilst the other positions select 500Hz CW, SSB narrow, SSB wide (optional), and AM (extremely wide). Dual concentric rotaries provide adjustment of AF/RF gains, IF shift/RIT etc, Tx carrier/mic gain (mic gain fixed on FM) and notch filter tune/squelch (all modes).

The digital frequency display is a fluorescent type, reading in 100Hz steps, but many status functions are also displayed. When the optional speech read-out board is fitted however, frequency is read out to 10Hz resolution. Also on the front panel is an 8-pin standard Trio mic socket and a quarter inch headphone jack.

### Synthesizer

The tuning knob operates a synthesizer, tuning in 10Hz steps at a rate of 10kHz per revolution when tuned fairly slowly, but around 100kHz per revolution when spun quickly. A slip ring at the back of the tuning knob can be adjusted to vary the tuning torque required. This is a much better system as you can alter it easily by hand when the set is in use, whereas Icom's variable torque requires a screw to be adjusted through a hole underneath. One of the bugbears in

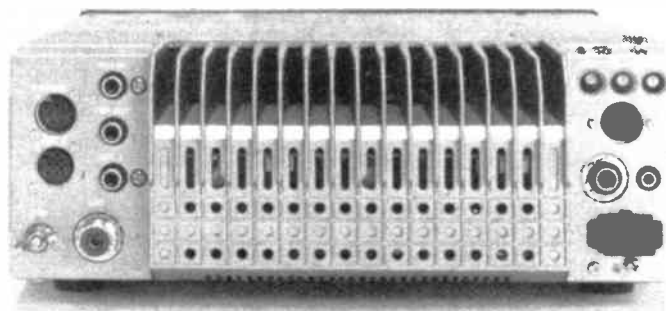
tuning a rig under mobile conditions when on SSB is that a jolt of the car can cause your hand to move the knob. Increased torque tends to prevent this happening, but many users prefer a loose torque for home base operation.

In the front of the top panel there is a three-position slider switch selecting VOX off and on for SSB, while on CW it selects semi or full break-in keying. The internal loudspeaker is positioned on the top of the case, facing upwards near the front, and although this is in a good position for the majority of users, it might be awkward if you have to set the rig well back under a dashboard as the audio could then become masked. A substantial carrying handle is fitted on the right side cheek, and under the front is a pull-out bail stand.

### Rear panel

On the rear panel there is a special 13.8V dc connector, above which there is a miniature 3.5mm jack for connecting an external speaker and a quarter inch key jack. Three recessed pre-sets allow adjustment of VOX gain, delay and anti trip level.

Three DIN type sockets are provided, named accessory 1, 2 and remote. Accessory 1 has six pins for interconnection with an optional Trio computer interface box type IC10. The accessory 2 socket has 13 pins, providing interconnections as follows: 1, 2, 5, 6, 7 and 10 n/c; 3, audio output from receiver at fixed level peaking around 300mV; 4, audio ground; 8, ground; 9, mic mute (mutes the mic amp when shorted to ground); 11, audio or data input (around 500mV required for full output and controlled by mic gain on SSB, but fixed again on FM);



12, audio ground for data input and 13, standby (external PTT). The remote socket has seven pins: 1, loudspeaker output; 2, control relay wiper going to pin-4 on Tx or pin-5 on Rx; 3, standby (external PTT); 6, ALC input; 7, +12V dc on Tx only, max current 10mA.

The antenna connection is through an SO239 socket, beside which is an earth wing nut. Three phono sockets are fitted, the first labelled accessory 3, which is left without any internal connection for user dedication, while the other two provide AFSK input and output connections for use with appropriate Amtor or RTTY interfaces.

### Trio omission

You will see from the above that, somewhat incredibly, Trio have completely omitted a transverter interface socket, which is available on various other Trio rigs, including the TS940S. I regard this as a very serious omission, although Lowe Electronics are busily engaged in working out a modification which will probably use the accessory 3 socket for Tx transverter RF drive, some of the n/c pins on the accessory 2 socket

for remotely disabling the PA when externally selecting transverter feed, and also perhaps HF receive at antenna level in/out as is provided with the TS940S.

A large heatsink on the back panel has an internal fan for cooling, and if the rig is used with an appropriate power supply it can give full output for up to one hour, providing you then let it cool off for 30 minutes. If you wind down the output power, you can use continuous operation for very long rag chews!

The rig measures 279(w) × 108(h) × 335mm(d) (including projections) and weighs 7.3kg (with the auto ATU). The optional mains PS50 power supply includes a cooling fan and is built with a conventional regulator and solid-state output circuitry. The TS440S costs £950 including VAT, and the following options are available: auto ATU, AT440, £125; PS50, heavy duty power supply, £192.60; PS430S, £139; VS1, speech frequency read-out, £27.70; and additional filters ranging from £39.56 to £46.89. A microphone is not included with the rig, but most of the Trio mics fitted with 8-pin plugs would be suitable.

### Subjective tests

The review sample arrived during March without the optional internal automatic aerial tuning unit, but this came a few days later. My colleague, Roy, found that the ATU was a fairly tight fit and slightly fiddly to install if he was to avoid pinching any of the wires. Installation of the unit took around half an hour. Because of the possibility of damaging some of the internal wiring, it would probably be better for the dealer to fit it unless you are quite experienced at digging into modern rigs.

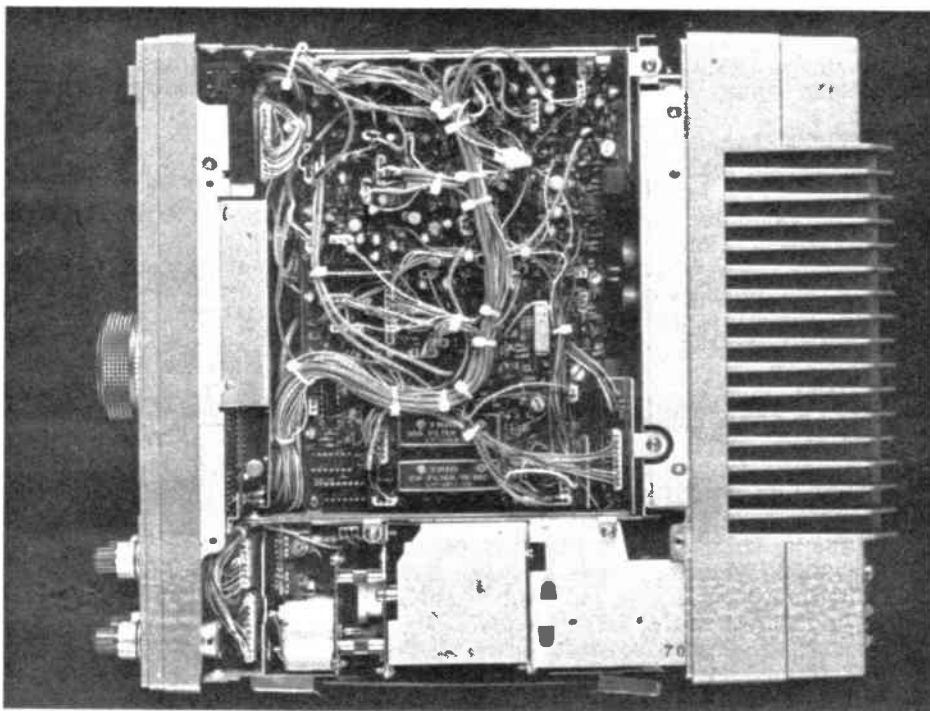
I used the rig on various bands from 1.8 to 28MHz on SSB, CW and FM. Originally I used a Trio hand mic, but soon changed to the Trio MC60 desk mic from which I obtained very good reports of modulation quality on SSB. Stations reported the transmissions to be very clean and clear. The processor worked well, adding a fair degree of punch to the transmission without it appearing to be over-processed. On FM stations commented that the quality was superb, and the response very wide, but the deviation appeared a little excessive. The full and semi break-in keying facility was much liked, and the VOX control worked very well. The up/down QSY buttons on the mic varied frequency fairly rapidly on SSB, but the QSY was not rapid enough for FM. However, if you set the FM channels in one of the banks of ten memories, you would be better off using the up/down buttons for changing memory.

### Automatic ATU

The automatic aerial tuning unit was a joy to use and corrected mismatches of up to 4:1 fairly rapidly. Mismatches of up to 5.5:1 seemed to be within the capability of the ATU, which will be a boon for mobile installations in obtaining full power off resonance into a high Q whip.

The receiver sensitivity seemed very good throughout, but the inadequacy of the highpass filter before the receiver when on the 1.8MHz band caused a considerable problem as I have many strong medium wave stations in my area. You will need to use an external ATU for Top Band in most circumstances, but a design which incorporates a highpass filter action below the tuned frequency is almost essential, a good choice being the Capco SPC300 reviewed in the January issue of *Amateur Radio*. The TS440S's highpass filter unfortunately cuts below 1.6MHz instead of 1.8MHz, and this means that local radio stations above around 1.3MHz are nowhere near adequately attenuated. It would have been far better if the filter was designed to cut steeply below 1.8MHz, which would have given a far greater attenuation below 1.6MHz.

The selectivity was good and it was useful to be able to choose between the two SSB filter bandwidths (one being an optional extra). As for the reciprocal mixing performance, I felt that the background noise in the evenings on





# G3OSS TESTS

both the 1.8 and 3.5MHz bands was rather more crackly than I would have liked, and I suggest that this must have been due to the slightly noisy synthesizer.

The 20dB antenna attenuator helped on the LF bands, and I did not note any overloading provided I used an external ATU. Without this there was a tendency for the odd products to be noted here and there. The rig received HF bands very well and I like the CW filter which had just about the right shape characteristics.

## AGC characteristics

The AGC characteristics were just as I like them and the reproduced quality from the built-in speaker was surprisingly good, no problems arising on strong speech transients. The notch filter seemed to have a very good performance, although it was slightly tricky to tune the notch exactly as you wanted it. The tuning knob assembly was superb and I liked the increase of tuning speed when the knob was spun very much, although I regretted the absence of a finger hole in the front of the knob. The tuning tension control was particularly good and very smooth.

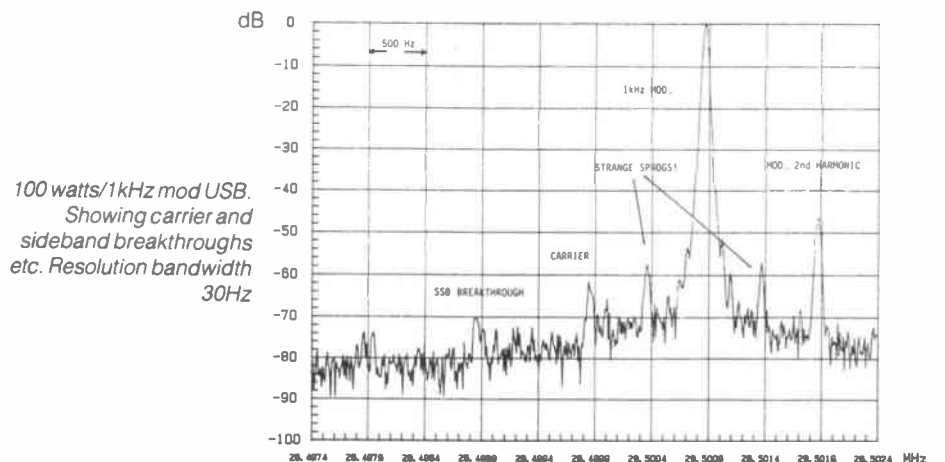
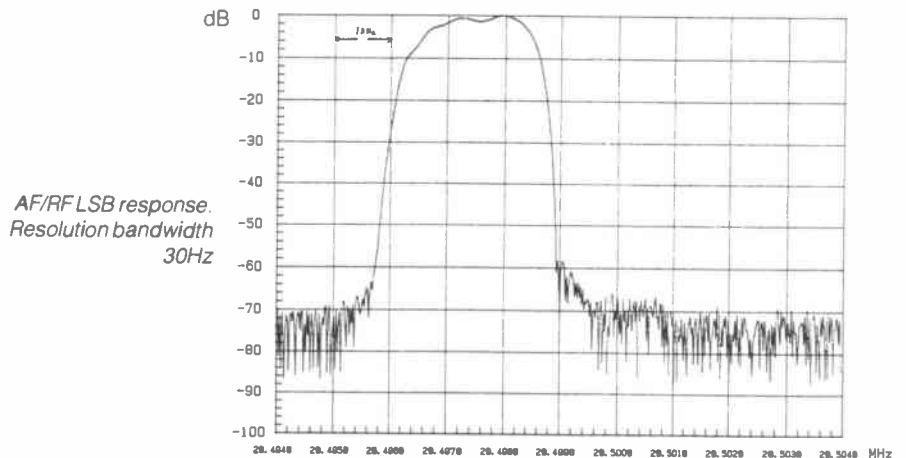
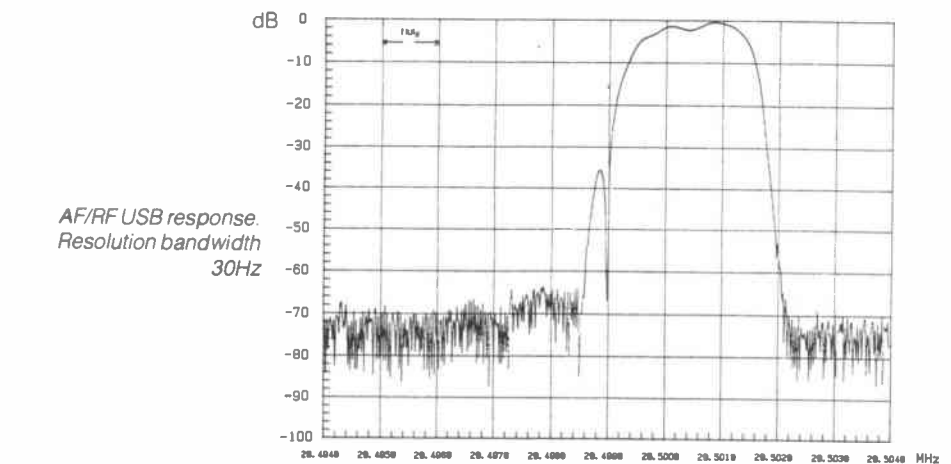
The received quality on AM was far better than average for a Japanese rig, and the wide response enabled many stations to sound more pleasant than usual, although there was of course much more interference from adjacent stations.

One could of course use the wider SSB filter for AM, and the sound quality improved slightly if you offset the tuning a little, but not far enough to depress the carrier level too much. Obviously whistles were virtually absent using the SSB filter, but the audio quality was extremely muffled, so it is a devil and deep blue sea situation, and it is a pity that no optional AM 6kHz filter is available. On 10m FM it was virtually impossible to separate 10kHz channelled stations properly, and quite often I noted whistles between stations.

## Memory functions

All the memory functions worked extremely well and were particularly easy to use, and I found it very useful indeed to enter the frequency directly. When you select a mode, selection is indicated aurally by a CW letter as appropriate, which is a nice reminder especially for the blind operator. Various pip tones are also produced as reminders. There is a MOX Tx button on the front panel, but you can also go to Tx using PTT on the mic, or externally, or using the excellent VOX controls.

I found the provision of two VFOs most useful as it permits split operation, which is often required on the HF bands. You can lock the frequency by depressing a button, which can be useful when you are mobile. The IF shift gave a very wide degree of adjustment, but I would have preferred it to have been slightly slower acting as only a small adjustment makes quite a difference on Rx. It was far easier



to QSY across a band on this rig than on the Yaesu FT757 and I much preferred the general handling.

You cannot switch the AGC off, which may be slightly irritating to a few users, but the RF gain control itself was particularly useful in reducing the gain, especially on the LF bands, thus avoiding background noise pumping on stronger signals.

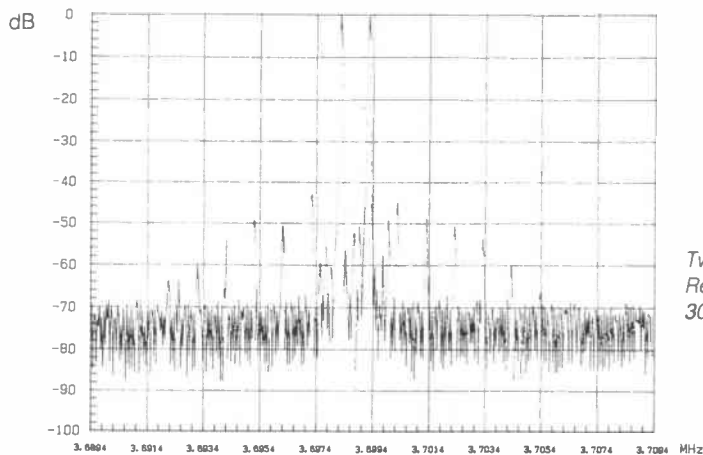
Front panel layout tends to be a matter of choice, but I think that Trio have designed it very well, with controls placed in quite convenient positions. I very much enjoyed using the rig despite the disadvantage of not having a transmitter drive socket, although this may possibly be forthcoming from Lowe Electronics as a modification.

## Automatic performance test

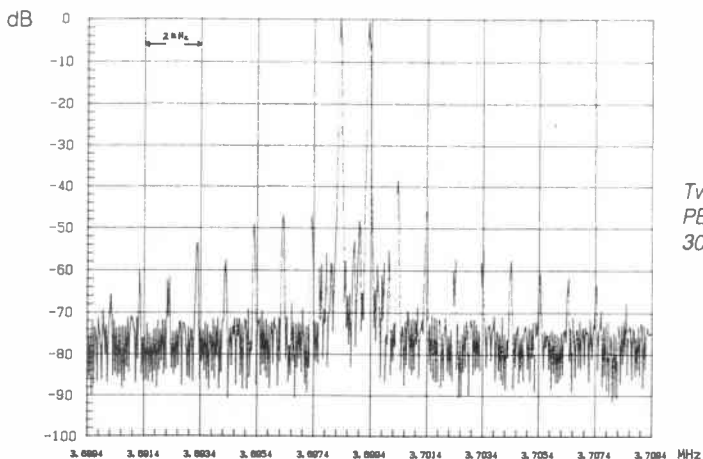
There is one very fascinating new feature about this rig, that is the unusual method of access to a sequence of 56 selectable tests. On pressing the AM and TF set buttons simultaneously and then turning the set off and on again, you will find that all the 56 tests are accessible in turn by turning the VFO knob round, the number of the test being displayed. Details of each of the tests will be listed in the service manual and Lowe Electronics stated that this excellent new facility may greatly reduce servicing time and should allow users to do their own diagnoses.

The test requires a 50 ohm dummy load to be connected to the antenna socket. We tried some of the test positions and

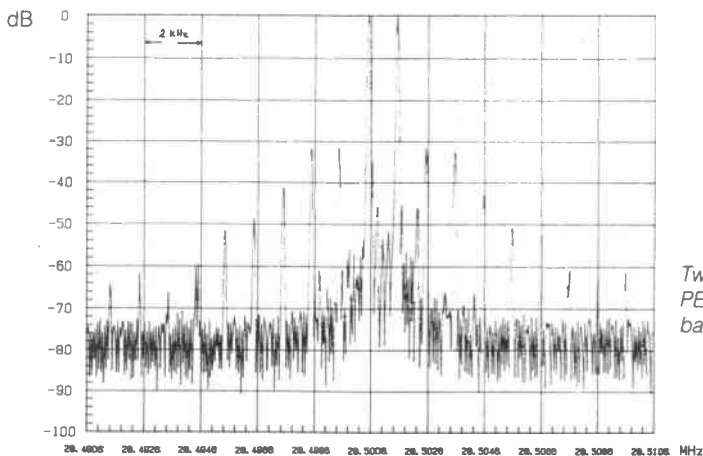
# G3OSS TESTS



Two-tone test 50 watts PEP.  
Resolution bandwidth  
30Hz



Two-tone test 100 watts  
PEP. Resolution bandwidth  
30Hz



Two-tone test 100 watts  
PEP into ALC. Resolution  
bandwidth 30Hz

lent far out from the carrier. This was investigated in depth and the performance was very similar to that of an unmodified TS940S.

A number of users have complained about the performance of many rigs on Top Band as they are subject to blocking and overloading if strong medium wave transmitters are received by their antennas. We applied many two-tone intermodulation tests at various spacings above and below 1.8 and 1.9MHz, and found that when the TS440S was tuned to these frequencies the intercept point did not begin to increase until the two interfering carriers were considerably below 1.6MHz.

There was only a slight improvement, for example, with carriers at 1.59 and 1.38MHz, but carriers at 780kHz and 1.29MHz gave an apparent intercept point improvement up to +37dBm, nearly 30dB higher than normal, which is excellent. Carriers spaced in typical positions for strong local stations at the top end of the medium wave were, however, inadequately rejected, thus proving that the bandpass filters were not properly designed for use in Europe. This is particularly unfortunate since the optional ATU necessarily omits a 1.8MHz position and is also only in the transmit path.

## Filter selectivity

The normal SSB filter selectivity is excellent down to -40dB, but the reciprocal mixing performance affected the -60dB reading making it seem much wider than it really was. On CW the YK88C filter had a bandwidth of around 500Hz for -6dB and 1.2kHz for -40dB. The FM selectivity was unfortunately rather wide and suited just 20 or 25kHz channelling, but is most certainly not suitable for 12.5kHz, let alone 10kHz, which is a pity as almost everyone is now using 10kHz channelling around 29.6MHz. Perhaps somebody could impress on the designers in Japan that narrower filters are absolutely essential in Europe.

The S-meter had a range of 31dB from S1 to S9, S9 coming out at around 50µV which is very sensible. We did however notice a slight tendency to drift over very long periods, but were unable to resolve slight measurement difficulties between one day and the next. The scalings above S9 at +20, 40 and 60dB were all fairly accurate, and the S-meter had quite a good logarithmic law overall. On FM I was disappointed to see that there was only a 16dB difference between S1 and 9, but this seems so usual.

If you use the AM wide filter for listening to broadcasting, rather than the SSB filter which is ridiculously clothly, you will find it very wide. The -40dB bandwidth at 18.5kHz explains why you are likely to hear whistles between two adjacent broadcasting stations.

The SSB product detector distortion was quite adequate, but not as low as that of the 940S, but there was a dramatic improvement in AM distortion compared

obtained some amazing displays, but unfortunately we could not interpret them as the service manual was not available at the time of writing.

## Receiver circuitry

The RF input signal from the antenna relay passes through switchable band-pass filters straight into the gates of a balanced mixer; 2 × 2SK125S MOSFETs in push-pull with a first IF output of 45.05MHz. This IF incorporates a fairly wide roofing filter and then mixes down to an 8.83MHz second IF having some of the filters in it. The main filters, however, come at the third IF of 455kHz.

