

# Amateur RADIO

For all two-way radio enthusiasts

Equipment review  
– CapCo SPC100 VHF ATU

50MHz  
– what to expect

Which aerial?  
– the vital choice



On test: Kenwood  
TH205E & TH215E hand-helds

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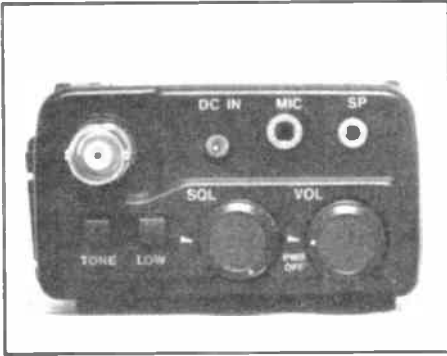


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brings in battery saving automatically one minute after the squelch has closed or the last touch of any button, or alternatively two seconds after any squelch closure. This is an excellent feature, and I have only come across it before in a few of Yaesu's recent models.

The typical current consumption of the receiver seems reasonable enough, considering the complex microprocessor circuitry and display, although it is higher than that of old rigs such as the IC2E.

Unless otherwise stated, all the receiver's performance tests were taken with the PB2 NiCad battery as dc source at 8.4V approximately. The current consumption tests were taken from a 13.8V supply.

Both rigs gave around 4.25W across the

band from the PB2 battery when switched to high power, low power being between 400 and 450mW. Power output increased to between 5.25 and 5.5W when the rigs were driven from an external 13.8V supply, using the dc lead type PG-2V (£2.16), which includes fuses in positive and negative wires. The lead measures 1.38 metres.

The maximum current taken on Tx high power was 1.35A on the TH205E, and 1.5A on the 215E, and this does seem very inefficient from a 13.8V supply. The low power consumption was 0.5A on the 205E and a rather high 0.56A on the 215E. This shows that long Tx periods will soon discharge a battery, so you should always use the rigs on external dc supplies where possible, or have one of the optional batteries fully charged as a stand by.

The frequency accuracy on Rx on both rigs was excellent, and Tx accuracy on the 205E was within  $\pm 100\text{Hz}$  with comparatively little drift over many minutes, whilst the 215E started at  $+180\text{Hz}$ , becoming spot on after many minutes. These accuracies are excellent, especially for a walkie talkie. Typical speech deviation peaked around 4.5kHz on both rigs, the 205E having an absolute maximum of just over 6kHz when subjected to extreme provocation, the 215E controlling this to 5.5kHz. The toneburst frequency was accurate on both models,



## Laboratory Measurements for Kenwood TH205E and TH215E 144MHz FM hand-helds

	TH205E	TH215E
RF sensitivity (12dB sinad)	-125dBm	-125.5dBm
Calculated RF input intercept point	-30dBm	-26dBm
Selectivity for 12.5kHz channelling	-10dB avge	-10.5dB
Selectivity for 25kHz channelling	-59dB	-60.5dB
Quieting at 12dB sinad point	16dB	16.5dB
Capture ratio	3.9dB	4.2dB
3dB limiting threshold	-131.5dBm	-131.5dBm
Distortion of 1kHz mod at 3kHz deviation	0.9%	1.1%
Max output power for 10% THD/8 ohms	0.55W	0.52W
Max output power for 10% THD/4 ohms	0.71W	0.67W
Typical Rx current	65mA	65mA
Battery save current	5mA approx	7mA approx
High power Tx current	1.35A	1.52A
Low power Tx current	0.51A	0.56A
Typical high power output from PB2 battery	4.3W	4.3W
Typical low power output from PB2 battery	0.45W	0.4W
Typical high power output from 13V	5.4W avge	5.5W
Typical Tx frequency error	within 100Hz	within 200Hz
Typical speech deviation	4.5kHz	4.5kHz
S meter bars (TH215 only)		bar 1 .... -122dBm bar 2 .... -116dBm bar 3 .... -109dBm bar 4 .... -105dBm bar 5 .... -101dBm bar 6 .... -98dBm

the deviation being well set.

Quite by accident I left the TH205E on for some 18 hours on squelch receive. Many hand-helds would have completely discharged themselves, but there was a reasonable amount of battery left on the review sample, which certainly brings home the usefulness of even the simpler battery save circuit on the 205E, let alone that of the 215E, which is superior.

### Conclusions

I was initially put off these two units because they omitted 12.5kHz channelling, but having had a long play with them I have realised that they have so many ergonomics and performance advantages that they are both worth considering; especially the TH215E, as Lowe Electronics should be able to supply a 12.5kHz channelled one fairly soon. The TH205E is remarkably good value for money if you can accept the 5kHz channelling, for all its other features seem to work very well indeed, and the technical performance is very competitive. The TH215E, when modified for 12.5kHz channelling, might well be your first choice of all handy talkies available, since it offers instantaneous access to any of its 10 memories with only one button push. Both the rigs seem very robust and well made, and so both get a welcome, and are recommendable. However, note my remarks on the 215E's dreadful instruction manual.

Very many thanks to Lowe Electronics, the Kenwood importers, for the loan of the review samples, and to Fiona for helping me with all the measurements.

# Amateur RADIO



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**Front cover:** Kenwood TH205E and TH215E hand-helds and CapCo S PC100 VHF ATU (p21). Photo by Jay Moss-Powell G6X11B

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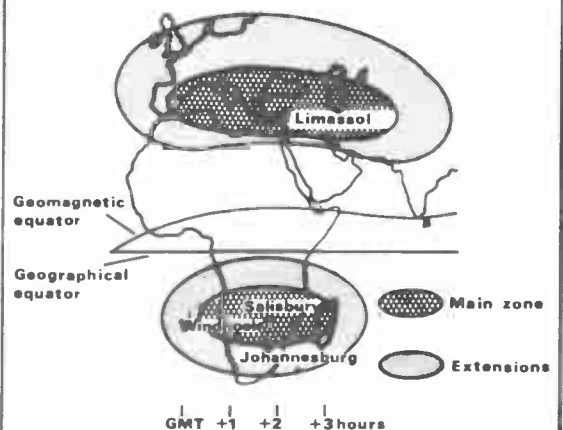
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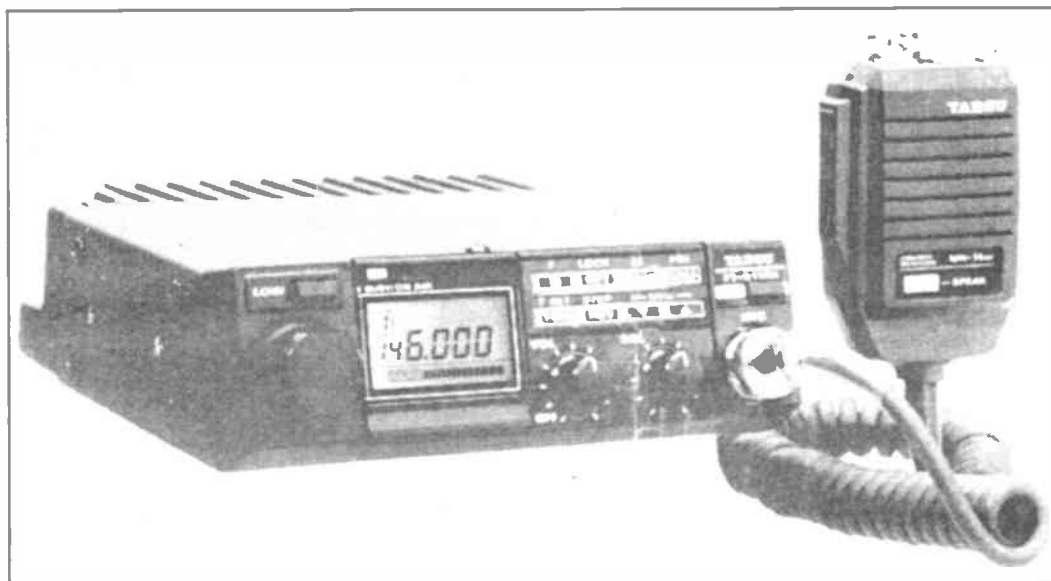
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DF92 0.80	EC894 0.60	EV116 0.58	ORP50 3.95	QV07-50 42.50	U855 0.65	2C51 0.75	6A42 3.50	6H54 9.50	12H7O 4.50	963 17.50
DF96 1.25	EC894 0.60	EV117 0.58	ORP50 3.95	QV07-50 42.50	U856 0.65	2C51 0.75	6A43 3.50	6H55 9.50	12H7P 4.50	964 17.50
DF97 1.25	EC894 0.60	EV118 0.58	ORP50 3.95	QV07-50 42.50	U857 0.65	2C51 0.75	6A44 3.50	6H56 9.50	12H7Q 4.50	965 17.50
DH63 1.20	EC2000 1.50	EV119 0.58	ORP50 3.95	QV07-50 42.50	U858 0.65	2C51 0.75	6A45 3.50	6H57 9.50	12H7R 4.50	966 17.50
DH77 0.90	EC2000 1.50	EV120 0.58	ORP50 3.95	QV07-50 42.50	U859 0.65	2C51 0.75	6A46 3.50	6H58 9.50	12H7S 4.50	967 17.50
DH79 0.88	EC2000 1.50	EV121 0.58	ORP50 3.95	QV07-50 42.50	U860 0.65	2C51 0.75	6A47 3.50	6H59 9.50	12H7T 4.50	968 17.50
DH149 2.00	EC2000 1.50	EV122 0.58	ORP50 3.95	QV07-50 42.50	U861 0.65	2C51 0.75	6A48 3.50	6H60 9.50	12H7U 4.50	969 17.50
DK91 1.20	EC2000 1.50	EV123 0.58	ORP50 3.95	QV07-50 42.50	U862 0.65	2C51 0.75	6A49 3.50	6H61 9.50	12H7V 4.50	970 17.50
DK92 1.50	EC2000 1.50	EV124 0.58	ORP50 3.95	QV07-50 42.50	U863 0.65	2C51 0.75	6A50 3.50	6H62 9.50	12H7W 4.50	971 17.50
DL35 2.80	EC2000 1.50	EV125 0.58	ORP50 3.95	QV07-50 42.50	U864 0.65	2C51 0.75	6A51 3.50	6H63 9.50	12H7X 4.50	972 17.50
DL63 1.00	EC2000 1.50	EV126 0.58	ORP50 3.95	QV07-50 42.50	U865 0.65	2C51 0.75	6A52 3.50	6H64 9.50	12H7Y 4.50	973 17.50
DL70 2.80	EC2000 1.50	EV127 0.58	ORP50 3.95	QV07-50 42.50						

# STRAIGHT & LEVEL

# STRAIGHT



## NEW YAESU Tx's

Yaesu have announced the introduction of the new FT757GX MkII multimode HF transceiver and the FT211RH synthesized 45W 2m FM multimode.

The FT757GX II combines the features of its famous predecessor, the FT757GX, with new developments in response to technological advances and to the most popular requests from serious HF operators.

This mobile/base compact unit now has special new digital features, plus an improved CAT (Computer Aided Transceiver) system for simplified programming and more advanced control by external computer. Ten memory channels, which store mode and frequency together with auto-resume loop scanning between dual VFOs and special clarifier memory are available.

Operator selectable mode dependent tuning steps are also now standard on this model.

Other features of this 100W PEP multimode include:

- a 40dB notch filter with adjustable IF shift
- wideband AM and narrowband CW IF filters
- a switchable RF amplifier and 20dB attenuator
- adjustable noise blanking pulse width (narrow to wide)
- full break-in QSK with cus-

tom integral keyer

■ and AF speech processor  
Optional accessories include:

- MD1B8 – Desktop scanning mike
- MH1B8 – Handy scanning mike
- FC757AT – Microprocessor controlled 100W ATU
- FL7000 – 500W auto solid-state QSK linear
- FAS-1-R – Remote antenna selector
- FP757GX – Switchable power supply
- FP757HD – Heavy duty series regulator PS with air cooling and auto-fan control
- and FP700 – Standard power supply (light duty)

Also making its debut is the Yaesu FT211RH – a superb compact synthesized 2m FM mobile/base transceiver (the FT711RH being its 70cm 'brother').

One major feature making the FT211 ideal for mobile or base use is its *reversible sloped front panel*, allowing convenient mounting. It also includes soft green back lighting of keys and controls. The large liquid crystal display incorporates bargraph and power/S meter.

The FT211RH utilises a wealth of chip components assuring high circuit reliability, while extensive modular circuit construction facilitates servicing.

Operating features are

similar to those on the FT23R and include:

- pushbutton and knob memory selection and tuning in selectable steps
- ten memory channels storing repeater splits
- one touch repeater reverse and call channel re-call
- band, memory and partial memory auto resume scanning

All the memories store independent T/R frequency; seven hold any shift and all accept automatically programmable  $\pm 600\text{Hz}$  shifts.

When the optional FTS12 tone squelch unit is installed, any of 37 standard CTCSS (subaudible) tone frequencies can be displayed, selected and programmed into any memory channel for either silent monitoring or encode-only operation.

Yaesu's advanced technology has made some enormous strides in recent months.

The FT757GX MkII and FT211RH are just two more examples of what Yaesu believe will prove both in the market place and the amateur shack to be just what the discriminating end-user is looking for.

For more information contact: **Fred Rendell, Amateur Electronics, 504 Alum Rock Road, Alum Rock, Birmingham, B8 3HX. Tel: (021) 327 1497/6313.**

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

## MAPLIN RADIO KITS

New Heathkit products featured in the 1987 *Maplin Buyer's Guide to Electronic Components* include the novice CW Transceiver, HW99. Designed for the first time amateur radio hobbyist, the powerful radio kit provides superior performance at a cost of £299.95. A matching station speaker, SP99, featuring a 3in communications receiver speaker is just £29.95.

Also new to the catalogue is the VLF converter, HD1420, which enables broadcasts below the standard AM band to be received. Battery powered, the cost is £49.95. An active audio filter, HD1418, at £79.95, and a DTMF DTMF decoder, HD1530, a touch tone decoder which eliminates any messages not intended for the user at £79.95 are also featured.

Maplin are pleased to announce three new antenna accessories – a remote co-ax switch, HD1481, which will remotely operate up to 4 antennas at £79.95, an active

SWL antenna, HD1424, suitable for use in locations where an outside antenna is not available at £49.95, and an antenna matcher, SA2550, which operates both CW and phone segments in a band from one antenna which is priced at £149.95.

Other products include a deluxe antenna tuner, SA2060A, at £269.95 and a Morse code practice oscillator start kit at £9.95 (MF01B).

New to the Maplin range are the Heathkit hi-fi and hobby kits. These include an audio amp starter kit, SK104, a 1 watt audio amplifier at only £14.95. A pseudo-stereo starter kit, SK107 is designed to convert a mono TV input from a video recorder into 2 different channels for synthesized stereo. This costs £16.95.

The Heathkit range of educational courses and products is well established. Top value classroom training courses as well as self-instructional courses are available on a wide range of computing and electronic subjects. Highlights include:

A top value digital techniques trainer, ET3200B, at £109.95 in kit form, or £184.95 fully assembled.

A digital circuit design course, EE1004, plus a laser technology course, EE110, both at £99.95 will meet the growing demand for courses on these key hi-tech subjects. Also included is the international award winning microprocessor course, EE3401A. At £99.95 the course provides a well organised, self paced home study programme covering all the basics of 8-bit micros.

New to the Maplin Heathkit range is the microprocessor course, EE3404, which at £49.95 covers all 6809 chip concepts. A computer maintenance course, EC2003, at £69.95 provides highly practical guidance on how to troubleshoot and maintain digital and microprocessor systems.

Other new courses and educational material include: Electronics for Automation, EE1901, Intelligent Machines, EE1900, both at £99.95

and a computer graphics course, EC3000, at £59.95.

A Maplin/Heathkit product freezer alarm, GD1183, will help relieve those household freezer anxieties. A two-speed beeper alarm plus a red flashing LED provide an alert that the temperature inside the freezer has risen above 6.5°C. At £19.95 the freezer alarm kit could avoid any freezer food disaster.

Finally, a most relaxing product for the lazy angler. The easy to build, battery operated Maplin fish caller starter kit, SK105, makes an electronic clicking sound similar to that made by a distressed fish, thereby attracting hungry fish to the area.

For technical fish, the system demonstrates the use of a 555 timer IC in mono-stable and astable modes.

All prices quoted include VAT where applicable.

For further information contact: *Maplin Electronic Supplies Ltd, 159-164 King Street, Hammersmith, London W6. Tel: (0702) 554155.*

## DIGITAL MULTIMETER

Electronic Brokers has introduced the Philips PM2535 digital multimeter designed for applications involving data collection, reduction, and processing.

The PM2535 utilises Philips' own advanced VLSI technology to provide a resolution of 100nV on a 300mV measurement, a short term stability of 0.002%, and a long term accuracy of 0.005%. To ensure total measurement integrity at such high resolution, the instrument features a true, fully guarded input which eliminates parasitic lead voltages and noise.

A choice of 6½, 5½, 4½ and 3½ digit modes are offered, enabling the user to select the optimum speed/resolution combination for every application. At the 3½ digit resolution, 100 measurements are made per second and measurements can also be transmitted through the standard IEEE interface at the same rate. Measurement and

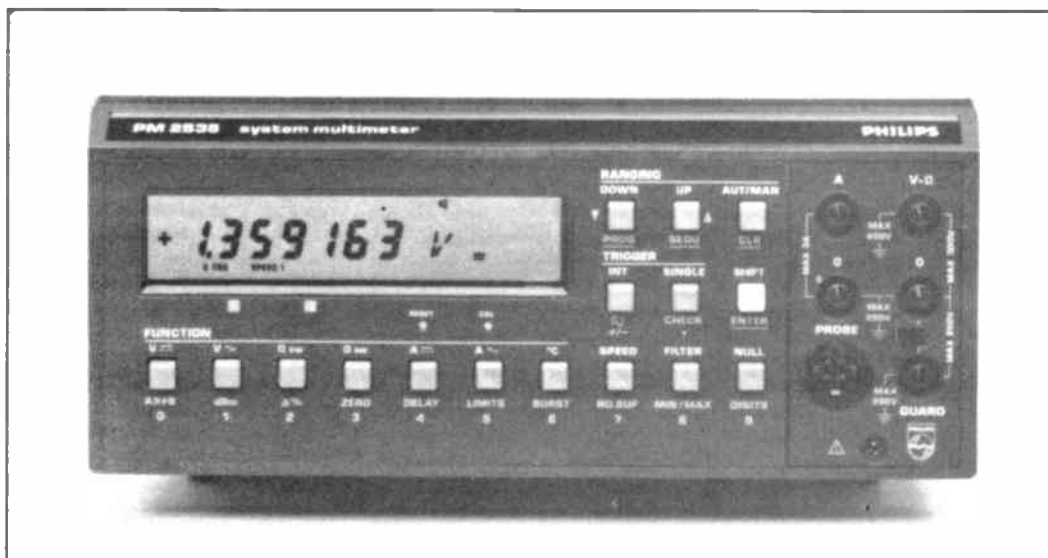
interface functions are galvanically separated, thus eliminating the possibility of ground loops between different instruments connected to the bus.

Standard features of the PM2535 include: the ability to translate a measured value

into the parameter required; a MIN/MAX mode for instant check of extreme values; a 999 point buffer which reviews the last 999 measurements at any time; and the ability to measure at up to 150 measurements/second and collect more than six seconds

of high speed measurements regardless of the controller's speed. After such a measurement cycle, all or any part of the buffered information can be transmitted at the normal transfer speed of the computer.

Easy to use, the PM2535 has





a range of normal measuring functions which are directly selectable by a single key stroke and a logical, very simple user prompting technique. Once the required measuring set-up has been programmed, it can also be saved in one of 10 non-volatile PROG memory locations, for easy recall when required again.

The PM2535 digital multi-meter is suitable for bench top use or rack mounting and is available with a range of accessories, including shielded measurement cable, resistance measurement cable, probes and rack mounting kit.

The PM2535 measures 280mm x 210mm x 86mm, and weighs 2.85kg.

For further information contact: *Electronic Brokers Limited, 140-146 Camden Street, London NW1 9PB.*

## URNS COUNTER

Telecomms are pleased to announce the release of their new British made Turns Counter. This is the final piece of the jigsaw in ATU components released over the last few months.

The Nevada TC48 Turns Counter is designed to drive their Nevada RC26 roller coaster coil, but could be used on any piece of equipment that required a multi-turn drive. 48 turns on the control knob produce 1

revolution of the outer dial and main drive shaft.

The retail price of the counter is £12.95.

Nevada Communications is the manufacturing division of Telecomms, and is dedicated to producing high quality British made products for the radio amateur. The Turns Counter was the idea and design of Ernie Quinell G4JEV.

Telecomms are always looking for new ideas and products and would be happy to hear from budding inventors with new items that we could help finance and produce for them.

For further information contact: *Telecomms, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 698113.*

## SUPER OCTOPUS

The latest version of the Octopus universal work holder system incorporates a number of design and manufacturing additions that enhance its convenience and range of applications. Available from Freetrade (TEP), the Super Octopus now incorporates a large 2½ inch diameter high quality lens that allows fine work to be carried out with reduced eye strain.

Freetrade has also changed the material of the flexible work-holding arms to a black anodised pure aluminium for

more positive positioning of objects, and the grip clips are now in a matching all-metal black finish.

Both the Super Octopus and the popular Octopus models consist of a base block secured to a work surface using a clamp mechanism and have four five-inch long flexible 'Stayput' wires. The Super Octopus Kit is fitted with two work clamps, the lens and a magnetic work holder. The arms can be angled precisely to give infinitely variable positioning of the work for accurate work such as soldering and gluing.

The Super Octopus is available complete with handy wallet at a recommended retail price of £7.95, excluding VAT.

For further information please contact: *Freetrade (TEP) Ltd, Moor Lane, Witton, Birmingham B6 7HH.*

## RX-4 PROGRAM

Technical Software have announced an improvement in their very successful Spectrum RX-4 program. The program has proved itself a firm favourite with SWLs and many licensed amateurs as it requires no interface, needing only a single lead connecting the radio to the computer.

While this system is cheap and simple, and produces some excellent results, the computer noise conducted along the lead and the absence of audio filtering prevent the reception of weak and fading signals and those suffering strong interference; frequent problems on the short wave bands.

Most receivers do not have any facility for narrowing the IF passband below the usual SSB width, except for a possible CW filter, which is unsuitable for receiving RTTY or AMTOR. A new version of this program is now available using an interface adapter board, which plugs into the back of the Spectrum and accepts an interface or terminal unit.

The TIF1 interface has been specially designed to reduce computer noise and it has very effective 2-stage filtering for the best reception of RTTY, CW and AMTOR under noisy and crowded band conditions. SSTV reception is also improved by the reduc-

tion in computer noise.

The interface adapter board comes assembled and tested with the new program for £40. Users of the existing RX-4 program can upgrade to this version for £21 and their old program. The TIF1 interface costs £15 as a kit (assembled PCB, cables and connectors) or £25 ready-made, boxed with all connections.

It should be noted that this version of the program will run on any 48K or 128K Spectrum, including the Spectrum +2, as it does not use the EAR socket. This makes it the ideal software for users of the +2 especially, as the only way of running such programs at the moment is by using expensive add-ons which do not provide noise isolation or filtering.

Both versions of this program are currently available to give the maximum choice. The original version costs £25.

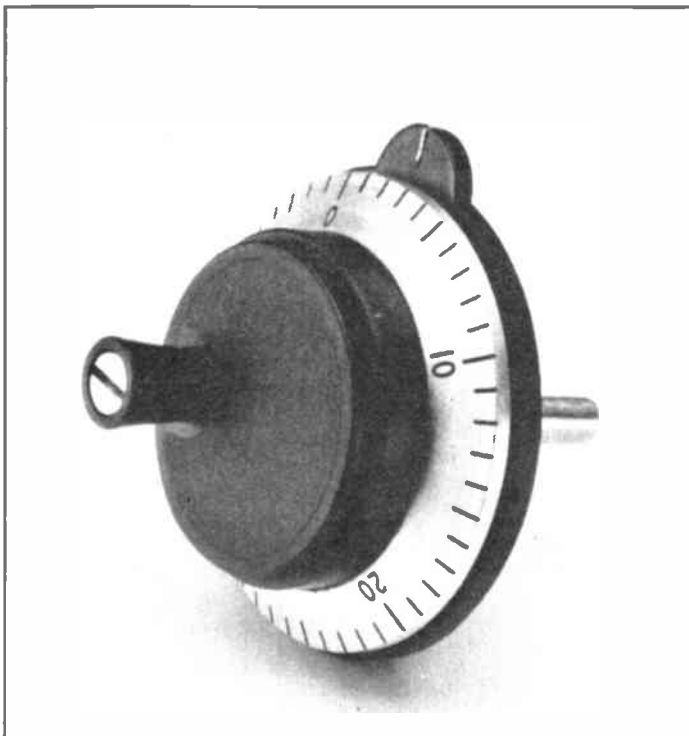
For further information contact: *Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF. Tel: (0286) 881886.*

## LOCATOR PROGRAMS

Technical Software have also announced that their popular BBC World Map and Locator program now has a companion program to cover the UK and Europe, which displays separate maps of the UK and Europe. As in the World Map program, locations can be entered as latitude and longitude, QTH (QRA), Maidenhead locator, National Grid Reference (for GB only), or one of over 430 European place names. The place names concentrate on the UK so that few people will be more than 20 miles from one of them, and most are a lot less.

The World Map program has a separate set of nearly 250 world-wide place names. For both programs the input is completely automatic, so you do not need to specify which type of reference you are using, the program works it out for itself. The program prints the distance, beam and return headings, VHF contest score based on the 50km ring system and, for HF DX if the distance is over 16000km, the long path distance and bearings also.

The programs display a real time clock and the local time of place names is shown with



## STRAIGHT & LEVEL

their position. The World Map also has daylight and darkness zones displayed (these are continually updated as the program runs and, if it is still going at midnight, this pattern is re-calculated and re-displayed for the new day).

Other refinements include a choice of colours to suit mono or colour displays, automatic correction for the equation of time (the difference between local mean time and solar time) when displaying the daylight/darkness zones, and automatic insertion of IO or JO when inputting Maidenhead locators for the UK.

These two programs represent the ultimate in locators for both the HF and VHF operator. They are available together for £10 on tape and £12 on 40 or 80 track disc. Existing users of the World Map program can upgrade with the usual 50% discount.

For further information contact: *Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF.*

### G1FTU SSTV

Pearsons Computing have announced the latest in their series of programs for the Sinclair Spectrum range of computers.

The program is called G1FTU SSTV Tx/Rx, and it allows the Spectrum computer to both transmit and receive slow scan television pictures - with no interface between the computer and the radio. The program is easy to use (see Trevor Morgan's review on page 28), whilst having many advanced features to make it compatible with both old and modern SSTV transceiver hardware, such as the popular SC1 colour machine.

A brand new, full feature receive system has been developed for the program, with performance on both HF and VHF in mind, with advanced 'intelligent' noise and false sync rejection. Vertical picture tearing is prevented by flywheel-type syncing during bursts of QRM, and several corrupted frames can combine to produce an enhanced picture.

The received picture neatly fills the screen and the program features a new linearity system to produce good results on both photos and text displays. Smooth shading

is used and the user has fine control over the brightness and contrast of the incoming picture via 'live' controls and on-screen status displays.

The program can receive 8, 16 and 32 second black and white SSTV, and 24, 48 and 96 second colour pictures (which are displayed in black and white).

Other receive features include 3 frame stores (plus the screen itself) in receive mode, and 5 frame stores (plus the screen itself) in 'receive only' mode. The stored frames may also be printed out and saved. Facilities have been included for graphics printers, microdrives, discs and cassette storage, and features include variable input sensitivity and many others for convenience and special effects.

In transmit mode the program can transmit both text and Spectrum screens in a variety of resolutions, in black and white or full colour. All of the Spectrum colours and grey levels are used to the full.

Modes available are 8, 16 and 32 second for black and white pictures and 24, 48 and 96 second colour transmissions. Both line sequential and frame sequential colour transmissions can be made.

Text transmission can be made in all modes and there are 9 text memories which may be edited before or during transmissions. There is also a personalised CQ memory and a special grey scale and colour bars facility built in. All memories are on view at once in a neat 'window' type display.

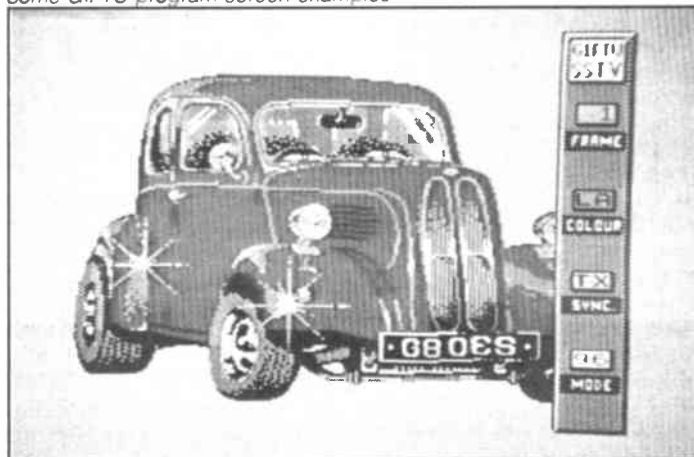
Other transmit features include selectable frame repeats, 'last frame' indicator and auto or manual colour advance.

The program costs just £12 in the UK, £13 in Europe and £14 elsewhere, with the microdrive version at £2 extra, and the Opus disc version at £4 extra.

The price includes a 10-page instruction booklet and a second cassette with 20 minutes of sample SSTV audio and a selection of top-quality screens as examples for transmission.

Further details are available from: *Pearsons Computing, 42 Chesterfield Road, Barlborough, Chesterfield, Derbyshire S43 4TT. Tel: (0246) 810652.*

Some G1FTU program screen examples



## CLUB NEWS

### Elvaston Castle Rally

The Elvaston Castle Mobile Radio Rally is an established annual event attracting an attendance of 18,000 to 20,000 visitors on a regular basis. The rally is planned to be a day out for all the family with something to interest everyone. The event takes place on the showground of the Elvaston Castle Country Park, which is located five miles South East of Derby on the B5010.

The main attraction is of course the large number of trade stands featuring all aspects of amateur radio equipment, electronics and computers. These stands are housed in large marquees sited around the arena, which is the focal point for entertainments taking place during the day.

Carefully selected outdoor stands that compliment the event are sited in between the marquees, and in certain cases between the marquees and the arena. These stands are mainly non radio, and normally include a number of craft stalls that will appeal to the wives and older children.

For the younger members of the family, a selected range of children's rides such as a bouncing castle or roundabouts etc offer the means of passing away some time. Other attractions include mini-motorbikes, miniature train rides and Punch and Judy, which is ever popular.

A major attraction of the event is the large bring & buy stand which is growing in size each year. All items submitted for sale must be electronics biased. A commission of 10% to club funds is payable on all sales. Should you wish to conduct your own selling, then tables are available in the flea market, but it is first come, first served, although they do try not to let anyone down.

An extensive range of catering is available on site giving a choice of such items as ice-cream, fast foods, hot and cold drinks and other speciality selections.

Many walks are available within the 300 acres of the park or you can visit the 'Old English Garden' or the 'Working Estate Museum', or you can just sit at the side of the lake and watch the wildlife go by.

Admission to the rally is free, but a small charge is levied by the local authority for car or coach parking.

The rally is open to the public from just after 9.00am and closes at 5.00pm. Talk-in is available, and details can be obtained from the extensive advertising carried out prior to the event. Should you have any queries, then you are invited to contact Mr John Robson G4PZY on Derby (0332) 767994.

### Doncaster Rally

The Doncaster & District Raynet Group have finally managed to find premises for the Rally which they hold annually. Although the Sunday Trading Laws caused quite a problem, they eventually got round this by holding this year's Rally on Bank Holiday Monday 31st August.

Throughout the world of amateur radio it is known that the Doncaster Rally is regarded as one of the best Rallies held. The funds raised help the group to purchase equipment for the use of the group, thus ensuring a reliable service when called upon in an emergency.

The rally is being held at the Bircotes Sports Centre, Waterslack Lane, Bircotes, Nr Doncaster, and doors open at 8am for traders, 10.30am for the disabled, and 11.00am for the general public.

For further information contact Mr S Bryan on Rotherham 540753.

### 1987 BARTG Rally

The annual rally of The British Amateur Radio Teleprinter Group (BARTG) will again take place at Sandown Park Racecourse on the Sunday of August Bank holiday weekend, 30th August 1987.

