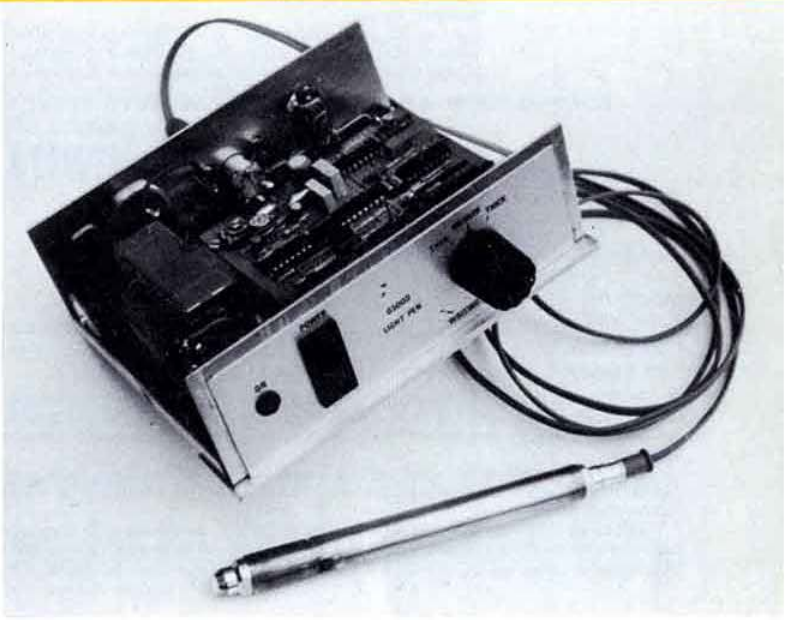
December 1980

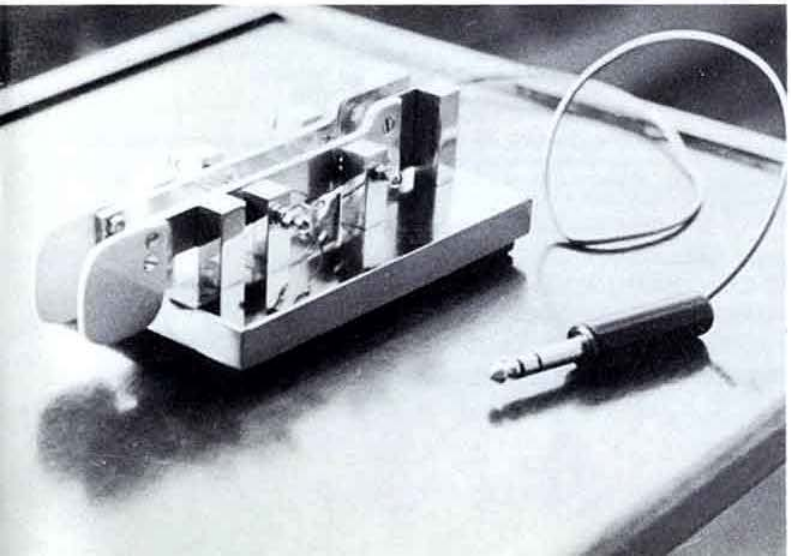
radio communication

journal of the Radio Society of Great Britain

The G3OQD light pen for the Robot 400

by M. H. EMMERSON, MSc, Grad IERE, G3OQD





A design for a dual-paddle morse key

by PETER HOWE, G4CHL

Photo: G3BPE

AVAILABLE FROM Catronics

VIDEO DISPLAY UNIT MODEL CD310
ESPECIALLY DESIGNED FOR THE RTTY ENTHUSIAST

The video display unit is designed to be an all-electronic replacement for a Teleprinter, and therefore does not suffer its disadvantages—bulk unreliability and noise.

The basic function is to take Murray Code—either from a Terminal Unit (on receive) or from a Keyboard—and produce a complete TV signal. This signal may be fed into a monitor or via the built-in UHF modulator into the aerial of an ordinary domestic TV set. The resulting display is a page of 16 lines of up to 64 characters.

It may also be used (with its keyboard) to send fully encoded Murray Code signals for transmit purposes.

16 lines per page
64 characters per line
Standard TTL compatible input
Standard IV video output
Flashing cursor
Auto-scroll at end of page
Cabinet size 9" × 2½" × 7" approx

Front panel controls for: **Letter shift**, **Figure shift**, **Page reset**, **Carriage return**, **Line feed**

Built-in mains PSU
Styled to match the Catronics CT100 Terminal Unit

Model CD310 with built-in UHF modulator: £170.00 (Add £5.50 for Courier delivery)

COMING SOON: 4 PAGE MEMORY VERSION TO STORE UP TO 64 LINES with built-in UHF modulator: PRICE approx £220.00

and don't forget the RTTY TERMINAL UNIT CT100 Mk2

Now incorporating a number of modifications, YOU have asked for:
including Completely automatic receive/transmit modes.
Protected and buffered input provided for TTY keyboard.
Automatic re-generation of incoming tones.
Special r.f. interference suppression circuit, etc, etc.

Inputs for:	**Outputs for:**
Audio FSK signal in	VDU or other TTL compatible equipment
Data in from VDU (eg CD310).	TTY Magnet – single or double current
TTY Keyboard or Tape Reader	AFSK to drive Transmitter

Featuring a unique digitally controlled **'Autoprint'** circuit which is a superior replacement for the 'Antispace' and 'Autostart' facilities found on some other terminal units. The terminal will ignore most CW and phone signals but will respond to a correct RTTY signal.

Tuning correctly into an RTTY signal is made simple with a single **'correctly tuned'** LED plus an additional **'Mark frequency'** indicator.

The FSK demodulator circuit utilises a special 'state-of-the-art' system to give excellent performance and stability at low cost. The demodulator is set to decode signals within 75Hz of nominal frequency i.e. 1200–1350Hz for space and 1370–1520Hz for mark, when in narrow shift position.

The teleprinter interface unit incorporates electronic 'de-bounce' circuitry to eliminate spurious switching from the Keyboard. The loop supply is protected by a separate fuse and is suitable for driving all single current and double current magnets known to be available.

VAT inclusive prices are as follows: CT101 without Teleprinter interface **£99.60**, CT103 Complete Terminal Unit **£104.90**. All models plus **£5.50** Courier delivery

G3PLX RTTY VIDEO DISPLAY

(April 1977 Rad Com)
Kit (excluding modulator and keyboard) **£107.00**
Set of printed circuit boards **£34.10**
Flashing cursor kit **£7.95**
Diode Matrix kit **£19.65**

Please add 40p postage.

NOTE regarding PROM program: The PCBs and programmed PROMs supplied by us make use of a slightly different program sequence resulting in different pin connections to those published in the 'Rad Com' article. Whilst constructors buying PROMs and PCBs from us will have no difficulty, those producing their own PCBs or having PROMs programmed elsewhere should note this important difference. A detailed modification sheet is available with the PCBs.

KEYBOARD KIT

The printed circuit board is designed to take a maximum of 70 keys but may be assembled with a smaller number of keys for a simpler keyboard.

The board is not dedicated to any specific coding, allowing it to be used for any project whether it requires ASC11, Baudot or any other code. This makes it suitable for many projects including;

G3PLX RTTY VDU
Auto morse sender, etc.

The Keyswitches themselves are single pole push-to-make type and require no extra mechanical mounting arrangements.

A legend sheet is provided with each kit enabling the constructor to label the keys to suit individual requirements.

Price: only £30.25. Please add 50p for postage

Pay by cheque, PO, Access or Barclaycard. HP also available (Written quotation on request)

CATRONICS LTD, DEPT C12 COMMUNICATIONS HOUSE,
20 WALLINGTON SQUARE, WALLINGTON, SURREY SM6 8RG. Tel: 01-669 6700

Shop/showroom open Monday–Friday: 9.00–5.30, closed for lunch: 12.45–1.45. Saturdays: 9.00–1.00.

Access

BARCLAYCARD VISA

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radio communication

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Radio Communication **is published by The Radio Society of Great Britain as its official journal on the first Friday of each month and is sent free and post paid to all members of the Society**

ABC MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

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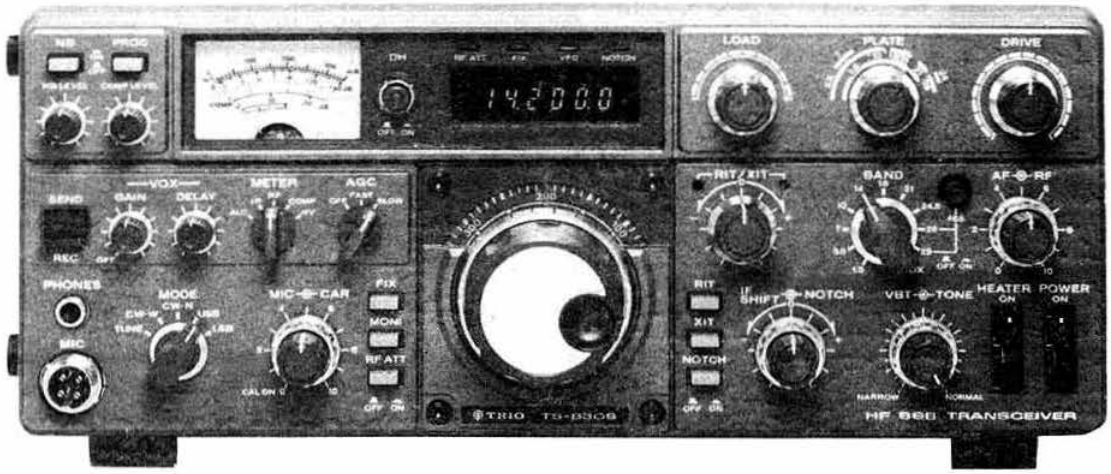
THE NEW HF RIG FROM TRIO



TRIO TS830S

The new TS830S, the latest from TRIO. A high performance, very affordable HF SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 metres (including the new three bands). The TS830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift and an IF notch filter, as well as very sharp filters in the 455kHz second IF. Together with the optional VF0230 (remote digital display VFO) which provides split frequency operation and 5 memories for frequency hold, the amateur has available todays advanced technology linked to the proven reliability and exceptional linearity of a valve PA.

AVAILABLE NOW £639.52 inc VAT
Carriage by Securicor £4.50
A winning price for a winning rig

- ★ VBT variable bandwidth tuning
- ★ IF notch filter
- ★ IF Shift
- ★ Various filter options
- ★ Built in digital display
- ★ 6146B final with RF negative feed-back
- ★ Optional Digital VFO for increased flexibility
- ★ Innovative PLL system of frequency generation
- ★ RF speech processor
- ★ Adjustable noise blanker level
- ★ Adjustable audio tone
- ★ RF attenuator
- ★ RIT/XIT
- ★ SSB monitor circuit
- ★ Expanded frequency coverage

All Trio equipment is available from the following authorised Trio dealers
LOWE ELECTRONICS LTD. 119 Cavendish Road, Matlock, Derbys. Tel: 0629 2430 or 2817

LANCASHIRE **Stephens-James Ltd** 47 Warrington Rd Leigh 0942 676790	**BIRMINGHAM** **Ward Electronics** Soho House 362-364 Soho Rd Birmingham B21 9QL. 021 554 0708	**SOUTH LONDON** **Catronics Ltd** 20 Wallington Square Wallington SM6 8RG 01-669 6700	**ESSEX** **Waters & Stanton Electronics** Warren House 18-20 Main Rd, Hockley Essex. 0702 206835	**W. SUSSEX** **Bredhurst Electronics** High St Handcross Haywards Heath W. Sussex. 0444 400786
BUCKINGHAMSHIRE **Photo Acoustics Ltd** 58 High St Newport Pagnell Bucks 0908 610625	**WALES** **MRS Communications Ltd** 76 Park Rd Whitchurch, Cardiff 0222 616936	**NORTH LONDON** **Radio Shack Ltd** 188 Broadhurst Gardens London NW6 3AY 01-624 7174	**YORKSHIRE** **Leeds Amateur Radio** 27 Cookridge St Leeds LE2 3AG 0532 452657	**EAST SCOTLAND** **Jay-Cee Electronics** 20 Woodside Way Glenrothes Fife KY7 5DE 0592-756962

TRIO **IMPORTANT INFORMATION** TRIO

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

LOWE ELECTRONICS Ltd

TRIO TS520SE

£437.00 inc. VAT

Carriage by Securicor £4.50

VOTED "MY FAVOURITE TRANSCEIVER" BY RADIO AMATEURS WORLD WIDE

In the face of ever increasing complexity in amateur radio equipment, it's comforting to know that the TS520SE is still in volume production. Radio amateurs all over the world (and dealers too) have voted the TS520SE "my favourite transceiver" because of its astounding reputation for reliability, high sensitivity receiver, and of course the unequalled Trio audio quality coming from the transmitter. The TS520SE incorporates all of the features demanded by today's amateur, and at an outstandingly low price. No wonder it's top of the list in popularity, and comparison with other transceivers will convince you that the TS520SE is the best value on the market today.

Of course, the bare figures cannot tell you just how nice it feels in use, nor can they tell you the pleasure of hearing other operators saying "never heard better audio OM, what rig are you using?" The TS520SE standard specification includes CW wide/narrow switching (using the optional 500Hz filter), semi breakin keying with sidetone, PTT or VOX operation, really effective noise blanker, switched AGC time constants, 5 function metering, switched RF attenuator, RIT, speech processing for punchy transmit audio, fixed channel facilities, 25kHz calibrator, fan cooled PA internal loudspeaker, and of course the TS520SE will take all the wide range of current matching accessories including the DG5 true frequency digital readout, the VFO520S remote VFO unit, the SM220 station monitor scope and panoramic display and so on.

When talking to prospective purchasers of the TS520SE, the question we are most often asked is "how does it compare in price to its rivals?" and the transceiver it is most compared with is the Yaesu FT101Z series. The price for the **FT101Z** taken from March 1980 Rad Com is **£575** including VAT and you also should add PA fan at **£13.80** (the fan is standard on the TS520SE) making a grand total of **£588.80.**

TRIO R1000

£285.20 inc. VAT

THIS PRICE INCLUDES DC KIT FITTED

Carriage by Securicor £4.50

The R1000 uses an advanced PLL system in an up-conversion scheme to a high (48MHz) first IF to remove any possibility of image responses. The receiver covers the entire frequency range from below 200kHz right up to 30MHz in 30 bands, each 1MHz wide. The bands are selected, not by ambiguous knob twiddling as in receivers using the Wadley loop but by a 30 position band switch which controls the PLL system.

The band switch also electronically selects the appropriate band pass filter network in the RF stages of the receiver so there are no "preselector" or "antenna trim" controls to twiddle – simply set the band switch to the range required – that's it!

A highly stable VFO tunes each 1MHz range and its linear, back lit scale makes readout easy. However, in addition to this dial, Trio have also provided 5 digit true frequency digital readout so as to guarantee spot-on accuracy on any frequency. As a further feature, the digital display can also be switched to read time, this being derived from a quartz standard. Marvellous for accurate log keeping. The display uses high intensity readout units which can be dimmed for use in low light conditions.

As for what else is inside this superb instrument – selectivity is catered for by three custom made IF filters; a 12kHz wide AM filter; 6kHz narrow AM filter; and a new 2·7kHz SSB filter with a shape factor of better than 1:2 6:60dB. Selectable sidebands are available at the touch of a switch. As an option, on request, you can have 6kHz AM wide, 2·7kHz AM narrow and 2·7kHz SSB. The 12kHz filter remains in the set for use if required.

For the first time in mid-price receiver, a true noise blanket is provided to remove pulse type ignition noise.

To minimise front end overload, a step RF attenuator is included which gives 0·6dB attenuation in four steps.

All the rear panel connectors are recessed on a sloping panel so that you can stand the receiver either on its back, or pushed hard against a wall when used in conventional shelf mounting. The antenna inputs allow the use of either a high impedance wire aerial or a 50ohm balanced input so that the proverbial long lump of wire will work really well with the R-1000.

This receiver is so advanced it makes everything in its price range completely obsolete.

THE FINEST EQUIPMENT FROM TRIO

LOWE ELECTRONICS Ltd

TRIO TS120V/S

TS120V £347.30 inc VAT
TS120S £432.40 inc VAT

PS20 4 Amp	**£44.85**	PS30 20 Amp	**£85.10**
AT120	**£55.20**	MC35S mic	**£13.80**
SP120	**£25.30**	TL120 linear	**£128.80**
VFO120	**£89.70**		

Carriage by Securicor £4.50

THE SYSTEM APPROACH

What do we mean by the "System Approach"?

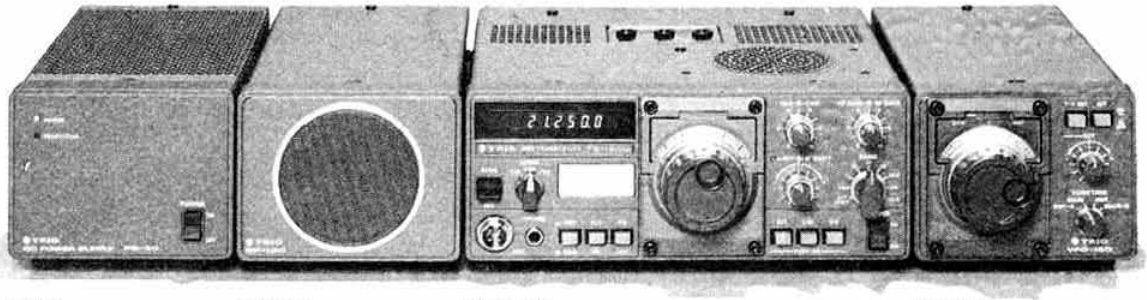
Well, take the TS120V and you have the finest 20W p.e.p. mobile HF transceiver you could buy. Many operators are even buying it as a second station because it's so good. Consider its features, the single conversion PLL derived top performance; the accurate digital readout; the passband tuning; the noise blanker; the superb engineering; THEN maybe add the PS20 mains power supply and you have an equally great home station; OR maybe add the multi-function VFO120 second VFO unit; OR the SP120 external speaker; OR the 100W AT120 antenna tuner or maybe even a superb Microwave Modules 2 metre or 70cm transverter to get you up on the VHF and UHF bands. It all adds up to a fine station tailored exactly to your own needs.

If you need more power, the TL120 200W p.e.p. linear is now available, but you will need a heftier 12V supply to run it. A suitable unit would be the PS30 which delivers up to 20 amps fully regulated and protected. Lots of people are buying the PS30 as a general purpose heavy duty supply for shack use.

Finally, should you really want high power all the time, consider the TS120S which incorporates all the features of the TS120V but has a built-in high power, fully protected 200W p.e.p. linear and it's still not too expensive to enjoy!

Do you realise that if you wanted to buy a top class ham band receiver, you could pay more than the price of the TS120V—and with the TS120V you get the complete station. Amateur radio has never seen such value for money.

TAKE A GOOD LOOK AT THE PRICES!!!



PS20 **SP120** **TS120V** **VFO120**

THE SYSTEM APPROACH BY TRIO

LOWE ELECTRONICS Ltd

TRIO

TR7800

2m FM
AT ITS VERY BEST
£268 inc VAT
Carriage by Securicor
£4.50

The new TR7800 just has to be voted the best 2 metre FM transceiver to appear on the world scene. Following detailed market research, Trio have produced what we think is the perfect mobile/home station rig for all users, incorporating all the features which were requested by amateur radio operators worldwide.

What does it do?

Let's take the basic specification first, and say that the TR7800 is a fully synthesised 2 metre FM transceiver having a minimum output power of 25W on transmit (typically 30 to 35W on random samples), and an incredible receiver which is typically producing sensitivity measurements of 0·12 microvolts for 12dB Sinad. This is certainly the best FM receiver of which we know. That's the basic story so let's go on to the user features.

It's clear from the photograph that you have direct keyboard entry of frequency actually from the front panel. From the keyboard, you can also select simplex and repeater shift functions for use either on UK or American repeaters. The digital readout tells you the operating frequency including any selected shift so you are completely in touch with your mode of operation.

So far so good—but what about the mysterious knob on the right hand side of the panel? Well, that selects a bank of 15 (yes, 15) memories for frequency storage and the smart part is that these are designated not 1 to 15 but 0 to 14. "So what?" sez you. "Aha" sez I, that means that if you program in all repeater channels from R0 to R9 using memories 0 to 9, the memory channel display shows you the repeater channel number whilst at the same time the digital readout shows you your transmit and receive frequencies. In addition to this, the memory channels also store the repeater shift so that it's called up automatically when you use the memory.

The remaining memories can be used to store any frequencies within the band, but a further smart part is that memories 13 and 14 can store completely separate transmit and receive frequencies for non standard shifts, etc. *And* memory 14 is also designated the priority channel so that any frequency put into it can be constantly monitored at 5 second intervals, whatever else the transceiver may be doing. *And* if you have the volume turned down, a piezo bleeper alerts you if a signal has appeared on the priority channel. You also have direct access to the channel by simply pushing the "Priority operate" button.

Final features for repeater operation include a tone burst which can be turned on or off as desired, and reverse repeater operation at the touch of a button.

Now for more facilities pertaining to scanning. In keyboard operation, you can scan the entire band in 25kHz or 5kHz intervals by simply touching the SC button. In memory mode, you can scan all fifteen memories using the same SC button. The scan system is (in my opinion) the best yet offered in that the transceiver scans until a signal is heard, stops on the frequency for about 5 seconds to allow you to check what's on, then steps on automatically to find the next busy frequency. If you want to stop the scan, simply press the PTT bar on the microphone or touch the C (cancel) button on the keyboard. By scanning this way, you eliminate the annoying locking up on busy repeater channels that so often ruins your enjoyment of an otherwise satisfactory scanning system.

In addition to scanning, the TR7800 can be stepped up and down the band in 25kHz or 5kHz steps using the UP/DOWN buttons on the hand microphone. The microphone is supplied as a standard with the TR7800. If either button is held down, the TR7800 tunes across the band until the button is released.

The mic buttons also allow you to step up and down the memory channels.

LED indicators show Simplex, +600 or −600 operation, a busy lamp on occupied frequencies and "on air" indication. Signal strength and TX output are indicated on an LED bar display.

Memory contents can be retained by installing four standard AA size Nicad batteries inside the transceiver. The batteries are charged when the TR7800 is switched on, and the memories are then retained for up to five days on the batteries.

All in all, the TR7800 is an amazing transceiver and follows the Trio design pattern for the '80s. Let's face it, Trio are now showing the way to go and the others are truly a long way behind. Why not see the TR7800 soon and test the truth in what I've been saying.

FROM AOR, THE NEW

AR 245 2 metre HAND HELD FM
SYNTHESIZED 144–148MHz TRANSCEIVER
5 WATTS/1 WATT OUTPUT £178 inc VAT

"A staggering technical achievement"; "How can they get it into such a small size"; "Outperforms any rig I've ever had"; these are typical of the comments made by amateur radio operators after seeing and using the remarkable AR245 2 metre FM handheld transceiver. What does it mean to you? Well, at last you can really take your amateur radio with you, anywhere you want to go, because in this handheld unit, you have a complete synthesized 2 metre FM transceiver covering 144·000 to 147·995kHz in 5kHz steps. Also included are + and −600kHz repeater shifts and a crystal controlled tone burst unit.

INCLUDED IN PRICE—NICAD PACK, CHARGER, WHIP, XTAL TONE BURST

2 METRE EQUIPMENT FROM LOWE

LOWE ELECTRONICS Ltd

TRIO TS770E

THE RIG FOR MULTIMODE CONTACTS ON 2m & 70cm

£730.25 inc. VAT

Carriage by Securicor £4.50

The only dual band high performance transceiver available today. The TS770E is another successful result of Trio's advanced engineering capability and represents the peak of RF engineering for VHF and UHF.

Full coverage 144-146 and 430-440MHz using an advanced microprocessor controlled synthesiser generating 20Hz steps for that "VFO feel". Eight memory channels which can be scanned, cross band operation for satellite use, VOX, break in CW, 15-18W output at any frequency, terrific receiver performance, search and scan facilities, in fact everything one might expect from the best equipment designed by the best manufacturer in the business.

The TS770E gives you a single package to replace all those boxes you use right now. Performance and convenience on VHF and UHF are yours today with the TS770E.

Fitted with repeater shifts of 600KHz for 2m, 1·6MHz and 7·6MHz for 70cm. Repeater shifts are automatically correct for the band in use, even on the memory channels.

For complete information, contact us right now and we will send a detailed brochure.

TRIO TR9000

THE MULTIMODE RIG FOR 2 METRES

£345.00 inc. VAT

Carriage by Securicor £4.50

The 2 metre band, beacons, repeaters, FM simplex, FM repeaters, CW and SSB. Single side band, a mode to conjure with, a decent location, either fixed or portable, a beam antenna and a TR9000 and the world, well given a lift, Europe is at your fingertips.

Cast your eye over the front panel. Apart from the now conventional RF/RIT, power/vol and high/low power controls, you will notice added facilities.

There is the 5 channel memory which will store specific frequencies, one of which will give a non standard repeater shift. Just the thing for net channels and your local repeater.

On FM the rig will scan in 25kc steps holding on each occupied channel. On SSB the search facility can be used enabling 10kc of the band to be rapidly covered. Used in conjunction with the up/down shift switch on the microphone the area of SSB search can be moved up and down the band in 10kc steps thus enabling the entire side band frequencies to be looked at quickly.

To enable quick reference to both FM and SSB sides of the band, that is 144 and 145MHz, two separate VFOs are provided thus for ease of operating VFO A can be left around 145·00MHz and VFO B on 144·00MHz.

So there we have it, a superb, simple to operate 2 metre multi mode rig that can be used either in the car or at home as a base station. 10 watts output of high quality speech on SSB and FM, the hallmark of Trio signals on the air.

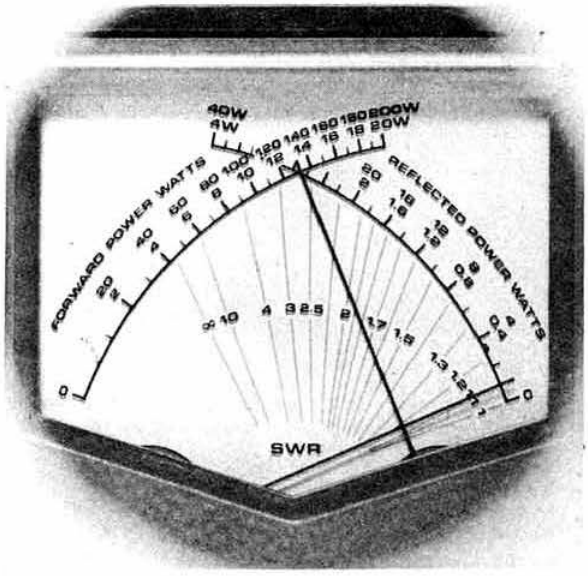
In line with Trio's design policy, the TR9000 is the easiest to use multi-mode rig on the market. Others may talk about ergonomics—it takes Trio to put in into practice

BO9 Base Plinth £32.20 inc VAT

PS20 Power Supply £44.85 inc VAT

THE COMPLETELY NEW APPROACH TO VHF/UHF

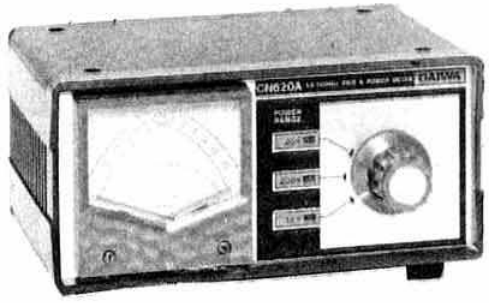
LOWE ELECTRONICS Ltd



WHAT DO YOU KNOW ABOUT CROSS POINTER POWER METERS?

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

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



CN620A £52.81 inc VAT

CNA1001A ANTENNA TUNER

£129.95 inc VAT

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

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

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

CNA1001A Specification

SWR/Power meter.	Frequency range		3·30MHz inc new bands
	Line impedance		50 Ohms
	Power ranges	Forward	20/200 Watts
		Reflected	4/40 Watts
	Meter accuracy		± 10% of full scale
	Power rating		500W pep
	Input power for auto tune		1·10W
Tuner	Frequency		3·5,7,10,14,18,24,28MHz
	Input impedance		50 Ohms
	Output impedance		10·250 Ohms
	Operate time		45sec maximum

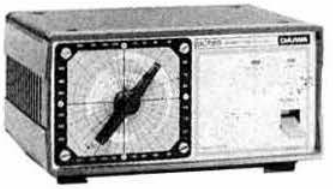
Size 225 x 90 x 245mm Weight 3·6kg Dummy load 10W (50W 1 minute)
Outputs for two antenna systems SO239 connectors

DAIWA INDUSTRY CO., LTD

DISTRIBUTED IN UK BY

LOWE ELECTRONICS Ltd

LOWE ELECTRONICS Ltd



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

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

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

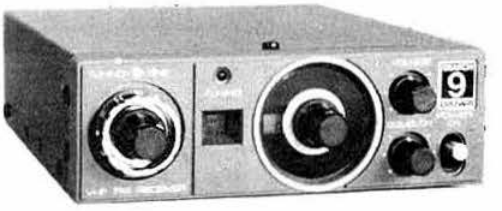
The rotators can be ordered as either "R" or "X" versions. The "R" suffix denotes the controller with the back lit scale and control by switches marked "left" and "right" to drive the rotator round. The controller pointer then smoothly indicates the direction in which the rotator is pointing. However,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

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

DAIWA ROTATOR SYSTEMS

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

CS201 £11.98 inc VAT
2-WAY COAX SWITCH
0–500MHz
PLUS DIAWA QUALITY

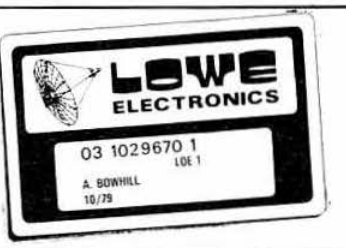


SR9 2m FM MONITOR
TUNABLE + CRYSTAL CONTROL
£46 inc VAT

DON'T FORGET THAT OUR CATALOGUE CONTAINS DETAILS OF THE WIDEST RANGE OF EQUIPMENT AROUND.
48p IN STAMPS WILL BRING IT TO YOU

THE WAY TO HAVE TOMORROW'S EQUIPMENT TODAY

WRITE FOR FULL DETAILS TODAY



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

HEAD OFFICE AND SERVICE CENTRE
CHESTERFIELD ROAD, MATLOCK, DERBYS. TEL: 0629-2817 or 2430. TELEX 377482. OPEN 9-5.30 TUES-SAT. PHONE IN 9am-9pm
For personal attention on the South Coast contact John, G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Ringmer 812071.
For equally helpful attention in Scotland contact Sim, GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771 0364.
FOR ALL THAT'S BEST IN HAM RADIO CONTACT US AT MATLOCK ANYTIME

WATERS & STANTON ELECTRONICS

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

STOP . . . . . THESE PRICES ARE UNBEATABLE!

FDK MULTI-700EX

2m 25W OUTPUT + PRIORITY SCANNING

COMPARE THE PRICE **£199 inc VAT**

- Full coverage of the 144-146MHz band with facilities for 12·5kHz steps anywhere in the band.
- Large four digit LED frequency display tuned in 40 × 25kHz steps in each 1MHz range.
- A specially designed five stage helical-resonator assembly together with the latest dual-gate MOSFET front end ensures excellent cross-modulation characteristics.
- Built-in crystal controlled automatic tone-burst with ±600kHz shift for repeater operation and optional +1·6MHz shift for use in conjunction with FDK/MUV-430A UHF transverter.
- Four additional priority channels-two diode matrix programmable in 12·5kHz steps and two crystal controlled for any frequency between 144-146MHz.
- Channel scanning of two chosen channels either synthesizer/matrix or matrix/crystal.
- Continuously variable RF output control from 1-25 watts.
- Advanced PLL technology provides good stability with low spurious output; integral power supply noise filter eliminates vehicle line noise and an automatic protection circuit protects the RF output power module against poor SWR, open or short circuit.

Complete with microphone and mobile mounting brackets **£199 inc VAT**

MOBILE SAFETY MICS

We have a shipment of safety mics due in by the time you read this advert. The model 202S clips onto the lapel and comes with gear lever control box at £20.95. Also in stock is model 202H which has a neck band and boom plus gear lever control box, incorporating up/down frequency control and tx/rx switch. £29.95. These mics suit all transceivers except the ICOM IC255.

FDK MULTI-750E

2m (& 70cm) ALL-MODE

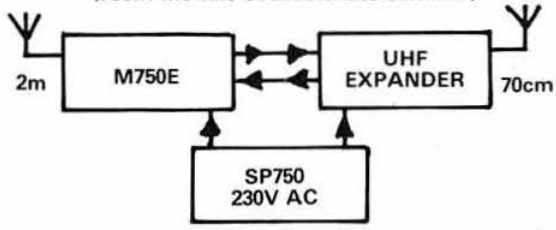
AMAZING VALUE **£299 inc VAT**

- Simple and smooth VFO control gives either 100Hz or 5kHz steps on both FM and SSB modes for optimum convenience.
- The large green fluorescent display tube gives full frequency readout to 100Hz and provides safe and clear readout for both night and day operation.
- Standard features include noise-blanker, RIT control with switch, RF attenuator gain control, automatic crystal controlled tone-burst, high and low power switching and remote up/down frequency control microphone unit.
- Compare its compact size and light weight, its smart appearance and comprehensive front panel controls. Simple and reliable operation is made possible by employing advanced solid-state and logic techniques.
- A dual VFO is employed for the selection of two independent frequencies anywhere in the band. This also enables split frequency operation, particularly useful when used in conjunction with the optional "UHF-EXPANDER" transverter.

For normal repeater operation a pre-programmed shift is selected by front panel selector.

M750 BUILDS INTO A 2m & 70cm PACKAGE

(70cm module available late summer)



FDK products are distributed by:

FDK UNITED KINGDOM, WARREN HOUSE, MAIN ROAD, HOCKLEY, ESSEX, ENGLAND.

WATERS & STANTON ELECTRONICS

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

YAESU—SALES PLUS
AFTER SALES SERVICE !

(NEW FT480 2m SSB transceiver in stock)

FRG7
RECEIVER
£189 inc. VAT
0·5–30MHz
Securicor Delivery £4.50 extra

NEW FRG7700
RECEIVER
£309 inc. VAT
FRG7700 ML77 £380

Free Securicor delivery

FT707 £499
FP707 £109
inc VAT
inc VAT
100W ssb/cw 80–10m
Fitted new bands
Free Securicor Delivery

SUPER DISCOUNT!

FT101Z £464 inc. VAT
FT101ZD £540 inc. VAT
160–10M transceiver
230v AC operation
Free Securicor delivery

HERE'S A REAL BARGAIN!

HAMS' 'FRIEND FOR LIFE'
VSWR/POWER/
FIELD STRENGTH METER
3MHz–150MHz
£11.95 inc. VAT. P&p 50p.

There really is no excuse for not owning this little instrument. It's a combined SWR meter, power meter and field strength meter covering the HF and VHF bands 3 150MHz. It tells you all the things you should know about your antenna and power output for optimum performance. For example you can find out whether your feeder matches your aerial, whether your aerial is resonant on the desired frequency, the bandwidth of your antenna, the power output of your transceiver, true VSWR and reflected power, and field strength – just the thing to check that the hand-held you have is actually radiating! It will never date, it needs no power supply (other than rf power from tx) and at £11.95 there really is no excuse for not owning one. So why not send today for your 'Friend for Life' – he's waiting for you!

DenTron . . .

NEW MODELS— FACTORY FRESH FROM USA

New MLA2500B
2kW 160–10m Linear
2× EIMAC 8875
tubes
£695 inc VAT

(new model fitted high/low power switching)

Den Tron GLA1000B

1kW Linear
80–10m

£295
inc VAT

This is the ideal linear for the budget minded ham radio operator—send for details today

Den Tron ATU's (including new bands)

1·8MHz–30MHz
MT3000A
3kW ATU
Built to
Military spec.

£275
inc VAT

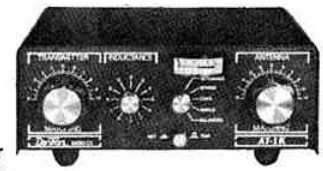
Two models to choose from

Includes exciter dummy load, RF watt meter, swr meter, antenna selector—matches anything to anything.

AT1K

1·2kW ATU
1·8–30MHz

£99 inc VAT
Includes swr meter
and antenna switch.



Ideal for UK licence limits

GLOBAL SHORT WAVE RECEIVING AERIALS

Global short wave antennas are designed for the serious short wave listener who requires general coverage capability throughout the short wave spectrum. Two models are available, either the broad band dipole or the inverted "L" model. Full details of these antennas are available on receipt of a stamped addressed envelope. The inverted "L" is **£9.95** and the dipole is **£29.** Both come with full instructions, hardware, etc and the dipole model includes 50ft of 50 ohm coax feeder.

WATERS & STANTON ELECTRONICS

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

TRIO

APPROVED TRIO DEALER

NEW LOW PRICES ALL MODELS STOCKED

24 HOUR DELIVERY—
—FROM THE PEOPLE YOU CAN TRUST

ALL PRICES INCLUDE 15% VAT

TRIO TS830S £639 inc. VAT

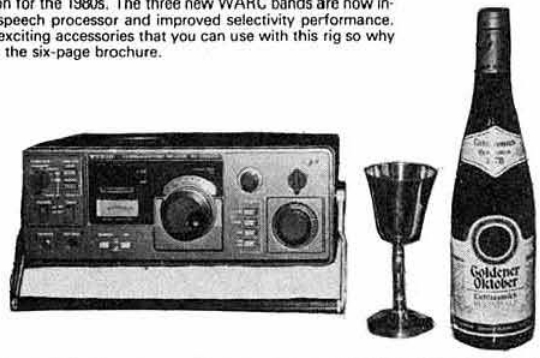
IT'S EXCITING!

It's the new, exciting Trio HF transceiver that sets the pace for base station operation in the 1980s. And if you are still old fashioned enough to believe that valves are not only cheaper than solid state P.A.s but also better, then you'll love this new model! 220 watts input on nine bands with digital readout and built-in power supply is going to give the competition a real headache at this price. Add to this the brand new variable selectivity control and notch filter plus the quality of Trio engineering that has now become an industry standard, and you have a true classic of the 1980s.

TRIO TS130S £491 inc. VAT

8 BANDS SOLID STATE

Hard on the heels of the Trio 120 series comes the new TS130—just as reliable, just as small, but with some really outstanding features that make it the number one mobile/base station for the 1980s. The three new WARC bands are now included together with speech processor and improved selectivity performance. There's also a host of exciting accessories that you can use with this rig so why not drop us a SAE for the six-page brochure.



NEW TRIO R1000 RECEIVER

YOUNG—BUT VERY MATURE!

Every one is individually tested by us and despatched by Securicor

NEW LOW PRICE £285 inc. VAT

REMEMBER—WE CARRY THE FULL TRIO RANGE AND ALL STOCK COMES FROM THE APPOINTED UK DISTRIBUTOR. DON'T TAKE CHANCES—BUY FROM WSE

NEW TRIO TR9000

NEW

TRIO

TR2400 £198 inc VAT

The new TR2400 really does eclipse all other hand-helds in its sheer technology. There's no other model that can approach its performance. The large LCD readout has low current drain and the 1·5 watts output is a good compromise between effective communication and reasonable battery drain. 10 memories, automatic scanning, instant reverse repeater operation, 144-148MHz etc etc . . . all adds up to the new leader in hand-helds . . . the Trio TR2400. Get your Barclaycard or Access cards ready for this one . . . half its fascination is operating it—the other half is owning it.

2 METRE FM/SSB/CW MOBILE OR BASE ONLY
£345 inc VAT

NEW TS770E 2m/70cm IN STOCK	£730
NEW TR7800 2m FM 25W IN STOCK	£268

The new Trio TR9000 heralds the beginning of a new era in 2 metre mobile or base station operation. A host of new features that makes its direct competitor look pretty expensive! FM has two tuning rates either 25kHz or 12½kHz per step. On SSB the tuning rate is in 100Hz steps or with the search button depressed, it will step in 10kHz at the same time searching for signals within each 10kHz segment. Dual VFO enables the operator to hold one frequency whilst searching for another. The inclusion of five memory channels provides for the storage of your five favourite frequencies.
Built-in scan permits FM scanning 25 or 12½kHz steps with momentary pauses on busy channels whilst providing continuous scanning of SSB/CW over 2MHz. Positive or negative repeater shifts are already programmed into the unit. For base station use, the PS20 AC supply can be used plus the SP120 external speaker and the BO-9 system base plinth. An exciting rig at a very reasonable price. Send today for details.