## Laboratory tests

Front-end sensitivity was very good from 1.6MHz to 30MHz, very similar

figures being obtained throughout this range. Below 1.6MHz a fixed attenuator comes in reducing the sensitivity by around 16.5dB. Below 500kHz the sensitivity increases again for long wave reception, but falls off gradually towards the low end at 30kHz. On FM, sensitivity seems slightly better than on the TS940S and should be adequate, although the rather wide IF causes it to be a few dBs poorer than ideal.

Intermodulation tests on the front-end show the RF input intercept point to be around +9dBm for wide spacings, reducing to approximately -26.5dBm for 10/20kHz spacing. This latter figure is affected not only by the rather wide first roofing filter, but also by a reciprocal mixing performance which is only fair close in to the carrier, although excel-

to an unmodified 940S. 90% modulation of 1kHz produced only 1.9% distortion, and this fell at lower modulation levels. At 300Hz distortion was 5.7%, which is quite a good figure for an unmodified Japanese rig.

The FM discriminator circuitry also gave fairly low distortion, 2.5kHz deviation of 1kHz producing just over 1%, which is very low. The rig gave 1.9W output into an external 8 ohm load, but some 2.9W was available into 4 ohms, so I would recommend a 4 ohm speaker for a mobile set up, especially if you would often use the rig in heavy traffic.

## SSB response

The SSB response, although mainly determined by the IF filter shape, is subject to a gentle roll off above 1.5kHz or so: this roll off presumably being present in the audio amplifier. The AM response extends almost flat to 3kHz, is only 6dB down at 4kHz, and around 10dB down at 5kHz. This will allow quite high quality reception of good AM broadcasts, but is a side effect of the poor AM selectivity. The FM received response, checked with 750 $\mu$ S pre-emphasis in the generator, proved to be very linear from around 800Hz to 2kHz, rolling off gently at the high end, but quite steeply below 350Hz. I suggest that the HF response does not roll off quickly enough, but the LF end is ideal.

The received frequency accuracy was within 50Hz or so, but by the time the rig had been warmed up for two hours the transmitted accuracy was generally around 100Hz out, which is quite good.

We checked the audio output level with various input levels from the signal generator, setting the receiver to produce a 1kHz beat note. The level had only reduced by 2dB for an input level of -110dBm, levels dropping rapidly below this. The total RF and IF gain is therefore just about right for most purposes, allowing the receiver to sound quite lively.

AGC plots of the 'slow' position showed an average recovery of around 2 seconds with stronger signals, and a slightly slower recovery on weaker signals. The speed seemed about ideal. 'Fast' AGC was typically around 0.3 seconds, which is useful for coping with nets and CW.

The signal-to-noise ratios on strong AM and FM signals measured well, and on FM the capture ratio was excellent. At the 12dB sinad sensitivity point on FM the quieting measurement was 16dB, showing that there was slight distortion on very weak signals.

FM limiting was excellent, the limiting point being way below the sensitivity point, so that all FM signals should reproduce with similar audio recovery levels. The tunable notch filter gave a notch of 31dB, which comes in after the S-meter take-off point. Switching between USB and CW produced a receive offset of around 800Hz, which I personally find irritating as I prefer this offset on Tx.



After putting a screened 50 ohm dummy load on the antenna input, I tuned all the way from 30kHz to 30MHz hunting for spurious carriers. There were quite a few of these, but hardly any of them moved the S-meter so were obviously weak. They were also in relatively unimportant areas, but one unfortunate one at 617kHz did bring the S-meter up to S6, and this one would affect the reception of RTE (Athlone, 612kHz) and Belgium on 621kHz (RTBF).

The transmitter gave 100W, or slightly over this on all modes across its range when the auto ATU was bypassed. The auto ATU loss with the output terminated in a 50 ohm dummy load varied between 0.5 and 0.7dB, the loss being at its highest at LF. These losses are insignificant in practice and no worse than most good quality ATUs. We took many two-tone intermodulation plots on various bands, and the best performance at full output was at 3.7MHz. The plot shows the performance to be very good, and a lot better than many other solid-state PAs. Comparing this with the 50W PEP plot at the same frequency is interesting, for at this level it is even cleaner. At 28.5MHz the 100W PEP performance is again good, the plot being taken with the drive set well into ALC to obtain the worst possible performance! You can see that the IPs reach -60dB by the 13th order, which is actually fairly similar to the LF performance, although low orders are worse. At 50W PEP the two-tone plot is not that much better however, presumably because of the characteristics of the PA transistors.

We checked the performance with the ATU switched in and the results were very similar. We had a very hard look at the harmonic and spurious output performance. When the rig was tested with the ATU switched out, the second harmonic was usually the worst, although the third of 10.12MHz was actually marginally worse than the second.

When the ATU was switched in, the second harmonic always improved, usually very dramatically, whilst the third also showed a useful improvement. Higher harmonics were well attenuated on all bands. In looking at 21 and 28MHz we did notice some strange spuri on

21MHz, these being at  $\pm 2.5$ MHz at around -51dB. At 28.5MHz spuri were noted at approximately  $\pm 4.8$ MHz at a low level of -56dB, but at  $\pm 12$ MHz spuri were seen at a level of -45 and 52dB, which is a little strange.

Returning to the two-tone plots, most of the little pimples around the two-tones, other than the normal RF IPs, are due to distortions within the microphone amplifier and modulation circuitry. These are all at low levels, which shows that this circuitry is very good and clean.

A plot taken of 1kHz modulation at 100W output showed second harmonic distortion in the mic amp at 0.45%, which is very low, carrier breakthrough at -62dB and alternate sideband rejection at the incredibly low level of -70dB. The plot also shows 500Hz modulation of the 1kHz modulation frequency, the sidebands being at -58dB, which is harmless enough, and equivalent to 0.25% AM modulation. Changing the modulation frequency did not affect this strange 500Hz modulation, which we assume must be somehow coming in from the synthesizer. The PS50 power supply gave an excellent performance and no significant ac ripples were noted.

## 'Measuretest'

In December 1984 I developed a method of plotting out the complete audio and IF passband shape of an SSB transmitter, and I have often used this method for reviews in this magazine. Technical details of the method are available in the Marconi 'Measuretest' pamphlet No 54, which I wrote for them in 1985, and which also contains information on other transmitter testing methods. The response plots for both LSB and USB taken with the TS440S show the filter to be excellent, the two sidebands being reasonably similar in characteristics. You can see the sharp null at the position of the carrier, which is due to the LF attenuation of the microphone amplifier, as opposed to the little blip which results from the shape of the IF filter on the other side of the carrier. Note: there is only a very slight ripple within the passband of the filter.

We checked the FM response of the transmitter by applying de-emphasis of 750 $\mu$ S in the Marconi 2305 modulation

# G3OSS TESTS

test meter, pen charting the overall response in the normal way. We were rather surprised to see that the response at 5kHz was only attenuated by 7dB, 3kHz being almost flat. The LF end was also quite extended.

Since the maximum deviation was around 5kHz before clipping, reaching a maximum of 5.5kHz into clipping, it will

be seen that an average speech transmission on FM will occupy nearly double the bandwidth that is desirable in the UK on the 10m band, showing that Trio's design is optimised for much wider channelling. You would therefore be advised to reduce the deviation somewhat by adjusting an internal pre-set to avoid spreading onto adjacent channels,

which could upset other band users. However, the transmitted quality as it stands is excellent, and you can use the full potential if there are not too many other users on the band.

The internal power meter read output power quite accurately, and it was most useful to be able to read SWR directly. The carrier control allows one to reduce output power down to an extremely low level, well below 1W on FM and CW, but it becomes an RF drive control on SSB, and controls the RF output gain rather than the peak output power.

## TRIO TS440S TEST RESULTS TABLE

### RECEIVER SECTION

#### RF sensitivity (12dB sinad)

SSB	1.9MHz	-125dBm
	3.7MHz	-125dBm
	7.05MHz	-125dBm
	14.2MHz	-124dBm
	21.3MHz	-124dBm
	28.55MHz	-124dBm
FM	29.6MHz	-119dBm

#### SSB RF input intercept point

	100/200kHz	+9dBm
	20/40kHz	-7dBm (affected by RM)
	10/20kHz	-26.5dBm (affected by RM)

(Performance similar on all bands tested)

#### Reciprocal mixing ratio

(Offset carrier level required to degrade noise floor by 3dB. Measurements in SSB bandwidth)

	5kHz	74dB
	10kHz	82dB
	20kHz	92dB
	50kHz	101dB
	100kHz	109dB

#### Selectivities

##### SSB selectivity narrow filter

	-6dB	2.1kHz
	-40dB	2.9kHz
	-60dB	5.4kHz (affected by RM)

##### SSB selectivity wide filter

	-6dB	2.3kHz
	-40dB	3.1kHz

##### CW selectivity

	-6dB	500Hz
	-40dB	1.2kHz

##### AM selectivity

	-6dB	6.7kHz
	-40dB	18.5kHz

##### FM selectivity

	12.5kHz channelling	13dB
	25kHz channelling	60.5dB

#### S-meter

SSB	S1	-104dBm
	S5	-88dBm
	S9	-73dBm
	S9+20	-55dBm
	S9+40	-33dBm
	S9+60	-15dBm
FM	S1	-112dBm
	S5	-100dBm
	S9	-96dBm
	S9+20	-92dBm
	S9+40	-88dBm
	S9+60	-81dBm

#### Distortion

	SSB product detector distortion	1.7%
	FM audio distortion @ 2.5kHz dev	1.2%
	FM audio distortion @ 4.5kHz dev	1.5%
	AM distortion 1kHz, 30% mod	1.5%
	AM distortion 1kHz, 90% mod	1.9%
	AM distortion 300Hz, 90% mod	5.7%

#### Audio output power

	10% THD into 8 ohms	1.9W
	10% THD into 4 ohms	2.9W
	FM maximum achievable signal/noise	54dB
	FM capture ratio	5dB
	FM quieting @ 12dB sinad point	16dB
	Notch filter depth	31dB
	Max Rx frequency error noted	50Hz

#### Transmitter

	Maximum output power - all modes	100W average
	Maximum Tx frequency error noted	110Hz
	SSB carrier breakthrough	-62dB
	1kHz alternate sideband rejection	70dB

### Conclusions

This rig's main competitors are the Yaesu FT757, the Trio TS430S and the Icom IC735. I feel it considerably outclasses the 757 and 430, so the choice is between the IC735 and this new rig. Although I much prefer the audio performance of the Trio, the RF performance of the Icom is rather better, the main area of improvement being that of reciprocal mixing. The IC735 is rather more fiddly to use, and the AM performance of the Trio is far better on strong stations, although the 735's AM selectivity is rather better. The FM received performance is not good enough on any of the rigs mentioned. The Icom's reciprocal mixing performance is a lot better, and Trio's engineers should have learned a lesson from John Thorpe's excellent modification to the 940S. I prefer the transmit facilities of the Trio, but it will be a serious disadvantage for some that Trio themselves have not provided for transverter interconnections. Several friends of mine are already using the Icom for feeding muTek transverters.

### Computer interfacing

The possibility of computer interfacing is interesting for it will allow many new possibilities, especially if you also use the data inputs and outputs, and I am delighted to see that the external relay switching is isolated from the chassis.

Although much of the circuitry has obviously come from the development of the TS940S, the general performance of the receiver is clearly not as good. It is very difficult to show any overall preference between the IC735 and the TS440S, so there is plenty of room for both on the market. If you want to work mobile on the LF and HF bands in a really big way, however, the built-in auto ATU facility will probably swing the balance, although Icom also do an external automatic ATU as well as what is in effect a base loaded whip. I have always found centre loaded whips a lot better though, and the Trio should work into these extremely well. From a base station point of view, both rigs have their good points.

I would like to thank Lowe Electronics for getting the review sample to me very quickly after its arrival in the UK, and for providing all the options at very short notice. Thanks are also due to my colleague, Roy Brooker, for assisting with the measurements and plots.

## ICOM IC02E MK2

updated ergonomics



The original Icom IC02E received a rather lukewarm review when I originally covered it in the May 1984 issue of *Amateur Radio*. It seems to have taken a long time for Icom to correct many of the logic problems, but at last I have received a review sample which is dramatically better, containing vastly improved logic. The general appearance is virtually identical, but operationally it is now much easier to use.

The new version allows you to permanently store the required repeater offset used, and it is only necessary to press the function button, followed by 'star' or 'hash' to obtain negative or positive repeater shifts. If you want to return to simplex, you just push the same function button again. The older version required five or six button pushes to obtain a repeater channel not in memory! A major grumble that I had with the previous version was that once you had patiently put in repeater shift, you immediately lost it if you QSY'd up or down one channel, thus making it difficult to hunt around the repeater channels. On the MK2 version, once a repeater shift has been selected, you can go up and down channels by pressing 'star' or 'hash' to step down or up in frequency.

In the original version it was necessary to insert a repeater shift into memory 1 if you wanted to store repeater shifts in memories 2 to 6. This was very tiresome if you wanted to use memory 1 as your main priority or calling channel, for most users have this as a simplex channel, and when memory 1 was simplex, memories 2 to 6 would not give a shift, although you thought that it was shifting as the appropriate minus or plus sign came up

on the display. Now, having chosen the rig's repeater shift, you can insert a simplex channel into memory 1, and memories 2 to 6 then have the same shift as that inserted in 1 even if 1 is not programmed for repeater use; memories 7 to 0 allowing any required shift when programmed.

Depressing button 'D' immediately accesses the frequency and mode programmed in memory 3, while the priority channel becomes memory 4. The frequencies stored into memories 5 and 6 are the limits for the programmed scanning mode.

We checked the output powers of the latest version, kindly loaned to us by Thanet Electronics, and on 13.8V dc (external) the rig achieved 5.2W high power and 550mW low power. With the rig working off the normal BP3 battery pack, we noted 4.2W and 500mW respectively with the battery charged for only about three hours.

In general use, the performance seemed very similar to the original unit, and modulation quality was good. These improvements now allow me to give the rig a good recommendation which can accommodate 12.5kHz channelling if required. I feel that its main competitor is the Yaesu FT209R or RH, and the only major difference between them is that the Yaesu has a rather useful battery economy circuit (see my review in November 1984 *Amateur Radio*). I understand that it is possible to modify the IC02E fairly easily to cover a much broader frequency spectrum by changing the programming diodes around etc.

For further details about the rig, see the original review.

## TRIO TS670

In the November issue of *Amateur Radio* G3OSS reviewed the Trio TS670 HF transceiver. Unfortunately, two pages of the author's copy were accidentally transposed so we have reprinted the relevant text correctly to clear up any confusion.

Please accept our apologies for any inconvenience this may have caused.

## Laboratory tests

The RF sensitivity on the 50MHz band is absolutely fabulous and as good as I have ever measured on any unmodified Japanese black box on any frequency. On the HF and LF bands the sensitivity falls a little but is at least as good as one could possibly need on all the bands below 30MHz on CW and SSB. On FM/10m, however, it is just a little lacking, although not bad. The reciprocal mixing performance is average and therefore slightly disappointing.

The noise floor fails to reach the astonishing figures of the latest Icom and Trio rigs from 20kHz outwards and close in to the carrier there is slight synthesizer noise, but this is not serious. We spent hours checking and recheck-

ing the RFIM measurements on 7, 28 and 50MHz bands. The blocking performance caused by frequencies fairly close to the required one is just adequate, and intermediate spacings show a clear improvement up to 50/100kHz. However, further out than this there is a most puzzling situation, the apparent intercept point degrades quite markedly and only improves again with carriers spaced 1 and 2MHz off-channel. The following explanation is highly tentative but seems probable.

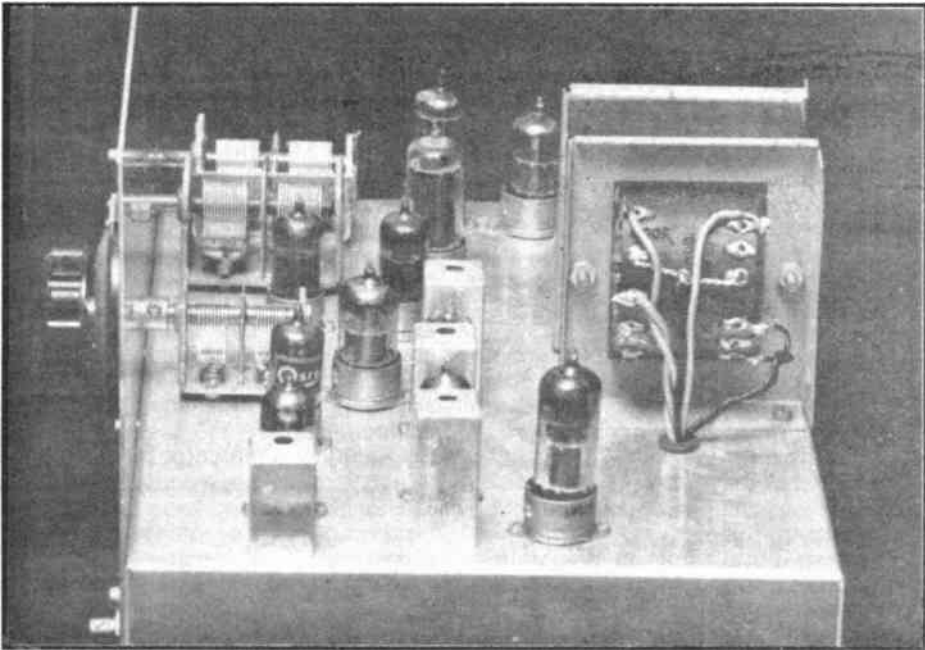
The AGC line feeds back to the RF stage as well as the single 8.83MHz IF stages. The mixer output, I suspect, is far from correctly loaded at off-channel frequencies, and thus causes severe degradation in the intermodulation performance at the mixer. The first IF filter, a crystal type, is fed directly from the mixer and is a roofing filter which has to be wide enough to pass FM. This feeds into the first IF stage which drives the noise blanker system, the FM section and the chosen additional IF filter for SSB/CW.

The rig comes with an SSB filter (YK88S), but optional additions are a CW filter type YK88C (500Hz), or YK88CN (270Hz) and an AM filter type YK88A with 6kHz bandwidth. The FM board is fitted as standard but the general coverage

board type GC10 is optional, as is the speech synthesizer read-out type VS1. A VOX unit accessory type VOX-4 has presets for VOX gain, anti-VOX and VOX delay. It also contains a built-in mic processor with gain control for use with the rig externally.

The RF intercept points are thus very disappointing for a modern rig, although the performance on 50MHz should be perfectly satisfactory even when activity mounts up to as high a degree as I think it might do one day. In the context of mobile operation the RFIM performance does not have to be so good, as received signals are much weaker. Mobile HF antennas are normally resonant over a fairly narrow bandwidth, especially on the 7MHz band where the problem is most severe in a home base station.

The CW and SSB selectivities both measured quite well, although the overall bandwidth of the latter was slightly wider than usual. However, this was certainly not too wide, thus permitting some good quality audio to come through. The skirts are fairly steep so that the bandwidth for -80dB at 4.7kHz is only 100Hz wider than the -60dB bandwidth. An alternative narrower SSB filter is available, type YK88SN, designed originally for rigs such as the TS130.



# BUILD TOP BAND FOR OLD TIME PART

DV Pritchard G4GVO and Tom  
construction of a Top Band transmitter  
the character of the good old  
build a rig

It has been said that any ideas about radio construction which crop up after two or three glasses of wine ought to be forgotten. Consequently we feel it should be mentioned that the growers of *Mosel Auslese* are entirely responsible for this article. We mention this so that the blame may be laid in the right quarter.

We had been talking about the (good) old days of plate and screen modulation and wondering whether CRAM (the Campaign for Real AM) had fizzled out, when Tom (I think it was Tom) said it was a pity that valves and their associated components were no longer easily obtainable. Flicking through the adverts in this magazine I informed him that they were; and very reasonably priced at that. With this information we roughed out a

few designs on scraps of paper.

Our aim was to see if a transmitter/receiver, typical of the fifties, could still be built using components in common use at the time. After a couple of hours (and another bottle) we came up with the circuit of a rig which would be entirely self-contained on a 12 x 9 x 2½in chassis. A further quick check of the adverts revealed that all the components were still available, so we decided to go ahead and build two rigs.

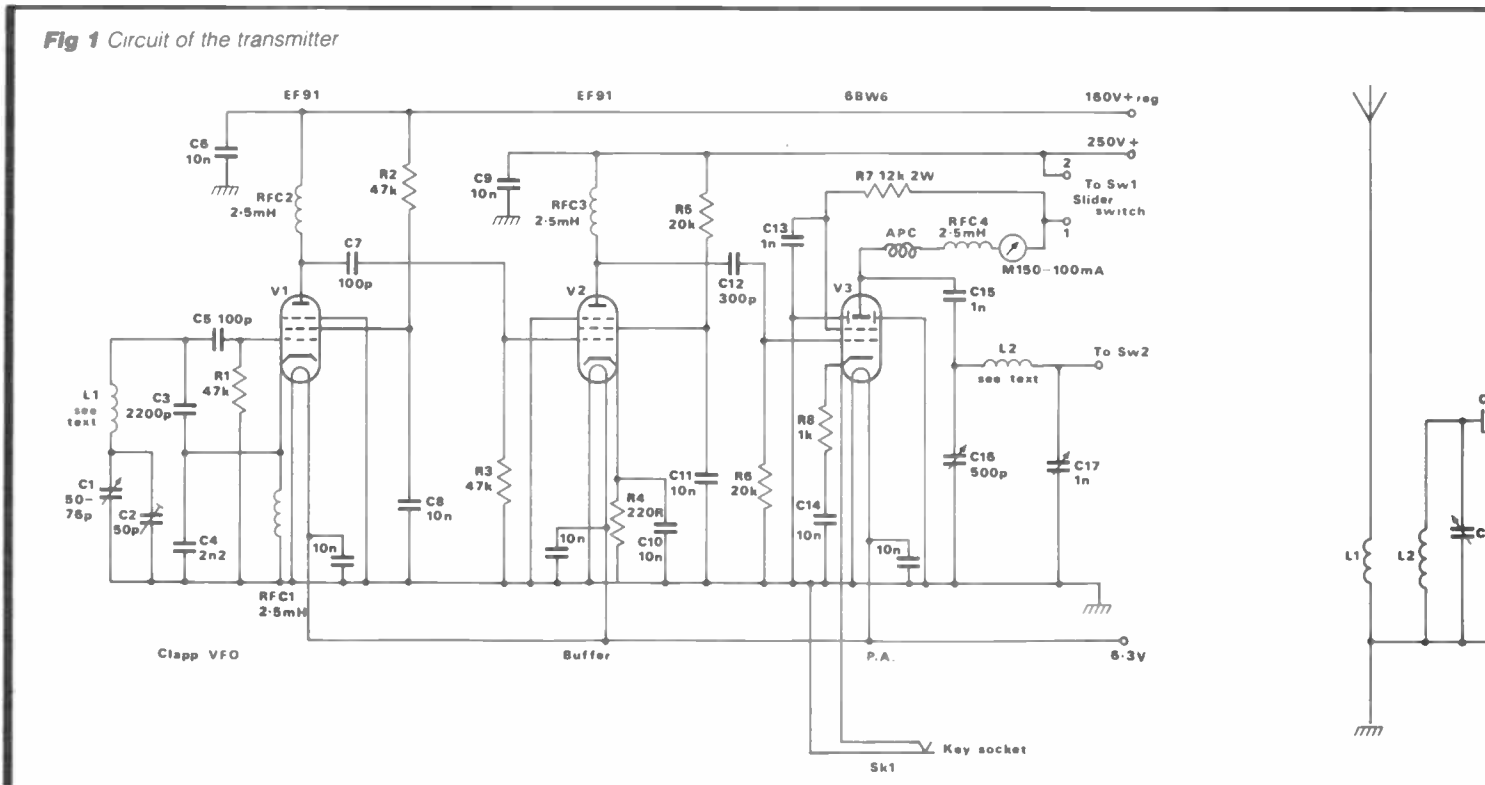
Invariably, many readers will ask why? We might be tempted to reply with comments about how rough sideband is on the ears, or how feeble inserted carrier is compared to real AM, or even how apprehensive some newcomers are about voltages over thirty or thereabouts – but we won't.