This rally is not only the rally for the RTTY enthusiast but has a limited number of regular rally stands to give this the mix that makes it of interest to all radio amateurs.

This year the club is looking forward to an even better rally, the hall has just undergone modernisation, leaving even more room in the hall for

exhibitors. Catering and Bar facilities will be annexed from the main hall to a more comfortable environment.

Last year it was noted how Packet radio was well represented by the exhibitors, as well as RTTY and the other modes of data communications. The car boot sale also provided a popular alternative to a flea market and was an outstanding success.

Sandown Park Racecourse is located on Portsmouth Road, Esher, on the A307 just south of Kingston upon Thames, Surrey, with easy access from the M25.

Special features include: The BARTG stand; a car boot sale; ample free car parking; easy access by car; and talk-in on S22.

Doors open from 10.30-17.00 and further details are available from Peter Nicol G8VXY, BARTG Rally Manager, 38 Mitten Avenue, Rubery, Rednal, Birmingham B45 0JB.

### Denby Dale Rally

The Denby Dale Radio Rally is being held on Sunday 21st June at the Shelley High School on the B6116 near Skelmanthorpe.

Doors open at 11.00am and all the usual attractions will be in attendance. Talk-in will be available on S22, SU22 and 10m FM.

For further details contact Gerald Edinburgh on Huddersfield 602905.

### DXpedition to Eire

A group of amateurs from the BBC Amateur Radio Group (Caversham) and the Newbury and District Amateur Radio Society, will be activating several rare squares in the South-West of Eire this summer.

From July 17th to July 31st, activity will be from 'UL' (IO41) and 'UM' (IO42) and 'VM' (IO52) squares. Operating times are not specified as this will depend on finding suitable sites.

From August 1st to August 10th, activity will be continuous (subject to the availability of operators) from a coastal site 1400ft above sea level in 'VL' (IO51) square. This will include the European VHF, UHF and microwave contests on the 1st and 2nd of August and also the RSGB low power VHF and UHF contests on the 8th and 9th of August.

Activity will centre around

the following frequencies:

80m - 3.645MHz  
10m - 28.567MHz. SSB,  
29.670MHz. FM & 28.885MHz  
'X' Band  
4m - 70.234MHz  
2m - 144.234MHz  
70cm - 432.234MHz  
23cm - 296.234MHz

Operators include:  
Bob G6HUN (E13VTU)  
Al G4VSQ (E12VZB)  
Roger G3UAX  
John G1AWD  
Roger G6IBI  
and Tim G4WGU

The group may also be joined by Andy E17AYB, Bill E19FK, Charlie E15FK, and Paul E12CA.

### MLARS Open Day

The following lectures and demonstrations have been arranged for the Mid Lanark Amateur Radio Society's Annual Open Day on June 14th:

Satellite working - by John Branegan GM4IHJ;  
Packet Radio - by Vic Kusin GM4HCO;  
and Amateur television - by Adrian Beale GM1FML.

Morse tests will be available, but prior application must be made to the RSGB in the normal manner. A book-stall will be operated by the RSGB, and there will be a QRP stall with discussions and demos as required. The West of Scotland Amateur Radio Club will operate an HF DX station.

Talk-in on S22 will be provided by the Lanarkshire Raynet Group. A number of traders stalls will be in operation and a car boot sale will operate (£1 per car) in addition to a bring and buy sale.

Entrance costs £1 per head, and further information is available from Dr Owen Gariott W5LFL on Holytown 732403.

### Country fair

On 20th June the 1466 (Holmfirth) Squadron Air Training Corps (club call G0ATC) is holding a country fair. The venue will be the Sands Recreation Ground, Huddersfield, Holmfirth.

The event is to raise funds for club activities, and will be opened by actress Katy 'Nora Batty' Staff. One of the attractions of the fair will be an official BBC exhibition tracing the history of 'Last of the Summer Wine' over its fifteen year history. It is hoped that

other members of the cast will also attend.

A special event station, GB6AC, will run from 9.00 until 5.00pm on the day, but will also be operational from the 12th of the month for 'general muttering'.

Further information can be obtained from Ian Halliwell G6TSW on (0924) 443442.

## Call up the Science Park

Amateur radio enthusiasts will have an opportunity to call up the Cambridge Science Park on 30th May. Cambridge Consultants Ltd, which has a flourishing amateur radio group, is inviting them to call the park up on that day as part of their summer party and sports day celebrations. The calls that come through will be confirmed with a QSL from the park recording the contact, and callers will be able to ask questions about what goes on at the park and at CCL.

Francis Pullen, a CCL technologist who is organising the event, is himself an amateur radio operator and has been a commercial radio broadcaster and a disc jockey in the past. He feels that the contributions made by amateur radio enthusiasts to innovative development of radio technology, such as Packet radio signalling, are often underestimated or ignored. He hopes to draw attention to the link between amateur radio and technical innovation by asking enthusiasts to contact a place and within it a firm whose names are strongly associated with technical invention.

For further information, please contact Lindy Beveridge on (0223) 64450 for the Science Park, and Francis Pullen on (0223) 358855 for Cambridge Consultants.

## Biggin Hill reshuffle

The Biggin Hill Amateur Radio Club have had a reshuffle. Jim Burr G3CTI has taken over as Honorary Chairman, Robert Senft G0AMP as Honorary Vice Chairman, Geoffrey Milne G3UMI as Honorary Secretary and Graham Chamberlain G8TBZ as Treasurer.

The club now meets at the Victory Social Club Hall, Kechill Gardens, Hayes, Kent, commencing at 7.30pm. The meeting dates for the remainder of the year are: 9 June, 21 July, 18 August, 15 Septem-

ber, 13 October, 10 November and 8 December. The programme has not yet been finalised.

All correspondence should be sent to the Secretary at 142 Hayes Lane, Hayes, Bromley, Kent BR29EL. Tel: 01-462 2689.

## Verulam ARC

The Verulam Amateur Radio Club meets at the RAF Association Headquarters, New Kent Road, off Marlborough Road, St Albans, on the second and fourth Tuesdays in each month.

On Tuesday 9th June they have an activity evening, and on 23rd at 7.30pm for 8.00pm, Mr A J Slater G3FXB is giving a talk entitled 'Box 88 Moscow'. Visitors are welcome to all meetings.

For further information contact the secretary, Hilary G4JKS, telephone St Albans (0727) 59318.

## Sheffield ARC

The Sheffield Amateur Radio Club now meets every Monday evening, and non-members are especially welcome to come along and see what amateur radio is all about.

The club offers talks, visits, test gear, advice, and tuition in Morse code and the Radio Amateurs' Exam.

Because they are affiliated to the Radio Society of Great Britain, you can also obtain discounts on books, etc.

The club meets on Monday evenings at 2000 (RAE class at 1930), at the Firth Park Pavilion, Firth Park Road, Sheffield 5 (under the clocktower next to the library).

Non-members are asked to pay 25p admission. Joining fee is £1 and the annual subscription £1.50. Tea and coffee are available.

For further details, please contact the club secretary, Alan G8ZHG at 3 Richmond Hall Crescent, Sheffield, South Yorkshire S13 8FN.

## Keep 405 alive

The aim of the recently formed 405 Line Society is to help members preserve and restore all items of 405 line television history.

Following the closure of the world's first high definition television service at the end of 1984, it became apparent that many enthusiasts had preserved a considerable quantity of 405 line equipment, dating from 1936

onwards, which was now obsolete and unuseable.

Consequently, a number of enthusiasts decided not only to preserve this equipment for our future generations, but to keep it in working order.

Annual subscription for membership to the society is £2 plus four stamped, addressed envelopes for the quarterly newsletter which, amongst other things, will carry free advertisements for members wishing to buy, sell or exchange 405 line equipment.

For further information contact H Journeaux on Parkstone 7480772.

## Taunton meetings

After many months without a permanent meeting place, the Taunton & District Amateur Radio Club is now able to meet again regularly in the Basement, County Hall, The Crescent, Taunton.

Meetings are held on the first and third Friday of each month at 7.30pm, and visitors are always welcome. Contact either G0FMF or G4XYZ (both QTHR) for details of activities.

## Southdown meetings

The Southdown Amateur Radio Society holds its main monthly meetings at the Chaseley Home for the Disabled, Bolsover Road, Eastbourne, starting at 7.30pm for eight.

Informal meetings are held on Tuesdays and Fridays at the Clubrooms, Hailsham Leisure Centre, Vicarage Lane, Hailsham.

For information about club events and regular activities please contact Peter Wood G1UTH, 2 Yew Tree House, Queens Road, Crowborough, East Sussex. Tel: (08926) 63061.

## 50 years with MARS

The Midland Amateur Radio Society's monthly meeting was turned into a 'Special Event' last March. At the end of a talk on 'Getting the best from VHF' the lecturer, Tom Douglas G3BA, was presented with an illuminated scroll commemorating 50 years in amateur radio, and a lot of that time connected with MARS.

The presentation was made on behalf of the club by the current President, Stewart Laing G8ODT, and the photograph shown was taken by another member Tim Jebbett G0GPZ, whose normal club office is Morse Instructor.

The meeting was held on Tuesday 17th March, so they will not be surprised to get some comments on two Scots celebrating on St Patrick's night, but would mention that they do have members of Irish extraction on the membership roll and of course amateur radio is 'international' and knows no boundaries.

G8ODT presenting an illuminated scroll to G3BA



## Radio classes

The Arnold and Carlton College of Further Education is running a number of courses of interest to the radio amateur.

Enrolment for all the classes can be by post, at the first class or by enrolment at the College on Monday 7th September from 10am to 8pm and on Tuesday and Wednesday, 8th and 9th September between 2pm and 8pm.

The courses include:

**Radio Amateurs' Examination.** Full course: aiming for the May examination, and is suitable for those with little or no knowledge of basic electronics. Tutors: A Lake G4DVW and R G Wilson G4NZU. The course will be held on Wednesdays, 6.30pm to 9.15pm, commencing on 16th September. The fee is £21.60. A short course: suitable for paper II resits and for those with some knowledge of basic electronics will be held on Thursdays, 6.30pm to 9.15pm, costing £10.80. The course for the December examination commences on 17th September and the course for the May examination starts on 7th January 1988. Tutor: A Lake G4DVW. A limited number of places will be available for students under the age of 15 on the above courses, by special dispensation of the LEA.

**Construction Classes.** A 'workshop' class, which may be joined at any time, and in which members may construct a wide variety of items of use in radio, from simple test gear to a full blown QRP transceiver. The class, which meets 8 times per term, starts on Tuesday 15th September at 7pm, the next block commencing on 5th January 1988. The fee is £6.80.

**Morse Practice.** These sessions are suitable for both beginners and improvers, the latter having the opportunity to use the college equipment and call sign to carry out live QSOs. The group, which can be joined at any time, has a fee of £4.30 for any block of 6 attendances, and meets on Wednesdays at 7pm; the first meeting being on 16th September. Members are asked to bring a cassette tape recorder, mains or battery, and headphones for the same. Tutors: R G Wilson G4NZU and J A Towle G4PJZ.

**Other Classes.** (a) Introduction to the RAE: a six week

course designed to give an introduction to the hobby and a 'taster' of what the RAE course entails. Commences mid-May on Wednesday nights at 7pm with A Lake G4DVW as tutor. Fee £9.60. (b) After the RAE: a group of six meetings in which some of the practicalities of the hobby are explored, together with the opportunity to be introduced to some aspects of the hobby which are outside the RAE syllabus. Leader: A Lake G4DVW and specialist speakers. The fee will be £9.60 and will commence at 7pm on the Thursday after the May examination.

For further information please contact: Arnold and Carlton College of FE, Digby Avenue, Mapperley, Nottingham NG3 6DR. Tel: (0602) 876503.

## Sound balance

In response to complaints from the hard of hearing about the poor audibility of dialogue in some television programmes, a working group has been set up to study the problem. The group consists of representatives from the British Broadcasting Corporation, the Independent Broadcasting Authority, the Independent Television Companies Association, the Royal National Institute for the Deaf and the British Association of the Hard of Hearing.

People with hearing difficulties have complained that they find it hard to follow dialogue in television programmes when any accompanying background sounds, such as music, audience response and effects, are present at a similar level. The working party intends to organise a series of tests to investigate the way that this type of sound balance affects the intelligibility of the dialogue, both for the hard of hearing and normal hearing viewers.

Background sounds are used in television programmes to help create 'atmosphere' and to add realism to the production. The objective of the tests is to see if it is possible, without impairing the artistic effect, to adjust the sound balance so that people with hearing difficulties can more easily understand the dialogue.

The tests are likely to be

complicated by the large number of factors that contribute to the problem and the manner in which hearing difficulties vary between individuals.

More information can be obtained from: Henry Price, BBC Engineering Information, Broadcasting House, London W1A 1AA.

## RAE analysis

Comments have often appeared in the pages of this and other magazines suggesting that there has been a decline in the standards of the RAE. Such comments are sometimes linked with the occasional problems of interference caused by radio amateurs to other radio (and non-radio electrical) equipment. Because of these comments, and those in other areas of the amateur radio press, the DTI has produced a report on the standard of the RAE since it started in 1946.

The City & Guilds provided statistics of the performance of candidates in the exam since it was introduced. The DTI analysed these to see if any decline in standards was apparent. The most interesting figures for this purpose were those in the overall results column which gave the percentage of candidates completing the exam who achieved a pass (or higher) mark.

The graph clearly illustrates that in recent years candidates' performance has become more consistent; since December 1971 no fewer than 60% of candidates passed and no more than 70%. Prior to 1971 there were much wider fluctuations, perhaps reflecting manual calculation of results. Calculation of results post-December 1967 has been done by computer. In a technical subject, such as the RAE, one would expect that roughly the same percentage of candidates would pass on each occasion, so a fairly even balance in the level of questioning appears to have been achieved.

Many criticisms have been levelled at the introduction of the multiple-choice format to the exam; it is, therefore, interesting to note that after the introduction of multiple-choice (in May/June 1979) the average pass rate was 67%, while for the seven years before the average rate was

63%. The lowest pass rate after the introduction of multiple-choice was 63% whilst the highest was 69.9%; in the previous seven years the lowest rate was 61.4% and the highest 66%. These figures suggest that a mere 4% of candidates are passing the RAE now who might not have done under the old system.

When it is considered that some knowledgeable amateurs may, for one reason or another, have had difficulty in expressing their knowledge in prose, a small improvement in candidates' performance under multiple-choice was to be expected. Nobody is likely to have done worse as a result of multiple-choice; it may simply mean that their command of the English language is no longer being tested.

In analysing the examination results it has not been forgotten that pass marks are set to reflect the general level of performance in the paper (eg by taking into account particular questions which candidates have done consistently well or badly in). It is interesting, therefore, to note that in percentage terms the average pass mark of Paper 1 has been 62%, with a range between 57% and 69%, and for Paper 2 the average pass mark has been 43%, with a range between 39% and 47%. Such a variation in the pass mark would seem reasonable.

It is concluded that an analysis of RAE statistics shows that standards have *not declined* over the years. Since multiple-choice was introduced, the pass rate has remained fairly constant, as has the pass mark. Some might argue that the pass mark is too low, particularly in respect of Paper 2 for which the average pass mark is 43%. However, when both papers are added together the average pass mark is about 50% which is not exceptionally low when compared with what is necessary for a GCE pass or a university degree, for example.

The Department of Trade and Industry has been looking at the standard of the RAE for the past year but the evidence has not pointed to being 'too easy'. The Department intends to keep closely involved in the running of the RAE to ensure that standards continue to meet its requirements.

# L·E·T·T·E·R·S

## RRD EXPENSE

I have just been reading the yearly report of the Radio Regulatory Division of the DTI, and I am amazed at what I read!

Their 491.5 Staff etc cost, in 85/86, £19,148,000, which includes an amount from the taxpayer, on top of their receipts, of £5,708,000!

Amateur radio licences supplied £731,000 of this, while CB licences pulled in another £1,491,000, which gives a grand total of £2,222,000 (note how everything is rounded to thousands, while Staff are taken to 0.5 persons?).

What do they do for this? I note that they took out five prosecutions for unlicensed use of amateur bands, two of which were discharged, making only three prosecutions for the whole year (£243,000 each?). Surely more were reported than this? No doubt they closed down many licensed stations for suspected interference

during this time?

I further note that they took out another four cases for illegal reception; interesting?

I enclose copies of the relevant pages, but no doubt complete reports can be obtained from the DTI if anyone should wish to read further.

56,346 ham licences were recorded in 86, but as a returned old timer I can only hear a very, very small fraction of these? Obviously, hams are buying thousands of very expensive rigs, judging by the number of firms in business selling them, but perhaps they are just used as ornamental status symbols? Or is it fear of the RRD? Dead bands seem to be the order of the day – no, I haven't deaf equipment!

Why not privatise the RRD? After all, it has happened with the BTL and the C&G who do the important things, like the RAE, and the RSGB have the authority to govern the Morse

test, and have achieved this both successfully and at minimum cost. Turn it over to the RSGB, that's what I say!  
**R Moores G3GZT, Brighton**

## RAW DEAL SUCCESS

With reference to a letter headlined *Unfair Trading* in the May issue from Mr D J Howes of Rochester, I myself have had similar experience with an Edinburgh firm who supply communication equipment, but advertising in a CB magazine.

Without going into all details, I will say that I was given advice by a local Citizen Advice Bureau to send the firm a recorded delivery letter, but having done this no reply arrived.

I was then advised to take the firm to court through the 'small claims' department, but not wishing to do this because of my disability (I am a member of RAIBC) I sought the help of *The Sunday Post* 'Raw Deal' department and got results within a fortnight, having waited since early January for refunding of monies under my own steam!

My advice to D J Howes is to write to 'Raw Deal' *The Sunday Post*, Albert Square, Dundee, and all it will cost is the postage (18p) initially and 18p to thank them for the results.

**Mr G Peel, Northumberland**

## PIRATE USER

May I please ask the assistance, of your excellent magazine, in advertising the fact that as far as I can ascertain my callsign – G2BZQ – is currently being pirated on 80 metres CW, by someone signing G2BZQ/QRP and my usual name abbreviation 'Rich'. There is reason to believe that IT is also using other bands.

He or she should be easy to identify as 'fake' because:

1. I never sign with the callsign G2BZQ/QRP, I only use G2BZQ.
2. I only operate, for some hours, up to 6am prevailing time, ie GMT or Summer Time.
3. For many months I have only used 80 meters CW in connection with antenna

research projects.

May I suggest to the person concerned that he or she uses the vacant callsign – G9ABF/QLF!

Thank you for your assistance.

**Richard Marris G2BZQ**

## NETHERLANDS CONTEST

On 6th and 7th June I have been invited over to the Netherlands by PE1KYV to work in a contest. The club callsign will be PI4PLM/P and the other amateurs operating are PA0CWS, PB0AGH, PD0ORE and PD0CDD.

We will be operating on 144MHz with an Icom 251E and a Yaesu FT700 linear, with a 1kW amplifier (400W), the Dressler D200S, and an 8.5 metre yagi with 17dB gain. On HF we will be using a Yaesu FT101 and a full size dipole for 80 metres. I'm hoping to work as many UK stations as possible. It will make a change to work the other way round. I'm hoping to be granted a licence for those dates.

Anyone wishing to arrange a sked should write to myself at 43 Manor Road, Horsham St Faith, Norwich, Norfolk.  
**Mike Thompson G1NIG, Norwich**

## TRANSMATCH UPDATE

There will be a lot of head scratching amongst the constructors of the two metre transmatch by H Goble in the May edition of *Amateur Radio*, if his instructions are followed to the letter.

The first half of the circuit is correct, although C1 the 35pF variable capacitor is shown on the drawing as C2 – probably a printing error. However, in the parallel tuned circuit consisting of L2 and C2, the earth tap on L2 cannot be omitted, but must be taken by a short length of copper wire and soldered firmly to the frame of the SO239 antenna output socket.

Lastly, and of more importance, the 'through type' SWR bridge should be connected between the transmatch and the transmitter, and not after the transmatch as shown on Mr Goble's circuit diagram.  
**H N Kirk G3JDK, Yorkshire**

## Summary of financial information

RRD costs in 1985/86 amounted to £19.148m of which £13.44m, or 70%, was met out of revenue from licence fees and other income

Income and costs	£'000	
	1985/86	1984/85
<b>Income:</b>		
Wireless telegraphy licence fees	11,259	9,989
Other income*	2,181**	6,771
<b>Total income</b>	<b>13,440</b>	<b>16,760</b>
<b>Costs:</b>		
Staff	9,658**	6,154
Accommodation	1,432	1,305
Sub-contracted work	2,354**	8,861
Other current costs	3,012	2,367
Capital costs – amortised charges	2,692	2,359
<b>Total costs</b>	<b>19,148</b>	<b>21,046</b>
<b>Excess of costs over income (Funded by the Exchequer)</b>	<b>5,708</b>	<b>4,286</b>

\*Mainly in respect of interference to broadcast reception  
\*\* These figures reflect the transfer of the Radio Interference Service from British Telecom to RRD. This took place during the financial year 1984/85

Table 4 Analysis of income from Wireless Telegraphy Licences: number of licences

Income – £'000		Category of licence	Number of licences at 31 March 1986
1985/86	1984/85		
93	96	Aeronautical	5,710
731	623	Amateur	56,346
1,491	1,808	Citizen's Band	139,690
611	543	Maritime	32,896
4,461	3,710	Private Mobile Radio (Land)	16,130
585	507	Other	39,401
7,972	7,287		290,173
		<b>Omnibus licences</b>	
3,287	2,702	British Telecommunications	
		Mercury Communications	
		BBK	
		IBA	
11,259	9,989		



# DX DIARY

News for HF operators compiled by Don Field G3XTT

I was rather taken aback recently to read a letter to the editor in another amateur radio journal, from a G0 station who had recently turned from VHF to HF. This intrepid operator had come to the conclusion that, without high power and a beam, the HF bands, at least on phone, were just too much hassle.

This set me thinking about the culture shock which someone experiences coming on to the HF bands for the first time. At the moment, pretty well at the bottom of the sunspot cycle, most HF activity is necessarily concentrated on 15 metres and below. Discounting the WARC bands for the moment, this gives HF operators some 1400kHz of spectrum in which to operate. At the same time, signals can propagate out to several hundreds, or even thousands, of miles.

### Much more crowded

In comparison, two metres provides 2000kHz of bandwidth and, except under lift conditions, a range limited to tens of miles. Is it any wonder then that the HF bands seem much more crowded than VHF, and QRM is the rule rather than the exception, especially at evenings and weekends. Going from VHF to HF is rather like going from quiet country lanes to your first outing on a busy motorway! I suppose it's hardly surprising that some give up and return to what they are familiar with.

However, the other side of the coin is that the HF bands provide a much more fascinating variety of DX than

VHF ever can, and it really is possible, with modest means, to ragchew with stations at the other side of the world; though of course this is easiest away from peak times, and easiest of all when ten metres is wide open.

For those who braved the bands, April provided some excellent openings to the Pacific on 20 metres and, lower in the spectrum, some fabulous openings to South America on Top Band, with signals booming in from CP8HD, CE3DPD, ZP5JCY, LU2DVI, HK1AMW and others.

### Sierra Leone

At the beginning of the month DJ6QI turned up from Sierra Leone making 6,000 contacts in 11 days, and working 140 countries in the process! He worked all US states in 4 days, and all continents on all bands, except 10 metres. Fifty countries were worked on RTTY, and 350 contacts with 35 countries on Top Band. Incidentally, Walter complains of having received a number of direct QSLs from UK amateurs without even a return envelope, let alone the cost of postage.

FR5ZU/E was active during April on 20 metres from Europa Island. Perhaps the most interesting station I heard, though, was SM2DWH/BT0 operating with battery power from the Tibetan slopes of Mt Everest. This operator is with a group of Swedish climbers trying to get to the top of Everest from the Chinese side, and he expects to be active until 6th June. Check 21244kHz around

1030GMT daily, and 20 metres around midday.

### Bhutan

While talking about the Himalayas, some readers may wonder what has happened to amateur radio activity from the tiny kingdom of Bhutan. A51PN used to be the only amateur regularly active from there, but has been off the air since 1982. A recent article by a travel writer sheds some light on the topic. Apparently, to obtain or renew an amateur radio licence in Bhutan requires passing a character test (!), a Morse test at 28wpm, and conducting a practical fault tracing exercise on an FT300 at the Wireless Headquarters.

The argument for these stiff requirements is that amateur radio should be of benefit to the government and, therefore that prospective amateurs should be of the highest calibre! The requirement to be able to repair one's own gear is on the basis that spares and professional help are rather hard to come by in this remote spot. Who said the RAE and Morse test were difficult!

### Practical help

Despite these stiff requirements, there is apparently a genuine desire in Bhutan to see some amateurs back on the air, and it looks as though VU2RBI and others may visit the country later this year to provide practical help. Efforts are also being made to provide details of licensing requirements in other countries in order to demonstrate that becoming a radio

amateur doesn't necessarily have to be a challenge of Olympian proportions.

Bhutan really is a 'forgotten' country. Apparently the total number of foreigners visiting the country in 1985 was just 2,000, so it is hardly surprising that they are so out of touch.

Perhaps now that some contact has been made, we might see the welcome reappearance on the bands of some A5 callsigns within the next year or so.

### Most wanted countries

While on the topic of rare spots, the US *DX Bulletin* has recently published the results of its 'Most Wanted Countries' survey.

The survey was conducted on a continent by continent basis. For all continents, except Europe, Albania came out on the top of the list. For European DXers the South Sandwich Islands topped the list in terms of rarity, with Albania taking the number two spot. Burma was next, followed by South Yemen, Bouvet Island, Vietnam, Afghanistan, the Andaman Islands, Laos and Kingman Reef.

Of this top ten, all are likely to remain rare except the Andamans which have, of course, been put on the air recently by a group of Indian amateurs.

Interestingly, there were reports in April that some USSR amateurs had been operating from Afghanistan, appending /X to their home callsigns for identification purposes. However, I have no confirmation of this.

## Saharan Arab Democratic Republic

The American *QRZ DX* recently reported the possibility of a DXpedition by a group of Spanish amateurs to the Saharan Arab Democratic Republic (RASD), part of the old DXCC country of Rio de Oro, adjoining Morocco. The political situation in this part of the world is still complex, but it seems that the RASD has its own parliament and army, and is officially recognised as an independent entity by more than 60 countries. If permission for an operation is forthcoming, expect to hear them on the bands for about 10 days in early August. Hopefully more information will become available before then.

## Hall of fame

Congratulations are due to this year's newly-elected members to the prestigious DX Hall of Fame, administered by *CQ Magazine*. The 1987 recipients of this honour are JA1BK and G3FKM. JA1BK is a well-known DXer and QSL manager, but his major contribution to amateur radio in recent years has been in helping to get Chinese amateur stations back on the air after a long absence.

G3FKM is only the second UK amateur to receive this honour, the first being Geoff Watts, founder of *DX News Sheet*. G3FKM has long held a high position in the DXCC Honour Roll, is RSGB HF manager, and secretary of IARU Region 1. He has also written the HF column in *Radio Communication* for many years, as well as contributing to amateur radio in many other ways.

## DXCC countries guide

Talking of Geoff Watts, last month I mentioned his invaluable DX Prefix List. He has since written to tell me that he now also produces a *DXCC Countries Guide*. This lists past and present prefixes back to 1945, plus a reference list of previous names of countries, both current and deleted, with other useful notes.

IOTA Islands and Russian Oblasts are also listed. The list runs to 11 pages and is available for £1 from Geoff at the address given in last month's column.

## Sir Walter Raleigh

Little has been heard of the Sir Walter Raleigh since G4AAL left the ship at the end of its Pacific leg. John was hoping to rejoin the ship on its final leg back to the UK. The dates are as follows: 9th-15th June, Lisbon; 19th-22nd June, Jersey; 22nd-27th June, Guernsey; 29th June, Spurn Head; 30th June, Hull. After 30th June the expedition will officially terminate and the callsign will fall into disuse. There are no plans at present for a follow-up expedition.

## Worked all Britain

June is shaping up well for those chasing the WAB Islands Awards. The Isle of Man Amateur Radio Society will operate from Peel Castle on St Patrick's Isle on 13/14th June using the callsign GD4IOM, and from the Calf of Man from 4-6th July using the same callsign plus GD4FLH.

Later in the year the Newport Amateur Radio Society will operate from three islands off the Dyfed Coast. Full details appeared on page 10 of last month's *Amateur Radio*, so I won't repeat them here. For all these WAB operations, though, remember to check especially the WAB net frequency on 80 metres (3760kHz) as the most likely spot on the dial to find them.

## Berlenga Island

A little farther afield, a group of Portuguese amateurs will operate from Berlenga Island from 18-21st June. This is also a good one for the prefix hunters as the callsigns to be used are CT0BI, CQ0BI, CS0BI and CR0BI. The group will operate on all the HF bands. The island has the reference EU40 for the IOTA award.

While on the subject of islands, the Rev John Miller, WA9YHW/HR6, is currently active from Roatan Island off Honduras. And Ed Young KH6GLU has taken up the job of Director of Telecommunications on the Island of Nauru. He will be there for two to four years, and has issued himself the callsign C21A. Ed has previously held the callsigns FW8DY, VR3DY, VK4LX, VK8XX and VK5AXX. His new address is Box 17, Republic of Nauru.

Incidentally, for those of you who don't know, Nauru is one gigantic phosphate mine,

and has just about the highest per capita income in the world. On the other hand, there isn't really very much to spend it on!

## Belau expedition

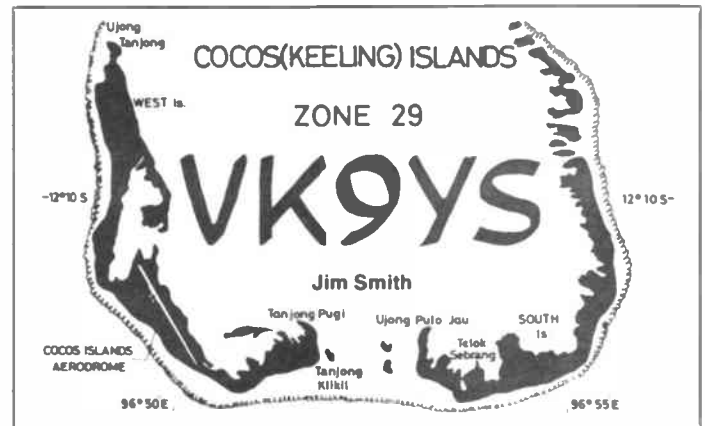
K1XM and KQ1F report having made about 4,000 contacts on their recent expedition to Belau, KC6. On Top Band they had only five contacts: two JAs, plus P29PR, HB9AMO (for whom this was his last zone on Top Band), and ON4UN. Not bad going!

## International fame

The fame of *Amateur Radio* magazine seems to be spreading. During April I received letters from readers in Brazil and California. Ross WB6GFJ writes to say that he will once again be in Tahiti during July, and will be using his FO0FB callsign. The frequencies on which to look out for him are 14145, 14180 and 14240kHz.

Luiz PY7AHJ sends details of the International Radio Hosts Diploma (IARH). The

*QSL cards received from Peter 1st Island, Cocos Keeling Islands and the Seychelles through recent amateur expeditions*





aim is to have worked (or heard in the case of SWLs), since June 1st 1979, amateurs in at least 23 countries where there are IARH Chapters. These countries include CE, CT, DL, EA, F, G, HK, HL, I, J7, JA, K, LA, LU, OE, OH, OZ, PA, PY, SM, VE, ZE, Y, YS, YV, ZP and ZS. To claim, send a log extract, certified by a national awards manager, with 12 IRCs to CX.P 4402, Recife, PE 51032, Brazil. There are separate classes for AM, CW, FM, RTTY, SSB and mixed mode.

### Diplome du Gabon

I also have to hand details of the Diplome du Gabon. This comes in three classes. The DDG1 requires confirmed QSOs with eight different TR stations on any mode and band. The DDG2 requires confirmed QSOs with 12 different TR stations on any mode, but covering at least three bands. The DDG Special requires one confirmed QSO on each of five different HF bands, to include at least two out of the three lower bands. The minimum acceptable signal report is 33 or 339. Send a

list of confirmed QSOs, certified by two other amateurs or the national awards manager, with 10 IRCs, to AGRA Diplome Manager, BP 1826 Libreville, Gabon.