Thanet Electronics for ICOM the amateur's professional friends

This month we are showing you:

IC720 – Highly popular Amateur Band Transceiver and GENERAL COVERAGE RECEIVER.
IC240 – The best value for money in synthesized rigs.
Thela 7000E – An outstanding communications computer.
IC202S
IC402 – A pair of magnificent sideband portables.
IC2E – Probably the smallest made, extra sensitive handy talkie.
IC251E – Must be the best value in 2M base stations.
IC255E – A great value 25W mobile transceiver.
IC260E – The ideal choice for multimade mobile.

On these, and all our other products:

* we offer a full year's warranty on all parts and labour * All prices including V.A.T.
* Free delivery for all transceivers, using registered first class post * H.P. and Part Exchange welcome

IC-720- The "Masterpiece" in modern communications

An exceptional 9-band HF transceiver for less than £700.INCL.

The "Masterpiece's" signal purity and superior receiver keeps you abreast of the advancing technologies and incorporates features wanted by amateurs worldwide.

SPECIFICATION

General

FREQUENCY COVERAGE	
RECEIVE:	0.1 – 30.0MHz
TRANSMIT:	1.8 – 1.999MHz
	3.6 – 4.099MHz
	6.9 – 7.499MHz
	10.0 – 10.499MHz
	13.9 – 14.499MHz
	17.9 – 18.499MHz
	20.9 – 21.499MHz
	24.8 – 25.000MHz
	28.0 – 28.999MHz
	29.0 – 29.999MHz
Temperature Limitation:	-10°C – +60°C
Antenna Impedance:	-10°C – + 60°C
	50 ohm
Power Requirement:	50 ohm
	13.8V DC, neg. ground, ± 15%
Current Drain:	Min audio output 0.9A, Max audio output 1.2A TRANSMIT: SSB 16A, CW, RTTY 20A, AM 14A
DIMENSIONS:	111 (H) x 241 (W) x 311 (D) mm.

Transmitter

Emission Mode:	CW(A1), RTTY(F1), SSB(USB/LSB), AM
Output Power:	100W Continuous (AM 40W)
Modulation System:	SSB, AM Balanced Mod. CW, RTTY reactance mod.
Spurious Output and Harmonic Output:	More than 60 dB below peak power output
Carrier Supression:	More than 40 dB below peak power
Unwanted Sideband:	More than 50 dB down at 1000Hz AF Output
Microphone Imp:	1.3K Ohm, dynamic with built in pre-amp.

RECEIVER

Receiving System:	Superhetrodyne, with continuous band-width control.
Receiving Mode:	A1, A3J (USB/LSB), A3, F1.
Intermediate Freq.:	1. 39.731 MHz 2. 9.0115 MHz 3. 10.750 MHz 4. 9.0115 MHz
Sensitivity:	Less than 0.25 micro volts for 10dB S + N/N
Spurious Response:	Better than 60dB
Rejection Ratio	SSB, CW, RTTY ± 1.15kHz at -6dB (Adjustable to ± 0.4kHz min)
Selectivity:	± 2.1kHz at -60dB CW Narrow (option) ± 250Hz at -6dB ± 750Hz at -60dB AM (without filter) ± 3kHz at -6dB ± 9kHz at -60dB with filter ± 2.6kHz at -6dB ± 6kHz at -60dB
Audio Output	More than 2 watts
Audio Impedance:	8 ohms

Due to the popularity of this model we apologise if there is any delay in delivering

Also available from our shop in Herne Bay are:

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

IMPORTANT

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

Thanet for ICOM

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

BARCLAYCARD VISA

The IC-240 - The start of a revolution in 2 meters transceivers

£169 INCL.

- Easy channel selection with minimum knob twiddling – yet with all the normal FM channels available – an all important safety feature.
- A fully automatic tone burst which operates only in repeat mode with NO buttons to press either on the front or on the back of the set.
- Instant reverse repeat at the flick of a switch without any re-tuning or memory programming.
- A very sensitive receiver with a spurious response performance far better than the average and a very clean transmitter with excellent clear, crisp modulation. (We measured a sensitivity of 0.1 uv pd for10dB sinad).

SPECIFICATIONS

GENERAL		
Semiconductor Complement	Transistors	34
	FET	7
	IC	13
	Diodes	33 to 128 depending on channels
Frequency Range (for specification)		144-146MHz
Voltage		13.8 VDC Negative Ground
Current Consumption	TX	2.0AMP at 10W
	RX	700MA at MAX Audio
		400MA Squelched
Size		58mm (h) x 156mm (w) x 218mm (d)
Weight		1.9 kilograms
Antennas Impedance		50 OHMS
Number of Channels		22 channels selected from any of the 80 channels on 25KHz spacing.
Frequency Control		Stabilized Master oscillator PLL programmed by diode matrix
TRANSMITTER		
Power Out		10 watts
Deviation		5KHz
Microphone Impedance		500 OHMS
Spurious Level		Lower than -60dB below carrier
RECEIVER		
Modulation Acceptance		F3
Type		Double Superhet. 1st I.F. 10.7MHz. 2nd I.F. 455kHz
Receiver Sensitivity		0.4uV or better
1 Microvolt S+N/N		30dB or better
Spurious Response		60dB or more attenuation
Bandpass		+. 7.5KHz/-6dB, +. 15KHz/-60dB
Squelch Sensitivity		-6dB below 1 microvolt
Audio Output		1.5 watts or more into 8OHMS

FOR ONLY £640.00 INCL.

Tono Theta 7000E A great computer on offer from Thanet

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

Some of the Outstanding Features
COMMUNICATIONS COMPUTER THETA 0-7000E 0-7000E
UHF and Composite Video Output * Printer interface * Wide range of transmitting and receiving speeds – 10CW speeds + 8RTTY * Built-in demodulator for high performance for 170, 425 and 820 Hz shift * Crystal controlled modulator for ASFK – Hi or Lo tone * Convenient ASCII key arranoement * Large capacity display memory – 2 pages 32chr x 16 lines split screen for Rx & Tx if required * Automatic transmit/receive switch * Anti-noise circuit * Battery backed-up memory 7 channels of 64chrs * Send function * Buffer memory – 53 character type ahead, rub out function * Simultaneous access of the memory – 53 character type ah
LF (line feed) cancel function * Cursor control function * Word mode operation * Automatic CR/LF (72, 60 or 80 chrs per line) * Echo function * Word Wrap around function * Transmit/receive in ASCII mode or RTTY * CW indentification function * Mark and break (space and break) system * Monitor circuit & CW practice function * Variable CW weights * Cross pattern checking output terminal * Log computer output provided * Test message function (Ry and QBF).

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

IC-202S £169 INCL.

What a tremendous pair

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

Their versatility is well worth an enquiry.

IC-402 £242 INCL.

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

Thanet for ICOM

The more you hold it the more you enjoy it the IC-2E Handy Talky £159 INCL.

CHECK THE FEATURES

FULLY SYNTHESIZED – covering 144-145.995 in 400 5kHz steps.
POWER OUTPUT – 1.5W with the 9V rechargeable battery pack as supplied – but lower or higher output available with the optional 6V or 12V packs.
BNC ANTENNA OUTPUT SOCKET – 50 ohms for connecting to another antenna or use the Rubber Duck supplied.
SEND/BATTERY INDICATOR – Lights during transmit, but when battery power falls below 6V it doesn't light indicating the need for a recharge.
FREQUENCY SELECTION – by thumbwheel switches, indicating the frequency.
+5kHz SWITCH – adds 5kHz to the indicated frequency.
DUPLEX SIMPLEX SWITCH – gives simplex or plus 600kHz or minus 600 kHz Transmit.
HI-LOW SWITCH – reduces power output from 1.5W to 150mW reducing battery drain.
EXTERNAL MICROPHONE JACK – If you do not wish to use the built-in electret condenser mic an optional microphone/speaker with PTT control can be used. Useful for pocket operation.
EXTERNAL SPEAKER JACK – for speaker or earphone.
This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck.

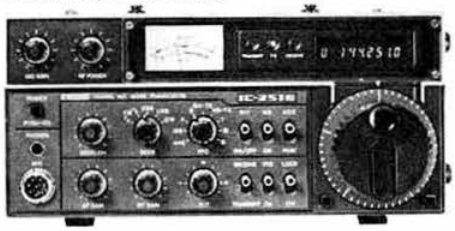
SPECIFICATIONS:

Transistors 4, – FETs 3, ICs 6 Diodes 21.
Frequency coverage 144-145.995 but will go to 147.995
Frequency Resolution 5kHz steps.
Frequency control by digital PLL synthesizer with thumbwheel switches.
Frequency stability within ± 1.5kHz.
Useable temperature -10 degrees C to 60 degrees C.
Antenna Impedance 50 ohms.
Power supply requirements DC 8.4V; with attendant battery pack DC 7.2 – 10.8V negative ground is acceptable.
Current drain at 8.4V

Transmitting:	High 1.5W	Approx 550 MA
	Low 0.15W	Approx 220 MA
Receiving at max audio output		Approx 130 MA
	Squelched	Approx 20 MA

Transmitter output power High 1.5W, Low 0.15W at 8.4V.
Mode F3, variable reactance frequency modulation, ± 5kHz.
Spurious Emissions more than 60dB below carrier.
Microphone built-in Electret condenser, Optional Speaker Mic can be used.
Operating Mode, Simplex or Duplex ± 600kHz from receive frequency.
Receiver Double Conversion superheterodyne FM.
Intermediate Frequency 1st 10.695MHz; 2nd 455kHz.
Sensitivity Better than 0.3uV for 20dB noise quieting.
Squelch sensitivity – less than 0.3uV.
Spurious response Rejection ratio more than 60dB.
Selectivity More than ± 7.5kHz at -6dB point
Less than ± 15.0kHz at -60dB point
Audio output More than 300mW-8 ohms.
Tone call Crystal controlled.

It will seduce you in it's own way the ICOM IC 251E £479 INCL. only



AFTER YEARS OF SUCCESS THE IC-211E HAS NOW BEEN REPLACED BY THE IC-251E, NOT JUST A FACE-LIFT, BUT A NUMBER OF IMPORTANT DEVELOPMENTS HAVE BEEN INCORPORATED.

MICROPROCESSOR CONTROL – CPU control with Icom's original programs provides various operating capabilities. No backlast dial controlled by Icom's unique photo-chopper circuit. Band edge detector and Endless System provides out-of-band protection. No variable capacitors or dial gear, giving problem-free use. The IC251E provides FM, USB, LSB, CW coverage in the 144-146 MHz frequency range. Thus the IC251E can be used for mobile, DX, local calls, and satellite work (easily extended to 148 MHz).
MULTI-PURPOSE SCANNING – Memory Scan allows you to monitor three different memory channels. Program Scan provides scanning between two programmed frequencies. Adjustable scanning speed. Auto-stop stops scanning when a signal is received in all modes.
DUAL VFO's – Two separate VFO's can be used either independently or together for simplex operation, and any desired frequency split in duplex operation. Automatic 600kHz shift available on switch-on.
CONTINUOUS TUNING SYSTEM – Icom's new continuous tuning system features a luminescent display that follows the tuning knob movement and provides an extremely accurate readout. Frequencies are displayed in 7 digits representing 100 Mhz to 100 Hz digits.
Automatic re-cycling restarts the tuning at the bottom of the band when the top is reached – and vice versa. Quick tuning at the bottom of the band when the top is reached the SSB and CW modes, and 5 KHz steps and 1 KHz steps in the FM mode, is provided for trouble free use.
EASIER OPERATION AND LIGHTER WEIGHT – The most compact, lightest weight all-mode 144 MHz transceiver. First to use a pulse power supply in communication equipment, for lighter weight and cooler running. 50mm-diameter large tuning control knob for smooth and easy tuning. Trouble-free controlling knobs for both receiving and transmitting. LED indicator for transmit and receiving modes.
MOST SUITABLE FOR BOTH FIXED AND PORTABLE STATIONS – Built in 240V AC and DC power supplies. Convenient Dial Lock switch for mobile operation. Easy carry handle. Effective Noise Blanker. IC-SM5 high quality stand microphone is suitable for fixed station operation. Powerful audio output 1.5 Watts at 8 ohm, for easy listening even in noisy surroundings.
OUTSTANDING PERFORMANCE – The RF amplier and first mixer circuits using MOS FETs and other circuits provide excellent Cross Modulation and Two-Signal selectivity characteristics. The IC251E has excellent sensitivity demanded especially for mobile operation, high stability, and with Crystal Filters having high shape factors and exceptional selectivity. The Transmitter uses a balanced mixer in a single conversion system, a band pass filter and a high performance low-pass filter. The system provides distortion-free signals with a minimum spurious radiation level.

SEND FOR MORE DETAILS ON TECHNICAL CHARACTERISTICS.

Thanet for ICOM

IC-255E– An experts mobile choice

for only £255 INCL.

NOW WITH IMPROVED FRONT-END

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

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

CAN YOU RESIST SUCH A TEMPTATION

Enjoy VHF mobile at it's best-IC-260E

Replacing the IC-245E, the IC-260E offers such extras as full frequency read out, upper and lower sideband, and scanning as well as FM and CW. Thus, it makes an ideal base station, when used with a DC power supply, as well as a mobile. The use of a microprocessor instead of an LSI chip has enabled Icom to offer this at a lower price than the IC-245E.

£399 INCL.

144MHz ALL-MODE TRANSCEIVER INCORPORATING A MICRO-COMPUTER – CPU control with Icom's original programs provides various operating capabilities. No backlash dial controlled by Icom's unique photo-chopper circuit. Band edge detector and Endless System provides out-of-band protection. No variable capacitors or dial gear, giving problem-free use. The IC-260E provides FM, USB, LSB, CW coverage in the 144-146MHz frequency range. Thus the IC-260E can be used for mobile, DX, local calls and satellite work. Easily extendable to 144-148.
MULTI PURPOSE SCANNING – Memory scan allows you to monitor three different memory channels. Program Scan provides scanning between two programmed frequencies. Adjustable scanning speed. Auto-stop stops scanning when a signal is received, in all modes.
DUAL VFO'S – Two separate VFO's can be used either independently or together for simplex operation, and any desired frequency split in duplex operation.
CONTINUOUS TUNING SYSTEM – Icom's new continuous tuning system features an LED display that follows the tuning knob movement and provides an extremely accurate readout. Frequencies are displayed in 7 LED digits representing 100MHz to 100Hz digits. When in Duplex and using the tuning-knob the two VFO's track together. Automatic recycling restarts tuning at the top of the band, i.e. 145.999.9 MHz when the dial goes below 144.000.0MHz. Recycling changes 145.999MHz to 144.000.0MHz as well. Quick tuning in 1kHz steps is available, and fine tuning in 100Hz steps in the FM mode, is provided for trouble-free QSO.
OUTSTANDING PERFORMANCE – The RF amplifier and first mixer circuits using MOS FET's and other circuits provide excellent Cross Modulation and Two Signal Selectivity characteristics. The IC-260E has excellent sensitivity demanded especially for mobile operation, high stability and with Crystal Filters having high shape factors and exceptional selectivity. The transmitter uses a balanced mixer in a single conversion system, a band pass filter and a high performance low pass filter. This system provides distortion free signals with a minimum spurious radiation level for an output of 10W or more.
ADDITIONAL CIRCUITS – The IC-260E has a built-in Noise Blanker, CW Break-in CW Monitor, APC and many other circuits for your convenience. The IC-260E has everything you need to really enjoy VHF operation, in an extremely compact rugged transceiver.

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

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

AMATEUR ELECTRONICS UK

AEUK—Your number one

YAESU FT-101ZD (WARC)

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

SPECIFICATIONS: F T-101ZD

GENERAL

Frequency coverage:
160m 1·8-2·0MHz, 80m 3·5-4·0MHz, 40m 7·0-7·5MHz, 30m 10·0-10·5MHz, 20m 14·0-14·5MHz, 17m 18·0-18·5MHz, 15m 21·0-21·5MHz, 12m 24·5-25·0MHz, 10m 28·0-29·9MHz

Operating modes:
LSB, USB, CW, AM

Power requirements:
100/110/117/200/220/234 volts AC, 50/60Hz; 13·5 volts DC (with optional DC-DC converter)

Power consumption:
AC 117V: 75VA receive (65VA HEATER OFF), 285VA transmit; DC 13·5V: 5·5 amps receive (1·1 amps HEATER OFF), 21 amps transmit

Size: 345(W) × 157(H) × 326 (D) mm

Weight: Approx. 15kg

TRANSMITTER

PA input power:
180 watts DC (SSB/CW), 50 watts DC(AM)

Carrier suppression:
Better than 40dB

Unwanted sideband suppression:
Better than 40dB @ 1,000Hz, 14MHz

Spurious radiation:
Better than 40dB below rated output

Third order distortion products:
Better than −31dB

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

Stability:
Less than 300Hz in first 30 minutes after 10min warmup; less than 100Hz after 30 minutes over any 30min period

Negative feedback: 6dB @ 14MHz

Antenna output impedance:
50-75 ohms, unbalanced

Microphone input impedance:
500-600 ohms

RECEIVER

Sensitivity:
0·25μV for S/N 10dB (SSB/CW)
0·5μV for S/N 10dB (AM)

Selectivity:
2·4kHz at 6dB down, 4·0kHz at 60dB down (1·66 shape factor); Continuously variable between 300 and 2,400Hz (−6dB); CW (with optional CW filter installed); 600Hz at 6dB down, 1·2kHz at 60dB down (2:1 shape factor)

Image rejection:
Better than 60dB (160-15 meters);
Better than 50dB (10 meters)

IF rejection:
Better than 70dB (160, 80, 20-10m);
Better than 60dB (40m)

Audio output impedance: 4-16 ohms

Audio output power:
3 watts @ 10% THD (into 4 ohms)

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

Access

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

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

FROM SOUTH AND EAST. We are located approximately two miles from Junction 5 of the M6 from which follow signposts to Birmingham. Within ½ mile turn right at Clock Garage and proceed towards city. After one mile look for traffic lights at Fox & Goose and immediately over the lights take minor left fork into Alum Rock Road. We are located one mile from this point.

FROM NORTH. Leave M6 at Junction 6 (Spaghetti) and follow left fork down to traffic island beneath motorway comples. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100yds veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.

FROM THE WEST AND SOUTH WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively leave M5 at junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

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

AMATEUR ELECTRONICS UK

KEEP AHEAD WITH YAESU!

YAESU FT-902DM

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

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

FT-902DM SPECIFICATIONS

GENERAL

Frequency coverage:
1·8–2·0MHz, 3·5–4·0MHz, 7·0–7·5MHz, 10·0–10·5MHz, 14·0–14·5MHz, 18·0–18·5MHz, 21·0–21·5MHz, 24·5–25·0MHz, 28·0–29·9MHz

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

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

Size:
342(W) × 154(H) × 324(D) mm

Weight:
Approx 18kg

TRANSMITTER

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

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

Carrier suppression:
Better than 40dB

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

Spurious radiation:
Better than 40dB below rated output

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

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

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

RF negative-feedback:
6dB at 14MHz

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

Antenna output impedance:
50–75 ohms unbalanced

Microphone impedence:
500–600 ohms (low impedance)

RECEIVER

Sensitivity:
0·25μV for S/N 10dB

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

IF rejection:
Better than 70dB

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

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

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

508–514 ALUM ROCK ROAD
BIRMINGHAM 8
021-327 1497
Telex 337045 6313

G3FIK

AMATEUR ELECTRONICS UK

source for YAESU MUSEN

YAESU

A NEW BREAKTHROUGH IN RECEIVER TECHNOLOGY!

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

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

Frequency coverage 150kHz-29,999MHz.

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

YAESU

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

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NORTH EAST—NORTH EAST AMATEUR RADIO, DARLINGTON 0325 55969
SOUTH EAST—AMATEUR ELECTRONICS, UK—COASTAL, CLIFTONVILLE, KENT KEN McINNES, G3FTE, THANET (0843) 291297, 9 a.m.-10.30 p.m.

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Western

Western FOR HF TRANSCEIVERS

ALL PRICES DOWN!

FT-707

Truly christened the "WAYFARER", Yaesu's new solid-state transceiver goes anywhere, base or mobile, and has all the desirable "big rig" features together with exceptional performance. 100W RF output; digital readout; IF width control; LED "S" and "Power" meter display; FULL band coverage, 80-10 metres, including 30m, 17m and 12m. This **must** be the transceiver all you YAESU fans have been waiting for!

CHECK **Western** PRICES!

ANCILLARY UNITS

FP-707 AC PSU/Speaker
FC-707 Antenna Tuner
YM-35 Hand Microphone
MMB-707 Mobile Bracket

TS-120S TRIO

A very popular mobile or base station solid-state HF transceiver. Small in size but big on features at a sensible price. This little gem from TRIO-KENWOOD features digital readout, IF shift to beat the QRM, VOX and break-in CW, 100W RF output on all bands 80-15 metres (slightly lower on 10m). Superb value for an up-to-date HF rig.

CHECK **Western** PRICES!

. . . OR IF YOU STILL PREFER 6146B's IN THE FINAL . . .

FT-101Z FROM YAESU MUSEN

Latest in a famous line, but what an improvement! Full band coverage, IF width control for superior selectivity, excellent performance and Yaesu's well-known quality. ZD model has digital readout built-in, both models in excess of 100 watts RF out (lower on 10m). Try our price for size!

NOW DOWN TO £479 'Z' £559 'ZD'

TS-520SE from TRIO-KENWOOD

It would be hard to find better value for an HF transceiver than the TS-520SE. Covering all HF bands 160-10 metres, it features 6146B in the PA; Wide/Narrow CW switching (with optional filter); speech processor; high sensitivity and dynamic range; RF attenuator and other features to make your operating a pleasure. A first-class transceiver at a down-to-earth price!

NOW DOWN TO £415

TREAT YOURSELF FOR CHRISTMAS! (or let the YL/XYL/OM do it!)

We have a wide range of accessory items which will make ideal gifts for the radio amateur in your life. A SAE will bring up-to-date price lists of such things as:

Antennas	SWR Meters	Microphones	Plugs and Connectors
Antenna Accessories	Power Meters	Head Phones	Valves
Rotators	Morse keys	Clocks	Cables

. . . and if you feel really generous, try us for—HF, VHF, UHF, TUNERS, SCANNING RECEIVERS etc., etc.

A NEW TELESCOPIC MAST FOR THE BUDGET-CONSCIOUS AMATEUR

Ever felt like having a tilt-over mast but thought you couldn't afford it? Ever thought that the big lattice masts were too much when you only need support for your VHF/UHF antennas?

THE ALL-NEW 30ft 'ULTIMAST' is the answer to your problems

- ★ Slim, unobtrusive appearance
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You may be knee-deep in snow now, but by the time your application has found its way through your Town Hall's Planning Department—AND . . . by the time your bank balance has recovered from Christmas—the spring flowers will be peeping up through the ground and your spade foot will be itching to start digging the hole for your WESTOWER base!

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BEWARE . . .
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FEATURES

- ★ Heights from 25 to 120ft.
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- ★ All have reinforced head units.
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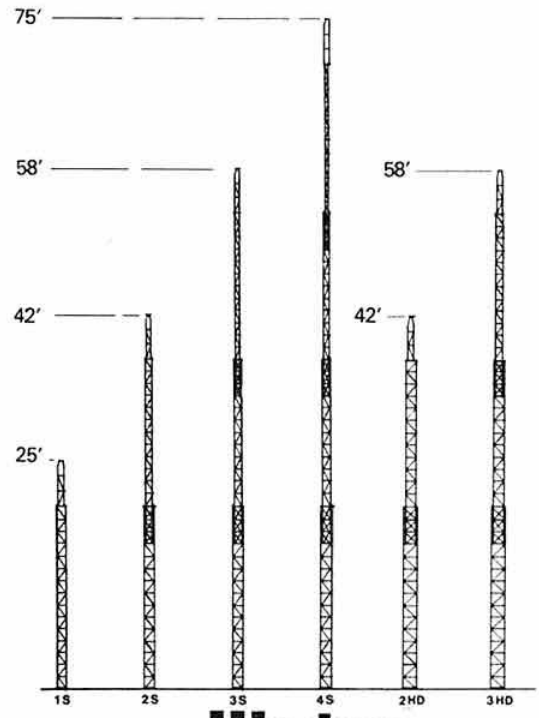

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AC-3801	Noise Blanker	124.20	5.00
AC-3802	Speech Processor	POA	—
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MM-280	Handheld Microphone	23.00	2.00
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NTN	Owners Manual	4.00	1.00
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R. L. DRAKE PRODUCTS

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PS-7	Power Supply 120/240v for TR-7	207.00	5.00
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RV-7	Remote V.F.O. for TR-7	132.25	2.00
MS-7	Matching Speaker for TR-7 and R-7	29.90	2.00
R-7/DR-7	Digital Receiver 0-30 MHz	989.00	5.00
SL-300	CW Filter for TR-7 and R-7 (300 Hz)	39.10	0.50
SL-500	CW Filter for TR-7 and R-7 (500 Hz)	39.10	0.50
SL-1800	SSB/RTTY Filter for TR-7/R-7 (1800Hz)	39.10	0.50
SL-4000	AM Filter for R-7 Receiver (4000 Hz)	39.10	0.50
SL-6000	AM Filter for TR-7 and R-7 (6000 Hz)	39.10	0.50
AUX-7	Range Prog. board and 1 Receiver module	32.20	1.00
RRM-7	Range receiver modules for Aux-7 (500 KHz)	5.75	0.50
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NB-7	Noise Blanker for TR-7	66.24	1.00
NB-7A	Noise Blanker for R-7 Receiver	66.24	1.00
FA-7	Fan for TR-7 and PS-7	20.70	2.00
MMK-7	Mobile mounting kit for TR-7	34.50	2.00
MN-7	ATU/RF Wattmeter. 160-10 m (250w)	124.20	5.00
MN-2700	ATU/RF Wattmeter 160-10 m (2kw)	207.00	5.00
WH-7	RF Wattmeter/VSWR Bridge (HF)	59.80	2.00
385-0004	Service Manual for TR-7	18.50	2.00
385-005	Service Manual for R-7	18.50	2.00
7037	TR-7 Service Kit	37.95	1.00
L-7E	Linear Amp. 2kw. 10m-160m. *Without Tubes*	759.00	10.00
	Tubes for L-7E (2 × 3-500Z)	138.00	5.00
TR-4CW(RIT)	Transceiver AM/SSB/CW with R.I.T.	496.80	5.00
AC-4	120/240v Power Supply for TR-4CW	109.25	5.00
34-PNB	Plug-in Noise Blanker for TR-4CW	73.60	1.00
DC-4	DC Power Supply for TR-4CW	138.00	5.00
RV-4C	Remote V.F.O. for TR-4CW	109.25	5.00
FF-1	Crystal Control for TR-4CW	39.10	1.00
MS-4	Speaker for TR-4CW; R-4C; SPR-4	29.50	2.00
TV-42LP	Low Pass Filter 100W	10.35	1.00
TV-3300LP	Low Pass Filter 2kw	18.40	1.50
7073	Hand Microphone for TR-7	18.40	1.00
7077	Desk Microphone for TR-7	29.90	2.00
DL-300	Dummy Load. 300W	20.70	1.00
DL-1000	Dummy Load. 1000w	37.95	2.00
RCS-4	Remote control ant. switch. 5 way (4 line)	82.80	5.00
CS-7	Remote control ant. switch. 5 way (7 line)	115.00	5.00
B-1000	Balun for MN-7 and MN-2700. 4:1	20.70	1.00
1525-EM	Encoder Microphone	36.80	1.00
AA-10	2m Amplifier. 1w in-10w output	46.00	1.00
WV-4	RF Wattmeter 20-200 MHz	69.00	2.00
SPR-4	Programmeable gen. purpose Receiver	460.00	5.00
DC-PC	DC Power Cord for SPR-4	4.60	0.50
FL Filters	For R-4C. .25/.5/1.5/4.0/6.0kHz. each	39.10	0.50
Manuals	Spare Operating Manuals	6.00	1.00
Crystals	Accessory Crystals for R-4C and SPR-4	6.44	0.50
Interface	R-7/TR-7 connecting cable	20.70	1.00
AK-75	Multiband Antenna	23.00	2.00
AA-75	Antenna Insulator Kit	2.30	0.50
RP-700	Receiver Projector	69.00	1.00
SP-75	Speech Processor	79.35	2.00

BENCHER PRODUCTS

BY-1	Keyer Paddle (Black base)	28.75	2.00
BY-2	Keyer Paddle (Chrome base)	37.75	2.00
BY-3	Keyer Paddle (Gold plated)	92.00	2.00
ZA-1	Balun 3.5-30 MHz for dipoles	12.65	1.00
ZA-2	Balun 14-30 MHz for beam antennas	13.80	1.00

HAL COMMUNICATIONS

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DS-2000	KSR	322.00	5.00
	Optional Morse for DS-2000	98.90	5.00
DS-3000	KSR version 3.X	920.90	5.00
DS-3000	KSR version 2.X	675.00	5.00
DS-3100	ASR super deluxe	1536.40	5.00
ST-6000	Demod./Keyer/Scope	414.00	5.00
ST-5000	Demod./Keyer	207.00	5.00
RVD-1005	V.D.U. Baudot	230.00	5.00
DKB-2010	Demod. keyboard with memory	253.00	5.00

TEN-TEC EQUIPMENT

TRANCEIVERS			
515	Argonaut. 5w. SSB/CW. 3·5-30MHz	276.00	5.00
540	Triton IV 200w. SSB/CW. 3·5-30MHz	437.00	5.00
544	Triton IV as above with Digital readout	546.25	5.00
545	Onmi-A. Analog. Series B. SSB/CW. 1·8-30MHz	598.00	5.00
546	Omni-D. Dig. Series B. SSB/CW. 1·8-30MHz	701.50	5.00
570E	Century 21. CW only. 3·5-29MHz	230.00	5.00
574E	Century 21. Dig. 70w. CW. 3·5-29MHz	299.00	5.00
580	Delta Digital. 200w. SSB/CW. 9 Bands	552.00	5.00
POWER SUPPLIES			
210/E	115/230 vac. 13vdc. 1A. for Argonaut	27.60	2.00
252MO/E	115/230 vac. 13vdc. 18A. for Omni	89.70	5.00
262M/E	230 vac. 13vdc. 18A. deluxe with VOX (Triton)	101.20	5.00
280	230 vac. for Delta tcvr	92.00	5.00
ACCESSORIES			
206A	Crystal Calibrator	18.86	2.00
208A	CW Filter for Argonaut	29.90	2.00
212	29.0-29.5 Crystal for Models 540/544	3.45	0.50
213	29·5-5·30MHz Crystal for models 540/544	3.45	0.50
215P	Microphone, ceramic, with plug	18.40	2.00
217	500Hz 8 pole Ladder Filter	36.80	1.00
218	1·8KHz 8 pole Ladder Filter	36.80	1.00
240	160m Converter for Models 540/544	69.00	2.00
241	Crystal Oscillator for Models 540/544	23.00	1.00
242	Remote V.F.O. for Models 540/544	112.70	5.00
243	Remote V.F.O. for Models 545/546	87.40	5.00
244	Dig. Display/Counter for Models 540/544	124.20	5.00
245	CW Filter for Models 540/544	17.25	2.00
247	Antenna Tuner	43.70	2.00
248	Noise Blanker for Models 545/546	32.30	1.00
249	Noise Blanker for Models 540/544	18.40	1.00
276	Crystal Calibrator for Model 570E	18.86	1.00
277	Ant. tuner/VSWR Bridge for Century 21	57.50	2.00
1140	DC Circuit Breaker for 540/544/545/546	5.75	1.00
1170	DC Circuit Breaker for Century 21	5.75	1.00
KEYERS			
645	Ultramatic, dual paddle for 545/546	55.20	2.00
670	Single-paddle keyer for 570/574	18.86	2.00
KR-5A	Single-paddle keyer. 6-14 vdc	25.30	2.00
KR-50	Ultramatic, dual paddle, 117 vac/6-14vdc	69.00	2.00

AVANTI ANTENNAS

AH151-3G	2m on-glass mount antanna	19.78	5.00
AH150-3M	2m magnetic mount antenna (3dB)	24.95	5.00
AH450-5G	70cm on-glass mount antenna	21.85	5.00
AH450-3G	70cm on-glass mount antenna (3dB)	19.78	5.00
AH28-9B	10m dual polarity base antenna	79.35	5.00
AV-200	27MHz on-glass mont antenna	17.25	2.00
AV-241	27MHz magnetic mount antenna	25.30	5.00

VIBROPLEX

Presentation	Super deluxe	89.70	2.00
Original	Deluxe	59.80	2.00
Original	Standard	46.00	2.00
Lightning	Deluxe	59.80	2.00
Lightning	Standard	46.00	2.00
Champion		43.70	2.00
Vibro-Keyer	Deluxe	59.80	2.00
Vibro-Keyer	Standard	46.00	2.00

Radio Shack Ltd for Christmas Bargains

BEARCAT SCANNING RECEIVERS

BC-210		184.00	5.00
BC-220		258.75	5.00
BC-250		258.75	5.00

TELEX COMMUNICATIONS INC

HFC-91	Underchin headphones	6.21	1.00
HMC-2	Underchin headphones	9.20	1.00
HTC-2	Twin Receiver headphones	14.72	1.00

BOOM MICROPHONE HEADSETS

CM-610	3·2–20 ohms. high imnpedance mic	29.90	2.00
CM-1210	3·2–20 ohms. high impedanc mic	39.10	2.00
CM-1320	3·2–20 ohms. high impedance mic	48.30	2.00
CM-1320S	3·2–20 ohms. Single headphone	36.80	2.00

DUAL MUFF HEADPHONES

C-610	Dual Receiver magnetic	6.90	2.00
SWL-610	Dual Receiver magnetic	8.28	2.00
C-1210	Dynamic, foarn-padded	18.86	2.00
C-1320	3·2–20 ohms. *TELEXS BEST*	26.22	2.00

MICROPHONES (battery powered)

PROCOM 1	High Output	11.96	2.00
PROCOM 11	Variable gain	17.95	2.00
CB-73R	Dynamic, noise-cancelling	23.92	2.00
CB-73S	as above with 6-wire lead	25.30	2.00

HUSTLER ANTENNAS

MO-1	Foldover Mast (fold is 15 inches above base)	13.80	5.00
MO-2	Foldover Mast (fold is 27 inches above base)	13.80	5.00
BM-1	Bumper Mount	10.35	2.00
C-32	Ball Mount	5.29	2.00
C-29	Stainless steel Spring	8.05	2.00
RM-10	10m Resonator	6.90	2.00
RM-15	15m Resonator	8.05	2.00
RM-20	20m Resonator	9.20	2.00
RM-40	40m Resonator	11.50	5.00
RM-80	80m Resonator	13.80	5.00
SF-2	2m 5/8 whip	9.20	5.00
RM-10S	High Power 10m Resonator	9.20	2.00
RM-15S	High Power 15m Resonator	10.35	2.00
RM-20S	High Power 20m Resonator	11.50	2.00
RM-40S	High Power 40m Resonator	13.80	5.00
RM-80S	High Power 80m Resonator	18.40	5.00
4-BTV	10–40m Vertical	69.00	5.00
5-BTV	10–80m Vertical	87.40	5.00
DCX	Discone VHF/UHF 40–700MHz	13.80	5.00
DCL	Discone VHF/UHF 40–700MHz (with 50ft coax)	20.70	5.00
QD-1	Quick Disconnect	10.35	1.00
5105	Top section of QD-1	8.05	1.00
HLM	Trunk lip Mount	12.65	2.00
CG-144	2m Colinear	23.00	5.00
CGT-144	2m Colinear with Mount	29.90	5.00
G6-144A	2m Colinear for Base Station use	52.90	5.00
G7-144	2m Colinear for Base Station use (7dB)	73.60	5.00

ASTATIC MICROPHONES

T-UG9-D104	Golden Eagle	71.30	2.00
T-UPG-D104	Silver Eagle	50.06	2.00
UG8-D104	Crystal D104	32.20	2.00
T-UG9-D104	D104 with amplifier and grip to talk	41.40	2.00
T-UP9-D104	D104 with amplifier and p.t.t.	41.40	2.00
525-DL6	Hand microphone. Dynamic. 400 ohms	12.42	2.00
400	Hand microphone. Dynamic. *BUCKEYE*	5.75	2.00
565-M6	Hand microphone. FET amp. *MARINER*	32.20	2.00
D104-M	Hand microphone. FET amp. 4 wire	24.15	2.00
D104-M6	Hand microphone. FET amp. 6 wire	28.75	2.00
555	Hand mic. noise-cancelling. 4 wire	21.85	2.00
557	Hand mic. noise-cancelling. 6 wire	26.45	2.00
531	Hand microphone. High impedance	8.05	2.00
539	Hand microphone. Noise-cancelling	8.05	2.00
1104-C	Desk Microphone. FET amp	36.80	2.00

TRIO OSCILLOSCOPES

CS-1830	Dual trace 30MHz B/w with delayed sweep	523.25	5.00
CS-1577	Dual trace 30MHz with signal delay	471.50	5.00
CS-1572	New dual trace 30MHz scope for VTR servicing	488.75	5.00
CS-1566	Dual trace 20MHz	339.25	5.00
CS-1560A	Dual trace 15MHz 10mV/cm on X and Y	316.25	5.00
CS-1562A	Dual trace 10MHz auto run and trigger TB	261.05	5.00
CS-1352	Dual trace 15MHz portable, mains/12v	362.26	5.00
CS-1575	Dual trace 4ch. audio scope	270.25	5.00
CO-1303D	Sgl. trace 5MHz service/student scope	109.25	5.00
DM-800	Dip resonance meter 700kHz–250MHz	51.75	1.00
AG-203	Sine/square generator. 10Hz–1MHz	120.75	5.00
AG-202	Sine/square generator. 20Hz–200kHz	65.55	5.00
SG-402	Matching RF generator. 100kHz–30MHz	52.90	5.00
DL-705	Digital multimeter	80.50	5.00
FC-756	Frequency counter. 10Hz–500MHz	258.75	5.00

The above scopes are complete with probes

TRIO EQUIPMENT

TS-820	160–10m Transceiver. 200w P.E.P.	669.30	5.00
DG-1	Digital readout to 100Hz	121.90	1.50
SP-820	Speaker	37.95	1.50
VFO-820	External V.F.O.	118.45	5.00
YG-88C	CW Filter. 8 pole	36.80	0.50
TS-520SE	160–10m Transceiver. 200w P.E.P.	437.00	5.00
DG-5	Digital readout and freq. counter	103.50	1.50
SP-520	Speaker	17.25	1.50
VFO-520S	External V.F.O	98.90	5.00
VG-3396C	CW Filter. 8 pole	37.95	0.50
DK-520	Conversion Kit to fit DG-5 to older TS-520	10.35	1.00
AT-200	160–10m Antenna Tuner. 200w	82.80	1.50
SM-220	Station Monitorscope	197.80	5.00
BS-8	TS-820 scan board for SM-220	48.30	0.50
BS-5	TS-520 scan board for SM-220	48.30	0.50
R-820	Amateur Band Receiver	690.00	5.00
YG-455C	CW Filter. 500Hz	58.65	0.50
YG-455CN	CW Filter. 250Hz	60.95	0.50
YG-88A	AM Filter. 6kHz	34.50	0.50
TS-180S	160–10m solid state Transceiver. 200w P.E.P.	589.95	5.00
TS-180S	As above but with Digital frequency memories	679.65	5.00
VFO-180	External V.F.O.	96.60	2.00
SP-180	Speaker	36.80	2.00
DF-180	Digital frequency control	104.65	1.00
AT-180	160–10m Antenna Tuner	95.45	5.00
PS-30	Mains Power Unit for TS-180	85.10	5.00
TS-120S	80–10m mobile Transceiver	432.40	5.00
TS-120V	80–10m mobile Transceiver. 20w P.E.P	347.30	5.00
MB-100	Mobile mounting bracket	17.25	1.00
YK-88C	CW Filter. 500Hz for TS-120S or TS-120V	28.75	0.50
SP-120	External speaker	25.30	2.00
VFO-120	External V.F.O.	89.70	5.00
AT-120	100w Antenna Tuner	55.20	2.00
PS-20	AC Power Supply for TS-120V	44.85	5.00
PS-30	AC Power Supply for TS-120S	85.10	5.00
TL-120	80–10m 200w P.E.P. Linear for TS-120V	128.80	5.00
TL-922	160–10m Linear Amp. 2kW. *Tubes included*	672.75	5.00
MC-50	Desk Microphone dual impedance	24.15	2.00
MC-35S	Handheld Microphone. 50K	13.80	1.00
MC-30S	Handheld Microphone. 500 ohm	13.80	1.00
LF-30A	HF Low Pass Filter. 1Kw	18.40	1.00
BPF-2A	2m Bandpass Filter. 144–146MHz. 50w rms	21.85	1.50
RD-300	High Power Dummy Load	48.30	2.00
TS-770E	2m/70cm all mode Transceiver	763.60	5.00
SP-70	Matching Speaker	18.40	2.00
TR-9000	2m synthesised multi-mode mobile tcvr	345.00	5.00
BO-9	Base plinth for TR-9000	32.20	5.00
TR-7600	2m synthesised mobile/fixed tcvr	220.00	5.00
RM-76	Microprocessor control unit	60.95	1.50
TR-2300	2m FM portable tcvr. PLL with all 80ch	POA	5.00
VB-2300	10w booster	49.45	2.00
MB-2	Mobile mount	17.25	1.00
RA-1	Helical rubber antenna	166.75	0.50
PS-1200	Power unitcharger for 2300/3200/2200GX	29.50	2.00
TR-2400	2m synthesised handheld tcvr	210.45	5.00
ST-1	Base stand and quick charger	43.70	2.00
BC-5	12v quick charger	17.25	2.00
SC-3	Carrying case	11.50	0.50
PB-24		14.26	1.50
TR-3200	70cm FM tcvr, fitted with 3 channels	164.45	5.00
MB-1A	Matching mobile mount	9.20	1.00
PB-10	Pack of 10 ni-cad batteries	10.35	0.50
TR-3200/2300	Spare power lead	1.30	1.60
R-1000	Gen. cov. Receiver. 0·2–30MHz	297.85	5.00
SP-100	External Speaker	26.45	2.00
HS-4	Headphones, tailored response	10.35	1.00
HS-5	Headphones, tailored response	21.85	1.00

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

Buy it with Access

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

BARCLAYCARD VISA

DATONG ELECTRONICS LIMITED

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

Multi-mode Audio Filter — Model FL 2

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

General Coverage Converter — Model PC1

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

Automatic r.f. Speech Processor Model ASP

Makes your transmitted speech louder and clearer for a given transmitter power. The 'Rolls-Royce' of r.f. speech processors Model ASP **adjusts itself to suit your voice level** and your microphone. Simply select the degree of r.f. clipping in steps of 6 dbs from 0 to 30 dbs. Connects in series with the microphone.