The simple answer may be pure nostalgia, or even a challenge. Yet it really goes beyond that. Top Band AM is not yet dead, and this rig not only puts out a really punchy AM signal, but will give years of service before any major components need to be replaced. Certainly there is more to its construction than most modern gear requires, but the effort is more than worthwhile as you will discover if you decide to build it.

### General design

The transmitter is nearly, but not quite, a 'Chinese Copy' of the famous AT5, which, alas, is no longer made. The differences lie in the line-up. This one uses an EF91 Clapp VFO, an EF91 buffer, and a 6BW6 PA. The circuit is shown in Figure 1.

Fig 1 Circuit of the transmitter



# LD A ND RIG IMES' SAKE ONE

R Mowbray G3VUE detail the  
transmitter/receiver tuned (!) to  
days. Support CRAM (?) and  
like dad's!



Figure 2 shows the circuit of the receiver which, though simple, is quite good for reception of normal Top Band AM, CW, and (if you insist) SSB. A 6BA6 RF preselector precedes an ECH81 mixer which feeds the resultant 465kHz signal to a further 6BA6 for IF amplification. The signal is detected by an EB91 double-diode and a portion is filtered off for AGC. An old stalwart, the ECL80, provides a triode stage of audio amplification into the pentode output section. No provision has been made for a BFO as the VFO in the NET position furnishes ample injection at signal frequency. However, space is available on the chassis for a BFO if one is considered necessary.

The aluminium chassis measures 12 x 9 x 2½in, and a front panel of 12 x 8in, a

bottom panel of 12 x 9in and a cover to fit are also required (see Figure 3). For those who prefer ready-made parts, the whole assembly is obtainable for approximately £9 from H L Smith and Co of Edgware Road, London, post and packing excluded.

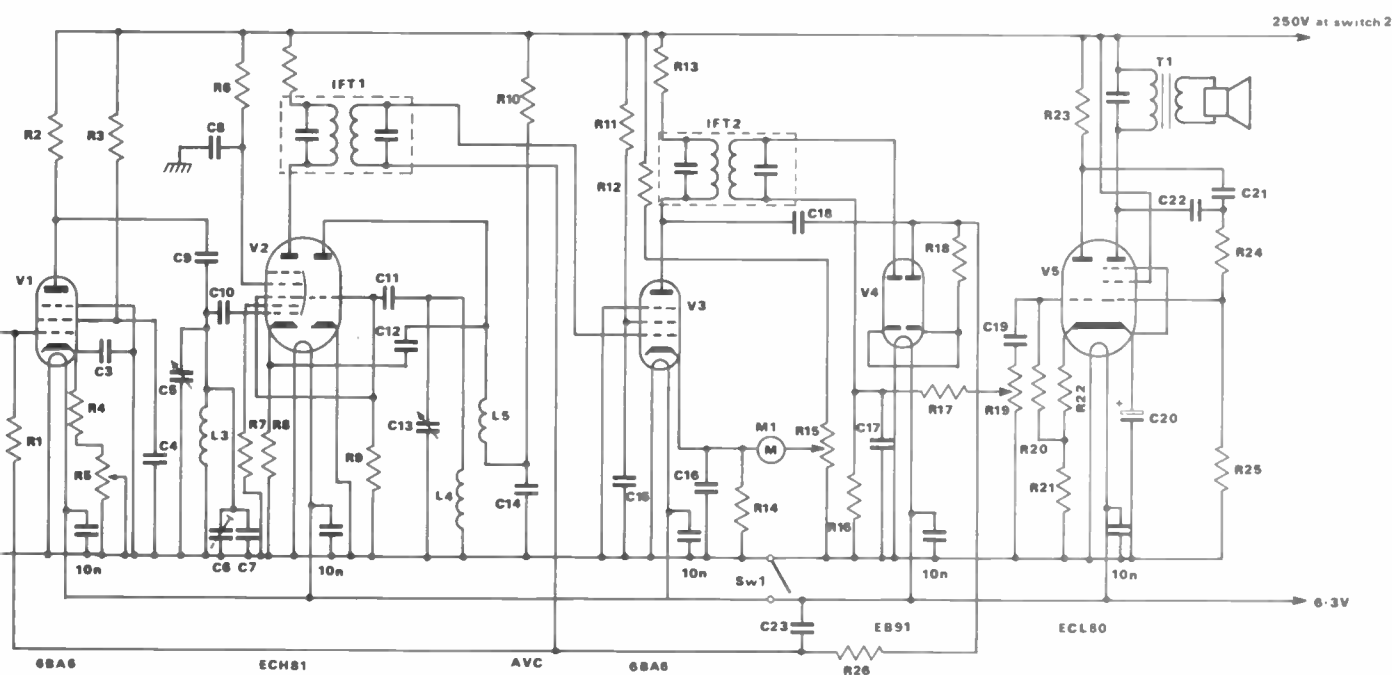
### Construction

Figure 4 shows the approximate layout of components as viewed from the underside of the chassis. We say *approximate* because, apart from the valve-holders, the coil cans and the IFTs, some variation in size is to be expected with certain components, such as the mains transformer, the modulation transformer, the smoothing choke and the variable capacitors. Nevertheless, it is possible to fit everything in quite easily.

At this point we ask for the indulgence of experienced constructors while we offer a few hints to those who may not have tackled valve equipment before.

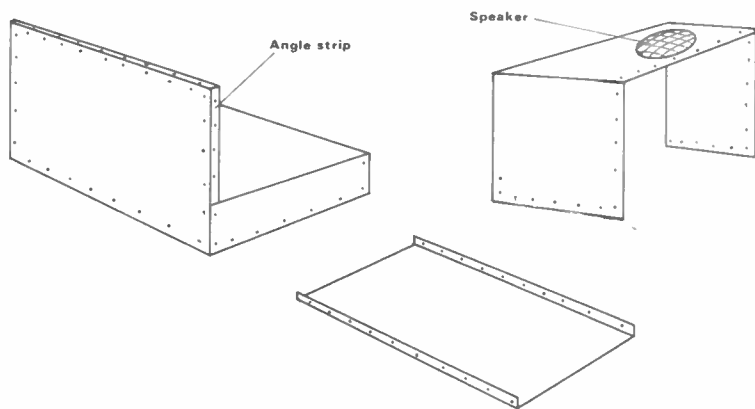
All the main components are laid out first and marked in position. It is best to begin with the mains transformer, the smoothing choke and the modulation transformer. Offer up the parts first and check that they do not clash with other components above or below the chassis. When marked, the holes are centralised with a punch, drilled to size and the burrs removed with a larger drill or a counter-sink rose. The valve-holders are similarly positioned, marked and the holes cut with a 'Q-Max' tank-cutter obtainable from plumbing suppliers (or your local old-timer). Two sizes of bit are required; a 5/8in and a 3/4in diameter for the B7G and

Fig 2 Circuit of the receiver

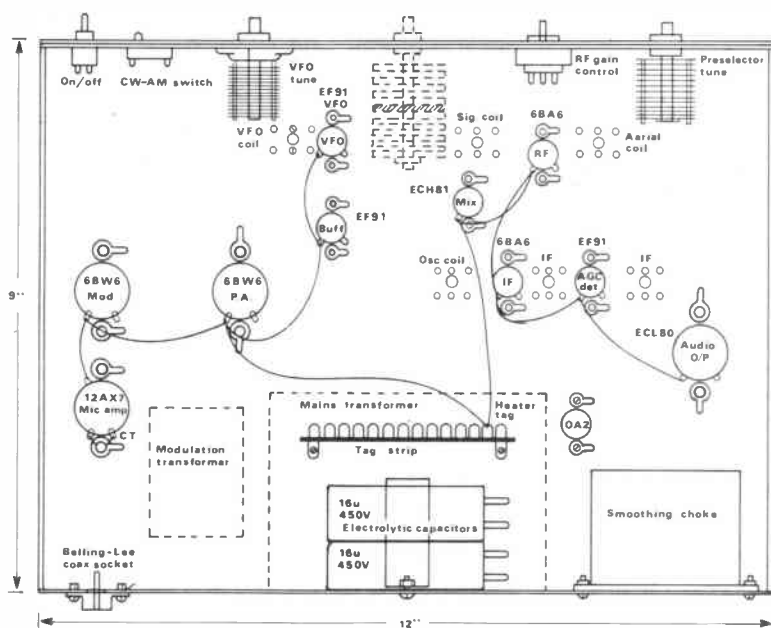


# TOP BAND NOSTALGIA

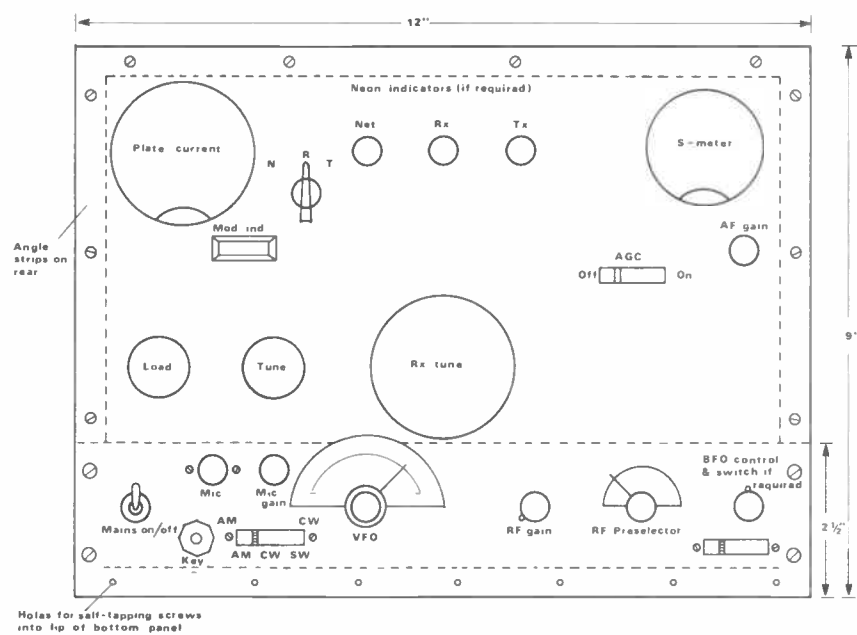
**Fig 3** Details of chassis, panel, cover and bottom panel



**Fig 4** Underside view of valve-bases and main components



**Fig 5** General layout of front panel



B9A holders respectively. You will also need an assortment of 2, 4 and 6 BA nuts, bolts, washers and soldering tags.

Ensure that the valve holders are orientated correctly, with the heater connections in the positions shown in *Figure 4*. Bolt them in place, not forgetting to insert a soldering tag under each nut as shown in the diagram. All tag-strips, coil-bases and IFTs are now positioned and their holes marked and drilled. A template for the IFTs is furnished for this purpose by the manufacturers. If the coils have already been wound, all these components may now be permanently mounted.

All components with shanks extending through the front panel should now be positioned, the shanks being measured and cut to the required lengths. On completion, preparations are made for drilling the panel.

## Very scientific!

This is achieved by the highly scientific method of placing the chassis on a flat surface (such as the XYL's polished rosewood table) and running a straight-edge along one side of the chassis. Align the panel and push it against the ends of the shanks, having previously daubed them with a suitable marking material (we used a spot of white emulsion because it was handy).

Remove the panel, centre-punch the positions and drill the holes (preferably *not* on the table). Holes are also made for the AM/CW switch and the AGC on/off switch and, as these are rectangular, you will have to mark them with a scriber, drill a number of small holes just inside the edges, and cut them out with a chisel. Actually, aluminium is a very obliging material, and if the holes are drilled as closely as possible, the spaces between can be cut with the tip of a penknife. A few minutes work with a file will smooth the edges to a fine finish.

Holes are also drilled at the panel edges for the 1/2in angle strips which support the cover and bottom panel. Those for the meters can be made with an adjustable cutter. The meters, incidentally, are the old-fashioned round ones often found at rallies. You can cheat if you wish and install modern ones, but these will not give the authentic appearance you are aiming for.

Some holes, such as those for the microphone and the key sockets and other components which are mounted on the front apron of the chassis, will obviously have to be made with the panel bolted in position. But before this is attempted, remove any variable capacitors still in position to prevent aluminium dust from getting between the vanes. When all the metal-work is completed, tighten up the panel securing bolts and ensure that the bottom panel and the cover fit perfectly. If some metal-work is required later on when the variable capacitors have been fixed in position, cover them with a piece of clean material to prevent the ingress of dust and small particles.



# TOP BAND NOSTALGIA

Holes will be required in the lips of the bottom panel and in the angle-strips which support the cover. These are for self-tapping screws and the appropriate clearing size is needed. The sides of the chassis will also have to be drilled for this purpose, but the work takes only a matter of a few minutes. The 3 ohm speaker is mounted under the top of the cover and a suitably sized hole will be required. It is better to wait until all the components on top of the chassis are in place before siting the speaker and cutting the hole as then, together with a piece of speaker gauze, the unit can be fitted when required.

Small plastic feet for the bottom panel are easily obtainable or made from any suitable material, and these are bolted in the appropriate positions. The Belling-Lee coaxial socket for the antenna, and the nuts and bolts for the earth connection are also placed in position.

Clearly, extra holes for grommets, tag-strips, etc, will be needed as construction continues, but these should present few problems. Remember to cover and protect any vulnerable items nearby, and to clear away any debris as you proceed.

Although all of this seems to involve a lot of work, in reality it is not a lengthy task: two or three evenings at a leisurely pace will see it through comfortably.

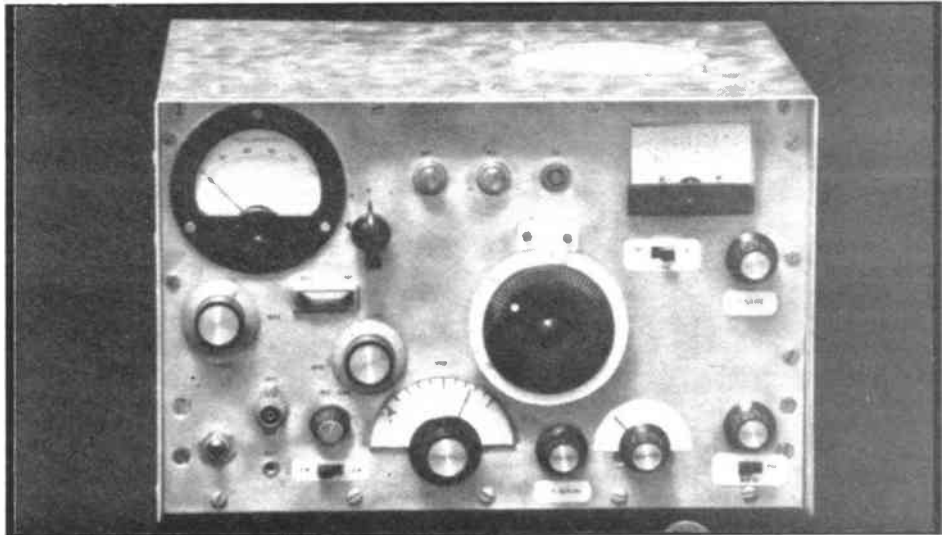
## Wiring

The heater wiring is put in first, a quick way of doing this being the use of No 16 bare copper wire and plastic sleeving. Don't bother about twisting the wires; this might be important with Hi-Fi audio, but not on 160 metres. Twist one end round the tag-strip near the smoothing components and lay out the wire to each valve holder in the order shown in Figure 4. This will tell you the total length required. At the same time, the plastic sleeving is measured between the points and cut ready. Solder one end of the wire to the tag-strip, push on the sleeving, take a turn round the tag on the valve holder, solder it in position, push on the next piece of sleeving and continue in this way to the end.

The second heater tag at each holder is now connected to the nearest earth tag bolted underneath the valveholder and the .01 RF by-pass capacitors are soldered in place. The central spigots of the holders and all tags at earth potential are now soldered together with the same size wire, using the second earthing tag, so that all earthing points of each valve are complete.

Proceed with the cathodes and solder in the resistors and by-pass capacitors. Don't make great twists at the connections—it isn't a factory job—a simple hook turn is all that is needed. Continue with the screen and anode wiring placing the various components needed as you go along. Finally, the grids and signal circuits are wired up.

Of course, it may not be convenient to work in exactly this order, and the method is only offered as a rough guide. Not every component has been shown,



but you will soon see where a tag-strip, etc, may be required for supporting components, and this is as much commonsense as engineering practice.

## RF and signal circuits

Ideally, the same size wire should be used here to preserve rigidity, but there is no reason why plastic covered wire should not be utilised. Keep all connections as short and direct as possible between the various points, but do not get grid and anode wiring too close.

Begin with the RF stage and continue to the end of the receiver. As this is quite simple, very little comment is required beyond the advice already given.

All coils are wound on 7mm diameter formers, obtainable with slugs and screening cans from Maxi-Q of Clacton. The IFTs are available from the same source (see components list). Figure 6 gives the winding details for all coils. The

windings are kept in place with a smear of acetate cement and you should check that the ten turns of the mixer oscillator coil are in the correct phase. If oscillation fails to occur the connections between the anode and C14 should be reversed.

C1 is a 100pF variable which, like C5/C13, is available from advertisers or may be found at rallies. C5/C13 is a 2 gang 75pF variable with five rotor vanes removed from C13 for oscillator tracking purposes. A polar type is ideal here.

On completion of the wiring, check all connections carefully (see Figure 7), especially those to the ECH81 mixer and the ECL80 output valve. Note that grid 3 of the mixer heptode is connected externally to the grid of the triode section, and that R20 from the triode grid of the ECL80 does not go to earth but to the conjunction of R21 and R22.

**Completed next month**

Fig 6 Details of receiver coils

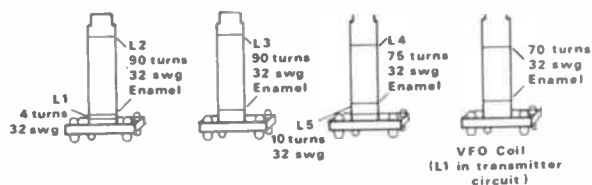
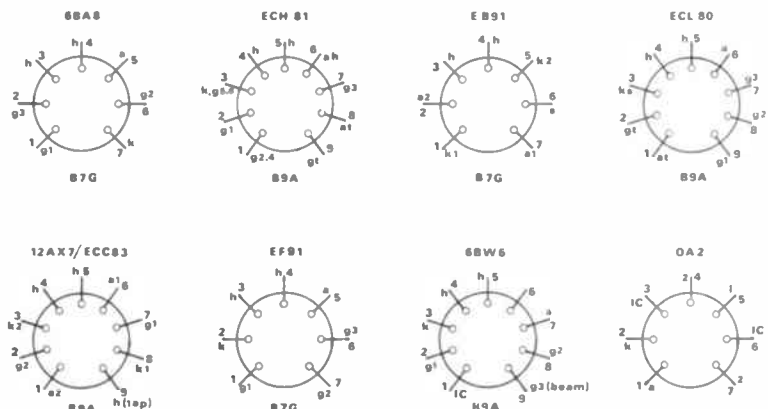


Fig 7 Details of valve-pin connections (viewed from underside)



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# DX DIARY

News for HF operators compiled by Don Field G3XTT

At the Visalia DX Convention, held in California in April, the expert from Stanford University was saying that we can expect the minimum of the present sunspot cycle to occur in July. The next maximum should occur around January 1991, with a smoothed sunspot number of 120 which, while not exceptional, compares well with recent maxima. Something to look forward to.

Nevertheless, we can't complain too much. Openings to the Pacific on 20 metres were frequent this spring and even 15 metres has been full of JAs from time to time. As for the LF bands, no one should have been short of DX contacts. In April DK7PE made a surprise appearance from Macau as XX9CW, and proved to be workable with relative ease on 20, 40 and 80 metres (CW only). Several G stations even managed to work him on Top Band.

Ron ZL1AMO had less success with his DXpedition. Although, as I reported last month, he got as far as Tokelau, he was unable to operate during the night because the locals complained about the noise of his generator. He left early and attempted an operation as ZK1CQ from the Cook Islands, but had problems with the customs people. In the end he returned home much earlier than planned.

Apparently he is now not too popular with a group of Top Band enthusiasts in the USA who supplied him with a linear covering 160m so that he could give them some new countries on that band.

## Operation Raleigh

This round-the-world expedition aboard the *Sir Walter Raleigh* will have started on its Pacific leg by the time this appears in print. The radio operators include G4TAW who has already been active as G4TAW/CE7. While at sea the expedition's amateur call-sign is GB0SWR/MM. Some operation from Easter Island is possible in mid June, followed by Henderson and Pitcairn Islands from 18th to 26th June. The ship then goes on to the Cook Islands, Samoa, Fiji and Tonga during July and August, and licences have been applied for. Unfortunately, propagation is likely to be against contacts with the UK, but definitely an interesting one to listen out for.

N5RM will also be travelling the Pacific in the near future. Look for him from the Cook Islands from 10th to 16th June, and from French Polynesia from 17th to 25th June. Bob is an excellent CW operator with an interest in the LF bands, so it is worth looking for him on 40 as well as 20m.

## Prefixes

HI60RCD is operational throughout 1986 to celebrate 60 years of amateur radio in the Dominican Republic. *DX News Sheet* also reports that AA5B was issued with the unusual call-sign XEFJTW for a recent contest operation from Mexico. After 10 hours of being QRMed and called a pirate, Bruce gave it up as a bad job and drove 600 miles home! Maybe there are advantages in being just a plain old G3 or similar.