### Ragchew

SP5EXA/JW expects to resume operations during June. SP51NQ will be in North Korea from 14th-22nd June and hopes to get permission to operate. Tom Christian VR6TC is now back on Pitcairn after medical treatment in New Zealand. He missed the ship he was expecting to catch from Norfolk Island and, instead, hitched a ride on the Aurora, the very same vessel on which the Norwegian expeditioners travelled to Peter 1st Island.

### Special callsigns

The special callsign TV8DEC will be aired from Paris from May 1st to June 30th, and TV7GLC will operate from Rouen over the same period. Another unusual callsign EX3TM, will continue activity from the USSR until 1st July. QSLs from A61AB are

now acceptable for DXCC credit.

KX6AO is active from Kwajalein Island with a 3 element quad at 140ft! 4X6TT starts a round the world trip in June following the end of his university course. He expects to visit many Asian and Pacific countries over the following several months and will try to get on the air whenever possible.

Some very unusual prefixes turned up from Chile during the Pope's visit. CW66PAX and 3G87PAX were just a couple of them. ZF2AH will be operational from June 26th to July 14th, and G3MCN will be QRV from the Faroe Islands from 7-14th July.

### Contests

Finally, a note of forthcoming contest activity. The World-wide South American CW Contest runs over the weekend of 13/14th June, for 24 hours from 1500GMT on 13th. Work all the world, but contacts with South America bring more points. Multipliers are DXCC countries and South American prefixes.

### All Asia contest

The following weekend sees the All Asia SSB Contest, a full 48 hour effort. Work Asian stations only. This is run by the JARL and Japanese stations form the majority of participants, but there are often some rare Asian stations to be found lurking on the bands during this annual event.

Looking into July, the IARU Radiosport Contest is now firmly established in the calendar, although the rules seem to vary from year to year. This is run by the Amateur Radio Relay League on behalf of the IARU and will take place over 11/12th July.

### Further information

In this column I try to alert you to the various major international contests which may be of interest. It isn't sensible to give the rules in detail, but I can often help with further information if required. Just drop a line to my callbook address. Until next time, good DXing. 73 de Don.

## ARE YOU A BUDDING WRITER?

We are particularly keen to receive construction articles, so if you have designed and built a project which you think could be of interest to fellow radio amateurs we would be pleased to receive your contribution.

You do not need to be an expert writer to see your name in print. Accuracy in the design of your project is far more important. If you can put your ideas down on paper, typewritten if possible, and illustrate them with clear drawings and photographs where appropriate, the *Amateur Radio* editorial team will sort out the style, grammar, spelling, etc.

If you have an idea which you wish to discuss with the Editor before submitting in article form, she will be pleased to receive your call.

We will, of course, pay for all articles which are accepted for publication.

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# WHICH AERIAL?

The antenna is the crucial link in any amateur radio station. A good aerial will enable contacts to be made more easily, and over greater distances, it will also enable simpler or lower powered equipment to be used quite successfully. This will mean that a fortune does not have to be spent on the latest sophisticated high power equipment in order to work the DX.

As the aerial system is so crucial, the choice of the right type of antenna is very important. Obviously most of us would like a large tower with a three element triband beam for HF and a series of parabees for VHF. Unfortunately, this is only a pipe dream for most people. Usually the choice of aerials for HF operation boils down to long wires, verticals and various forms of dipole. Each of these can perform well and has its own merits, however, it is not so easy to decide which one is likely to produce the best results for any particular situation. One type of aerial may work very well for a receiving station where the ground conductivity is good, but may be totally unsuitable for a transmitting station where the ground conductivity is poor. Factors like these can have a great

bearing on the type of aerial chosen.

What is more, the decision is made even more crucial because it is likely that whatever type of aerial is chosen will have to stay for some time, as the investment in time, effort and money may mean that the aerial cannot be changed too often.

## The long wire

The long wire is one of the most common aeralis in use. Strictly speaking it should be called an end fed wire, because a long wire as such must be several wavelengths long and the usual end fed wire is less than a wavelength. This aerial has gained popularity because it is easy and convenient to use, its length is not critical and it can be used for multiband operation. It only requires a simple matching unit, such as that described in the July 1986 issue of *Amateur Radio*, and then you're off.

In order to make the best use of an end fed wire it should be as high as reasonably possible and preferably a minimum of a quarter wavelength in length. If the aerial is shorter than this its efficiency falls rapidly, even though it can be made to resonate and give a low

VSWR reading.

Another requirement is a good earth; the better the earth then the better the aerial will operate. If it is not possible to install a good earth then a counterpoise system can be used. This can consist of one or more wires.

Although 'long wires' are very easy to erect and convenient to use, they do have some drawbacks. Firstly they have to be tuned against earth, and because of this they do require a good earth system. Often, however, the shack will be located well above ground resulting in the earth wire being quite long. This can lead to the equipment itself sitting at an RF potential, which can sometimes result in the operator obtaining small RF burns or shocks from the equipment. Another problem is that the aerial starts radiating immediately it leaves the ATU, leading to high RF levels in the shack. Not only could this be bad for one's health if high powers are used, but it may lead to problems of the RF getting back into the equipment.

Not only does it mean that RF may get back into the equipment in the shack, but it is also more likely to get into domestic equipment such as televisions and hi fi's. These problems are made worse if there is a long earth wire as the RF also tends to find its way along the mains wiring and into televisions, videos and hi fi's.

So, long wires can be very convenient. However, they are not always the best solution for a transmitting aerial, but they are fine for listening.

## Verticals

Another type of aerial which is very popular is the vertical. There is a wide range of multiband trapped aeralis which can be bought for under £100. In many ways these aeralis are ideal because they can be erected so that they occupy comparatively little space. If they are

Fig 1 A typical 'long wire' aerial

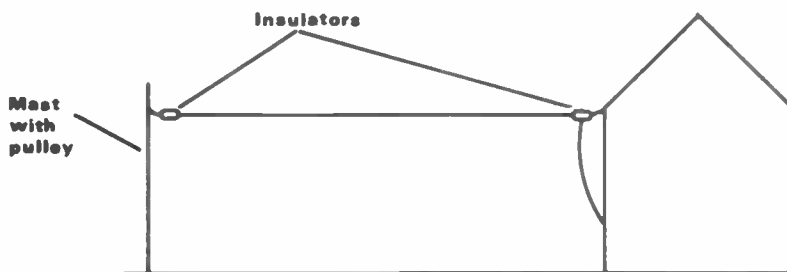


Fig 2 Radiation pattern of  $\lambda/2$  dipole

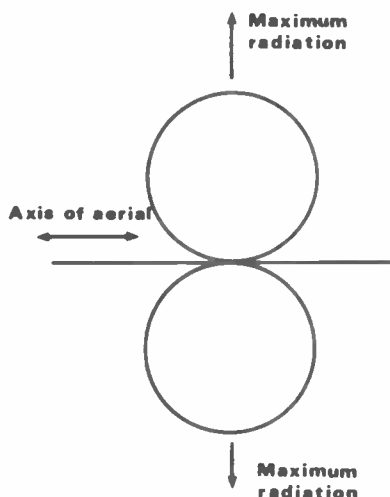
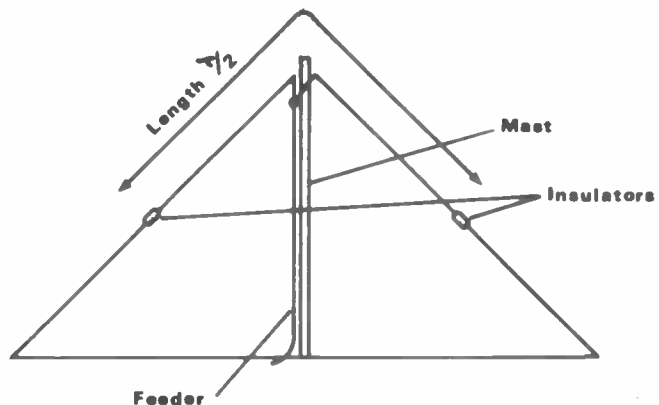


Fig 3 Inverted V dipole



# The choice of the vital element

by Ian Poole G3YWX

ground mounted, ie mounted at ground level using an earth instead of a set of radials, they can be fitted into any postage stamp sized garden.

When this method is used it is essential that the earth is good, otherwise the efficiency of the aerial will be greatly impaired. Some years ago I used a ground mounted vertical and had very disappointing results. The reason for this was quite simply the poor earth. The ground consisted of about 18 inches of soil on top of sandstone and in spite of burying a considerable amount of copper and radials little improvement could be made. However, a friend only a few miles away was able to put down a good earth and his vertical, which was exactly the same and worked very well.

The other alternative to ground mounting a vertical is to fix it above ground and use a set of radials. This makes the aerial a true ground plane, and this option is better in several respects. The aerial no longer relies on the earth connection, and also it is physically higher. Against this a system of radials has to be used. Fortunately, this does not have to be a full set of quarter wave radials for each band in spite of what the purists say, it is possible to obtain quite satisfactory results using even a small number of loaded or trapped radials. This option is particularly attractive where space is limited or the wife insists that the aerial should not take over the whole of the garden.

In general these aerials perform well, as being vertical they give a low angle of radiation. This is advantageous not only because the low angle of radiation enables the transmitted signal to reach more DX, but it also reduces the local high angle signals. Having said this there are some disadvantages. Firstly, verticals are more difficult to construct than a long wire or dipole, or alternatively they are considerably more costly. Nevertheless they are still a very effective and useful form of aerial.

## Dipoles

The trusty dipole is a form of aerial which every radio amateur must have used at one time or another. Unlike the previous types of aerial it does not require an earth for it to operate satisfactorily. In fact it is a balanced aerial, whereas the others were unbalanced, so in theory if it is fed with co-ax it requires a balun for it to operate, but in practice it operates satisfactorily without one.

Normally a dipole is a half wavelength long and fed at its centre where the current is a maximum and the voltage a minimum. This gives a feed impedance of around 70 ohms (73 ohms to be more exact) in free space. The exact value of

the feed impedance will vary according to factors such as nearby objects.

Whilst dipoles are most commonly half a wavelength long there is nothing to stop one making them an odd multiple of half wavelengths. The major difference is that the radiation pattern will change. A normal half wave dipole has the familiar radiation pattern shown in *Figure 2*. Increasing its length generates extra lobes which have their points of maximum radiation, and tend to become more in line with the axis of the dipole.

Having suggested that dipoles can be made larger, it is often a problem to fit even an ordinary sized one into the average sized back garden. This need not be so much of a problem as the aerial can be bent to quite a degree without reducing its performance too much.

One popular way of bending a dipole is to make it into a form of an inverted V, as shown in *Figure 3*. This is very useful as it not only reduces the amount of space it occupies, but only requires one tall mast instead of two. Then, to top it all, the majority of radiation occurs where the current is highest and this is in the centre which is the highest point of the antenna.

Dipoles can also be bent in other ways.

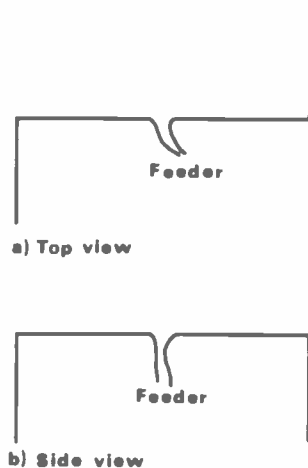
Normally this does not detract from the performance too much, provided they are not bent excessively. So if the space for the aerial is not quite large enough, one can generally be made to fit.

## Multiband dipoles

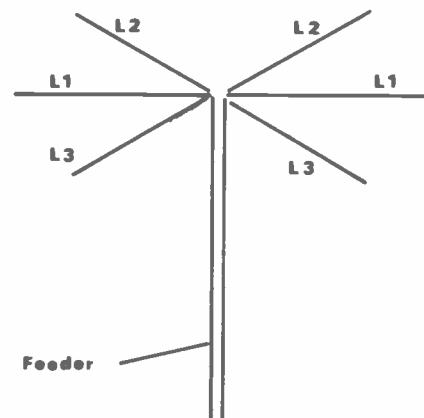
A dipole is often thought of as only a single band aerial. Fortunately this need not be the case. There are several ways of enabling a dipole to be used on more than one band. The first of these has already been mentioned. By using a dipole on a frequency three times its fundamental it becomes a three half wavelength dipole instead of a half wave one. This particular approach is often used by operating a forty metre dipole on fifteen metres.

Another approach which is often used is to connect several dipoles to a single feeder, as shown in *Figure 5*. In this way an aerial which is effectively a multiband dipole can be made. Although it may seem that the sections of the aerial which are not in use at any given time would detract from its operation, this is not so. The elements which are not in use present a high impedance and because of this they do not unduly affect the

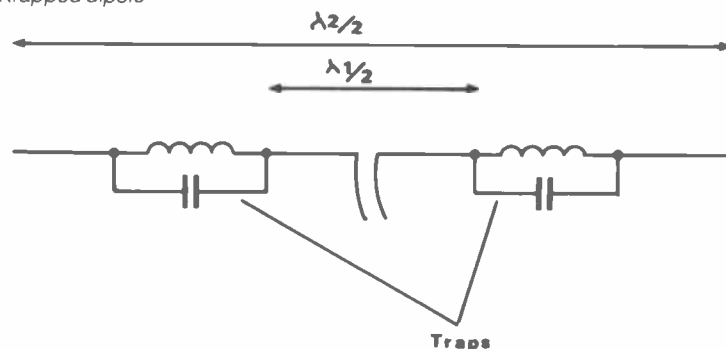
**Fig 4** Two ways of bending a dipole



**Fig 5** Multiband dipole using a single feeder to feed several dipoles



**Fig 6** A trapped dipole



# WHICH AERIAL?

operation of the one which is being used.

The other commonly used approach in making a multiband dipole is to use traps, as shown in *Figure 6*. The traps isolate different sections of the aerial at different frequencies and enable the correct resonant length to be chosen for a given band. For example, the traps for the aerial shown in *Figure 6* would be resonant at the frequency corresponding to  $\lambda_1$ . In this way only the length between the traps is used. Then for the frequency corresponding to  $\lambda_2$  the whole aerial is used. In fact the traps act as a loading coil when the whole aerial is in use making the overall length shorter, which can be quite an advantage in some instances.

When making traps, great care should be taken. Firstly they must be able to withstand the voltages present at the end of an aerial (the capacitors in particular have to be high voltage types), and secondly the traps should not be affected by water, as any moisture could drastically alter the performance of the aerial. Although it is quite possible to make traps there is quite a large variety on the market for those who feel a bought item may be better.

Apart from using a straight trapped dipole for just two bands, it is possible to obtain multiband versions. The W3DZZ or G8KW aerials are prime examples, which cover 10, 15, 20, 40 and 80 using just two traps, one in each leg. In addition to these bands it is possible to cover 160m by joining the inner and outer of the coax and tuning it against earth.

## Open wire feeders

All the dipoles mentioned so far rely on the aerial presenting a good match to a

coaxial feeder. This limits the operation to a narrow band or bands. However, if open wire or balanced feeders are used then it is possible to operate the aerial over a wide band of frequencies, provided that the aerial is a minimum of half a wavelength long. The transmitter end of the feeder is then connected to an ATU possessing a balanced output to match the aerial to the transmitter.

The disadvantage of this type of system is that open wire feeders are not as tolerant as co-ax to being run around the house, or being passed close to metallic objects. This tends to unbalance them and cause losses.

The open wire feeder can be made quite easily by taking two lengths of wire and spacing them apart by six or eight inches. Although the spacing is not particularly critical, it can be maintained by placing spacers every 18 inches or so. These spacers can either be bought or made, and several ingenious ideas for making them have appeared in the magazines, including using the bodies from clear plastic ballpoint pens. If a hole is drilled in either end the two wires can be passed through making a simple and effective spacer.

As an alternative to the true open wire feeder it is possible to use the flat 300 ohm ribbon cable. If this is used take care to use the black plastic cable with 'holes' in the dielectric as shown in *Figure 8*. The cable using the white translucent plastic should be avoided at all costs. The reason for this is that the plastic absorbs water very easily causing the losses to rise to unacceptable levels.

One particular aerial which uses open wire feeders and has become very popular over the years is the G5RV.

There are two versions of it which are shown in *Figure 9*. It uses a resonant line to give a good match on most of the pre-WARC 79 bands. In one form it is possible to use any convenient length of open wire feeder, provided that it is connected to a suitable ATU. In the other form, 34 feet of open wire feeder or 29 feet 6 inches of 300 ohm ribbon cable should be used. This can then be connected directly to 75 ohm cable to give a reasonable match on most bands.

Although the way in which the aerial manages to operate on several bands is slightly more complicated than many others it is still worth mentioning. On 3.5MHz it functions as a half wave dipole – the centre of the aerial appearing in the feeder itself. Then on 40 metres it acts as two half wavelengths in phase. Here the feeder transforms the impedance to provide a reasonable match. For twenty metres it operates as a  $3\lambda/2$  aerial. Finally, on fifteen and ten it functions as a  $2\lambda$  aerial, and two  $1.5\lambda$  phased antennas respectively, with the feeder again providing the matching.

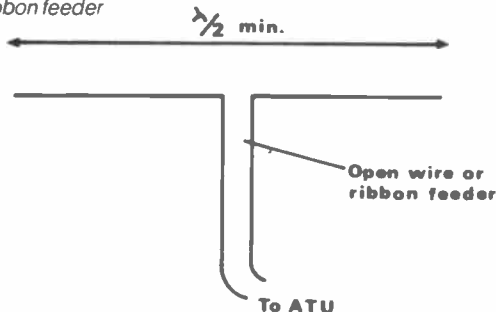
The G5RV aerial has provided many people with excellent results over the years. Accordingly it can be the ideal multiband aerial choice for many people. However, as it does not give an ideal match on all bands, the use of an ATU is essential to protect the PA of any transmitter which might be used.

## Summary

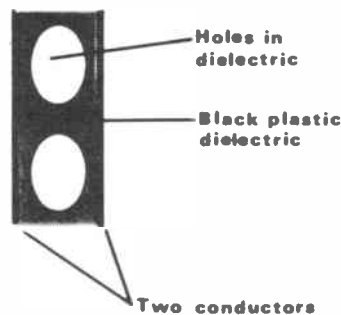
There is a very wide selection of aerials for the keen radio amateur to choose from. Those which are described here only represent a small fraction of the vast number of designs which can be used. However, they do include some of the more popular types: the ones which are easier to construct or more likely to give successful results.

Out of those outlined the long wire is probably the most common aerial used by listeners. It is simple, effective and cheap. However, when it is used for transmitting it can give rise to problems, such as TVI and high RF fields in the shack, and it needs a good earth. Verticals also need a good earth or ground plane, and are more expensive to construct or buy. The various forms of dipole are probably the safest bet. They are cheap, easy to construct and almost invariably give good results. What more can one want?

**Fig 7** Multiband dipole using open wire or 300Ω ribbon feeder



**Fig 8** Suitable 300Ω ribbon feeder



**Fig 9** Two forms of G5RV aerial



# ANGUS McKENZIE

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## TESTS

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In the past few months both Yaesu and Icom have released mini hand-helds which received acclaim in this magazine. Hot on their heels come two new models from Kenwood, formerly Trio. The TH205E costs £218 including VAT, rubber duck, NiCad PB2 battery pack and trickle charger, whilst the TH215E costs £258 including VAT, with the same accessories.

Both the new models seem to have identical audio and RF circuitry, but the microprocessor controlled facilities are different. The TH205E has up and down buttons for changing frequency in 5kHz increments, and it is not possible to program any other step size into it. It has three memories which can store repeater shift information as well as frequency and can be instantly accessed. The 215E has ten memories, and the up and down buttons can step frequency with a programmable step size of 5, 10, 15, 20 and 25kHz, but alas not 12.5kHz. The memories can store frequency, repeater shift and, somewhat curiously, the step size.

### Basic features and accessories

On the top of both models is a BNC 50 ohm socket for interconnection with the antenna, a short rubber duck being provided. This is a great improvement on the completely non standard screw threaded phono socket on the TH21E. The top panel also contains rotaries for squelch control and audio volume with power switch. Two buttons are provided for selecting auto 1750Hz toneburst and high/low Tx power. There are three small sockets, a cylindrical dc socket with centre pin positive (*CAUTION, opposite polarity to similar Yaesu dc socket*), a 3.5mm jack for external microphone and a 2.5mm jack for an external speaker or headphones. Kenwood can supply a speaker mic with a double plug (SMC30, costing £29.85) which is compatible with these sockets.

Both rigs have a standard PTT lever on the left side cheek, which only requires a slight depression to operate, and which I prefer to either the rubbery ones or vice like grip types on some other rigs! Above the PTT is a small button which allows you to open the squelch momentarily.

The photographs show the two front panels, from which you will see that the 205E omits any form of S meter, frequency being read out in 5kHz increments, in addition to basic status indications. Below the push buttons is the loudspeaker/microphone section, and under this clips one of four NiCad battery packs. These actually fix on to the rig with a bayonet type push and rotate action, giving a very secure clamping to the main metal die cast chassis, which I rather liked. Both rigs have a release clip at the bottom left.



## KENWOOD TH205E AND TH215E

### 144MHz FM hand-helds

The BP2 is normally supplied with the rig, and gives 8.4V at 500mAh capacity, a spare one costing £36.10. For £60.40 you can purchase the BP1, which gives 12V at 800mAh capacity, and the PB3 gives 7.2V at 1.6AH capacity for £66.64. I can well imagine many amateurs baulking at the price of these NiCad packs, and I have a vision of somebody talking into one of these rigs with a budget car battery strapped to his back!

Further accessories include a carrying case (two sizes available to cope with the different battery sizes), a fast charger/mains PSU costing over £100 and capable of charging two batteries at once, and a

telescopic antenna type RA3 costing £13.88.

The dc input on the top panel is suitable for use with external supplies from 7 to 16V dc. The BNC antenna socket allows you to use the rig in a mobile or fixed station installation. The charger takes around 15 hours to charge the PB2 battery fully, and although I much appreciate a rapid charger, I would have thought that Kenwood could have made one a lot cheaper than £100! The situation seems to be becoming very similar to purchasing expensive pick up cartridges, for many replacement stylii cost over half that of the complete cartridge,

and a complete set of the Kenwood accessories costs about as much as the rig.

## TH205E front panel facilities

The entire front panel display can be brightened up by holding a lamp button down. Another button enables scan, operation of which is quite conventional. The memory access button is extremely simple to use, and one can use the up and down buttons immediately after pressing a memory. The memory stored frequency can always be re-accessed by pressing one of the three memory buttons at any time, and thus this rig will be quicker to operate than many of the older types. A slide switch operates a key lock, and in this mode all the buttons become inactive.

In general operation I set one of the memories on a local net channel at 144.825, another one on 145.5 (the simplex calling channel), whilst the third was on one of the London repeaters. By using the appropriate button and the up and down keys, I found I could reasonably quickly find any desired frequency, although the 5kHz steps were extremely annoying.

The rig is a very simple one, despite its microprocessor operation, and is obviously basically designed for the US market, although the American 'AT' version does have some additional features concerning repeater phone patching and extended band coverage. Note that there is no S meter on this model, but I can't really see that one misses it much.

## The TH215E front panel facilities

In this model the display extends across the entire width of the front panel, and includes a simple S meter in which up to six horizontal bars appear in the display. There is a complete 1 to 9 and 0

matrix pad on the front, which allows you to enter frequency to the nearest 5kHz. Additional buttons provide: display illumination on/off; repeater  $\pm$  or simplex switching; reverse repeater; 'save' (switches battery save circuitry on and off, and in conjunction with a function button, selects auto save or normal save modes); memory write; and scan enable. On either side of the '0' button are frequency stepping buttons for changing channels up and down.

A second function allows you to select the channel stepping rate between 5 and 25kHz channelling. The chosen channelling, eg 15kHz, can be retained in one of the 10 memories as part of the memorised data. Other second functions include: priority monitoring (priority frequency in memory 1); beep on/off; scanning complete band or limited section between frequencies in memories 8 and 9; memory scan; and three different scan stop and restart options. If you hold the up or down buttons in, the rig steps appropriately in a continuous scan, but this is normally rather slow. You can select a faster QSY by pressing the 'function' button. This allows a very fast QSY up and down the band. Two other second functions will definitely be found useful, one being 'key lock enable' whilst the other is 'Tx disable', which when selected stops any accidental or unauthorised transmitting (useful when there are kids around!). In other respects the 215E seem identical to the 205E.

## Modifications available

Lowe Electronics have informed me that the Rx coverage of these models can be increased quite considerably with the usual internal dabbling, so you could easily convert one for extended coverage for an overseas trip. They also point out that an internal crystal can be changed, which will allow you to select

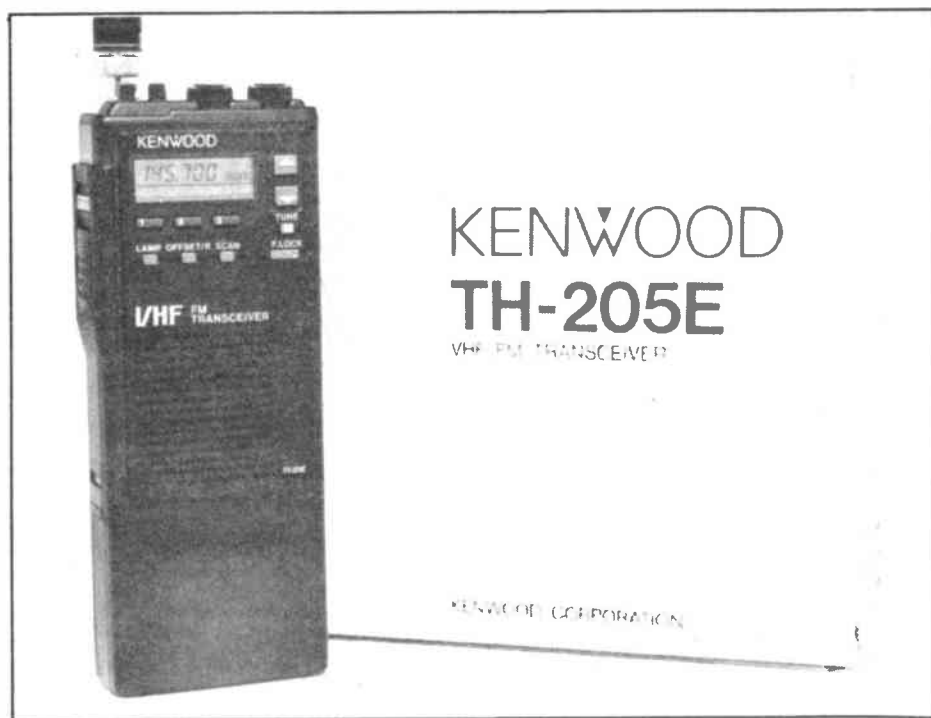


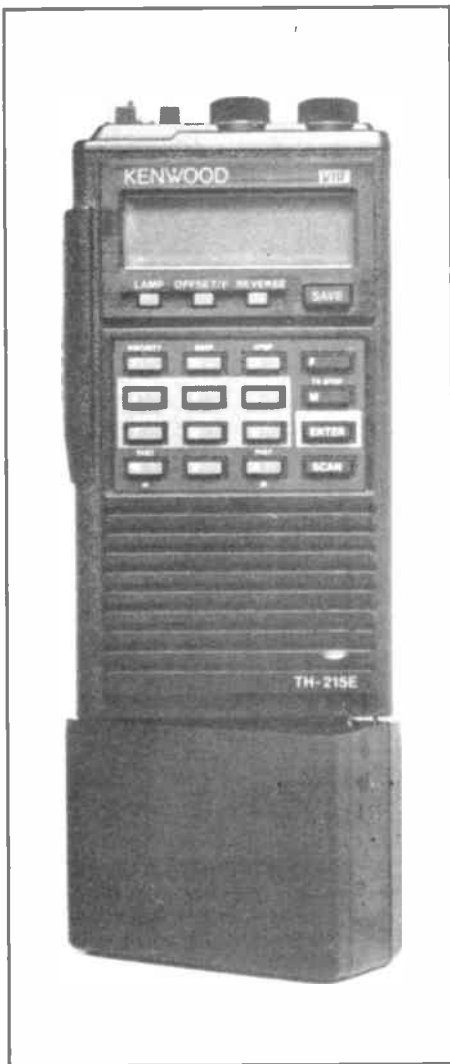
between 12.5 and 25kHz channelling. However, you would have to sacrifice 15kHz channelling if you carry out this crystal change, and the rig would thus only be suitable for use in Europe. The selectivity measurements seem to infer that the Rx filter is an E type which is slightly on the wide side, and if you wanted to use the 215E for 12.5kHz channelling, you would have to have the filter changed. The importers are looking into the practicability of this.

## Subjective comments

There was little to choose between the transmitted quality of the two rigs, the general comment being that the modulation was of clear communications quality. Optimum performance was reached when I was talking around 5cm back from the rig. There was no report of any transmitted nasty noises, and the deviation in practice seemed about right. On Rx the quality was better than average and very clear, the internal speaker seeming quite sensitive and producing a fairly high maximum sound pressure level for a handy talky.

When I was using either of the rigs on an external dc supply and on high power, I noted that the back of the rig became very hot, and I would describe it as getting very warm even on low power.





This will discourage you from having long overs, and the manufacturers do warn you in the instruction book that you should not rest the rig on a plastic surface because of the heat build-up. They don't seem to worry much about your skin heating up though!

### In use

Walking around the house with either of the rigs fitted with their rubber ducks and tuning around the band in a busy evening, showed both of them to be very sensitive indeed. On an external antenna the apparent sensitivity was definitely well above average, which is a strong plus point, but I did note some intermodulation products around the top end of the band produced by strong local police transmissions above 147MHz. I have often noticed this with hand-helds when connected with an outside antenna, but this rig's excellent sensitivity showed the problem up slightly more. I cannot see that it will trouble you either under hand-held or mobile operation, and even connected to a simple monopole it should be satisfactory, unless you are very close to strong out of band signals.

I do feel that Kenwood should have incorporated 12.5kHz channelling, for both Icom and Yaesu have managed it in their European options. It is difficult to

compare the rig with its competition, for the Kenwood ones are slightly larger, but I feel that the ones under review are rather more robust. They both have a similar weight, which falls between the smaller handy talkies and big boys, such as the Yaesu FT209R.

I liked the TH215E quite a lot, and found it very easy to use once I had mastered, with my wife's assistance, one of the worst instruction books I have yet come across. Here are three sentences extracted from the 215E book: 'In digits of 1MHz and 1kHz, 10 numeric keys becomes as shown below'; 'Activate the circuit 1 munit after the last key operation during the squelch closes'; and 'Inserting the battery by force without checking the shape may damage the case'.

There are many diagrams with strange ellipses on them which are almost incomprehensible, and a lot of space is taken up with drawings of fingers on up and down keys. If the instructions could be written in proper English, it would be far clearer, and one would not need the useless drawings. Kenwood really must check their instructions with their importers first in future, for as it stands, I gain the impression that Kenwood have just purchased 'a bland new transration machine which has gone tellibly long!'

### Laboratory tests

Both sets had astonishingly good front end sensitivities, only equalled in the past in a walky talky by a very carefully set up muTek front end in a Yaesu FT290. The sensitivity was 3dB better than the average competing models. Unfortunately, the RF input intercept point was no better than that of its competition, and this explains why some products were noted as spurii from strong out of band police signals when the rig was used with a large external antenna. Quieting was

also excellent. The capture ratio on both rigs measured well, showing excellent discrimination between strong and weak signals on the same channel.

The selectivity was not suitable for 12.5kHz channelled stations, but was adequate for 25kHz channelling, although not as good as some of the competition here. FM limiting was excellent, and audio distortion in the discriminator and output stage was somewhat lower than usual, which helped the rig to produce some clean audio. Just over half a watt was available into an external 8 ohm load, and around 0.7W into 4 ohms. This is adequate for a walky talky, but not really enough for use in the car.

Received frequency responses were remarkably flat from 400Hz to 2.5kHz, above which they fell to around -8dB at 5kHz. Below 400Hz attenuation was as rapid as I have seen for quite a time, 200Hz being -17dB and 100Hz around -31dB! This considerably helps clarity, and reduces distortion in the very small built-in speakers, both sets having the same type of roll-off.

The very crude S meter on the 215E nevertheless gave 24dB difference in RF level between the first bar coming on and all bars present. A very weak signal was enough to bring on the bottom bar, which is a good point. The squelch action was excellent.