The Answer to the Morse Test Model D70

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

Very Low Frequency Converter Model VLF

If your communications receiver gives poor results below 500kHz Model VLF is the answer. It also adds MW and LW coverage to amateur bands-only receivers for news, time checks etc.

- Connects between antenna and receiver input.
- Converts signals from 0 to 500kHz to the range 28 to 28.5MHz, with low noise and high sensitivity. Useable to 1MHz with reduced sensitivity.
- Crystal controlled for high stability.
- Quality construction in diecast aluminium box (size 112×62×31mm), SO239 connectors, LED indicator, in/out switch.
- Operates from internal 9 volt battery or external supply (5–15 volts DC).

Active Receiving Antennas — Models AD270, AD370

Ultra-compact receiving antenna systems giving wideband coverage from 200kHz to over 30 MHz at high sensitivity.
Models AD270 and AD370 give **similar receive performance to large conventional antenna systems yet are only 3 metres in overall length.** The balanced dipole configuration also gives good rejection of local interference.
Model AD270 (an upgraded version of Model AD170) is for indoor mounting.
Model AD370 is waterproofed for outdoor use.
Model AD370 & AD270 head units only are also available separately for upgrading earlier AD170 systems.

Products not shown in this advertisement

Model FL1, Self-tuning notch/peak audio filter.
Model D75, R.F. Speech Processor.
Model RFC/M, R.F. Speech Processor P.C.B. Module.
Model MPU, Mains Power Unit.
Accessory Leads.

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

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

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

KDK KYOKUTO

KYOKUTO DENSHI COMPANY LIMITED

KDK 2025 2m SYNTHESIZED 25W TRANSCEIVER

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

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

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

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

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

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

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

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

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

"What's the catch?" "None!" Compare the test specifications, the features, the construction, the quality and the price.
The 2025 is available from the importers or listed dealers

£225 INC. VAT AT 15% INC. SECURICOR

AMATEUR ELECTRONICS LTD, 508-514 Alum Rock Road, Birmingham 8	J. BIRKETT, 25 The Strait, Lincoln	D. P. HOBBS, 13 Benedicts Street, Norwich	REG WARD & CO LTD, George Street, Axminster
AMATEUR RADIO EXCHANGE, 2 Northfield Road, London, W13	BREDHURST ELECTRONICS, Handcross, West Sussex	HOLDINGS LIMITED, Mincing Lane, Blackburn BB2 2AF	SMC (JACK TWEEDY) LTD, 150 Horncastle Road, Woodhall Spa
AMATEUR RADIO SHOP, 4 Cross Church Street, Huddersfield HD1 3PT	C. B. ELECTRONICS, 771 Ormskirk Road, Wigan	LEYS AND DUNCAN, 19 Low Street, Banff	SMC (JACK TWEEDY) LTD, 79 Chatsworth Road, Chesterfield
AMCOMM, 194A Northolt Road, South Harrow	GAREX ELECTRONICS, 7 Norvic Road, Marsworth	LOWE ELECTRONICS, Chesterfield Road, Matlock	SMC (NORTHERN) LTD, 257 Otley Road, Leeds 16
B. BAMBER ELECTRONICS, 5 Station Road, Littleport	L. HARDIE, 542 George Street, Aberdeen	RADIO SHACK LTD, 188 Broadhurst Gardens, London NW6 3AY	SMC LTD, Osborne Road, Totton

SOUTH MIDLANDS COMMUNICATIONS LTD

S M HOUSE, OSBORNE ROAD
TOTTON, SOUTHAMPTON
HAMPSHIRE SO4 4DN

TELEPHONE: TOTTON (0703) 867333
CABLE: 'AERIAL' SOUTHAMPTON
TELEX: 477351 SMCOMM G

VERSATOWER

TELESCOPIC & TILTOVER RADIO TOWERS

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

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

25–120ft, post, base plate, wall, fixed base or mobile (on high-speed trailer) versions.

Price of towers are for the complete package—tower sections, mounts, telescopic and luffing gear, guys, head unit and winches. AS APPROPRIATE FOR ANY PARTICULAR MODEL

The sample of prices exclude VAT and delivery

STANDARD 13M20 SERIES				*HEAVY DUTY 16M20 SERIES*			
Post Mounting 13M20				*Post Mounting* 16M20			
P25	25'	Tower	£236.20				
P40	40'	Tower	£323.60	P40	40'	Tower	£476.60
P60	60'	Tower	£392.70	P60	60'	Tower	£541.10
Fixed Base 13M20				*Fixed Base* 16M20			
FB25	25'	Tower	£175.60				
FB40	40'	Tower	£262.40	FB40	40'	Tower	£382.20
FB60	60'	Tower	£332.20	FB60	60'	Tower	£446.70
Socket Types 13M20				*Socket Types* 16M20			
SP25	25'	Tower	£274.60				
SP40	40'	Tower	£361.50	SP40	40'	Tower	£528.50
SP60	60'	Tower	£431.30	SP60	60'	Tower	£592.70
Base plate 13M20				*Base plate* 16M20			
BP25	25'	Tower	£276.00				
BP40	40'	Tower	£361.90	BP40	40'	Tower	£496.30
BP60	60'	Tower	£431.20	BP60	60'	Tower	£560.70
Wall Mounting 13M20				*Wall Mounting* 16M20			
W25	25'	Tower	£190.20				
W40	40'	Tower	£277.00	W40	40'	Tower	£390.30
W60	60'	Tower	£346.80	W60	60'	Tower	£449.50

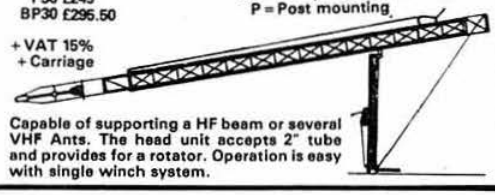
80-85-100-120' and MOBILES PRICES ON APPLICATION

NEW '30ft': 10ft SECTIONS

P30 £249
BP30 £295.50

+VAT 15%
+Carriage

BP = Baseplate mount
P = Post mounting



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

SOUTH MIDLANDS COMMUNICATIONS LTD

OSBORNE ROAD, TOTTON
SOUTHAMPTON SO4 4DN

SMC

Telex: 477351 SMCOMM G
Tel: Totton (0703) 867333

SMC-HS

INTERCHANGEABLE ELEMENT MOBILE ANTENNAS

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

MODEL	BAND	GAIN	TYPE	POWER	LENGTH	PRICE
20SE	14MHz		(¼λ)	100W	1·72m	£12.00
15SE	21MHz		(¼λ)	130W	1·72m	£10.00
10SE	28MHz		(¼λ)	100W	1·27m	£10.00
4E	70MHz	0dB	½λ	150W	1·03m	£6.50
2NE	144MHz	3dB	⅝λ	150W	1·30m	£5.50
78F	144MHz	4·5dB	⅞λ	100W	1·75m	£10.00
78B	144MHz	4·5dB	⅞λ	150W	1·72m	£11.00
258	432MHz	5·5dB	2×⅝λ	100W	0·94m	£10.00
358	432MHz	6·3dB	3×⅝λ	100W	1·36m	£12.50

BALL BASE COIL

FOLD BASE COIL

BASE COIL 'FOLDED' STATE

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

CABLE ASSEMBLY

SMCSOCA

GUTTER MOUNTING

SMCGCD

MAGNETIC BASE

SMCSOMM

C/w 4M RG58 & PL259 plug	Adjustable, cast, chrome	c/w 4M RG58 & PL259 plug
SMCSOCA . . £3.00	SMCGCD . . . £3.00	SMCSOMM . £6.50

Carriage, £1.00 complete antennas, or £0.50 for accessories—any quantity

NB: Prices do NOT include VAT (15%)

SOUTH MIDLANDS COMMUNICATIONS LTD

OSBORNE ROAD, TOTTON
SOUTHAMPTON SO4 4DN

SMC

Telex: 477351 SMCOMM G
Tel: Totton (0703) 867333

South Midlands

SMC FOR CHOICE IN 2m MULTIMODES

FT480R

- ★ 144–146MHz (143·5–148·5MHz possible).
- ★ USB-LSB-CW-FM (A3j, A1, F3).
- ★ Special linear PA module fitted.
- ★ 12V dc (13·8V dc) operation negative earth.
- ★ 30W PIP A3j, 30W dc A1 and F3.
- ★ A1 and F3, 10W or 1W output switches.
- ★ Bandpass filter no tune design.
- ★ Excellent receiver dynamic range.
- ★ Outstanding sensitivity on SSB and FM.
- ★ 3SK59 Mosfet RF, 3SK51 mixer.
- ★ Bandwidth 2·4kHz and 14kHz at −6dB.
- ★ Semi break in with side tone.
- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx and Rx freq (inc RIT).
- ★ String LED display for "S" and PO.
- ★ Convenient Concentric AF and squelch.
- ★ Digital receiver offset tuning.
- ★ Advanced effective noise blanker.
- ★ FM; 100, 25 (12½), 1kHz steps.
- ★ SSB; 1,000, 100, 10Hz steps.
- ★ Dual digital VFO system.
- ★ Any TX Rx split with A and B VFO's.
- ★ ±600kHz standard repeater split.
- ★ Four easy write-in memory channels.
- ★ Memory kept alive with 12V supply.
- ★ Memory scanning with slot location display.
- ★ Up/down tuning/scanning from mic.
- ★ Priority channel on any memory slot.
- ★ "F set" clears non step component.
- ★ Lock on tuning controls on Tx.
- ★ Satellite mode allows tuning on Tx.
- ★ Scanning for busy or clear channels.
- ★ Size (Case): 8·3" D, 2·3" H, 6·9" W.
- ★ Size (Projections): 10·1" D, 3·0" H, 7·0" W.
- ★ Size (Bracket): 10·1" D, 3·5" H, 8·5" W.
- ★ Weight 5¾lb (2·6kg).
- ★ Generous 2W audio output.
- ★ Indicator for FM modulation level.
- ★ LED's; "On Air", Clarifier, Hi/Low.
- ★ Matching FP80 Mains PSU available.

£359 inc

FT225RD

- ★ 144–148MHz inclusive Coverage.
- ★ Multimode SSB-LSB-FM-AM-CW.
- ★ AC mains or 12V dc working.
- ★ Smooth Dual speed VFO.
- ★ Digital readout to 100Hz.
- ★ Mode sensitive digital readout.
- ★ Analogue readout to 1kHz.
- ★ 22 Fix Channels (2 × 11) (2MHz).
- ★ Memory Option S or split use.
- ★ "S"/centre zero/P output meter.
- ★ Switchable 20dB RF attenuator.
- ★ Switchable Xtal cont tone burst.
- ★ Switchable Meter function on Rx.
- ★ Accessory rear panel DIN socket.
- ★ Front Panel FM power control.
- ★ Front Panel VOX/MOX/Control.
- ★ Front Panel SSB Mic Gain control.
- ★ Switchable effective noiseblanker.
- ★ Switchable AGC—Slow or fast.
- ★ Switchable lights/readout brightness.
- ★ Semi Break in CW with side tone.
- ★ Clarifier on Rx or Rx + Tx.
- ★ Carifier works on VFO, xtal & mem.
- ★ ALC external phono socket.
- ★ Normal/Reverse repeater split.
- ★ Auxiliary repeater shift option.
- ★ Relay make-break-common sockets.
- ★ Front panel adjustable squelch.
- ★ Plug in board construction.
- ★ 11·8" D × 11·1" W × 4·8" H (case).
- ★ 14·2" D × 11·5" W × 5·6" H (projections).
- ★ Weight 20lb (9kg).
- ★ LED's for; MEM, Burst, NB & Attn.
- ★ LED's for; RPT, CLAR, VFO, MEM, On Air.
- ★ Front panel headphone jack.
- ★ PLL (VCO) At 130MHz for clear signal.
- ★ 25W + PEP A3j, 25W + F3.
- ★ 2W of AF to inbuilt speaker.
- ★ Highly sensitive and selective.
- ★ Conservatively rated PA for low IMD.

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Communications Ltd

SMC FOR CHOICE IN SOLID STATE HF TRANSCEIVERS

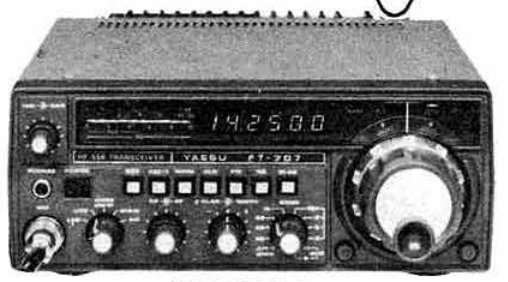
YAESU

FT107

If you have been searching for an all solid state HF transceiver with a "broad band" output that will deliver 75 per cent of maximum power into a 3:1 load, then look no further than this Yaesu. The FT107M covers 160–10M (plus) and is fully equipped with: variable IF bandwidth, audio peak/notch filter, RF speech processor, variable threshold noise blanker, full metering—including SWR, and boasts a schottky diode ring mixer for excellent receiver dynamic range. The all new memory system provides 12 stored channels (with fine tuning), scanning from the optional microphone and the exclusive DMS—digital memory shift. This system using a photo interruptor (with fine tuning) to control the 100Hz synthesizer to provide any offset up to 500kHz, from the memory channel (almost the equivalent of 13 VFOs).

- ★ 160–10 meters plus WWV plus 2 auxiliary bands.
- ★ USB-LSB-CWW-FSK-AM multi-mode.
- ★ Full broad band "no tune" power amplifier.
- ★ 240W PIP. 75 per cent power output at 3:1 VSWR.
- ★ 12 memory channels with clarifier on memory.*
- ★ Digital Memory Shift gives offset from memory.*
- ★ Up/down scanning control from microphone.*
- ★ Variable IF bandwidth—16 poles of selectivity.
- ★ Bandwidths: 6kHz*, 2·4kHz–300Hz, 600Hz–300Hz.*
- ★ Selectable CW "fixed" widths CW-W and CW-N.*
- ★ Tunable Audio Peak (AFP) and Notch filter.
- ★ Diode ring mixer for very high Rx dynamic range.
- ★ Noise blanker—front panel adjustable threshold.
- ★ AGC; slow-fast-off switchable from the front panel.
- ★ Attenuator 0–20dB, plus RF gain on front panel.
- ★ RF speech processor fitted—front panel adjustable.
- ★ Digital (100Hz) plus analogue frequency displays.
- ★ Meter Reads; Vcc, Ic, ALC, Compression and SWR.
- ★ Semi-break in with side tone. Vox built in.
- ★ Choice of built-in or separate power supply units.

£690 inc VAT



FT707M

The FT707 'The Wayfarer' is an ultra-compact transceiver ideally suited for the home station or as a travelling companion. The FT707 is THE radio of the eighties: 80–10m, including 30, 17 and 12m—all factory installed—100W output (10W's' model) 50% developed in 3:1 VSWR—Digital, bright LED's in mode sensitive counter and analogue readout—Transceiver status at a glance, from string LED and single displays—16 poles of crystal filtering provides continuously adjustable IF bandwidth 2·4kHz to 300Hz (N.B. This is true 'variable bandwidth' that minimises much of the adjacent channel interference not 'IF shift')—Noise blanker of most advanced design using local AGC loop—Schottky diode ring module, power transistor buffers, ultra clean, low noise local oscillator are combined to produce, size and price notwithstanding—a remarkable receiver.

- ★ 80–10 metres (including 10, 18 and 24MHz bands).
- ★ USB-LSB-CWW-CWN-AM (Tx and Rx operation).
- ★ 100W PEP. 50% power output at 3:1 VSWR.
- ★ Full "broad band" no tune output stage.
- ★ Excellent Rx dynamic range, power transistor buffers.
- ★ Rx Schottky diode ring mixer module.
- ★ Local oscillator with ultra-low noise floor.
- ★ Variable IF bandwidth—16 crystal poles.
- ★ Bandwidths 6kHz*. 2·4kHz–300Hz (600–350)Hz*–300Hz.*
- ★ AGC; slow-fast switchable from the front panel.
- ★ VOX built-in and adjustable from the front panel.
- ★ Semi-break in with side tone for excellent CW.
- ★ Digital (100Hz) plus analogue frequency display.
- ★ LED Level meter reads: S, PO and ALC.
- ★ Convenient concentric AF/FR gain controls.
- ★ Indicators for: calibrator, fix, int/ext VFO.
- ★ Receiver offset tuning (RIT-clarifier) control.
- ★ Advanced noise blanker with local loop AGC.
- ★ 25kHz crystal calibrator feature.
- ★ Internal, xtal or external VFO control.

**Optional*

£500 inc VAT

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FRG7

The FRG7 is an economically priced general purpose communications receiver employing all solid state construction for reliability and performance. It uses a Wadley-loop drift cancellation system for high stability and image rejection. Listen to Radio Amateurs, shortwave broadcasts, BBC and commercial medium wave station, CB and much much more.

A side by side comparison between the FRG7 and any of the mass of "all singing and dancing" transistor portables, possibly costing much more, will soon reveal why the FRG7 is a most popular choice.

- ★ "Industry standard" receiver.
- ★ 0·5–30MHz.
- ★ SSB (LSB/USB), CW, AM.
- ★ Selectivity of ±3kHz at −6dB.
- ★ Wadley-loop triple conversion.
- ★ 10kHz Direct dial readout.
- ★ Well calibrated "sharp" preselector.
- ★ AM Automatic noise suppression circuit.
- ★ Antenna Hi to 1·6MHz, 50ohm to 30MHz.
- ★ 3 position RF Antennuator.
- ★ 3 position AF (LP, WBP, NBP).
- ★ 110–240Vac and 12Vdc.
- ★ Internal Battery holder option.
- ★ Illuminated edge type "S' meter.
- ★ Optional Battery holder £5.00.

£199.00 inc

FRG7700

The FRG7700 is a deluxe all purpose communications receiver using the latest in large scale integration, phase locked loops and bandpass filters for superb performance. It uses an up conversion circuit with 48MHz first IF with professional quality crystal filter. The receiver can be used for listening to all normal HF services, and the inclusion of FM allows reception of 10m FM, and with a convertor VHF Amateur and Marine bands. The FM detector, the clock/timer, and the optional 12 channel memory (instant write in recall of frequencies anywhere in the tuning range) places the FRG7700 head and shoulders above similar priced receivers.

- ★ Incredible new receiver.
- ★ 0·15–30MHz.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2·7kHz, 6kHz, 12kHz, 15kHz, @ −6dB.
- ★ Up conversion 48MHz first IF.
- ★ 1kHz digital plus analoge display.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500ohm to 2MHz, 50ohm to 30MHz.
- ★ 20dB pad plus continuous antennuator.
- ★ Constantly variable tone control.
- ★ 110 and 240Vac and 12Vdc option.
- ★ 12 channel memory option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ FRG7700M £389. Memory option £83.95.

£309.00 inc

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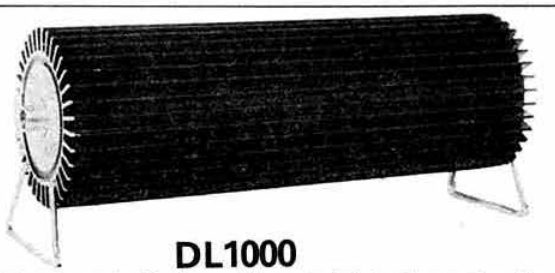
SMC BRAND EQUIPMENT

SP4

RF speech processor. Audio to audio via polyphase SSB generator, clipper and filter. Low noise input stage with frequency tailoring. Preset output level control, front panel input/compression level control plus superb bar led display of compression level. Push button on/off and in/out switches. 4-pin input and output sockets. 12V dc operation for portable and supplied with mains adaptor (SMCP1202) for home. 15×14×5cm, black end panels and grey hammer finish case suits any shack.

SMCSP4 (postage and packing £1.00) **£60.00**



DL1000

52ohm dummy load in a heavy duty, extruded aluminium casing with black anodised sides, natural ends and SO239 connector. The high quality non-inductive resistor is immersed in instrument grade transformer oil. The unit is supplied ready filled and sealed and with a pair of chrome wire stands. DC to 150MHz where it exhibits a 1·2:1 VSWR. High power handling capacity of 1kW for three minutes 300W continuous, under normal conditions. Weight 2·7kg, size 30cm long by 10cm diameter, with 40, 1·3cm fins, boosting the surface area three-fold to a big 4,150sq/cm.

SMCDL1000 (postage and packing £1.95) **£34.65**

P1202

12V PSU providing 200mA from 240V ac 50Hz. 3-pin 13A plug type (4·5×7×6cm). 250gm c/w 1·8m marked cord and 2·1mm plug + ve centre. UK made to BS 413.

SMCP1202 (postage and packing £0.60) **£4.35**

SMCS2

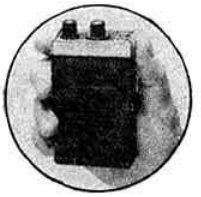
50ohm coax changeover switch. Grounding of unused port, gives high isolation (60dB @ 300MHz) and static protection. Quality cast housing with positive action switch. SO239 (UHF sockets). Low SWR 1·2:1) and high (1kW) power handling.

SMCS2 (postage and packing £0.70) **£6.95**

HF12

12 channel FM pocket monitor 2·5×1·5×4·5", 8oz inc. batteries. 12kHz bandwidth, 130–170MHz standard.

SMCHF12A12 c/w S(20–23) R(0–7) **£60.00**



T3-170L

50ohm HF/VHF SWR and relative power meter. 3·5–170MHz power up to 1kW (3·5MHz 1:1 SWR). Calibrated 50 and 100 forward and 3:1 and 100 on reverse. 4·8(5·8)×2·0×2·2" with two 1·6×1·0" flush meters. SO239 sockets.

SMCT3-170L (postage and packing £0.80) **£10.30**

GP144W

2m high gain 6dB (over ½λ) colinear. Multiple ⅝λ. Ultra low angle radiation. SO239 connector recessed in support tube.

SMCGP144W (postage and packing £1.50) **£21.74**

GP432X

70cm gain 6·8dB colinear. 3, ⅝λ, 5' 6" long mechanical excellence. Connector recessed into support tube.

SMCGP432X (postage and packing £1.25) **£24.35**

HF5

5-band trapped vertical. 15·5' tall, remarkable value.

SMCHF5V Vertical (postage and packing £1.50) **£35.00**

SMCHF5R Radial (postage and packing £1.50) **£26.65**

118M

Ultimate mobile antenna! Around 7dB gain. Special 1½λ design. BSD Bumper Strap £6.70. SOCAL Cable £3.35.

SMC118M (postage and packing on all three items £1.50) **£24.65**

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FRG7700

COMMUNICATIONS RECEIVER

- ★ 150kHz-30MHz no gaps
- ★ SSB-CW-AM and FM
- ★ 2·7kHz-6kHz-12kHz-15kHz
- ★ Up-conversion no preselector
- ★ 12 channel memory option
- ★ Mains and 12 volts dc
- ★ Clock/timer built-in

General Coverage
From 30MHz to 150kHz (lower at reduced spec.) in 1MHz bands selected by a 40 way rotary switch calibrated 0-29 (plus 1, 3, 7, 10, 14, 18, 21, 24, 28, 29 for easy amateur band changes).

All Modes
SSB, (USB and LSB), CW AM and FM. The inclusion of a N.B.F.M. detector and squelch opens new horizons. On 10m; Simplex, plus USA repeaters, and with a convertor, Marine, P.M.R. lab use, and of course, the VHF/UHF amateur bands, where the high quality noise blanker will be found to be most efficient.

Selectivity
4 filters fitted as standard! SSB, 2·7kHz and FM 15kHz. For AM, 3 positions! Narrow 2·7kHz, Medium 6kHz and Wide 12kHz, which with the tone control, and switchable AGC provides the operating flexibility demanded by discriminating BCL's in today's crowded bands.

Sensitivity
Fraction of a microvolt sensitivity provided by the latest 3SK73 mosfet RF stage makes the best use of inefficient aerials for those difficult locations. A 20dB switchable attenuator and a continuous RF attentuator on the front panel minimises problems with very powerful stations.

Ease of use
No preselectors! Up conversion with a 48MHz first IF and professional grade crystal filter, plus dual PLL system provides automatic selection of the input bandpass filter direct from the band selector of memory.

The VFO has both a pleasing bright, but dimmable digital readout and a back illuminated analogue scale. It is tuned by a comfortable 1¾" knob with a fast tune finger tip recess through a zero backlash slow motion drive. The front panel is remarkably uncluttered, clearly labelled and the controls are in logical positions. The illuminated meter is calibrated in both conventional 'S' units (0-9 +20, +40, +60dB) and in SIMPO 1-5 for broadcast station reporting.

Timer
An inbuilt quartz clock/timer is featured. The display is in 12 hour format (with AM/PM indicators) on the digital frequency readout, ideal for accurate log keeping. In the event of a mains failure the clock continues to run (but does not of course, display) on the memory back up cells. For use with a tape recorder: 3·5mm jack provides 100mV of audio (irrespective of the position of the AF gain control) and relay contacts (15V @ 1A max) provide remote control. This relay is switched by the timer which may be programmed switch on/switch off (and snooze—allows up to 59 minutes of listening after switch off).

Antennas
On the rear panel a SO239 coax socket provides a 50 ohm input (2-30MHz) for resonant antennas and convertors. In parallel, and in addition, are posts, for Earth, and for 500 ohm antenna input (up to 2MHz).

Memory (option)
12 frequencies *anywhere* within the timing range may be stored by simply touching the M button and then recalled by pressing the MR button, no preselector adjustment, no range switch adjustment. The memory is tunable by ±1kHz and is kept alive year long by 3 'AA' dry cells. The memory may be used for storing; the frequencies of a particular broadcast network (and with a convertor), common marine channels, 2m FM channels (switch between the VFO and memory for repeater input/output) etc.

World Wide Portability
Power: Mains; 240-220 VAC easy adjustment to 100-120V, 50/60Hz. 12 VDC external supply.
Size: 13" × 5" × 9"
Weight: 14lbs (c/w carrying handle)
Speaker: Inbuilt 8 ohms, 1·5W of AF, External 4-16 ohm unit. ¼" phone jack for personal listening or winkling out the weak ones.
Memory: Going on a trip? Store Radio 4 and all the BBC World Services in the memory and keep in touch with the news.

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

A seasonal message from the President

Photo: G3LEI

As the time for the traditional seasonal message draws near, it is an occasion to reflect upon my year of office and the progress of communication.

The opportunity of visiting clubs, conventions, rallies and other events both in the UK and overseas has enriched my amateur radio horizons with a better understanding of the needs and problems of others. There is a tremendous pride and spirit in being an "amateur", and a great awareness of being part of a service that has so much to offer in scientific achievement, competition, and community service in one way or another—in fact "the wonderful world of amateur radio".

The year has seen an increase in membership and membership services. There have been staff changes at Doughty Street; I refer in particular to the resignation of Mrs Heather Allin and Paul Gallier, to whom I offer my personal thanks and best wishes for the future.

I am grateful to all members of Council, headquarters and editorial staff for their loyalty and guidance throughout the year.

In conclusion I wish you all a very happy Christmas and a peaceful and prosperous New Year.

Peter Balestrini, G3BPT

QTC
amateur radio news

Christmas holiday closures

RSGB headquarters will be closed for normal business from 25 December to 4 January inclusive.

The *Radio Communication* editorial office in Chelmsford will be closed from 22 to 26 December inclusive, and on 1 and 2 January.

Subscription payments by banker's order

It is normal for members who pay their subscription by banker's order to receive a new membership card some six weeks after their payment has been received by the Society's bank. There are two reasons for this: (1) in many cases payment advice to the Society by the bank is not made until the third week in the month; (2) it is not cost effective for the Society to print new membership cards on a day-by-day basis, thus batches of cards are printed at two to three-week intervals. These two factors can combine to produce a typical delay of some six weeks. The Society's systems take these factors into account, and this is one reason why a membership card is valid for three months after the renewal date printed on the card.

Planning permission

A government consultation document was issued earlier this year making proposals that fees should be imposed for planning applications. The fee appropriate to an amateur radio mast was shown as £30, no different from many commercial installations.

The RSGB, with the guidance of Mr R. Price, G4BSO, has made comments on the consultation document, setting out the reasons why no charge should be imposed, or in the worst case a nominal sum.

QSL Bureau

G4LAA-G4LZZ. The sub-manager for this group of callsigns will be Mr C. Lennox, G8NVP, 65 Westover Road, Bramley, Leeds 13, West Yorkshire. G8NVP already handles the G8UAA-G8ZZZ group.

G6AAA-G6CZZ. The first of this new series of Amateur B licence callsigns will be issued after G8ZZZ has been allocated, and the sub-managers for the group will be Mr D. and Mrs J. Brooks, G4IAQ/G4IAR, 28 Avon Vale Road, Loughborough, Leics LE11 2AA.

The QSL Bureau could still use one or two helpers to sort cards at home on a casual basis. Anyone interested, who should have their own transport and reside in or travel through SW London/N Surrey, is asked to contact G3DRN, QTHR.

Affiliated society (or club) contact

One of the objectives of the RSGB must be to improve the communication between the Society's organization and individual affiliated societies and clubs. Over the past year, RSGB headquarters has been in regular communication with all affiliated societies and clubs, and has forwarded such items as posters and information sheets. As these links with each society and club are improved, it would be an advantage for communications to go via one person who will be registered on the Society's data processor, and for convenience the Society will in future refer to him/her as the "affiliated society contact" or "affiliated club contact".

It will be up to each society or club to nominate this person as appropriate, and it should be noted that all communications from HQ—including *Radio Communication* and subscription reminders—will be sent to the person nominated. If any change in the existing contact person is thought necessary, affiliated societies and clubs are asked to advise RSGB HQ and to quote their club callsign or reference number.

Society awards

At its meeting on 25 September, Council approved the following awards recommended by the Technical & Publications Committee for the year ended 30 June 1980:

The **Norman Keith Adams Prize**, for the most original article contributed to *Radio Communication*, to **P. H. H. Jones, BEM, G3DRE**, for "BROMA—Binary Read-Out Meter Adapter" (September 1979).

The **Courtenay Price Trophy**, for outstanding technical development in the field of amateur radio, to **J. P. Martinez, G3PLX**, for his work on the Amtor radioteleprinter system.

The **Ostermeyer Trophy**, for the most meritorious description of a piece of home-constructed radio or electronic equipment published in *Radio Communication*, to **N. G. Hyde, G2AIH**, for "A 144MHz synthesized fm transceiver" (March/April).

The **Wortley Talbot Trophy**, for outstanding experimental work in the field of amateur radio, to **R. G. Cracknell, ZE2JV**, and **R. A. Whiting, 5B4WR**, for "21 years of te" (June/July).

BARTG

At the annual general meeting of the British Amateur Radio Teleprinter Group held on 1 November, it was decided that in order to cover rising costs the subscription for 1981 should be increased to £3 upon first joining, with an annual renewal figure of £2.50.

Applications for membership and renewals, in future, should be sent to: Mrs I. Double, BARTG Membership Secretary, 89 Linden Gardens, Enfield EN1 4DX, England, and not to any other address.

Reticon components

On page 1022 of the October issue of *Radio Communication*, in the article "The G4BWE speech processor", reference was made to a Reticon SAD1024 device. Further information on Reticon devices can be obtained from E. C. & G. Reticon, Seymour House, The Courtyard, Denmark Street, Wokingham, Berks RG11 2DR.

Signals on public electricity supplies

The increasing number of devices being developed which use the consumers' electrical wiring installation as a communication or signalling channel has led the Electricity Council to issue a revised Engineering Recommendation (G22/1) covering superimposed signals on public electricity supply networks. The devices include speech communication systems, usually within a consumer's premises, and various forms of remote alarm, such as fire or burglar alarms, which use the consumer's wiring as the communication path.

Potential problems created by these devices include:

(1). The distortion of mains voltage waveform which may affect other consumers' electrical supplies.

(2). The injection of signals into the supply network, which may cause interference with other communication equipment.

(3). The provision of a blocking filter to limit the injection of signals into the supply network, which may interfere with supply control signals which may be transmitted by the area electricity board.

(4). The electrical safety of such devices.

(5). The possibility that electricity board and consumer signalling systems may interact with each other.

Electricity boards may use their mains and services for remote control of the supply system and of consumers' loads, with their knowledge and consent, and it is important for the benefit of all consumers that currents created by a consumer's signalling device should not be capable of interfering with a board's signalling system.

It is therefore essential that there should be no penetration by a consumer's signals beyond his supply terminals. In order to meet this requirement it may be necessary for the consumer to install blocking equipment.

The consumer should also be aware that the Post Office will be concerned about the possibility of radio interference from such devices, and that there may be a need to consult the Home Office regarding licensing arrangements, particularly when communication between separate buildings is concerned.

Copies of Engineering Recommmendation G22/1 may be obtained from: The Distribution Engineering Branch, The Electricity Council, 30 Millbank, London SW1P 4RD, for an advance payment of £1.

1981 RSGB PRESIDENTIAL INSTALLATION

The installation of Mr Basil O'Brien, G2AMV, as the 47th President of the Radio Society of Great Britain will take place during a

SOCIAL EVENING
(Buffet supper followed by dancing)
commencing at 7 for 7.30pm on
Saturday, 10 January 1981
at the
Queen Hotel, City Road, Chester

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

Price per person: £3

All applications for tickets must quote callsign or BRS number of the applicant, and should be addressed to Miss D. P. Biesiegel, RSGB HQ, 35 Doughty Street, London WC1N 2AE, **and must be received by 15 December 1980.**

For those wishing to stay at the Queen Hotel, specially reduced terms have been agreed. Bookings must be made direct with the hotel, mentioning the function and adding to the address above "Cheshire CH1 3AH" (Tel 0244 28341).

Raynet—a tie for Christmas

An ideal Christmas present—a tie with the Raynet motif on a navy blue background—may be obtained at a cost of £2.80 incl p&p, from Jane Balestrini, QTHR G3BPT.

A gasfet preamplifier for 432MHz with 0·5dB noise figure

by J. N. GANNAWAY, G3YGF,* and C. W. SUCKLING, G3WDG

Introduction

This article describes the construction of a state-of-the-art preamplifier for 432MHz with a noise figure of around 0·5dB (a noise temperature of 35K), using a gallium arsenide fet (gasfet). It also outlines the importance of the other components of the receiving system, such as feeder losses and the subsequent stages of the receiver which can also affect the noise figure of the overall system. Also included is a design for a second-stage preamplifier using a BFR34A which has a noise figure of around 2dB. These preamplifiers are in current use by the authors in their 432MHz moonbounce system. The main emphasis is on achieving very low noise figures, but the devices are also capable of very good strong signal performance if a slightly poorer noise figure is acceptable—this trade-off would probably be made if the preamp was to be used only for normal terrestrial purposes.

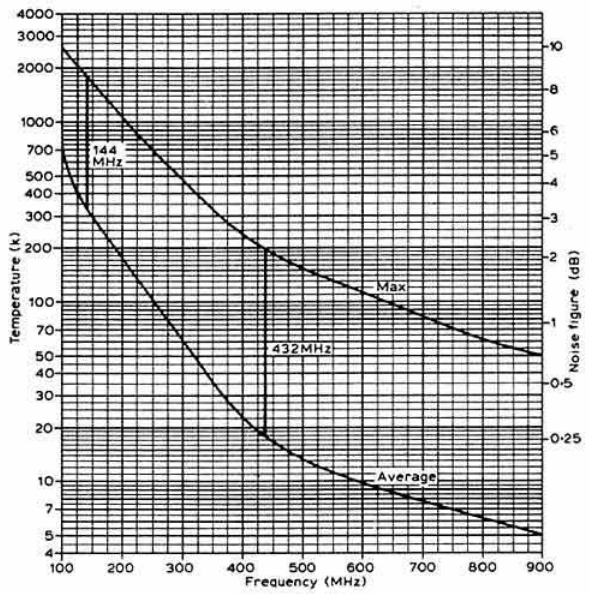


Fig 1. Plot of sky temperature against frequency. *(Errata*: **In Figs 1, 2, 3, 9 and 10, "k" should read "K", signifying °Kelvin)**

* Dept of Engineering Science, University of Oxford, Parks Road, Oxford OX1 3PJ

The benefits obtained from a low receiver noise figure will depend on the ambient noise level, which is the sum of contributions from several sources. Thermal noise will be picked up by the antenna from both the sky and the earth—man-made noise sources will be ignored, as they are not a fundamental limitation, and are usually only of short duration.

Typical values of the noise level from the sky are given in Fig 1; at some time during the day the most noisy parts of the sky can be near the horizon, and so may be in the antenna beam. The sky's noise level is expressed both as a noise figure in decibels and as an absolute temperature; this is the value of system noise figure or temperature for which the noise from the sky will be equal to the noise generated in the receiving system. The noise contribution from the earth will be at a temperature of around 290K (3dB nf), although this decreases at lower frequencies where the ground reflects, rather than absorbs, the signals. Feeder losses also introduce noise as well as attenuating the wanted signal. Finally there is the noise generated in the receiver front-end. So it can be seen that the noise from the receiver preamplifier is only a part of the noise present at the receiver output.