## Falkland Islands

QRZ DX reports that VP8WTW will be active until December, Barry's home call is G4ZCN. The suffix of his VP8 call stands for Wimpey-Taylor-Woodrow, one of the two consortia involved in the construction of the new airport. Other stations active from the airport site are VP8BGO, VP8BGX and VP8BJR. From elsewhere in the Falklands VP8LP, VP8WA and VP8PTG are active.

Barry's station consists of an FT757GX to a tribander at 20 feet. You can QSL him via his home call, or direct to B Grylls, PO Box 2, MPA, Falkland Islands.

## Vietnam

Mike KM1R was in Saigon in late April, and apparently managed to make it on to the air to contact a number of US amateurs. This one could well turn out to have been genuine. Back in 1982 Ian G4LJF met with Vietnamese telecommunications officials who were very receptive to the idea of issuing amateur licences. Unfortunately, the big stumbling block is actually getting into the country. KM1R had a legitimate reason for being there, tracing lost US servicemen on behalf of the US government, so was able to obtain a visa. The question now is whether others will be able to follow in his footsteps and mount a DXpedition of some sort.

## San Felix

CE3ESS was at the Visalia DX Convention and was able to fill in some of the background to the CE0AA opera-

tion which took place about 18 months ago (the first operation from that island for many years). The island is under Chilean military jurisdiction, so the only way an operation could take place was under the auspices of the military. A search was made for some suitable radio amateurs within the ranks, and eventually two amateurs in the Chilean navy, CE9DVN and CE2GXY, were assigned to San Felix for 12 weeks.

## Official mission

Their official mission was to put the island on the air on the amateur bands! As such they were able to call on the full support of the military machine, so were able to put up some impressive antennas including a TH6 at 90 feet. The equipment and antennas were actually provided by the Radio Club of Chile.

Unfortunately the operators were not 'DX trained', so a number of list operations took place early on. However, they soon caught on to the idea and were able to do a very good job of working the pile-ups. As a result, many amateurs were able to put this rare one in the log, some on all five of the main HF bands. There was also some operation on Top Band and 6 metres, although I am not aware of any European contacts taking place on these bands. The final QSO total was 31,000.

Whether we can expect a repeat performance at some time in the future is anybody's guess. Unfortunately, after the expedition ended there were problems with the QSL

cards. Apparently, at least half the incoming cards went missing en route, presumably because parties unknown had discovered that most of the envelopes destined for Box 700, Santiago, contained IRCs or dollar bills. The Chilean club, nevertheless, made valiant efforts to deal with all cards received, including those via the bureau. If you are still in need of a card, can I suggest sending yours by registered air mail. This was how I got mine in the end.

Just in case you have never heard of San Felix Island, perhaps I should end by saying that it is a 1.5 by 0.5 mile volcanic outcrop, some 500 miles west of Chile. Incidentally, it used to be possible to differentiate the Chilean offshore islands by their prefixes. CE0A was Easter Island, CE0X was San Felix and CE0Z was Juan Fernandez. Unfortunately this system ceased a couple of years ago, so it is not always obvious where a CE0 station is operating from. Another curiosity is that some of the CE0 stations are 'novices' who are allowed HF band privileges because of the distance from the mainland.

### Jim Smith

At the Dayton Hamvention in April Jim Smith VK9NS was elected the newest member of the *CQ Magazine* Hall of Fame. Jim is probably best known for his Heard Island operation, although he first came into the limelight as P29JS when he started the daily Pacific net on 14220kHz. This net still continues and has enabled many amateurs to work new countries in the Pacific. Jim has also operated from a number of other countries, although he gave up his UK call some years ago and it is now held by his son. In recent years Jim founded the Heard Island DX Association as an alternative to the US DX Foundations. Jim's wife Kirsti, who operated from Heard Island as VK0NL, later wrote a book about the expedition under the title *Heard Island Odyssey*.

### Contests

The All Asia SSB Contest takes place over the full weekend of 14/15 June, and the RSGB Summer 1.8MHz Contest on 28/29 June. The latter has proved interesting in the past, with both North

and South American stations being worked. Apart from these, June is a quiet month for HF contests.

### Islands

To date this year the Islands on the Air enthusiasts have been having quite a field day. Several of the French island groups were activated during April and May and a number of other interesting ones have turned up, such as AI5P/TF7 from Westman Island (IOTA reference EU71). The French publication *Les Nouvelles DX* has obtained the callsign FV6NDX for use during 1986 and is encouraging expeditioners to offshore islands to borrow the call. Listen out for it with a three letter suffix to indicate the island group. GM4RXW/M is due to operate from the Outer Hebrides until mid June, and other operations from islands off the UK coast are also in the wind. More details when available.

Incidentally, a number of UK island groups have yet to be put on the air. These include the Farne Islands (off the Northumberland coast), the Flannan, Monach, Shiant and Treshnish Islands, plus Rockall (all off Scotland) and St Tudwal's Island (off Wales). Plenty of opportunities here for an *Amateur Radio* reader to establish a 'first'.

### Awards

Full details of the Islands on the Air Awards programme now appear in the new *RSGB Callbook*, as do details of other RSGB awards such as the new 5-band Commonwealth Century Club and the ITU Zones awards. It is nice to see that the RSGB now sponsors such a challenging series of awards which, hopefully, will achieve international status. The US award programmes are all very well, but having to send cards to the USA is always worrying, especially as the turn around time at the ARRL has now extended to about 12 weeks.

I note from QRZ DX that the CW Group of Argentina has now introduced the Five Argentine Islands award for CW contacts with five different Argentine stations located on islands. The list of valid islands includes (yes, you guessed) the Malvinas Islands and San Pedro Island (South Georgia). I wonder how many UK amateurs will be applying?

### Cheating

Still on the subject of awards, rumours are now circulating that as many as 50% of the holders of the prestigious 5-band Worked All Zones Award may have included invalid or bogus QSL cards in their claim. The award is very difficult to achieve (even now there are only about 110 holders worldwide in 7 years), with certain zones, such as Zone 1 (Alaska) and Zone 26 (Thailand, etc), being particularly hard to get.

The most serious allegation is that one particular Alaskan amateur has been faking contacts, particularly on 80m, to give chasers of this award the last one they need.

### It does happen

Undoubtedly cheating does go on, both in awards chasing and in contest scoring, but this recent case seems to be a particularly flagrant example. We can only hope that *CQ Magazine*, who sponsor the Worked All Zones award, will take a tough line with any proven offenders.

### Thirty metres

Finally this month, let me return to the topic of 30 metres. I spent quite a lot of time on the band during April and was pleasantly surprised at the level of occupancy, with stations to be heard more or less round the clock. W1BIH/PJ2 was on almost nightly, and many other stations in Central America, Africa and Asia were there for the taking. Most can be worked with modest power and a simple antenna (I generally use a quarter wave vertical above a good set of buried radials), and many are quite prepared to rag-chew in a leisurely way.

Unfortunately, the same cannot be said for 18 and 24MHz. They seem to be almost empty nowadays, but we may see more activity as summer conditions arrive. Remember, with these bands and with 10 metres, just because they sound dead doesn't necessarily mean they are not open. A CQ call can often bring surprising results.

73 and good DXing.

## EDITORIAL ASSISTANT

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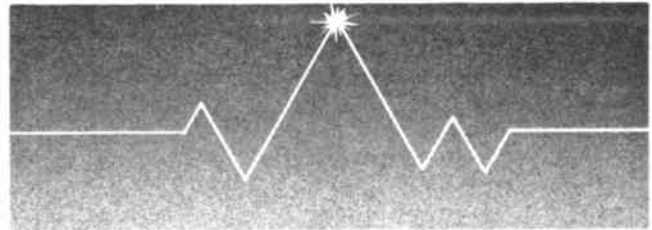
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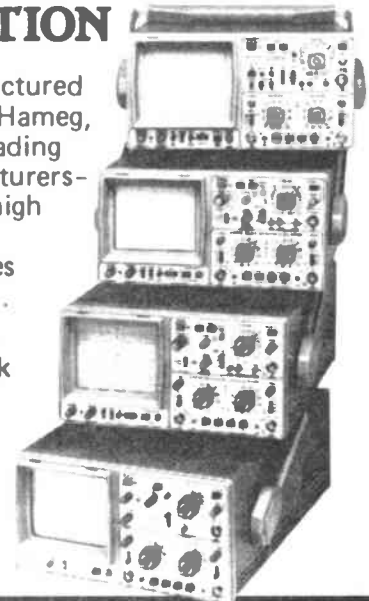
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# INTRODUCING SATELLITE COMMUNICATIONS

## PART II

In this two part series, Joe Kasser G3ZCZ explains how satellite communications can be understood and enjoyed by everybody

Fig 1 Commonly used bands in the amateur satellite service

### Commonly used satellite communications bands

#### 1. Assignments

**10 metres 29.3 – 29.55MHz**  
**2 metres 145.8 – 146.00 MHz**  
**70 centimetres 435.0 – 438.0MHz**

#### 2. Satellite transponders

Spacecraft	Mode	Uplink	Downlink
AMSAT-Oscar 6	A	145.85 – 145.95MHz	29.45 – 29.55MHz
AMSAT-Oscar 7	A	145.85 – 145.95MHz	29.40 – 29.50MHz
AMSAT-Oscar 7	B	432.125 – 432.175MHz	145.975 – 145.925MHz
AMSAT-Oscar 8	A	145.85 – 145.95MHz	29.40 – 29.50MHz
AMSAT-Oscar 8	J	145.90 – 146.00MHz	435.10 – 435.20MHz

The data supplied on AMSAT-Oscars 6-8 is for historic purposes as the spacecraft are no longer operational.

#### Currently active

AMSAT-Oscar 10	B	435.05 – 435.15MHz	145.95 – 145.85MHz
AMSAT-Oscar 10	L	1269.05 – 1269.85MHz	436.95 – 436.15MHz
RS5	A	145.91 – 145.95MHz	29.41 – 29.45MHz
RS7	A	145.96 – 146.00MHz	29.46 – 29.50MHz
RS8	A	145.96 – 146.00MHz	29.46 – 29.50MHz

#### Future (proposed) spacecraft

(For proposed launch in late 1985, early 1986). Should become JAMSAT-Oscar 12 once in orbit

Fuji-1	A	145.85 – 145.95MHz	29.40 – 29.50MHz
Fuji-1	M	1267.55 – 1267.75MHz	436.00 – 435.80MHz

For launch late 1985, early 1986

RS9/10	A	145.96 – 146.00MHz	29.46 – 29.50MHz
RS9/10	K	21.26 – 21.30MHz	29.46 – 29.50MHz
RS9/10	?	21.26 – 21.30MHz	145.96 – 146.00MHz

The AMSAT Phase 3C spacecraft will contain a mode B transponder as well as other transponders, having either uplink or downlink capability on the higher frequency bands. AMSAT has a policy of not obsoleting user equipment, so mode B will be around for a long time. As mode A is an excellent introductory mode, it can be expected on any further general purpose Phase 2 type spacecraft. The Russians also tend to favour HF so mode A and possibly mode K will also be around for a while.

### The ideal aerial

The ideal aerial for copying satellite signals is rotatable in azimuth and elevation (to cope with all the possible angles that signals may come from), immune to changes in polarisation (to cope with horizontal, vertical and in-between polarisation due to the 'Faraday Rotation' in the ionosphere), and has a reasonable amount of gain (to cope with the fading in the already weak signals generated at the satellite).

Vertical and horizontal polarisation are different kinds of linear polarisation. Radio signals can also be circularly polarised. A circularly polarised aerial will respond equally to horizontally or vertically polarised signals and changes in the plane of polarisation will not be detected. Circular polarisation also comes in two kinds: left-hand and right-hand (clockwise and anti-clockwise). To compound the problem, left-hand circular polarised signals are not well received on right-hand circularly polarised aerials, and vice versa.

### Aerials in common usage on 10m

Figure 1 lists the commonly used bands in the amateur satellite service. The most frequently used downlink bands are the 10 metre, two metre and seventy centimetre bands. The first band that most people try when they become interested in satellites is the 10 metre downlink and the two metre uplink, commonly known as 'mode A'. This is because they usually have the 10 metre capability in their station, and can thus attempt to copy the satellite with no additional cost in equipment. Once hooked on receiving, the cost of the transmitter is usually justifiable.

Putting together a minimal receiving and transmitting capability is not difficult, although steerable aerials for the 10 metre band are relatively large. There are thus very few radio amateurs who can steer their 10 metre aerials in both azimuth and elevation. Steerable aerials for two metres and seventy centimetres are much smaller and more manageable.

Aerials in common use on the 10 metre band comprise verticals and multi-element beams which are optimised for DX working. These aerials give very good responses to signals arriving from low angles, but are not at all well suited for signals arriving from high angles. The vertical aerial responds to low angle radiation from all directions, while the beams respond to low angle signals from the direction in which they happen to be pointed. Stations using these aerials have trouble hearing signals arriving from higher angles.

Conventional literature has touted the turnstile or crossed dipole aerial as being the answer to the problems of satellite reception on 10 metres. It has circular polarisation and a high angle response pattern. This aerial does very well when the satellite is located at elevations of greater than about 30 degrees, as seen by the observer, but has a poor response to signals arriving at low angles (close to the horizon). Typical radiation patterns for these aerials are shown in Figure 2.

Most people have problems when it comes to working mode A, because radio amateurs who decide to have a go tend to fall into two categories.

The VHF/UHF operator who decides that satellites offer a challenge, as well as DX, may have excellent linear (horizontal or vertical) polarised aerials for the 2 metre uplink band, but nothing for 10 metres. Reading that a turnstile is an effective and simple device for reception, he may build one, then find that he can hear something. It may be weak, but 'by golly those signals are coming from outer space'. Step back for a minute and analyse that situation as sketched in Figure 3.

The uplink aerials on two metres can put a powerful signal into the satellite when it is at low angles of elevation, as seen by this operator. His downlink aerial, however, receives most successfully when the satellite is at high angles, as seen by the same operator. In other words: when he can hear it he cannot access it, and when he can access it he cannot hear it (meaning, he cannot hear himself).

The second type of amateur is the HF operator. He usually has a good beam aerial for 10 metres and, reading that a turnstile aerial is a good aerial for satellites, builds one and uses it. Step back for a minute and analyse the situation as sketched in Figure 4. The uplink aerials on two metres put a weak signal into the satellite when it is at low angles of elevation, as seen by this operator.

His downlink aerial, however, receives the best signals when the satellite is at low angles, as seen by the same operator. In other words, when he can hear it he cannot access it, and when he can access it he cannot hear it (meaning, he also cannot hear himself). This is the inverse situation to that of the VHF/UHF operator, but has the same characteristics: namely, they are both alligator operators (all mouth and no ears).

### The apartment dweller

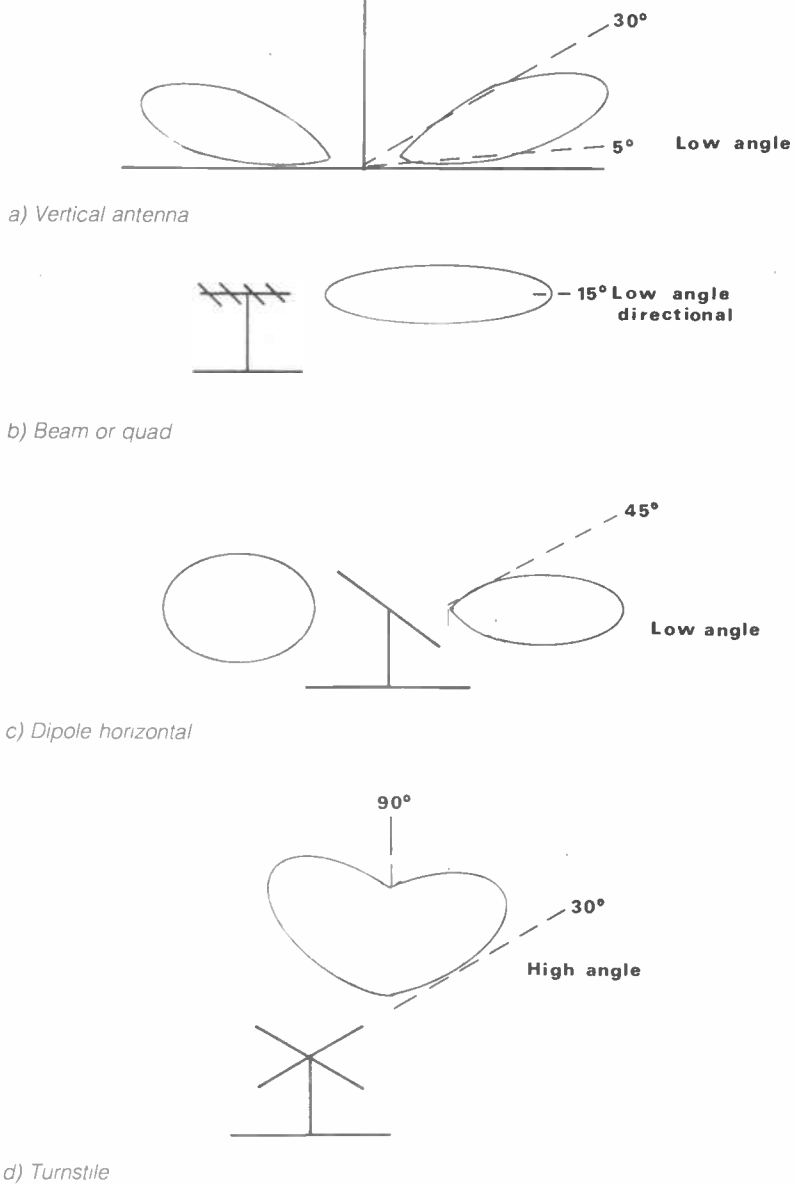
There is a third category beginning to emerge, however. This is the apartment dweller who is not allowed to, or cannot put up HF aerials at all. This type of operator can usually put some kind of VHF/UHF array on a balcony and work mode B quite well.

It is when he tries mode A that he has problems, because of the size of the 10 metre receiving aerial. Thus the vast majority of radio amateurs who decide to become active in satellites have trouble working them.

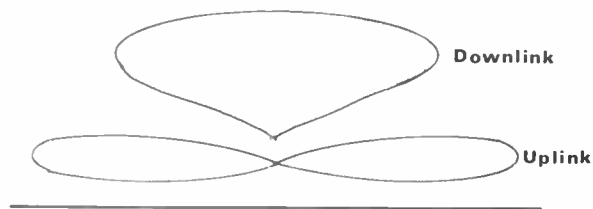
In order to get the most enjoyment out of satellite operation it is necessary to match the uplink and downlink aerials. Before doing this, consider some other aspects of the satellite communications path.

The Earth-satellite-Earth communications link is a line of sight path. Each ground station has a range circle, for which a window is present allowing communications into the satellite. In order to work any other station the range circles of the two stations must overlap, as shown in Figure 5. The amount of time

**Fig 2** Typical antenna radiation patterns

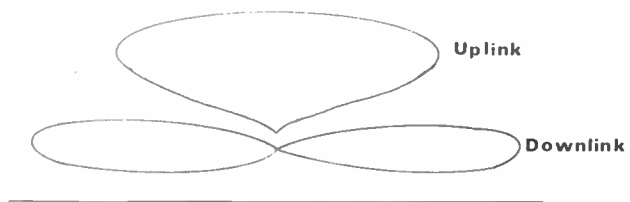


**Fig 3** Typical VHF/UHF operator antenna characteristics



Hears well when satellite is high in the sky, talks well when satellite is low in the sky

**Fig 4** Typical HF operator antenna characteristics



Hears well when satellite is low in the sky, talks well when it is high in the sky

# SATELLITE COMMUNICATIONS

that a contact can take place in is governed by the time that the spacecraft spends in the window. Thus, the higher the elevation of the satellite, as seen by the ground station, the shorter the communications range along the surface of the Earth. The best DX contact between any two stations is when the sub-satellite point of the orbit of the spacecraft passes over the ground where their range circles just touch (ie at a tangent to both range circles). They will, however, also have very little time to make that contact.

## Characteristics of aerials

Let us summarise the characteristics of aerials in use by radio amateurs. The usual three element quad or yagi type aerial puts out a good directional low angle signal, the turnstile aerial puts out a good omni-directional high angle signal and the vertical aerial puts out a good omni-directional low angle signal. The 3/8 and 5/8 aerials used for two metres have good omni-directional low angle radiation characteristics. Somewhat directional high angle radiation may be obtained from sloping dipoles attached between the top of a mast and the ground in the manner of guy wires (don't ever use them as such), as shown in Figure 6.

If you want to work the satellites in a successful manner, you must match the characteristics of your uplink (transmitting) and downlink (receiving) aerials so that they have similar radiation patterns.

## Receiving signals

The satellite downlink is usually marginal. The spacecraft is using low power and is a long way away. Every ESE contact practically qualifies the spacecraft for yet another 1000 mile per watt award for QRP communications. Most modern (and some that are not so modern) receivers suffer from a loss of sensitivity at the top end of the 10 metre band, so that using a pre-amplifier to increase the strength of the received signals is a good idea.

Most radio amateurs feel that to communicate with DX stations they need the biggest aerial they can put up, and the maximum power they can put out. There is a fallacy at work here. If the minimum amount of transmitted power to put an S9 signal into a DX location is, for example, 100 watts, then for that transmitter to use 1000 watts would be a waste of power – or would it?

Ignoring the QRM factor for the moment, in which the more power you use the louder you are and the more likely you are to be heard over the rest of the pack, if the signal is made weaker or attenuated by the ionosphere for one reason or another, what happens? In our example we are receiving signals from a transmitter having the calculated 100 watts and a fade equal to 5 S-units has taken place, so the received signal would be dropping down to S4. This isn't too serious as S4 signals can be copied, but what happens if the station is using QRP and was S4 to start with? The same fade

would take it down to S1, or below the noise level, and no signals would be copied. The communications link should contain enough gain to minimise or avoid loss of reception due to extreme fading. In other words, some kind of margin should be built into the link.

## The communications link

The communications link in a satellite contact can readily be split into two sections: the uplink and the downlink. Consider each of these in turn.

In the downlink the transmitter output power is not under the control of the radio amateur; it is fixed by the satellite. The attenuation of the signals radiated by the satellite is a function of the distance of the spacecraft from the receiving station. The actual strength of the received signal at the ground station aerial will vary because of the attenuation due to fading and polarisation changes in the ionosphere, which is subject to the whims of the gods. Thus, all the ground station operator can do is make sure that he has the most sensitive receiving capability that he can have.

Ideally, the receiver should be such that the beacons on the downlink are receivable at good signal strength. In most cases that means that a receiving pre-amplifier should be used in front of the receiver.