The battery current consumption saving circuitry was quite remarkable in both rigs, and whilst it was automatic in the 205E, allowing only 5mA or so to be drawn from the battery at minimum in a one on to two off approximate ratio, the 215E drew a minimum of about 7mA. In the latter, you can set the ratio from 300mS on to any time between 300mS off to 2.7S off in 300mS increments. The receiver wakes up fully when the squelch is broken during a 300mS on period. You can select between an auto mode, which





## G3OSS TESTS

When I was confronted with one of these ATUs at the NEC show at the end of March, I have to admit that I was a little puzzled and amused at first by Tony Johnston's claims for the unit, although later I did see his point. The unit is designed to match a very wide range of impedances to 50 ohms between 144 and 146MHz, and to take several hundred watts throughput. There is even a built-in 1:4 balun, which can be used to feed balanced ribbon cable to some types of antenna.

It was claimed that this unit could match almost anything from a G5RV to a large dustbin lid, and indeed I did find that it would load up some incredible mismatches!

### Internal construction

The unit is assembled inside a die cast solid metal box with miniature feet on the bottom cover. This cover can be removed to expose the inside. On the back panel there are SO239 sockets for coaxial input and output, and two banana sockets spaced 50mm apart. There is also an earthed wing nut terminal which is shorted to the case, and therefore to the screen sides of the input and output sockets.

The Tx connection is taken via a short length of thick wire to a variable capacitor of 30pF maximum. This forms the input part of a conventional pi tank circuit, the series coil being a one turn loop of around 1.9 $\mu$ H. The output capacitor to earth is also a 30pF variable, and the output is taken first to the terminal banana socket and then to the second one in parallel with the output SO239. In between these two sockets is a length of URM72 co-ax forming a balun of sorts, by introducing, theoretically, a 180 degree phase shift between the two banana terminals. URM72 is 50 ohms impedance, and has a solid PTFE dielectric.

The unit is very well made inside, but I am surprised that a number of the connections are slightly on the long side, and I would have preferred the banana terminals to have been closer together. The longer wires, eg connections from the coaxial Tx co-ax socket to the variable capacitor, will be adding some series inductance, and this might limit the total range of impedance that can be accommodated.

### Subjective tests

I initially tried using the ATU in my antenna feed to a 20 year old clover leaf omni-directional system, which has a 1.5:1 SWR at the shack end. By careful tuning it was possible to bring this right down to 1:1, and at this setting field strength from the antenna was at maximum. Loss seemed to be negligible. I cannot say that the unit made any noticeable difference to the results, but it certainly did not do any harm. I tried the unit with various other VHF antennas, all of them being 50 or 75 ohms, and they all worked fine.

I then tried loading up into a UHF discone, designed to work only above



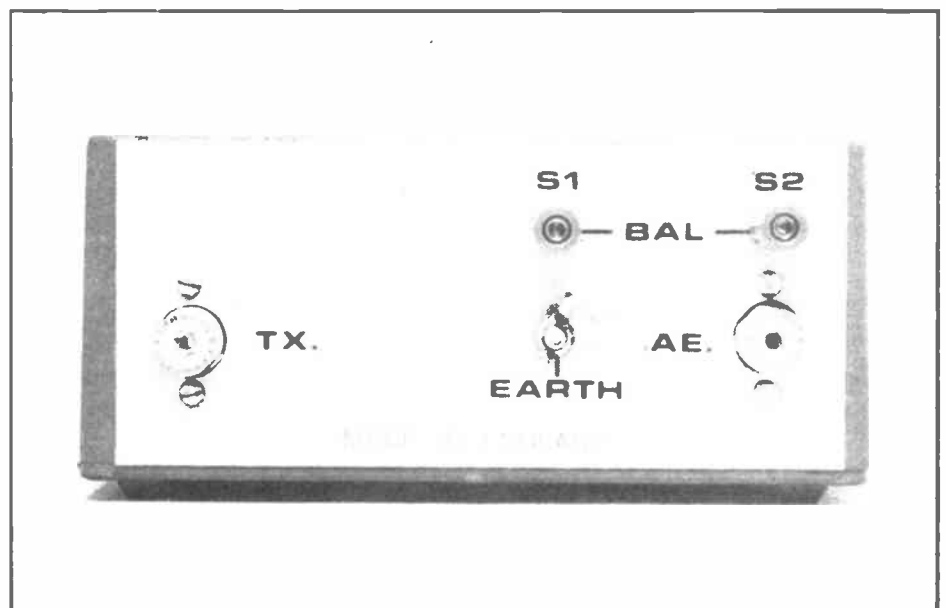
## CAPCO SPC100

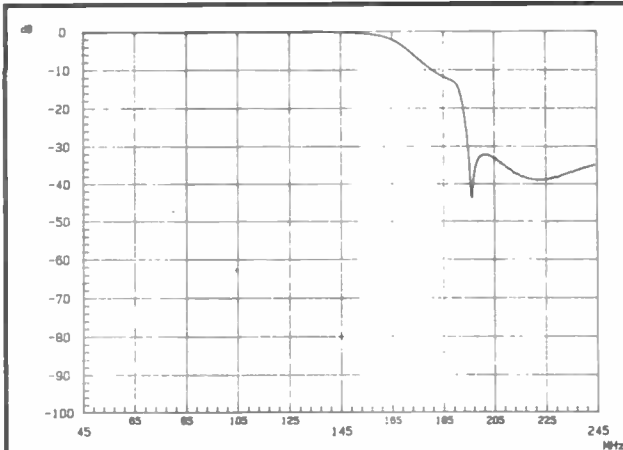
### VHF antenna tuning unit

400MHz, and having a 6:1 SWR at 144MHz. After carefully setting the ATU for maximum forward and minimum reverse power indications on my Bird 4410 watt meter, and obtaining almost no returned power, I carefully noted the field strength produced by feeding a second antenna, about 20ft away, straight into my Marconi analyser. The level into the analyser was very carefully noted, and the ATU then adjusted to give maximum field strength. This improved by 0.7dB, but at this point the SWR had degraded to around 2:1, showing that there was some power absorption within the ATU.

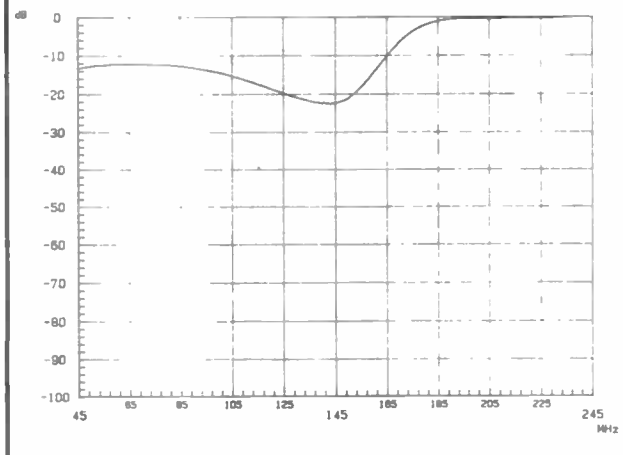
However, a 2:1 SWR is not too serious, and the improvement on both transmitted signal strength and received levels was quite marked, showing that the ATU is quite effective.

Each of the variable capacitors is rotated through a 6:1 reduction drive from the knob on the front panel, and a red cursor moves over a 0 to 10 scale, which is useful for logging purposes. It was easy to adjust the unit, but the manufacturers advise, quite correctly, that one should first tune up for maximum on receive by using the main rig's S meter when monitoring an





CapCo SPC100/145MHz  
ATU Through loss/50 ohms  
load tuned for best SWR.  
Resolution bandwidth  
1000kHz. 20MHz per  
division



CapCo SPC100/145MHz  
ATU. Return loss curve when  
tuned 50 ohms/145MHz.  
Resolution bandwidth  
1000kHz 20MHz per  
division

## Brief laboratory tests

Having set up the ATU very carefully into a 50 ohm dummy load for best SWR, we measured the through loss on the Marconi 2382 spectrum analyser. *Plot 1* shows the loss from 45 to 245MHz, from which you can see the filtering action above the band, the through loss at 145MHz being a mere 0.2dB. *Plot 2* shows a typical return loss curve with the ATU feeding into a 50 ohm termination. It was possible to match over a wide frequency range from well below 120MHz to around 160MHz, so the unit could have some other applications.

## Conclusions

This is the first VHF ATU that I have come across in many years, and it will certainly have some useful applications for some experimenters, but it is not really a cure all. You might well find it useful in an emergency situation and it could dramatically improve the match in to or out of a linear, and give improved results. However, I have to add a very cautionary note, as inappropriate use could easily cause damage to a high power PA, and it should be used with a good SWR meter on the transmitter side. If you have a poor SWR it is better to try to find out the cause, and correct it by readjustment.

A fascinating item, costing £59 including VAT, which can be recommended for special purposes, and which should be able to handle a lot of throughput power, and which has a useful filtering action.

CapCo also make the SPC50 for the 50MHz band, and I suggest that this would be particularly useful and could be strongly recommended, as it would allow you to match virtually any HF antenna for 50MHz. There is no reason why you should not load up an HF beam on 50MHz with its help, but of course you could not expect the results to be as good as those you would get with a proper resonant antenna for the band.

Many thanks to Tony Johnston of CapCo Electronics Ltd, 63 Hallcroft, Birch Green, Skelmersdale, Lancs WN8 6QB (phone (0695) 27948), for the loan of the review sample.

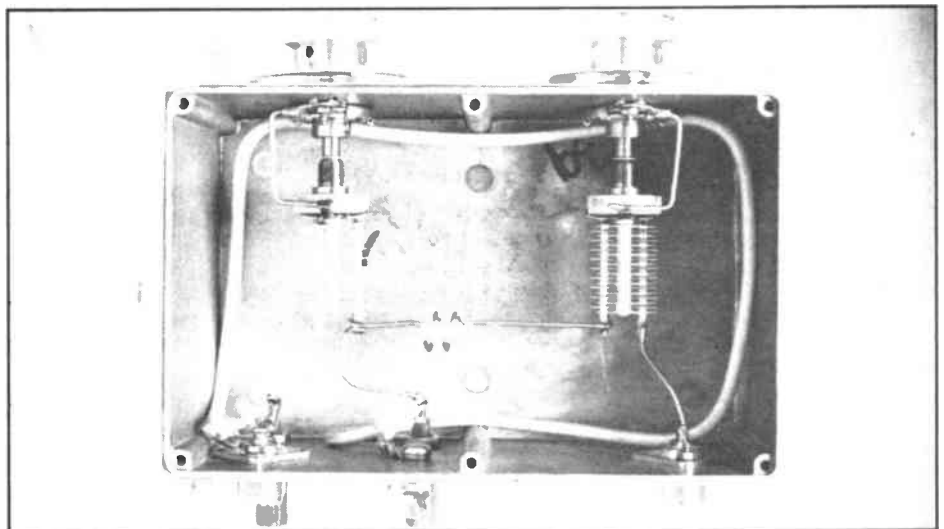
intermediate strength station. One can then go to transmit, preferably on low power, and tune up for optimum SWR. If you have a field strength meter, or a voltage sensor on the line to the antenna, then you can tune up for maximum smoke (from the antenna but not from inside the rig!), provided that this is consistent with an acceptable SWR.

The manufacturers state that this ATU can be useful if you wish to match LF or HF antennas into a 144MHz rig. This could be helpful if, through planning problems, you are unable to put up any VHF beams. The ATU will at least allow you to match the rig to some pretty crazy aerials, but the situation would be somewhat rare in which you could not even put up a halo antenna on a chimney. My own feeling about the matter is that a VHF antenna which has a bad SWR has either been incorrectly designed or installed (in particular the latter), and you will get better results by making adjustments to the antenna to improve the SWR than by correcting it in the shack. The SWR is itself not necessarily harmful, but is often an indicator that something is materially wrong with the antenna system. A faulty balun, a wire off, or a problem resulting from a local owl's fondness for perching, or water in the co-ax can all contribute to bad SWRs.

An ATU of this type can have one very specific benefit: the low pass filtering action further reduces any radiation of harmonics. Also, some rigs are fussy about SWR, and you may obtain more

transmitted power by carefully tuning the ATU for the best match. You are unlikely to win more than a dB at most though, even by careful matching with an ATU, and most installations will show no improvement at all.

If you like playing around with experimental antennas, and you like the idea of trying balanced feed lines, then you might have a lot of fun with this ATU. Once you have designed your DX special array, and proved that it works well, you could then set about matching it properly at the antenna rather than in the shack, thus using this ATU as a tool rather than for routine use.





# SHORT WAVE LISTENER

TREVOR MORGAN GW40XB

Welcome to another listeners' column, and I hope that by the time this gets in print the weather has improved from it's present wet and windy phase!

Let's start this month with the mailbag, and firstly to Brian Pearson RS90580, of Bradford. Brian uses the FRG7 directly fed to a long wire formed into a delta loop formation. He started real log keeping at the end of March and has had some very interesting catches, including BL6, DV7, DV9, H76, HK3, KL7, TA2 and YB2. He mentions that the BL6 was in QSO with K4YT running portable in the Phillipines, and both signals were good strength. Brian is now starting to get into the hard hunting group.

Being retired may seem the answer to many a prayer, but it's no fun when the retirement is enforced through injury or illness. Ray Williams of Grantham is one such listener who, following a spinal injury, was forced to retire and now finds listening one of his few pass-times. Ray uses the Trio R300 kindly loaned by the RAIBC, which is shortly to be replaced by a new Lowe HF125. Ray is an avid collector of crystal sets and would be interested if anyone has one laying around. Contact him through me at the usual address please.

## Listener reports

Luciano Marquardt G1VDW, of Hereford, has been listening hard, despite his new licence, and has logged 4N7ZZ, V3WW, LZ9A, CS0NH, NJ2L/P1 and V1CIT on twenty, while fifteen brought H24SA, ZZ5EG and 4Z2Q. He's now trying for the 'A' licence, so it looks like he'll be QRV on HF before long.

Joan Slater RS90400, of Matlock, is a relative newcomer to the listening scene, having started in 1986 with an FRG7 and upgraded to the R1000. She was very excited at having received the signals put out from the Aves Island DXpedition using their 4M0ARV callsign. She

logged them solidly from 1920 until 2115, but had to desert them for more pressing domestic matters. Joan is another listener getting in on the award hunt, so we look forward to much more news from her in the future.

Jim Lawrence of Halstead has been a listener from way back and started with a good old HRO set. Then, in the mid sixties, he went onto a Lafayette HF30 and joined the RSGB. Due to work commitments, the HE30 became the family wireless set, but now he's retired a nice new R2000 graces the shack, wired up to an end fed only twelve feet off the ground. However, he is now experimenting with RTTY and CW using the Spectrum computer, and hopes to re-learn Morse.

## Snake antenna?

Next to Shaun Imms of W Bromwich, who mentions a QSO heard between WB3ZS and AG30. During the QSO it was mentioned that WB3ZS was using a 'snake' antenna, and Shaun would like to know what a snake antenna is... anyone know? John is using an FT7B and would like to obtain some add-ons for it, so if you know of any, please drop me a line.

So to our award winners for this month. Colin Tait RS88825, of Lisburn, got in with his Silver claim for 500 prefixes heard, and some very nice stuff was listed too. A61, A92, AL7, CS2, CU3, FF2, HH2, HV3, J28, J73, TA3, V44, VP2, VU4, XT2, YC3, YT7, ZP6, ZZ5, 4S7, 4S4, 6W1 and 8P9 were just a few in the lists. The bands certainly seemed to be on the upgrade as there were a lot of fifteen metre catches in Colin's lists. Now he is chasing them for the Gold and the UBA annual contest.

Trevor Newstead RS87801, of Exeter, is no newcomer to these columns, but it's nice to see him on the awards list with his first claim for Bronze. A71, A92, AP2, CO7, C53, CP8, CU2, HH7, HK7, HV3, J37, J73, KZ2, KM9, LU6, PY6, TK9, TR8, V44, VS6, YC0, 8R1, 5H3 and

9Y4 already featuring in his logs.

Changing to the broadcast scene, a claim for this award came from Dr Harold Cones of Virginia, USA. Harold is president of the Great Circle Short Wave Society, which has its roots in the late 1950s when the American *Popular Electronics* magazine issued WPE numbers to short wave listeners who were interested in being part of a complete US Listeners' Callbook. Unfortunately, the idea was discontinued, but listeners holding the originally issued WPE numbers have got together to form the GCSS, which boasts over a hundred members. The principle interest is in the 'nostalgic' use of receivers of the period when the WPE calls were issued, so there are plenty of Hallicrafters, Heathkits, Lafayettes, HROs and other valve based receivers to be found in their shacks. Naturally, a lot of refurbishment has had to be done, and one item in their very interesting Newsletter relates the total rebuilding of an ancient receiver that had been subjected to flood water and was found to house a variety of animal life when a member dug it out of the mud!

## Tale of woe

Amongst the rest of the mail comes a tale of woe from Runcorn, where our friend AR Hawkins found a very weak signal around 24MHz. Digging out the frequency listings, he came to the conclusion that the only station that was likely to be valid was Falklands BC. After a 45 minute earache through Morse, TVI and other noises, midnight came, and the discovery, at last... a BBC Radio 2 harmonic! Incidentally, our slightly disgruntled mate is looking for a digital readout to use with the AR88D... any offers?

It's nice to see Dave Howes of Rochester back in the mailings. Dave went off for a while to pursue his photographic bit. However, the withdrawal symptoms were

such that he is back with a vengeance with another FRG7700, and has just lined up the Hamgear preselector that I reviewed last month and, after a few teething problems, is now pleased with the results. One thing any ATU likes to see is a good earth system at t'other end! One reader swears by the use of a good depth of peat with a salt base and some nice long copper rods! Dave has also mentioned the Gozo Award, which requires reception of stations on the island of Gozo, Malta. Full details are available from G Galea 9H4F, Greenfields, Triq Is, Sokkor 8, Kerzem, Gozo, Malta.

As regular readers remember, *Amateur Radio* helped enormously in giving birth to the International Listener's Association. The Association recently enrolled its 200th member and is growing steadily.

## Twinned clubs

As previously mentioned, I had a very nice letter from Dr Harold Cones of the GCSS. As a result of continued correspondence, the GCSS and the ILA have now 'twinned' as sister clubs, and are to exchange regular news and information, so we look forward to an interesting future of friendship with our colleagues on the other side of the pond.

Members of the ILA will also be able to meet each other at the Longleat Rally this year, where I shall be manning our stand. We'll be very visible this year, and I look forward to meeting any readers who are going.

Another development within the association is the formation of a local unit in the Blackpool area. There is quite a lot of SWL interest in that area, and Ivor Scott ILA191 has formed the local group. Plans are afoot for visits to local radio stations and other places of interest, so if you are interested in getting together with a few keen listeners, contact Ivor on (0253) 864555.

The White Rose Amateur Radio Society 7th LF Bands Contest results show many familiar names in the top entries. H Hofman NL8722 was top scorer with a total of 69,307 points, with J Martin, an unaffiliated listener, in second place with 62,549 points. ILA member Tony Blackburn RS87156 came a very respectable fourth with 51,740 points while another ILA member, Eddie Gauci 9H1-15357 came in at eleventh place with 18,664 points. The CW section was won by R Stanbridge RS31879 with 22,137 points.

**Poor conditions**

The WRARS reports that band conditions were not so good on 80m this year and stateside stations came to the rescue with increased activity. Some 280 US and Canadian stations were reported, which was an increase of 28% on last year. In all, 88 countries were logged on eighty, including a lot of Indonesian stations. 40m offered contestants some tasty morsels, with an opening to the Far East and Brunei, Korea, Hong Kong and Japan amongst the 89 countries logged on the band.

Top band offered an all time record of 50 countries logged, with CW bringing in JA5DQH and VK6HD, while XE1L and HP1XXO were to be found working the 73 Magazine's transmitting contest on SSB. All in all a very successful contest, and the organisers thank the contestants for their support.

Angela Sitton G1XEO, of Stevenage, has been playing with the key for most of the past month and, from words uttered by the examiner following her recent test, this will probably be the last time I'll be writing that callsign in the column. Well done lass!

Although the receiver has felt a bit deserted of late, Angie still managed to send in a few notes from the log. Lots of JAs were heard around 0900 on fifteen in mid-February and J28 (Djibouti) was heard on 15 a couple of times around midday (in the form of J28EM) in early March.

A nice logging was ZS6NPSA from the South African National Parks Jubilee on March 11th at 1650 on 15m. Twenty yielded a few nice ones, including VK6MA at 1400, YZ2LMS at 0041, KA4FTL and VE3EW at 2330 and ZD8RP at 1851, all during March, which shows how band conditions are improving.

When John Pearson G1FTU comes up with a new program for radio use, it is usually something a bit different from the run of the mill stuff, and his new slow scan television effort is no exception.

**SSTV program**

The program comes in a package of two cassettes, the first of which contains the transceive program proper. The program is able to transmit and receive in a variety of modes, and the mode chosen is displayed in a window to the right of the screen, together with other relevant information. However, as we are interested in the receive side, let's concentrate on that for the moment.

Loading the program takes about the average amount of time for a program of this type. Once loaded, you are presented with the familiar menu of options, from which you can select transmit, receive or receive only. The point about the latter is that, once selected, all transmit functions are lost, as you then have more memory for storage.

In receive mode, the mode

display gives the current values of brightness, contrast and sync detection and these are directly accessible during receive so that you can adjust the incoming picture. During reception, a picture can be stored instantly in one of five memories by simply pressing the relevant memory key. This gives a short bleep and the screen border flashes briefly.

If you wish to hold the current picture on screen without storing it, you can do so by pressing the BREAK key. To exit from this state simply press ENTER. To recall one of the memorised pictures, simply press CAPS SHIFT and the relevant memory number. ENTER returns you to the normal receive mode. Instant printout of the picture being received or of the stored pictures is possible using COPY, and the program is again put into a hold situation until the picture is transferred to the printer, when ENTER restores the receive mode. The program works as standard with the Alphacom or similar printers, but it is possible to use other printers and John will be pleased to supply the program modifications for various printer/interface combinations.

**Using the program**

I tried the program on the 48K and 128K Spectrums with no loading problems. As with all data type reception, a reasonably strong signal is required, but on the very first attempt, using the Yaesu FRG7700 and G5RV for reception, I received a transmission from HA6VV, despite a contest being in progress on the band, and this was followed by another from IS0XRI which, although badly corrupted by close SSB signals, was readable. As a receive program, it was quite excel-

lent and a lot better and easier to use than some programs I've seen (see samples below). John does supply sample 'off air' signals to enable you to check that your equipment is set up correctly, which is helpful.

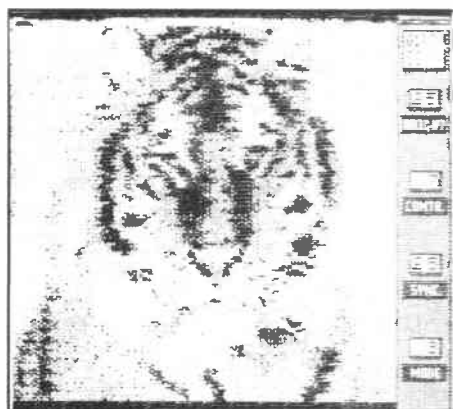
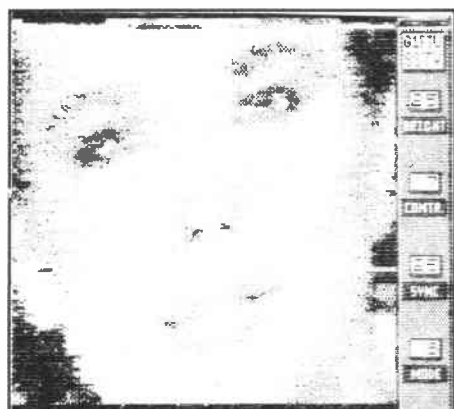
To mention the transmit side briefly, I am doubtful whether this is really true SSTV as we understand it as, in effect, it is really data transmission that can be performed by any parties using a computer and suitable software. Some time ago, I mentioned experiments using programs for data transmission, which led to the development of a transmit/receive interface.

**True SSTV?**

Using that system, blocks of script or pictures were transmitted and received very successfully by those taking part in the experiment. This program provides screens for use in transmission, but these are simply blocks of data. I'm of the opinion that, they are away from the principle of transmitting live television, but if you think differently I'd like to hear your comments.

As a program, I can find nothing to fault it, and it comes personalised for transmit use. As a receive only program it is excellent and worth the asking price for that alone, in my view. The program is available from Pearsons Computing, 42 Chesterfield Road, Barlborough, Derbys S43 4TT.

Last month I mentioned the simple Vega 242 receiver and suggested that it was very good value and a good way of getting into listening cheaply. I have since obtained one of these receivers and have been putting it through its paces using its own aerial and a 'long wire'. Next month I'll give you the results.



# Thanet Electronics is dead LONG LIVE ICOM (UK) LTD.

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

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



To celebrate our name change we are offering to those persons who selected the following badge numbers at N E C this year a gift from the ICOM range. To claim your prize just send your winning badge to ICOM (UK) LTD and we will send you the fantastic ICOM Micro 2, 2 metre handportable. Naturally this does exclude those persons who already claimed their prize at the N E C. The numbers are 1271 2751 3200. This summer ICOM (UK) LTD will be one of the sponsors for Richard Branson's Transatlantic Balloon Challenge. They will be using ICOM communication equipment.



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

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

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

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

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

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

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

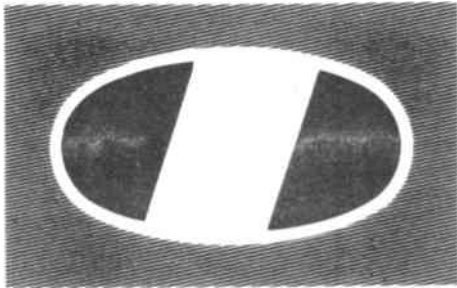


## ICOM 70cm Promotion

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

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





# ICOM

## THE HOTTEST ITEMS THIS SUMMER

### VHF/UHF FM Handportables

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

### Micro 2E/4E

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

### IC-2E 2 metre Thumbwheel Handportable

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

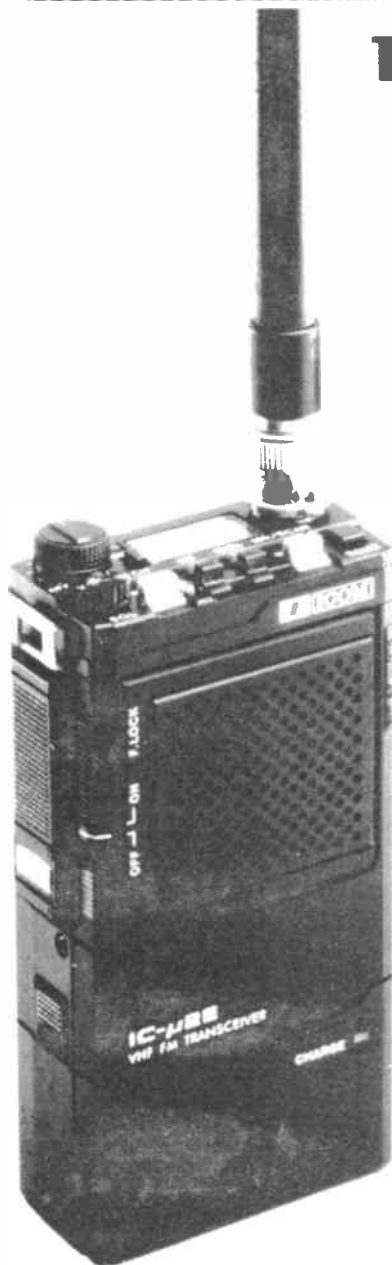
### IC-02E/04E 2 metre and 70cm Keypad Handportable

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

### IC-12E 23cm Handportable

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

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



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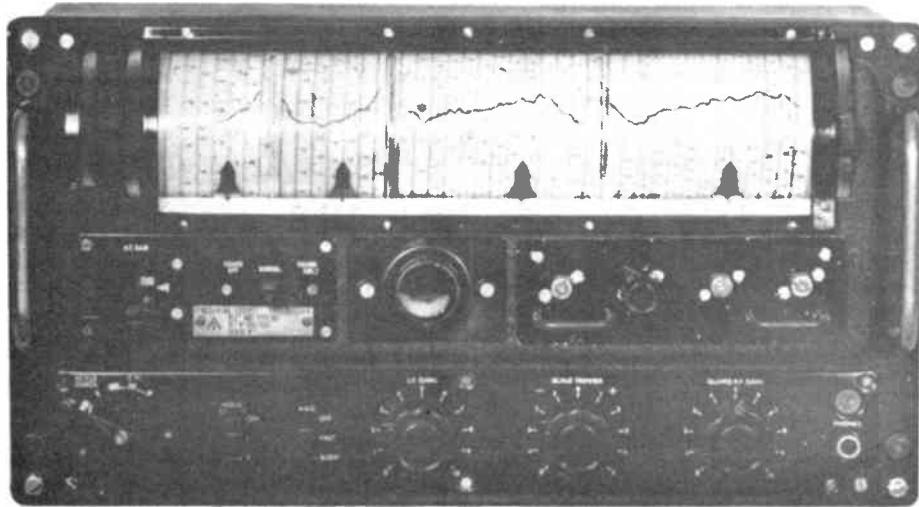
## Datapost



**ICOM (UK) LIMITED**  
Dept AR, Sea Street,  
Herne Bay, Kent CT6 8LD.  
Tel: 0227 363859.

# THE R1475

The underestimated receiver



For some reason the R1475 has never been very highly regarded by amateurs, yet it is capable of a performance which, particularly on CW, will match or exceed that of other more popular receivers from the same era. Even today, the performance of the R1475 can justify its place on the shack bench either as a general coverage receiver, or as part of the main HF equipment for operators who wish to set up an effective station at minimum expense. Even so, the R1475 can normally be purchased for less than £20 and frequently at half this figure.

## Original application

The R1475 was introduced into RAF service shortly after the end of WWII as a general purpose ground station receiver for the reception of CW, MCW and Amplitude Modulated transmissions.

The equipment covers a frequency range of 2 to 20MHz, plus a further 'guard channel' in the range 2 to 7.5MHz. The sensitivity is better than 1 microvolt for

10dB signal to noise throughout the frequency range.

The frequency is indicated on a drum type dial extending for almost the full width of the receiver and which provides a scale thirty feet long. Of this, the two lower bands each occupy five feet and the upper bands ten feet.

This scale is calibrated at ten kHz intervals throughout its range, the marks being at about one eighth inch intervals at high frequencies, and more at lower. A reset accuracy of 2kHz below and to 4kHz above 11MHz is therefore possible. Dial alignment may be checked by use of an internal calibration oscillator. Tuning is accomplished by means of edge mounted controls to the left of the dial assembly, whilst the waveband control is on the right.

Beneath the dial assembly are two rows of controls, the upper row comprising (from left): dial lock; RF gain and guard channel switch; guard channel unit with oscillator tuning; and

preset trimmers for the oscillator and RF bandpass tuning. The lower row comprises: system; noise limiter and AGC switches; LF gain; scale trimmer; and guard channel RF gain controls. A 'magic eye' tuning indicator is located in the centre of the upper row of controls.

Four selectivity positions are provided by the system switch: 300Hz; 1.2kHz and 3kHz for CW; and 5kHz for telephony operation, these being obtained by a combination of IF and AF filters. Three position AGC and noise limiter switches are fitted, the former giving the choice of off, short and long time constant and the latter, two levels of suppression.

In common with many other armed forces receivers, the audio output level is relatively low, giving only about 150 milliwatts. This, however, is quite adequate to drive headphones or even a small loudspeaker.

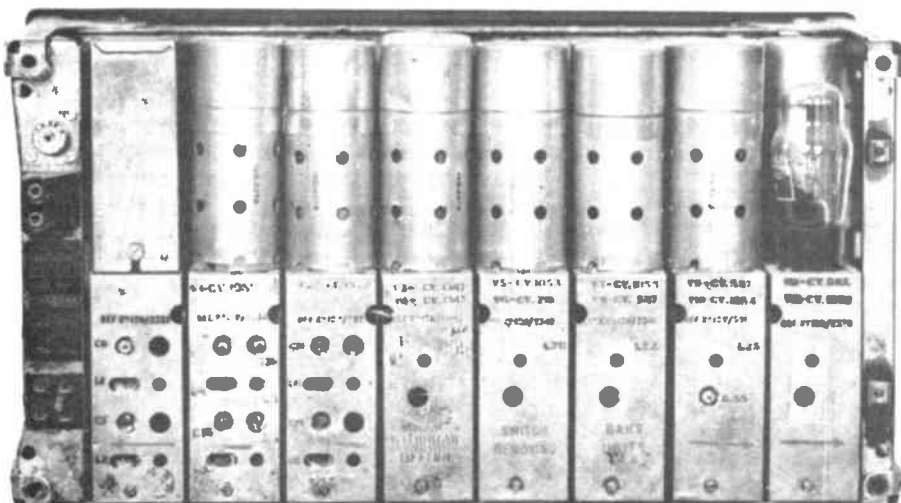
## The circuit

The R1475 employs a total of thirteen valves, ten of which form a conventional single superhetrodyne circuit with amplified AGC. The additional valves are: a voltage stabiliser; the guard channel frequency changer; and a magic eye tuning indicator. All thirteen valves are international octal types whose 6 volt heaters are wired in 'series pairs' across the 12 volt heater supply.