On the lower vhf bands the thermal noise from the sky does not make it worthwhile to use a receiver with a noise figure of less than about 2dB. Even if an ideal, noiseless receiver were used, the s:n would only be improved by a decibel or so. At higher frequencies, however, particularly when the antenna is beaming upwards, less noise is picked up from the ground and the noise level from the sky is also much lower, so it is worthwhile building receivers with a much lower noise figure. On

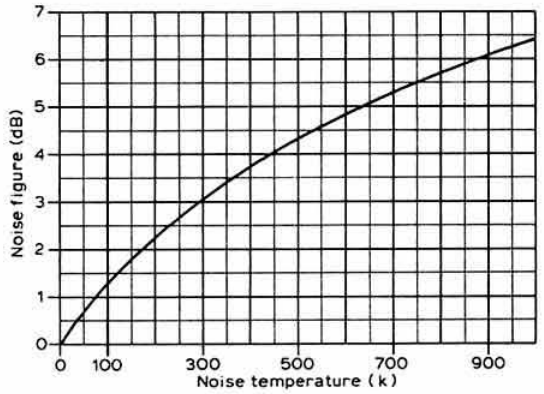


Fig 2. Graph for converting noise figure to noise temperature

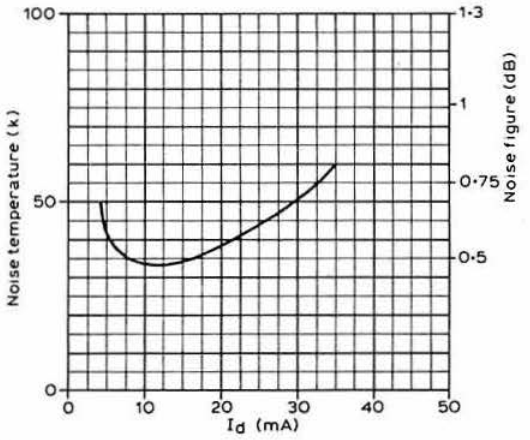


Fig 3. Variation of noise temperature of the gasfet preamp with drain current

432MHz, with the antenna pointing skywards for satellite or moonbounce work, the improvement in s:n obtained by going from a 3dB to a 0·5dB nf could be up to 6dB, so the effort involved in developing very low noise figure preamps is well rewarded.

This improvement, much greater than the difference between the two noise figures, may seem illogical, but it is a consequence of noise figures being expressed relative to room temperature (290K), so they cannot be used directly to calculate the s:n when the noise source is at a different temperature. The concept of noise temperature is a better way of expressing both receiver and external noise levels, and is very useful in these cases. It is a means of specifying noise powers, eg the equivalent noise power at the input of the amplifier, and the actual noise power from the sky.

The available noise power P, is directly proportional to absolute temperature T, $P = k \times T \times B$, where k is Boltzman's constant, $1{\cdot}38 \times 10^{-23}$ J/K, and B the bandwidth (Hz), so it is very simple to calculate s:n ratios using temperatures to represent the noise powers. The relation between noise figure and noise temperature is shown in Fig 2, which is a plot of the following relation:

$$NF_{dB} = 10 \log \left(1 + \frac{T}{290}\right)$$

Noise figures of 2-3dB are readily obtainable on 432MHz using inexpensive bipolar devices. The lower limit is about 1dB, but this figure is not easily achieved.

Previously, the way to improve on these noise figures was to use rather exotic techniques such as masers and parametric amplifiers, but gasfets have recently become available and they offer a very simple solution to the problem. They are really intended for use in the 2-20GHz region where they can give noise figures of 1-3dB with associated gains of 15-8dB. These figures are themselves quite impressive, but their performance is even better at lower frequencies (uhf). The devices themselves have noise figures of around 0·3dB (21K) in the 300-600MHz region, with gains of 18dB achievable with an untuned output circuit. The noise figure begins to rise again below 300MHz due to flicker noise. Their strong signal performance is superior to bipolar devices because they produce the best noise figure at a higher device current, typically 10-15mA, whereas bipolars optimize at around 4mA. They will also hold a very low noise figure up to much higher drain currents, 20-30mA, see Fig 3. For many terrestrial applications, this high dynamic range will be more important, so the device would be run at 30-40mA drain current, giving an nf of around 1dB.

The one major problem in their use is that they have a very high input impedance. Bipolars have input impedances which are relatively close to 50Ω, typically a few hundred ohms, so they are quite easy to match in either narrow or broadband systems, leaving open the option of fitting a narrow, low-loss, bandpass filter in front of the preamp. On the other hand, gasfet input impedances are many tens of kilohms, so a very high Q network is necessary to step up the impedance with low loss, and it is consequently difficult to make them operate over a broad bandwidth. This is a disadvantage for many professional applications, but actually a positive benefit for amateur applications, as it requires the construction of a very narrow bandwidth low-loss input matching circuit which will reject out-of-band signals and reduce the number of spurious products generated in the receiver. This is particularly effective, since the filter is in front of all the active devices in the receiver. Broadband preamps can suffer badly in this respect from the large number of strong signals present in the vhf/uhf bands. This preamp has been used in close proximity to a 400W station on 144MHz, with both antennas on the same mast, 6ft apart, and no problems were experienced.

Noise matching

The best possible noise figure will not be obtained from a device just by stepping up the 50Ω input to a value equal to the complex conjugate of the device's input impedance, which is the condition for maximum power gain, and therefore also results in the preamp presenting a matched load to the input line. For the best noise figure the device must be fed from a specific impedance which is usually quite different to its input impedance, and so the preamp will mismatch the input line. For bipolar devices this mismatch corresponds to a vswr of around 2:1 at vhf.

Gasfets, however, need a much larger mismatch, in the region of 15:1. A consequence of this large mismatch is that the input matching required for maximum gain and minimum noise figure will be very different. Typical values of the impedances required for these two conditions were measured, and are shown in Fig 4 for several devices, a GAT5, a GAT4 and an ALF1000.

These values can also be expressed in terms of S parameters but, since the impedances involved are so much greater than

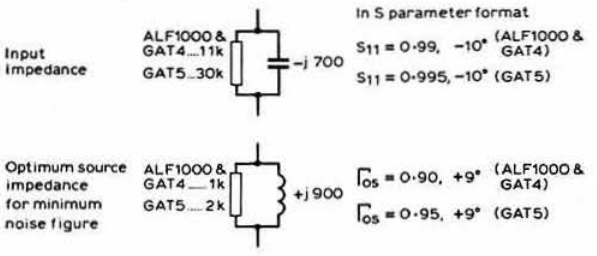


Fig 4. Input and optimum source impedances for several gasfets

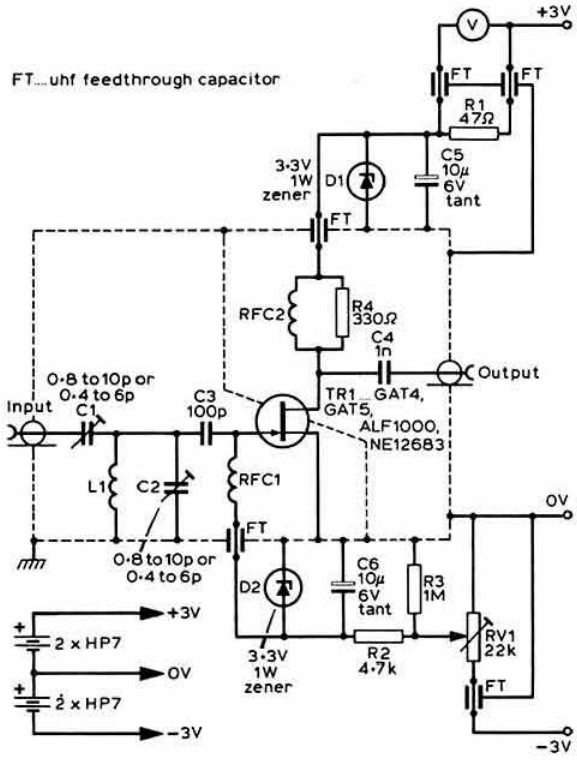


Fig 5. Circuit of the gasfet preamplifier

50Ω, it is not a very useful way of expressing them. The function of the input matching network is therefore to transform the 50Ω input to approximately 2kΩ in parallel with an inductive reactance of 900Ω. This reactance roughly cancels out the input capacitance of the fet.

The input resistance of the fet is very much larger than this value, so it has little effect on the loaded Q of the input circuit. The loaded Q required is about 15–30, depending on the type of fet. The most important feature of this preamp design is the input matching circuit, which has a very high unloaded Q (approximately 1,000) in order to reduce the losses in it, which will degrade the noise figure.

Construction

The circuit of the gasfet preamplifier is given in Fig 5. It is built on double-sided pcb which is used as a ground plane, and the whole amplifier fits in a 4·4 by 2·4 by 1·25in diecast box, with the ground plane replacing the lid. The screens are also made from double-sided pcb for rigidity and ease of soldering, and the covers for the input inductor L1 are made from thin brass or copper foil. The layout is shown in Fig 6 and the photograph.

First, mark and cut out the pcb to fit over the top of the box, and drill holes for the mounting screws in each corner. Mark the position of the posts in the corners of the box on the pcb, so as to avoid mounting anything on the board which will foul them; this is likely to occur if the input socket is too near the corner of the box. Solder the three pieces of pcb screen (0·8in high) in place, soldering both sides of the board all along their length. Mount the feedthrough capacitors in the screens and lid. The one into the drain compartment should be about halfway up the screen, and the one into the gate line about 0·2in from the top of the screen. Cut out two small pieces of pcb about 0·125in square for use as mounting pads for the fet leads, and glue them down flat to the ground plane on each side of the gap in the screen. Mount the input and output sockets and C2, making sure that the sockets do not foul the sides of the box. If four-hole mounting sockets are used they can be pushed through the pcb from the inside of the box and soldered to the ground plane inside the box. Single-hole fixing sockets can either be used in this way or bolted in. SMA, TNC or BNC sockets are particularly suitable on grounds of size, but BNC are rather less reliable electrically as they can become intermittent after a lot of use. N type sockets are too large.

Adjust the distance by which the input socket protrudes above the pcb so that C1 can easily be soldered to both C2 and the input socket. Next, bend up the input inductor L1 from some copper sheet about 0·040in thick, and solder it in place—at the grounded end first and then the end resting on C2. All the other components can then be installed. Take care when soldering to the Johanson trimmers, as the top

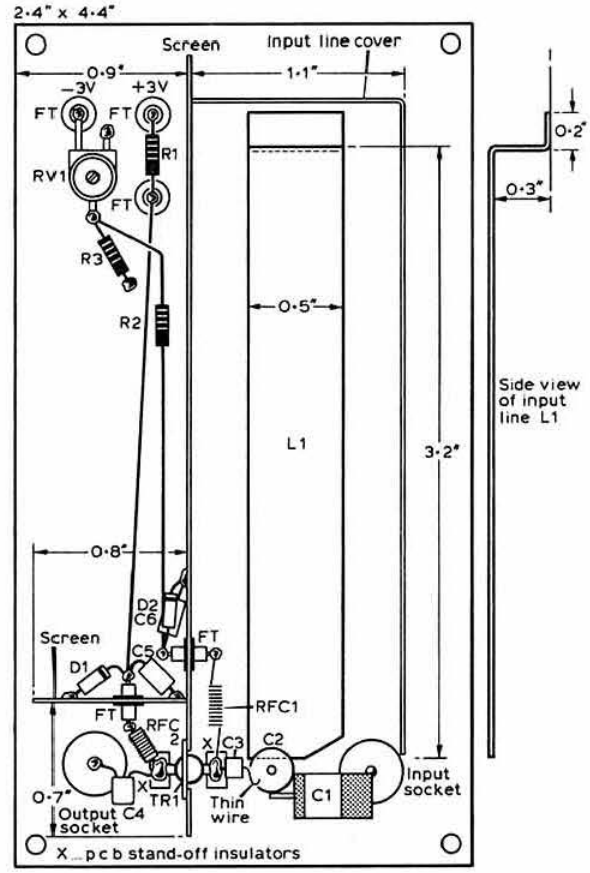
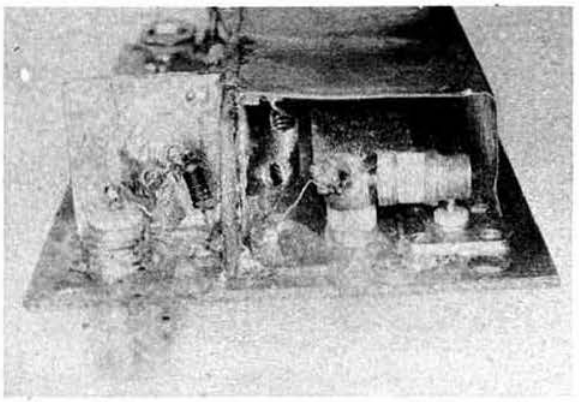


Fig 6. Layout of the gasfet preamplifier



The gasfet preamplifier before installing the final screen across the fet and input line

connections can become unsoldered from the body if they get too hot. A piece of flexible wire, rather than copper strip, should be used to connect C2 to C3 to prevent any stress being applied to C3. Next bend up the screen to cover the top, side and end of L1, and solder it in place all along the joins. It should stop just at the end of L1, leaving access to both the variable capacitors and the fet, and be about 0·3in above the copper line.

At this stage it is worth checking that the line can be made to resonate at 432MHz with C1 set approximately midway and with a 50Ω load on the input socket. Apply power and check that the correct voltages appear at the fet connection pads.

The next step is to install the gasfet. This requires sensible precautions when handling it, to avoid damage due to transient voltages, particularly as the devices are quite expensive. A few simple precautions are:

(1) Do not handle the device in a room where one can draw sparks from objects after walking across the floor.

(2) Touch earthed objects frequently.

(3) Touch the source first when picking up the gasfet.

(4) When installing the device in the amplifier, hold the amplifier at the same time, thus keeping them both at the same potential.

(5) When soldering the gasfet into the circuit, unplug the iron from the mains and ensure that the iron is earthed to the pcb during soldering.

For devices in the P103 package (threaded stud mounting), drill a 1·2mm diameter hole in the pcb between the two stand-off pads. The lead with a 45° cut across the end is the gate. Bolt the device in place, being careful not to tear off the thin foil leads by allowing the whole package to rotate while tightening the nut. Solder the leads to the stand-off pads. For the cross-type package, solder the two source leads to the screens on each side of the stand-off pads. The gap between the two screens can now be closed by soldering some thin metal foil across it, and another foil screen can be soldered over the end and top of the input circuit, leaving access to adjust C1.

C1 will need to be about 1–2pF and C2 about 3pF. These components must be very low-loss, and Johanson or JFD types are recommended. Miniature ptfe dielectric gold-plated trimmers similar to those supplied by Vero have also been used successfully for C1. C3 is ideally a 100pF chip capacitor, but ordinary disc ceramic types may be suitable. RFC1 must also be of low-loss construction; it is about 15 turns of 26swg enamelled wire, self-supporting, 0·125in diameter with the turns slightly pulled apart. RFC2 is 10 turns of similar wire wound on the body of a resistor of a few hundred ohms (R4). The feed-throughs must work effectively at uhf, and the resistor R3 is just used as a stand-off insulator to support the preset, RV1.

The BFR34A preamp, Fig 7, is built in a very similar manner in a smaller diecast box, but screens will probably not be needed, other than the one shown in the layout in Fig 8.

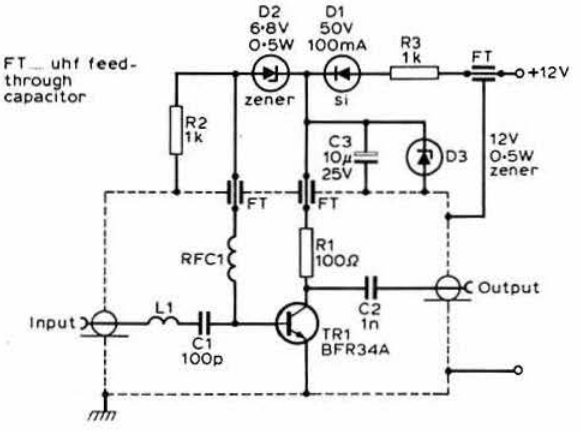


Fig 7. Circuit of the BFR34A preamplifier

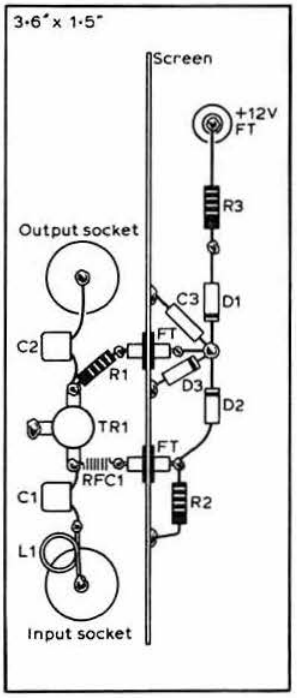


Fig 8. Layout of the BFR34A preamplifier

Power supplies

Gasfets are very sensitive to transients because of the very small capacitances and dimensions of the chip. The width of the gate is about 1 micron, so even relatively low voltages can produce very high electric fields in the chip. The manufacturer's maximum ratings are typically as follows:

Vgs	−6 to 0V.
Vds	0 to +6V.
Vdg	0 to 10V.
Pmax	500mW
Max forward gate current	2mA
Max reverse biassed gate leakage current	10μA

The gate is the electrode most liable to damage by transients, but once it is installed in the circuit it is fairly robust. By far the safest and very strongly recommended way of powering the preamp is from dry batteries. Holders for four HP7s can conveniently provide ±3V if a connection is made to the centre tap of the batteries. These should be mounted near the preamp, as excessively long leads will increase the chance of picking up transients from other circuitry, such as relays, which will also be at the masthead. It may be possible to design a transient-proof power supply, but perhaps rather risky to test it on one's own gasfet. The circuit given provides some protection, but zeners are fairly slow-acting devices and can still allow transients through. A very fast-acting zener diode is supplied by RS Components as a transient suppressor, with a rise time in the picosecond region and a very low dynamic resistance, and one of these may well be the solution to the problem. However, they are as yet untested by the authors, who regard batteries as the only really safe way of powering the preamplifier.

Testing

Set the bias preset to about half-way, then apply first the gate and then the drain supply. This order avoids the device taking Idss (50–100mA), which occurs if the gate bias is applied later. Reverse the order when switching off. The drain current should be set to 10mA initially, and can be monitored by measuring the voltage across the 47Ω resistor. The preamp may oscillate if it is run without a 50Ω load on the input.

Once the gasfet and a suitable second stage amplifier have been built, the matching of the gasfet will have to be carefully optimized to achieve the 0·5dB noise figure. The two preamps should be connected by a fairly short piece of cable to avoid introducing further losses; it should be the same piece of cable which will be used when they are installed in the system.

There are two approaches to the optimization. If facilities are available to measure and adjust the antenna accurately to 50Ω, then the preamps can be optimized on the bench when fed from a noise source with a 50Ω source impedance. The impedances should be kept to a vswr of less than 1·1:1 if the best noise figure is to be maintained. This method is the best, in that the preamp will be set up for 50Ω sources and can be measured on standard laboratory test gear.

Alternatively the preamps can be installed on the antenna, and noise injected by running the noise source into a small antenna near the main one, taking care that neither it, nor the presence of the operator, will upset the matching of the main antenna. Once it has been optimized in this way, the cables, relays etc between the antenna and the gasfet should not be changed, as they may alter the matching. With care, both methods can produce equally good results, since the actual antenna impedance is not important, provided that it is transformed to the correct impedance at the fet gate.

C1 should be set initially to 1–2pF, and C2 adjusted for best noise figure. Then C1 can be altered and C2 reoptimized. This procedure is necessary because both ends of C1 are floating, and the presence of the trimming tool alters the impedances. Both Vd and Id will affect the noise figure. The effect of Id is shown in Fig 3, while Vd has been found to produce a broad optimum in nf around 1·5 to 3V; typical values being 2·5V and 10mA. Whichever method is used, some form of noise figure indicating meter is necessary. A suitable instrument was described in [1] with some further modifications in [2]. This turns a noise source on and off at about 10Hz and, by measuring the ratio between the two noise levels at the audio output of

Components list

Gasfet preamplifier (Fig 5)

C1, 2,	0·8–10pF (MVM 010 or 106, or 0·4–6pF (MVM 006) Johanson or JFD trimmers
C3	100pF chip or disc ceramic
C4	1nF disc ceramic
C5, 6	10μF 6V tantalum
R1	47Ω 0·125W
R2	4·7kΩ 0·125W
R3	1MΩ 0·125W
R4	330Ω (see text)
RV1	22kΩ skeleton preset
L1	(see text)
RFC1	(see text)
RFC2	(see text)
FT	UHF type feedthrough capacitors
D1, 2	3·3V 1W zener diodes
TR1	GAT4, GAT5, ALF1000 or NE12683

BFR34A preamplifier (Fig 7)

R1	100Ω 0·125W
R2, 3	1kΩ 0·125W
C1	100pF disc ceramic
C2	1nF disc ceramic
C3	10μF electrolytic 25V
L1	1t loop 22swg 0·25in dia
RFC1	10t 26swg enam 0·125in dia
D1	50V 100mA silicon
D2	6·8V 0·5W zener
D3	12V 0·5W zener
TR1	BFR34A
FT	UHF feedthrough capacitor

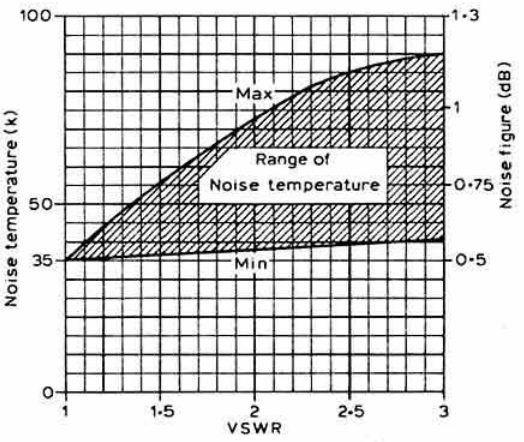


Fig 9. Variation of noise temperature of the gasfet preamp with source vswr

the receiver when the noise source is on and off, it can display the s:n ratio, which will be related to the noise figure. It is a very simple and extremely useful piece of test equipment, and can be used to optimize almost any receiver. In the absence of any test equipment it may be possible to set up the preamp by listening to a weak carrier, and adjusting for best s:n, but the nf meter is far more accurate, and quicker and easier to use. One word of warning: be careful not to tune up the gasfet preamp on the image frequency of the converter. These two preamps have enough gain to give quite a good noise figure even when tuned up on the image frequency, as some converters have very poor rejection of the image frequency; one using a 28MHz i.f. only had 10dB image rejection!

After optimization, the gain should be about 18dB and the overall noise figure 0·5dB. The BFR34A should give a noise figure of about 2dB (173K) and a gain of 13dB. The effect of the source impedance differing from 50Ω is shown in Fig 9. The worse the vswr, the greater the worst case noise figure, although—depending on the phase of the mismatch—it can also still be quite close to the best value.

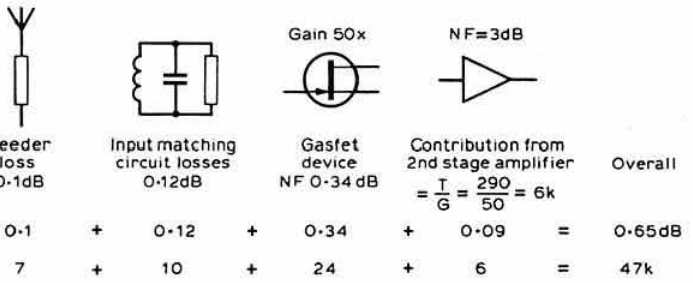


Fig 10. Diagram showing the sources of noise in a typical receiving system

Measurement of the final noise figure is not easy. Few commercial nf meters are accurate to better than ±0·2dB in this region, and there are many other sources of error that can creep in. The best method is the hot/cold load technique, where the preamp is fed from 50Ω resistors held at two different temperatures. The ratio of the receiver noise outputs is measured, and compared with the ratio of the two temperatures and, hence, the ratio of the two noise powers. This technique is usually done using liquid nitrogen (77K) or dry ice for the lower temperature, and room temperature for the higher one. Kitchen table type measurements can be done using the temperature difference between ice and boiling water, but great care must be taken to ensure that the load impedance does not change between these two temperatures as this may also alter the noise output from the preamp. The liquid nitrogen/room temperature method was used to obtain the noise figures quoted here. They should be accurate to ±0·15dB.

Various gasfets have been tried in this circuit, including the Plessey GAT4, GAT5 and GAT6, the NEC NE12683, and the Alpha ALF1000, having gate widths from 1 to 0·5 micron; all of them giving very similar performance. The GAT2, having a 2 micron gate, is considerably worse at over 1dB. Although the first five devices all gave similar noise figures in the circuit, their inherent noise figures are actually somewhat lower than 0·5dB. The extra noise comes from the losses in the input circuit, and it is here that there is much scope for improvement.

Other devices which may be suitable but have not been tried by the authors are any of the other gasfets intended for use at 2–20GHz, having gate widths of 1 micron or less, such as the Mitsubishi MGF1400 series, or NEC V244 or V388. These devices are not cheap, in the region of £20–£100. However, these figures are not much more than a currently available commercial bipolar 1dB nf preamp, and their prices are still falling.

Installation

The preamp should be mounted as close to the antenna as possible, as any feeder loss will degrade the noise figure; 0·1dB loss will add 7K (0·1dB) to the system noise temperature. If the feeder from the masthead has a loss exceeding 1dB, then the second-stage preamp should be at the masthead as well. For best performance with these low noise figures, the antenna radiation pattern should also be considered. A high side-lobe level will result in high noise pickup from the surroundings but give maximum gain, whereas a low side-lobe level will give a quieter antenna with a lower gain. A compromise must therefore be reached if the antenna is to be used for both transmitting and receiving, as the requirements for the two conflict.

The noise coming out of the second stage can be split into contributions from several places in the preceding circuitry. The losses in a typical system are shown in Fig 10, giving an overall receiver noise figure of 0·65dB. Noise introduced by the antenna has to be added to this figure to get the overall system temperature, so it will be seen that a great deal of effort must be put into the rest of the system, as well as the first preamp, if it is to be used to its best advantage. The actual noise temperature of the fet chip is 15–30K (nf 0·2–0·4dB), depending on the device, so much of the noise is still coming from the passive components in the circuit, hence the strong emphasis on low loss in the design.

The two preamps may be considered to have a rather large gain (30dB) to put in front of the converter, as it will degrade the strong signal performance of the system. If this is an important consideration, then the whole receiver front-end must be designed with it in mind. It could be argued that for the applications for which it was intended, moonbounce or satellite reception, strong signals are the last thing to worry about!

References

[1] "An alignment aid for vhf receivers", J. R. Compton, G4COM. *Radio Communication* January 1976, p36.
[2] "Microwaves", *Radio Communication* October 1979, p934; March 1980, p270. □

The G3OQD light pen for the Robot 400

by M. H. EMMERSON, MSc, Grad IERE, G3OQD*

Introduction

The light pen is a device for writing captions, cartoons etc directly on the tube face of a fast-scan tv monitor connected to the output of an sstv scan converter, in this case the Robot 400. The idea is not original, having been first seen by the author when in contact with a Continental station using a commercial DL2RZ-designed SC421 scan converter. As no circuit details of this system were available, it was decided that a light pen should be designed to work in conjunction with the author's homemade version of the Robot 400. From this initial decision it took a considerable time to produce the circuit described here; the reason for which will become apparent in the following description of how the circuit operates.

Theory of operation

The basic principle of operation of the light pen is quite simple. When light from the spot forming the line-scan raster passes a photo transistor, a pulse is generated which writes into the scan converter memory.

In practice, however, there is a problem due to the response time of the photo transistor. This delays the write pulse, so that the writing appears shifted to the right from the pen position. This was overcome by delaying the write pulse by a little less than one line time, so that writing actually occurs on the line below the one detected, at a position corresponding to the actual pen position. This delay is conveniently obtained by using a dual monostable with the time delay of the second one being trimmed to enable the writing position to be adjusted to coincide with that of the pen. Two monostables in series are used, because using only one would require an excessively high duty cycle.

The next problem concerned the thickness of the writing and the sharpness of the line that could be obtained. The thickness seemed to be affected by the screen brightness, and the sharpness could be improved by restricting the angle of view of the photo transistor to the screen. At this stage in the design it was decided to try some logic processing of the pulse from the photo transistor, before it was used to write into the memory.

Processing takes two forms: first, only the fast rising edge of the pulse from the photo transistor is used. Then the writing width can be set by using a programmable dead-end counter (reset after each line) to count the number of pixels to be written into on a particular line.

Second, as the photo transistor will be able to "see" a number of lines in the vertical direction, it is desirable to restrict the number of detected lines that actually cause writing to occur. The first line "seen" by the photo transistor will not be fully in view and will therefore not be as reliable in timing and amplitude as those directly in view. A programmable counter (reset after each frame) is used to ignore the first line detected and then, by decoding the outputs of the counter, the counter can be stopped after the desired number of lines have been written on. It should be noted at this point that each line stored in memory is displayed twice by the Robot 400 on the monitor screen. The practical significance of this is that when writing into two lines of memory, three detected lines from the monitor must cause writing to memory, increasing to five for three lines in memory.

The above processing gives the means for determining the writing thickness in both the horizontal and vertical directions, and it was therefore decided to include a switch to select writing thickness and, hence, make the unit more versatile.

Circuit description

Video amplifier. The video amplifier consists of two parts, the first of which is housed in the light pen itself. This uses the photo transistor PTR1 and TR1 in a cascode arrangement which has the advantage of fast response to changing light levels. Video output is fed down the light pen cable by emitter follower TR2, acting as a low impedance line driver. A further amplifier is used at the other end of the cable to provide sufficient voltage level to operate the comparitor. AC coupling is necessary in this stage to prevent any steady voltage level, due to ambient lighting, from operating the comparitor.

Comparitor. The 311 comparitor, IC1, is used to detect the small pulses received from the video amplifier and convert them to ttl logic level pulses. The threshold is adjustable so that it may be set to respond to the video input, yet not to respond to any noise level present.

Logic. The positive going pulses from the comparitor clock the latch IC2a, which is held in the clear state by IFHB from the Robot 400 to prevent the latch from being clocked by any noise present during the video blanking time. Clearing the latch in this way prevents the output from the comparitor causing writing to occur in more than one position along a line, further improving noise immunity. The positive-going edge from the Q output of IC2a triggers the monostable, IC5a, which in turn triggers the adjustable monostable, IC5b.

This operation is, however, inhibited by a high level on the "A" input of the first monostable (pin 1 IC5), provided by the inverted (by IC7d) Q_D output of the counter IC3. This counter is clocked by the positive-going edge of the $\overline{Q}$ output from the latch, IC2a, occurring at the end of the line that IC2a has been clocked. The preset count, loaded into the counter (IC3), determines the number of detected lines before writing is enabled by Q_D (pin 7 IC3) going high. The circuit shows a preset count of 7 and, as writing starts when a count of 8 is reached, this circuit will ignore just the first detected line. The number of ignored lines may be increased (taking "A" low gives 2, "B" low gives 3 etc), but it must be remembered that if too many lines are ignored then there will not be enough left to give thick writing at low brightness levels.

The number of lines upon which writing can take place is determined by the decoded (by IC4) outputs of IC3. The selected decoded output is used to prevent latch IC2a changing state when clocked, and an inverted version from IC7f inhibits IC3 from further counting.

Horizontal writing width is determined by the counter IC6 which is preset to the number of pixels to be written on. Writing is initiated by the rising edge of $\overline{Q}$ from the line delay

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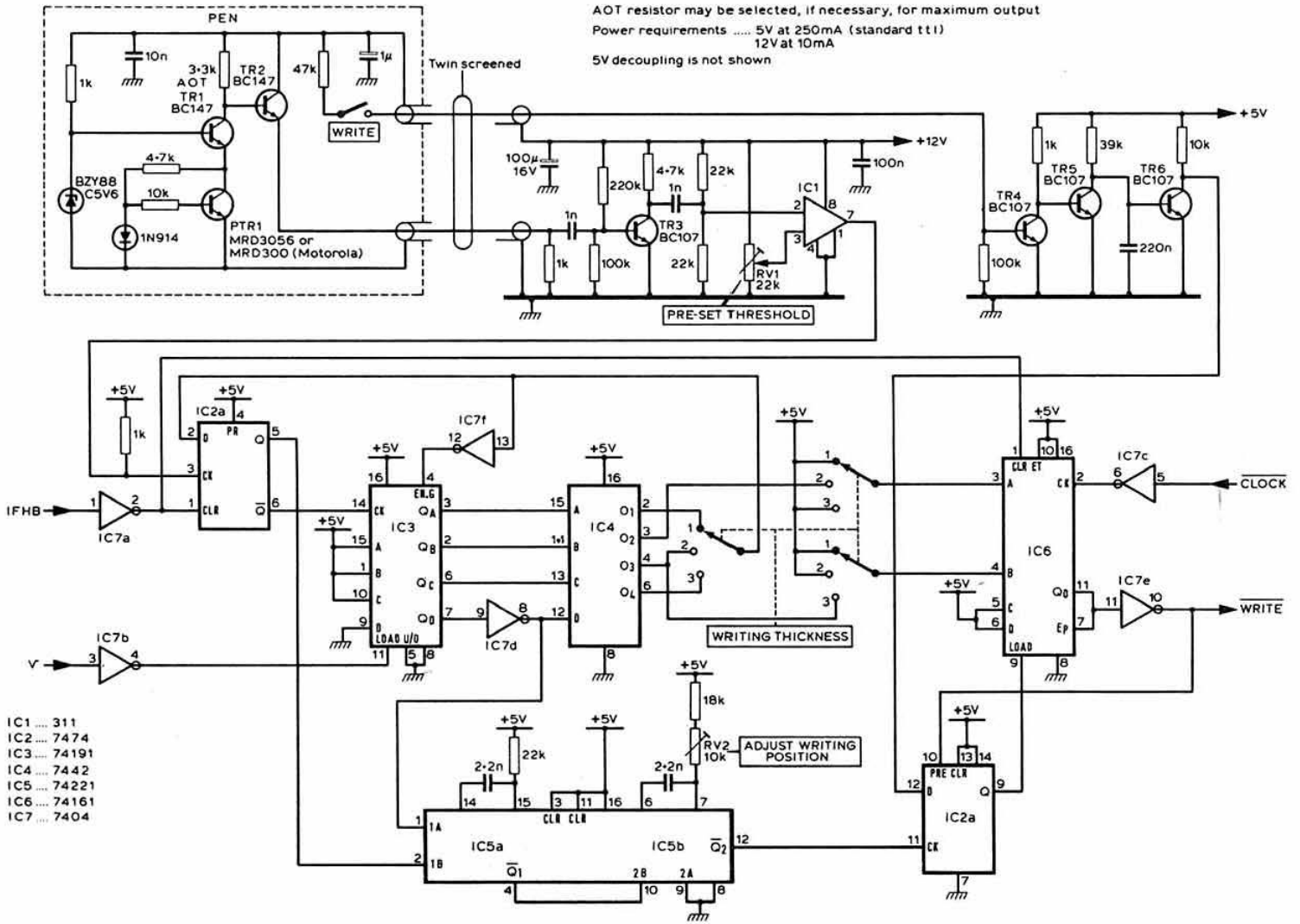


Fig 1. Light pen circuit (for Robot 400). (*Errata*: IC2a at bottom right-hand corner is, in fact, IC2b; IC4 pin 6 labelled O4 should be O5)

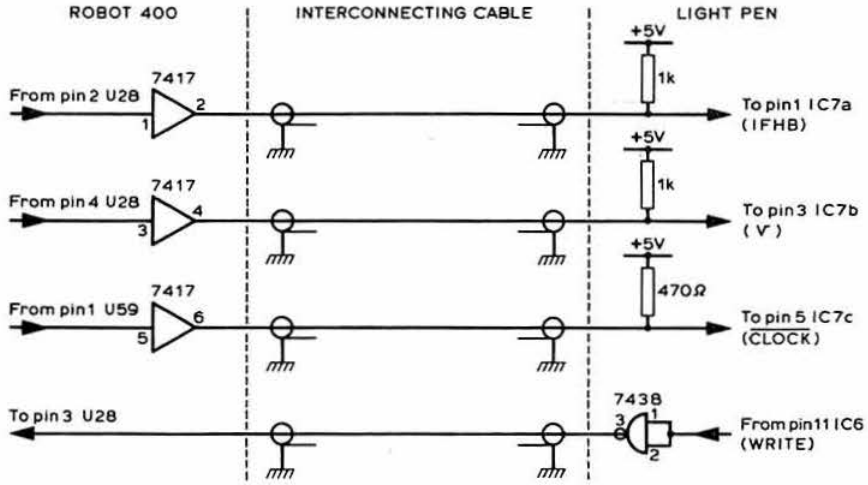


Fig 2. Interface circuit

circuit IC5b clocking the latch IC2b, causing its Q output to go low and load the counter IC6. This operation is only enabled when the D input of IC2b is pulled low by TR6. The delay network between TR5 and TR6 prevents writing until after any contact bounce in the write switch.

As the modified Robot 400 requires a low write enable pulse, this is obtained from the inverted (by IC7e) Q_D output of the counter IC6. This counter is initially cleared to zero by IFHB and prevented from counting by the low Q_D output being connected to the enable input EP. When the counter is loaded, Q_D goes high, removing the load input by pre-setting the latch IC2b. The counter will now be clocked by the pixel clock from the 400 until Q_D once again goes low and inhibits further counting. In the thick and medium writing selections, the counter IC6 only writes the full horizontal width on one line; this is achieved by programming the counter from the decoded output of the line counter IC3.

Construction

Construction is in two parts, the pen and the logic board; the construction of the pen being the most critical. There are many forms that the pen could take depending on the preferences of the constructor; however, there are two important points, the positioning of photo transistor in the tip of the pen, and screening the amplifier to exclude any rf. The problem with the photo transistor is to mount it in such a way that the field of view is restricted to the area in front of the pen tip. In the prototype the photo transistor is mounted in a small tube of ptfe to provide a low-friction contact with the glass of the crt. The effects of reflections from the walls of the tube are reduced by having a small aperture in front of the photo transistor lens. This problem could also be reduced by making the tube shorter but without letting the diode lens touch the screen.

The prototype pen consists of a 0·5in diameter copper tube 5in long, with the pen amplifier being constructed on a narrow piece of Veroboard using miniature components, so that it may be slid into the tube. Writing is controlled by a miniature microswitch with a small cut-out in the side of the tube to allow the actuator to be pressed. The photo transistor mount was constructed from a cut-down right-angle BNC plug; this also, fortuitously, contained the necessary ptfe tube. The cable grip at the other end of the pen is also made from an old BNC plug, the body of which was found to be a push fit into the tube.

The logic section of the pen can be housed within the 400 or in an external self-contained box. The latter option was chosen for the prototype because there was insufficient room on the front panel for the writing thickness switch, and, as it was proposed to add two more memories to the scan converter, any further demands on the power supply were considered undesirable. If the logic is to be mounted within the 400, the "LS" series ttl should be used to reduce power consumption, also it is possible to permanently wire the medium writing thickness to avoid drilling an extra hole in the front panel.

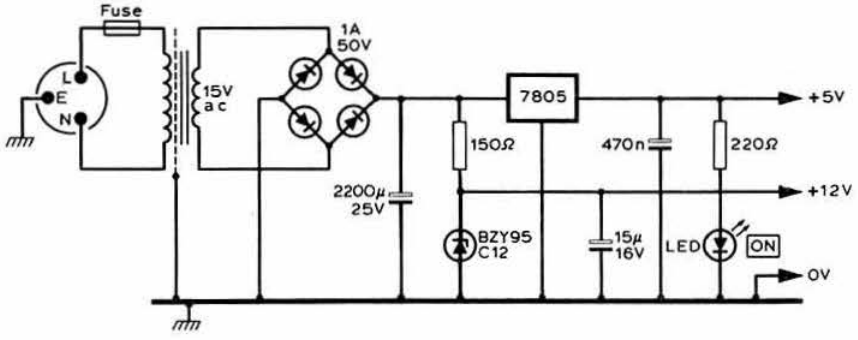


Fig 3. Power supply

With the logic mounted externally it is recommended that an interface circuit be used, so that the logic levels of the 400 are not loaded by the capacitance of the interconnecting cable, which should, in any case, be kept as short as possible.