In the uplink the receiving aerial and on-board receiver sensitivity are governed by the design of the satellite. The attenuation of the signals from the ground, as received by the satellite, is a function of the distance of the spacecraft from the transmitting station. The actual strength of the received signal from the ground station aerial will vary because of the attenuation due to fading and polarisation changes in the ionosphere, which is again subject to the whims of the gods. The effects of the ionosphere may also be different on the uplink to that of those on the downlink.

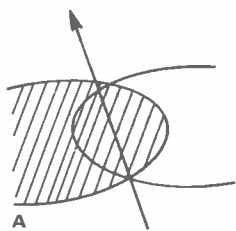
## AMSAT EIRP

In the past AMSAT has performed the link calculations before the launch of the spacecraft, and released a recommended value in radiated (EIRP) uplink power for people to use with the satellite. This number has usually been over pessimistic and most satellite users have no trouble working through the transponder with much less power. The common solution to this problem is to boost the transmitter power until a good return signal is heard.

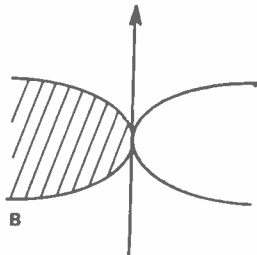
This is not the optimal solution, as stations who have problems hearing themselves will tend to use too much power, not because they cannot get into the satellite, but because they cannot hear themselves getting into it. The ionosphere may also behave differently in different places at any particular time, so that whereas the sending station is having trouble hearing his own downlink, other stations a considerable geographical distance away may be copying him with ease.

Fig 5 Contact possibilities

A typical contact possibility



B Range circles are tangents. Best DX minimum time



C Larger window, longer time

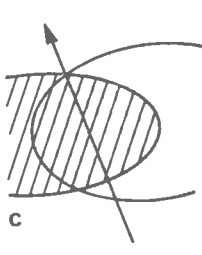
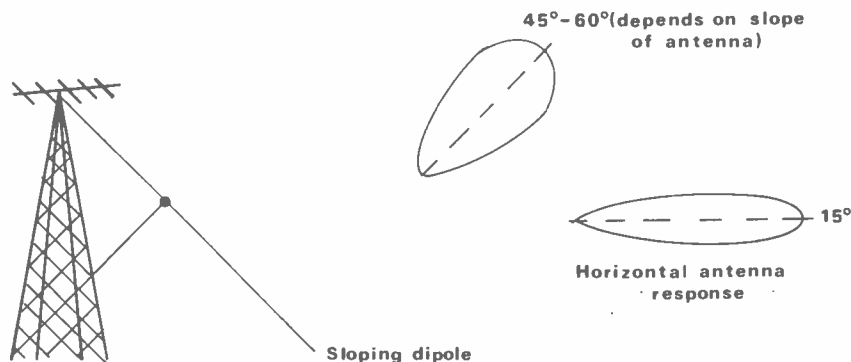


Fig 6 Sloping antennas for 10 metres. Optionally put slopes on four sides of a tower: this will work well for regular 10 metre contacts. Put dipoles or beams on the top of a tower.





# SATELLITE COMMUNICATIONS

There is no easy solution to this situation and the compromise answer is to attempt to make your own signal, as received on the downlink, equal in signal strength to that of the transponder beacon. This means that you must adjust your transmitter power to keep your own signal as strong as the beacon on your receiver. You can do this either by reducing the transmitter power gain, or by aiming the aerial away from the spacecraft.

## Obtaining gain

Gain in the communications link can be obtained by using amplifiers or by using directional aeriels. Directional aeriels have the disadvantage in that they must be moved to track the satellite and keep it in the beam during the pass, while omni-directional ones do not. On the other hand they are usually cheaper than amplifiers, particularly high power UHF transmitting ones. Thus to obtain a certain power output level on the uplink, the amateur has a choice of a directional aerial and low power, or an omni-directional aerial and high power, or something in between. Similarly on the downlink, if directional aeriels are used, a receiving pre-amplifier may not be an absolute necessity. In any event, for any reasonable results, make sure that the characteristics of your uplink and downlink aeriels are matched.

## Locating the satellite

The common adage 'if you can't hear them, you can't work them' must be modified for satellite users to include 'if you can't locate them, you won't hear them, and if you can't hear them, you can't work them'.

The satellites used by radio amateurs move around with respect to all ground based stations. In order to work them each radio amateur must know, not only when a satellite is in range, but where to aim the aerial to put a signal into the thing. A number of different techniques have been developed over the past few years. Graphical circular slide rules were first used very successfully for Phase 2 low orbit satellites. As the personal computer found its way into ham stations, computer programs were developed to locate the satellites.

By some happy coincidence, the first Oscar satellites that were used by a large number of amateurs (the AMSAT-Oscar 6, 7 and 8, and the early Radio spacecraft) were in circular orbits. This made locating them easy—all one had to do was pick a 'reference orbit', as published in the amateur radio press, and add the orbital increment to determine the position of the next equator crossing (start of the next orbit), and then add the period of the orbit to update the time of the following orbit.

When the first Phase 3 satellite

(AMSAT-Oscar 10) was put into service it was placed in an elliptical orbit with a high apogee and a low perigee; definitely a non-circular orbit. Tom Clark W3IWI of AMSAT, an astronomer by profession, wrote a program that utilised Keplerian elements for keeping track of the position of any satellite in the amateur satellite service (Reference 1). All of these programs have been widely disseminated and there should be at least one member of each ham radio club who knows how to get hold of them. In the event of that failing, AMSAT can supply copies of such software via their Software Exchange.

## Summary

This article has described the requirements for equipping radio amateurs to communicate via the Oscar and RS series of communication satellites in the amateur satellite service, and the reasons why many amateurs get less than optimum results during their initial attempts to work communication satellites.

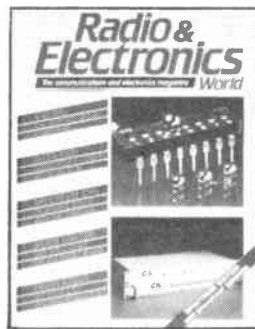
Hopefully it will help those interested to obtain satisfactory results, without too much trial and error and expensive mistakes.

## References

*Basic Orbits*, Tom Clark W3IWI, *Orbit magazine*, March/April 1981.

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# AmRad 10GHz system

by Glen Ross G8MWR

We have now reached the point where we have our microwave head on frequency and a full VFO controlled transmit system up and running. Next we must organise the receive side of the equipment: two separate methods of achieving this will be described.

## IF choice

Three intermediate frequencies are commonly used; 10.7, 30 and 100MHz in that order of popularity, with 10.7 being by far the most common. As with any oscillator, the Gunn diode generates noise sidebands around the nominal frequency and therefore it would seem that the higher IF would give better results as it is spaced further from the fundamental. In practice the difference between the various intermediate frequencies is minimal because the noise sidebands spread so far out that one would have to go to an IF of several hundred MHz before any significant advantage was obtained.

Before attempting to make use of the receive section of the head you *must* remove any components connected from the mixer connection to earth, with the exception of the resistor which *must* be left connected at all times. If your unit has a 'bolt-on' mixer, remove the circlip from the mixer connecting pin.

Fig 1 Simple system using a BC receiver

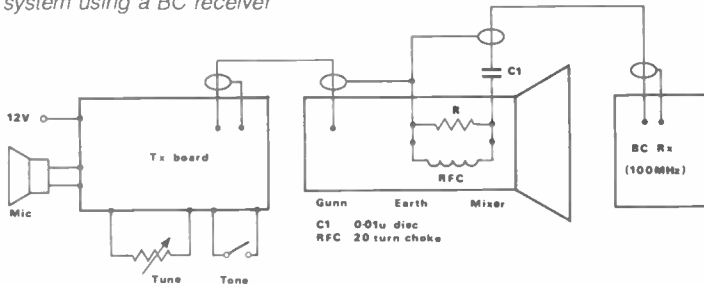


Fig 2 Broadband low-noise pre-amp

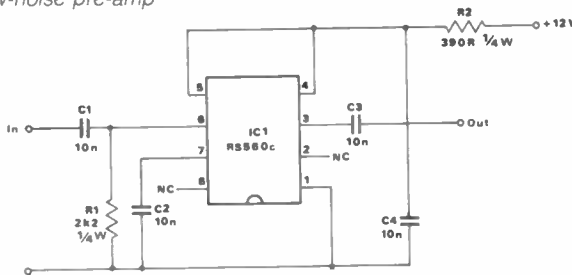


Fig 3 Block diagram of 10.7MHz system

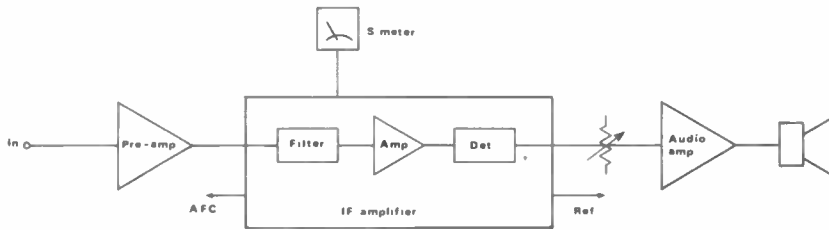
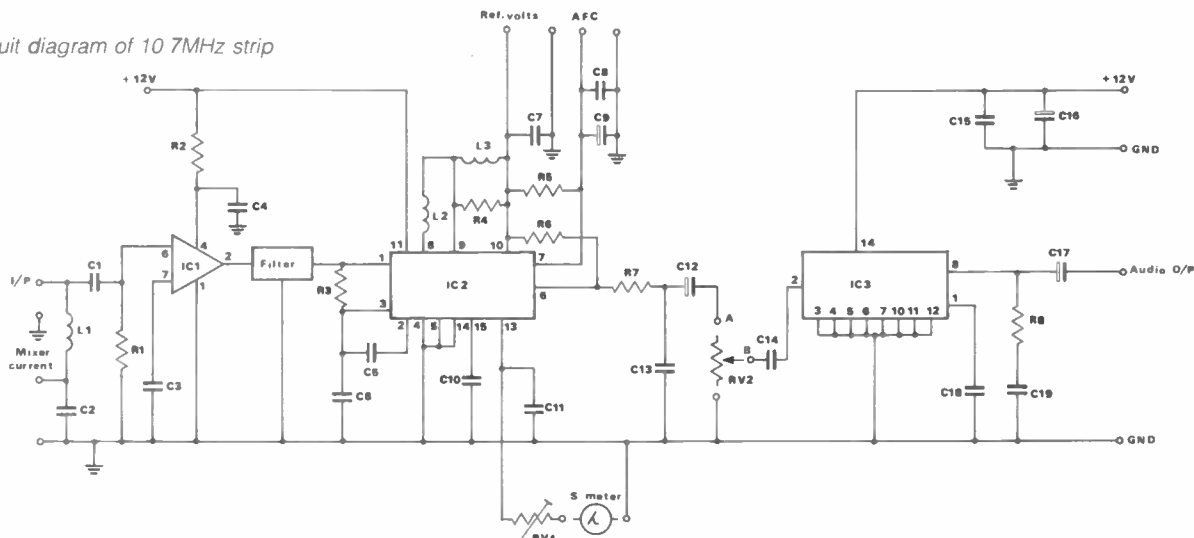


Fig 4 Circuit diagram of 10.7MHz strip



## The simple way

This involves the use of around 100MHz as the IF and simply consists of feeding the signal from the mixer section of the head into a standard, cheap broadcast FM receiver of the type that can be picked up for a few pounds at your local Sunday market. To minimise random pick-up the rod aerial should be removed from the set. A small phono socket is mounted on the back of the receiver case and the centre connector of this is wired to a convenient earth point, the socket then forming the new IF input to the receiver.

Tune the broadcast receiver to somewhere around 100MHz, where there is no interference, and look for signals on 10GHz; Figure 1 shows the system. The RFC consists of a few turns of thin insulated wire wound round a pencil and allowed to spring off to form an air

spaced choke. Without this choke there will be no earth return for the mixer current and the results will be very disappointing to say the least.

### Improvement

The results obtained from the simple system will depend to a large extent on the noise figure of the broadcast receiver. As these were intended to operate with very strong input signals, they frequently have no RF stage and this, coupled with lossy input circuits, means typical noise figures of around 10dB. Due to the fact that the microwave mixer diode has no gain, and in fact has a conversion loss, the noise figure of the following stage – in this case the broadcast receiver – adds directly to the noise of the mixer and so tends to determine the overall performance.

A simple way to overcome this limitation is to install a low noise pre-amp in the line between the mixer and the broadcast receiver. This could use any of the standard dual gate MOSFET designs for two metres, the only change being to wind an extra two turns on the coils to lower the tuning frequency of the stage. This approach will lower the noise figure of the IF system from around 10dB to something approaching 1dB with an overall improvement in the sensitivity.

### Alternative design

A circuit for a preamplifier using an integrated circuit is shown in *Figure 2*. This circuit has several advantages: it can be used with any IF as it is capable of giving up to 40dB of gain from 100kHz up to around 300MHz, and provides a noise figure of about 2dB over this range; the impedance of the microwave mixer is around 200 ohms (although this needs to be carefully matched into the pre-amp to obtain the best results).

In the circuit shown the input biasing has been set so the stage is noise performance optimised at this input impedance. No other matching components, such as toroidal transformers, are required. As shown the stage will give 30dB gain, but cutting the link between pins four and five can increase this to 40dB, although this is not usually required. Any pre-amp used should be

mounted as close as is reasonably possible to the microwave head and should be well screened to avoid unwanted signal pick-up.

### 10.7MHz IF strip

Although the 100MHz system will work well, one of the inherent problems with it is keeping out unwanted broadcast and public service transmissions. This can be a real headache when working on high hilltops where the signal levels from these stations can be very high indeed. These problems can be overcome by using 10.7MHz as the IF; a block diagram of this system is shown in *Figure 3*. All stages are contained on one PCB.

The full circuit diagram is shown in *Figure 4*. The pre-amp stage is the IC version already described, with the additional capacity to monitor the mixer current. If this facility is not required then the metering pin must be connected to earth so as to provide a path for the diode current. This is followed by a ceramic filter which sets the bandwidth of the receiver. If full duplex operation is required it is important that this filter is centred on 10.7MHz: normally this is indicated by the absence of a coloured coding dot on the body of the filter.

These filters are available in various bandwidths and, whilst a 180kHz bandwidth filter will give a better signal-to-noise ratio than a wider one, it will also give the impression that most people are over deviating. A reasonable compromise is around 250 to 280kHz.

The next IC is a 3189 and provides all the signal amplification, detection and other requirements. An output is provided for an S-meter (an inexpensive tape recorder type meter is ideal for this purpose) and also an optional AFC control voltage and its associated reference line. The AGC output is not used and neither is the muting facility, which may provide an advantage on two metres but can be a real pain when trying to find signals on 10GHz that initially may be too weak to open the squelch.

The third stage is an LM380 audio amplifier which is capable of providing about 1 watt to the loudspeaker. This sort of level is required to overcome wind and other noise which may be found on site.

The circuit should be built on double-sided board using the upper surface as a ground plane; a component layout is shown in *Figure 5*. All integrated circuits should be soldered into the board to ensure good stability in the case of IC1 and IC2 where the stage gains are very high, and to give good heatsinking in the case of IC3. All decoupling capacitors should be fitted using the shortest lead lengths which are reasonably possible and all earth connections should be made to the ground plane side of the board. The layout of the board should be straight line (in one end, out the other) and resemble the circuit diagram.

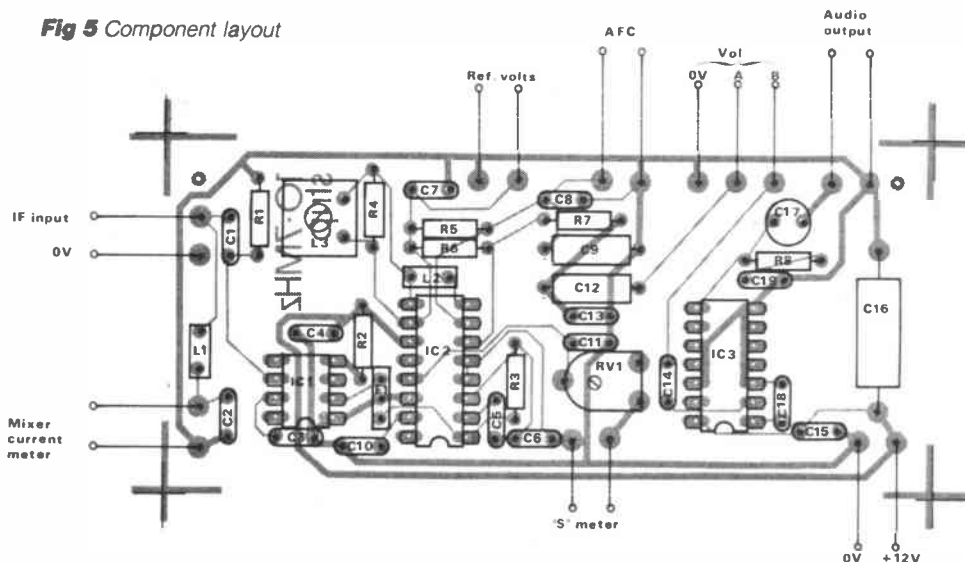
### Setting up

The unit can be set up without the aid of any test gear. As a starting point, disconnect the mixer input to the board and connect two or three feet of wire to the input pin. High power broadcast and Morse stations should now be audible. Adjust the core in L3 for *minimum* audio output. Reconnect the mixer and, while listening to the hiss, very carefully adjust L3 for *minimum* output. This will usually occur with the core about two turns in from the top of the screening can. Final adjustments should be made with the aid of a weak station and should be for best signal-to-noise ratio *not* maximum audio output. The S-meter sensitivity should be adjusted to give a reading which touches full scale on a strong local signal.

### PCB

A high quality double-sided PCB for the 10.7MHz receive section is available for £3.50, including postage, from the Microwave Society, 81 Ringwood Highway, Coventry CV2 2GT. Next month we will give designs for both horn and dish aerials with details of a good general purpose feed system.

**Fig 5** Component layout



### 10.7MHz STRIP COMPONENTS

C1, 2, 3, 5, 6	.01 disc
C7, 8, 10, 11, 13	.01 disc
C4, 14, 15, 18, 19	.1 disc
C9, 12	10µF 16V (elect)
C16	470µF
C17	100µF
R1	2K2
R2	390R
R3	330R
R4	5K6
R5	5K6
R6	8K2
R7	2K7
R8	3R
VR1	100K
VR2	10K (log)
IC1	SL560
IC2	CA3189
IC3	LM380
Filter	SFE 10.7MA
L1, 2	22µH RFC (TOKO 7BA)
L3	KACSK 586HM (TOKO)

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<input type="checkbox"/> Affectionate	<input type="checkbox"/> Fun Loving	<input type="checkbox"/>
<input type="checkbox"/> Romantic	<input type="checkbox"/> Ambitious	<input type="checkbox"/>
<input type="checkbox"/> Intellectual	<input type="checkbox"/> Creative	<input type="checkbox"/>
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<input type="checkbox"/> Dining Out	<input type="checkbox"/> Collecting Things
<input type="checkbox"/> Travelling	<input type="checkbox"/> Spectator Sport
<input type="checkbox"/> Theatre/Cinema	<input type="checkbox"/> Poetry/Reading
<input type="checkbox"/> Walking/Cycling	<input type="checkbox"/> Gardening
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A triband beam at 100ft, full size aerials for 40 and 80, a couple of high quality transceivers, a 400 watt linear and all the ancillary equipment to go with it. A nice pipe dream, but unfortunately that is usually as far as it goes. More often than not the average HF DXer has to make do with far more modest equipment, and it is more likely that his station will consist of a hundred watt transceiver and a multi-band wire aerial, such as a trap dipole or a G5RV.

Even though this type of station will not be as strong as the big stations, there is no reason why you should not be able to work some very good DX. Although it will obviously require a bit more native cunning and skill than it would for a station with a large aerial array and running the full legal limit, this is surely where a lot of the enjoyment lies.

### Experience counts

Techniques learned through experience on the bands can be used to get through pile-ups or to know where to look to find the DX, or the best times to be around. All of these factors and many more become second nature to the leading DXers and enable them to use their time on the air to its greatest potential. In fact time is more often than not one of the biggest limiting factors, as there are very few people who can spend endless hours listening for DX at all times of the day.

Experience and know how are just as important if not more so, than having a big signal. The hints and tips learned from spending time on the bands or from other amateurs, prove invaluable when chasing some of those rare and elusive stations.

### Know the bands

Each amateur band has its own particular characteristics. The bands normally associated with DX operation will be open to different parts of the world at different times, or they may be closed altogether so that only local stations can be heard on their ground-wave. Then other bands normally used for local communications can open up to DX from distant parts of the globe.

Not only do the conditions on the bands vary according to the time of day, but they also change according to the time of the year and position of an eleven year sunspot cycle, and even then it is only possible to give the probability of the band being open. In fact it is knowing which band is most likely to be open to the right area of the world that enables people to work the good DX.

One example of knowing how best to use a band can be shown by taking 80 metres, a band normally associated with local contacts during the day and noise at night. However, around dusk and dawn it can produce some very good DX. It is quite possible during spring and autumn to make regular contacts to New Zealand. In fact signals of S9 +40dB are often reported, which may seem surprising. Also during the winter, when the days get shorter, it is not unusual to be able to work or hear the west coast of the States, Canada and sometimes Alaska at

# DX CHASING FOR ALL

Ian Poole G3YWX explains how a little native cunning and skill can pull in the DX even if you don't have an aerial farm

two or three o'clock in the afternoon.

Another band which holds a lot of surprises is 10 metres. When this band is open it is quite possible to obtain some quite spectacular contacts with a very modest station. Being the highest frequency band in the HF spectrum, propagation is influenced by many factors, some of which are associated with HF phenomena and others with VHF.

### Cycle doldrums

Firstly there is the familiar F layer propagation which follows the eleven year sunspot cycle and because we are at the bottom of the cycle at the moment it

is not open as much as it will be in a few years.

Then there are the VHF types of propagation. In the months of May, June, July and August, signals can be heard via sporadic-E where the E layer becomes very dense in places and reflects signals sometimes as high as 150MHz. In addition to this it is also possible to hear signals which have been bent around the Earth's surface by tropospheric ducting. This mode is particularly dependent upon weather conditions and a close eye kept on the weather charts can pay off.

It is also helpful to pay close attention to the different accents, the signal

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ZONE 39

	DATE	Z	MHZ	2 WAY	RST
G3YWX/A	23.6.71	427	28/21/22	FSB/CCL	58

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 FRI00B  
 14AVQ  
 2 EL QUAD

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# DX CHASING FOR ALL

strength – do they sound as if they are likely to be 'locals' or are they a distant station? For example, it is a waste of time waiting to find out the callsign of a very strong station with a European accent chatting about the weather in Milan. But a station who is just giving reports and attempting to make as many contacts as possible is a different kettle of fish altogether.