The signal enters the main receiving channel through one of two aerial inputs, either the coaxial socket (50 ohms impedance) or the terminal block, which is nominally 500 ohms. This is then coupled to a tuned RF stage using an EF39 RF pentode followed by a 6K8G triode hexode frequency changer operating in conjunction with a temperature controlled local oscillator using a separate 6J5G triode. These are succeeded by: two EF39 IF stages at 601kHz; a 6Q7 double diode triode AGC detector/amplifier; a further 6Q7 as the signal detector/Beat Frequency Oscillator; an EB34 double diode noise limiter; another 6Q7 as AF amplifier/RF gain control delay; and a 6J5 as the output stage. A VR150 neon stabiliser provides a stable 150 volts for the RF oscillator.

The BFO operates on the low frequency side of the intermediate frequency and is crystal controlled on 600kHz. It will therefore also function as a calibration oscillator in conjunction with the front panel 'scale trimmer' control. Use of this technique, however, leads to one of the disadvantages of the receiver for amateur use, for, when receiving SSB, only the lower sideband can be resolved, thus limiting operation on the DX bands above 10MHz to CW. The scale trimmer is a small variable inductance which is tapped across a section of the oscillator tuning

Rear view of the R1475 - note mod to aerial socket





inductance.

Three functions are controlled by the five position 'system switch'. These are selectivity; BFO switching; and circuit changes for scale calibration. In the first position the receiver is configured for AM reception with the BFO switched off and selectivity at broadest. The second position switches on the BFO and a connection between the BFO and the RF stage to provide a scale calibration signal. The remaining three switch positions are for the reception of CW, in which the BFO remains operational but the connection to the RF stage is open circuit. Additional IF selectivity is inserted and the audio filter is brought into circuit to give 3kHz, 1.2kHz or 300Hz overall bandwidth.

**The guard channel**

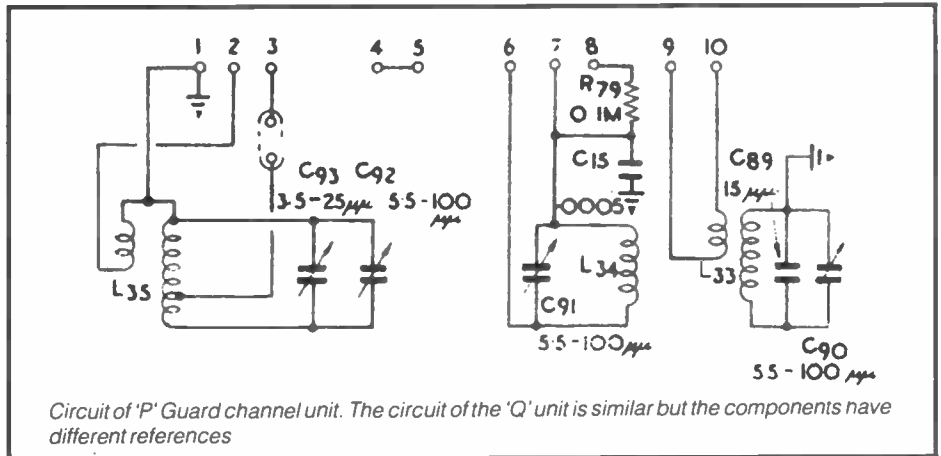
The guard channel utilises a separate 6K8 frequency changer, and a unit which plugs into the front panel containing the tuned circuits and the crystal which determines the secondary frequency. Two different guard units are available: unit 'Q' (Tuning Unit Type 132), which covers 4.1 to 7.5MHz; and 'P' (Tuning Unit Type 131) for 2.0 to 4.2MHz.

These may be made tunable by short circuiting the crystal socket. By adding capacity across the tuned circuits, the 'P' unit may easily be modified to cover the 160 metre amateur band. As no RF amplifier is used on the guard channel, sensitivity is lower, but is still adequate for most 160 metre operation.

The output of the guard channel frequency changer feeds in parallel with the main frequency changer to the common IF and later stages. A switch selects the use of either main, guard or both channels simultaneously.

**Construction**

The construction of the receiver follows a practice which was unusual at the time of manufacture but, with solid-



state techniques, has become quite common today. It comprises a 'mother board' to which is attached the front panel, the tuning capacitor and tuning scale, and into which plug eight separate units, each of which carries one or more stages of the receiver.

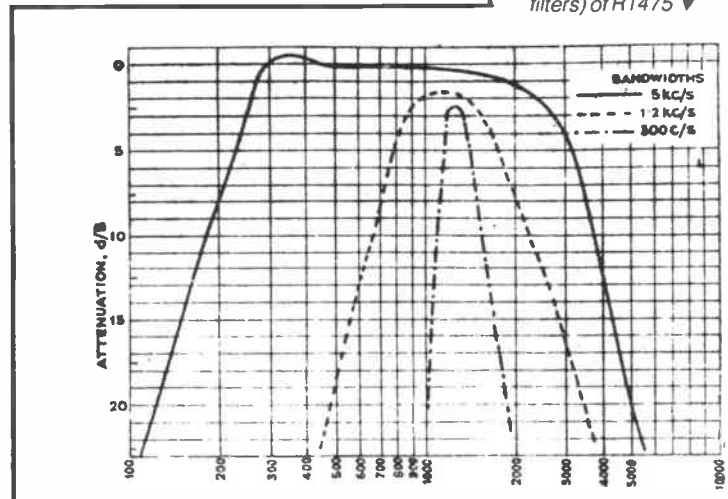
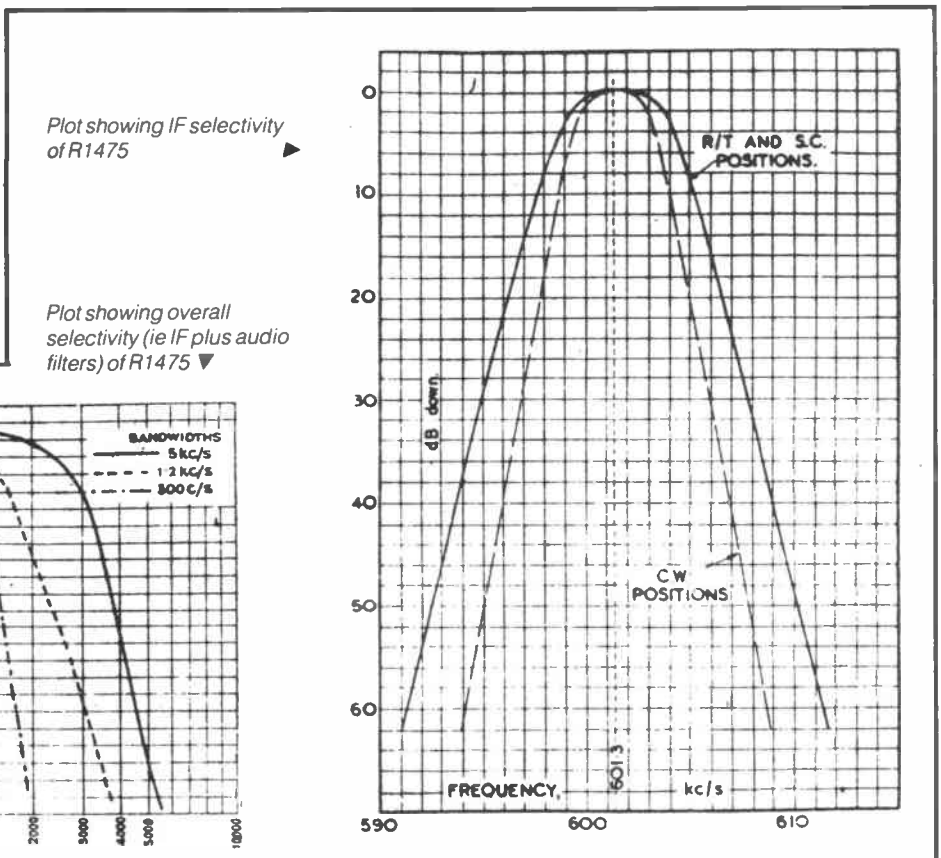
**Wafer system switch**

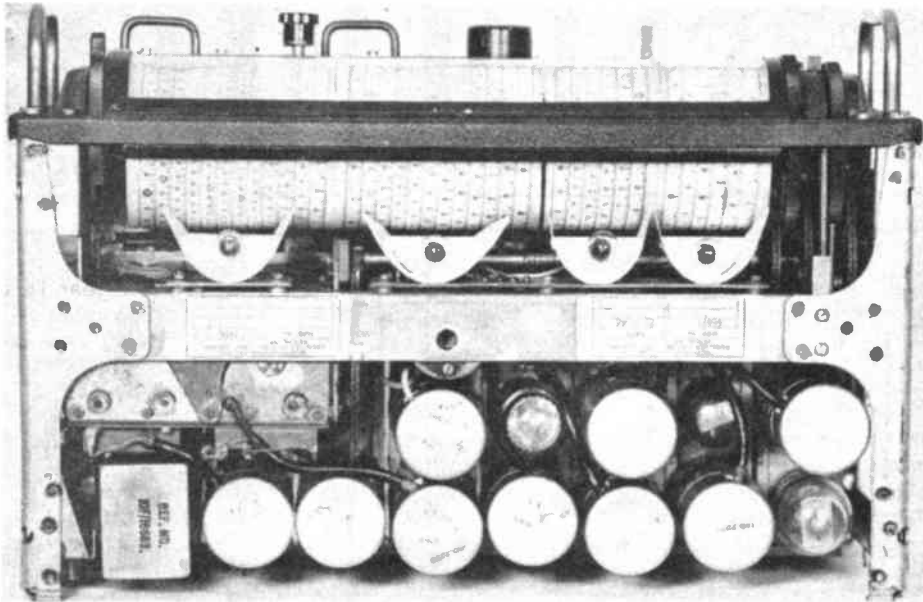
The four left hand units also contain a wafer of the system switch controlled by a bar which passes through each unit. Similarly, the three right hand units each contain a wafer of the wave change switch controlled by a bar passing from the right hand side of the receiver.

Before any attempt is made to remove any of these units, the appropriate bar must be removed, otherwise serious damage will result.

There are several advantages with this type of construction, the main ones being ease of manufacture and field repair by replacement of units, but to the amateur, the most important is probably the excellent internal screening which it provides.

All audio outputs are intended for 600 ohm loads, an unbalanced 150mW being available at the front panel jacks and the upper 4 pin Jones socket, and a balanced 3mW on the lower Jones socket for





A top view of the R1475

connection to telephone lines.

Power is applied to the four pin Jones plug, and for operation the receiver requires power supplies of 12 volts at 1.8 amperes for the valve heaters and an HT supply of about 250 volts at 65mA. One side of the heater supply is earthed within the receiver, but the HT negative line forms part of the biasing circuits and is below earth potential. The negative line of the applied HT supply should therefore be 'floating', but if earthed to the case of the power supply unit, great care should be taken that the case of that unit and the receiver are well insulated from each other.

The difference in potential between earth and HT negative is only a few volts and is unlikely to be dangerous to the operator, but if it is short circuited it will affect the operation of the receiver.

### Valve Base Connections

PIN	EF39 (CV1053)	6J5 (CV1832)	6K8 (CV1347)	VR150 (CV216)	6Q7 (CV587)	EB34 (CV1054)	VI103 (CV1103)
1	M	-	M	-	-	M.S	-
2	H	H	C	H	H	H	H
3	A	A	A	x	A	A2	A
4	G2	x	G2	x	D2	C2	T
5	G3	G	Go	A	D1	A1	G
6	x	x	Ao	x	-	x	x
7	H	H	H	x	H	H	H
8	C	C	C	x	C	C1	C
TC	G1		G1		G		

#### Key

M - Metallising  
 S - Internal Screen  
 -- Pin fitted but no internal connection  
 x - No pin fitted  
 A - Anode 1  
 A2 - Anode 2  
 Ao - Anode of oscillator  
 C - Cathode  
 C1 - Cathode 1  
 C2 - Cathode 2  
 D1 - Diode 1 anode  
 D2 - Diode 2 anode  
 G or G1 - Control grid  
 Go - Grid of oscillator  
 G2 - Screen grid  
 G3 - Suppressor grid  
 H - Heater  
 T - Target

### Modifications

Possibly due to low cost of the R1475, many modifications have been suggested over the years. There is not space to describe any of these in detail, nor is it appropriate to this article, but readers may be interested in some which have been successfully applied. One of the most common has already been described, that being the modification of a guard channel unit for 160 metres.

When a guard channel unit is not available, many have blanked off the panel aperture and transferred the RF gain control function to the, now unused, guard channel RF gain control. It should be noted that if the guard channel 6K8 frequency changer is removed, however, an 18 ohm resistor must be wired across the heater connections (pins 2 and 7) in order to retain the balance of the heater line.

This can most conveniently be done by removing the glass envelope from a defunct octal valve and wiring the resistor across the appropriate valve pins and plugging into the 6K8 valve holder. S meter circuitry has also been incorporated by removing the magic eye tuning indicator, using the now unused

### Connections to Jones Plugs and Sockets

**SK1** - Pins numbered  
 13 - relay keying  
 14 - 600ohm high level output  
 15 - earth  
 16 - output low level

**SK2**  
 13 - RF AGC  
 14 - balanced output, low level  
 15 - IF AGC  
 16 - balanced output, low level

**P1**  
 13 - earth  
 14 - 12 volts to heaters  
 15 - negative HT  
 16 - positive HT

valve holder for a 6J5 triode to drive the meter.

To enable SSB to be received on 20 metres, some operators have added a further switched BFO crystal on about 603kHz.

### Operating the receiver

To anyone unused to the R1475, at first it seems an ungainly beast, for few of the controls are where you might expect them. However, very quickly it will be realised that considerable original thought has gone into the front panel design and in the author's humble opinion, it is one of the most, ergonomically designed receiver panels ever manufactured.

Consider sitting facing the receiver and receiving a signal. For most people their right hand will be occupied either writing the text of the message or filling in the logbook. Any minor tuning adjustments will therefore have to be accomplished by the left hand. For this reason the tuning control is to the left hand side of the receiver, as is the edge mounted RF gain control. It is this which will need to be adjusted to compensate for varying signal strength, and automatically falls under the left thumb. If further adjustments are necessary, the controls are in descending order of importance from left to right, ie system (bandwidth), noise limiter, AGC time constant, AF gain and scale trimmer.

The tuning scale design is not unique, but nevertheless may be unfamiliar to many readers. The scale itself is a spiral line drawn upon a cylindrical surface divided into four frequency ranges, the axis of the cylinder being horizontal. The scale lighting is controlled by the range switch so that only the part of the scale corresponding to the selected waveband is illuminated. A transparent window carrying an individually calibrated cursor line is fitted close to the curved surface of the scale. The frequency setting is indicated by the intersection of the frequency scale and the cursor line. Four metal flags (one for each range) are fitted near the bottom of the scale, which, as the scale is rotated, move horizontally along a further fixed scale to indicate the whole number of megacycles.

Although each scale is individually calibrated, minor errors can occur. These may be minimised by switching to the scale check position of the system switch and tuning to the calibration point nearest to the frequency in use and correcting any error using the scale trimmer.

### Conclusion

The R1475 receiver has one or two slight disadvantages compared with some other receivers of the period, but when current price levels are considered, and particularly when CW is the main mode of operation of the station, it can provide an effective economic solution for the minimum expense station.

The receiver illustrated has been beautifully restored by Peter Haynes G8MGZ.

# G3OSS – A PROFILE

by Ken Michaelson

Angus McKenzie is a man who has overcome a disability of such a nature that it could have completely altered his way of life. Angus is blind, but having said that, the first point he made to me when we met was that he refused to allow it to make any difference to the way he lives and works, which was proved to me during our discussions.

Angus was born in London, in Maida Vale, on 24th September 1933. He attended St Paul's School, and by the time he reached his early teens, he had decided to specialise in mathematics, physics and chemistry. He was a brilliant student and had his own laboratory at the school and was the only boy to possess a key to the poisons cupboard. Amongst his many interests was a love of music, and while he was a student in London he led the basses in the church choir, singing on an average twice every Sunday, as well as playing the violin in a string quartet. He used to be a very good sight reader before his vision went, and singing in the church choir brought him a love of the organ.

It appeared that he had been having trouble with his sight for some time, although it made no difference to his studies, but about this time the vision went in his right eye, and he could only see out of the left hand side of his other eye. Because of this he had an unfortunate accident: he knocked over a bottle of sulphuric acid. The mess was cleared up and nobody said anything, but a few days afterwards the accident was repeated, which upset him to such an extent that he rushed out of the laboratory to the science master and told him that he could not continue with his studies.

Eventually it was decided that he would go to the Imperial College to continue his studies in engineering drawing, but this course was also doomed, as Angus found it impossible to carry out as, in order to see, he had to get within two to three inches of the paper. It grew too much to bear, and so he came home and decided to give up the idea of obtaining a degree. However, the authorities at the College told him that, although they could not award him a degree under the circumstances, any time that he wanted a reference they would be pleased to certify his qualifications. He took advantage of this promise later in his career when he applied to become a member of the Institute of Electronic and Radio Engineers, where he was later invited to become a Fellow.

It was at this point that his father died and Angus wondered what he was going to do with his life. He had been experimenting with tape recording for some time, and at about the same time that he was forced to leave Imperial College, he had a most astounding offer.

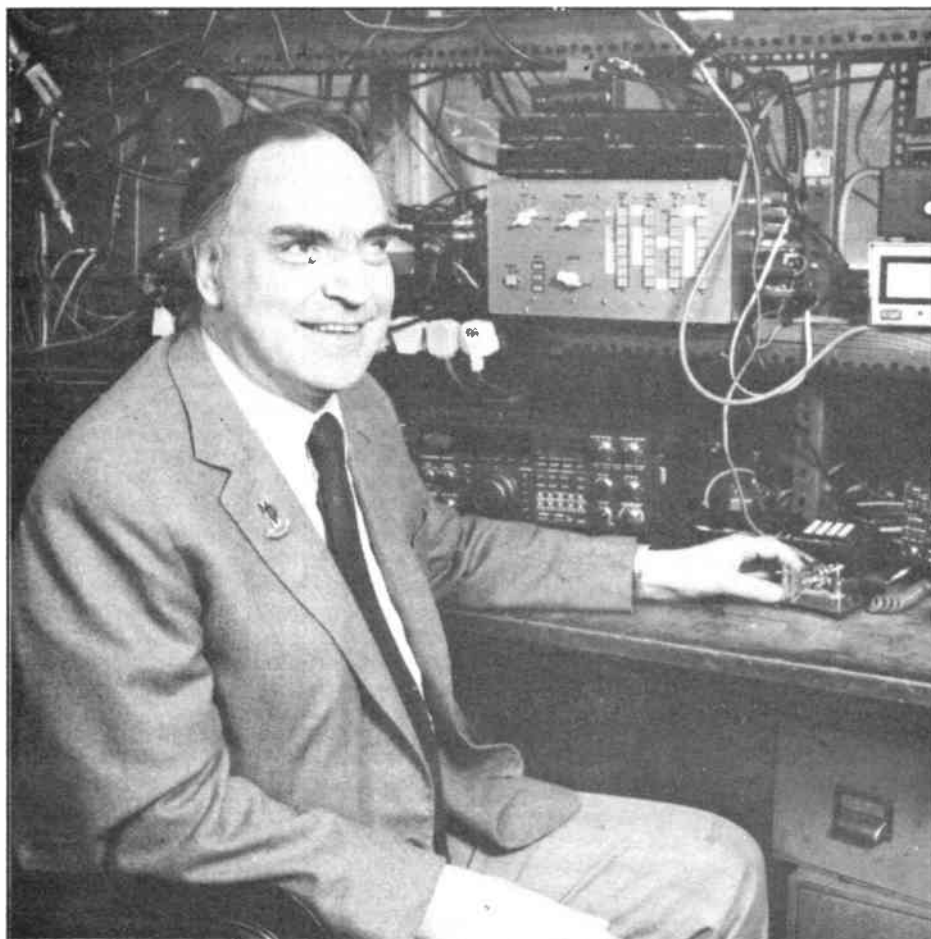
Someone told him that a large recording studio had gone into liquidation and that the Official Receiver wanted to sell its equipment as a job lot. He went to see it and then went to his legal trustees and persuaded them to allow him £1000 from his father's estate to set up in business. He offered the Official Receiver £700 for the job lot, and although he considered that it was rather a low offer, he contracted in writing to completely clear the premises. Under these circumstances the Receiver agreed to the sale, and Angus got organised with a few friends.

There were several back breaking weekends, but they completely cleared the place, his mother nearly having a fit when he arrived home with a large

furniture van full of recording equipment. It was obvious that he would have to move quickly, so he rented a flat in Belsize Park to house all the gear. This was in 1955. In 1956 he went to Vienna with a Vortexion recorder, to help Hungarian refugees making recordings for the United Nations. He also interviewed refugees and played music for them that the State would not allow them to hear.

When he returned from Vienna he heard of someone offering a tiny recording studio in Fulham for sale. The man concerned was Larry Lyons, who was blind, but had been in sound recording all his life. As Angus knew he would lose his sight completely sooner or later, he asked Larry to help by





teaching him the tricks of the trade for when he went blind himself. Larry stayed for a year, and was absolutely invaluable to Angus.

Time went by and Angus made lots of recordings, usually 78s but some LPs as well. One day he found an advertisement in a newspaper which said 'Synagogue for sale. Would make excellent art gallery or sound studio'. It was quite convenient, being situated near Baker Street, and he became quite interested in this building as he knew something about it that the selling agents did not. Apparently it had been the French Chapel Royal in the eighteenth century, and he knew that the French royalty who used it had had a basement built there. The selling agents weren't even aware that the basement existed! Angus bought the place, found the trapdoor and built stairs down to the basement. He redesigned the place acoustically, since he was familiar with acoustic design from his studies at Imperial College, and the studio was ready in the winter of 1958. Within two years he was recording more commercials and soundtrack for TV than any other studio, in fact about 40 per cent of the market. But in 1959 he went blind . . . .

During this time he had become engaged to Fiona, his wife, who came from Glasgow. He had met her at the meetings of the English Speaking Union and in 1959, before his sight finally went, they got married. There was a two week

honeymoon, and immediately on his return Angus went into hospital for what turned out to be abortive efforts to save the sight of his left eye. He remained in hospital until 1960, and during this time had many visitors, one of whom was Dick Grubb. Dick, being an enthusiastic amateur, suggested that Angus might take up amateur radio as a hobby. Angus had always been interested in short wave receivers and the like and, in fact, helped in the operation of the amateur radio station at Imperial College, call sign G5YC, which was then operated mainly by Dick Grubb, G3FNL. So, he decided to go in for the Radio Amateurs Examination, the well-known RAE. This had to be an oral examination, of course, but naturally he passed.

When he was asked for his choice of the call letters which were available, he decided on G3OSS, to stand for 'Olympic Sound Studios', which was the name of his recording business. He could not have this call immediately, so he accepted G3ORS, which were the letters of a radio club he intended to form, 'Olympic Radio Society'.

In the event the club did not come into existence, and in due course G3OSS became available. The letter containing permission to use this call came through some days before Christmas 1960, but Fiona withheld it from Angus and presented it to him as a surprise on Christmas day!

Angus started his transmitting operations using an old RCA AR88

receiver, and a Hallicrafters HT37 as a transmitter. He also had a special audio 'gimmick' to tune up and dip the PA. Many fellow amateurs used to hear this odd noise on the bands and say 'Oh, that's old Angus tuning up!' A far cry from today's transceivers, many of which incorporate a synthesized speech module which will announce the displayed frequency and mode.

The AR88/HT37 set-up gave way to the Collins S line with the well-known 30L1 linear, but Angus currently uses the Trio TS940S and has gone in for QRO (high power) VHF working.

As far as the HF bands are concerned, these are covered by a TH6DXX beam and trap dipoles, made by Angus in a special way, are used for the lower bands. He has used his knowledge of audio transmission lines to obtain the best impedance match between the trap and the end of the dipole.

## The first amateur to make a transmission in stereo multiplex on 2m

He was in the vanguard of HF mobile working and I well remember hearing him working a VK one morning, while driving to work, when he was transmitting from his car on Hampstead Heath. Angus also recounts the story of going to Folkstone for a weekend. Fiona had parked the car on the cliff top and he had called his friend, saying he wanted to show him something. Switching on the rig in the car, he joined a QSO with two VKs and a ZL (two Australians and a New Zealander), much to the amazement of his friend.

During this time Angus had moved from HF operation to VHF and UHF, and all the antennas to enable him to operate at these frequencies were mounted on the various chimney stacks of his house. He has a professional antenna erection firm to maintain the various arrays, and by the look of them they need it! At the start of this foray into VHF and UHF, Angus did have some trouble with his neighbours, who apparently objected to the appearance of the house with the various antennas on top, and he eventually received a visit from the Residents' Association (something all amateurs dread!).

However, it was all cleared up in the end, and he is now operational on all available amateur bands up to 2.3GHz. He has also won many awards in this part of the spectrum, including the Senior Award for 2 metres, 4 metres, 70cms and 23cms. In order to get the 'Supreme Award' one has to have three Senior awards and, of course, Angus has four!

Just in passing, he told me that he was the first amateur to make a transmission in stereo multiplex on 2 metres. This took place in 1969 and was received perfectly in South London. He has been experimenting with AMTOR, a method of keyboard transmission and reception

## G3OSS — A PROFILE

similar to RTTY, but with a built-in error correcting facility. Naturally, he is able to use the keyboard to transmit, but is looking for some sort of computer program which will decode the ASCII characters being received and convert them into speech. For AMTOR working he uses the famous AMT-2, coupled to a BBC computer. At the moment all operating in AMTOR is carried out by one of his friends, Andy G1JHM.

Between 1960 and 1965 Angus was running a large recording studio, but after doing this for five years he came to the reluctant conclusion that it was too much for a blind man and sold out. In the meantime, he had already opened a hi-fi and record shop in St John's Wood, north west London, called 'Roundabout Records', so he opened another shop in Hendon. The shop in St John's Wood was finished off by the no parking double yellow lines, but the one in Hendon prospered.

However, Angus was not satisfied. He had a desire to get back to the recording business, so in 1968 the Hendon shop was disposed of and 'Angus McKenzie Laboratories Ltd' was born. At around the same time he re-established himself in writing for the technical press. His laboratories, recording equipment and filed master tapes occupy several rooms of his house in London, and he has a collection of some 7/8000 LP records.

The organisation of Angus McKenzie Laboratories prospered, the profits from the business being ploughed back again in the shape of very sophisticated and specialised equipment. Angus admits to charging high fees for his services, but points out that the amount of test apparatus available for use and the fact that he and his colleagues have a vast amount of experience between them in this field warrants it. I must admit that I was very impressed with what I saw.

### In 1979 he was awarded an MBE for services to the industry

Many will have read with interest the highly informative reviews which have been printed in various magazines under Angus' name, and possibly taken his information as the deciding factor when buying a new piece of equipment. With this in mind he has written a book entitled *The Buyer's Guide to Amateur Radio*, which brings all this information together and is available from the RSGB.

In 1979 Angus was honoured by being made a Member of the Order of the British Empire (MBE) for services to the audio industry. He leads a very full life, and finds time to attend meetings of a number of societies, notably the RAIBC

(Radio Amateurs Invalid and Blind Club), and he has recently become a member of the Verulam Amateur Radio Club. Just as a final means of occupying his time (!), he has been elected a member of the Council of the Radio Society of Great Britain and is also on the VHF committee. His wife Fiona is obviously supportive, and now the children are grown up she takes a greater part in the day to day running of things. Angus has also retained one or two young men at a time as assistants, released from University to study business operations as a part of their sandwich courses, and I would think that they leave Angus McKenzie Laboratories with a very great knowledge of audio and radio equipment. He is always willing to help any other radio amateur should he/she ask, but, and this is a point he was very definite about, should they decide to telephone, it must be in the evening. Angus runs a business, as you will have gathered from what I have said, and he has not the time to answer queries during the day.

All I can say in conclusion is that I left his home with a feeling of admiration for the man who had not only overcome a great disability, but had done so to such an extent as to have had two flourishing businesses in his career, with the second one growing all the time. Good luck Angus.

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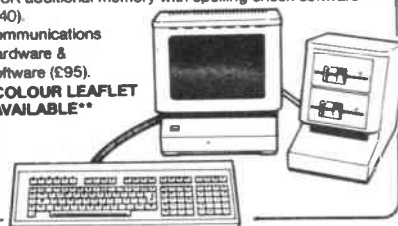
- \*DATABASE — allows information storage & retrieval by user-selectable criteria.
- \*EDITING — including easy reformatting, global search & replace, save & move, cursor control etc.
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- \*KEYBOARD — low-profile keyboard additionally has 43 clearly marked dedicated function keys.
- \*DISC DRIVES — dual SHUGART 5 1/4" DSDD drives each 430K capacity formatted. **£296.00**

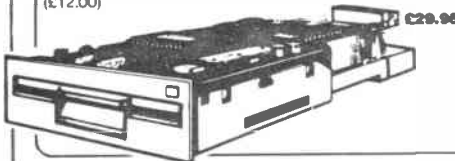
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## MITACHI Model 305S/8X 3" disc drives.

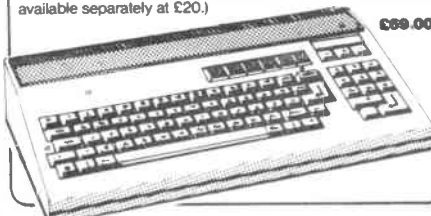
With SHUGART compatible interface (34 way edge connector) and suitable for BBC with DFS. AMSTRAD 664/6128, TATUNG EINSTEIN & many others. Will usually replace 5 1/4" drives directly. 250K (double density unformatted) per side reversible; 40 track; standard power connector for 12V & 5V; overall power consumption typically 3.7W. Supplied BRAND NEW with connector pin-out details etc. but uncased without PSU. Data cables are available for AMSTRAD & BBC (£7.50) and an installation pack including data & power cables with instructions is available for the TATUNG EINSTEIN (£12.00) **£29.95**



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\*VAT & CARRIAGE must be added to all items. Carriage is £3.00 + VAT for 3" disc drives, and £10.00 + VAT for most other items.

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# 50MHz

# What to

The big news for 50MHz enthusiasts recently was the opening speech at the RSGB National Convention by Mr John Butcher MP of the DTI, stating that they would be studying the RSGB's submission on 50MHz regarding further relaxations, and look sympathetically at class B access to the band. Linking 50MHz to access at 70MHz was also mentioned. Once the current discussions with the RSGB are concluded a further announcement will be made, and I hope to be able to bring you some more news soon.

On the subject of transatlantic auroral effects, Charlie Newton G2FKZ (RSGB Propagation Studies Committee) recently wrote to me saying 'I was very interested to read about the 50MHz long range transatlantic auroral effects in the March issue, as I feel that I can offer an explanation for what happened. The theory I am going to explain is not the only one, but it's the one that fits my data the best, so I like it!

'Firstly, this is not something new. For many years American amateurs have reported long range openings on 50MHz coast to coast when aurora has been about. In my records I have many reports of television reception in the old VHF bands I and III during, just before, or just after the main auroral event, again using frequencies around 50MHz. The reception was very good, particularly from Iceland and northern Norway, so how does it happen?

'Initially we must understand how the earth's magnetic field is formed in space. It is compressed on the sun's side due to the pressure of the solar wind, and is elongated on the tail side. However, there is a 'cleft' over the auroral oval where there are, in effect, few field lines. So, what we have in effect is a hole (see Figure 1).

'Now, it so happens that if negatively charged particles leak into this region they can penetrate down to the outer atmosphere. This effect was first noticed

at the Thule laboratory in Northern Greenland. Sporadic E, known as Thule type sporadic E, often resulted because of this leakage. However, it is not quite as simple as this. First the energy needed to push the electrons into the cleft is reasonably high, so it is when the cleft is looking at the sun, ie midday, that the particles have the energy to get in.