Layout of the logic is not critical, the prototype having been constructed on Veroboard; it should be emphasized, however, that adequate decoupling must be used, as is appropriate for ttl or LS ttl. A 0·1μF capacitor per ic is more than adequate and may help reduce the effect of stray rf, and, for the same reason, the logic unit should be housed in a metal cabinet.

It is recommended that a good quality timing component be used with IC5 to prevent the writing position drifting. The capacitors should be polyester rather than ceramic, and the variable resistor can be a multi-turn cermet trimmer.

Modifications to the 400

Modifications to the 400 are quite minimal. Only one connection has to be broken, which can easily be done by removing U28 from its socket and bending up pin 3 (wrongly labelled pin 13 on the Robot diagram) [1]. A 1kΩ pull-up resistor can now be placed on top of the ic and connected between pins 3 and 14, with pin 3 becoming the $\overline{\text{WRITE}}$ input. The other connections required are as follows: IFHB from pin 2 U28, v from pin 4 U28, and $\overline{\text{CLOCK}}$ from pin 1 U59. Note: all U numbers refer to the Robot 400 schematic diagram.

If the interface circuit is used, it may be constructed on Veroboard and housed within the 400.

Alignment

Alignment is quite simple, only two controls being involved. First, set RV1 to maximum (+12V on pin 3, IC1) and RV2 to mid-track. The pen should now be held in front of the monitor screen with the brightness set fairly high; reducing the setting of RV1 should cause the pen to write. Reducing the monitor brightness and reducing the setting of RV1 will enable maximum sensitivity of the pen to be obtained. But note that reducing the setting of RV1 too far will cause the pen to stop writing; the correct setting for RV1 is just backed off from this point. The final adjustment required is to set RV2 so that the writing on the screen appears under the pen.

If the pen fails to work, the first thing to do is to carefully check the circuit for any wiring errors, as fault finding on this circuit will require the use of a good double-beam oscilloscope, preferably with a delayed time base. As the circuit does not involve any critical adjustments it should work first time.

Using the pen

In practice, use of the light pen is quite simple, providing the following procedure is followed. The first step is to set the background upon which writing is to be performed. Second, the shade of the writing must be set to give the desired contrast with the background. Finally, the MEMORY INPUT controls on the Robot 400 should be set to the CAMERA and HOLD modes.

Before writing on the screen it is important that the contrast and brightness of the monitor be set correctly to obtain writing on the particular background chosen. In general it will be found that the lowest contrast setting at which the writing can easily be seen will give the best results. This is especially true when putting black writing on a white background, in fact it

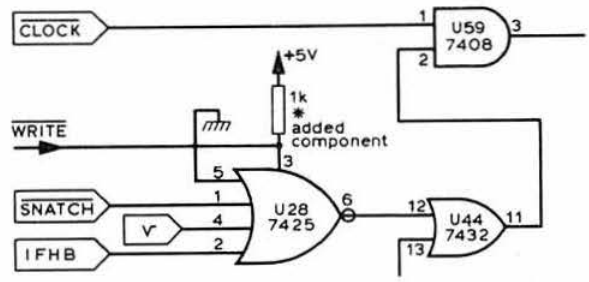


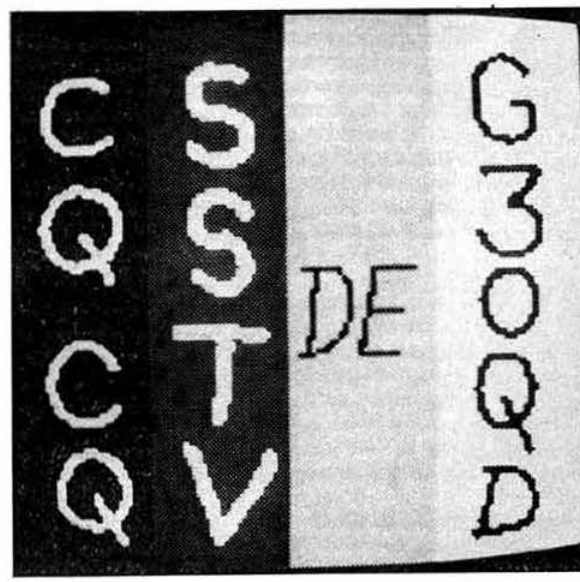
Fig 4. Modifications to Robot 400

may be found more convenient to use the video invert facility on the Robot 400 when this is required. It is of course necessary to have the monitor brightness set so that there is adequate brightness for the photo transistor to detect at all parts of the screen to be written on. As it is operationally inconvenient to change the contrast and brightness controls of the monitor between using the light pen and receiving sstv, it is quite possible to use a second monitor in parallel, with its controls adjusted to suit the light pen.

It will be found necessary to write slowly on the screen, rather like writing with chalk on a blackboard, otherwise the vertical lines will become broken. The reason for this is fundamental, and due to the 20ms screen refresh rate.

Setting the background

The background may be set in a number of ways, the simplest of which is either a plain black or white. This is achieved by setting the SNATCH CONTRAST to zero and then snatching a frame with the SNATCH BRIGHTNESS, at zero for a black background or at maximum for white. It is not necessary to have a camera or other fast-scan source connected during this operation. However, if a grey background is required it will be necessary



Different writing thicknesses on grey scale background

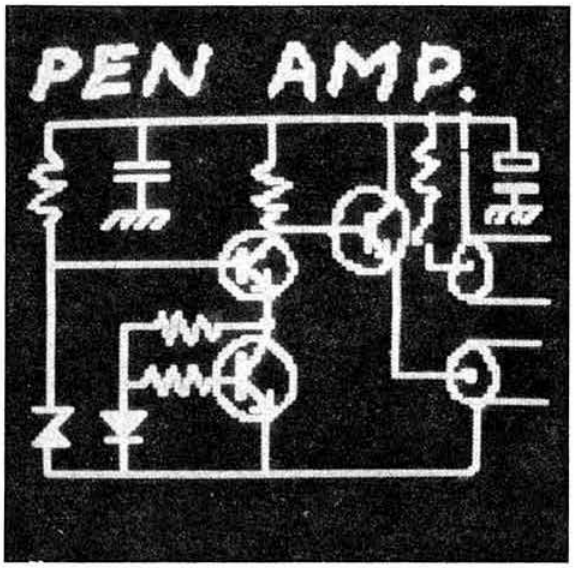


Diagram drawn using "thin" writing position

Writing on a picture background

to guess the setting of the brightness control before pushing the snatch button. But with a camera or other source of fast-scan video connected, it is possible to set the exact grey shade required by switching to DISPLAY CAMERA mode.

A further readily-available background is the internally generated grey scale in the Robot 400; it is possible to snatch a frame of grey scale and then write down the stripes.

Horizontal stripes may also, but not so conveniently, be achieved as follows. Turn the RECEIVED CONTRAST to zero, then, by adjusting the receive brightness while the converter scans down the screen, stripes of any height or shade may be produced. The HOLD switch must then be set to hold, to prevent the carefully-prepared background from being erased.

During the above operation the controls on the 400 are set as normal for receiving sstv, except that it is desirable to disable the input signal by switching to TAPE or OTHER to prevent incoming sync pulses resetting the display.

It is also quite possible to write on a picture, which may be snatched from camera or other fast-scan video source or received as sstv over the air or from tape.

Setting the writing shade

The writing shade is set using the SNATCH BRIGHTNESS control with the SNATCH CONTRAST set to zero. The control should be set to give adequate contrast between the writing and the background. Normally white (control at maximum) or black (control at maximum) are used to give maximum contrast, but grey could be used if desired. In fact the writing contrast can be reduced to zero so that the pen writes at the same shade as the background and the pen then becomes an eraser.

Selecting the writing thickness

Of the three writing thicknesses available, the "medium" position is most suitable for general purpose use, the "thin" position can be used to advantage for drawing circuits etc on the screen, while the "thick" position can be useful in getting over essential information, such as callsigns, under poor conditions.

The off-screen photographs show some of the possible ways of using the light pen, other possibilities are left to the ingenuity of the user. It should be noted that the photographs were taken with the image processor [2] switched on; although not essential for operation of the light pen it is considered a worthwhile addition to the 400.

A further consideration is the type of monitor to be used with the pen. If the monitor has a protective glass plate in front of screen, this may have to be removed to enable the pen to be placed close enough to the screen. The pen has been used with both 9in and 12in monitors with good results, but it will be found easier to draw straight lines on the larger screen due to the 128×128 pixel matrix being larger. If too large a screen is used it may be impossible to obtain thick writing, unless the pen is modified to increase the area of view of the photo transistor.

Conclusions

Although it is the author's opinion that sstv should be used primarily for picture transmission, and that rtty is better suited for transmitting written information, the light pen described herein represents a simple alternative to the impersonal captions generated by an sstv keyboard.

Several copies of a slightly earlier version of the light pen have been sent to interested sstvers, and as a result several amateurs in Finland are to be seen on 14MHz using this light pen design.

References

[1] Schematic diagram Model 400, drawing No 400 931B. Robot Research Inc.

[2] "G3OQD image processor", *SSTV scene* July 1979, *Radio Communication* pp644-5. □

A design for a dual-paddle morse key

by PETER HOWE, G4CHL*

Introduction

Several designs for electronic iambic mode morse keyers have been published, including the G3RVM design for the "ultimate" keyer [1]. These circuits can be built as an integral unit with the paddles incorporated into the same box as the electronic circuit, or with the paddle unit separated from the electronics as in the G3RVM design.

The advantage of keeping the paddle unit separate from the electronics is that it can be made to a higher mechanical specification with consequently nearer ideal characteristics.

The characteristics of a good paddle unit are:

(1) Good mechanical stability to ensure that fine adjustments, such as a very small contact gap, can be made, and that such adjustments do not change.

(2) Independent adjustment of the tension and gap of both paddles should be easy.

(3) The key should have sufficient weight to stop it moving when in use.

(4) The size and position of the paddles should allow comfortable operation.

(5) Good electrical stability with a positive switching action.

Commercial dual-paddle morse keys are available but have to be imported from the USA and are generally expensive. This article gives details of a key which was built using conventional workshop facilities and easily available materials.

Explanation of the design

There are two methods of mounting the paddles of a dual paddle key: one is to use bearings (such as ball or needle bearings) to allow the paddles to move; the other is to use pieces of spring steel, one end of the spring held solidly, the other connected to the paddle. The second method was chosen for simplicity, no requirement for adjustment and no problem with wear.

The second problem when designing a key is to insulate the contacts from the main body of the key, which is earthed. Much thought was given to this, as it was essential that the method used did not interfere with the mechanical stability. The solution has been very successful in practice. The contacts consist of two 1·25in brass 6BA set screws, each passing through a hole in one paddle to make contact with the opposite paddle when they are squeezed together. Each screw was held in position by passing it through a screw thread in a brass stand-off; the screws being insulated electrically from the stand-offs by using Perspex sleeves for the threads. These sleeves were threaded externally at 0BA size and internally at 6BA size. The Perspex was screwed into the stand-offs, the ends made flush, the 6BA contacts screwed through the centre of the Perspex and secured with lock-nuts. This gave excellent mechanical and electrical stability.

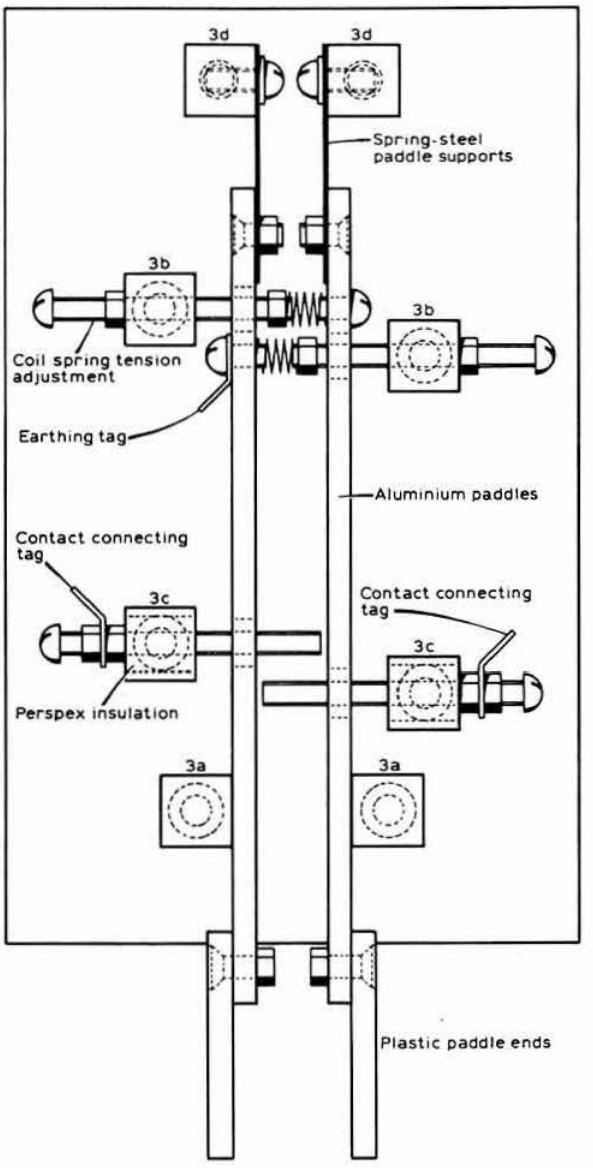


Fig 1. Plan view of the assembled key

The key was built on a heavy mild-steel base; this material being reasonably cheap (compared with brass) and easily machined. The two paddles were made of 0·125in gauge aluminium mounted on two pieces of spring steel connected to two brass stand-offs. Eight stand-offs were mounted on the base: two holding the paddles in position; two holding coil springs in place to give tension adjustment; two holding the contacts in position; and two acting as stops to give the stationary paddle position. A plan view of the assembled key is shown in Fig 1.

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The contact materials of brass and aluminium tend to oxidize over a period of time, and this may lead to an increase in the contact resistance. This has not been a problem with the author's key because it is used with a cmos keyer, which has a high input impedance. This means even a high contact resistance is tolerable, up to tens of kilohms. However, if the contacts were used to switch an appreciable current, higher grade materials would be preferable.

The contacts on the key were improved by making the ends of the brass screws as flat as possible by rubbing with emery cloth and then polishing the ends with a buffing wheel. When cleaning the contacts, take care to polish, rather than abrade the surfaces.

Construction of the key

Base. The base was made from a 5in length of 0·5 by 3in mild-steel bar. The ends were made flat and square using a shaping machine. Holes were drilled as shown in Fig 2, using a stand drill. The holes on the underside of the base were countersunk, except the two holes nearest to the right of Fig 2, which were widened on the underside, using a milling machine, to accept a 0BA nut.

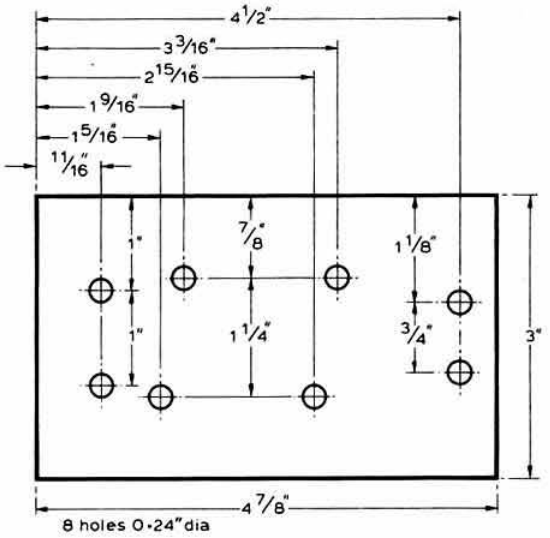

Fig 2. Top view of base showing position of holes

Brass stand-offs. These were made from 0·375in square-section brass rod. The pieces cut from the rod were made exactly the right length by facing off the ends using a lathe with a four-jaw chuck. This gave a good surface finish. The holes in one end of the stand-offs were drilled, also using the lathe, to be tapped for a 0BA thread. Holes were also drilled in the sides of six of the stand-offs for 0BA and 6BA threads, as shown in Fig 3.

Perspex insulating sleeves. These were made from a Perspex rod of 0·375in diameter. The end of the rod was turned down to the correct diameter for tapping a 0BA thread (0·2in). Using the lathe, a hole was drilled down the centre of the rod for a 6BA thread (0·089in). After cutting the threads the Perspex rod was screwed into the side of the stand-off and then sawn off. The Perspex remaining proud of the brass side was removed using emery cloth. This procedure was repeated for the second insulated stand-off, using the remaining length of threaded Perspex.

Aluminium paddles. These were made from 0·125in thick aluminium sheet. Great care was taken to ensure that they remained flat. Consequently the aluminium was cut roughly to shape using a band saw and then filed to the shape shown in Fig 4. The filing took a great deal of patience to make sure that both paddles finished up the same shape!

Plastic paddle ends. The paddle ends were cut from 0·1in plastic sheet material, and the corners rounded to give the shape shown in Fig 5. Holes were drilled and countersunk for the 6BA screws to attach the plastic to the aluminium paddles.

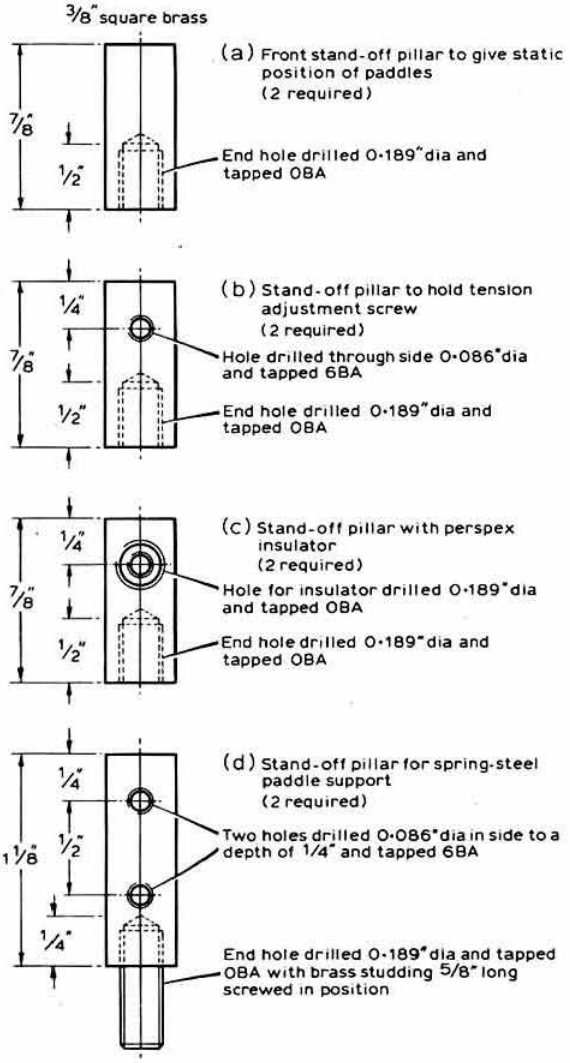

Fig 3. Brass stand-offs

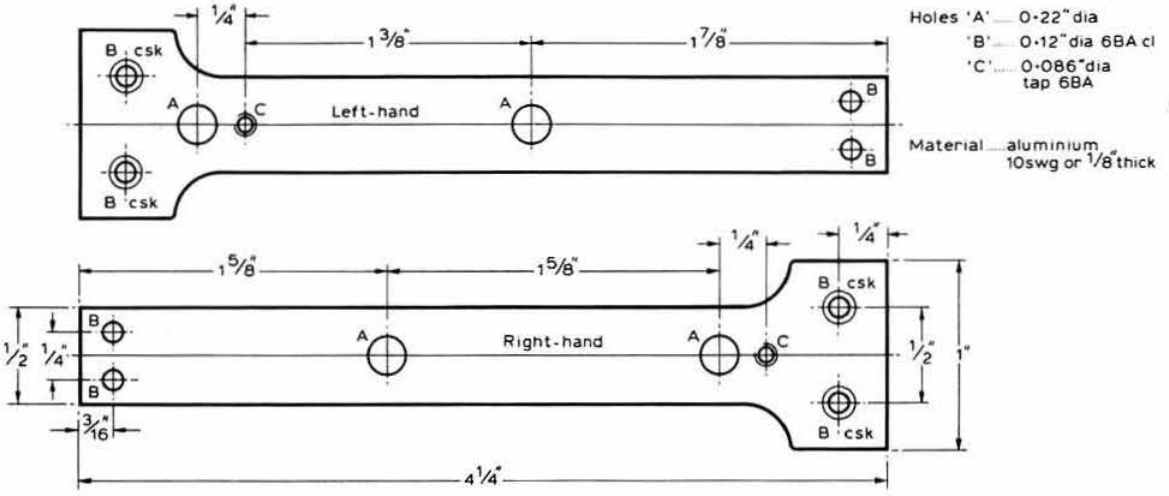

Fig 4. Aluminium paddles

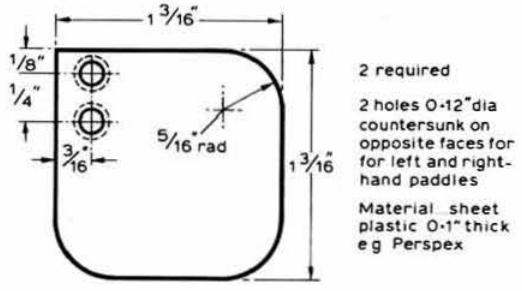

Fig 5. Plastic paddle end

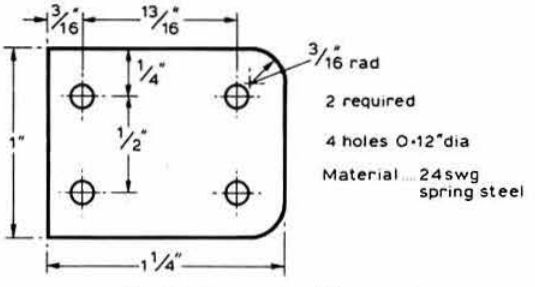

Fig 6. Spring steel paddle support

Spring steel paddle supports. These were made from 24swg spring steel strip. The spring steel was cut to 1 by 1·25in, and two corners were rounded as shown in Fig 6. The holes were drilled for 6BA clearance.

All dimensions have been given in inches due to the Imperial sizes of all the materials used.

Surface finish

Any sharp edges on the base were removed using a file, and the surface was smoothed off with emery cloth. The base was then sent to a local plating works to be chrome-plated. It must be noted that the quality of the surface finish of a chrome-plated article depends to a large extent on the quality of the finish before chroming; the plating process tending to emphasize any scratches rather than hide them!

The brass stand-offs were finished with various grades of emery cloth, finally using a very fine grade. They were then polished using a buffing machine. Care must be taken during the machining of the brass not to scratch the surface, as brass is a soft metal. the aluminium paddles were finished in a similar way to the stand-offs.

List of materials required

Description	Size	Quantity
0·375in square section brass rod	1·25in	2
0·375in square section brass rod	0·875in	6
Mild steel	3 by 4·875 by 0·5in	1
6BA set screws (round head)	1·25in	2
6BA set screws (round head)	1in	2
6BA set screws (round head)	0·25in	6
6BA set screws (countersunk)	0·25in	8
6BA nuts		16
6BA washers		4
0BA screwed brass rod	1·75in	1
0BA set screws (countersunk)	0·75in	6
0BA nuts		2
Spring steel (about 24swg)	1 by 1·25in	2
Aluminium sheet (0·125in thick)	4·25 by 1in	2
Perspex paddle ends (optional)	1·25in square	2
0·375in round section Perspex rod	About 2in	1
0·1875in dia coil springs	About 0·25in long	2
Adhesive rubber feet		4
6BA solder tags		3

Assembly

The six shortest stand-offs were attached to the base in the positions shown in Fig 1 using 0BA set screws. A 1·125in stand-off was attached to each piece of spring steel using four washers and 6BA screws. The other ends of the spring steel were connected to the paddles. The two paddle/stand-off assemblies were placed in position and the stand-offs secured to the base using two 0BA nuts.

(Continued on page 1285)

An hf probe for an oscilloscope

by C. P. MEADOWS, BA, TEng (CEI), MITE, G8RWC*

MANY amateurs own or have the use of an oscilloscope, a device which can, to a degree, measure the amplitude and frequency of a voltage presented to its input. More importantly, it can give a visual impression of the wave shape of the voltage under examination. However, is the oscilloscope's picture the analogue of the input? Probably not if high frequencies and pulses with fast rise of edges are being used. This is because the oscilloscope and its input lead can seriously affect the operation of the circuit to which it is connected.

A typical oscilloscope has an input resistance of 1MΩ and an input capacitance of 50pF, while a connection lead, say 1m long, might have a capacitance of 50pF. This means that 100pF is connected to the circuit under measurement, and a cheap and easy way effectively to reduce this capacitance loading is to use the probe assembly, Fig 1, the effect of which is to make a divider network, Fig 2. Capacitance C2 symbolizes the connection cable capacitance and input capacitance of the oscilloscope, R2 symbolizes the input resistance of the oscilloscope.

If Vv is the voltage to be viewed and Vscope the voltage available to the oscilloscope's deflection system, it can be shown that at any frequency

$$\frac{Vv}{Vscope} = \frac{1}{10}$$

Such a network, is the basic "divide by 10" probe often used with oscilloscopes. The probe's effective capacitance Ceff which the test circuit "sees", is found by

$$\frac{1}{Ceff} = \frac{1}{C1} + \frac{1}{C2}$$

$$Ceff = 10pF$$

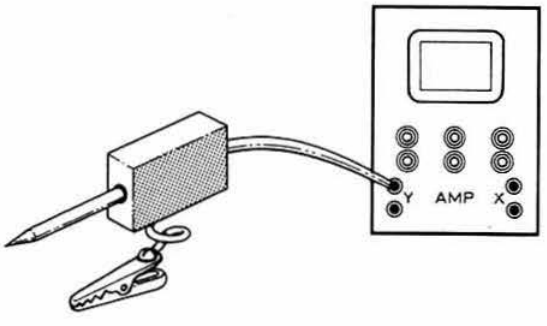

Fig 1. Probe and coaxial cable connected to oscilloscope

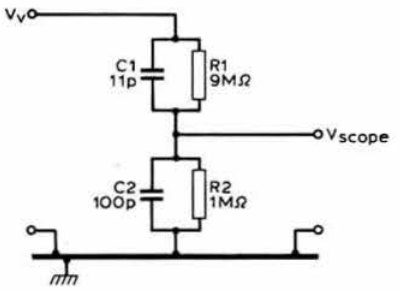

Fig 2. Equivalent circuit of Fig 1

since the capacitors C1 and C2 are in series. The resistance loading is increased to advantage by a factor of 10.

The disadvantage of the "divide by 10" is that the signal Vv is reduced at Vscope by a factor of 10. However, most oscilloscopes have sufficient gain to counteract this.

In practice, because the capacitance of the oscilloscope is not precisely known, it is usual to include a small variable capacitance in the probe assembly. This allows the time constants C1R1 and C2R2 to be adjusted so that they are equal. This adjustment is necessary to achieve constant attenuation at any frequency.

Setting up

The variable capacitor is easily adjusted if the probe is connected to a square-wave voltage of about 1kHz in frequency. The displayed wave shape should be adjusted for square wave appearance, Fig 3(a). Figs 3(b) and (c) show the wave shapes for the other conditions.

In constructing a divider probe, the question arises as to which end the variable capacitor should be connected. The answer is to some extent bound up in another complication apparent at high frequencies. The connecting coaxial cable is a transmission line and, as such, is mismatched at both ends.

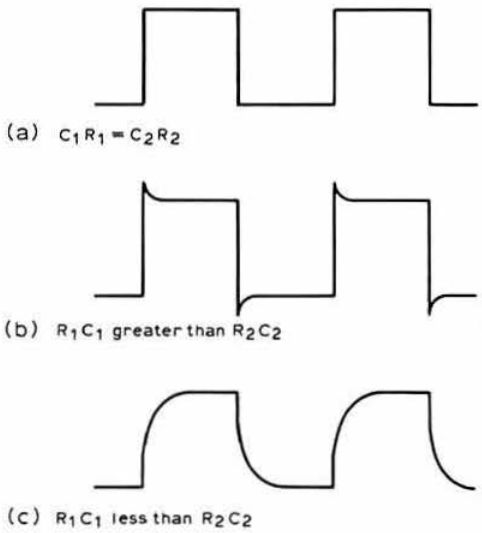

Fig 3. Wave shapes under different conditions

*14 Conway Crescent, Bedford MK41 7BW.

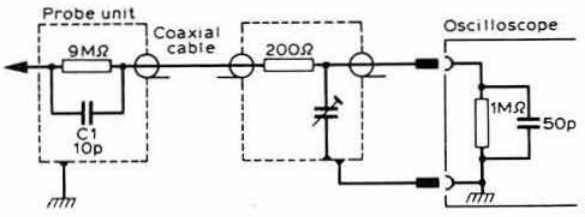

Fig 4. Circuit diagram showing all components

This causes voltage reflections to occur which are similar to those giving rise to swrs of 1 + in transmitter systems. The effect of these reflections may be reduced by connecting a resistor of value 200Ω in series with the inner conductor of the cable. This resistor has no effect on the dividing action of the probe assembly.

Fig 4 shows the complete circuit arrangement for the probe. Since the 200Ω resistor is also connected at the oscilloscope end, the variable capacitor is also connected here for convenience. It could be housed in the probe unit, but this of course would make the probe larger.

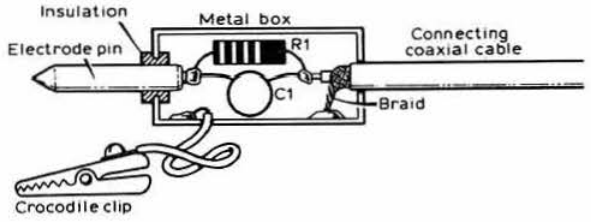

Fig 5. Probe unit with coaxial cable

Construction details

The capacitor used by the author was a sub-miniature ceramic type. Its working voltage is of little importance, since the maximum input voltage is safeguarded by the rated maximum for the oscilloscope being used. Resistor R1 could be a 10MΩ 0·5W high-stability carbon type. Using 10MΩ instead of 9MΩ will alter the division by 10 slightly, but the oscilloscope will probably not be exactly 1MΩ in any case. These two components are best housed in the smallest metal box into which they can be fitted. A large probe will prove difficult to handle when making a measurement.

At the oscilloscope end any low-wattage 200Ω resistor will do, but the variable capacitor needs a little more consideration. The actual input characteristic of the oscilloscope will determine the value of the capacitance needed to achieve equal time constants of about 90μs. It is possible to use the miniature type 2–10pF yellow body, although for greater adaptability (ie for use with almost any oscilloscope), the mica dielectric and ceramic base type (3–40pF) is preferable. These two components may be housed in a metal box similar to that used for the probe unit. Fig 6 shows the arrangement.

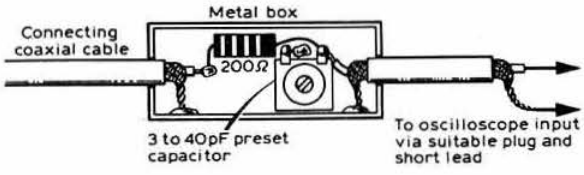

Fig 6. Oscilloscope end box

Debugging

If a square wave cannot be obtained but, say, Fig 3(b) is seen, increase the length of the connecting coaxial cable; while if the picture is similar to Fig 3(c), shorten the cable. □

A design for a dual-paddle morse key

(Continued from page 1283)

A 0·25in 6BA screw was inserted into each paddle to position the earthing tag on the left-hand side and the tensioning springs. A 1in 6BA screw was screwed through the two stand-offs, with the lock-nut and spring positioning nut placed as in Fig 1. The positioning nut was held on the screw thread using Loctite nut-locking compound. The tensioning coil springs were inserted between the paddles and the opposite adjusting screws.

The 1·25in 6BA contact screws were screwed through the Perspex insulators in the next pair of stand-offs. The connecting tags and lock-nuts were positioned as shown in Fig 1.

The plastic paddle ends were attached to the paddles using 6BA screws and nuts. Four adhesive rubber feet were attached to the underside corners of the base. Finally, following adjustment of the contact gap and tension, the connecting lead, consisting of a twin wire screened cable, was soldered to the tags, and the key was ready to use.

Conclusions

This article gives details of the key as it was built. The design could easily be adapted to take account of the tools and materials available to the constructor. For instance the plastic paddle ends could be omitted and the paddles lengthened and shaped to take their place. If a more rigid material were required to make the paddles, then stainless steel could be substituted for aluminium.

Although many readers may not have access to the fairly comprehensive workshop facilities required to make this key, it is hoped that this article will influence the design and construction of dual-paddle keys, to enable the charcteristics listed in the introduction to be obtained.

The author obtained a quotation of £8·50–£10 from a local engineering firm for supplying and machining the base, depending on whether the steel was in stock, the grade of steel used, and the amount of machining necessary. The remaining parts of the key could be made by anyone with a small lathe and a range of taps and drills.

Reference

[1] "The 'ultimate' keyer", C. I. B. Trusson, G3RVM. *Radio Communication* May 1977; and "Mk 2", *Radio Communication* February 1980. □

Getting the best out of an hf mobile rig

by W. FARRAR, G3ESP*

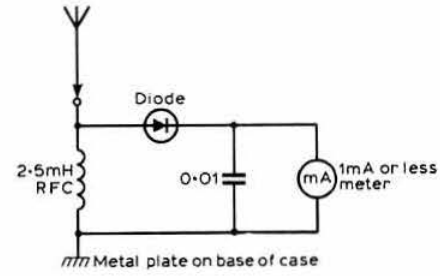

Fig 1. Circuit diagram of the rf pick-up meter

IT is said by "those who know" that a mobile whip antenna is rather less efficient than the antenna at home, and this seems to be a reasonable statement. It is therefore necessary to get the maximum energy possible radiated from it, especially if the transmitter has only a few watts output, as is the case with the FT7 at G3ESP/M. The purpose of this article is to guide the mobile operator to this desirable state.

The position of the whip on the vehicle has some bearing on the radiation, but various reasons might dictate a less than optimum position. For instance, mounting in the centre of the roof is probably best, but this would involve cutting a hole in the roof and disturbing the roof lining, reducing the eventual re-sale value of the vehicle. Furthermore, there is a good chance that the antenna will strike low branches and bridges, and it will not be very accessible for adjustment. A good compromise position is on the front or rear wing, as with the familiar car-radio antenna. It is easily accessible and, if mounted at the front just ahead of the windscreen pillar, it may be possible to have quite a short length of feeder.

One can read in the handbook how to tune up the transmitter, using its panel meter as an indicator, if it has output tuning controls; a reflectometer can be fitted in the feeder to get minimum swr; and the antenna can be adjusted for resonance by using a dip-meter or noise bridge. But, having done all these things by the book, can one be sure that the antenna is in fact radiating the maximum possible energy? If the tuning up is done with the aid of an external rf pick-up meter, and all the variables are adjusted until this meter gives a maximum reading, then the antenna must be giving of its best—whatever any other devices may show.

Some mobile antennas are broadbanded, with no adjustment possible, so all one can do is hook it up and hope for the best. Others, like the author's old base-loaded Tavasu, include a telescopic whip section, the length of which alters the resonant frequency and which must be correctly adjusted for maximum radiation. If one buys such an antenna, selects the loading coil appropriate to the band in use, and draws the whip out to its full extent, it is highly probable that the antenna will not be correctly tuned, with a consequent reduction of the radiated energy.

To get it absolutely right a simple pick-up with a visual indicator is needed. The author uses an untuned "crystal set" circuit, with a 1mA meter in place of headphones (Fig 1). This is assembled in a small box, made from hardboard, with rubber feet. A small metal plate is set in the bottom of the box, and a short telescopic vertical antenna, taken from a defunct broadcast receiver, is screwed into the top. The unit is initially placed on the roof of the vehicle close to the radiating antenna. The transmitter is set to the desired frequency and everything on it adjusted for maximum output. If it has broadband output circuitry, there is very little to do. Of course, the transmitter has to be set to a.m. or cw, as on ssb there is no output without modulation. The pick-up unit is placed so that there is some indication when a continuous carrier is emitted. This is for a moment only, to avoid unnecessary radiation, and to prevent over-running of the pa stage.

The user stands outside the vehicle, reaching in through the window to the microphone switch, or other "send" control. With the antenna initially at full length, it is shortened a few centimetres at a time, switching the signal on briefly after each adjustment, having moved away from the antenna to avoid body-capacitance effects. In shortening, the bottom of the whip is telescoped, so that there is no need for a step-ladder to reach the top section. When the meter reading on the pick-up has reached an approximate maximum (it might be necessary to move it further away from the sending antenna, or to shorten the pick-up antenna, to prevent the meter needle going off the scale) the antenna length should be adjusted up or down in smaller amounts until an absolute maximum is reached. If the transmitter has a tunable output, this should then be checked to ensure the highest possible reading on the pick-up meter and hence, maximum radiation.

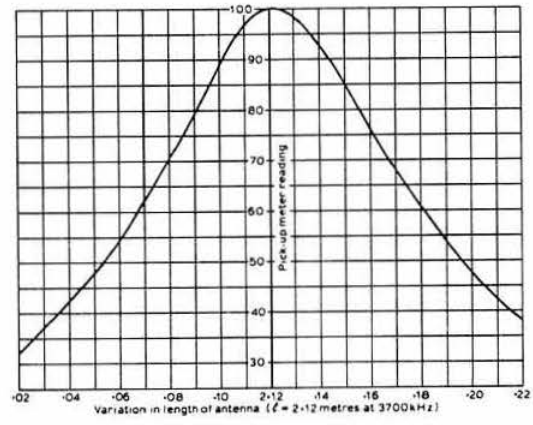

Fig 2. Effect of variation in length of base-loaded Tavasu whip antenna on radiation at 3,700kHz

*1 Barnsley Road, Ackworth, Pontefract WF7 7BS

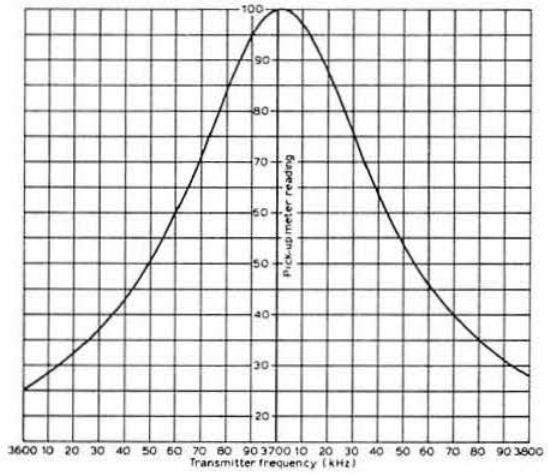

Fig 3. Variation of pick-up meter reading with change of frequency between 3,600 and 3,800kHz, using FT7 transceiver and base-loaded Tavasu whip antenna resonated at 3,700kHz

In the author's experience, one can vary the transmitter frequency within certain limits without significant loss of output, especially on the higher-frequency bands. Since the 7MHz band has a telephony section only 60kHz wide, the antenna can be tuned up on 7,070kHz and cover the lot. The same consideration applies to the higher bands. Things are different, however, on the 3·5MHz band. Here the length of the whip is critical to within 1cm, and if one tunes more than 10kHz either side of the initial frequency there is a noticeable fall in radiation. Affairs would surely be similar on the 1·8MHz band, although the author has no facilities for checking this.

With the transmitter set up on 3,700kHz, Fig 2 shows the variation in reading on the pick-up meter as the length of the telescopic antenna is varied. With the antenna tuned to resonance on 3,700kHz, Fig 3 shows the variations in meter reading as the transmitter is tuned on each side of this frequency. On the other bands there is little or no noticeable variation in output with the antenna tuned to the middle of each phone band, as the transmitter is tuned over the band. The antenna, however, still has to be adjusted correctly in the first place, although the tuning is not so sharp as it is on 3·5MHz.