All these points can be used, probably subconsciously, to tune over the less promising stations and to pick out those more likely to be the wanted DX.

## Give away signs

There are several other give away signs as well. Probably the most obvious is one in the unmistakable cacophony of a pile-up which will usually reveal some interesting station in amongst everyone calling him. However, having discovered who everyone is trying to contact it is worth deciding if there is any chance of getting through or if there are just too many people calling.

Pile-ups attract stations like bees around a honey pot and it is amazing just how many stations can be calling. After a few attempts it should be possible to get a good idea of which pile-ups to leave and which ones to have a go at. It is worth remembering that if there are a lot of stations in one pile-up they cannot call any other DX which may be coming through at the time!

It is not only important to know what to

look for but also where to look. For a variety of reasons several frequencies have become popular for DXpeditions and the like. On CW 25kHz up from the bottom end of the band is a favourite, whereas on phone they tend to have different positions on the band according to which band it is. Then on eighty metres there are 'windows' set aside for DX working, so that at the times when it is possible that DX stations might be heard local contacts should avoid these frequencies.

The sideband window used to occupy only the top 10kHz of the band, but owing to the amount of DX traffic it has now been increased to the top 25kHz.

One time when a lot of DX contacts can be picked up is during contests. The contacts have to be short so that as many contacts as possible can be made and this means that there is a much better chance of getting through. Each band has its own distinctive characteristics and with a little experience it is possible to get a 'feel' for each band.

## Variable conditions

However, band conditions do vary according to the time of year, number of sunspots and so forth. Therefore it is possible to give some estimates about the likelihood of a band being open to a particular place. Tables of predictions appear in some radio magazines, such as the RSGB *Radio Communication*, and these can be used to give an estimate of

which band and time will be best to hear a particular area of the world.

## What's on

It is obviously very useful to know about any DXpeditions or special stations which are likely to be on the air. Very often they will give the frequencies they will use as well as other useful information including, of course, the dates they will be active.

It can also be very useful to have information about the operating habits of DX stations. People are often creatures of habit and will have favourite frequencies as well as particular times when they operate. Information of this nature can be used to give a better chance of hearing and working them.

There are plenty of places where this kind of news and information is published. One of these is Don Field's *DX Diary* in *Amateur Radio*. However, a publication designed specifically for DXers is the *DX News Sheet*. This was originally published weekly by Geoff Watts but it is now run by the RSGB. This sheet gives up to date information on DXpeditions, DX stations which are currently active, stations heard on the band and so forth.

## Tricks of the trade


When listening on the bands there is a whole host of ways of giving yourself a better chance of working DX. The first step is to be able to quickly pick out the DX stations from the run of the mill ones. The pickings can be very rich and even more so if the times are chosen carefully. It is obviously nice to be on for as much of the contest as possible, but often towards the end when people have worked most of the other stations who have been on for the whole time, some very rare stations can have very few people call them. This is an ideal opportunity and one not to be missed. One example I can remember is hearing KG6DX call CQ several times and receiving no replies (except myself), whereas normally he would have a pile-up on top of him!

Another good time to be on is when band conditions are changing. This means that the band may be open to the UK and not to the rest of Europe. Good use can be made of this technique, particularly when a band such as fifteen or twenty metres is just closing to North and South America. At this time stations can be contacted with relative ease as there is little competition.


## Phone tricks

When trying to get through to a DX station, either in a pile-up or just under bad conditions, the name of the game is to make yourself heard. Obviously the first thing to do is to make sure that the best use is being made of the available signal. This can be done by using a speech processor in one form or another. A well processed signal can effectively raise a signal by over an 'S' point, but a badly processed one is

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 Sierra Leone.

RSGB logo

Tnx QSL via GW3AX

# DX CHASING FOR ALL

more of a hindrance than a help. Consequently it is worth investing in a good processor.

Although audio clipping can be used to advantage, the gain which can be achieved is limited by the distortion which is produced, or if too much audio processing is used the quality of the signal deteriorates rapidly. However, RF clippers are superior (and more costly) because the distortion products can be removed to make the signal far easier to copy. It is also worth being able to switch the processor out of circuit. Although they give a useful gain and are usually beneficial, in some instances DX stations have been able to pick up unprocessed signals out of a pile-up because they sound different to everybody else. In other words, if you don't get through with the processor in, try again with it off!

### CW tricks

Although CW is different to phone in many ways the basic ground rules of making your call or signal stand out still apply. An easily read signal is a great benefit, so it helps either to be able to send good, well-spaced Morse, or to use an electronic keyer so that all the ratios and spacings are correct. In fact, for the serious CW DXer, a keyer also has the advantage of being able to send further. This is a great benefit because speeds of about twenty to twenty-five words per minute are commonplace and stations

sending at twelve will be left behind.

There is also the necessity of getting your callsign in quickly. It is no use repeating the other station's callsign twice and then giving yours. A quick 'DE G3YWX K' with your callsign repeated either once or twice is all that is needed.

Using simple ideas like these, together with a bit of common sense, can make all the difference on both phone and CW.

### Conclusion

DXing is open to everybody. Regardless of whether the station is large or small it is possible to work DX given the

time, perseverance and some of the skills involved. DXing can be enjoyed by everyone on the bands – the exhilaration of getting through a pile-up or contacting a station before a pile-up starts, or even contacting a new country is not restricted to the 'Big boys'. However, it should be remembered that even though other people may call out of turn and cause annoyance to others, good manners and operating techniques should be observed all the time. After all, it is only a hobby, but one which can provide a lot of enjoyment to everyone on the band if a little thought for others is made.

**VP8 ANT sends 73's to** *G3YWX*

DATE <sup>D</sup>  <sup>M</sup>  <sup>Y</sup>

TIME   GMT

R  5  4  3  2  1

S  9  8  7  6  5  4  3  2  1


T  9  8  7  6  5  4  3  2  1

MODE  CW  SSB  TTY

BAND  160  80  40  20  15  10

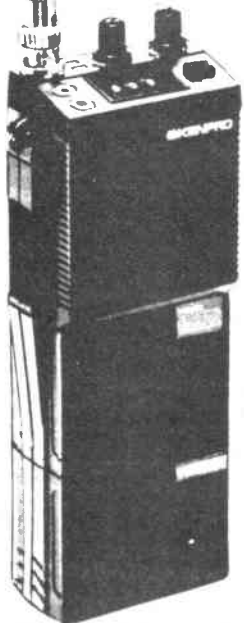
QTH  S.Ga  S.Ork  Ant.  Falk.

Thanks for the QSO!  
73's *Richard*



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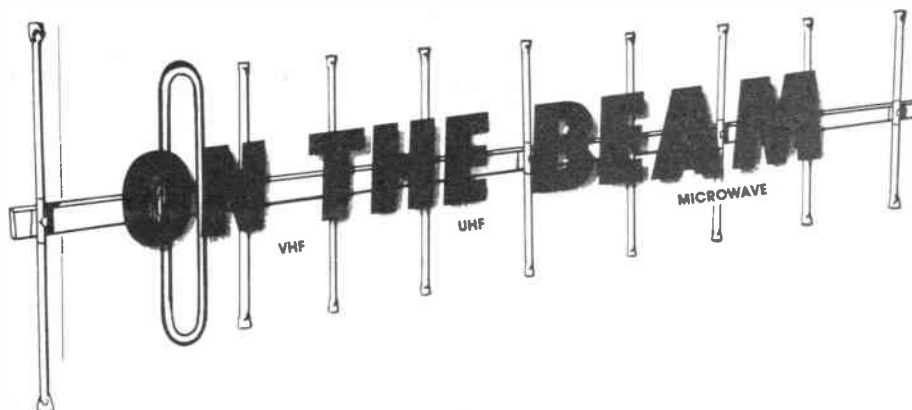
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## News and comment from Glen Ross G8MWR

### Class B Morse

As you know, the Morse experiment concluded at the end of March and, hopefully, you completed your return to the RSGB and are now waiting to see if it is going to be written into the licence. It seems as though you need not have gone to all the trouble, because a notice in the *London Gazette* last December included the permission for class B people to use Morse as a permanent part of the licence.

Once again, the RSGB were not consulted before this notice was published and, in fact, were not aware of it until they were told by the authorities! A press notice to clarify the situation is expected soon and might even be published in the editors' confessions at the front of this issue (see *News of the World for details! Ed*). The official RSGB view is that the DTI made a mistake in the published schedule and this may well be true, whatever the cause it seems as though it is going to be good news for all of us.

### Crossband

A number of people have written to ask for clarification on the subject of crossband working between class B operators on VHF and our A class brethren on HF (G4... talking on 80 metres and G6... replying on two metres). This is in fact perfectly legal and the position was clarified in an official letter last December from which I quote: 'It is perfectly in order for a class B licensee to receive an HF transmission from another licensed amateur radio station and to respond by transmitting on frequencies for which he/she is licensed to transmit.'

The surprising thing about this letter is the fact that it seems to have received little publicity from other quarters, are we the only people you can rely on to let you know what is happening?

### The mole

Here is something else for you to mull over. Our intrepid mole has come up with the information that the top end of 70cms, from around 435MHz in fact, is likely to either disappear, or at least to be

filled with a new government or military system. There is nothing firm to go on but the news has been repeated by other usually well-informed sources and our informant says that there has been some back-up to the idea from contacts in the electronics industry.

### Shared band

If the information is true it is going to make life difficult for the ATV enthusiasts and could also cause a lot of confusion on the satellite links centred in this area. We already have problems in various parts of the country from the Syledis location system and from the Mold communication and repeater service. In the South there is also the encroachment of taxi radios to contend with.

There is little we can do about these 'intruders' onto 70cms because it is a shared band, although there are strong arguments about the ethics of band usage by Syledis.

It has always been assumed that our occupancy of the band was safe, but in view of what has happened on the Continent in the way of both spectrum losses and really drastic power limitations perhaps we should start to have a more suspicious attitude to what is starting to creep into 'our' band.

### It fell down!

This is a comment that has been made by several people with respect to aerial systems and the recent gale force winds. It is something which may well be expected, based on the idea that if your aerial did *not* fall down in the gales then it was not large enough.

On a more serious note, have you checked to see that you have adequate insurance for your aerial system? You may be surprised to find that it is not generally covered by normal house insurance, the get-out is that they only cover normal TV aerials or provide no cover at all. The damage that a large aerial and its supporting masts can cause if it falls on to a parked car, and the even more horrifying and expensive consequences if it injures someone, is something that requires your attention.

### Check it

Most of us usually make a good job of putting our aerial systems up originally, but from then on, as long as they work well, we tend to ignore them. Fixings do tend to rust, guy-wires and their fixings are subject to wear and tear, and even Rawlbolts can work loose in the brickwork over a period of time.

Now the nice weather has arrived, a weekend spent checking over your installation and the cables and connections is time well spent. While you are about it, check the fixings of the elements to the boom and perhaps clean the elements and give the whole thing a coat of good quality clear varnish. Not only will you sleep better when the winds are howling next winter, but you are also going to be sure of the best results your aerial is capable of providing.

### The sporadics

By the time you read this we should be at the start of the sporadic-E propagation season and newcomers to the band are in for a great surprise. The usual mode of propagation on two metres could perhaps be described as 'straight there' with no assistance from reflections, as is normal on the HF bands.

However, from time to time the E layer becomes dense enough to reflect VHF signals and when this happens the potential workable distances are very high.

Contacts deep into Russia, down to Malta and Greece and even into North Africa are regularly reported, and exceptional contacts into Israel (4X4) have been made.

### How's it done?

The one thing you are going to need is plenty of patience. As the name implies the events are sporadic, so it involves an awful lot of listening around the bands.

The one thing it does not need is a lot of power although, as with most activities, this certainly helps when the going gets tough. Last year contacts were reported into Russia using no more than a barefoot FT290 and a five element beam at 25 feet.

More important than power is being in the right place at the right time. My first contact with Malta was made by accidentally switching on the shack receiver and hearing the station come up out of the noise; one call and he was in the bag. Within ten minutes the world and his wife knew he was there and bedlam resulted. I left them to it and moved up the band where I found a couple of Italians calling CQ and, once again, got instant results; all these contacts being made without switching on the linear.

### Operating

An opening can last from a few seconds to all day, but remember that there is going to be a great demand for the DX stations. Work on the theory that they are only going to be there for a few seconds and pass on the minimum amount of information, which usually amounts to your call, his report and your locator. He will probably return by simply saying QSL, he is not asking for your card



## ON THE BEAM

because that is assumed to be on its way, but is using the term in its true sense of 'did you copy OK?' You would then simply respond with QSL meaning 'Yes, all copied'. As soon as this is completed get out of the way.

You will notice there was no mention of your name, the gear you are running, or even the name of the town that you live in. The idea is to get the minimum amount of information across that is required and then get out of the way – fast. This gives other operators a chance to work him and gives you more time to find another DX station while the going is good.

### Finding it

As the E layer gradually becomes denser it starts to reflect higher frequency signals and 50MHz will show activity both before and more often than two metres will. The more usual place to look is on the VHF broadcast band around 90MHz. If this starts to fill up with foreign broadcast stations all speaking strange tongues then there is a fighting chance of it reaching two metres.

By the time the BBC announcers are telling you not to adjust your sets because all those funny things that are happening to your picture are caused by interference, you can be sure a major event is under way and it's time to get the gear warmed up.

### A new dimension

This year should see tremendous sporadic-E activity to the States on 50MHz and the A class men should have a ball. Even if you cannot transmit on the band it is well worth investing in a converter and knocking up a dipole aerial so that you can listen to the activity. There are some very big stations in the States, some of them running a kilowatt to stacked arrays, so you are definitely going to hear them. One advantage of this band is that the activity tends to last for much longer periods, so the contacts are far more normal than the quick fire affairs on two metres.

For perhaps the first time there will also be a lot of American stations looking for sporadic contacts into Europe on two metres, which would be possible using double hop effects. When that sporadic event is in full swing try turning your aerials Stateside and see what is going on; you never know, you might be the first across the pond. That would certainly get you one of our special class certificates.

### Awards

A lot of enquiries about the awards continue to arrive. Here are the basic requirements for the Bronze 144 award, with the requirement for 70cms in brackets: you need 7 (5) countries, 20 (15) counties, 20 (15) squares and a minimum distance worked of 500kms (400kms).

What you do not need are QSL cards, simply send a copy of your log entries signed as a true copy by at least one other amateur (let's face it, the only person you can cheat is yourself!).

Awards are available for 23cms and a special category is also available which, so far, has only been issued once for a mobile to mobile contact on 10GHz. If you think your special activity deserves some recognition write and let me know.

### Tailspin

I've run out of space again. Please keep your news and comments coming to me at 82 Ringwood Highway, Coventry CV2 2GT or via Prestel on 203616941.

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# SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

What use does the average amateur make of pencils? Filling in the log book? No, the regulations say indelible records should be kept. Jotting down Morse onto a scrap of paper? Well, maybe. Older readers may care to show their age by recalling their use to lower crystal frequencies. However, two major uses of pencils do exist, one of them only just emerging, and I shall let you into the secrets.

The first use concerns variable resistors, or pots to use the technical name. Quite a lot of them, pre-set or panel mounting, rely on a little bit of carbon held in a hole in the rotating disc (ie the moving bit). This carbon is held under pressure from the disc and pushes down on the track to make the variable contact. As time goes by the moving bit loses its pressure and, one day (normally half-way through a contest) the little bit of carbon jumps out, invariably making a bid for freedom on the shack floor when you open the case up.

I must confess that your scribe specialises in losing the carbon bit when cleaning up noisy pots, particularly early Icom and Yaesu mobile rig pre-sets. The solution is to carefully sharpen a pencil, cut the point off, with as long a length of carbon as you can (three sixteenths or so is adequate), rub the non-pointed end on a bit of fine sandpaper to remove sharp edges, then pop it in as a replacement. HB pencils are the best! A great, permanent repair for pre-sets, but only a 'get-you-home' technique for frequently used panel mount controls, such as volume, since the pencil lead will eventually cut through the fixed carbon track. OK it's a bodge, but a handy one to know for emergency situations!

The next use for the humble pencil I claim totally as my own invention, and is an even greater bodge than above. The idea came about as a result of a problem with a singing and dancing Japanese wonderbox containing the serviceman's nightmare: surface mounted components on a substrate, plus printed-on resistors (yuck).

Five minutes with a scope soon tracked down the lack of transmit audio to the second stage of the audio amp, and ten seconds with an AVO resulted in transistor good, base bias non-existent. Twenty-two k's worth of fixed resistor from base to rail soon restored the action, but curiosity drove me on to see what was wrong with the substrate.

Careful examination under an eye-glass showed that the printed-on resistor

consisted of an eighth of an inch of black gunge between two Y-shaped tracks. On one end of the resistor the Y was not making contact with the track, probably as a result of a shortcoming during production. The 'bodge' was a careful rub with an HB pencil into the corner of the Y to remake the resistor-print contact. The result was a success, and the owner readily agreed that it was worth a try when compared with the cost of a new board. So far it's worked for three months, so the method looks hopeful.

## LA200 valve linears

I've mentioned my interest in 10 metre FM before. Whilst ferreting about at a car boot sale some time ago, your scribe came across a PG Electronics LA200 linear. The attraction was the indication of a capability of 125 watts on the front panel meters, so the usual car boot sale haggle commenced. The owner stated that it had suddenly stopped working, and a look through the holes in the lid had convinced him that, since the valves (there are two) were not lighting and everything else was, they had blown. He had wisely decided not to go inside the case, due to the high voltages within, and here I must agree.

If you don't know what you are doing, don't delve into valve linears. There is often approaching a thousand volts lurking about inside, which is dangerous enough, but some, due to cost cutting, do not have EHT bleed resistors. It is not uncommon for the EHT rail to still be at 300 odd volts five minutes after switch off, so take care. I make it a rule when working on any valve PA to clip an AVO between the PA anode and the deck after switching it off (with the AVO on the 1kV range), and wait until I can get the AVO down to the 10 volt range before I go in. Not all linears have the EHT on the anode at all times, and in the cases where it isn't, then it's look around the power supply time. In this case looking for a capacitor of tens of microfarads with thousands of volts rating.

Back to the story. After a bit of haggling I eventually walked off with the linear after parting with the princely sum of a fiver. On the work bench the previous owner's diagnosis initially seemed correct - 12V ac across the two valves (they were six volters in series) and no red glow. Maybe my luck was in, because on pulling the first valve out it was OK and so was the second! It took a while to dawn on me that a valve socket was duff.

Having now learnt, I have bought several duff examples of this linear and in each case it has been the valve base that is open circuit. The trouble is not confined to heaters, and all sorts of weird behaviour has disappeared after operations on the valve bases. The best cure is to unsolder both bases, clean up the contacts with a pin and then re-tension them; although occasionally you can get away with a squirt of cleaner. These linears really are worth looking out for as they go great guns on 29MHz, have a massive mains transformer (compared with some of the skimpy things in other units), two valves and a blower as standard. It's a shame about the long-term reliability of the valve base, as this linear has one of the most accurate wattmeters of all valve linears.

I've often wondered at the definition of an Italian watt, they seem incompatible with British ones and they are always bigger. Some Italian '30 watt' transistor PAs use a 20 watt rated transistor and only give 15 out. This LA200 gives 100 watts out for 4 in on FM when indicating 125, which is quite respectable.

## Bird Thrulines

At the Leeds rally I was standing chatting to a mate in the queue for the bring and buy. He was in a queue of about twenty people waiting to check-in. Suddenly my friend noticed that the bloke behind him in the queue had a Bird Thruline in his hand, plus a reasonable clutch of elements. 'What are you asking for that?' He asked.

'Sixty quid' says the owner. Before I had time to faint a voice, five back in the queue from us, shouts out 'I'll give you eighty-five, cash, now.' The meter changed hands in seconds.

The above story is a reflection of the esteem in which this directional wattmeter is held. For those not in the know, a Bird Model 43 is a meter in a case with two RF sockets (normally N-types), one on each side. An inch diameter hole under the meter accepts an element, and RF energy flowing through the unit is detected by the element and displayed on the meter. The element may also be rotated to indicate forward or reflected power.

Various elements are available, the standard range covering from 50 watts in the 2 to 30MHz range, up to 1000 watts in the 400 to 1000MHz range. The lowest power available on the standard range is 5 watts full scale, although there are little known ranges available which go down

## SECONDHAND

to 100mW, and high frequency elements that go up to 2300MHz.

The Bird, as it is known, is held in high regard by those in the know, and its popularity is reflected in its secondhand price. Desperate ads often appear in this and other magazines, both for the unit and its associated plug-ins. As a guide, seventy-five quid to about a ton is the going rate for a unit with one plug-in, and twenty-five to thirty-five each for additional plug-ins. They are built like the proverbial brick built outbuilding, evidence of which was displayed when your scribe, as an apprentice, dropped one from the top of a sixty foot water tower. The unit landed face down in mud and

worked perfectly when retrieved. So they *are* rugged.

### Eddystone 770 series

I've had a few letters about the above receivers over the last few months, concerning the sensitivity of the rigs, or rather the lack of it. The bald fact of the matter is that, by today's standards, they are deaf. The VHF receiver boasts a sensitivity of five microvolts for 15dB signal-to-noise, and the UHF version is even worse at ten microvolts.

If these figures don't mean much to you, the average two metre Japanese wonderbox is a quarter to half a microvolt for 20dB signal-to-noise. The

problem is that these receivers look very attractive, but their performance doesn't live up to their looks. To be fair, the lousy sensitivity is displayed for all to see in the handbook, but this is often not forthcoming when for sale secondhand.

A fact also not realised by many is that the vast majority of these were seventy-five ohms input impedance. If your example has a TV type (Belling Lee) socket on it, it's odds on to be seventy-five ohms. A wideband matching balun (made from a UHF torroid core, three turns to your fifty ohm aerial and lead, four to the receiver) will transform a poor installation into a mediocre one, but don't expect miracles.