'There is also the interplanetary magnetic field which must be taken into account, and most aurora occurs when this is southerly, so from our point of view the coupling is important. Remembering that unlike poles attract, and that the earth's magnetic field is at an angle to the geographic poles, there are seasonal times when the coupling is better. For American amateurs the latitude of the auroral oval is much more south in the states than here, so more stations are available to make contacts.

'Now, if we can accept that electrons can get in at the cleft, then due to the magnetic and electric fields that exist in the high atmosphere, a drift of the electrons will occur easterly, so they will come our way. As it so happens the magnetic field is weakest around midnight, so we now get deeper penetration of the electrons through the atmosphere into the ionosphere. However, the precise energy level is now all important. If the energy is too high they go through the E layer to the D and cause massive absorption, but it does happen at times that the energy level is critical only for penetration to the E layer (about 10 kilo electron volts), so sporadic E can form. In practice it is about the midnight sector that has the best chance of occurrence (see Figure 2).

## F2 clouds

'It has *not* been proved, but it is in my mind quite feasible to say that if energy levels are right, then there is no reason why we should not see F2 clouds at times. The reason why this is new to the European amateur is simply that we have not - up to now - had a suitable band for this mode of propagation! In all the thousands of records that I hold of 144MHz aurora contacts, I only know of one that *may* have been associated with this type of sporadic E propagation. So the critical energy levels seem to be such that 50MHz could well be the frequency that will be most affected.

'The report of SM6PU of K1TOL is very interesting, but I would point out that it fits the time pattern we would expect in order to get the ionisation patches over the Atlantic, and the auroral oval is farther south the more westerly you go, so it is more likely. Unfortunately, for the European amateur, the oval is just south of Iceland, so the sporadic E effects will be well to the north, but if we are honest we do not know what the limits of the

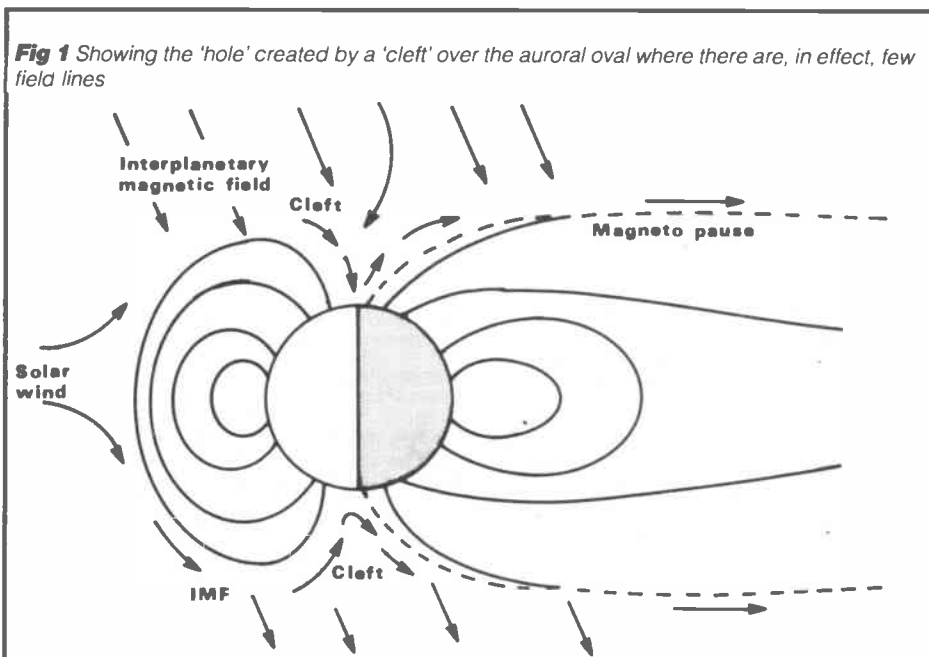
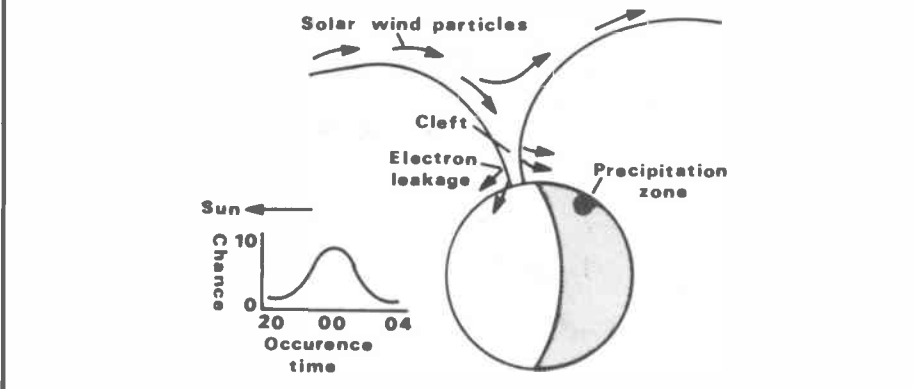


Fig 1 Showing the 'hole' created by a 'cleft' over the auroral oval where there are, in effect, few field lines



# Expect.....

by Ken Ellis G5KW

Thule electron precipitation are.

'Perhaps I ought to say finally that at 50MHz there are other modes where very long range F2 contacts may be possible just prior to auroras, but that is another story (perhaps you will tell us one day Charlie)!

## Transequatorial propagation

During the run-up to the peak of sunspot cycle 18 from 1946 onwards, a form of long distance propagation was discovered around 50MHz between stations equi-distant and at right angles to the geomagnetic equator. These could not, at that time, be explained by known conventional propagation theories. In America during 1947 XE1KE began working Argentine stations on 50MHz during the afternoon and early evening hours, with over 50 contacts with LU and OA4. The LUs also worked TG9JW, CE1AH and PY2QK.

Before WWII the author, as MD5KW, was serving with Royal Signals at the Army Wireless Chain Establishments in the Suez Canal Zone of Egypt, and had the time and facilities to conduct extensive monitoring.

Consistent reception of All India Radio Band I TV, harmonics of services and commercial stations established that there was a potential for long distance propagation on the north-south path across the equator around 50MHz.

To explore this probability, a beacon station was constructed for operation on 50 and 58.8MHz, with a power output of 50 watts into a home constructed four element directional array. This set-up was powered by a modified RAF prop-pitch motor, changing north-south direction at thirty minute intervals. Loan of a cabin and an obsolete 50 foot wooden radar tower, which was installed near the sleeping quarters at the officer's mess, was also obtained.

The beacon started operating early in 1946, and in addition a continuous listening watch was kept for crossband replies on 28.100 at the remote signals receiving station a few miles away. An ideal arrangement for the situation.

## Reception reports

During the remainder of 1946 and early 1947 several reports of reception were received from Europe and South Africa, including reports from German stations DEM6753, DE8923 and DE8291. I wonder who and where they are now? Any information would be appreciated. Regular monitoring was also being carried out by G5BY, G6DH, G6XM, G2AOK, VQ2PL, ZS1T, ZA1P and others, but no contacts were made until the autumn of 1947.

The first exciting and historic crossband and direct contacts were fully reported in the *Short Wave Magazine*,

November 1947 in an article entitled *Five metres - The First break* by E J Williams BSc G2XC, and repeated by G5KW in an article in *SWM* in July 1986, so I will only refer to the main historic events.

Early in November, ZS1P and others were receiving the Alexandra Palace TV afternoon transmissions with fair regularity. On October 4th at 1405-1414, G5BY on 28MHz worked ZS1P on 50MHz on CW and phone for a first crossband contact. The first two-way contact on 50MHz was made a week later by PA0UN and ZS1P at about 1200GMT.

On October 14th VQ2PL heard MD5KW on 50MHz, and on the 15th MD5KW and VQ2PL had a 50/28 crossband QSO. The following day I worked VQ2PL and ZS1P two way on 50MHz.

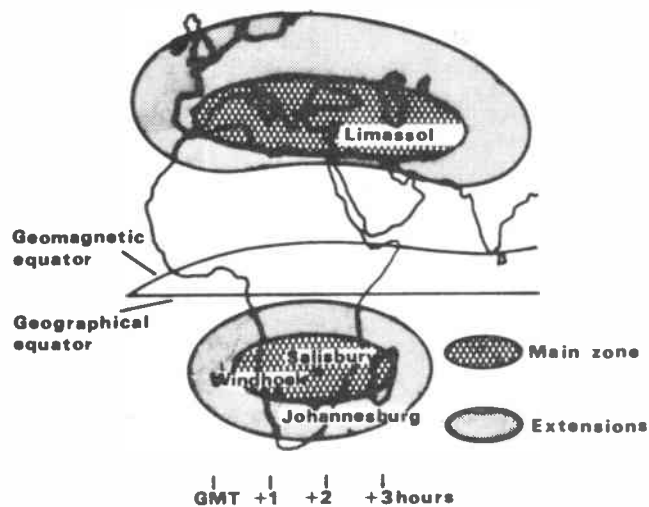
On Sunday 19th MD5KW reached G for the first time and was heard by G5BY from 0800 to 0835 and from 0948 to 0952; crossband contact being made at 0820. G61K reported MD5KW at intervals from 0945 to 1100 peaking to S9. The same day

J9AAO worked CE1AH on 50MHz two-way for a new world record of 11,300 miles, which stood for many years.

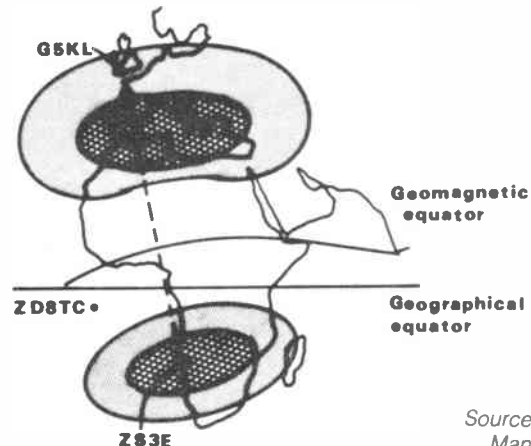
## TEP during cycles 19 and 20

After the withdrawal of operating permits for 5/6 metres in the UK due to Band I TV, interest faded and the 50MHz DX was virtually forgotten until a revival of interest during the International Geophysical Year when a few experimental permits were issued. Gordon Spencer G4LX of Newcastle reported reception of the ZE2JV tests several times in May 1958. Later he had permission to operate on 52.5MHz and made tests every evening during September and at noontime on Sundays. The evening tests were received in Salisbury (ZE2JV) during September. G4LX on the other hand heard ZE2JV 15 out of 29 evenings tried, and heard noontime tests on 2 out of the 4 made. G4LX reported the South African signals briefly for two evening periods between

**Fig 3** The TE zones at 50MHz as seen from Limassol in the North and Salisbury in the South. At 144MHz the respective zones fit neatly inside the main zones at 50MHz



**Fig 4** The TE zones at 50MHz as seen from the Isles of Scilly in the North and ZS3E in the South



Source: ARRI VHF Manual 1965

# 50MHZ – WHAT TO EXPECT

## CYCLE 21 TRANSEQUATORIAL PROPAGATION FROM ISLES OF SCILLY ON 50MHz/28MHz Bands

	DATE	TIME GMT	CALL	HIS	MY	REMARKS
1980	9 Mar	1142	ZS6LN	599	59	High solar noise 1400
	10 Mar	1112-1200	ZS6PW	569	55	
	10 Mar	1210	ZS6LN	229	239	Fluttery signals
	12 Mar	1225-1232	ZS6LN	229	239	
	14 Mar	1310-1340	ZS3E	56	59	
	16 Mar	1245-1405	ZS3E	56	56	
	24 Mar	1300	ZS6XJ	56	57	
	1 Apr	0945	ZS6XJ	569	57	
	1 Apr	1340	ZS3E	569	57	Very loud and clear
	3 Apr	1050	ZS6XJ	56	56	
	12 Apr	1515	ZS5TR	45	56	
	5 Nov	1420	ZS6LN	339	56	
1981	29 Mar	1530	ZS6LN	539	55	Fluttery
	29 Mar	1536-1600	ZS3E	239/57	55	
	28 Sept	1730	ZS3E	59	56	
	4 Oct	1645	ZS6LN	52	53	Very clear signals
	5 Oct	1607-1612	ZS6LN	579/52	52	
	9 Oct	1630	ZS6LN	339	53	Weak and fluttery
	15 Oct	1735-1925	ZS3E	57	55	
	23 Oct	1535	ZS6LN	329	53	
	10 Oct	1237	ZS6XJ	45	52	
	10 Oct	1257	ZS6LN	539	57	Very clear signals
	10 Oct	1530	ZS3E	529	55	
	10 Oct	1530	ZS6BUF	529	57	
	18 Oct	1120	ZS6BT	579	56	
	18 Oct	1200-1245	ZS1STB Beacon (Cape town heard 329)			clear signals

1700 and 1715, reporting a clean signal, and between 1900 and 1930 with a flutter, which is characteristic of TEP.

For a fully detailed appreciation of TEP, the excellent articles by RG Cracknell G2AHU ex ZE2JV and RA Whiting 5B4WR/G3UYO in *Radio Communication* June-August 1980 are recommended. Within the articles evidence was produced to confirm: T E propagation takes place via the ionosphere; equinoxial dropout which affects all signals above 50MHz; and three distinct modes of propagation.

The three modes of propagation were: normal F layer at irregular periods between 1100 and 2100 hours at very strong signal strengths; F type TE providing strong signals, often characterised by very deep fading or severe distortion, and occurring mainly between 1830 and 2030 hours; and pure TE providing weak signals accompanied by a characteristic flutter fading pattern, the maximum occurring about 2100 hours, but signals may be propagated at noon and throughout the evening until after midnight.

The classification of the three modes was established by time delay tests by oscilloscope photographs of an unmodulated 50MHz signal received in Limassol from Salisbury by different modes of propagation. Observation of the varying angles of arrival, examination of the flutter fading, and frequency spreading of the received signal was indicated.

### TEP during sunspot cycle 21

The main programme of my study during the period 1979-1982 concerned the North American path and other DX,

and only a limited time was available to examine the north-south TE path. An extract from my log is included as a guide to possible times and dates of future openings during the current sunspot cycle. It will be noted that the three modes of propagation mentioned above are indicated in the log.

The consistently strong signals from ZS3E indicate a good TE path to the UK, although we are probably just outside the main zone (see *Figure 3* based on the original as seen from Limassol and Salisbury (source: ARRL VHF Manual 1965)). The main ZS6 stations and the ZS1STB beacon are also outside the main zone.

### The future programme

Now that 24 hour operation is permitted in the UK, some of the studies that we can usefully undertake include: a full exploration of the possibilities of longer range TEP; confirming or disproving that stations must be equidistant or at right-angles to the magnetic equator in order for TEP to work; a determination of whether TEP will work at higher frequencies. This particularly applies to 70MHz; TEP during the years of the quiet sun (see the article 'An amateur IQSY Project', *RSGB Bulletin*, June 1965).

### From the mailbag

Dr Fred Anderson ZS6PW, who has carried out TEP investigations for many years with SV1DH, ZE2JV (now G2AHU) and others, and operates the ZS6PW and ZS1STB Still Bay Cape Town beacons writes, 'There is at present more activity and interest in 50MHz than ever before. I think the excellent conditions of a few

years ago came too soon for many of the people who are now active locally. In the meantime they are getting equipment ready for the coming cycle. Another reason for the upsurge in interest is the fact that ZR (limited licence) amateurs are now allowed to use this band. A scheme is under way to provide a chain of beacons over ZS6, ZS2 and ZS3. Arnold Mynett ZS6BMS (who played an active part in the UK during the IGY) is co-ordinating this project.

I use a Yaesu FT625RD with about 15 watts on 50MHz, but I am building an amplifier with about 400 watts PEP. I believe that many of the exotic modes can only be appreciated when one uses high power. At Still Bay the ZS1STB beacon is still running, and recently I constructed a combined set that produces both 50.010 and 28.300MHz output, about 40 watts power output on each frequency and with yagies at about 30 feet height. The 28300 is not a listed beacon and uses the callsign ZS1LA.

Bill James G6XM, one of the original 5/6 metre gang, has recently moved to Okehampton, Devon, and has had a long battle with the local council over his planning application for a 31ft telescopic tower in his garden. He had the support of the local Mayor (himself a radio-amateur), so Bill is once again active on the band. In a future column I hope to include a 'Flashback to 1932', with some photographs of G6XM and other pioneer 5 metre operators during a 5 metre field day.

Jim Treybig W6JKV (who is well known for his annual 50MHz DXpeditions to exotic QTHs) sent in the following letter.

'My location on my last trip to the Azores was very bad for working the UK. Unfortunately there were no hotels on the north side, so my antenna was pointing into high hills. The USA was across the water! My signal was copied in California, almost 5000 miles away, during 4 days of my visit. I found it quite interesting as W6UXN was 20dB over 9 for 20 mins. QRM however was so bad we did not make a contact on his end. The most interesting thing was the time of day - almost all of my openings were between 1000 and 1700GMT. California openings were 6.00am local time. Contacts were via sporadic E, ie I was hearing the intermediate locations - 4 or 5 hops. However, when I worked W7US Arizona their path differed to mine. They were hearing Colorado over Canada, while I was hearing ARK and NYC, much farther south. I'm going somewhere this summer, but haven't decided where yet. I'll let you all know when I decide.

### Acknowledgement

We are grateful to Charlie Newton G2FKZ, a member of the RSGB's Propagation Studies Committee, for the copyright information he has allowed us to include in this column.

This information will be included in a book Charlie is writing on his specialised subject, Aurora, to be published by the RSGB in due course.



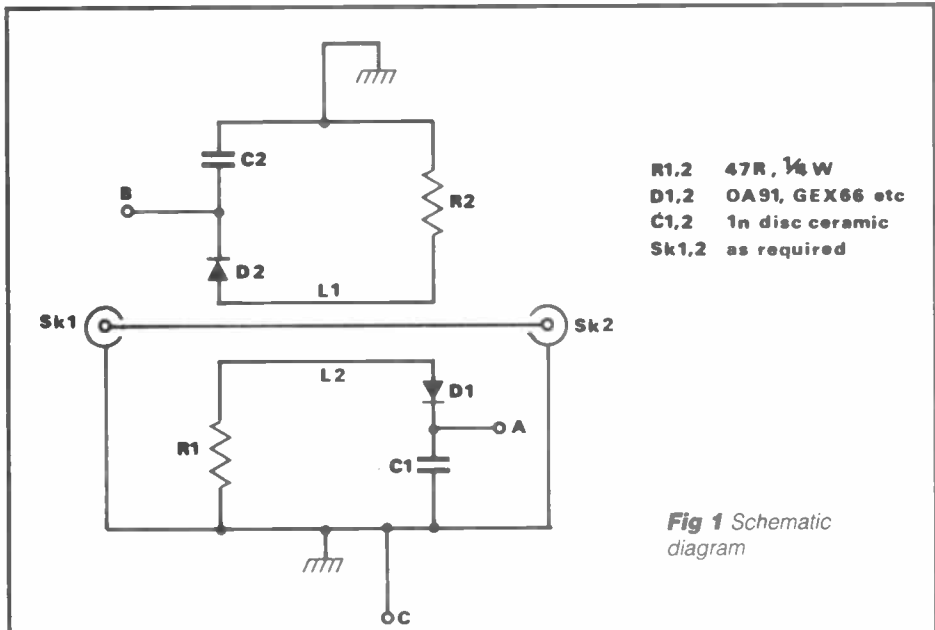
# PROJECT

# BOOK

by Martyn Williams

Last month we investigated at some depth the problems inherent in using that common piece of equipment, the SWR meter. This month we get down to building the actual meter itself. There are several different ways of designing the meter, but the usual method is to provide sampling loops alongside the feeder line, arranged in such a way that you can measure both the forward and reverse powers. This is shown schematically in *Figure 1*.

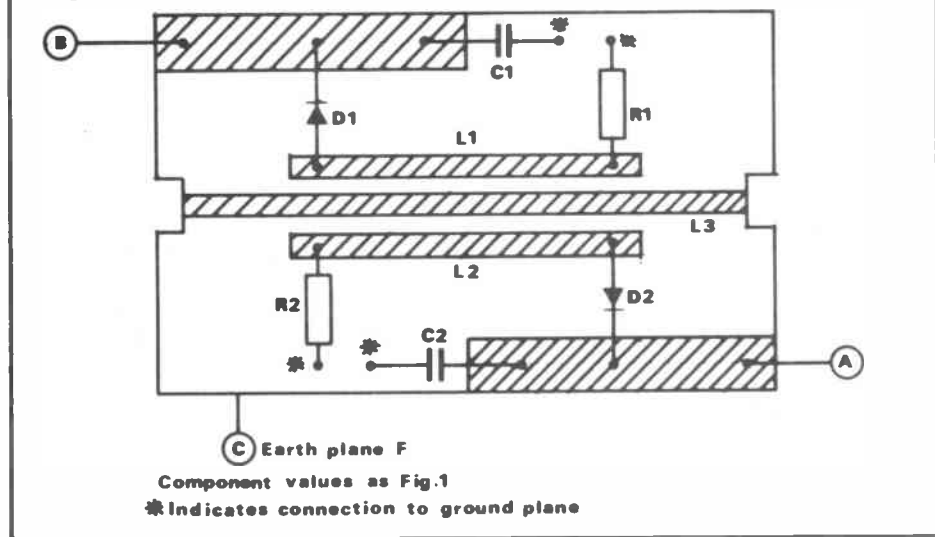
It is possible to construct the sampling loops by simply feeding some insulated wire underneath the outersheath of a piece of coaxial cable, and this is commonly the way that HF SWR meters are built. Once you get above 30MHz it is not possible to maintain the symmetrical layout that is required to get equal sensitivity in both lines. This is easier to obtain if the whole unit is made on double sided PCB material as shown in *Figure 2*.



- R1,2 47R, 1/4 W
- D1,2 OA91, GEX66 etc
- C1,2 1n disc ceramic
- Sk1,2 as required

Fig 1 Schematic diagram

Fig 2 PCB layout



## Construction

The details of all the important dimensions are shown in *Table 1*. From this it is possible to select data for the bands that you are interested in. The data is given to provide good operation on two bands, but you will usually find that the performance is also adequate on the next band up. The widths of the centre track and the two coupling loops must be adhered to so as to obtain correct impedance matching of the lines. The reverse side, or ground plane, must not be etched away. The overall size of the board is not important and should be of a convenient size to fit the box which will house the unit. Obviously it must be long enough to accommodate the required line length.

## Sockets

The sockets to be used are a matter of choice at the lower frequencies, but for the highest frequency units they should be N or BNC types. The board should be made a close fit between the two sockets and the notches shown on the board diagram should be cut in such a way as to allow the socket pin to be soldered directly to the line. The earth plane can be soldered directly to the body of the socket if a BNC type is used. If not fit earth tags to the socket mounting screws and use these to make the shortest possible connections to the earth plane.

## Components

The two diodes and capacitors should be mounted using the shortest possible lead lengths, particularly on the higher frequency units. The earthed ends of the two capacitors are taken through holes drilled in the board and are then connected to the ground plane. The strips marked for connections A and B should not be shortened down on the highest frequency unit as the capacity between these lines and the ground plane is used to give more satisfactory decoupling than would be provided by the capacitors alone.

## Metering

The meter used is not critical, and something in the range of 100 microamps to one milliamp full scale should suffice. Stick to something nearer the 100 microamp end if you consistently run very low power. The circuit is shown in *Figure 3*. This part of the unit may be built in the same box as the sampling lines, or the sampling unit may be mounted at the aerial and lines brought down to the metering box. To make a two meter unit simply duplicate the circuit for the single meter and use a ganged sensitivity control as shown in *Figure 4*.

Table 1

LENGTHS OF L1 AND L2	
MHz	
50 + 144	95mm
144 + 432	65mm
432 + 1296	35mm
Spacing between L1, L2 and L3 is 2mm	
L1, L2 and L3 are all 3mm wide	

# PROJECT BOOK

Connect the unit into the coaxial line to the aerial and set the sensitivity control to minimum. Now switch on the transmitter and set the sensitivity control for full scale reading on the meter. Switch to reverse reading and measure the SWR using the calibration shown in Table 2. These assume the meter movement is calibrated with a 1 to 100

scale, but if this is not the case it is a simple matter to adjust the readings. To check that you have reasonable accuracy, connect the meter into the line in the opposite direction and rerun the test. You should end up with the same reading which indicates a fully balanced unit. It is unlikely that you will get this, but it should be close.

SWR	% READING
9.0	80
8.0	77
7.0	75
6.0	71
5.0	66
4.0	60
3.0	50
2.5	42
2.0	33
1.9	31
1.8	28
1.7	25
1.6	23
1.5	20
1.4	16
1.3	13
1.2	9
1.1	4
1.0	0

Fig 3 Single meter

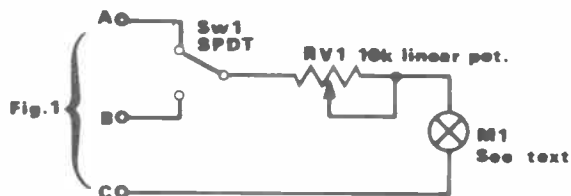


Fig 4 Dual-metering option

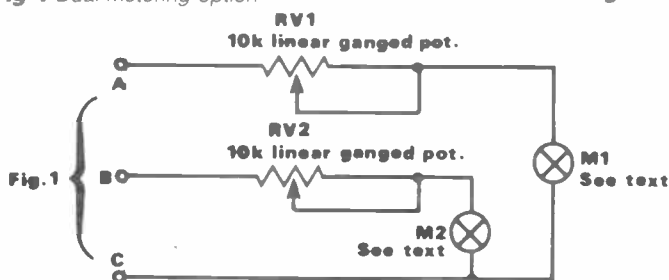
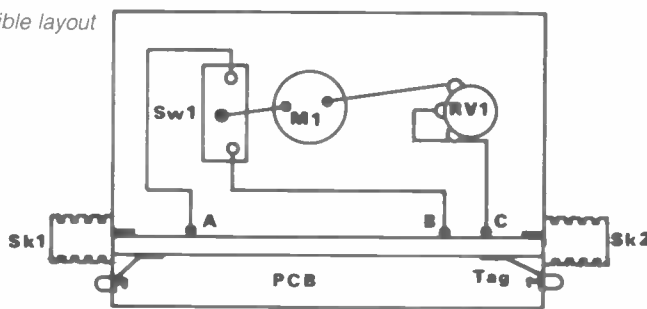


Fig 5 Possible layout



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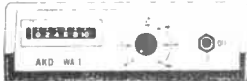
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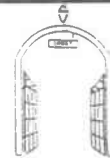
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# REPEATERS & DIGIPEATERS

Bill Pasternak WA6ITF has written many books on amateur radio and video, as well as the Westlink Amateur Radio Report. Here he explores the amazing world of repeater operation in North America and suggests how to get on the air if you can make the trip...

You may travel the world over and I guarantee you will never see more FM, repeater and digipeater operation packed into one small corner of society. North American hams, especially those in the United States, point with pride to the nearly 10,000 FM repeaters now on the air and are quick to add that this number may double in a few years! Bragging? Well yes... to some extent, but a quick look at the ARRL repeater directory for North America will prove to even the most casually interested that FM repeaters in North America outnumber the total in the rest of the world by a factor of five; and that's only counting the ones which are 'sanctioned' or 'co-ordinated' machines. There is really no way to know how many other FM repeaters are actually on the air under the title of 'pirate'.

## Frequency co-ordination – what is it?

Here in the United States, the great repeater boom of the early 1970s is far from over, and future growth patterns cannot be predicted. Unlike the rest of the world, where a given national amateur radio society holds anything from loose reign to overall control over FM repeater operations, in the United States and Canada the national organisations provide little other than a clearing house of information that they gather from individual frequency co-ordinators and/or frequency co-ordination councils, and compile annually into a listing which is issued as a 'Repeater Directory'.

These 'co-ordinators' can be anything from an individual who has literally 'set up shop' in a given district, to a state or province-wide organisation with hundreds of members, a strict constitution and rules, and a separate sub-council or technical committee to oversee all operation on a given band (not just FM and repeaters).

The rule of thumb appears to be that the larger and more densely populated a geographic area, the more complex the nature of its frequency co-ordination. In all cases, co-ordinators work as volunteers since FCC (federal) regulations clearly prohibit them from being paid for their efforts.

By their very nature, repeater co-ordinators and co-ordination councils are highly political entities, and in most cases they are quick to expand their sphere of influence to encompass new and emerging modes together with special interests. And so it is that the older 'FM only' type of co-ordination

body is giving way to what we call the 'spectrum management association' concept, as new and special interest modes, such as full-duplex and simplex automatic phonepatch, fast-scan ATV, AMTOR and Packet radio, come along.

This latter body is politically structured to provide political and technical representation to every mode and special interest that you may find in a given spectral parcel. For example, where I reside in southern California we have several of these spectrum management organisations operating on a 'by band' basis, giving a voice in spectrum development to every interested party, from the most advanced of digipeaters, or Packet switches as they are now called under the latest protocol, right down to and including any die-hard AMers who still refuse to admit that their 1959 Gonset Communicators are not today's state-of-the-art in communications. Despite band crowding, especially on our 2 metre, 1.25 metre and 70cm bands in most major urban areas, this concept of total voluntary band planning by local area groups is meeting with a surprising amount of success.

## Relay devices recognised

Currently all the following forms of relay devices can be found operating in North America.

**Open repeater:** An FM relay placed in service by an individual or group of people for providing repeater service to all radio amateurs in a specific region. In crowded areas where repeaters are co-channelled, even open repeaters may require the use of some form of tone access. CTCSS is most commonly used and tone frequencies are public domain information.

**Open repeater/open autopatch:** An open repeater with telephone interconnection available to all users. Keypad microphones dial the digits, ★ turns on the phonepatch and hash disconnects.

**Open repeater/closed autopatch:** As above, but telephone interconnect is limited to certain people. The phone access codes are more complex and unpublished.

**Closed repeater:** A repeater for the exclusive use of members of the repeater group, membership of which is open to any interested amateur. Usually

access requires the use of an unpublished CTCSS tone. May or may not have autopatch featured.

**Private repeater:** As above but membership is at the discretion of the system licensee. Always requires unpublished CTCSS tone for access and autopatch facility is usually included.

**Remote base:** Properly called the 'privately owned, individually owned and operated, amateur remotely controlled base station radio system'. While in some cases a 'remote' may actually be owned and operated by one amateur, as a practical matter almost all remotes take the form of private repeaters, with a small user base and added features to provide for crossband/cross-mode operation on other UHF, VHF and high frequency ham bands. Remotes talk to one another using established national calling frequencies on VHF and UHF and de facto world-wide calling frequencies on the HF bands. Most common are 29.600MHz FM, 14.260MHz and 7.240MHz. Most remotes are super hightech devices which provide their users all the benefits of an HF/VHF/UHF base radio with control from a UHF hand-held or mobile set.

**Linear translator:** Any or all of the above, but using linear transponder technology to permit multiple operators simultaneous operation on a power division basis. These units can pass or 'relay' any mode and are not limited to FM. Most have 50 to 200KHz wide 'operating windows' depending on band of operation. None are known to 'open' category devices and they are restricted to the USA.

**Simpatch or simplex autopatch:** This is an FM relay device which uses just one discrete frequency and a telephone interconnect to provide mobile and hand-held telephone service. It uses high-speed switching and sampling techniques to permit single frequency operation, so it is highly spectrum efficient. All such systems are privately owned and require the knowledge of unpublished control commands and CTCSS access tones. The remote control link must be operated on frequencies above 220MHz and the system must be under positive control at all times (USA only).

**Remote simpatch:** Similar to above but capable of crossband or cross-mode

# STATESIDE STYLE

operation for longer distance access. Only legal when operated under manual control at the base. Generally on 75 metres above 3.940MHz and very few are in operation (USA only).

**Digipeater:** Now renamed Packet radio switch under level II protocol, all are believed to be open to all amateurs. Since most are individual's stations, no exact count of these systems is available, but it is thought that the number of active switches runs already into the thousands.

## Visitor's guide

While North American hams have many bands on which relay operations take place, the two that are of most interest to visiting hams from other nations appear to be 2 metres and 70cm. I suspect this is because these are the only two bands common for relay operations worldwide. Therefore, I shall concentrate on them and note that similar gear exists for most other VHF and UHF bands as well.