In conclusion, to emphasize that the procedure as described really works, tests were carried out with G3US, who picked up the signals on his FT401, with a very small antenna attached, at a distance of some 400m from G3ESP/M. When the pick-up meter showed maximum reading, G3US's S-meter also showed a maximum. As the mobile whip was detuned by changing the length a little, so the pick-up meter and the remote S-meter also showed reduced readings. Moreover, the method has been used successfully for more than 11 years. If it is not successful, dx cannot be worked. □

G3ESP adjusting the antenna on his motor caravan

BOOK REVIEW

Early radio wave detectors by Vivian J. Phillips. Published by Peter Peregrinus Ltd in association with the Science Museum as Volume 2 of "History of Technology" series. 223 pages. Price (UK) £18.

One of the truly remarkable aspects of the development of radio is that for centuries of recorded history, electromagnetic waves existed (if only in the form of atmospherics) unsuspected and undetected; yet once shown to exist (theoretically by Clerk Maxwell, in practice by Heinrich Hertz following "near misses" by Loomis and Hughes) then within the space of just about 15 years (1895–1910) a whole battery of different ways of detecting them, many of extraordinary ingenuity, were found. Spark gaps, coherers, "anticoherers" (electrolytic detectors), magnetic detectors (electrodynamic and hysteresis), "liquid coherers" (thin-film and capillary detectors), thermal detectors, "tickers", "tone wheels", mechanical heterodyne receivers etc . . . and the intriguing physiological detectors (first catch your frog) and the human guinea-pig, with the operator reading morse by his sense of taste (even then some signals had a particularly sour taste!): none of these has survived the passage of time. Crystal (semiconductor) detectors, the Fleming diode and the De Forest Audion triode were almost submerged among the many until the "modern" era began around 1910.

This excellently illustrated book covers the principles and practice of all these many early detectors, but throws little new light on the personalities involved. Did De Forest really appreciate the importance of his "grid", or was he just trying to get round Fleming's patent on what was a practical development of the Edison effect? Nevertheless a fascinating book, though clearly PPL (the publishing company of the IEE) does not expect a large sale, since only a small print could justify a price so high even by present day standards. But seek out a library copy.

G3VA

EQUIPMENT REVIEW

The Max-100 frequency counter

by R. F. STEVENS, MBE, G2BVN

THERE is available today, at prices acceptable to the radio amateur, an extensive range of frequency counters which is supplemented at frequent intervals by constructional articles. A number of the counters available are intended for use in connection with a receiver, and contain circuitry permitting direct reading of the receiver frequency. The Max-100 counter is designed for direct measurement of an rf input, eg from an hf bands transmitter.

Circuit

The four sections of the counter will be seen in the block diagram: these are (a) the input amplifier; (b) the main counter, the heart of which is a 40-pin lsi chip; (c) the display, and (d) the time base.

The front-end processes the input signal and conditions it for the high-speed decade counter that follows it. The counter output is then fed into the main counter, where the major portion of signal processing is done. Measurements are sorted into digits and updated periodically by precise timing commands from the time-base section. Once a measurement is ready for display it is converted from a binary code to a display code, and finally fed to the eight seven-segment LED read-out.

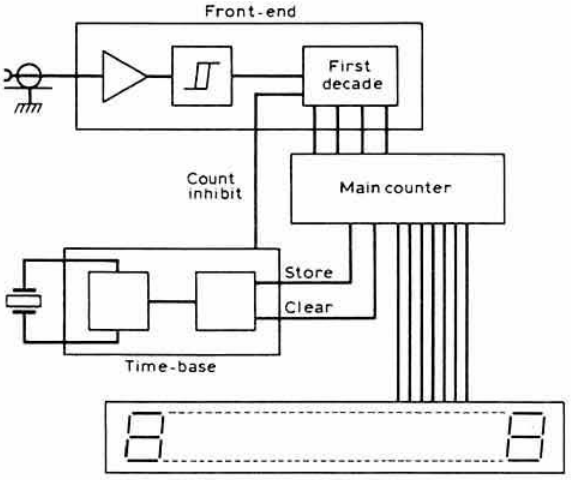

Fig 1. Block diagram of the Max-100

Description

The Max-100 is completely automatic in so far as counter functions are concerned; the only control is an on-off switch. The display comprises an eight-digit seven-segment LED-type with extra large 0·6in digits. In normal lighting conditions this enables the display to be read from a greater-than-usual distance. There is adequate input over-voltage protection, and details appear in the outline specification. There is an automatic low battery indicator, and the entire display blinks when the voltage drops below 6·6V dc.

The counter is housed in a plastic case, and internally the circuit is on one pcb.

The battery compartment is located at the rear of the unit, with access through the bottom of the case. There is provision for six cells, and there is a small switch for selection of either nicad or alkaline. The existence of this switch is not mentioned in the instruction manual. The counter may be operated either from external batteries or through an ac adapter/charger.

Outline specification

Input characteristics	
Impedance	1MΩ shunted with 56pF
Connector	Phono jack
Coupling	AC
Sine wave sensitivity	30mV 20Hz–50MHz 100mV typical 50MHz–80MHz 300mV typical 80MHz–100MHz
Count accuracy	Time base accuracy ±1 count
Overload	Peak ac or dc 10Hz–500Hz 200V 500Hz–1kHz 100V 1kHz–10MHz 75V 10MHz–100MHz 50V
Time base	Crystal oscillator: 3·579545MHz Accuracy: ±3ppm at 25°C Trimmer adjustable: ±40ppm Gating time: 1·0s Update time: 1/6s
Lead zero blanking	For all but the least significant digit.
Automatic decimal point	When the display shows greater than 1MHz, decimal point appears between the sixth and seventh digit.
Low battery indicator	When the battery voltage drops to 6·6V, display will pulse on and off at a 1s rate
Batteries	Six nicad or alkaline AA-type
Net weight	1·5lb (0·68kg)
Size	1·75 by 5·62 by 7·75in (45 by 143 by 197mm)

The 500MHz prescaler PS-500

Accessories

A number of optional extras are available for use with the Max-100. These include an ac adapter/charger which plugs directly into an ac socket, and there is a car cigarette lighter adapter for use with any 12V negative ground system. An in-line tap with vhf connectors is rated at 3W maximum. Where it is not desirable to make a direct connection to the rf source, a 12in mini-whip antenna with a right-angle phono plug fits the counter signal input jack. A prescaler is available which will extend the upper frequency limit to 500MHz. A vinyl carrying case is also available.

The 12-page instruction manual contains sufficient information for operation of the counter. There is no servicing information nor a circuit diagram. The equipment is subject to a 90-day warranty.

The price of the Max-100 is £77.55 + VAT.

Operation

With a practical upper limit of about 110MHz, use of the counter is confined to the hf bands and 70MHz. However, there are many other applications when the low frequency response of the unit will be useful. Using the mini-whip the counter readily responded to an hf bands transmitter at a distance of about 1m. Comparison of the counter readout with others also available showed no divergence. The unit is particularly useful in connection with mobile equipment, when its self-contained portability is an asset.

Acknowledgement

The equipment for review was supplied by the UK distributors, Continental Specialties Corporation [UK] Ltd, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ.

NEW PRODUCTS

Co-ax 2 coaxial cable stripper

To simplify the problems involved in stripping the three elements of coaxial cable to three different predetermined lengths, a new, fully adjustable, hand-operated cable stripper has been introduced by AB Engineering. Featuring three independent cutting blades which can be pre-set to strip outer cable, screening and insulation, the Co-ax 2 unit measures 97 by 50 by 20mm and weighs only 60g, making it ideal for pocket or field engineer's tool kits. The tool comes complete with 12 push-on end stops from 4 to 16mm, which can be fitted to the three cutting apertures to simplify and speed coaxial cable stripping. The body of the Co-ax 2 is manufactured in reinforced polyamide, and the replaceable cutting blades are hss ground, hardened and tempered for long life.

Further information from AB Engineering Company, Timber Lane, Woburn, Beds MK17 9PL. Tel (052525) 322.

Vaco wrench sets

These pocket type sets of hex key wrenches are ideal for storage in tool kits or tool wallets. Each set of keys opens out like a penknife to give a range of popular sizes. The inch set contains 0·050, $\frac{1}{16}$, $\frac{5}{64}$, $\frac{1}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, and $\frac{1}{16}$ in sizes. The metric set contains 1·27, 1·5, 2, 2·5, 3, 4 and 5mm sizes.

The inch set costs £3.37 + VAT, and the metric set costs £3.07 + VAT. These products are made by Vaco, one of the premier tool manufacturers in the USA, and are available from Toolrange Ltd, Upton Road, Reading RG3 2JA. Tel Reading (0734) 29446 or 22245.

Palomar antenna tuner PT3000

Palomar Engineers announce a new 1·7 to 30MHz antenna tuner. In a new compact size measuring 5 by 14 by 14in it has all the features of other Palomar tuners: built-in noise bridge for no-transmit tune-up, input balun for more efficient balanced line operation, and 0·25in copper tubing coils for lower-loss high-power operation.

Palomar PT3000 antenna tuner

Using the popular wide-range transmatch circuit, the Model PT3000 features an 18-position inductance switch. A selector switch that connects the transmitter to a dummy load jack, direct to a coaxial-line-fed antenna, to the antenna through the tuner, or to single wire or balanced-line-fed antennas.

The price is $349.50. For a descriptive brochure write to Palomar Engineers, Box 455, Escondido CA 92025, USA.

technical topics

Pat Hawker, G3VA

DECEMBER issue already—how the year has flown! Just time, before getting down to business, to send all members Christmas and New Year greetings, to thank the many who have helped smooth the task of compiling the column—and sincere apologies to quite a few of you whose ideas are still in the pending file or, for a variety of reasons, may (in newspaper parlance) have been "spiked". During the year I seem to have answered a lot of postal enquiries, though once again sheer pressure of work has made it impossible to achieve "100 per cent QSL". Readers are asked to keep enquiries to a minimum as, unfortunately, I do not always have the time, knowledge or facilities to cope with general enquiries unrelated to items that have appeared in *TT*. Would I were the walking data bank that some correspondents seem to imagine!

Better safe than sorry

One imagines (or at least hopes) that there can be few amateurs who are not aware of the potential hazards involved in any use of the electricity mains. But most of the safety notes that have been included in *TT* and elsewhere have been concerned primarily with ensuring that an operator will not inadvertently come into contact with dangerously high voltages or currents. But there is another form of hazard that applies to all domestic appliances: the risk of fire. Much of the advice aimed at reducing such risks tends to be applied common sense rather than high technology, and after a period of time many of us adopt a casual approach to mains-connected appliances that is perhaps the greatest danger of all. So this month I make no apologies for including advice that may seem elementary, but which is "uncommon sense" that too often we ignore—and I admit to being an inveterate "match-stick" user who should know better!

Cecil Broadhurst, G3PH, who has spent many years as an electrical contractor, writes as follows: "The liberties taken with, and the misuse of, 240V mains supplies are becoming increasingly alarming. Our staff was recently called to a house where a rear bedroom had been gutted by fire and much of the rest of the house 'smoked out'. It turned out that this was the result of a fellow amateur radio enthusiast going out and leaving his soldering iron switched on. Apart from the other damage, he lost all his equipment. This latest experience prompts me to offer a few do's and don'ts:

Do not use taped joints in mains leads.
Do not use silver paper to replace blown cartridge fuses.
Do not overload a mains socket with an impressive array of multi-way adapters or plugs.
Do not push wires into mains sockets by using match-sticks.
Do make sure your system is earthed properly.
Do make sure that your socket(s) are wired correctly in respect of "line", "neutral" and "earth".
Do have sufficient sockets fitted to accommodate all your equipment.
Do use correctly-rated fuses or fuse wire.
Do check periodically for frayed flex, poor plug connections and the like.
Do use a proper junction box and correctly-rated cable for extensions to the supply.
Do have a master switch to isolate the shack, preferably with a red indicator lamp easily visible by the family."

G3PH concludes: "Over the years I have seen far too many lash-ups in domestic properties, and although I am not suggesting that these are commonly found in amateur shacks, please, for the sake of yourself and your household, take care with your mains supplies."

G3PH's advice reminded me of a series of recommendations agreed by manufacturing members of BREMA which was issued a few years ago at a time when there was concern at the number of fires ascribed to colour tv sets. Several of the points made by BREMA were basically similar to those made by G3PH. However, there were a few additional points that seem worth recalling:

Do see that all electrical equipment which does not have to remain operational is switched off at the mains outlet if you are going away for an extended period.
Do not continue to operate equipment if you are in any doubt about it working normally, or if it is damaged in any way.
Do not remove any fixed cover unless you are qualified to do so—and even then, withdraw the mains plug before you start.
Do not leave equipment switched on when it is unattended—check that it is all switched off at night and when you go out. Make sure that all the family know how to switch if off.
Do not obstruct the necessary all-round ventilation: especially *do not* stand the set (equipment) close to curtains or on soft furnishings such as carpets (unless legs are fitted). Overheating can cause unnecessary damage and shortens the life of the equipment.

While most amateur equipment tends to be less combustable than domestic receivers, I can recall at least one case of a transmitter bursting into flames (not mine!) while the operator was out of the room. The broadcasters have similarly experienced this problem, even on equipment specifically designed for unattended operation, and are making increasing use of such techniques as heat-sensing cable. This consists of two conductors, normally kept separate in a pvc sheath, which fuse together at a temperature of about 68°C. This is arranged so that when the cable short-circuits the transmitter is automatically shut-down. In practice this simple system is proving very reliable, and already one case of over-heating of a tv broadcast transmitter has been detected in this way. Before this system was used, a fire seriously damaged at least one high-power unattended transmitting installation in the UK.

900MHz step-recovery diode multiplier

The announcement that the Home Office is proposing to locate a cb-style "Open Channel" band on about 928MHz must have set a number of designers scratching their heads over the problem of providing economical yet stable rf output power at this unexpectedly high frequency.

They might do worse than take a careful look at a report by M. A. Fleming of AERE Harwell (Report AERE M3054 *The design of a simple uhf frequency multiplier* January 1980, available from HMSO price £1). This 14-page report (brought to my attention by David Wills, G4FOG) describes the design and construction of a "times six" multiplier, based on the Hewlett Packard step-recovery diode type 5082-0180. One prototype 900MHz unit provided an output of 350mW when

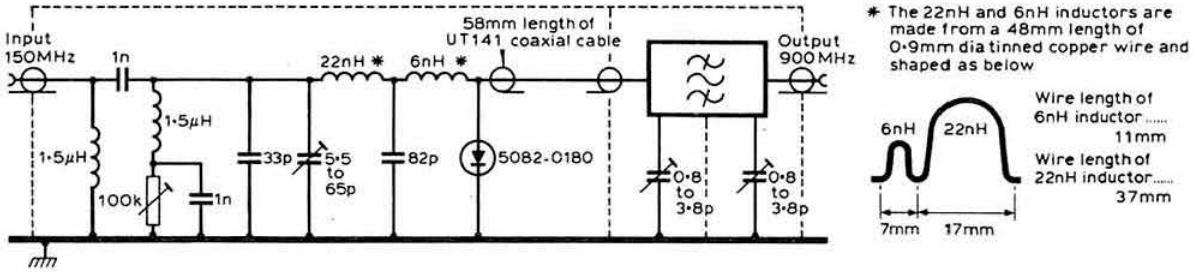

Fig 1. Circuit diagram of the AERE 900MHz multiplier capable of providing over 200mW output with a "times six" step-recovery diode

driven by about 800mW of crystal-controlled 150MHz input, although 200–250mW output is a more typical figure. Since this diode is intended for multiplication factors of up to 10, with suitable modification the design could probably be used as a times-nine multiplier to provide output (or drive) on the 1·3GHz band directly from a 144MHz transmitter etc. On 900MHz several AERE prototypes have proved capable of operating continuously over long periods with an output of about 200mW with typical efficiencies of 36–38 per cent.

The coaxial resonator of the multiplier is coupled to a band-pass output filter to remove unwanted components. A low-loss two-resonator coaxial cavity filter provides more than 40dB attenuation at 750MHz. This is built, together with the multiplier, into a standard die-cast box with 50Ω BNC connectors; no power supply is needed.

The report includes an HP67/97 calculator program for the design of step-recovery multipliers, design notes etc. Figs 1 and 2 show basic details of the construction, although for full design data reference should be made to the original AERE report.

The use of step-recovery diodes to obtain rf output at uhf and shf in low-cost 12GHz domestic receivers for direct-broadcast satellites is another indication of the growing value of this type of approach. While the original version of the Japanese NHK/NEC 12GHz adapter (*IBA Technical Review No 11* or *Wireless World* January 1979) used a Gunn-diode local oscillator, a more recent version uses three bipolar transistors, a dielectric resonator and then a "times-four" step-recovery diode multiplier all in a form capable of being mass-produced at low cost. Despite what has been written elsewhere, I strongly suspect that it will be some time yet before the average viewer will be taking his tv from direct-broadcast satellites, but the experimental work on 12GHz should provide spin-off for amateur microwave enthusiasts.

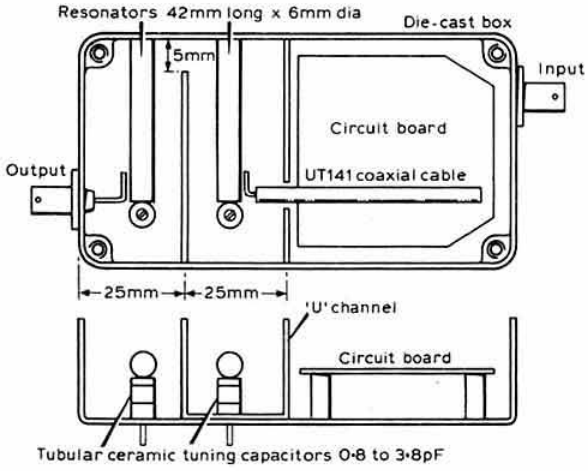

Fig 2. Layout of the AERE multiplier showing the output filter using coaxial resonators

Optimum QRP transceiver

The combined direct-conversion receiver and low-power transmitter—a concept first suggested many years ago in *Technical Topics* by Charles Bryant, GW3SB—has long established its popularity among QRP enthusiasts, as, for example, the many users of the HW7/HW8 transceivers could testify. But for some time it has been evident that many who follow this approach (including most of the factory designers) tend to be satisfied with relatively low standards of performance, and are seemingly highly delighted when they find that real contacts can be made without careful optimization of the circuitry.

Elsewhere (*IERE Conference Proceedings No 40* "Radio Receivers and Associated Systems" July 1978) I have argued that with the sole exception of the "audio image" even a simple dc receiver is fully capable of providing extremely good results, though in practice very few designs achieve this. A significant key to success (as Dick Rollema, PA0SE, discovered, *TT* January 1978) is the use of a good doubly-balanced detector/mixer, such as the MD108, SBL-1 etc, combined with care in achieving hum-free and stable high-gain audio amplification.

In *QST* (August 1980, pp14–19) Roy W. Lewallen, W7EL, shows how he arrived at an "optimized QRP transceiver" for 7MHz. It is interesting to see that he fully endorses the doubly-balanced mixer approach. Equally interesting is that a good deal of work has convinced him that "complexity and performance don't equate"—his final circuitry is not really any more complex than the original design, yet the improvement has been very considerable. Apart from the mixer, he stresses that since the af gain has to exceed 100dB "great care must be taken to prevent feedback or amplification of power supply hum". He also shows that a miniature rig can still provide all those useful facilities associated with a full-size transceiver, including full break-in (with af muting by means of a fet series-gate attenuator), "rit", sidetone, active af filter and good keying characteristics. His rig (apart from a separate atu) is all packed into a diminutive 1½ by 2½ by 3½in (40 by 70 by 90mm) package, though he does not necessarily recommend others to rush into

this degree of miniaturization, since it can make it difficult to modify or troubleshoot once built.

Incidentally, tests in the UK have shown that with doubly-balanced mixers such as the MD108, very effective reception can be achieved on 70 and 144MHz with dc receivers, provided the local oscillator is sufficiently stable.

Improving the doubly-balanced mixer

As though on cue, from Dick Rollema, PA0SE, has come a practical and clearly very useful method of improving (for a variety of applications) the performance of home-built doubly-balanced mixers. He writes:

"Simply adding two capacitors, C1, C2, to a doubly-balanced mixer, as in Fig 3, improves the suppression of the carrier component in the output signal by some 20 to 26dB. This has been shown by two Russian research engineers, D. A. Ivanov and V. K. Koblyakov (*Telecommunication and Radio Engineering USSR* May 1977).

"Because the capacitors cannot conduct dc, the direct current flowing through diodes D1 and D2, and also D3 and D4, must be equal. This forces the diodes to have a working point that also provides optimum balance for the fundamental components of the input signals. The two capacitors have no adverse effects on the operation of the dbm; values are not critical, but obviously their reactance should be low with respect to the impedances of sources and load of the mixer.

"I gave this interesting idea a practical test in my homemade ssb transmitter; this uses the old technique of generating the ssb signal at vlf, in my case at 20kHz, allowing the use of an ssb filter using five tuned circuits having ferrite pot cores. Because of the low frequency, carrier suppression in the original modulator is good, of the order of 50dB or so. But adding two 1·5μF capacitors improved suppression by an additional 10dB, with the result that the remaining carrier is almost impossible to detect.

"Another useful application is in a direct-conversion receiver. If this is well designed the mixer noise overrides the noise contributed by the af amplifier; such mixer noise is almost totally noise stemming from the oscillator. It follows that the better the balance of the mixer, the more sensitive the dc receiver becomes. With a commercial dbm, such as Anzac MD108 or Mini-Circuits SBL-1, mixer balance is so good that an rf amplifier is unnecessary below 21MHz, since external noise from the antenna overrides set noise.

"With a homemade mixer, using a germanium diode quad, OA154Q, and trifilar-wound transformers on ferrite cores, my dc receiver is almost as sensitive on the low hf bands as with commercial dbms (an outline of this receiver is given in *TT* January 1978). But on the higher bands the sensitivity is degraded by increasing oscillator noise, undoubtedly the result of mixer balance becoming less effective. When two 10nF capacitors were added to the mixer as in Fig 3, the receiver sensitivity on the high hf bands became as good as on the lower ones!

"It is, however, only fair to add that the commercial products still remained the winners by a short head. Sensitivity was measured as the emf of a signal generator with 50Ω internal resistance, feeding the receiver, that causes a 10dB signal-plus-noise to noise ratio at the receiver input. The af bandwidth is restricted by a low-pass filter with 1,900Hz cut-off frequency. Sensitivity measured about 0·8μV as an average for the bands 1·8 to 21MHz with either an MD108 or SBL-1. My homemade mixer, with the two capacitors added, averaged about 1·3μV."

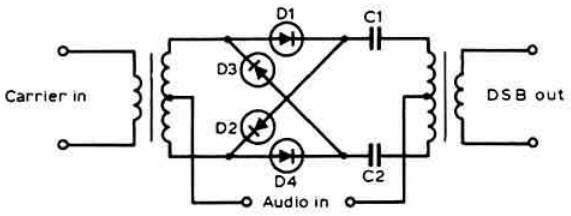

Fig 3. Russian technique for improving balance of a doubly-balanced mixer and so increasing carrier suppression, as tested by PA0SE

Groundsat and the dc receiver

TT (November 1978, p942) reported the first public demonstration of the fascinating Plessey "Groundsat" on-channel vhf repeater which has been developed primarily for use with military tactical fm portable radios. Two Groundsat units can also be used as transceivers providing full duplex operation on the same frequency with output powers up to 1W and with simple vertical antennas spaced around 20ft apart. At the time, for obvious commercial reasons, the company was not prepared to disclose even the principles on which this system worked: in other words how could a transceiver be designed so that the receiver would continue to receive weak signals while rebroadcasting them at some 100dB extra power on the same frequency?

At a recent IEE meeting, Chris Richardson of Plessey Electronic Systems Research, Romsey, the inventor, outlined the principles, although actual circuitry was not disclosed.

The key feature turns out to be the use of a two-phase *direct-conversion* receiver, designed for nbfm reception, and so arranged that a very deep notch (active filters) "tracks" or

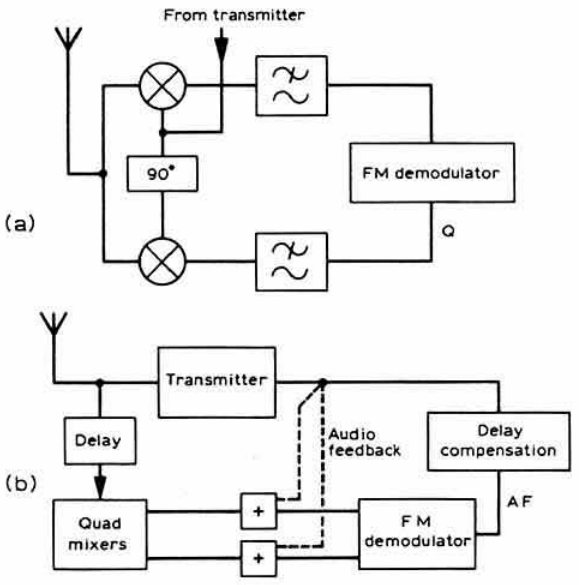

Fig 4. Basic principles of the Plessey Groundsat on-channel 30-76MHz repeater or "fm-duplex" transceiver. (a) Two-phase dc fm receiver. (b) Rebroadcast (repeater) mode loop including audio cancellation of unwanted signals and compensation

follows the instantaneous angle-modulated frequency (a frequency that depends upon modulation *amplitude*) by using the varying transmitted signal as the "local oscillator" of the receiver, together with audio cancellation to provide the notch, and using loop compensation for the rebroadcast mode. Fig 4 shows the basic two-phase dc front-end and an outline of the system in the repeater (rebroadcast) mode. These techniques provide some 90-110dB of isolation, to which can be added about 30dB of isolation provided by the separation of the receiving and transmitting antennas.

Clearly the system is suitable only for nbfm, and the two-phase circuitry is needed to make the d-c receiver suitable for nbfm reception (the use of d-c receivers for normal vhf mobile radio has also been investigated at STL, and we hope to refer to their work on another occasion). There seems no reason why the Groundsat techniques should not be used by amateurs, either for a local-area on-channel repeater for use with very simple handheld rigs not having 600kHz off-sets, or for duplex fm on the same channel. But you will have to develop your own circuitry.

Trans-horizon propagation on uhf/shf

To the professional telecommunications and broadcast engineer trans-horizon propagation (Fig 5) on vhf, uhf and shf is, apart from "scatter", almost always an unwanted anomaly, causing co-channel interference. On the other hand, for the amateur it is the much-sought-after bonus that brings the dx signals. The professional's poison is our meat!

Some of the current work by British Telecom research at Martlesham, Suffolk, is of particular interest in showing that super-refraction along sea paths can hardly be considered an "anomalous" condition, since some degree of signal enhancement has been proved to exist for around 10 per cent of the total time (Fig 6). This finding is based on more than 1,300 hours of recording signals at Martlesham over the 192km path from Rockanje, Netherlands, during 1977-9 on 11·365GHz. Whereas the free-space path attenuation (ie attenuation over an optical path) is about 160dB, signals with less than 210dB attenuation were recorded for 10 per cent of the total time, and less than 180dB for about one per cent of the time. For this sea path it has been found that the most consistent time for super-refractive conditions is about 1800gmt, and such propagation tends to be at a minimum about 0800gmt.

The results of this work have been fully described in two papers by M. T. Hewitt and A. R. Adams which were presented at a URSI Symposium in Canada in May 1980,

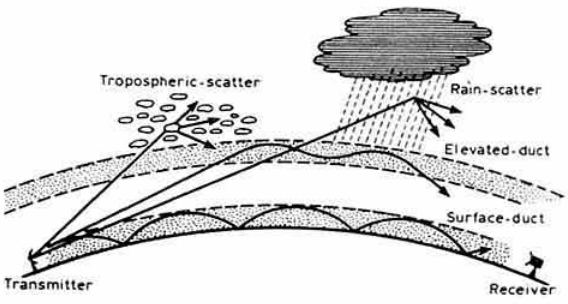

Fig 5. Trans-horizon propagation mechanisms in the lower atmosphere (Hewitt and Adams, British Telecom Research)

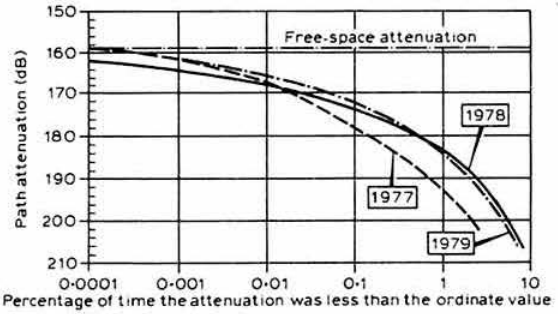

Fig 6. Cumulative distribution of path attenuations in 1977-9 over the 192km path between Rockanje, Netherlands, and Martlesham, Suffolk, using a frequency of 11·365GHz. Note that signals were measured for almost 10 per cent of the total 1,300 hours of the tests, and that for one per cent of the time the path loss was only about 20dB more than the calculated free-space attenuation. The results at 11GHz would be applicable over a fairly wide range of uhf/shf bands

reprints of which were available at the recent Martlesham Open Days. One paper identifies the basic mechanisms of how trans-horizon propagation is related to specific meteorological conditions and covers not only the sea path, but also land and mixed land-sea paths.

The main weather patterns that result in super-refractive layers in the lower atmosphere, as reported by Hewitt and Adams, are summarized below; these powerfully support many of the empirical findings noted by amateurs on the uhf and microwave bands.

Subsidence. Air which slowly descends within an anticyclonic system becomes progressively heated by compression; this subsidence is halted when opposed by forces in the air below. And the warmer air then spreads out in a layer without mixing with the lower, cooler air. When the subsidence inversion is about 2,000m above the surface, it imparts stability to the lower air, suppressing convection currents. Where the subsidence inversion descends still lower, there will be a very pronounced inversion layer which may last several days. The lower the layer the stronger the trans-horizon signals will tend to be. Subsidence inversions can be identified meteorologically from radiosonde data; this form of inversion can exist over land or sea.

Advection. The air flow around anticyclonic systems over central Europe produces a drift of warm dry air out over the cooler very moist air over the sea. When, in the absence of winds, there is little convection turbulence, this overlay of warm air continues without mixing. It is this form of layer that is the main reason for the enhancement of 11GHz signals for more than 10 per cent of the total time, although it would appear from the papers that signal enhancements are seldom as pronounced as those very low subsidence inversions. Advection inversions occur primarily over the sea but also can occur in low-lying coastal areas. They can be identified from meteorological data by differences in temperature and humidity, though problems can arise in linking data with inversions.

Radiation cooling. After a warm day and a calm, cloudless night, there will be often considerable cooling of land surfaces, and surface ducts may be formed. In fact radiation nights are the most frequent cause of signal enhancement over land areas in the UK, but the events tend to be of short duration. Day-night temperature difference, cloud cover and wind speed can all provide reliable indications of radiation cooling. For a

given degree of surface cooling there is likely to be a trade-off between height and the refractivity lapse rate, so that signal enhancements will be less and fewer as the "roughness" of the intervening path increases (ie hills etc).

Weather fronts. Some signal enhancements are due to the movement of weather fronts into an area of a weakening anti-cyclonic system. Such relatively short periods of trans-horizon propagation result from super-refractivity somewhere within the frontal structure, but further investigation is needed as these frontal disturbances are the most difficult of all the mechanisms to detect from meteorological data. No reliable indicators have yet been found and the authors consider "this remains an important area of work to be completed".

The British Telecom work is aimed at being able to derive a good approximation of the levels of interference that would exist on a particular path by using meteorological data—but clearly it should also be of considerable value to amateurs in predicting, estimating and understanding ducting and tropo "openings".

Filters using tv crystals

The G3OTK design for a 4·43MHz ladder filter based on six colour-tv receiver crystals (*TT* September 1980, p907) has brought some useful comments from Dave Gordon-Smith, G3UUR, including the value of such designs as the basis of a filter providing switched bandwidths.

It may be recalled that in his important series of articles on ladder filters, Jack Hardcastle, G3JIR, pointed out that it is not necessary (or indeed entirely desirable) for all crystals to be exactly the same. G3UUR considers that some experimenters, particularly those using colour-tv crystals, believe that these are all on exactly the same frequency if they have the same numbers printed on them. The PAL colour sub-carrier frequency is defined as 4·43361875MHz ±1Hz but that does *not* mean that these low-cost crystals are all accurate within 1Hz or anything like it (if they were there would be no need to transmit the colour burst which is used to synchronize the crystal-controlled colour reference oscillator).

G3UUR believes there are spreads of about ±50ppm (ie about ±200Hz); he has measured spreads of +160Hz to −90Hz relative to the *series-resonant* frequency of 4,431kHz.

G3UUR suggests that the two 390pF series capacitors in the G3OTK filter can be omitted if the X3 and X4 crystals are selected to be about 140 to 200Hz higher in frequency than the others. Fig 7 shows a practical filter built by G3UUR some time ago in which advantage was taken of this approach; it represents an eight-pole (1dB ripple) quasi-Chebyshev design. But if the same crystals were randomly positioned in the filter it would be found that the passband would "go to pot" and a 3dB kink would almost certainly appear at the hf end of the passband.

There is also need to recognize that not all colour-tv crystals are to the same specification. G3UUR has come across two distinct types: the P129 specification crystals as used by G3OTK, and for the filter in Fig 7; and the P128 specification which has lower notional inductance (41mH compared with 75mH). This would mean that a filter providing a 2·4kHz bandwidth with P129 crystals would have a bandwidth of only about 1·3kHz with P128 crystals unless the values of the coupling capacitors and termination resistors were changed (capacitors would need to be reduced by a factor of 0·55, resistors increased by a factor of 1·8). G3UUR mentions that tv crystals that he has bought from Messrs J. Birkett have been of the P129 type, but some acquired cheaply (20p each) at exhibitions have been P128.

G3UUR has also designed (although not yet tested) a filter providing six different bandwidths suitable for both ssb and cw operation. He points out that the crystal ladder filter seems ideally suited to this type of approach. He writes:

"In order to reduce the number of switched components, I have designed the filter so that the terminating resistors remain constant and the ripple merely decreases with the bandwidth. This also reduces the variation in insertion loss. The 2·4kHz position has a 1dB ripple Chebyshev response, and the 500Hz position represents a Butterworth response. A 5:1 bandwidth change is possible if the maximum tolerable ripple is 1dB. This range is fixed by design constraints: the ratio of 1dB to 0dB ripple response terminating resistance is approximately 5:1 for the same bandwidth, and therefore the same terminating resistance satisfies bandwidths that have a ratio of about 5:1.

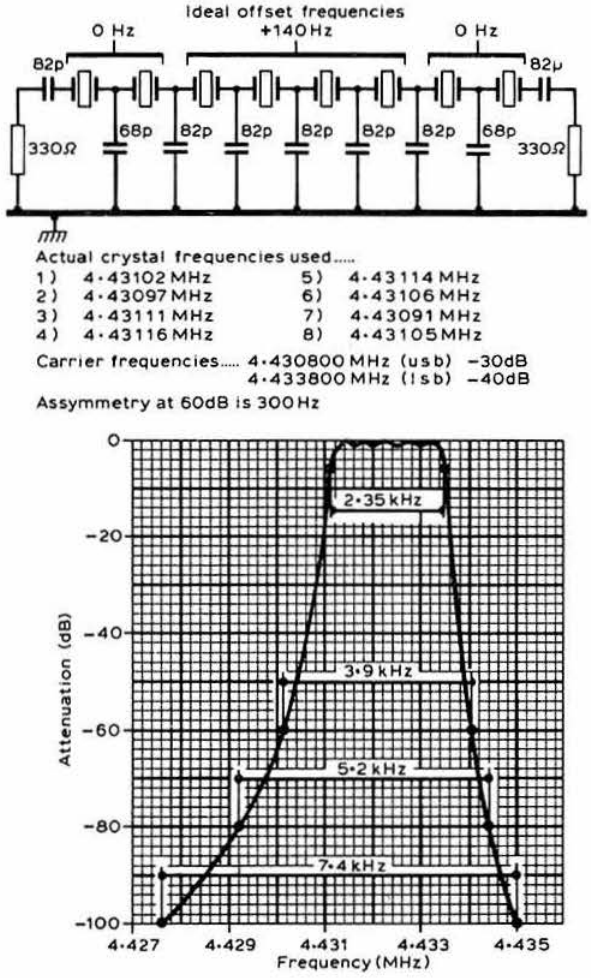

Fig 7. Ladder crystal filter using P129-specification colour-tv 4·43MHz crystals. It provides a performance comparable with the ladder filter in the Atlas 180 and 215 transceivers. Insertion loss 4·5dB, shape factor (6/60dB) 1·66. Note that the rate of attenuation on the low-frequency side of the response is as good as an eight-crystal lattice design. On the hf side it is better

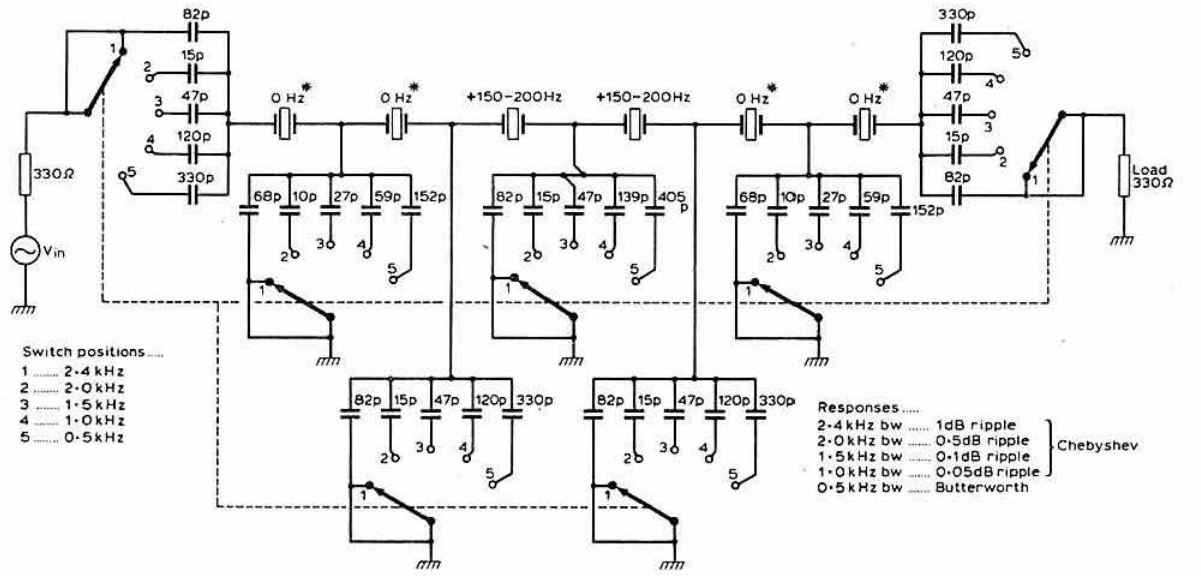

Fig 8. G3UUR's design for a switched variable-bandwidth ladder filter using colour-tv crystals. Note that crystals shown as 0Hz offset can in practice be ±50Hz without too detrimental an effect on the passband ripple

"The whole arrangement can be built inside a diecast box with the crystal pcb alongside the selectivity switch. I settled on a six-pole design, since seven wafers were the most I could reasonably manage. A four- or six-pole 2·5kHz roofing filter before the variable bandwidth filter would be advisable. The main disadvantage of this system is that the passband moves low-frequency as it is narrowed. This can be compensated for by moving the carrier crystals down in sympathy with the filter centre frequency: a total shift of 1kHz or less would probably be adequate. This could be corrected at the vfo by an rit shift so that the incoming signals remain resolved as the selectivity is changed. Add a crystal notch filter and you have an excellent single conversion receiver for relatively little outlay. Less than £6 would cover all the filter crystals, and by shopping around a bit this could probably be halved."

In practice many operators would be well satisfied with fewer selectivity positions, and might not be unduly worried at the slight shift in centre frequency since they would be well satisfied by an "ssb" position, say 2·4kHz bandwidth; and one or two "cw" positions of 1 and 0·5kHz or so. I would be interested to hear of any experiences with a switched-bandwidth crystal ladder filter.