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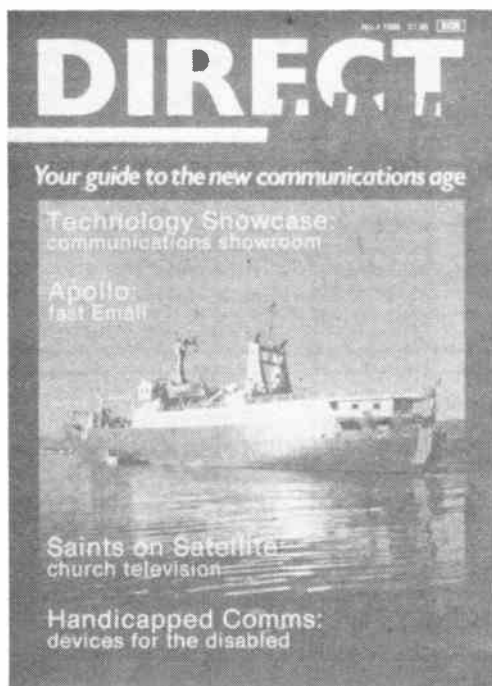
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■ Trio TS820S HF transceiver, VFO 820, SP520, manuals, excellent, £465. KW108 monitor scope, as new, £90. Yaesu FP707, £85. Trio TS530SP, as new, £550. Canadian 52 set, HF Tx and Rx, 813 final, manual, £65. Jap electronic keyer, £30. Heavy admiralty key, £20. Ekco AD65 Round bakelite 1934 radio; ditto A22-1950 model; 1926 Gembrell 2 valve mains, 1926 Burndept Ethophone. Wanted: Philips super-inductance receivers, will swap or buy. Jim Taylor, 5 Luther Road, Winton, Bournemouth. Tel: (0202) 510400

■ FT290R mobile mount, boxed, £230. PF2UB, SU8, RB10, RB14, £50. Wood and Douglas 70cm 10W PA/pre-amp, £35. W&D 70cm ATV Tx/Rx, 10W, boxed, circuits, £100 ono. Rigonda 6 inch TV, mains or 12 volts, £25. B&W TV camera, 12 volts, £25. All in working order. G8FRL, QTHR. Tel: (0223) 61222, ext 601 (office)

■ FDK700EX 25W 2m mobile-base in original box. Two ½ mobile whips, one with mag mount. 2m 8 element beam, 7 amp regulated power supply. Dual SWR power meter, 2m Slim Jim, £160 ono. Tel: Wolverhampton (0902) 737090

■ Stop look. HF Icom 730, superb condition, never used, boxed etc, £350. 70cm C78 FM portable, good condition, boxed etc, £150. Morse tutor, Datong D70, boxed etc, £45. Offers considered on all items. Tel: (0442) 61936 evenings only please

■ Super Star 360 FM. Recent service, £50 ono. Tel: (08012) 3500 evenings only

■ Heathkit SW717 receiver, £60, no offers. Tel: Wood Clochen 378

■ Complete RAE course and multi-choice exam papers, £35. Pye desk type mic, £8. Headset, complete with mic, not WD type, £10. Various 240V timers, complete with bases, £8 each. Various 240V relays, complete with bases, £5 each. Two voltmeters, 0-40V, two milliamp meters, 0-500, £5 each. One freq meter, 46 to 54 cycles, £9. Mr Gearing, 1 Crawford Rise, Arnold, Nottingham NG5 8QF. Tel: (0602) 204083 after 8pm

■ Ham base Jumbo, offers around £120. Tel: (0283) 221870

■ AKG D509 dynamic microphone, £20. Film industries ribbon microphone, £10. Rascal dual diversity unit, MA168B, with handbook, £45. Minimitter low-pass filter, 30MHz, £10. Pair of Quad ESL63 loudspeakers, almost new, £995, no offers. Pair of Sendor loudspeaker stands, £18. Dual 10 band professional graphic equaliser, new, £195. 10 output line distribution amplifier, new, £180. Allen & Heath ADT unit, new, £195. All carriage extra. B J Whitty, 'Fourways', Morris Lane, Halsall, Ormskirk, Lancs L39 8SX. Tel: (0704) 840328

■ *Electroniques Hobbies Manual*, 1967, 600 pages, useful information. Large circuit for Vanguard Mk2 Tx. Perdio PR32 town country service information. Assembly instructions on labgear 3-band quad. Instruction manual for NC121 receiver. Details for TT21 linear amplifier 3.5-28MHz (1964). Instructions Tx MI8167, ET4336, RCA. Details RAF Rx type 78. Service manual Aiwa AR158, 159, £2 each. Headphones 300Ω black, light, communication, £5. Two new boxed OC26, £3. Alan Edwards, 32 Heldhaw Road, Bury St Edmunds, Suffolk IP32 7ES. Tel: (0284) 60984

■ Selling Eddystone 630X receiver, 550kHz to 30MHz, 2 RF stages, variable selectivity, £95. Lightweight antenna rotator, complete with control box, £35. Tel: (0283) 63767

■ Circuit digital frequency meter and prescaler kits, unopened, cost £75, accept £50. Sinclair 16K ZX81, £15. Computer compatible cassette player, unopened, £10. Yaesu YO100 adaptor kit, allows

monitor scope to be used with receivers with IF of 9MHz, £10. Tel: St Albans 39333

■ Rascal RA17 commx recvr with SSB adaptor, handbook, fifty radio mags. Will deliver within fifty miles, £225. Mr Robbins. Tel: Lymington 22979

■ Oscilloscope, Tektronix model 2215, 60MHz dual trace, probes and manual, as new, £750 ono. Tel: 01-949 2317

■ AR2001 communications receiver, 25-550MHz, perfect, £250 ono or exchange for FRG770M. Tel: (0604) 499331 day, 405531 evenings

■ 3kW! Kubota petrol generator, has only run for 30 hours from new. Substantial saving on new cost, £525. Four 25el loop yagis for 23cm, including tonna 4 way splitter, £95. Parabolica 23cm 50 watt PA in kit form, including PSU module, £115. MET 432/19, brand new, £29. Phone the musical answering machine, or even G6JNS! Tel: (0905) 620041

■ Ham Concorde II multimode. Ideal for conversion. Good working order. Complete with instruction and service manuals, £40. Realistic DX302, digital readout, general coverage receiver, 0-30MHz, triple conversion, excellent condition, would consider swap for hand-held receiving scanner. Straight sale, £100 ono. Ronald R Smith, 55 Chester Road, Edmonton, London N9 8JH. Tel: 01-807 2462

■ Datong Morse key board, vgc, £85. Tel: (0305) 786930 Weymouth

■ President Grant converted CB rig, to 10 metres AM, SSB, with mike, perfect, £37. Two stereo wood cabinet speakers, £12 the pair. Morse key, hi-mound model HK100, bug type, new, £15. Various mikes. Collect or carriage extra. Tel: (0274) 728219 Bradford, West Yorkshire

■ Robot 400 SSTV converter, excellent condition. With box, manual and cables, £300. Mr Simon Corbett. Tel: (0635) 200865

■ Sludge pump type cavity wavemeter, 140-500MHz, professionally made and calibrated with instructions, needs detector diode, £10 plus carriage. Speaker to match KW77 receiver, £5 plus carriage. Two position co-ax switch with SO239 sockets, £4. Statesman type press button plug in telephone, £20. Extended basic module for Texas instruments T199/4A computer, £15. Tel: (0926) 498388 Warwick

■ Brand new and boxed World receiver, quartz controlled, SSB, 16 memory, 2 speakers, clock, mains/battery, AM, FM, £350. Money only. Hitachi stereo radio cassette recorder, large, portable, 16W Dolby, mains/battery, and record deck, £130 money only. Good as new. Tel: 01-207 2326

■ Realistic Pro2001 VHF/UHF keyboard entry scanner, £100. Xtal VHF/UHF ten channel scanner, £30. Both 12V or mains. Realistic hand-held, VHF four channel Xtal scanner with Nicads, £20. BNOS 12/15A PSU, £50. Mark Ham, St Andrew's Close, Helpringham, Sleaford, Lincs NG34 0RE. Tel: Swaton (052921) 286

■ Anderson Jacobson AJ832 Quarm daisy wheel printer on stand. Tektronix type S46 bench oscilloscope with type L plug-in unit plus service and operation manuals. Dictaphone with remote mike, takes normal size cassettes. Prefer exchange any or all items for 2 metre mobile FM or multimode transceiver with cash adjustment if necessary. Will also sell. G8NWI QTHR, Rainham, Essex. Tel: 52679

■ Advance model E2 signal generator, 100kHz to 100MHz, £30. Also Taylor model 68A, 100kHz to 220MHz, £30. 30kV EHT probe extends range of multimeter to 30kV, £10. TV cross-hatch generators, £10. Advance J2 audio signal generator, 10Hz-100kHz, £25. Linstead S2 EHT generator, 0-5kV variable at about 1.5mA, £15. Will consider exchanges, with cash where applicable, for ex-RAF/army WWII radio gear, eg 1155, R107, WS19. Ask for Tony Howard. Tel: (0234) 68559 (work hours only please)

# FREE CLASSIFIED ADS

Free! Yes it is exactly that. 2 boxes full of radio/electronics bits. Includes transformers, resistors etc. No splits. The lot free - I've no room for them. GM4YRS. Tel: (0224) 313236 ext 62 (office hours) or 40983 (after 8pm)

Grandstand citizens band transceiver, finest base station available on UK 27MHz FM. This radio is in excellent condition, both externally and internally. Owned by myself since new (one of the very first ones) and looked after as deserved. Ideal for 10m FM conversion, absolutely no modifications done, serviced and checked bi-annually by qualified personnel, £130 ono. Carriage anywhere in mainland UK or Isles without hesitation. Good home please! Tony D Sheach, 8 Struan Road, Portree, Isle of Skye, Scotland IV519EG. Tel: (0478) 2548 after 6pm

Yaesu 290R, £250. AMT2 TU plus CBM64 software EPROM, £175. Joystick VFA, plus joystick ATU, £35. Oskerblock SWR power meter, 50/75 ohms, 1.8-144, £10. Tel: 01-764 6767

Microwave Modules 144/432R transverter, £110 ono. Will swap for Trio TH41E hand-held, cash adjustment. Solidisk SWR128 sideways RAM for BBC B, brand new, £100 ono. 16K sideways RAM for BBC B, £20 ono. Julian Tether, Highview, Culworth OX17 2AX. Tel: (0295) 768152. Prestel MBX919998417

Racal RA117 receiver, Racal RA121 SSB adtr, Racal RA137 LF con. All in cabinets, complete, leads, manuals. Also 15in mon speaker. £315 or exchange AR2002 scanner or similar or Icom R70. Also Sony TC645, 3 motor, 3 head, reel to reel, original packing, £150, or exchange for VC10 VHF converter for Trio R2000. W H Abbey, 21 Moat Close, Bramley, B/stok, Hants. Tel: (0256) 882825

Exchange Trio TH41E hand-held, 70cm, mains charger, two rechargeable battery packs, one dry battery pack, speaker mike and cash adjustment for Yaesu FT790 multimode 70cm transceiver or similar. John G1RZR, Nottingham. Tel: (0602) 277906

Bremi 5-7 amp 13.8 volt PSU, £15. Zetagi B70 60 watt AM 11m linear (12 volts input), £20. Home-made microphone switching unit (1 in 3 out), ideal for use with power mic, etc, £12. Bremi TVI filter, £4. Bremi ant matcher, £4. Dynamic microphone (pace 5550), £3. Assorted pre-sets, switches, transformers, etc. Bagful worth at least £20 for £8. Other bits too numerous to mention. Info on application. Carriage anywhere, no object. Tony D Sheach, 8 Struan Road, Portree, Isle of Skye, Scotland.

Trio TS510 HF transceiver and PS510 PSU, bands 80/40, 20/15, 10 metre SSB/CW, in very good working order, recent overhaul, complete with microphone and manual, £150 ono. Would consider swap for mobile HF rig with cash adjustment. D Waterhouse, 4 Ermiston Villas, Rosmead Street, Hull HU9 2TT. Tel: (0482) 27908

Power supply 13.8V 30A, over voltage and short circuit protected, £50. Iambic keyer self-contained, CMOS, long battery life, £14. 2m and 4m transmitter chassis, both have a QVQ03-20 in PA, £10. Telephone, ideal for ext fitted with inphone plug, £8. EPROMs, 2708, ex computer, pack of three, 80p. Brand new resistors, approx 140 per pack, many values, 35p. Semiconductors, £2 pack. Gino Martorano, 81 Sapcote Drive, Melton Mowbray, Leics. Tel: (0664) 500228

Jaybeam 16el 2m antenna, £20. Microwave Modules 144/30LS linear, £55. Both under 12 months old. Tel: (0782) 661748

Trio communications receiver, JR310, including service manual, £70 ono. Tel: (0623) 552639

Icom IC745, 6 months use only, perfect working order, all modes: LSB, USB, CW, RTTY, AM and FM (extra), ICSM6 desk mic, also ICHM12 hand mic, plus ICPS15 mains power supply. Complete HF stn, £750. Mr A Stevenson G0DDO. Tel: (0603) 46236 Norwich

Trio Kenwood R1000 communication Rx, mint, £229 ovno. Icom ICB1050 converted 40ch 10 FM modified PA, 6W out, £25. Alarm system, UK500 by Answercall. Radio sensors, auto dial to 4 pre-programmed numbers with voice synthesized emergency message. Can operate bell/siren also. Plus works as memory phone, auto dial, etc. Must be seen, £150 ono. M Hurrell. Tel: (0732) 823662 Kent

MuTek GD1F 107UB 10GHz Gunn diode board, £45. Solfan 10GHz in-line head unit, £15. Icom SP3

ext speaker, £45. HM7 mic, £15. Rank Xerox 400 tele copier, £20. P Chamberlain, 9 Goffs Close, Crawley, Sussex RH11 8QB. Tel: (0293) 515201

Two aircraft radio altimeters, type AN-APN, transmitter and receiver suitable, 70cm tunable, 418 to 462MHz, never used, original packing, £25 the pair. Buyer collects. Tel: (0702) 218522 Southend

FT757GX, as new. FC700 ATU. YM38 mic. Pocom 2002 auto RTTY, Morse, Tor, etc, decoder. TAU ATU, 1kwatt maximum, 1.8 to 30MHz. Rediphon marine VHF transceiver, mains valve, 28 channel. Sinclair QL computer. Bargain at £950 or may separate. No offers. 6 Westward Lodge, 94 Claremont Road, Seaford. Tel: (0323) 897535 after 6pm

Heathkit HW8, vgc, £90 ono. Eddystone EC10, £50. Mr J H Vardon, 3 Barkers Lane, March, Cambs. Tel: (0354) 54274 after 6pm

Tx valves. One 813 and ceramic holder, two TZ40s, six 1625s, 3 doz radio and TV valves. Mains trans 1500V, 500mA mod trans for TZ40. Both new for T1131 Tx. Offers single item or lot. W Munroe, 5 The Chantry, Bromham, Wilts SN15 2ET. Tel: Bromham 850491

RCA ET8010A transmitter, 1943, 355kHz to 500kHz in 5 fixed channels, 115 volt, 200 watt. RCA ET8019E transmitter, 1949, 2-22.4MHz, 200 watt, as used in WWII merchant marine? TU5B tuning units from BC375 transmitter, TA12C transmitter, 4 channel in range 300kHz-12MHz, 40 watt. BC614E speech amp. TG10F keyer. Test set 210/BC906D. Eddystone S640, S504. Valve testers. Open to offers, swaps. See wanted ad. Tel: 01-833 3008

Valves, boxed, unused, octals: UX5, UX7 and British types also. 6F6GT, £1 each. 6F6M, £1.50 each. 6A7G, £2 each. SAE for full lists please. Over £5 post free. A E Jeffrey, 42 Dennis Road, Padstow, Cornwall PL28 8DE. Tel: (0841) 532723 after 7pm

FDK750XX two metre multimode, excellent condition, original packing, latest model, used only as base station, can be seen working, £270 ono. Bob G4ZRS not QTHR. Tel: (0634) 712351 Medway area

Unused radio valves, 290 in makers' boxes. Offers. Tel: Doncaster 884467

Uniden CR2021 receiver, 150kHz-30MHz + 76MHz-108MHz, FM, AM, SSB, narrow/wide filter, built-in ATU, keyboard entry and LCD readout, 8 memories and programmable scanning, mains power unit and manual, £115. Tel: 01-437 4421 weekdays 9am-6pm, or 01-568 6152 evenings and weekends. Ask for Brian

FT290R 2m all mode, nicads, charger, £250. MM linear 144/30LS, £60. FT708 hand-held, £160. G3RCO, QTHR. Tel: Seaton 21016

Yaesu FL101 SSB, HF, Tx complete with manual, leads, etc, boxed and in excellent condition, £210. Advance J-1 signal generator, £15. Solatron digital multimeter 7040 with leads and manual, £20. US navy miniature scope, needs PSU, £12. Eagle 0-20V/3A lab power supply, new and boxed, £8. 5A h/duty Variac transformer, £15. 807s new and boxed, £1.50 each. G4FZG QTHR. Tel: (0242) 580329

Ham Major 588, unmodified, USB/LSB/FM/AM, perfect order and ideal for conversion to 10m, £40. AR88LF communications Rx, 75kHz to 30MHz, good working order, £35. Halicrafters S36, requires attention, £20. Tequipment 50MHz D83 dual beam scope, perfect, £400. Tony. Tel: (0375) 378783

Lafayette homebase converted to 10m FM, also Lafayette 120 channel AM/FM/SSB transceiver, easily converted to 10 metres. Also 25 watt linear amp and 20-30MHz pre-amp. Will exchange for general coverage receiver or transceiver. Will also consider HF or 2 metre, 2300FM 7010 SSB. G1JJN QTHR. Tel: (061) 793 1292

BBC-B micro +DDFS, 40/80T drive, 16 socket ROM/RAM board, 32K SWR, EPROM programmer + SW, view, word wise, and many games, £400 ono. B/W TV, £20 vgc. Superstar 2000 11m mobile + 25W amp, £50. Will separate or swap for HF equipment. Also stereo cassette radio with Dolby B and detachable speaker, £50. Andy. Tel: Chelmsford 262637

Trio TS530S all band transceiver, new condition, MC50 mic, new spare valves (three), low-pass filter, headphones, owner's and workshop manuals, £500, buyer to air test collect, any day after 2pm. Gregg, 2 Park Road, Granborough, Nr Aylesbury, Bucks

FDK700AX, 5-10-100kHz steps plus sat band 144 to 148kHz, boxed, excellent, £130. Also Belcom LS102 26.30MHz, checked and serviced by R Withers, unused since, £180. Mr T Waters, 42 Tregundy Road, Perranporth, Cornwall TR6 0EF

National Panasonic RF-3100L FM/LW/MW/SW 32-band receiver. Double super-heterodyne PLL synthesizer, BFO, 110V-240V ac, battery portable, mint condition, £100 ono. Mr G Atkins, 10 Portland Drive, Gosport, Hants PO12 2TE. Tel: (0705) 521735

Realistic DX400 comm receiver, 3 months old, AM/FM/SSB/CW, sell for £120 or swap for FRG7. R Green. Tel: (061) 795 3886

HF5 antenna plus radials, little used, excellent condition, £35. Tel: Bedford 742139

Icom 290E, 10W, 144MHz, all mode transceiver, scanning mic, very good condition, original box and packing, mounting screws, brackets, £350 ono. Tony Amies, 111 Wood Lane, Treeton, Rotherham S60 5QU. Tel: (0742) 691314

New 3 element beam, 11 metres. Also rotator control box and 60 feet of 3-strand wire for control box. All of these items are as new, antenna is new. £85 the lot, or will separate if required. Tel: (0282) 59320 anytime

Yaesu FT480R, mobile fittings, SWR, ATU, Drae 6 amp PSU, £200. Icom IC2E with accessories, £120. Mustang mobile CB plus PSU, £10. Yaesu FRG7 communication receiver plus trap dipole, £85. G3LIV RTTY computer interface, £35. Creed 444 plus PSU, £40. Sprague. Tel: Exeter (0392) 38195

RA17 Rx, very good condition, no marks, £150 ono. S Brumby, 69 Gilbert Road, Lichfield, Staffs WS13 6AY. Tel: Lichfield 256816

FT101ZFM Mk3 Warc mic, vgc, £400. DX302 digital readout, £80. Prefer buyer collect. G3JXR. Tel: (0908) 642398

HF5 plus radial kit, cost £130, four months old, as new, £80. Tel: (0282) 24027 evenings, (0282) 27321 ex 220 day

726R 2m, 70cm HF sat unit and narrow filter, exc cond, £1,050. SEM 2m 10X linear and PSU, £110. £1,100 the lot. Mike. Tel: Epsom 24276

AR88D, recently serviced, matching speaker, operation manual, numerous spares, good condition, buyer to collect, £80 ono. B Turner, 1 Godley Lane, Dilhorne, Stoke-on-Trent, Staffs. Tel: Cheadle 753442

Midland base station, 27MHz Tx/Rx, receiver model 76-900, mint con, perfect order, want £200, cost new £280. If buyer collects, aerial included. Tel: Ellesmere, Salop (069 171) 2368

## WANTED

FTDX401 trans, working or faulty, plus any info, mods, etc. Also wanted: Lincor 70 (Belcom). Write or call John McCallum G4YMC, 31 Meadow Road, Lemington, Newcastle, Tyne and Wear NE15 7LP. Tel: (091) 2674881

Yaesu FT102 trx, preferred AM/FM board and narrowband SSB, CW and AM filters fitted together with mike. Write, no phone and house-bound. Jess Luxton, 'Bergheim', Battery Hill, Fairlight Cove, Hastings, East Sussex TN35 4AD

Antenna noise bridge (LAR modules). Tel: (0926) 498388

Trio TR7930 2m transceiver, must be in excellent condition. Tel: (0206) 394336 (Essex)

Private collector requires good, original condition receivers BC348, CR100, R1155, APR4, and accessories, Collins 75A4 and any WWII airborne radio/radar equipment. Will collect. P Bristow, 6 Finmere, North Lake, Bracknell, Berks RG12 4WF

Have Polaroid Polavision land player and Polavision instant movie land camera. Used twice, as new. Swap for HF Rx or HF Tx/Rx in vgc, anything considered, WHY, or sensible offers. Tel: 01-200 3825, NW London

Have Jones 882 electric sewing machine in vgcw, with carry case, value around £80, swap for any HF Rx or HF Tx/Rx, age not too important, must be vgcw. Tel: 01-200 3825, NW London

AR2001, AR2002, willing to exchange multimode FT790R 70cm in very nice condition with extra equipment for AR2002, ie SP400 2m/70cm pro SWR/PWR meter and 200-page VHF/UHF 29-100MHz book of channels. Or swap AR2002 for TRS80 model 100 24K lap computer plus pro software for same. Much more equipment not listed. No cash, hence exchanges. Ring for a good deal. Tel: (0473) 85526 anytime, day, night

## FREE CLASSIFIED ADS

■ Employment wanted in electronics or any allied field, by young man, 20, class B radio ticket, little experience but willing to learn, anything, anywhere considered. Write or phone, Dave Jackson, 49 Yoden Road, Peterlee, Co Durham. Tel: (0783) 863703

■ Circuit diagrams, workshop manuals, etc for IC240 and Superscan SS240 scanner. Reasonable prices paid or can photocopy and return. H Colborn, 6 Days Ground, Shrivenham, Swindon, Wilts SN6 8ET

■ Would appreciate copies of *Amateur Radio* for issues of November 1984 to July 1985 inc, and October 1985. Alternatively photocopies of series, 'Back to Basics'. Please state cost either way and postage to Malta. Eddie M Gauci, 70 Stella Maris Street, Sliema, Malta

■ Trio DM81 grid dip oscillator. Tel: (0293) 515201  
■ Hand-held scanner with air band and search facility. Tom Valentine, 38 Grampian View, Montrose, Angus DD10 9SX

■ Valve short wave receivers: HRO, National, Hammerlund, Hallicrafters, Collins, BC312, BC348, R390A, etc. Valves: output triodes like PX4, PP3/500, 300A, 350, early collectors' valves etc. Early quality hi-fi such as Quad, Lowther, Leak, Radford, WE, Tannoy, Ortofon, Sugden, Decca, Wharfedale, Stentorian, Goodsell, Williamson, Pamphonic, Avantic, etc. Compact wartime equipment and clandestine spy-sets in any condition, also manuals, accessories. Tel: 01-833 3008

■ Racal Syncal 20 watt transceiver. Good condition, sensible price. B J Whitty, 'Fourways', Morris Lane, Halsall, Ormskirk, Lancs L39 8SX. Tel: (0704) 840328

■ Handbook, circuit, manual for Barlow Wadley XCR30 Mk 2 receiver, or photocopies please. Also *Rad Comm* for Jan 1973, or photocopies of page 28. Alan Edwards G3MBL, 32 Heldhaw Road, Bury St Edmunds, Suffolk IP32 7ES. Tel: (0284) 60984

■ Wanted by pensioner returning to amateur radio: Labgear LG300 transmitter Mk II and companion modulator power supply. Alternatively would be interested in labgear LG50 transmitter.