A ham visiting the United States or Canada wishing to operate FM on the 2 metre band needs a radio (transceivers are commonly called radios) which is capable of satisfying the demands of three differing bandplans, while also covering an amateur allocation which is 4MHz wide. In ITU region 2 the 2 metre band is from 144 to 148MHz. Fortunately, many companies make 'A' (American) versions of their 'E' (European market) gear. To all intents and purposes the A means that the rig is 5kHz based, so that it can adhere to any of the three bandplans, since all are divisible by the number 5. However, I do not want to give specific model numbers since these change rapidly in the volatile amateur radio marketplace.

Quickly one thing becomes clear. Most, albeit not all, E (European) suffix radios give a poor account of themselves in an A (American) suffix world. To add insult to injury, at present non world-wide capable FM radio exists. But there's some hope.... With the price of basic hand-held units sitting at about the \$200 (US) mark, it might be best to leave the E suffix radio at home. Purchase an A suffix model on arrival in North America, and then sell it at a small loss before departing from home. Alternatively, if you are a wizard at microchip surgery you may be able to re-strap the synthesizer wiring so as to make an E radio operate to A standards. In reality, that's what the manufacturer has done. About the best advice I can give is to say that for every E

suffix radio there exists an A suffix counterpart. If you like what you have been using and it's a current model, consider buying an A version when you arrive.

The manufacturer also makes one other significant change. He eliminates the toneburst which is a definite 'no-no' in this part of the world. It is not illegal, but simply bothersome to listen to. For that reason, many years ago hams standardised on the use of continuous tone code squelch (CTCSS) as the de facto method of tone accessing a repeater. While all the 'standard EIA tones' are used on open repeaters where channel loading requires tone access, it's not something that a visitor should worry much about. Of the more than 6,000 open repeaters on 2 metres, only about 500 or so use tone access. The rule of thumb is that whenever possible, open repeaters remain carrier squelch, so for the traveller, a tone encoder is not really a necessity.

## GB phone home

One nice amenity is to have a touch-tone encoder microphone to permit the use of open autopatches when you encounter them. Such an encoder mike is standard with most mid-to-high priced 2 metre FM sets, and about a \$50 option on low priced units. Now, you will not find an open autopatch system in the very crowded cities like New York, Chicago or Los Angeles, but they are fairly common in rural areas, of which there are many. If you are driving on a lonely stretch of road at some ungodly hour, it's nice to know you can summon help by phone from your automobile should an emergency arise. If you're a stranger in a foreign land, it could be your key to survival. In short, it's well worth having.

## The three-quarter metre band

70cm is a lot easier to deal with on an equipment level, but is far from the band I would suggest for a visiting ham. Here's why...

70cm, or 3/4 metres as we call it, is best classified as being a private band in some key places. Now, I know this might be a bit hard to understand for someone who has not lived a lifetime with the situation, but at least let me make an attempt. Also keep in mind that for every rule there are exceptions.

In the more rural areas, 70cm has yet to see a major inrush of hams. North America has the 220MHz band, which is not available to the rest of the world, and that's the one being populated at this

time in the less urbanised regions. In fact, it's quickly becoming the 'new 2 metres' and most major urban areas are already out of room on 220MHz for new repeaters!

## Radar problems

Back to 70cm. When you get into the big cities you find that 70cm is very active, but you also learn quickly that most repeaters have restricted access and limited 'select' membership. In other words, they are the private repeaters and private remote bases I described earlier on. Some, like the two which this writer belongs to, will not mind if an out-of-town visitor happens by to say hello now and then. Others you will find to be far less hospitable.

In any case, to operate the 70cm FM repeater sub-band requires a radio which covers 440-450MHz in 25kHz centres plus a CTCSS encoder capable of developing all the standard EIA sub-tones. On the 70cm band CTCSS tone access is normal for all relays, especially in coastal regions. This is because the 70cm band is very prone to offshore and ship-board radar interference, and a tone encoder is a must for 70cm operation.

Other bands where you will find FM relay operations include the upper MHz of 10 metres, the upper 2MHz of 6 metres, the 22-225MHz band and all region 2 allocations above 70cm.

## Directories

A North American repeater directory is a must for the visiting ham, and an excellent one is available from the American Radio Relay League (ARRL), 225 Main Street, Newington, CT 06111. Price is currently \$3 US funds.

If you plan to visit a specific city, state or province, might I suggest that you seek out the repeater co-ordinator for that region and request a 'regional repeater list'. Some co-ordinators publish them regularly, while others never do. However, a regional publication is usually more up-to-date and accurate than an annual national listing.

One final note. If you want to gain a more in-depth understanding about FM and repeater operation in this part of the world, may I refer you to a book entitled *The Practical Handbook of Amateur Radio FM and Repeaters*, co-authored by myself and Michael Morris WA6ILQ. It's a good week's worth of reading and contains the insight that cannot be covered in this short piece. It's available from Tab Books, catalogue number 1212.



## News and comment from Glen Ross G8MWR

Perhaps you will remember that the sporadic activity last year was not very impressive. The openings were few and far between and were generally of short duration, with one or two exceptions. This year we will hope for better things and we now have a band where sporadic activity manifests itself earlier and for longer periods; I refer of course to the 50MHz band.

The first signs of activity this year showed up on April 20th, when the band was open to Spain and Portugal for several hours. The really big signals on the band were from EA1MU, CT4KQ and CT1WW, who was received at 20 over 9 using only 15 feet of wire thrown out of the dining room window at an average height of around three feet as an aerial. A dipole at thirty feet produced signals that kept the S meter hard against the end stop. The band which is usually as silent as the grave suddenly burst into life as the great army of what has been described as 'licensed listeners' caught on to what was happening.

### Operating standards

One thing that caught the ear was that it was possible to have a reasonable QSO with the DX stations rather than just the fast exchange of details, which is the norm in a two metre opening. This is due to the fact that everyone knew that the opening on the lower band was likely to stay around for some time and also, due to the lack of class B operation, there were less stations chasing the DX.

For those of you who will be experiencing your first sporadic openings on two metres and who also want to live a long and happy life, let me mention a couple of operating points to keep in mind when you start chasing the DX.

Keep your remarks down to your callsign, the signal report and your locator. You will get the same information from the DX station, which you will confirm, and then you will get out of the way... *FAST!* Why no mention of your name, and 'the QTH is London, I spell that for you... L as in London... best wishes to your wife and family old man, and by the way the aerial here is a Wizzbang

special and I am running 25 watts from a Harikari 999x. The weather here... etc?'

### Why the rush?

The reason for the brevity is very simple. The DX station may only be available for a minute or two and many stations will want to get that new square. The rules are to get in fast, exchange the minimum amount of information and then get away fast so as to give the maximum number of operators the opportunity to get the DX and to give yourself the greatest chance of finding some more rare stuff.

Frequently the DX station will not even give his callsign more than once every five minutes, it being assumed that everyone calling him will have found out who he is from his previous contacts. Let us assume that the DX station is SV1ZZ and that I am going to call him; the contact would go something like this.

At the end of his current contact I would send 'G8MWR..G8MWR..G8MWR' and he (I hope) would reply 'G8MWR you are 5 and 9 in Athens, QSL?' I would go back with 'QSL, you are 5 and 9 in IO92GK, QSL?' he would then reply 'QSL...QRZ' and the pile up calls again. The QSO has taken possibly ten seconds to complete.

### The QSL bit

You will have noticed the frequent use of QSL in the above exchange. This is not an invitation to send him a card to confirm the contact, because it is automatically assumed that you will do that anyway. It is used in its correct Q code meaning of QSL? with a query, being did you get my message, and QSL meaning everything received OK. It is simply a confirmation that the information has been correctly received.

As far as getting the QSL card itself is concerned you are in the lap of the gods. Most stations do send them and the quickest I have received arrived only five days after the contact; the slowest took seven years to get to me. Do be patient and remember that a busy DX station who gets involved in a lot of openings may have several thousand cards to write out.

It is not surprising to realise that he may not relish the task of getting down to that job!

### The microwaves

The first of the 10GHz cumulative contests saw a tremendous number of new stations on the band, including some who were running portable ATV. Another noticeable thing was the surprising number of people who had 24GHz equipment available; from my site a few miles South of Stratford on Avon I managed six contacts on 24 without making any skeds beforehand, which is certainly something which could not have been done last year.

It is known that there will be activity from the summit of Snowdon during several of the contests this year, making paths of up to around 250km available on both 10 and 24GHz. It is also known that there will be activity from excellent sites in both South East Scotland and Northern Ireland, so there is plenty of long distance activity to look forward to.

### Conventional

If you are thinking about moving up to microwave operating, but you do not know what to expect up there, then make a date to attend the Midland Microwave Convention, which is intended for people like you. The event will take place on July 18th in the main concourse at Wolverhampton racecourse, and will be an absolute must for everyone interested in the bands above 1296MHz.

The convention is being run by G6FK and a group of enthusiasts as a follow up to last year's very enjoyable event, and is not connected with any particular society or organisation. There will be demonstrations of gear for all modes on bands up to at least 24GHz and a full compliment of lectures, including such interesting things as phase locked generators at 10GHz and above; starting on 23cms; narrow band equipment for 10GHz and much more.

The people manning the various sections of the event will all be acknowledged experts in their own fields of interest, and it will be a tremendous opportunity to do a bit of brain picking. I will be on the Microwave Society stand where you will be able to see, and use, wideband gear for 10 and 24GHz, SSB on 10GHz and full colour high definition TV with sound on 10GHz. More information can be obtained from G6FK, who is QTHR.

### Repeating

Several new repeaters have recently been licensed for operation on the 70cm band. The latest batch includes GB3BV, RB1, Hemel Hempstead; GB3DD, RB10, Dundee; GB3DT, RB0, Wimborne; GB3RM, RB12, Paisley; GB3PD, RB10, Peterhead; GB3RE RB11, Chatham and GB3SG on RB15 at Cardiff. The licences for this are approved, but that does not mean that they are likely to be available for use immediately. Check with your local group to find out when they will be coming on air.

On the Packet radio front, the RSGB have given some interesting figures on

## ON THE BEAM

the use of the GB3HQ repeater. In the first two months of operation it has handled more than 1000 messages from over 250 different stations, including some in Germany, Holland and Belgium.

### Odds and ends

The DTI have confirmed that the next series of class B licences to be issued will be in the G7???? group, there had been some talk as to whether they might have gone to the M1???? series. At least we have managed to fend off getting into 'transistor type' call signs, such as 2A2AA for a few years. The QSL manager for the new series will be G6OVO, who is located in Birmingham. News of the hoped for common licence is that Germany, which had removed the concession, has now reinstated it. However, there is still no news of any concrete activity towards implementing the licence in this country, mainly because it would require a rewrite of some of our conditions so as to give some common ground on which to issue a licence.

There is currently discussion between the RSGB and the DTI with a view to reorganising the whole of our licence structure and this may provide the opportunity to join the CEPT licence scheme. There is also some rumour that these discussions may simplify, or even remove, the requirement for log keeping.

50MHz is on the increase in Eireland with eight permits already issued and a further 25 in the pipeline.

### Something special

If you are really after the long distance stuff on two metres, then this is for you. The information was late in arriving but you should get this edition just in time to make use of it. A group of amateurs in Cyprus will be operating on an all day basis during the last week of May using high power on 144.2MHz, and 'beacon mode' on 144.01MHz. They will also be using talk back facilities on HF using 14.33 and 21.33MHz.

This operation is specifically for contacts into the UK, so our continental neighbours will come a poor second in the attention stakes. I suggest that you keep an ear open on the HF frequencies even if you are not a class A man, much useful information can be gleaned to improve your chances.

### Stop press . . .

LATE NEWS . . . I have just heard that the operation will continue right through the month of June, which will give great opportunities for sporadic E operation over the path. Good hunting and please reread my earlier hints about sporadic operating. If you goof this one you will certainly be classed as amongst the unclean!

### The biggest rally?

Possibly the largest amateur radio rally in the world is the Dayton Hamfest in the States.

If you would like to attend next years event, then the man to get in touch with is Peter Crosland G6JNS, who is trying to organise a group booking so as to cut the costs.

This event will be held in April 1988. Peter is also trying to get a party together for the Freidrichschafen Rally in Germany. More information from him QTHR.

### Sign off

That is it for this month. Please keep in touch by writing to me at 81 Ringwood Highway, Coventry or on Prestel using 203616941.

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# SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

## FT480R

I've had several of these two metre multimode rigs in now, coincidentally all bought fairly recently, secondhand. One of the facilities on the rig is the so called satellite mode. When set-up for this, by pushing a slide switch over underneath, it is possible to re-tune the frequency of the rig whilst on transmit. This is obviously of great use when using two in, ten out satellites to allow adjustment for doplar shift. Unfortunately, this facility, when switched in, does not disable the priority scanning system when on transmit. The net result is that you, the user, may be chatting away and about every five seconds your carrier disappears for half a second, the carrier QSYing from the channel in use to the priority channel. Life gets even more embarrassing since, if no priority channel has been entered since the last total power down, the memories reset to 145.000. Not too handy if you are within range of an R0

repeater! One rig came in with this as the fault. If all else fails, read the handbook!

Quite a few of the 480s appearing on the workbench have a duff aerial changeover relay in the PA module. If your duff rig is taking the right sort of current on FM transmit (say 3 amps), but there is no action up the aerial hole, then the relay is probably the culprit. I'm beginning to hate those itchy tichy cradle relays, they are downright unreliable. Videos, linears and rigs with them in have all given me aggro lately.

Still on the subject of 480s, like most Yaesu rigs the PA has a well designed margin of PA dissipation in hand. Why, oh why, must people try and squeeze a few more watts out of their rigs and sacrifice that designed in safety factor? It's not clever to push a 10 watt rig to 15 watts out or more. Not only are you probably getting into non-linear areas of the output device's characteristics, with resultant muck out, but the PA is

probably now under stress and will give you a shortened life span. The answer is simple, if you want more power, get a decent linear.

## Buying secondhand

One of the 480s bought above was purchased from an 'independent' secondhand trader who buys, sells and exchanges only secondhand rigs. I think it would be fair to say that when this trader had the rig and tried it out it probably was OK, but after the 'new' owner had had it a month the aerial changeover relay became intermittent. My reason for saying that it probably was OK with the trader is that when the owner brought it to me it took a day's soak at 35°C before the fault reappeared in my hands. However, I digress.

The owner, now with a duff rig, contacted the trader who 'instantly' offered him his money back, no questions asked. The owner had, quite rightly, grown attached to it and wanted to keep it (the sensitivity of his particular example was outstanding, well above average for these rigs, and they are normally good). Apparently there was quite a 'reverse' argument to the normal one of 'I want my money back', and the trader in question offered to drive up and collect it for repair or let the owner have it repaired in the owner's locale at the trader's expense. The moral of the story here is that it is possible to buy a secondhand rig with a meaningful guarantee from a trader!

These otherwise desirable rigs seem to go for £225 (boy, you were lucky), to £275, and that's more or less what you should be thinking of giving a dealer. Some examples are surprisingly sensitive, well above their sales specification.

## Variable capacitors

An old timer was recounting a tale of woe about his equally old transceiver. Apparently the PA tune capacitor had become more and more intermittent, the problem being a rotor-to-case open circuit. After several fruitless cleaning attempts he had bought a very similar ex-broadcast valve radio one at a flea market. The problem was that, having fitted the replacement, it did not have quite the 'swing' of capacitance required. What was really irritating him was that it was so close to being right. Only on forty did it lack capacitance, and even then a dip could be obtained, but it was just off the edge when the 'load' capacitor was readjusted. Being a wise man he had added parallel capacitance, but the small amount of capacitance

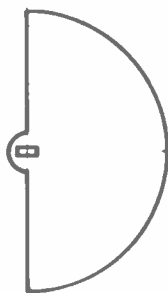


Fig 1 Moving or rotor vane

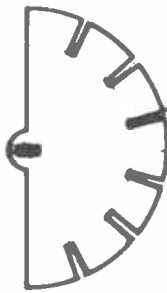


Fig 2 End rotor vane

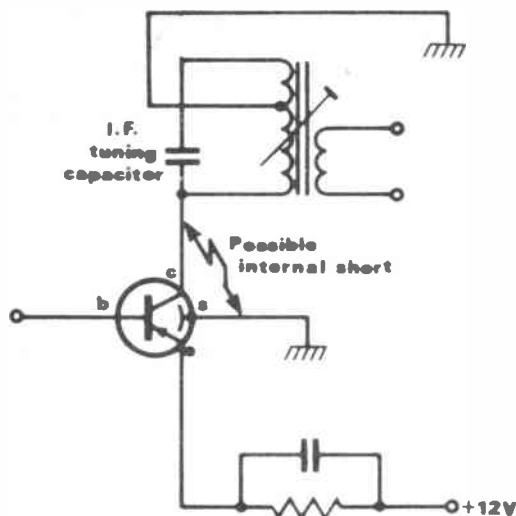


Fig 3 Showing screen to connector short



required cost him the 'dip' at the minimum capacitance end on 21MHz. He was about to concede defeat and start moving taps about on the PA coil. My suggestion was to check the so called 'alignment tabs' on the new variable capacitor he had fitted. All I got was a blank look.

In the bad old days of valve radios when large variable capacitors were fitted, the moving or rotor vane looked roughly like the one shown in *Figure 1*. The end rotor vane was different (see *Figure 2*). When I say end, by the way, I mean *each* end of *each* bank of vanes, ie a twin ganged capacitor would often have four alignment vanes. The idea was that the tabs could be bent out, ie away from their other friends in the bank, to lower the capacitance at given points over the rotation angle of the shaft. Since in a superhet the front end coil (to which one 'bank' will be connected) has got to be tuned to a different frequency to that of the local oscillator, to which the other bank is connected, the two coils and capacitors will not track or align the required difference in frequency exactly (the IF), unless there is some way of changing the capacitance of one bank against the other, hence the tabs.

## Back to the story

To get back to the story about the transceiver in question, I suggested that the alignment tabs be checked and, if necessary, adjusted back to give the highest maximum capacitance. I also emphasised the extreme care required in doing this since all other vanes must be parallel to each other and the slightest knock can bend them (a stiff bit of card or thin metal slid in next to the adjustable vane can sometimes help).

The upshot of the story is a happy ending, the rig could be used on all bands with an acceptable PA dip after adjustment. If you think about it, ten vanes could make up a 300pF capacitor, ie each vane contributes 30pF. If two of these on one bank were adjusted down to, say, half of their nominal 30pF each, you would be 30pF light on each section. With two sections strapped, as was his case, you are 60pF short and consequently could well be in trouble.

## FT100

This rig was a very early Yaesu HF all transistor, except driver and PA, transceiver, covering only 80, 40, 20, 15 and 10 metres. Ten metre coverage is restricted to 28.5 to 29MHz, although it is fairly easy to switch in another crystal if you require the CW end (or indeed the HF end) of the band. You have selectable sideband plus CW and AM, and another nicety is that there is a built-in 12 volt inverter (check this out if buying secondhand if contemplating mobile use, since the inverter transistors are often suspect). The mains power supply is also built in, and all variants have a built-in 100kHz calibrator.

Performance wise the receiver is a bit down on modern day gear. Expect about threequarters of a microvolt to give 12dB

signal noise on SSB, except on ten where they are notoriously deaf and you will probably have to stuff in two microvolts for 12dB. Receive audio is not loud, even into an efficient external speaker (none fitted), and may not be enough for a noisy van, but just about OK with a good signal in a quiet car.

The Tx is quite clean and, given a decent mike, can sound quite pleasant. Nasty Japanese line output valves lurk in the PA area, so it is best to throttle the urge back a bit and keep it to about 75 watts or so if you require a long life from them; should you care to check their new price you *will* be interested in getting a long life out of them. Talking of Tx, there isn't a CW side-tone, but building one could be a pleasant project.

Apart from the dead inverter transistors mentioned above, another common fault on these rigs is AGC trouble. It normally manifests itself as an RF gain control working backwards, the S meter making a dive for the end stop all the time the rig is on receive, and receiver being as deaf as a post. A quick and good check is to earth the AGC line via a lowish value resistor, say 56Ω. If you examine all the tracks down the right-hand side, with the rig upside down and the front facing you, your heart will fill with joy as all the tracks are marked with what they are: +12V Rx, AGC, VFO mixer etc. Having found the area in trouble, the fault will, helpfully, lie right across the rig in the AGC amp/switching area. All the RF handling transistors, eg front end, IF, mixers etc, are Japanese equivalents of the AF11X series, including the screen which occasionally goes short to collector, à la AF11X, although physically looking different. Since we are talking PNP transistors with the emitter going to a positive rail, collector to earth (yuck, these circuits make my brain hurt), if you get a screen to collector short (see *Figure 3*) dc checks are not conclusive. Think about it; the collector 'load' will be shorted out but all else dc wise will appear normal. The cure is, once again, to cut off the screen wire.

## Deliberations

At a recent rally a friend was deliberating between a KW2000 and an FT100 and asked for my opinion. It was an interesting fight, both receivers are equal sensitivity wise, although the KW is arguably better for strong signal handling. The KW has higher power out on transmit, but the FT100 has built-in mains and 12 volt power supplies, whereas the KW has neither. Being somewhat hard up, my friend opted for the FT100 since they are normally about the £100 to £125 mark, just a bit down on the KW price. I can recommend the FT100 as a 'beginner's' first rig, as this was my HF station for many, many years, and gave solid reliable service throughout, despite being severely abused. A few examples exist as Sommerkamp FT150s, and the FTDX100 and FTDX150 are similar.

On the subject of 'my' FT100, I recall a QSO when a young lady and I were on

holiday in the Isle of Skye. I had the FT100 in the van and heard an American aeronautical mobile station calling CQ. I called him back and a pleasant QSO resulted. It transpired he was about an hour out from the UK, flying from America to a Scottish airfield. Although he had to break off occasionally, to work in the cockpit (he was acting flight and radio engineer), the QSO was great fun, and eventually the pilot made a slight course alteration to fly over us and waggle the wings. One of my more memorable QSOs!

## Broken cores

A lot of letters received as a result of writing this column refer to broken cores. Although the best thing to do to avoid broken cores in IF, front ends etc is to use the correct adjuster tool, very often the rig has been bought second-hand with the cores already bust.

Sometimes the break is visible, but often the break in the core is halfway down. The way to deal with this one is to turn it from *both* ends at the same time, which avoids the normal jamming problem as one half tries to ride up the other at the break. Although this method can be surprisingly successful, if it fails you only have one other physical approach; drill the bugger out. I'm not a big fan of this, my mechanical skill (and patience) is limited, and I'd guess at only a 50/50 chance of success.

## The electrical solution

I much prefer the electrical solutions. Let us assume that it is an IF core that has jammed, although the method applies, with care, to other cores. A GDO or a signal generator and scope will give the resonant frequency of the 'duff' cored coil. Now simply re-align the other cores, (be careful not to bust those too!) to the 'new' IF. You will often be surprised to find that the broken core is only 10kHz off and front end re-alignment is not required. This approach is OK in a receiver with a free-running front end, but if we are, say, talking IF in an HF SSB rig, then moving the IF is obviously not on.

Refer again to *Figure 3*. Note the IF tuning capacitor. It is a fixed value because the inductance is variable. Unfortunately some berk has now bust the core so we cannot now vary the inductance, but we could now vary the capacitor, couldn't we? The trick is to remove the fixed capacitor and connect, in its place, a variable a bit bigger in value. Clever huh? Note that the fixed tuning capacitor may well be hidden inside the IF can, but your replacement variable doesn't have to be, unless you experience instability.

My 'bodge book' shows a few other methods I've used to get myself out of tight corners. Before purists start writing in about poor response due to different LC ratios, coupling factors etc, I know that absolutely none of these are good practice (!), but surely a nearly working perfectly rig is 98% better than a dead

heap 'cos you can't get the spares.

A dead Japanese radio can yield 450kHz IF coils that can be grafted in if you are keen (I've patched up dozens of Mohecans like this, he admits in shame). Note that most Japanese IF coils are colour coded. Yellow core is mixer to IF, white is interstage IF and black (no colour) is last IF to detector. All the above refer to 450kHz. For 10.7 look for orange or green cores in the IF and pink and blue (a pair) in the discriminator. I must also admit, in sheer desperation, to successfully using a red, ie medium wave oscillator coil out of a Japanese radio, as

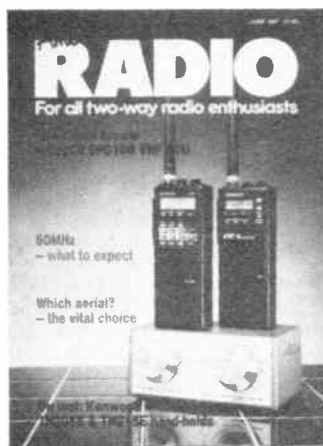
both a 1.6MHz IF and as a Top Band (1.8MHz) front end coil.

Finally, in the 'perhaps I shouldn't admit to ever having done this' department, if you are really desperate try screwing in either another core from the other side (or even down on top of the broken core if the coil is too high in resonant frequency), or screw in a brass screw if too low. This method comes from the now almost forgotten days of the 'magic wand' alignment tool. This was a 6 inch long, thin bar with brass at one end and ferrite on the other. You pushed first one end then the other into a coil core

(without turning the core already in there). If the performance of the receiver dropped off with both ends of the wand in the core, then that coil was properly aligned and turning it was going to be a waste of time.

Incidentally, if you cannot get another core in, you wouldn't consider mashing up another core and dropping bits of it in on top of the broken core until the coil re-resonates, then sealing the whole lot up with wax, would you? Or using brass filings if it has to go the other way? That would be too much of a bodge, wouldn't it? Oh well, just thought I'd mention it.

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73 from Dave G4KQH, Technical Manager.



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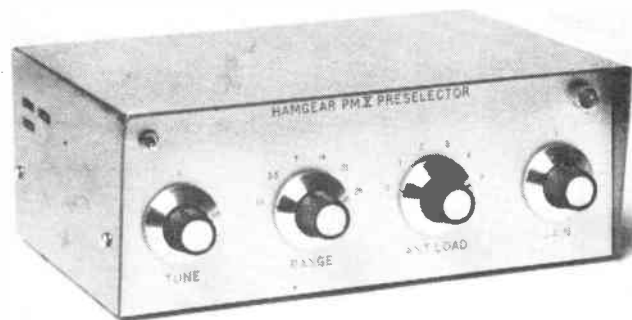
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- Tono 550 RTTY, CW, ASCII terminal, £180. Sony Air-7 receiver, bought Nov 1986 from Sony, with mains PSU, £170 or will exchange for signal R532 airband, must be mint condition. Tel: (0772) 704009 after 6pm
- For sale or exchange: Audioline PT345 40ch, 27MHz Home Base transceiver (originally cost £165 new last year) - plus Harvard 'good buddy' 40ch, 27MHz mobile CB, both in perfect working order. Total value approx £175, plus accessories, incl SWR meter-phones etc. I will accept first offer over £120 (plus p/p & ins), or will exchange both legal transceivers for a Ham International Jumbo base station, or similar type of multimode base station (must have LSB/USB/AM/FM frequencies). All replies to this advertisement will be acknowledged. Please write to: Mr R P Guiney, 134 South Seton Park, Port Seton, East Lothian EH32 0BN, Scotland
- Uniden CR2021 HF receiver, 150kHz to 29.999kHz, plus 16MHz to 108MHz, SSB, USB, LSR, AM, CW, FM, with PSU for 110V to 240V or 12 volts, with box, manual, etc. Sell for £175 or vno, or exchange for VHF, UHF Rx or WHY? Tel: Leon 01-785 9325
- Disposal of valve stock: rare types and standard range. Examples: Raytheon 2K28, £15. QQVO-320A, £10. E55L £5. QQVO-2/6, £10. 3B28, £5. QB5-1750, £20. QY5-50D, £20. XR1-6400, £15. 829B-3E29, £5. 832A, £5. Also used but good: 813s, £5. 5B254M, £4. Plus

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many boxed octals. SAE for list. Also Collins 180-R-6C auto antenna tuner, suit technically minded ham. Phone for details, £30. Nev Kirk G3JDK, 54 Allendale Rd, Rotherham, Yorks, S65 3BY. Tel: R'ham 541606 anytime

■ Tono 550 RTTY CW decoder, £130. Phillips N4414 4 track reel to reel tape recorder, £50. Realistic DX160 Rx, MW, LW 1.6, to 30MHz, £40. Dozens *Wireless World Magazine*, 1930s and 1940s, offers. Tel: (0273) 673556 Brighton, after 2pm

■ Eddystone Dial Drive Unit, approx 4 x 6 x 3/4 inches, 5 uncalibrated scales + 0 - 100 logging scale, 6:1 reduction drive, £10. Datong D70 Morse Tutor, unused, + key, £42. Miss White (Edinburgh) Tel: 661 6101, not after 8pm

■ Icom IC21 2m FM transceiver base station, or mobile with 7 pairs of crystals, also matching Icom, IC21 receive VFO, £70. Noel G1XIU Tel: (0203) 491245

■ Sony Air 7 hand scanner, cost £249, accept £195. No offers. Bearcat DX100, 10-30MHz, gen cov rcvr, cost £379, accept £279, no offers. Both mint and as new (still under guarantee). Toshiba F11 11-band portable, cost £79, accept £50 or part exchange any for mint 2m base station (726, 757 etc). S Nicholls, 'Tor Haven', King St, Brixham, South Devon. Tel: (08045) 2281

■ Pye Cambridge FM10BV/6 in very good condition, crystallised and working on six channels, with some spares and service info, £50 ono. Pye U450 UHF Tx and Rx, both in good clean working order, with manual, £15 each. Pair 4CX250Bs and UHF bases, all brand new and unused, sell for £100 ovno, or swap for 2 metre hand-held or mobile rig. Marko 444 11 metre AM/FM 120 channel rig, will easily convert to 10m res, £35 ono. Wanted: Rigonda Fiesta or Vega 402 6in TV line output transformer type 7012, or complete set for spares cheap. Delivery/collectible possible within reason (share costs?). Mr Dimmock, 13 Stephenson Way, Bourne, Lincs PE10 9DA. Tel: (0778) 423433

■ Yaesu FT480R 2 metre all mode transceiver, includes manual, mobile mount, 5/8 whip, mag mount, all cables and fixings, £300 ovno. Alan G6JOF, Coventry. Tel: (0203) 616741, early evenings please

■ Commodore 64 computer, MPS801 printer, C2N cassette, £150. Yaesu FT101 mark 1, non-WARC, fan, 600Hz filter, G3LLL DBM, dc lead, YC601 counter, £250 cash the lot. Yaesu FT708 hand-held, case, 2 NiCads, fast charger, speaker mic, first £150 cash secures. All buyer collects. No time or money forces sale. Tel: Gravesend 321797 (Kent) evenings

■ TS830S, £700. Datong UC/1 Rx converter, 0.1MHz-30MHz to 144MHz or 28-30MHz, £60. Eddystone 840A gc Rx, £60. AMTOR PCB use with teleprinter for AMTOR, £30. 4CX250B VHF base & chimney, £10. Tel: Hitchin 811591 evenings

■ Exchange Yaesu FT726, only 2mtr fitted, vgc, less than one year old. Exchange for FT757 or similar HF general coverage transceiver. Tel: (0604) 43344. Paul G1SBA

■ Yaesu FT One gen coverage trv, all options, with MD1 base scanning mic. G4NYC. Tel: (0529) 21327 after 9pm

■ Trio R2000, fitted 118 to 174 VHF unit, good condition, manual, £350 ono. Also Grundig Satellit 3,400 proff, no clock, sticky switch on filter but still good buy at £95. 6 presets, FM, MW, LW, short, 150 to 29.999 SSB, dig readout, batt, built-in charger. Tel: Andover (0264) 65779, Bill Lawrence

■ 1939 quality radio 'feeder unit', long, medium and two short wave bands, HF, FC, IF & SW bands. HF, FC, IF and audio stages. 'Magic eye' tuning indicator, complete with power pack, loud speaker and spare valves. Sundry radio components of the 30's also available. Offers? F Cope, 50 Dennis Road, Gravesend, Kent DA11 7NW. Tel: (0474) 66051

■ Two metre trcvr, FT2F, £50. Trio 2200 (needs slight repair), £35. Standard C58 multimode, £340. 27MHz SWR meter, £3. Magmnt aerial (27MHz), £7. Spectrum prgrms, Morse, £4. RTTY etc, £20. Logbook, £5. RAE maths, £6. 44MHz xtals, 145-625, 145-650, £1.50 each. Realistic DX302 comms rcvr, £175. 1939 Hallicrafters Sky Challenger, £80. Spectrum plus 48K, £50. Datacorder (Dixons), £15. SX200N aerial, £1. Mike G1XGM, Flat B, 51 Brownhill Road, Catford, London SE6. Tel: 01-461 5398