Transmission-line vfo

John Baker, K3NZS (*QST* August 1980, pp39-40), has built a 3·5–4MHz oscillator needed to drive a frequency counter with a drift of not more than 0·3Hz/hour. The key feature of his unit, which has an oscillator fundamental of 35–40MHz with a divide-by-10 7490 ic, is the use of a length of miniature RG-174/U coaxial cable as the main frequency determining element: Fig 9. The cable is just over 5ft long but occupies only about one cubic inch, care being taken to ensure that turns of the cable do not shift mechanically with respect to one another, and isolated as far as possible from temperature changes.

In practice, K3NZS used the shield case of an old 2in (51mm) panel meter, wrapping the cable in glass-fibre wool and packing it all into the meter case, which was earthed to form a shield

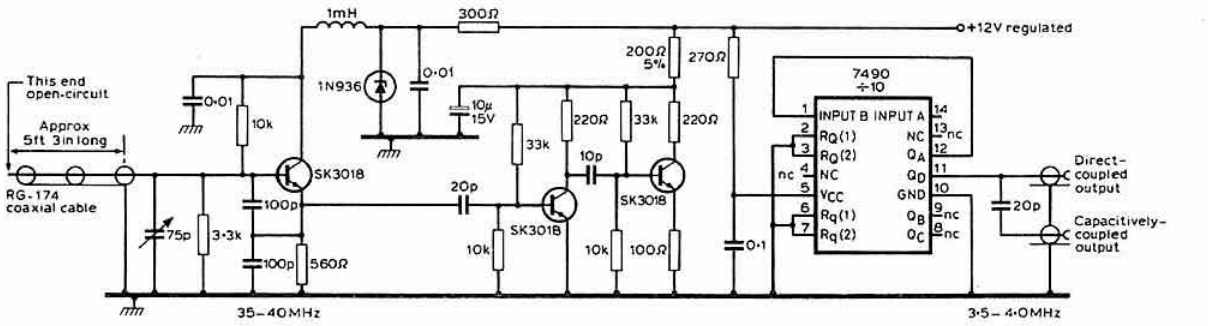

Fig 9. K3NZS's stable oscillator using length of miniature coaxial cable as the main frequency determining element. The oscillator tunes 35–40MHz and is followed by a 7490 decade divider

and temperature guard. Other precautions included using a good, stable variable capacitor for C2. This could be temperature-compensated, but K3NZS did not find this necessary. The entire unit should be built in a mechanically solid manner in a heavy-gauge box. K3NZS used a pcb to increase mechanical stability.

Loop transmitting antennas again

D. J. Reynolds, G3ZPF, has drawn attention to a low-profile transmitting loop antenna (Model 629) now being marketed by Technology for Communications International (TCI) and intended for professional communications, including embassy radio systems, at transmitter powers of up to 1kW.

However, the claims made on behalf of this antenna in some of the trade journals would appear to be misleading, since they suggest that compact loop antennas for hf transmission represent an entirely new development. Readers with long memories (or copies of *ART*) will recall the ingenious octahedral, low-resistance hf transmitter loops developed by the US Army for use in Vietnam jungles (*TT* November 1967 and *ART*) which sparked off quite a lot of amateur interest in this technique, including the use of coaxial cable braid to form the low-resistance loop as successfully developed by G6NA (*Radio Communication* September 1968).

From the illustrations, the TCI Model 629 appears to use large diameter (several inches) tubing formed into a squat "loop" only a few feet high with a microprocessor-controlled automatic tuning unit which appears to be housed in "bulges" on the main structure. It is claimed to be considerably more effective than vertical rod or whip antennas at low frequencies, and to provide more high-angle radiation for medium- and short-distance hf communication. The US State Department is said to have ordered a number of loops for embassies and consulates, and that low-profile loops are unlikely to attract attention from hostile political groups or environmentalists. I believe the British FCO favours vertical antennas made unobtrusive by concealing them in those dignified flag poles so beloved by the diplomatic community!

A detailed article on this antenna has appeared in *Communications International* (March 1980). TCI's data sheet reveals that the loop of copper tubing is some 70in (178cm) long by 39in (99cm) high, with a copper ground screen comprising eight 2·5 by 10ft sheets which form a rectangular ground screen 10 by 19ft (3 by 5·8m). Weight is about 550lb (250kg). Efficiency is claimed as five per cent at 3MHz; 21 per cent at 6MHz; 52 per cent at 10MHz; and 97 per cent at 18MHz, suggesting that such a loop would give useful results on all hf bands from 3·5MHz upwards.

The commercial unit, with its microprocessor atu etc, is presumably at a "professional" price, but for those with plenty of really hefty copper tubing and ground-plane sheets, such a transmitting loop would provide an unobtrusive, roof-top antenna: but be warned, the current price of copper is around £900/tonne!

Tips and topics

W. H. Jarvis, G8APX, has two useful tips: (1) to screen a preamp or other piece of additional circuitry for easy insertion into an already tightly-packed case, wrap it snugly in a "sandwich" made by putting a piece of aluminium cooking foil into a polythene bag. Connection to the foil is then made using one or more lengths of copper coaxial cable braid; (2) a stiff "antenna" wire, easily cut to length for fitting into the inner of a Belling-Lee socket, is made by slightly fattening a bicycle wheel spoke by "tinning". The spoke nut can be used as a combined anti-corona tip and handler.

Lyell Herdman, G6HD, comments on "coaxial capacitors" (*TT* August, p791) as follows: "Solid dielectric coaxial cable with either polythene or ptfe dielectric has a capacitance of about 20pF/ft for 75Ω cables, and about 30pF/ft (ie 1pF/cm) for 50Ω cables. The small ("¼in") types such as UR43/UR70 are rated to work at 2·75/1·8kV peak rf, and the larger ("½in") types UR57/UR67 at 5/4·8kV peak rf (dc ratings are about eight times higher!). The types with a single-wire inner conductor easily make good semi-variable, high-voltage, low power factor capacitors. For some 15 years I have been using UR113 ("¼in ptfe") as the neutralizing capacitor for my A3 1·8MHz pa with 450V dc and 100 per cent modulation."

Coplanar 144MHz rhombic

A number of useful comments have been received on the 144MHz coplanar rhombic (*TT* September) from Chris Bartram, G4DGU; Fred Brown, G5AW1/W6HPH; and "Pol" Parrott, G3HAL. The source was "Improved antennas of the rhombic class" by E. A. Laport and A. C. Veldhurs (*RCA Review* March 1960, pp117–25). But unfortunately although this paper *did* give a gain figure of 27dB it appears that the authors later agreed this had been wrongly calculated: in fact free-space gain is about 15dB, or (with 6dB earth gain) 21dB. This is about the same as for a conventional rhombic, although the sidelobes *are* considerably reduced; it is not enough gain for moonbounce. But there is still a lot to be said for vhf/uhf rhombics, and I hope to return to the subject later. The attraction of the rhombic is simplicity.

More on the flexible all-band dipole

Comments continue to arrive stressing the value of the flexible, multiband, centre-fed dipole (*TT* June/July, p637, and November, p1157). Ray Griese, K6FD, believes there are many features in this type of antenna that make it attractive for amateur operation, including both mechanical and electrical considerations, although some of these are seldom mentioned in print. He writes:

"Antennas of this type radiate best when the ends of the element are insulated with the usual glass or porcelain insulators *plus* nylon cord or rope to the supporting structure. It should be remembered that the glass insulators are dc insulators only, the capacitance effect between the high-voltage end of the antenna and a wire support is large enough effectively to couple the antenna into the supporting structure. A test for this is the null that should exist in the direction of the antenna but seldom does; the lack of a null is partly caused by ground reflection when the antenna is low in respect of wavelength but partly due to radiation from the supporting structures. To check this point, try erecting a self-supporting one-element rotary dipole; on the higher frequency bands the pattern becomes the familiar figure-of-8, and in a fairly clear location the nulls will be found to be deep and very sharp.

"It is desirable in many instances, however, to operate amateur stations with omni-directional antenna patterns. This can be done very simply and conveniently with this form of dipole, by bending in the form of a 'U', as originally noted by Dr G. H. Brown of RCA. An even simpler method is to support the antenna with three poles and to have the antennas separated by an angle of from 15–20° to 45–60°, forming what can be termed a "Lazy Vee" but providing virtually an omni-directional radiation pattern, depending on the circumstances.

The departure from a true circular pattern should normally be only a few decibels at the most, representing one, or possibly two, S-points at the receiving end.

"The radiation is horizontally polarized, and maximum radiation, with low antenna height, will be straight up. However, this is very effective on 7 and 3·5MHz in daytime and early evening, although disappointing for dx during periods of low-angle signal propagation."

Car interference suppression

Alex Gordon, G8FYO, draws attention to a handy 14-page booklet *Radio Interference Suppression* (Publication PLT6338A) available from Lucas Electrical Ltd, Parts & Service Division, Audio Department, Great Hampton Street, Birmingham B18 6AU. This provides a well-illustrated guide which may help you to identify the various interference-producing components of the vehicle, including electronic tachometer, instrument stabilizer, generator, voltage regulator, wiper motor, electric clock, heater motor, fuel pump etc, and indicates how suppression components can be fitted.

Among the general advice, the point is made that vehicles having glass-fibre bodies are considerably more difficult to suppress adequately than all-metal-bodied vehicles: to the extent that Lucas do not recommend fitting vhf/fm (broadcast) radios in the glass-fibre vehicles.

It also suggests that some vehicles imported into the UK may prove more difficult to suppress than the local variety (and that a British brand name does not always imply the vehicle has been made in the UK). For example, if the ignition coil has a painted can, all paint should be removed from underneath the saddle clamp, so that the clamp makes a metal-to-metal contact with the coil. There is also apparently a tendency for some French and Italian vehicles to produce interference from the gear lever and steering column, requiring the offending component to be bonded to earth with heavy braided cable.

The booklet also indicates that some types of electronic ignition systems may be difficult to suppress. It is suggested that where a separate ignition amplifier is used, ensure that the case is bonded to earth. Wrap the interconnecting leads with aluminium foil and connect this to earth by means of heavy braided cable. Antennas should not be located near the ignition amplifier.

Reference is made to a further Lucas publication *FM—an appreciation of vhf reception in vehicles* (Publication PLT6194), although I have not seen this. □

A hole borer for antenna ground sockets

by J. R. HEY, Tech (CEI), MSERT, G3TDZ*

WHEN a piece of 1·75in steam pipe together with a 4ft 6in piece of 2·5in pipe came the author's way, it seemed like a gift from above. In fact it came from above—it was from an old factory sprinkler system!

Those who have ever tried to dig a hole 4½ft deep for a ground socket will already know the problem. It involves a huge crater just in order to wield the spade; then there are the tree roots and the xyl's pretty flowers. Fellow amateurs told the author how the man from the PO uses something like a giant wood bit or corkscrew when erecting a telegraph pole, but without welding equipment, fabrication of such a device seemed impossible. A 5ft length of 4in plastic drain pipe rescued from a rubbish tip provided the answer, for it seemed that if teeth could be cut in its end and reinforced by steel cutting edges, it could be used like an oil drill. A tommy bar, actually a length of 0·5in aluminium antenna rod, was pushed through holes easily drilled at the upper end.

It is better to dig a primary hole, say one spade's depth first, to test the soil and clear surface rubbish. An aid to drilling is a watering can at hand. Liberal doses of water into the hole soften the earth and lubricate the drill shaft. At every foot depth, or even less, lift the drill to remove the core. Garden soil, clay, and crumbly shale present no problem, but larger rocks have to be broken up by plunging some implement, such as a crowbar or pick, down the hole.

It took the author just 20min to bore the shaft, fit the ground socket, pack the hole and tidy up. Now the multiband vertical stands proudly: I am pleased, the xyl is pleased, the dog is delighted; even the doctor might well be happy as a recurrence of backache which resulted from last winter's snow shovelling has been avoided. Drilling does become harder and slower after 3ft or so.

Oil companies will lose no sleep because of G3TDZ's oil drill—well, it does drill "oils", doesn't it? □

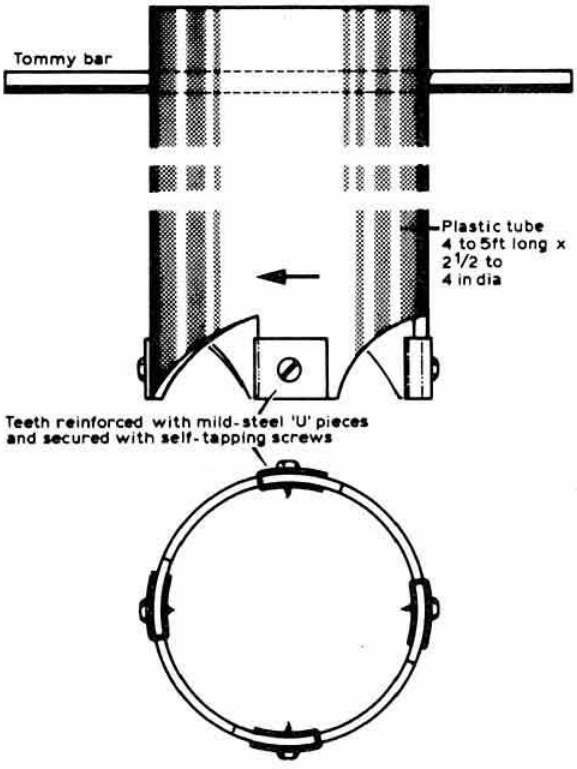

Fig 1. Constructional diagram of the hole borer

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Sporadic-E observations in 1980

by R. A. HAM, BRS15744*

ALTHOUGH a reasonably-sized sporadic-E event occurred around 0830gmt on 4 April, the 1980 sporadic-E season did not really begin until the evening of 3 May, and ended 108 days later on 18 August. This was approximately 13 days longer than the 1979 season.

As in previous years the author used an R216 vhf communications receiver. This was mainly to monitor the television synchronizing pulses transmitted on Ch E2, 48·25MHz and Ch R1, 49·75MHz, for advanced warning of sporadic-E and, when this manifested, to tune between 40 and 80MHz listening for broadcast dx. Regular observations have shown that the 50MHz region of Band 1 is the most vulnerable to sporadic-E disturbances, and that the pulses in this region are among the first signals to be heard and the last to fade away when sporadic-E is present. For the third year running the author used a JVC3060 625-line television receiver which, like the R216, was connected to a dipole antenna about 10m agl, and was tunable from 48 to 68MHz to cover European channels E2, 3 and 4, Italian A and B, and Russian R1 and 2.

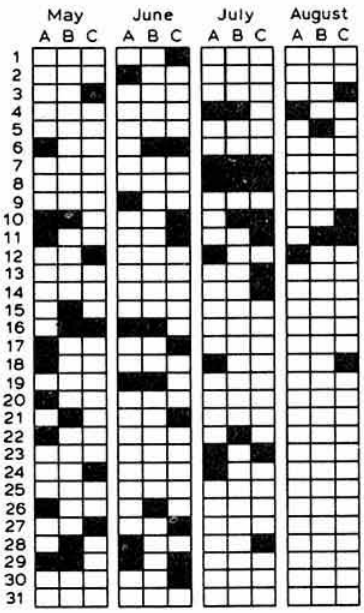


Fig 1. Monthly distribution of sporadic-E during the 1980 season

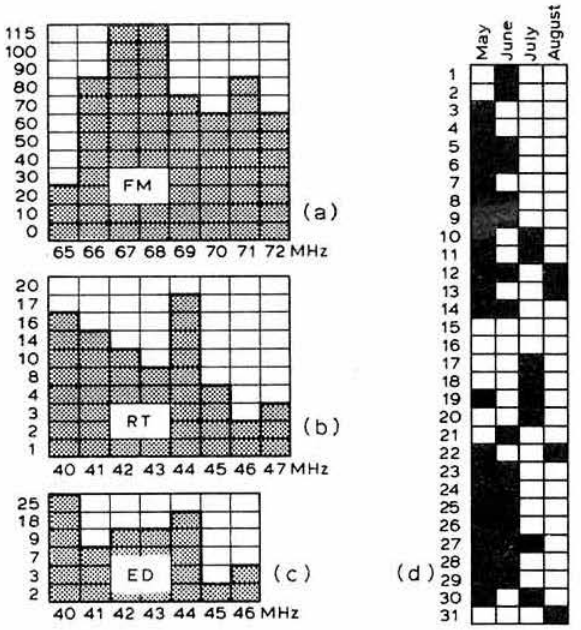


Fig 2. (a) East European fm stations heard in the UK during periods of sporadic-E. (b) European radiotelephone signals heard between May and August 1980. (c) Electronic devices heard during sporadic-E events. (d) Monthly distribution of solar radio noise recorded by the author on 143MHz

During the 1980 season sporadic-E reflections influenced the normal paths of signals between 40 and 80MHz on 52 days, compared with 48 days in 1979 and 69 days in 1978. The author's daily observations were made at approximately 0800, 1230 and 1800gmt, and the sporadic-E events recorded at those times are indicated by the dark squares in Fig 1 under times A, B and C respectively.

Continental broadcasting stations

Almost every day, as indicated in Fig 1, the sporadic-E disturbances extended up to 80MHz, with strong signals from up to 40 eastern European fm broadcasting stations being received in many parts of the UK. Fig 2(a) shows the radio frequency distribution and the number of times that the signals were heard by sporadic-E. As previously observed, the majority of these signals were subject to deep and sharp fading at the onset and shortly before the end of each event.

DX tv

During the season strong television pictures were often received by the author and fellow dx tv enthusiasts in the UK from those countries listed in Fig 3. The deep fading mentioned earlier also applied to the 50MHz tv band, and it was interesting to see pictures from widely separated stations fighting for predominance on the screen as the influence of the sporadic-E disturbance inconsistently changed direction. Among the fascinating items seen was a variety of test cards, some of the Moscow Olympics, football matches, tennis from Wimbledon and such programmes as "The Muppets", "Lassie" and "Popeye", as well as news bulletins from several foreign countries.

*Faraday, Greyfriars, Storrington, Sussex RH20 4HE

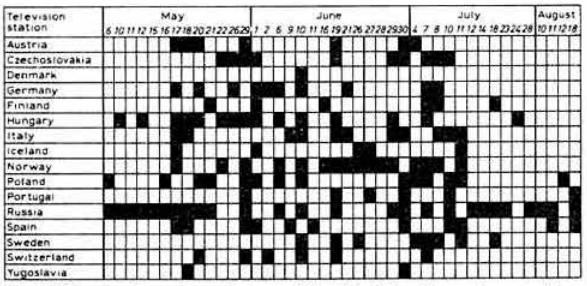


Fig 3. Distribution of tv pictures identified by the author and tv dxers during the sporadic-E season

European radiotelephone stations

Fig 2(b) shows the distribution of European radiotelephone signals heard by the author during the period. The total number received was 74, compared with 99 in 1979, and 229 in 1978. This marked drop in numbers during the past two seasons may well be a sign that rt signals are moving from this part of the spectrum. As in 1979, the main activity from these stations was around 40, 41 and 44MHz.

Electronic devices

Fig 2(c) illustrates the radio frequency distribution of the odd signals, such as teleprinters, tones and various beacons, which were heard between 40 and 46MHz during the 1980 sporadic-E season. In all, 73 such signals were received, with the main concentration around 40 and 44MHz.

Major events

Although the majority of sporadic-E events during the 1980 season were of average intensity, Es influence did extend to Band 2 and the 144MHz band for short periods between 7 and 13 July when amateurs in the UK established two-way communications with stations in Italy, Malta and Sicily, mainly on 12/13 July.

28MHz band

Signals from the International Beacon Project station in Germany, DL0IGI 28·205MHz, were heard by the author on 12 days in May, 14 in June and 11 each in July and August. As noticed in previous years, these signals were very strong when sporadic-E conditions were about, and during the 1980 season signals from the Norwegian beacon, LA5TEN, were behaving in a similar way.

Solar activity

The author recorded 48 days of solar activity on 143MHz during the 1980 season, Fig 2 (d)—which shows 50 days as it was made up to 31 August; the same number of days as in 1979, and only four more than in 1978. As previously stated, the author cannot find any direct connection between the "active" sun and sporadic-E disturbances. □

"The Secret Listeners"

by PAUL WRIGHT, G3SEM*

THE sudden death of a great friend of mine, Hugh Lawley, G6ZG, prompts me to try to achieve a little more recognition for a now diminishing group of radio amateurs who made a unique and seemingly invaluable contribution to British and Allied Intelligence during the second world war.

With the showing on BBC2 last year of the television programme "The Secret Listeners" (for which I had researched for more than two years), the story was revealed of how almost 1,500 British amateurs and other morse operators had served during the second world war as "Voluntary Intercepters" (VIs), after over 35 years during which virtually no detailed information had leaked out. But there are still many present-day amateurs who know little of the story.

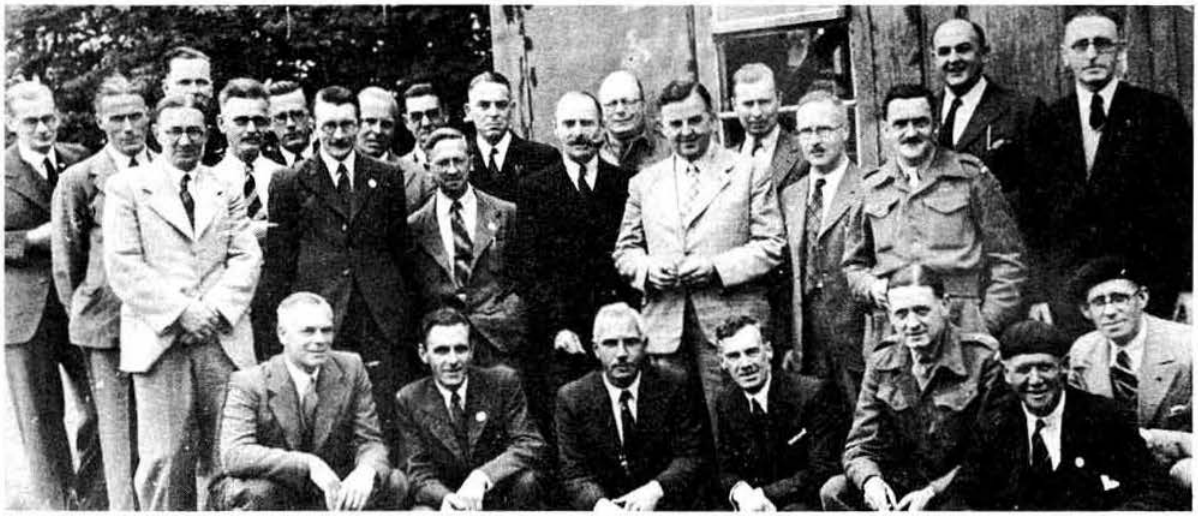
Approach by RSS

It began in 1939 when Arthur Watts, G6UN, the then President of the RSGB, was approached by Lord Sandhurst, an officer in the Security Service (MI5), to find out if radio amateurs (who were officially closed down on 1 September) could help in setting up a radio listening watch on behalf of the Radio Security Service. RSS was much concerned that enemy agents might try to set up mf air navigation beacons in this country to guide hostile aircraft, or possibly try to contact Germany by means of hf radio.

Arthur Watts responded enthusiastically; he felt this was a golden opportunity for amateurs to show they could make a useful contribution during wartime—and indeed the idea of an amateur "listening watch" had been mooted during the first world war. Gradually, under oaths of secrecy, he talked to some of the leading dx and contest operators of the time; then, in spreading ripples, the bulk of amateurs with useful cw experience were roped in—or at least those who had not already been "called up" or joined the Services as members of the 1932 Royal Naval Wireless Auxiliary Reserve (RNWAR) or the 1938 RAF Civilian Wireless Reserve (CWR). By spring 1940 this new and shadowy organization of VIs ensured that there were "secret listeners" spread all over the country.

The practical problems facing civilian spare-time intercepters were far from negligible, particularly after the fall of France made invasion a real possibility. Amateur transmitting equipment had been impounded at the outbreak of war, and any sounds of morse attracted attention; a number of VIs were reported by suspicious neighbours as enemy spies. If there had been a successful invasion their position as undercover listeners for the Security Service would have been . . . well, interesting. To provide "cover" they were later enrolled into the Royal Observer Corps, although some eyebrows were raised when it was noticed that they could not always tell a Blenheim from a Junkers 88.

*c/o BBC, St Catherine's Close, All Saints Green, Norwich, Norfolk NR1 3ND.



A wartime meeting of VI group leaders at the Leatherhead regional office of the Radio Security Service. Old-timers will recognize many familiar faces, as very many of these amateurs served on the RSGB Council in the 'forties and 'fifties, including at least three former Presidents (Arthur Watts, G6UN; "Dud" Charman, G6CJ, and the late Gerald Marcuse, G2NM). Lord Sandhurst (centre, standing and smoking a pipe) and a number of "Box 25" officers are also in the group

Initially, VIs were instructed simply to listen for anything unusual, gradually being provided with guidance as to what was *not* wanted. The mass of enemy and Allied Services traffic was the responsibility of the Services, enemy transmissions being covered by "Y", the joint Services intercept organization, in which a number of pre-war amateurs were already involved.

The great discovery

The VIs, if truth is to be told, found no mf beacons and few genuine enemy spies in Britain. For from the outset of the war German agents, as they arrived in this country, were quickly located (for reasons that will emerge later) and often "turned" into double agents, controlled by British Intelligence in what became known as the "Double Cross" system, sometimes with British amateurs at the key of the German "suitcase" sets (which often required skilled adjustment before they could be made to work). But the VIs stumbled on to something infinitely more important than a few lone German spies would ever have been, a spreading network of German secret communications links between stations in Berlin, Hamburg, Vienna and Wiesbaden and outlying German Intelligence posts in occupied and neutral countries and in ships. Some were radio links with agents in the field, but many more were the busy circuits to the "Asts" and "KOs"—the main Abwehr and RSHA offices in the towns and cities. A few were dx circuits to North and South America.

These stations used the techniques of "clandestine" radio: for example, callsigns were not linked and were frequently changed; out-stations could reply on any one of several frequencies; stations seldom used a "net" frequency, etc. It was quickly realized that while VIs were hearing and logging these stations, little or nothing of this traffic was being reported or intercepted by the official "Y" organization. The VIs seemed to possess a "sixth sense" in sniffing them out from the vast mass of wartime w/t traffic. Possibly this was because many of the German operators were former amateurs themselves and tended to engage freely in "chat"; possibly because their transposition ciphers tended to have a different "feel" to the military substitution codes.

The VIs duly filled in their RSS log sheets and sent them by post to headquarters, which for a time was located in the cells of Wormwood Scrubs prison, but which soon became the cryptic "Box 25" that was in reality Arkley View, Barnet, in North London. Here RSS set up its discrimination and traffic analysis unit, manned in part by amateurs, to keep tabs on this interesting and growing German radio activity and to extract all possible signals intelligence from the logs before passing the coded messages to the Government School of Codes and Ciphers at Bletchley Park (Station X or "BP"), some 40 miles north-west of London.

The logs were marked with comments such as "Watch please" or "OK covered thanks" or "More please" and then returned to the VIs to show what to look for and to spur them on to even greater efforts. In some areas the VIs were formed into local groups under a VI group leader who in turn was responsible to regional officers of RSS located in various parts of the country.

The regional officers, each with a small staff, held occasional meetings with the group leaders, or directly with the VIs, to encourage them to spend many hours diligently searching for and copying stations which sent messages that meant nothing to them. By 1941 the logs were flooding into Box 25, reaching a peak of 10,000 pages in a single day. There was just one highly unfortunate breach of security. In circumstances that have never been fully explained, the *Daily Mirror* in February 1941 published a report headlined "Spies tap Nazi code" that described, at least in outline, the VI system. It could not have come at a worse time.

For at first only the relatively low-grade "agent" codes had been readily deciphered at Bletchley Park; the great bulk of the five-letter cipher traffic sent to and from Germany was as meaningless to the BP cryptoanalysts as it was to the VIs. But then, towards the end of 1940, things developed in a way that underlined the remarkable success of the VI system, yet at the same time also sowed the seeds of its later decline.

The German traffic

From about December 1940, BP began regularly to break into the vitally important transposition hand codes used for the majority of the messages to and from the Ast and KO outstations. Soon British Intelligence was reading, daily, dozens of top secret messages about the plans and activities of the German Intelligence services all over Europe. This, it can be argued, was as valuable to the Allies as the "Y" interception of Enigma machine-code messages of the German Air Force and (later) the German Navy—the key intelligence material distributed as ULTRA. For the Germans had one extraordinarily careless cryptographic practice; they frequently re-encoded messages received in a relatively low-grade code, word for word, into a higher-grade code for retransmission. Apart from the intrinsic value of the Intelligence traffic, there are some who firmly believe that it was often the Abwehr/RSHA messages that helped BP solve the Enigma keys so quickly that they frequently read the German military traffic before it reached its intended destination. There is also no doubt whatsoever that the ability to read over the shoulder of the German spy chiefs played a vital role in the Allied deception plans (many of them based on double agents) that saved countless thousands of lives during the landings in North Africa, Italy and France.

But effective though the VI system had proved itself during 1940 at finding and collating the German secret communications, spare-time listening could not be expected to cope with regular interception of all this traffic, much of it sent during the VI's working day. The system had become *too* successful.

Furthermore, RSS was a creation of the Security Service, but those who were concerned with Intelligence activities on the Continent were members of the Secret Intelligence Service (MI6). With considerable reluctance, and following the intervention of Sir Winston Churchill, a joint arrangement was agreed between the different organizations. A special intercept station would be built and manned by operators drawn largely from the ranks of the VIs. As a result, from autumn 1941 many of the erstwhile radio amateurs were enlisted into Special Communications Unit No 3* and found themselves at Hanslope Park, a country estate conveniently near to BP and to Whaddon Hall, the secret service radio base. Even before the permanent station had been completed in May 1942, Hanslope Park became known as "The Farmyard", and is still remembered half-affectionately by those who served there as the longest lasting, if most frustrating, Field Day of all time. The station provided a 24h watch on the many German networks that had been uncovered by the VIs; other smaller stations were set up in Scotland, Cornwall and Northern Ireland. A network of hf df stations was established to keep tabs on the locations of the many fresh out-stations that the Germans kept establishing.

At the time, the former VIs, knowing nothing of the high-level arguments as to who should have control over them, found it difficult to take kindly to the uniformed ambience of Hanslope and felt let down by RSS. This mood was heightened at the end of 1941 by the departure from Box 25 of Lord Sandhurst, who had established an extremely strong *rapport* with "his" VIs. He moved to another branch of SCU at Whaddon Hall, where later he was able to bring in from Hanslope a number of ex-VIs.

A few VIs became full-time intercepters in their own homes; the others were mostly put on to "general search", seeking out new stations in allotted frequency bands. A still extremely useful but perhaps altogether less exciting "hunt" than in those heady days of 1940–1 when they first found and put together the networks (or "groups" as they were called) and became, admittedly by accident, an important and unique "source" of information about what was happening in occupied Europe, the unpleasant "surprises" that were being prepared for the Allies, and the fruitless attempts to infiltrate spies into the UK.

Some, though by no means all, VIs had an inkling of the part they were playing in the war effort; others were left in ignorance on the "need to know" principle; virtually none was told of the deciphered contents of the messages. Some of those who joined SCU3 came to know a good deal more, and some were drawn into aspects of Intelligence that even today have not been fully revealed and are still subject to the Official Secrets Act. Military historians are just beginning to catch up with the role of Sigint between 1939 and 1945 but tend to concentrate on the code-breakers at BP rather than on those who had the often equally difficult task of plucking the "goodies" out of the air.

Unfortunately inter-departmental and careerist rivalries persisted. At the end of the war in Europe, those who were still VIs received an undistinguished certificate signed by H. J. Creedy of the War Office thanking them for their efforts; a few, a very few, received the BEM, an award that some may feel hardly reflected the importance of the role they had played in making possible British Intelligence's greatest coup of all time. Otherwise, at least until "The Secret Listeners" was screened, the whole VI-SCU3 set-up remained unacknowledged, even during recent years when book after book has told the story of Ultra, Enigma, Bletchley Park and Naval Intelligence.

The former VIs themselves tend to shrug this off, recognizing that secret intelligence often needs to be kept secret; that they have much more to be thankful for than those British, American and European amateurs who gave their lives or suffered unspeakable hardships in serving their countries as civilians, Service personnel or in the Resistance movements.

But it saddens me, as someone of a later generation than the VIs, that many of the names and callsigns that have appeared increasingly of late in the obituary column of *Radio Communication* have only rarely carried any hint of their work as VIs.

Much of the material I collected during the making of "The Secret Listeners" is now with Pat Hawker, G3VA (whose help in putting together these notes I gratefully acknowledge). It is hoped later to publish a comprehensive account—in so far as this is possible—of the role of British radio amateurs in the greatest, if saddest, amateur radio contest of all time. □

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*SCU3 was one of about a dozen Special Communication Units, under Brigadier Richard Gambier-Parry (former G2DV) engaged during the war in a multitude of covert and semi-covert activities on behalf of the Secret Intelligence Service (MI6). The counterpart organization in Germany—Signal Regiment 506—similarly contained many whose early operating experience had been gained on the amateur bands: they provided radio communications for the Abwehr (Military Intelligence) and the altogether less savoury Reichssicherheitshauptamt (RSHA) into which the Abwehr was later incorporated. RSHA included the notorious Sicherheitsdienst (SD) and the Gestapo, though there appears to be no reason to suppose that German amateurs, drafted into the regiment to work for Intelligence, took any active part in the type of activities with which, unhappily, we associate the parent organizations. The largest radio network (Group 2) was based on Berlin, with particularly active links to many intelligence posts (including shipping observers) in the Iberian peninsula, Norway, the Balkans and Asia Minor.—*Pat Hawker, G3VA.*

4-2-70

John Morris, G4ANB*

Certificate of appreciation for G4BPY

Some of the activities of Gordon Pheasant, G4BPY, of Walsall, towards the promotion of 70MHz awareness abroad were described in October. Several 70MHz enthusiasts have written to *4-2-70* with words of praise for his work, which has included sending designs and converters to foreign operators, and building the 5B4CY beacon on 70·112MHz. His efforts have been instrumental in producing a large number of cross-band contacts between the UK and countries in Europe, several of them "firsts", for G4BPY and for many other operators. These activities were discussed at a recent meeting of the VHF Committee, where it was decided that a special certificate of appreciation should be sent to G4BPY in recognition of his services.

Repeater news

The final three 145MHz repeater licences in vhf Phase 4 have been issued by the Home Office. One of the newly-licensed units, GB3WR, became operational on Ch R0 on 27 September from the Mendip Hills, near Wells in Somerset. The other two, GB3KN (R4, Maidstone, Kent), and GB3YJ (R7, Leamington Spa), are both due to come on the air by the end of 1980.

UHF repeater GB3SK (RB6, Folkestone, Kent) is off the air pending a site change. A proposal for a new 433MHz repeater, GB3WP, to be sited at Stalybridge, east of Manchester, has been provisionally accepted by the Repeater Working Group.

The Amateur Radio Association of Bahrain now have a vhf repeater operating on Ch R6. The repeater (callsign unknown) uses a single 5dB colinear antenna at 220ft asl and runs 20W output. Access is by the usual 1,750Hz toneburst. Operation and coverage have been excellent since installation last year, and amateurs sailing on vessels in the Arabian Gulf have been working over a distance of 300 miles. S. K. Street, A9BXE, the chairman and repeater keeper for the association, has issued an invitation to anybody travelling in the area to use the repeater, and they are assured of a warm welcome.

Returning to a somewhat less exotic part of the world, the Repeater Working Group held a very lively open meeting at Warrington on 20 September. A proposition rejecting the use of 12·5kHz channel spacing was passed unanimously. This was, of course, merely a statement of the views of the people present at the meeting, rather than a formal RWG decision, but it nevertheless gives some insight into the "grass roots" feeling on the subject. A suggested alternative was to make much more use of 433MHz, which has a comprehensive repeater network and is far more useful than many 144MHz users probably realize. It was argued that it would be absurd to make the expensive change to 12·5kHz channel spacing, which it is generally agreed would give inferior performance, when there is ample space on uhf.

Groups planning to build a repeater are asked to contact the general manager at RSGB HQ at the earliest possible stage so that their proposal can be taken into account when planning other parts of the network. This is becoming increasingly important now that the repeater networks are approaching saturation in some parts of the country.

Repeater channels revisited

The problem of finding enough channels on 145MHz for a comprehensive repeater network while avoiding co-channel interference was discussed in August's *4-2-70*. The suggestion that fixed stations using repeaters should use the least possible power and avoid "repeater dxing", or, better still, leave the repeaters for mobiles, brought several dissenting letters whose contents indicate that some elaboration on this theme is called for.

The Repeater Working Group of the RSGB bears the responsibility of co-ordinating the efforts of the many hard-working repeater groups around the country to provide a unified repeater network. The chairman of the RWG, G3XDV, has provided the following summary of the reasoning behind the "repeaters for mobiles" policy.

A repeater network can be designed for mobiles, or it can be designed for fixed stations, but not both. If the former, repeaters would be too close together for fixed stations to operate without causing co-channel interference; if the latter, there would be large areas between units where mobiles would not be able to access a repeater. An attempt at compromise would give the worst of both worlds. This argument holds even more force when the number of channels available is limited.

With the vhf repeater network still growing, there are areas where gaps still exist in mobile coverage, and co-channel interference is not *yet* a problem. In other parts of the country the terrain is such that repeaters are effectively screened from one another. It is significant that most of the letters received on this topic came from such areas.

VHF fm voice-modulated repeaters are licensed for the *express purpose* of aiding communication between and to mobile and portable stations. Fixed stations wishing to work a mobile or portable station heard on the repeater are asked to use as little power as possible, and move to a simplex frequency whenever practicable.

Tropospheric openings

Whenever two or three vhf operators are gathered together and start discussing propagation, the conversation inevitably turns into a debate as to which was the best-ever opening. In this context it looks likely that the opening of 3 October 1980, when a ridge of high pressure over southern England produced some of the best conditions on vhf and uhf for several years, will be a strong contender.

Propagation was better than average between 29 September and 2 October. Geoff Grayer, G3NAQ (ZL34f), worked stations on each side of the Swiss-French border on both 144 and 432MHz during this period. G3NAQ runs 400W p.e.p. to a 16-element Tonna at 65ft agl on the lower band, but only 20W p.e.p. to a 21-element Tonna at a similar height on 432MHz. On 29 and 30 September he heard IW1AHH, just the other side of Mt Blanc, calling him on 144MHz, but the signals were very weak with heavy QSB, and no contact resulted. Still with 144MHz, John Heys, G3BDQ (AK square), used a Nag linear running 150W dc input on cw and a 16-element Tonna at 400ft asl to work HB9PDN/P (EH79h), and to exchange 30dB over

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nine reports with HB9ARI on 30 September.

The bands were apparently fairly quiet on the following day, but conditions began to improve again on 2 October. On 144MHz G3BDQ worked HB9ARI again (with signal strengths as good as those of the previous contact), and many German stations in squares out to FH. G3NAQ worked several Swiss and German stations, as well as LA1EKO (BQ37g) in the Eko Fisk oilfield. Geoff Brown, GJ4ICD (YJ70a), has claimed a "first" between Jersey and Austria on 432MHz for a contact with OE2CAL. G3NAQ found very little dx on the higher band, and commented that the propagation seemed to be taking signals over his head—he could hear GI and GM operators working into central Europe, and Scandinavia being worked from the Channel Islands.

The best opening of all during this period began to develop in the afternoon of 3 October, and evoked superlatives from many correspondents: "Finally really broke—best opening heard so far"; "QSOd 17 countries on 432MHz"; "The big evening"; "Did not turn the beam away from Czechoslovakia and still got replies from Scandinavia"; "The only problem now is that I have over 2,000 QSLs to write out for September/October." Propagation was greatly enhanced on all bands from 144MHz upwards, although with irregular coverage of the country. On several occasions dx being heard and worked from one location was completely inaudible only a few kilometres away, with the opposite situation prevailing a short time later.