Manuals or info with either if possible. Tel: (0272) 642101 anytime

■ ATU, suitable for Yaesu FRG8800. Must be in good condition. Mr Appleton, 82A Gillygate, York YO3 7EQ. Tel: (0904) 644695

■ Yaesu FT200 and PSU, or Trio TS520 or Yaesu FT101. Durham area preferred, or will collect or pay carriage. Ian. Tel: (0388) 662630 evenings or weekend

■ Murphy A146CM service sheet and Mazda valves type 6C9, 6F15 and 6LD3. Also seeking Faraday's *Experimental Researches in Electricity*, vol 1 only. Alan Williams G3KSU. Tel: Ryde (0983) 65551

■ Exchange high quality metal detector, many valuable finds, 4 levels of check, for best comms receiver offered. Metal detector is VLF model, is in excellent condition and complete with case, headphones, tools, books, etc. Johnston. Tel: Ferndown, Dorset 891538

■ Comtron CXX 120 channel AM/FM CB, any condition. Also, linear amplifier for 10 metre band. Tel: (0252) 871812

■ FRG7700 Yaesu receiver or Yaesu FRG8800 receiver. Tel: Wood Clochen 378

■ Receiver for home base use, covering VHF marine band. Reasonable price. F W Nash, 39 Fleet Street, Holbeach, Lincs. Tel: Holbeach 22649

■ R2000 with VHF converter, or FRG8800 with converter. Urgent, for cash. Also Nato 2000 in good condition. Tel: (0283) 221870

■ KR600 rotator, 2 element triband quad, ie Qemquad, pair 813s and bases, pair 500pF 20kV Encap ceramics caps, or pair 0.001µF 5kV disks. Three 0.0µF 3KVdc twelve 0.01µF, 1kVdc. Tel: (0625) 527250.

■ Valve 6F8G or equiv: VT99 or CV1917. Your price paid. G Wegg, 23 Kerdane Dane Park Rd, Hull HU6 9EB. Tel: 855052.

■ VHS video recorder in working order, capable of playing standard hire tapes from the local shop. Loading and key format not important. Make not critical providing it works OK. £60 or near to that figure. Also can anybody help with alignment data

(photocopy or original for the following sets: Trio JR500S receiver, Murphy B40D receiver, Dymar Lynx radio telephone, model 931, Pye Pocket-phone transmitter for UHF FM band(PF1T2E). All expenses paid. Mr Neale, 85 Broughton Road, Leicester LE2 6NE.

■ BBC engineering training manual, 1942 edn. Also modern *Radio Communication*, Vols 1&2, by JH Reyner, 1940. Leslie Biss, 62 Farfield Avenue, Knaresborough, North Yorks HG5 8HT.

■ Burndept 470 that has been xtalled for 70cm on RB6, RB4, SU8, SU20, RB10, good price paid for rig in vgc or mint. Also would like harness for same or would have 471 with spare Nicads and charger with above channels. Tel: Leigh (0942) 675445. S Balon G1HAW, QTHR.

■ Exchange piano, Seeger, good condition for Racal RA17 receiver or similar, could deliver. Tel: Runcorn 61439.

■ Wanted for Redifon R50m, power supply unit and circuit diagrams for both set and PSU or will purchase complete set in any condition. A Keys, Mill Lane Farm, South Somercotes, Louth, Lincs LN11 7DA.

■ Rotator and beams for 70cms. Bases for 4CX250S. Mark Smith, PO Box 14, Stornoway, Isle of Lewis, Outer Hebrides, Scotland.

■ Marconi Osram valve, type V24, or substitute types QX, DEV and DEQ. Preferably working with sound filament. Stan G3XON, 14 Dagden Road, Shalford, Guildford, Surrey GU4 8DD. Tel: (0483) 36953.

■ Amateur bands SSB/CW transmitter in good working order. FL200B, KW204 or similar. Fair price paid. N Rowley, 11 Brewer Road, Bulkington, Nuneaton CU12 9RF.

■ Marconi 1017 mercury receiver. Heath RA1 Rx. Codar 250/S power unit. Price and details to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SXL2 1DA.

■ Urgently wanted - handbook, manual, for Yaesu PMR FTC1525A. Anything considered, original, copy, or photostat. Your price, or all costs paid. Peter Hunter, 2 Huxley Close, Norwich, Norfolk

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Amateur  
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## Thursday 26th June

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## ADVERTISING RATES & INFORMATION

DISPLAY AD RATES		series rates for consecutive insertions			
depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
61 x 90	1/8 page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	1/4 page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	1/2 page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES		series rates for consecutive insertions			
depth mm x width mm	ad space	1 issue	3 issues	6 issues	12 issues
128 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
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DEADLINES				
Issue	colour & mono proof ad	mono no proof & email ad	mono artwork	on sale thurs
Jul 86	29 May 86	4 Jun 86	6 Jun 86	26 Jun 86
Aug 86	3 Jul 86	9 Jul 86	11 Jul 86	31 Jul 86
Sep 86	31 Jul 86	6 Aug 86	8 Aug 86	28 Aug 86
Oct 86	28 Aug 86	3 Sep 86	5 Sep 86	25 Sep 86

CONDITIONS & INFORMATION		
<p><b>SERIES RATES</b> Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.</p>	<p>If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken. <b>COPY</b> Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations. Printed - webb-offset.</p>	<p>Above rates exclude VAT. <b>PAYMENT</b> All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by the publication date. Overseas payments by International Money Order or credit card. <b>FOR FURTHER INFORMATION CONTACT</b> Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 219876.</p>

ACCESS

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VISA

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IType	Price (£)	Type	Price (£)	Type	Price (£)
AC127	0.28	BC327	0.16	BF117	0.80
AC128	0.30	BC328	0.16	BF119	0.82
AC128K	0.34	BC337	0.12	BF120	0.35
AC141	0.58	BC338	0.12	BF125	0.42
AC141K	0.58	BC350A	0.24	BF127	0.44
AC142	0.58	BC440	0.36	BF154	0.23
AC142K	0.58	BC441	0.40	BF157	0.48
AC151	0.45	BC461	0.58	BF158	0.30
AC152	0.45	BC547	0.12	BF160	0.23
AC176	0.30	BC548	0.12	BF167	0.32
AC176K	0.44	BC549	0.10	BF177	0.42
AC187	0.28	BC550	0.10	BF178	0.26
AC187K	0.38	BC550C	0.10	BF180	0.27
AC188	0.28	BC557A	0.10	BF181	0.27
AC188K	0.38	BC558	0.10	BF182	0.32
ACV41	0.90	BCX34	0.29	BF183	0.32
AD142	0.80	BCY70	0.16	BF184	0.30
AD143	0.88	BCY71	0.17	BF185	0.28
AD149	0.72	BCY72	0.16	BF194A	0.15
AD161	0.42	BCZ10	3.21	BF195	0.12
AD182	0.58	BC111	2.60	BF200	0.30
AD161/162	1.20	BD124P	1.70	BF222	0.38
AF14	1.20	BC130Y	0.68	BF224	0.20
AF15	2.10	BD131	0.36	BF224J	0.20
AF16	2.10	BD132	0.36	BF240	0.30
AF17	1.85	BD135	0.26	BF241	0.30
AF171	0.48	BF136	0.28	BF242A	0.34
AF172	0.42	BD137	0.28	BF244A	0.30
AF125	0.58	BD138	0.30	BF244B	0.28
AF126	0.58	BD139	0.30	BF257	0.22
AF127	0.38	BD140	0.28	BF258	0.26
AF139	0.40	BD144	1.80	BF263	0.38
AF178	2.28	BD145	1.82	BF262	0.34
AF239	0.50	BD150A	0.68	BF263	0.38
AF279S	1.40	BD160	1.58	BF270	0.30
AL100	5.40	BD165	0.48	BF271	0.28
AL102	4.40	BD183	0.70	BF273	0.22
ASV90	3.20	BD201	0.52	BF274	0.22
AU110	2.80	BD202	0.57	BF324	0.46
AY102	4.32	BD204	0.57	BF336	0.32
BA110	0.68	BD222	0.80	BF337	0.28
BA121	0.42	BD225	0.40	BF338	0.28
BA129	0.38	BD232	0.45	BF363	0.35
BA148	0.12	BD234	0.58	BF459	0.35
BA154	0.12	BD235	0.30	BF371	0.27
BA155	0.12	BD236	0.38	BF422	0.20
BA157	0.28	BD237	0.38	BF450	0.38
BA164	0.14	BD410	0.78	BF457	0.38
BB105B	0.30	BD434	0.58	BF458	0.37
BB105G	0.48	BD438	0.70	BF463	0.46
BB110B	0.42	BD439	0.85	BF461	0.38
BC107	0.10	BD507	1.05	BF461	0.32
Aor B	0.12	BD518	0.88	BF490	0.86
BC108	0.10	BD520	1.20	BF471	0.68
A B or C	0.12	BD599	0.90	BT101	1.14
BC113	0.12	BD707	0.74	BF471	0.84
BC114	0.12	BDX18	1.60	BF444	0.88
BC115	0.12	BDX32	1.48	BF229	0.28
BC116	0.12	BF115	0.32	BFX30	0.40

Type	Price (£)	Type	Price (£)	Type	Price (£)
BC117	0.22	BFY52	0.22	BY199	0.72
BC118	0.28	BFY90	3.80	BY206	0.16
BC119	0.28	BFY90S	1.34	BY207	0.16
BC125	0.14	BR100	0.25	BY210/400	0.21
BC140	0.27	BR101	0.40	BY210/600	0.24
BC141	0.26	BR103	0.50	BY210/800	0.28
BC142	0.24	BRV99	0.50	BY227	0.22
BC143	0.28	BSX13	0.42	BY228	0.46
BC147	0.18	BSX19	0.32	BY238	0.85
A or B	0.14	BSX20	0.30	BYX10	0.20
BC148	0.10	BSX59	0.78	BYX36/150	0.40
A or B	0.12	BSX76	0.65	BYX36/600	0.48
BC149	0.10	BT100A/02	0.90	BYX46/300	0.70
BC157	0.12	BT101/300	3.70	BYX55/350	0.26
BC158	0.12	BT101/500	3.25	BYX55/600	0.30
BC159	0.12	BT102/300	3.60	BYX71/600	1.18
BC160	0.30	BT106	1.15	BYZ12	0.78
BC161	0.30	BT108	1.25	C106D	0.48
BC168B	0.20	BT109	1.15	E1222	0.32
BC169C	0.12	BT116	1.20	E5024	0.34
BC170	0.16	BT119	3.30	GE7872	0.80
BC171	0.10	BT121	2.99	ITT2002	3.34
BC171	0.10	BT121	2.99	MEU21	0.82
BC171	0.14	BT138/600	1.30	MJ400	1.45
A or B	0.10	BTY79/400R	2.70	MJE2955	1.00
BC172	0.16	BU100A	2.30	MJ3000	1.80
A or B	0.12	BU104	1.80	MJE340	0.46
BC177	0.24	BU105	1.20	MJE371	0.85
BC178A	0.30	BU105/02	1.55	MJE520	0.44
BC182	0.10	BU108	1.75	MJE2955	1.00
A B or C	0.12	BU124AE	0.80	MJE3055	1.40
BC182L	0.12	BU126	1.40	OA47	0.10
A B or C	0.09	BU133	1.40	OA90	0.07
BC183	0.10	BU204	1.30	OA91	0.07
A B or C	0.10	BU205	1.30	OA95	0.12
BC183L	0.10	BU206	1.50	OA200	0.08
A B or C	0.10	BU208	1.40	OA202	0.10
BC184L	0.10	BU208A	1.40	OC26	2.85
A B or C	0.10	BU208/02	2.05	OC28	3.15
BC207	0.15	BU326S	1.75	OC35	4.75
BC208	0.45	BU407	1.10	OC36	2.75
BC212	0.10	BUX80	3.70	OC42	0.72
A B or C	0.10	BUX20	0.85	OC44	0.72
BC212L	0.09	BUY69A	2.60	OC45	0.68
A B or C	0.10	BUY69B	1.98	OC71	0.60
BC213	0.10	BY122	0.60	OC72	0.70
A or B	0.10	BY126	0.10	OC81	0.68
BC213L	0.10	BY127	0.08	OC200	2.46
A or B	0.10	BY133	0.08	OP12	0.85
BC237	0.11	BY135	0.05	R2008B	1.20
BC238	0.14	BY164	0.35	R2010B	1.20
BC239C	0.16	BY179	0.56	TIC44	0.38
BC251	0.14	BY182	0.80	TIC45	0.45
A B or C	0.14	BY184	0.38	TIC46	0.70
BC301	0.30	BY187	0.80	TIC47	0.70
BC302	0.30	BY189	0.75	TIC106A	0.95
BC303	0.30	BY196	0.84	TIP30A	0.38
BC307A	0.18			TIP31C	0.30
BC323	0.90			TIP32	0.35

## SWITCHES

Sub Miniatures	
Toggle	
SPST 60p SPDT 63p	
DPDT	58p
Miniature Toggle	
SPDT 68p SPST 65p	
DPDT	72p
DPDT Centre off	
DPDT	85p
On/Off	12 volt & 6 volt
Slide	15p
Push-to-Make	28p
Push-to-Break	25p

## PLASTIC BOXES

3x2x1"	0.85
3x2 1/2x2"	0.93
4x3 1/2"	1.15
6x4x2 1/2"	2.50
8 1/2x5x3 3/4"	2.95
Colour Black, all boxes with lids and screws	

## LEDS

Red 3mm x 5mm 10p	each 100 for £6.00
Yellow 3mm x 5mm	£10.00 reel
10p each 100 for	£10.00
Green 3mm x 5mm	13p each 100 for
£10.00	

## ROTARY SWITCH

1 pole 12 way, 2 pole 6 way, 3 pole 4 way, 4 pole 3 way 50p

## COPPER WIRE

Tinned + Enamelled copper wire  
2oz reels 14 to 38 swg per reel £1.00

## BT SECTION

Master socket	£2.85
Secondary socket	£1.95
BT plug & lead	£1.25
4-core cable	
15p meter cable clips	75p per 100

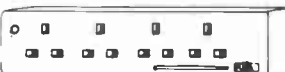
## ELECTRONIC COMPONENTS MAIL ORDER CATALOGUE

PRE-PAID ENVELOPE SPECIAL OFFER  
136 ORDER FORM PAGES INCLUDES  
50p FREE VOUCHER

SOLDER  
16g 250gms £4.60 reel  
18g 250gms £4.40 reel  
22g 250gms £4.80 reel

### ONLY £1.00

### JUNE SPECIAL OFFER



## 4 WAY EXTENSION SOCKET

3-PIN SOCKETS - FUSED & WITH NEON INDICATOR

### ONLY £3.50

WITH ORDERS OVER £5.00

### GAS SOLDERING IRON £13.90 ORYX SPARE TIPS PORTASOL

£4.50

EXCLUDING 5 SPARE CHARTS 3-CHANNEL CHART RECORDER

£40 EACH + £10 P & P

### CERAMIC KIT

CERAMIC CAPACITORS

5 OFF EACH VALUE

£4.75

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5 OFF EACH VALUE

£3.50

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£1.99

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- 75p EACH

### WIRE STRIPPERS

75p EACH

5 for £3.00

### PICK-UP TOOL

75p EACH

5 FOR £3.00

RESISTORS - CARBON FILM 5%	
1/4W 1R0 to 10M (E12 Range)	2p each, 15p/10, 75p/100
1/2W 1R0 to 10M (E24 Range)	2p each, 15p/10, 75p/100
1W 10R to 10M (E12 Range)	7p each, 40p/10, 3.50/100
2W 10R to 10M (E6 Range)	8p each, 60p/10, 5.00/100

## RESISTOR KITS - each value individually packed

1/4W pack 10 each value E12-10R-1M 610 pieces	5.75
1/4W pack 5 each value E12-10R-1M 305 pieces	3.35
1/2W pack 10 each value E12-2R2-2M2 730 pieces	7.95
1/2W pack 5 each value E12-2R2-2M2 365 pieces	4.75
1W pack 5 each value E12-10R-10M 365 pieces	15.00
2W pack 5 each value E6-10R-10M 365 pieces	18.50

## RESISTORS - WIREWOUND Generally 5%

2.5W-0.22 to 270R - available in preferred values	0.15
4W-1R0 to 10K - available in preferred values	0.18
7W-0.47R to 20K - available in preferred values	0.36
11W-1R0 to 22K - available in preferred values	0.18
17W-1R0 to 22K - available in preferred values	0.24

74LS		74LS	
74LS00	0.24	74LS148	1.28
74LS01	0.24	74LS151	0.70
74LS02	0.24	74LS153	0.70
74LS03	0.24	74LS155	0.85
74LS04	0.24	74LS157	0.40
74LS05	0.24	74LS158	0.88
74LS06	0.24	74LS160	0.82
74LS08	0.24	74LS161	0.88
74LS09	0.24	74LS162	0.70
74LS10	0.24	74LS163	0.58
74LS11	0.24	74LS164	1.74
74LS12	0.24	74LS165	1.10
74LS13	0.33	74LS166	1.50
74LS14	0.48	74LS168	1.48
74LS15	0.24	74LS170	1.40
74LS16	0.24	74LS173	0.98
74LS17	0.44	74LS174	0.75
74LS18	0.24	74LS175	0.70
74LS19	0.24	74LS176	0.82
74LS20	0.24	74LS177	0.88
74LS21	0.24	74LS178	0.88
74LS22	0.24	74LS179	0.88
74LS23	0.28	74LS180	0.88
74LS24	0.24	74LS181	0.75
74LS25	0.24	74LS182	0.74
74LS26	0.24	74LS183	0.84
74LS27	0.24	74LS184	0.96
74LS28	0.24	74LS185	0.84
74LS29	0.24	74LS186	0.84
74LS30			

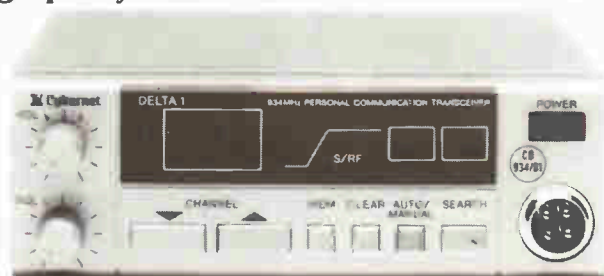
## 934 MHz PERSONAL RADIO

# The Nevada Range

Join the growing number of people discovering this exciting radio band.

934 MHz offers 2 way high quality communications from 10 - 250 miles (according to location/weather conditions).

7.



**THE CYBERNET DELTA 1 934 MHz TRANSCIVER**  
Has been engineered specifically for the UK market using latest "state of the art" technology.

- Sensitive RX (0.25  $\mu$ V for 12 db SINAD).
- 16 memories available.
- Auto/Manual scan and search facility.
- External 'S' meter socket.

**£355**  
+£5 SPECIAL DELIVERY

### POWER SPLITTER

Enables the co-phasing of any two similar 934 MHz antennas to give an additional 3 DB gain.

**£24<sup>95</sup>**

### HRA 934 L IN-LINE GaAs FET PRE-AMP

A super new ultra-low noise pre-amp which fits in line on any base or mobile installation. Guaranteed to give a staggering increase in received range. Extremely low noise 0.7 DB NF. 20 DB gain.

**£125**

### HRA 900 MASTHEAD PRE-AMPLIFIER

Super low noise GaAs FET pre-amplifier that mounts at the masthead. Low insertion loss and noise (typically 0.8 dB) coupled with 15dB gain enable this unit to double the received range of many sets.

**£139<sup>95</sup>**

### SWR/POWER METER

This precise and extremely accurate meter features an illuminated scale, low loss 'T' type connectors and twin meters for both power and SWR measurement. Power 0-50 watts in two ranges.

**£89<sup>95</sup>**

### REMOTE ANTENNA SWITCH

High quality weatherproof masthead mounting switch. For switching 2 antennas with one cable feed.

**£59<sup>95</sup>**

### HAS-2

Remote DC switch for mast head antenna switch

**£6<sup>95</sup>**

### WR 900 SWR/POWER METER

A low cost unit measuring power to 100 watts in three ranges.

**£49<sup>95</sup>**

### ANTENNAS

Manufactured to the highest possible specification.

1. **PA7-E BASE COLNEAR**  
Gain 7.14 dBi stacked  $\frac{3}{8}$  array. **£66**
2. **P714-RE**  
High gain gutter mount, mobile antenna. **£44**
3. **P7-ME**  
High gain mobile magnetic mount antenna. **£44**
4. **P7-E**  
High gain gutter mount mobile antenna. **£44**
5. **G900A**  
Low profile, bolt thru mobile antenna. **£25**
6. **G900R**  
Low profile bolt thru mobile antenna in black. **£25**
7. **Tc 12L MKII 12 ELEMENT BEAM**  
A new aluminium version of our successful 12 element loop quad. Gain: 18dBi. **£49**

# NEVADA 934

Professional Series

ASK YOUR DEALER FOR MORE INFORMATION OR CONTACT US DIRECT.

Telecomms, 189 London Road, Portsmouth PO2 9AE. Tel: 0705 662145 Telex: 869107 TELCOM G

Nevada 934 MHz Catalogue with full details and specifications of the complete range is available from Telecomms £1.00.