■ DNT M40 cnv CB rig on 10m, very good rig, many

hours of good contacts, good cndx, 5 watts, offers around £60.00. Please apply Rodger Cuddington, 23 Dovetree Rd, Leighton Buzzard, Beds LU7 8UP. Tel: L Buzzard 372536

■ Trio R2000 HF communications receiver, 150kHz to 30MHz, with SSB/AM/FM/CW modes, programmable memory, scan, store facilities, mint condition with manual and boxed, £445, carriage extra. Tel: Stourbridge 390335 evenings or weekends

■ Sharp C1855E 18 inch VHF colour TV; bands 1+3, six presets, auto contrast system, systems B,G,I. Ideal for TV-DX, £120.00 ono. Would exchange for 2mtr or 70cm hand-held, eg TH21E, TH41E, IC02E, IC04E, FT209R, FT709R, anything considered, not xtal controlled. WHY? Sorry no phone, details to: Mr S J Bishop, 22 John Street, Brightlingsea, Essex CO7 0NA

■ Yaesu FRG7700 receiver, plus FRT7700 tuner, immaculate condition, £250 ono. Hall, 23 Brownhill Rd, Chandlers Ford, Eastleigh, Hants

■ Eddystone EA12 amateur bands Rx with new valves and manual, working order, in superb condition but has fault, hence £90 only. Must be collected by purchaser. Eddystone EB36 solid-state Rx, no BFO, long, medium, three SW bands, clean condition. No manual, needs attention so £20 only. Trio TS130V HF Tx/Rx with mic, AT130 ATU, perfect working order, £420 ono. N Richardson, 2 Edna Road, Ringlestone, Maidstone, Kent ME14 2QT. Tel: (0622) 685443

■ HP41CX calculator, very good condition, 1yr old, cost £230.00, sell £150 ono. Also high power valve type RS315OCJ by Siemens, 100kW, yes 100kW, offers. This item heavy, prefer buyer collects. Also Daiwa RM940 infra red remote microphone for mobile use, £20.00. I Manson GM1PSU, 19 Houston Gardens, Uphall, West Lothian. Tel: (0506) 857262

■ Yaesu FT707, vgc, with mic, also PSU FP707, ATU, meter, headphones, manuals for all the above items, all in gwo, price £550 the lot. Tel: (0282) 39874 anytime

■ Heavy duty rotator and control box, five wire, gwo and condition. Cost £136 when new, price £45. Bargain. Tel: (0282) 39874 anytime

■ Dragon 32K computer complete with games cassette tapes, joystick, transformer and cassette recorder. The lot price £45, bargain. Tel: (0282) 39874 anytime

■ Daiwa heavy duty rotator and round controller, plus five element Jaybeam, £80 ono. A Bennett, 187 Barton Road, Stretford, Manchester M32 9RA. Tel: (061) 865 7896

■ Trio 9130 2m m/m, £350, with Heatherlite mic and spare mobile mount. Hirschmann rotator and 12 ele ZL beam (2m), £50. Contact Geoff G0GLW. Tel: Bracknell 52601

■ Standard C8800 2m mobile, vgc, £150. AR40 rotator and Jaybeam 2m IOXY, £50. 2ft mast stand-offs, £10. Tel: Paul, 01-673 4140

■ Clearout. Bird thruline power meter plus plug in modules, mains auto transformer 110/240, mains auto transformer variable, 1000MHz dummy load, 250MHz scope probes. Swap for Pentax Super A camera body or sell. Offers evenings or weekends only. Mr Denis Stowe, Sittingbourne, Kent. Tel: (0795) 24980

■ Eddystone EC10 Rx MK1 with Eddystone ac to dc power pack, plus battery pack, instruction manual, in class one condition, re-calibrated, £65. Call or write, Chubb, 32 Kelvedon Road, Fulham SW6 5BW

■ Yaesu FT726R, fitted 2m, 6m, 70cm modules, satellite unit and CW filter, SP102 matching speaker and MD-1 desk mike, £1400. Kenpro KR5400 elevation Azimuth rotators and dual rotator controller, £200. Allweld 30ft telescopic tower with header unit, £200. 2m 10 ele XY beam, £30. 70cm 88 ele multibeam, £30. Tonna 6m, 5 ele beam, £35. Sinclair 128 micro data recorder etc, £125. Yaesu FRG965 scanner with discone, £375. Long illness forces sale. 24 Reservoir Road, Edgeley Park, Stockport SK3 9QJ. Tel: (061) 480 1933

■ Sommerkamp FTDX150, 80m to 10m, 70 watts out. Also SEM ATU, 80m to 10m. £190 both items. Roger G0FCH. Tel: (0793) 695226

■ Sony CRF320, FM/MW/LW/SW, 32 band professional Rx, excellent condition. Willing to swap either Panasonic RF8000 onward model Rx, or

modern communication Rx of recent make, or sell! Tel: (061) 7431570

■ Yaesu FR101DD digital deluxe receiver, 160, 80, 40, 20, 15, 10, main broadcast bands, 6m, 2m, all modes, first class condition, £275. Buyer collects (Wilts, not Sundays). Tel: (0249) 653740

■ Racal RA17L receiver, vgc, £160. Zetagi 200W linear BV131, £65 as new. Ham Multimode II, 26.515 to 28.305, £80. 3 amp power pack, £8. Pye Cambridge radio telephone, offers. Tel: Mike, Wishaw (0698) 357869 after 6pm, or write PO Box 3, Wishaw, Scotland

■ Trio TR2200GX 2m FM transportable, fully xtalld, mic charger, boxed in mint condx, £70.00. Tel: Weymouth (0305) 813202

■ Trio TH41E with two NiCad packs, soft case, dc car adaptor, BNC adaptor, charger, mint cond, boxed, manuals, etc, £195 ono. 2 metre 8 ele quad, £27 ono. G6ZKA. Tel: (02756) 2275, Keysham

■ Trio 9000 2 metre multimode, mint, boxed, £350. BNOS 10/50W 2 metre linear with pre-amp, mint, £90. Might consider mint FM/AM/SSB Rx in full or part exchange. Morse course (records, RSGB tape) plus oscillator, £10. Olympus OM10 plus manual adaptor, mint £90. Wanted: Jobo CPE2. Simma roller motor drive plus drums 8x10, 12x16, 16x20, £150. Buyers to inspect and collect. L R Williams, 37 Elm Drive, Brightlingsea, Colchester, Essex CO7 0LA. Tel: (0206) 304544

■ Yaesu FT757GX, Yaesu FC757AT, Yaesu FP757HD, £1200 the lot, will not split. B T Alberga, 54 Mere View, Yaxley, Peterborough PE7 3HF. Tel: (0733) 315456 or (0733) 241290

■ Marconi model 264 (circa 1935) for sale or exchange. My interest is post-war valve radios or books or equipment. Also have Ekco PB515. J H Coles, 18 Bilford Avenue, Worcester. Tel: (0905) 56818

■ Yaesu FRG7700 receiver with memory facility, perfect working order with original packing and user manual, £300. NAD5120 turntable with A and R cartridge, little used in excellent condition, £50. Matching 6050C cassette deck, equally good, £70. Mr S Wilkinson, Plot 1 Hildyard Close, Hedon, North Humberside HU12 8PE. Tel: (0482) 898322

■ Yaesu FT480R 2m transceiver and 12V PSU plus SWR, power meter, 2m beam antenna, mast and rotator. Datong D70 Morse Tutor, ZX Spectrum and PSU. £450 the lot. Separate items can be arranged. Buyer collects or delivery can be arranged (cover expenses). P R Morgan GW1RZE. Tel: (0792) 863695

■ WWII equipment: 19 set Canadian and British and ancillary equipment. 62 set, C12, A14. Prefer buyer inspects and collects. John. Tel: (0903) 41810 after 7pm and at weekends

■ Trio R600 receiver, £200. Tel: Wood, Clochan 378

■ FT102 filter, AM/FM, £550 ovno. R600 Trio Rx, £200 ovno. Tel: (0908) 642398. G3JXR QTHR

■ Sony CRF320 FM/MW/LW/SW, 32 band, digital HF Rx. Excellent condition. Willing to swap for modern communications receiver of recent make, or National Panasonic RF8000 onward model Rx, or sell. Exchange Sinclair ZX81 16K plus PSU, for Sony AN1 antenna, or frame antenna with unbalanced differential amplifier for MW DX. Tel: (061) 7431570

■ Scanner users, I have photocopies of service manuals for the following: Tandy, Realistic PRO30, PRO31, PRO32 and PRO2021, Yaesu FRG9600 and combined AOR 2001-2002 (UK) versions. All £5 each plus 50p P&P. Phillips. Tel: 01-743 0811

■ Icom IC251E 2 metre multimode transceiver, complete with muTek front end. As new condition, £400. John G3XKN QTHR. Tel: (05255) 2207 (Bedfordshire)

■ Microwave Modules MML144/100S linear amp, 10 watts in, 100 watts out, £95. 20 amp 13.8 volts power supply, twin meters, volts and amps, £50. 4 off 3 inch square muffin fans, 240 volts ac, £3.50 each. Buyer inspects and collects. Would exchange linear and PU for good hand-held IC2E etc. Tel: (0462) 35248 after 6pm. Terry G4OXD, Hitchin

■ Icom AT500 auto ATU, little used, boxed, vgc. Wanted: Altron 30ft mast or similar, also manual ATU, eg FC107, FC102, FC707, FC700 or WHY? Would consider ATU plus cash. Phone for a chat. Tel: Stalham 82075 ask for Ian, daytime only

■ Manuals for Creed 444, Eddystone 880R, Venus SSTV monitor, Mullard valve tester, Telegrip D54 scope, EMI WM1 scope, Robot 80, Cossor 339

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scope, EMI lab type EHT unit, 100 to 2,500 complete working, 813 valves bases, TT21 valves, various crystals. Exchange only. J Brown, 45 Marlborough Avenue, Falmouth, Cornwall TR11 4HS

■ SMC polar phaser II 2 metre antenna polarisation (variable) switch unit (as new), £33 ono. Welz Diamond 2 metre base collinear (new), £20. Jaybeam 2 metre 8ft element crossed yagi (new), £30. 70cm 10 element crossed yagi (new), £33. 015/1296 23cms yagi (new), £35. Paul G4XHF. Tel: (0293) 515201

■ American wartime short wave receiver, BC348Q, covers 200kHz to 18MHz in six bands, with headphones and operation and maintenance book, £35. Tel: Waltham Cross (0992) 22517 evenings

■ PA system, ideal for radio club talks, small rallies, amateur drama, gala days etc. Comprising 120W H&H amp, indoor speakers, outdoor horns, reverb, mic and stand, all leads and bits. Make yourself heard! Offers around £300. Richard G1GUH. Tel: (0283) 813709 (Burton)

■ FT290R, muTek front end, c/w NiCads etc, and 10 watt matching linear, 15 months old, £275 ono. Racal g/c receiver, R174, immaculate, £175 ono. Chris Mould keyer and hi mold paddle, £25. Hansen 1.8-30MHz RMS and PEP power/SWR meter, type 301, MH, £25. Brand new and unused. Arthur. Tel: (061) 624 2808

■ 2 meter FM mobile rig, standard C8900 latest model, only one inch high, 10 watts, mobile mount, manual, excellent condition, £125. Tel: 01-764 6767, Chas

■ Scanner, Realistic PRO30 hand portable, 68-88, 108-136, 138-174, 380-512MHz. AM/FM, search and scan, 16 memories, with rechargeables and charger, rubber and base aerials included, all boxed with instructions, etc. Few months old, little use, as new, bargain, £170 ono, or may swap for good 2m hand-held or Pye hand-held. Also PRO31, no extras, as new, offers over £80 or swap. S Smith, 237 Callowbrook Lane, Rubery, Birmingham B45 9TR. Tel: (021) 453 2862

## WANTED

■ FDK RX40 professional receiver, covers 141MHz-180MHz, rechargeables, complete with mains charger, thumbwheel frequency counter, gives cover entire range. VIC20 16K computer, C2N cassette unit and 1520 plotter printer. Lots pens, paper and software, complete with RX-4 receive prog and interface, receives AMTOR, CW, RTTY, SSTV, perfect condition. Wanted: home base VHF, UHF scanner or HF receiver in good working order - not valve. Cash. Mr Sommerford, 37 Collingwood Close, Peacehaven, Sussex BN9 8BG.

Tel: Peacehaven (0723) 81095

■ Help! FRG9600, Commodore 64, interface and video board. Information needed to get them working together, computer programs etc. Do I need a monitor or can I use a TV? David Forward, 13 Hobbes Close, Malmesbury, Wiltshire SN16 0DA

■ FC102 Yaesu ATU, in good condition. Bert G0GHP.

Tel: Southend (0702) 348746

■ Geloso G209R receiver, complete, and in good working order, or one for spares with crystals and good condition mains tranny, as original. Where can the Amperite 6H6 Ballast valve be obtained from? Note: it is *not* the 6H6 double diode, it is a Ballast device using the same code number and is a four loop filament inside an octal 'GT' size valve envelope. M J Shepherd, 66 Westerland Avenue, Canvey Island, Essex SS8 8JS

■ FRG7 or any Rx in gwo. Swap for Polaroid Polavision instant movie outfit c/w zoom lens in new condition, original box. Would consider complete CB station suitable for mod to 10m FM. WHY? Tel: 01-906 4206

■ Sony CRF330K, must be in mint condition, with instruction manual if possible. Tel: (0602) 706213, evenings if possible

■ Icom AT500 auto ATU, little used, boxed, vgc. Wanted: Altron 30ft mast or similar, also manual ATU, eg FC107, FC102, FC707, FC700 or WHY? Would consider ATU plus cash. Phone for a chat.

Tel: Stalham 82075, ask for Ian, daytime only.

■ 1920's crystal sets, also valve sets transmitters or receivers, civil or military. Also wanted: amplifiers of that period and horn loudspeakers. Any decent early valves and components and WWI military equipment. Replies guaranteed. Some early 1930s sets considered. Ron Irving G3SYX, Fir Glen, Beesby Road, Maltby-le-Marsh, Alford, Lincs LN13 0JJ

■ Urgently wanted: instruction manual for power and SWR meter by Osker Block (electronics engineering) Co Ltd, Tokyo Model No SWR-200B, 20/200 watts. Also obsolete Yaesu/Icom 70cm rig, SSB/CW required (FM not necessary), no need for scanning/memories. Have *PW* magazines, 1944, 1945, 1946, not complete; and *Practical Television* 1950, odd issues. Bill Barrett. Tel: (0834) 83369 after 7.30pm

■ Ex-service German WWII equipment, parts, literature, valves for museum purpose only. Any condition acceptable. Radio/radar accessories/manuals. British: WS18, WS65, R208 receivers, T1190 transmitter, Electra receiver. Will collect. Available: WS38, WS19, Collins 51JY receiver. OZ8RO, R Otterstad, Vejdamms, DK-2840, Holte, Denmark. Tel: (010 452) 801875

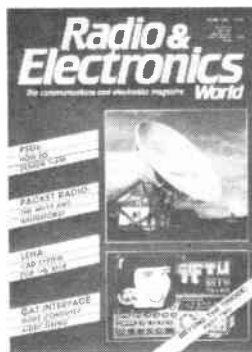
■ Heathkit stuff wanted for alternative station. VFO type VF-1U, DX40 or similar transmitter for CW only. HD1210 keyer. Also need some HC17/U (FT-243) crystals for DX40U. Can collect 100 miles radius from London, please call Eddie G0AQI QTHR. Tel: 01-445 0528 eves, w-ends

■ IC260, IC255 A or E, FTV707, Txvt, FT707, FT107, (not S). Do you have any of the above in good clean condx? Seller must be reasonably local. Mark G4RGB. Tel: Medway, Kent (0634) 30822

■ Exchange superior hi-fi separates system, cabinet, speakers, originally worth £450 for TS130S, TS520SE, FT101E (or 530S with cash adjustment) with PSUs while awaiting licence. Cannot send hi-fi through post - must be collected. Tel: Wigan (0942) 35386 evenings (Friday & Saturday) or (0524) 415789 weekday evenings

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MB3705 £1.80, MB3712 £1.50, MB3722 £3.50, MB3730 £2.50, MB3731 £3.50,  
MB3756 £2.60, MB8719 £3.85, STK461 £7.50, STK463 £8.40, TA7205AP  
£1.00, TA7222AP £1.30, TA7229 £3.25, TA7240 £2.95, TA7607 £2.95, TA7614  
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12 Longshore Way, Milton, Portsmouth PO4 8LS

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contains 20 x 0.4A/H cells, new in box, £8 + £2.50  
p/p. 24v Ni-Cad battery contains 20 x D type cells,  
used condition, £10 + £3 p/p. Ex-govt. type A14  
A.T.U. tunes 2 to 8 MHz into 8 or 16ft. whips, new in  
box, £16 + £3 p/p. Pye Pocket-phone U.H.F.  
receiver type PF1, used and untested £4.50 + 70p  
p/p. Ex-govt. radio set type A40 complete station  
£27 + £4 p/p. Radio set type A41 complete station  
less battery box £27 + £4 p/p. Radio set type 88  
complete station £25 + £4 p/p. Ex-govt. small  
morse signal lamp £5 + £2 p/p. 500v wind handle  
type insulation tester £25 + £2 p/p. Wayne Kerr  
pulse generator type CT500 freq., pulse, width,  
delay and amplitude control, 240v mains, complete.  
in transit case £17 + £3 p/p. Pye hi/band FM base  
station type F100FM 149 MHz £90.00 (new), Pye  
VHF base station type F464T 400 MHz £45.00 inc  
p/p. STC/ITT UHF 460 MHz base station, RxTx (but  
no case) unit 1 inch wide type 3LRU/4LRU £35.00  
inc p/p. STC/ITT 139 MHz transmitter, type 4LMU  
£35.00 inc p/p. STC/ITT 110 MHz receiver £20.00 inc  
p/p. Burndept hi-band FM mobile TxRx type  
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52. 1 - 12V DC miniature relay
54. 10 - rows of 32 gold plated IC sockets (total 320 sockets)
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56. 1 - miniature unselector with circuit for electric jigsaw puzzle
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61. 4 - ferrite slab aerials with L & M wave coils
63. 1 - Mullard thyristor trigger motor
66. 1 - magnetic brake - stops rotation instantly
67. 1 - low pressure 3 level switch can be mouth operated
69. 2 - 25 watt pots 800 ohm
70. 2 - 25 watt pots 1000 ohm
71. 4 - wire wound pots - 18, 33, 50 and 100 ohm your choice
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89. 1 - mains motor with gear box 1 rev per 24 hours
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172. 10 - 12V 8W bulbs Philips m.a.s.
178. 3 - oblong amber indicators with neonlamps 12V
180. 6 - round amber indicators with neonlamps 240V
181. 100 - p.v.c. grommets ½ hole size
182. 1 - short wave tuning condenser 50 pf with ¼" spindle
184. 1 - three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
188. 1 - plastic box sloping metal front, 16 x 95mm average depth 45mm
193. 6 - 5 amp 3 pin flush sockets brown
195. 5 - B.C. lampholders brown bakelite threaded entry
196. 1 - in flex simmerstat for electric blanket soldering iron etc.
197. 2 - thermostats, spindle setting - adjustable range for ovens etc.
199. 1 - mains operated solenoid with plunger 1" travel
200. 1 - 10 digit switch pad for telephones etc.
201. 8 - computer keyboard switches with knobs, pcb or vero mounting
206. 20 - mtrs 80 ohm, standard type co-ax off white
211. 1 - electric clock mains driven, always right time - not cased
216. 1 - stereo pre-amp Mullard EP901
232. 2 - 12V solenoids, small with plunger
236. 1 - mains transformer 9V 1 amp secondary C core construction
241. 1 - car door speaker (very flat) 6 ½" 15 ohm made for Radiomobile
241. 2 - speakers 6" x 4" 4 ohm 5 watt made for Radiomobile
243. 2 - speakers 6" x 4" 16 ohm 5 watt made for Radiomobile
244. 1 - mains motor with gear-box very small, toothed output 1 rpm
245. 4 - standard size pots, ½ meg with dp switch
249. 1 - 13A switched socket on double plate with fused spur
266. 2 - mains transformers 9V ½ A secondary
267. 1 - mains transformers 15V 1A secondary p.c.b. mounting
291. 1 - ten turns 3 watt pot ¼" spindle 100 ohm
296. 3 - car cigar lighter socket plugs
298. 2 - 15 amp round pin plugs brown bakelite
300. 1 - mains solenoid with plunger computer type
303. 10 - ceramic magnets Mullard 1" x 3/8 x 5/16
301. 1 - 12 pole 3 way ceramic wave charge switch
305. 1 - tubular dynamic microphone with desk rest
308. 1 - T.V. turret tuner (black & white T.V.)
310. 2 - oven thermostats
313. 5 - sub miniature micro switches
316. 1 - round pin kettle plug with moulded on lead
453. 2 - 2 ½ in. 80ohm loudspeakers
454. 2 - 2 ½ in. 80ohm loudspeakers
463. 1 - mains operated relay with 2 sets c/o contacts
464. 2 - packets resin filler/sealer with cures
465. 3 - 5A round 3 pin plugs will fit item 193
466. 4 - 7 segment I.e.d. displays
470. 4 - pc boards for stripping, lots of valuable parts
473. 1 - 5" 4ohm speaker with built in tweeter Radio mobil
480. 1 - 3A double pole magnetic trip, saves repairing fuses
488. 4 - 1000uf 25V axial electrolytic capacitors

**FROZEN PIPES** Can be avoided by winding our heating cable around them, 15 mtrs connected to mains cost only about 10p per week to run. Hundreds of other uses as it is waterproof and very flexible. Resistance 60ohms/metre. Price 28p/metre or 15m for £3.95.

### CAR STARTER/CHARGER KIT

Flat Battery? Don't worry you will start your car in a few minutes with this unit - 250 watt transformer 20 amp rectifiers, case and all parts with data £17.50 post £2

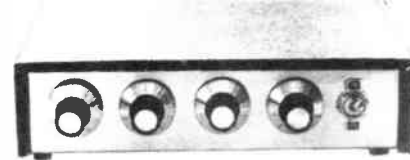


Ex-Guaranteed Board. Guaranteed 12 months.

### VENNER TIME SWITCH

Mains operated with 20 amp switch, one on and one off per 24 hrs repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95 without case, metal case - £2.95, adaptor kit to convert this into a normal 24hr time switch but with the added advantage of up to 12 on/off's per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

### SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by ¼" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

### 12 VOLT MOTOR BY SMITHS

Made for use in cars, etc. these are very powerful and easily reversible. Size 3 ½" long by 3" dia. They have a good length of ¼" spindle - 1/10 hp £3.45, 1/8 hp £5.75, 1/6 hp £7.50

### 25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake - switch on lights to ward off intruders - have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at £2.50

### THIS MONTH'S SNIP

3" floppy disc drive unit plug in and with all electronics. Japanese made, brand new. We are told that this is a standard replacement in many Amstrad and other popular computers, and we supply with technical information. Special snip price £29.50 including post and VAT.

### 12V BATTERY OPERATED SIREN

(Or you can work this off a 24V transformer). Makes a shocking noise, will frighten away any intruder. Japanese made one 50p each, 2 for £1, ref RD106. American, storage sealed but unused and guaranteed perfect, only 20p each, 5 for £1, ref BD221

### WONDERFUL BREAKDOWN VALUE - HAND HELD STEREO UNIT

Contains two beautiful miniature moving coil loudspeakers. These could also be used as microphones, also contains many other useful parts including mini stereo amp, transistors, condensers, rocker switches etc. To use this as a personal amplifier simply add a speaker, only £1, ref BD029

### SPIT MOTOR

Powerful mains operated induction motor with gearbox attached. Shaft has square hole which gives very easy coupling and quick release if required. Shaft speed 5rpm. Price £5, ref SP54

### PUSH SWITCH REF 14DM

Double pole c/o switch, able to handle 10A at mains voltage. Mounts through an oblong hole like a rocker switch. Has its own push rod, so does not require a knob. Change over occurs when switch is depressed and returns to normal when pressure removed. 3 for £1, ref BD489

### 20V-0-20V 1A MAINS TRANSFORMER

Upright mounting. Primary thermal cutout to interrupt the supply if transformer overheats. Price £2, ref 2P138

### 4 BOOKS FOR £1

Book 1 describes the Mullard Unilex amplifier and gives details of a suitable cabinet. Book 2 describes several useful pieces of test equipment which could be quite easily constructed. Book 3 is electronic projects. Book 4 describes short wave receivers which can be easily constructed and is intended for mainly beginners. Our ref BD400

### TRANSFORMER IN WATERPROOF METAL CASE

24V 5A output. Ideal for garden lighting or to operate pond pump etc. Case has cable glands for mains in and low voltage output leads. Price £5 plus £1 post, ref SP88

### MAINS RELAY

With transparent plastic cover. Could be pcb or clip mounted, has single 8-10A c/o contact. Ref bargain 2 for £1, ref BD486

### PANEL METERS

Engraved vul, approximately 1 ½" square. Luminate these from behind and you will have a really super looking panel. Ref bargain 2 for £1, ref BD366

### TRANSMITTER TUNING CONDENSATOR

160pf made for a very famous RAF transmitter, only £1 each. Unused but mounting brackets will need a bit of cleaning up due to storage. Our ref BD424

### MAGNETIC READ/WRITE UNIT

A read/write head mounted on a thumb operated lever: is made to traverse magnetisable paper. The paper is held between top and bottom rollers which can be spun for localisation of the written message - new and unused only £1 each, B0381

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Master socket (has surge arrester - ringing condenser etc) and takes B.T. plug £3.95  
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### £2 POUNDERS\*

- 2P2 -Wall mounting thermostat, high precision with mercury switch and thermometer
- 2P3 -Variable and reversible 8-12v psu for model control
- 2P4 -24 volt psu with separate channels for stereo made for Mullard UNILEX
- 2P6 -100W mains to 115V auto-transformer with voltage tapings
- 2P8 -Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
- 2P9 -Time and set switch. Boxed, glass fronted and with knobs. Controls up to 15 amps. Ideal to program electric heaters
- 2P10 -12 volt 5 amp mains transformer
- 2P12 -Disk or Tape precision motor - has balanced rotor and is reversible 230v mains operated 1500 rpm
- 2P14 -Mag Stop kit - when thrown emits percing squeak
- 2P15 -Intelligent Beam kit for burglar alarms, counters, etc.
- 2P17 -2 rev pr minute mains driven motor, ideal to operate mirror ball
- 2P18 -Liquid/gas shut off valve mains solenoid operated
- 2P19 -Disc switch-motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
- 2P20 -20 metres extension lead, 2 core - ideal most Black and Decker garden tools etc.
- 2P21 -10 watt amplifier, Mullard module reference 1173
- 2P22 -Motor driven switch 20 secs on or off after push
- 2P26 -Counter resettable mains operated 3 digit
- 2P27 -Goodmans Speaker 6 inch round Bohm 12 watt
- 2P28 -Drill Pump - always useful coupled to any make portable drill
- 2P31 -4 metres 98 watt interconnecting wire easy to strip
- 2P32 -Hot Wire amp meter - 4 ½ round surface mounting 0-10A - old but working and definitely a bit of history
- 2P34 -Solenoid Air Valve mains operated
- 2P38 -200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating arial or a tumbler for polishing stones, etc.
- 2P43 -Small tube blower or extractor fan, motor inset so very compact, 230V
- 2P46 -Dur famous drill control kit complete and with prepared case
- 2P49 -Fire Alarm break glass switch in heavy cast case
- 2P51 -Stereo amplifier, 3w per channel
- 2P55 -Mains motor, extra powerful has 1 ½" stack and good length of spindle
- 2P62 -1 pair Goodmans 15 ohm speakers for Unilex
- 2P64 -1 five bladed fan 6 ½" with mains motor
- 2P66 -1 2Kw tangential heater, 115v easily convertible for 230V
- 2P67 -1 12V-0-12v 2 amp mains transformer
- 2P68 -1 15V-0-15v 6 amp mains transformer
- 2P69 -1 250V-0-250v 60 mA & 86.3v 5A mains transformer + 50p post
- 2P70 -1 E.M.I. tape motor two speed and reversible
- 2P72 -1 115v Muffin fan 4" x 4" approx. (s.h.)
- 2P75 -1 2 hour timer, plugs into 13A socket
- 2P82 -9v-0-9v 2 amp mains transformer
- 2P84 -Modern board with press keys for telephone redialler
- 2P85 -20v-0-20v 3 A Mains transformer
- 2P88 -Sangamo 24 hr time switch 20 amp (s.h.)
- 2P89 -120 mm. time switch with knob
- 2P90 -90 mm. time switch with edgewise engraved controller
- 2P94 -Telephone handset for EE home telephone circuit
- 2P95 -13A socket on satin chrome plate
- 2P97 -mains transformer 24V 2A upright mounting
- 2P98 -20m 4 core telephone cable, white outer
- 2P99 -500 hardened pin type staples for telephone cable
- 2P101 -15V mains transformer 4A upright mounting
- 2P105 -capillary tube thermostat for air temperature with c/o switch
- 2P108 -mains motor with gear box giving 110rpm
- 2P109 -5" wide black adhesive pvc tape 33m, add £1 post if not collecting

### OVER 400 GIFTS YOU CAN CHOOSE FROM

There is a total of over 400 packs in our Baker's dozen range and you become entitled to a free gift with each dozen pounds you spend on these packs.

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### £5 POUNDERS\*

- 5P1 -12 volt submersible pump complete with a tap and switch, an ideal caravan unit.
- 5P2 -Sound to light kit complete in case, suitable for use to 750 watts.
- 5P6 -12V alarm bell with heavy 6" gong, stable for outside if protected from direct rainfall. Ex GPD but in perfect order.
- 5P12 -Equipment cooling fan - mini snail type mains operated
- 5P13 -Ping pong ball blower - or for any job that requires a powerful stream of air - ex computer. Collect or add £2 post.
- 5P15 -Unselector 4 pole, 25 way 50 volt coil
- 5P18 -motor driven water pump as fitted to many washing machines
- 5P20 -2 kits, matchbox size, surveillance transmitter and FM receiver
- 5P23 -miniature (appr 2 ½" wide) tangential blow heater, 1-2kw
- 5P24 -½ hp motor, ex computer, 230V, mains operation 1450rpm. If not collect add £3 post.
- 5P25 -special effects lighting switch. Up to 6 channels of lamps can be on or off for varying time periods
- 5P27 -cardridge player 12V, has high quality stereo amplifier
- 5P34 -24V 5A toroidal mains transformer
- 5P35 -modern board from telephone auto dialler, complete with keypad and all ICs
- 5P37 -24 hour time switch, 2 on/off's and clockwork reserve, ex Elec. Board loading up to 50A. Add £1 post
- 5P41 -5" extractor fan, very quiet runner (s.h.), gntd 12mths.
- 5P48 -telephone extension bell in black case, ex-GPD
- 5P52 -mains transformer 26V 10A upright mounting, add £2 post
- 5P54 -mains motor with gear box, final speed 5rpm
- 5P58 -Amstrad stereo tuner FM and LM. AM
- 5P60 -DC Muffin type fan 18 to 27V, only 3W
- 5P61 -drill pump mounted on frame, coupled to mains motor
- 5P62 -2 ½ kw tangential blow heater, add £1.50 post if not collecting
- 5P73C -high pressure mains operated gas or water valve with tube connection suitable soldering
- 5P74 -6rpm 60W mains motor and gearbox with instant stop
- 5P79 -30rpm 80 watt mains driven motor with gearbox
- 5P82 -1 25rpm mains 80w motor with gearbox
- 5P84 -1 delay time switch, adjust 0-20 seconds
- 5P89 -1 light box size 14" x 12" for circuit tracing pcb's. Add £3 for postage and packing
- 5F72 -1 turntable for vdu or scope
- 5P81 -1 stepper motor bi-directional, 7.5" steps 12-14V coil
- 5P86 -1 mains transformer with 2 x 100V 1A secondaries. Add £1.50 post
- 5P88 -1 24V 5A mains transformer in waterproof case, ideal for garden lighting, pond pump etc.

**LIGHT CHASER KIT** motor driven switch bank with connection diagram, used in connection with 4 sets of xmas lights makes a very eye catching display for home, shop or disco, only £5 ref 5P56.

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