The earliest dx contact reported took place at 1523gmt, when Dave Bonfield, G4JXK (ZK14b), running 100W into a 9XY Tonna at 30ft agl, worked OE9LSI (EH49b) on 144MHz. During the evening both 144 and 432MHz opened to central Europe and Scandinavia. Among the best dx contacts made on the lower band were G4JXK to OK1KIR/P (GK45d), G3BDQ to OK2BFH/P (JJ33g), G3NAQ to SP6GWN/P (IK65h) and G3NAQ to OK2BFH/P—the last contact spanning a distance of 1,411km. GJ4ICD made contacts as far afield as EQ, GI, GP, HS and JT locator squares. G3BDQ switched on the 144MHz equipment at 1948gmt, and immediately heard and then worked OK1DKM/P (GK45d). He stayed on the air until 2359gmt, and worked a stack of dx, including five Danes in GP, GQ and FO squares, two Swedish stations in GP square, and a round dozen Czechoslovakians in squares as far as JJ. Are 12 OK contacts in one evening a record for a UK station?

On 432MHz the enhanced conditions were equally productive of long-distance contacts, including two more claimed "firsts" from the Channel Islands. GU8FBO worked OE2CAL (GH16c), and GJ4ICD worked OK1KIR/P for what are believed to be the first Guernsey to Austria and Jersey to Czechoslovakia contacts on this band. Other contacts by GJ4ICD on uhf included all but two of the many QTH locator squares in France. Bryan Harpur, G8DKK (ZL08d), concentrated his efforts on 432MHz, and made several dx contacts, the best being F9FL (AD71b), OK1KIR/P and OE2CAL. The best dx for G3NAQ included OK1AIB/P (HK29b) and OE2CAL.

Perhaps the most telling comment on this spectacular lift in conditions came from G3BDQ: "I remember when I first came on 144MHz in 1958 that OK contacts were an 'impossible' dream . . . (these contacts are) a tribute to modern equipment and the expansion of vhf activity in far-away places that have contributed so much to modern dxing".

Geoff Brown, GJ4ICD, has reported yet more "firsts" recently claimed by operators on Jersey, in addition to those mentioned above. The good conditions on 2 September helped GJ8KNV to claim the first Sweden to Jersey contact on 432MHz, while GJ3YHU used meteor scatter during the August Perseids meteor shower for the first 144MHz contact between Jersey and the Faeroe Islands.

Neil Montanana, G8RWG, returned from a holiday in Spain in September and received news of the good conditions prevailing at the beginning of the month. He recalled mention in an earlier *4-2-70* (February 1980) of the Sahara sand dust associated with the tropospheric opening in late November 1979. G8RWG wonders if any similar association existed with the Sahara dust which was over Spain at the end of August, causing very high temperatures and extremely unpleasant conditions.

50MHz

The regular 50MHz dx beacon monitoring activities of Trevor Brook, G3WBQ, in Surrey, produced only a single brief observation during late September and early October. The ZS6PW beacon was weakly audible between 1656 and 1701gmt on 9 October. ZS6PW is now back on its nominal frequency of 50·0300MHz, after a brief excursion to 50·032MHz, and the chirping and frequency jumping problems appear to have been cured. G3WBQ has found transequatorial propagation considerably less evident during the first part of October this year than it was during the same period in 1979.

EI9D must be eagerly awaiting the onset of good conditions on 50MHz, as he has just been loaned a 120W linear amplifier for the band by Lunar Electronics of San Diego, California, in the person of WB6NMT. The loan was arranged with the assistance of ARRL vhf columnist W3XO, and the amplifier was collected by G3IOR while attending a recent AMSAT meeting in Washington, DC.

Ken Ellis, G5KW, recently embarked on a 12-month propagation study expedition to various parts of the world. He is travelling with equipment for all bands up to 144MHz, including 50 and 70MHz, and has promised to be active whenever possible. Several of the planned ports of call are in countries where 50MHz operation is permitted. G5KW normally acts as controller for the 50MHz information net which runs every Monday evening from 1800gmt on or about 3·65MHz. During his absence G4JCC is controlling the operation of the net.

Beacon news

The mystery of the 432MHz beacon HB9F heard by G3XDV (*4-2-70* October) has been solved by Bryan Harpur, G8DKK, in Luton. HB9F has been operational since the beginning of July this year from a 2,300m asl site west of Geneva, locator DG41. It runs 10W output on 432·984MHz, the power being split between two corner reflectors, one beaming north and one south, with beamwidths of ±45°. This information was passed to G8DKK by HB9BPQ (ex-G8BGQ) in Geneva. Several other readers have reported hearing HB9F during the enhanced conditions of early October. The beacon keeper is HB9MFL, who would welcome reports.

G8DKK has been running troposcatter tests with HB9BPQ, and HB9F has proved invaluable as an indicator. It has been possible to predict the likelihood of a contact by monitoring the beacon, which is often weakly discernible in the noise at Luton. The keying has been described by G8DKK as somewhat curious, in a manner reminiscent of HB9HB on 144MHz. He has also heard the F6KKU beacon on 431·995MHz, but has been no more successful than G3XDV in finding any details.

All has also been revealed about the F6KKU/B 432MHz beacon heard by G3XDV. The information in this case was provided by Esmond Aguilar, F6GOV/G4KBJ, a Briton who has been living in France for the past 30 years. F6KKU/B is situated at a height of 100m on the top of the Lille town hall, near the Belgian border. Power output is 1W on 432·000MHz. No French repeaters are easily accessible by mobile stations in and around Lille, so one of the local clubs, F6KKU, decided to investigate the possibility of installing a local 432MHz unit. F6KKU/B is being used to study the coverage which could be expected from a uhf repeater at the same location.

A formal proposal has been submitted for the new Scottish 70MHz beacon being planned by Chris Tran, GM3WOJ, and associates for the same location as the existing 144MHz beacon, GB3ANG (YQ35c, 144·975MHz). This should be an ideal compromise site for both tropospheric and auroral indications, and there are many amateurs operational on 70MHz nearby in Fife. The suggested frequency is 70·690MHz, and it is proposed that the same callsign, GB3ANG, should be used by both the 70 and 144MHz units.

GM3WOJ has also been inquiring about the 144MHz beacon GB3LER (ZU65f, 144·965MHz), which has been off the air since it was blown up by the psu going over-voltage. The Shetland club hopes to take over this unit on a locally maintained basis, and GB3LER should be operational again by next spring, or possibly earlier if suitable spare hardware can be found.

The fastest ton in the west?

Steve Lovell, GW8XPZ, received his new callsign from the Home Office on 19 September and decided to run his own competition—to work 100 different stations during his first day on the air! He spent a total of eight hours on Caerphilly Mountain in south Wales, operating an IC22A with a 40W linear amplifier and a 5λ/8 magnetically-mounted whip antenna on the roof of the car, and worked a total of 103 stations. Three of the contacts were made through the local repeater, GB3BC, but Steve went on to make sure that he worked 100 stations using fm simplex, mostly on Ch S15.

This exercise caught the imagination of 144MHz operators, and as the day went on stations were queueing up to work GW8XPZ/M. Steve wishes to thank the many amateurs who helped him make what must be the fastest century on record. He found a great sense of friendship on the band. A short "QRZ contest" would bring up a caller, saying "I'll be number 62" and so forth.

Can anybody match this singular way of starting on 144MHz? It would be interesting to hear the experiences of other readers during their first days on vhf and uhf.

144MHz cw activity

Several favourable comments have been received on the proposal made in September by Bill Scarr, G2WS, for nightly 144MHz "cw contact periods" from 8 to 8.15pm. Activity is slowly but steadily growing between these times, neatly complementing the Monday evening cw activity periods at 2000gmt.

Many recently-licensed Class B operators have been heard to state that they are busy learning morse code in order to obtain Class A status. Both the weekly and nightly events provide ideal opportunities to increase receiving speed and at the same time learn the operating procedures used on cw. A good technique for acquiring skill is not to be put off by stations which seem to be sending faster than one can copy. Proficiency is achieved much more quickly by trying to receive at 15wpm and missing a lot than by searching for a signal that is slow enough to copy perfectly.

Patrick Bennet, G4JHL, in Worcestershire, is more concerned with the plight of those who have passed the morse test, but have not yet gained sufficient expertise to be able to go on the air with confidence. Patrick, who is disabled, and describes himself as "a novice aged 61—the oldest teenager in the business", finds himself in this predicament. He has long tried to establish contact during the Monday evening activity periods, but all too often his concentration lapses, as by the time the activity commences he is usually thinking of retiring for the night. G4JHL is therefore looking for a retired or disabled well-seasoned cw operator who can find time to control a morning net. Anybody could join in with just a few words, and so gain confidence with the knowledge that the rest of the net would be sympathetic to any errors. Your scribe will gladly pass on messages from any volunteers.

Patrick also commented on the apparent inability of some operators to understand the abbreviation "QRS". This means "Please send more slowly", and is one of the most useful, but much under-used, Q-codes for the newcomer to cw mode operation.

70MHz Scottish expedition plans

Chris Tran, GM3WOJ, has revealed some of the plans being formulated by the South of Scotland VHF Contest Group to mount a 70MHz meteor scatter and contest expedition to the northern mainland of Scotland next year. The group is planning to leave a "B-team" on its regular contest site on the Mull of Galloway next August, and mount an expedition arranged to coincide with the Perseids meteor shower and the 70MHz Trophy contest, nobly "sacrificing the chance of winning again in the hope of activating a new square or region". The 3·5MHz band will be used as a talkback link, and the group have hopes of setting several new records by meteor scatter, which is much easier on 70MHz than on 144MHz.

G3XBY has also been persuaded to travel north for the 70MHz Trophy contest in August 1981. He hopes to be operating from the Inner Hebrides, another new area.

Moonbounce experiments at GW3XYW

Stuart Jones, GW3XYW, has written to *4-2-70* with details of some of his recent eme activities from south Wales on 432MHz. During the activity weekend on 27 September he worked K5JL and OH3TH. The contact with OH3TH is thought to be the first between Wales and Finland by moonbounce on 432MHz.

GW3XYW uses a 6m (20ft) diameter dish antenna with a preamplifier based on an MGF1400 gasfet and a K2RIW linear amplifier. Present experiments include the development of an automatic tracking system to allow full concentration on operating the station, without worrying about where the antenna is pointing, "rain or moonshine". The system uses a PET microcomputer with a home-brewed interface.

Stuart is also interested in sounding the Lagrange or Trojan points in the lunar orbit for any possible echoes. These are the points leading and trailing the moon in its orbit by 60°. They normally represent points of stability where any interplanetary flotsam tends to congregate, although in the case of the earth-moon system the situation is complicated by the gravitational influence of the sun.

RSGB FOUR METRES AND DOWN AWARDS

The following awards, intended to mark successful vhf/uhf achievements, are available:

Title of award	Requirement
70MHz Standard Transmitting	3 countries, 30 counties
70MHz Senior Transmitting	6 countries, 60 counties
70MHz Standard/Senior Receiving	As transmitting
144MHz Standard Transmitting	6 countries, 40 counties
144MHz Senior Transmitting	15 countries, 60 counties
144MHz Standard/Senior Receiving	As transmitting
432MHz Standard Transmitting	3 countries, 20 counties
432MHz Senior Transmitting	9 countries, 40 counties
432MHz Standard/Senior Receiving	As transmitting
1,296MHz Standard Transmitting	3 countries, 20 counties
1,296MHz Senior Transmitting	6 countries, 40 counties
1,296MHz Standard/Senior Receiving	As transmitting
Supreme Award (fixed stations only)	Three Senior awards, or two Senior awards plus one 1,296MHz award

(1) All claims must be fully supported by QSL cards.
(2) All contacts must have been made after 1 January 1961 in respect of old UK counties, or after 1 January 1975 in respect of new counties. Scotland revisions with effect from 1 January 1976.
(3) Eligible counties are shown on the list attached to the claim form.
(4) Stations are eligible for the awards in the following groups:
  (a) Fixed stations;
  (b) Alternative address (/A) stations, any address;
  (c) Portable (/P) stations, any location;
  (d) Mobile (/M) stations, any location.
(5) All claims must be submitted to the vhf awards manager, whose name appears on the title page of *Radio Communication*.
(6) For the return of cards send adequate postage in stamps. Also send an address label from a recent issue of *Radio Communication* as proof of RSGB membership.

RSGB 4-2-70 SQUARES AWARDS

The following awards, intended to mark successful vhf/uhf achievement, are available. A certificate and one sticker will be issued, and further stickers will be issued as additional QTH squares are worked.

Title of award	Requirement
70MHz 20/4	20 QTH squares including 4 countries
70MHz 25/6	25 QTH squares including 6 countries
70MHz 30/8	30 QTH squares including 8 countries
70MHz 35/10	35 QTH squares including 10 countries
144MHz 40/10	40 QTH squares including 10 countries
144MHz 60/15	60 QTH squares including 15 countries
144MHz 80/18	80 QTH squares including 18 countries
144MHz 100/20	100 QTH squares including 20 countries
432MHz 30/6	30 QTH squares including 6 countries
432MHz 40/10	40 QTH squares including 10 countries
432MHz 50/13	50 QTH squares including 13 countries
432MHz 60/15	60 QTH squares including 15 countries

(1) All claims must be fully supported by QSL cards bearing QTH locator details.
(2) All contacts must have been made after 31 December 1978.
(3) Eligible countries are shown on the list attached to the claim form.
(4) Stations are eligible for the awards in the following categories:
  (a) Fixed stations;
  (b) Alternative address (/A) stations, any address;
  (c) Portable stations, any location;
  (d) Mobile stations, any location.
(5) All claims must be submitted to the RSGB vhf/uhf awards manager, whose name appears on the title page of *Radio Communication*.
(6) All applicants must be members of the RSGB and must enclose an address label from a recent issue of *Radio Communication* as proof of their membership.
(7) QSL cards submitted must be in alphabetical order, and a checklist enclosed of the QTH squares claimed.
(8) For the return of QSL cards, adequate postage in stamps must be sent with the application.

Awards

A much larger than usual number of award claims has been submitted recently. Notable among these was a claim for the 1,296MHz FMD Senior from Eric Neal, G8GP, who already holds Seniors for 70, 144 and 432MHz. Peter Burden, G3UBX, of Wolverhampton, becomes the first holder of the 432MHz 10 countries and 40 squares sticker. Tony Collett, G8GXE, submitted a multiple claim to collect two FMD Awards, two Squares Awards, and one Microwave Award.

The full list of recent 4-2-70 Squares Awards is as follows: 144/10/40 to G8GXE, G4CUS, G8OMI, G8RXH, GU8BFO, G3XDY, G8NDF and G8PKN; 144/15/60 stickers to G3NAQ, G8CXQ, G4HMF and G8BWR; 144/18/80 sticker to G4IJE; 432/6/40 to G8GXE; and 432/10/40 No 1 to G3UBX.

In the FMD series the 144MHz Standard has gone to G8NDF; 144MHz Seniors to G3AHB, G8GXE and GU8BFO; 1,296MHz Senior No 3 to G8GP; and 144MHz receiving certificate No 37 to BRS26003.

RSGB vhf/uhf awards

Several enquiries have recently been received about the various vhf and uhf awards given by the RSGB, so the full rules are reproduced here. There are two sorts of award, both of which are available to transmitting members, on the basis of confirmed contacts, and to receiving members, for confirmed reception reports. The Four Metres and Down (FMD) Awards are given for working or hearing suitable numbers of countries and UK counties on 70, 144, 432 and 1,296MHz. The 4-2-70 Squares certificates are awarded on the basis of the number of countries and QTH locator large squares (first two letters of the QTH locator) heard or worked on 70, 144 and 432MHz. Each type of award is available in several categories, as shown in the rules. Claim forms, which include county and country lists, are obtainable from the vhf awards manager, Jack Hum, G5UM, 27 Ingarsby Lane, Houghton-on-the-Hill, Leicester, on receipt of an sae.

Both G4ANB and G5UM receive a small but steady stream of enquiries asking if the FMD Awards are to be phased out and only the newer Squares Awards continued. The answer is that as long as the demand continues the FMD Awards will be retained. Claims for the Squares Awards are far outnumbered by those for the FMD series, and therefore no changes are planned.

Another regular query concerns the status of a claim if a member is compelled to change QTH while collecting the cards for an award. Although it was once mandatory to start afresh, this ruling was so onerous that it was dropped several years ago. If, when a claim is made, the member indicates which contacts were from the old QTH and which from the new, this can be noted on the certificate if desired. It is also possible for those who have already earned a certificate before changing QTH to start collecting from scratch for a second certificate. Certificates may also be annotated "cw only" or "fm only" where appropriate if requested.

Final

Best wishes for Christmas and the New Year to all readers, and keep those letters flowing in. Special greetings and thanks to the many correspondents who have sent news and views to *4-2-70*.

the month on the air

John Allaway, G3FKM*

DURING the course of his very long career in amateur radio, your scribe must have received many thousands of pieces of correspondence which contained the words "amateur radio" or his callsign in the address. During this period he is not aware of any package which has gone astray because of this—and in fact the very reverse has happened on more than one occasion when the rest of the information on the envelope was incomplete and the Post Office has been able to route it correctly because of the mention of amateur radio.

This happy state of affairs does not apply in some other countries, and the mention of amateur radio or a callsign in some cases can be an open invitation to the less scrupulous to steal—since many such letters include ircs or even money. There are also places where even properly licensed amateurs prefer to retain a low profile for other reasons.

The moral of this seems to be: when mailing correspondence to amateurs in the lesser developed countries do not make any mention of amateur radio in the address.

Once again the festive season is with us, and the writer would like to take this opportunity to thank all those who have helped him to compile *MOTA* during 1980—and to wish all readers a very happy Christmas.

Dxpeditions

Some possibility of a properly licensed operation from the South Sandwich Is is mentioned in *QRZ DX*. This quotes VP8PP as saying that a group of VP8s hopes to visit the islands early in January and may use the callsign VP8SSI. This would be the first legal operation from the area for 12 years.

The International DX Foundation reports that the KP2A 1980 Asian Expedition produced 55,300 QSOs. This included the operation from 9M6MU, VS5, VS6CZ and CR9A. W4MGN's African trip produced 5,096 contacts, and TY9ER 2,132. For information about the foundation write to Box 117, Manahawkin, NJ, 08050, USA, enclosing an sae and irc.

The *DX Bulletin* quotes *DX-NL*'s report that DL1VU would leave on 1 November for Australia, New Zealand and Tonga, where he would join up with OE6BVG to travel until March 1981. A tentative schedule was: Tonga (from 25 November), Wallis Is (from 15 December), Niue (January), New Caledonia (February), and New Hebrides, Cook Is and French Oceania also possible. Activity will be mostly on cw about 5kHz above lower band edges, and QSLs will be dealt with by DL2RM.

Just after the closing date for last month's *MOTA*, information arrived from the YASME Foundation which said that Iris and Lloyd Colvin, W6QL/W6KG, were to commence another of their expeditions on 1 October. They were due to visit Israel, Crete, the Dodecanese Is and other places. Later information is that they will leave Tel Aviv on 13 December for Florida where they will collect more log books and proceed to FM, FG and FS. All QSLs should be sent to the address in "QTH Corner". A reminder that those who have proof of contact with 30 or more YASME calls may apply for the YASME Award by sending their cards to W0MLY. There is no charge.

According to *QRZ DX* there may be an expedition on the air from St Peter & Paul Rocks on 12, 13 and 14 December. Six operators will be involved—three on each mode—and they have the callsigns PY0RA and PY0SA.

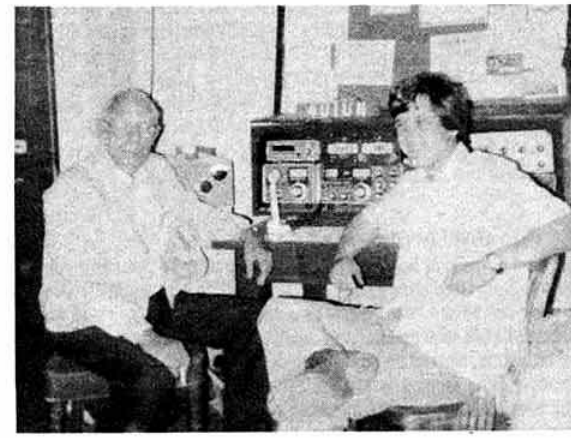
VK2NDK is expected to operate from Kiribati during December, and is likely to use the following frequencies: 3,595, 7,095, 14,195, 21,295 and 28,595kHz (ssb) and 25kHz above lower band edges on cw.

G4JWT and G4JVG hope to be active from the Aland Is again, probably towards the end of December or during January 1981. Callsigns will be G4JVG/OH0 and G4JWT/OH0, and favoured frequencies will be 3,790, 14,225 and 28,550kHz. Equipment will be an FT707 and wire antennas, which will include a delta loop for 3·5MHz. Some 21 and 7MHz operation may be included.

4U1UN

Martin Atherton, G3ZAY, recently visited New York and had the chance to see the amateur station in the UN building. It is located in the changing area of a recreation room on the 40th floor, and the equipment for the hf bands consists of an FT101, a Henry linear amplifier, and a multiband dipole antenna fixed to the parapet about 500ft above ground. The local noise level is very high and the antenna performance is degraded by the metalwork in the building, which makes operating none too easy. The station is generally available for use by visiting amateurs (who do not need a USA reciprocal licence) on Saturdays by prior arrangements with W2MZV (who is the station QSL manager) or HB9RS/W2 (the club president). Other times are difficult to arrange because the changing room is often needed at short notice.

Martin also gives advice to those wishing to visit ARRL HQ at Newington. He advises taking a train to New Haven and then changing to the Springfield train and dismounting at Hartford. After a 10 min walk to the bus station take the New Britain bus to Main St, Newington. A whole day is needed for the round trip from New York City.



W2MZV (l) talks to G3ZAY during his recent visit to 4U1UN (see text)

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News from overseas

Allan Papworth, G3WUW, is now in Bahrain and using the callsign A9XDB. He is looking for UK stations every Sunday around 1600 on 21,150kHz or nearby. QSLs should be sent to the address in "QTH Corner". Allan says that A9XDA is also newly licensed in Bahrain.

John Peach, G5JP, recently returned from Greenland, where he had been a member of the British NE Greenland 1980 Expedition which was led by Dr Geoff Halliday of the University of Lancaster. He wishes to record his appreciation of the efforts made by a number of British stations to copy his signals—especially on 7MHz where noise, static and magnetic disturbance are not kind to low power. He mentions G3KHZ, GI3AXI, G3IPM, GM8CH, GM3AXR, GM3KPD, G8DV; and G8FF, the owner of the HW7 used. GM3SWK, GM6RV, GM3AWF and G3FXB also helped. Operation on 21MHz was easier, even though the transmitter input was only 1·5W and used /P. All contacts were normal—not dxpedition type, and John thinks that very few would have thought it possible to get through from OX after 1000 on 7MHz running only a few watts.

Nigel, G3TXF, visited Mauretania recently and managed to make 1,700 contacts (all on 21 and 28MHz cw) thanks to the help received from the Mauritanian OPT and from Jacques, 5T5CJ. He was able to operate with his own callsign—5T5NC—and QSLs should be sent to the address in "QTH Corner".

Andre (formerly 5Z4KL, 5Z5KL, 5Z4KL/Uganda etc) is now GM3VLB. He writes: "After several moves up and down the country since my return to GM-land in 1973, I finally settled two years ago in Kelso. Activity on the air has been rather low due to the frequent moves, but by next year there should be a quad on the outskirts of Kelso. Four of my pupils at Kelso High School passed the RAE last year and we have just received the school call, GM4KHS. I have just started another class at the local community centre and have 11 "hopefuls". Other former East Africa amateurs are welcome to join us on the Ex-East Africa Net every Wednesday on 7,095kHz at 1245 (local time) and all friends are welcome. It was nice to meet so many old friends for the first time during my first visit to the Scottish National Convention recently."

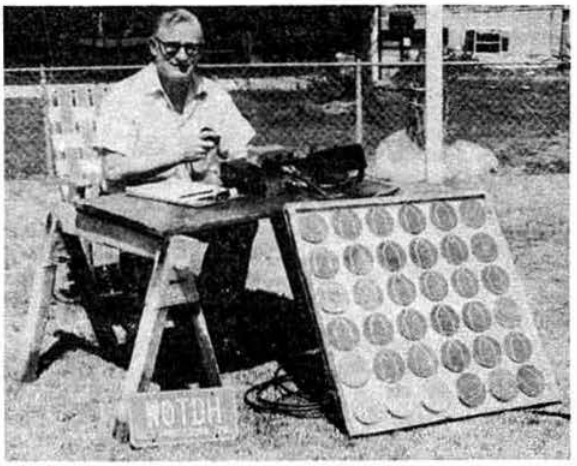
Peter Conway, now G3UFI but formerly 7Q7BC, has written to say that anyone who contacted him when he was 7Q7BC or 9J2BC and who still needs a QSL should apply to the address under the former call in "QTH Corner". He left Malawi at the end of June and at that time there was no sign of licences being re-issued. It seems that there are rumours of activity by 7Q7AE and 7Q7LW, and as both are members of the Malawi Police this could be correct.

Phil Weaver, VS6CT, now asks for QSLs via KB9N at the address in "QTH Corner". He says that anyone still looking for VS6 or Zone 24 might be able to find him on 28,450kHz at 1300 on most days. A recent visitor to Hong Kong was Don Wallace, W6AM, who still (at 82 years old) climbs the 35ft telegraph poles on his rhombic "farm"!

DX news

GJ3RAX has passed along the information that the Spanish novice licence holders (using the EC prefix) have cw allocations on 3,550-3,575kHz, 7,020-7,030kHz, 14,000-14,150kHz and 21,100-21,150kHz. They also have a phone band from 29,100 to 29,100kHz.

Fred Laun, formerly HS1ABD and K3ZO, is now in Colombia and awaiting an HK3 call.



W0TDH, St Louis, Missouri, runs a Cobra 138A from solar power with the 18V at 1·5A generated by a 30 by 30in solar panel consisting of 36 4in-diameter cells bought on the surplus market

The Pacific DX Net meets at 0530 on Tuesdays and Fridays on 14,265kHz. VK3PA and VK2CX often act as co-ordinators, and they call in full members of the net first—in order to be one of these, one must have been operational at some time from the Pacific and have registered with WB8LJW.

It is reported that all amateur radio activity from Turkey has been stopped during the present period of unrest. TA1MB has advised his QSL manager that all mail is subject to check and it is suggested that no correspondence of any kind be sent to Turkish amateurs. TA1MB is not able to send his logs to K2UO, and this will mean a delay in dealing with QSL requests.

Father Dave, CE0AE, has now returned to Easter Is. CE9AL is a new station on the air from the South Shetland Is.

TJ1CK, Conrad, is a new operator and should be in Cameroon for several years. He has been heard on 21MHz between 21,250 and 21,300kHz around 2100, and also on 28MHz around 1300. 9U5BB is now acting as QSL bureau for Burundi amateurs, and may be found on most evenings around the following frequencies: 14,017, 21,017 and 28,017kHz (cw); 14,090 and 21,090kHz (rtty); and 21,210 and 28,900kHz (ssb).

Okino Torishima will be deleted from the DXCC Country List with effect from 1 December, and it is understood that the 7J1 prefix will probably be used after this date for stations on Ogasawara.

G4JVG/SM0 reports that G3KTJ is on 14,275kHz at 2000 on most days helping a number of European, North American and Japanese stations to contact some of the more difficult South Atlantic and Antarctic stations. Among those who have been heard on the net are CE9AF (South Shetland), VP8PP (Falkland Is—QSL to Box 224, Port Stanley), VP8SB (Adelaide Is, Antarctica—QSL to G3ZMF), VP8SU (South Georgia—QSL to G3RCA), VP8ZR (South Orkney—QSL to G3KTJ), and ZS1ANT (Sanae Base, Antarctica). He also mentions that VP8SU is often on 14,265kHz at 1900.

Long Skip mentions that CE9AF may be found on 14,274kHz at 0000, or on 28,500kHz at 1730. Mario, CE9AH, has been on 7,004kHz from 1000, 14,006kHz from 0300, 21,018kHz at 0000, and 29,010kHz at 1830. Atturo, CE9AL, has been on 14,225kHz at 0900 with CE9AH.

3B6CD has now returned to Mauritius and his replacement is not an amateur radio operator. Moosa, 3B8AE, was due to be back on Rodriguez Is on 11 November and was expected to use the callsign 3B8AE/3B9. D68AP has closed down, and D68AM appears on 21,280kHz at 1730 and on 28,560kHz at 1900 to work prepared lists of stations. FH8CL is also reported to keep a schedule with I8KFB at 0300 on Tuesdays and Thursdays on 14,220kHz. 5R8AL is active again and has been heard near 21,275kHz after 1730.

G3DYY may be in Zanzibar at the time this is being read, and hopes to be using a 5H1 call for the rest of December. He is likely to use cw only and has a TenTec Century 21. 5N0DOG used the callsign 5N20DOG during October to celebrate the 20th Anniversary of Nigeria's independence.

Two other African stations keep regular schedules: 5V7HL meets N5ADC every Sunday at 2100 on 21,290kHz, and TL8WH talks to N4AXR on Sundays at 0500 on 14,340kHz, and on Mondays at 2100 on 21,390kHz.

VS5LH frequently operates between 0900 and 1030 on Mondays and Thursdays on 14,210kHz.

VR6TC still continues his regular appearances on Tuesdays and should be sought on 28,950kHz at 1830 or on 21,352kHz at 2330. Diane, T2XYL, likewise can be found daily between 0700 and 1000 in the 14,220-14,280kHz part of the 14MHz band, or at weekends on 21,315kHz at 0800.

Welcome

The following overseas amateurs joined the Society during August and September: DB6DB, EA7GT, EA1DA, EI2DS, EI2DU, EI4DU, EI5ABB, EI7DN, EI8DW, EI9DM, F1ELT, F1EUQ, F5DE, F6FOB, F8YO, JA4ZU, K7KK, LA1ND, OZ2JF, OZ4ZT, SM3EVR, SM0GMZ, VE3CYP, VE7CUE, VK6WV, VP2AG, VP9IX, VU2XXZ, WD4PEQ, WA8LTX, W0OJD, ZS6AD, 5N8THG and 9Y4AL. In addition, the following listener members joined: D. B. Collins (DL), H. Miller and J. C. Lowes (ZS6), J. W. Petrie-Baker (VU), P. McNally (EI), B. Nelson (EA), G. Maciocci (HB), M. O'Farrelly (EI), J. Mainardi (F), M. J. Dunn (DL), J. Morpeth (EA), J. West (VS6), J. de Sousa Fontes (CT) and V. Sancto (DL).

Radio Amateurs Conversation Guide

Steven Pocock, G4GTU, has written to commend this publication and says that the book is outstanding and the cassettes very helpful. Understanding the replies received may prove a problem however! Delivery takes about three weeks and the *Guide* now costs US $10, with supplements costing US $2 and cassettes US $8. Orders should be sent to Transelectro OY, Box 8, SF-00601 Helsinki 60, Finland. Supplements currently available cover Finnish, Swedish, Dutch and Serbo-Croat—the last two being worked on at the time of writing. Bulgarian, Japanese, Italian and Russian cassettes wil be available soon; German, Spanish, French, English, Finnish and Swedish cassettes are already available.

Contests

Canada Contest

0001-2359 28 December

Open to all, 1·8 to 144MHz, phone and cw combined. Single-operator single- and multi-band, multi-operator single-transmitter multi-band categories. The same station may be worked twice on each band—once on cw and once on phone. Exchange RS/T plus serial QSO number (from 001), Canadian

Graham Bubloz, G4FNL, is mainly interested in cw hf operating

stations will indicate their province. QSOs with Canada count 10 points, with others one, and there are 10 bonus points for working CARF official news stations using the suffix TCA or VCA. Multipliers are the number of Canadian provinces/territories worked on each band and mode (12 provinces × eight bands × two modes = maximum 192). Frequencies around which activity will centre are listed as 1,810, 3,525, 3,770, 3,900, 7,025, 7,070, 7,230, 14,025, 14,150, 14,300, 21,025, 21,200, 21,400, 28,025 and 28,500kHz. Entries must include log sheets, dupe sheets, and a summary sheet showing a chart of multipliers per band/mode and score calculation. Send entry and comments to: CARF, 203-1946 York Avenue, Vancouver, BC, Canada, V6J 1E3, before 15 January 1981. Enclose sae and irc for copy of results.

Results of the **1979 CQ WW DX Contest (CW)** appeared in October *CQ*. Scores of UK stations were as follows:

SINGLE OPERATOR

Callsign	Band	Points	Callsign	Band	Points
G3MXJ	All	2,122,120	**G3FXB**	(28MHz)	389,302
G5CMX	. .	1,249,558	G3HCT	. .	324,618
G3XTT	. .	547,820	G3RUX	. .	285,797
G3ESF	. .	514,280	G3TZU	. .	198,107
G3DYY	. .	453,632	G4CNY	. .	193,380
GW3JI	. .	356,004	G3MZV	. .	152,640
GI3JEX	. .	161,756	G4FNL	. .	75,040
GW3MPB	. .	145,656	**GM3YOR**	. .	59,040
G2AJB	. .	143,714	G4FDC	. .	11,058
GI5UR	. .	118,632	**G3TVW**	(21MHz)	106,920
GM3NHQ	. .	81,070	G3JKY	. .	50,912
GM3WRN	. .	80,560	**GU3MBS/M**	. .	50,830
G4BUO	. .	58,302	G4DNV	. .	32,890
G6NK	. .	43,610	**G3KDB**	(14MHz)	246,584
G8DI	. .	41,216	G3PVA	. .	132,552
GM4BFX	. .	36,378	**GU4IUW**	. .	5,270
G4IUF	. .	27,180	**GW3NYY**	(7MHz)	139,040
G3CWL	. .	2,001	**G3SZA**	(1·8MHz)	21,960
GU4CHY	(28MHz)	427,934	**GW3GWX**	. .	1,280

MULTI-OPERATOR SINGLE-TRANSMITTER

G4DSE	1,246,485 points	G4BRA	379,750 points
G3GJL	935,101 points	G4BP	214,840 points

In the **QRP section** (5W or less input) **G4BUE** had the highest world score with 481,347 points on all bands. Certificate winners are listed in bold type.

ARRL 10 Meter Contest

0000 13 December to 2359 14 December

The same station may be worked on both cw and phone. Maximum of 36 hours operating time for single-operator entrants. Stations in the USA and Canada send RS/T and state or province, and others RS/T and a consecutive serial number starting from 001. Stations not land based will send their ITU zone number. Each QSO is worth two points—four if with a novice

QTH CORNER

A7XD	PO Box 4747, Doha, Qatar, Arabian Gulf.
A9XDA	P. Francis, PO Box 597, Bahrain.
A9XDB	A. Papworth, PO Box 26180, Bahrain.
GJ5DQE	W. Daub, DK3KD, Solingerstr 79, 4018 Langenfeld, W Germany.
GU5DQT	F. Lerbs, DJ5PA, Steinaecker 51, 7000 Stuttgart 71, W Germany.
KC6YC	J. Sullivan, W7EJ, 3644 SE Gladstone St, Portland, Ore, 97202, USA.
KC6ZR	R. Zalewski, W7ZR, RFD 1-Box 518, Beaverton, Ore, 97005, USA.
KA6HIQ/KH3	W. Morris, Box 4, APO, San Francisco, Cal, 96305, USA.
PJ2CC	(18/10-29/10) W. H. Mullin, 3103 Faber Dr, Falls Church, Va, 22044, USA.
TR8IG	B.P. 580, Libreville, Gabon.
UA1PAL	via UA4HLK, c/o Box 88, Moscow, USSR.
VK9NC	D. R. Clark, VK4UA, Box 27, Woody Point, 4019, Queensland, Australia.
VP2EA	A. Cruciger, KB4QB, 9675 Woodmont Rd, Orlando, Fla, 32811, USA.
YASME	YASME Foundation, Box 2025, Castro Valley, Cal, 94546, USA.
ZB2GH	U. Huebner, DF1AH, Rosenstr 4, 3352 Einbeck, W Germany.
ZD8KM	F. Bliss, G3IFB, "Coppalex", North Rd, The Reddings, Cheltenham, Glos GL51 6RE.
5T5NC	N. S. Cawthorne, Holt Cottage, Kingston Hill, Kingston on Thames, Surrey KT2 7JH.
ex-7Q7BC	P. A. Conway, G3UFI, 1 The Woodlands, The Ridge, Hastings, TN34 2SF.
9U5BB	A. Bergmans, c/o Belgian Embassy, BP 1920, Bujumbura, Burundi.

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

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or technician class licensee, and the multiplier is the total number of USA states, Canadian provinces, DXCC countries and ITU regions (as sent by /MM stations only) worked. Appropriate log forms and instruction sheets are available from ARRL Communication Dept, 10 Meter Contest, 225 Main Street, Newington, Conn, 06111, USA. Logs should also be sent to this address and be posted before 15 January 1981.

Hungarian CW Contest

1600 13 December to 1600 14 December

All bands 3·5 to 28MHz. Single-operator, single- or multi-band, and multi-operator all-band. Exchange RST and serial number (from 001). HAs will also send two letters indicating their county (BA, BP, BE, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE or ZA—a total of 19 on each band) and these will count as multipliers. Each HA contact counts one point, and the final score is QSO points multiplied by the sum of the county multipliers from each band. Include a summary sheet and signed declaration and post within six weeks of the contest to: Radio Amateur League of Budapest, PO Box 2, H-1553, Budapest, Hungary.

DXCC Honor Roll

September *QST* listed the following British stations with at least 310 countries confirmed out of the possible 319. Mixed modes: G3FXB/G3FKM (319), G3AAE/G3HCT (318), G2BVN (317), G5VT/GI3IVJ (316), G2FYT/G3JEC/G3NLY/GM3ITN (315), G2BOZ/G3JAG (313), G5RP/GI3OQR (312). In the phone list: G3FKM (319), G5VT (316), G3JEC/GI3IVJ (315), G3TJW (314), G3UML/G5AFA (311).

Awards

The Canadaward

For those who have confirmed contact with all Canadian provinces and territories on any one band (note: VO1 and VO2 count as one province). Separate awards are issued for each band on which the applicant qualifies, and mode endorsements are available. All contacts must have been made since 1 July 1977. Send QSLs and $2 or 10 ircs (plus postage for the return of the cards) to Canadawards, PO Box 2172, Stn D, Ottawa, Ont, K1P 5W4, Canada.

The Five-Band Canadaward

As above but five bands required (60 QSLs). Fee is $25. A six-band version is also available.

The 9H Diploma

Awarded to any licensed amateur or listener who acquires the requisite number of points by contacting Maltese stations. One point is earned for each 9H station, but QSOs with Gozo (9H4) and 9H1MRL (the MARL club station) count two points. European applicants need 10 points, others five.

The Dip-Med

HF applicants require contacts with at least 15 of the 26 Mediterranean countries—one of which must be with Malta. The countries are 9H, EA, EA6, EA9, F, FC, CN, 7X, 3V, 3A, I, IS, IT, SV, 5B, SV5, SV9, ZB2, YU, ZA, 4X, OD5, SU, TA, YK and 5A. For either of the Maltese awards, applicants should send a list of QSL cards held (certified by two other amateurs), together with 12 ircs or US$2. to: The Awards Manager, MARL, PO Box 575, Valletta, Malta. The awards are free to blind and handicapped applicants.

Band reports

Back on the air again after his move, G8KG has once again provided a summary of conditions during the past month which reads as follows: "The general trend of solar activity was upwards during September and October, with the average solar flux for the past 27 days rising above 200sfu on 18 October, and reaching 206 at the time of writing (26 October). The highest daily flux value during the period was 259sfu on 12 October, which was higher than on any day in October 1979. The peak muf on the N Atlantic path reached 50MHz in the third week in October—a combination of high solar activity, low 'A' index and the onset of the 'seasonal improvement'—but minor magnetic storms towards the end of the month caused rather disturbed conditions on the higher hf bands.

"The three-month mean sunspot numbers centred on June, July and August were 157, 143 and 142, and preliminary sunspot data for October suggest that the curve is now rising again. Recent solar activity has involved the rather rapid appearance of active regions, and this has meant that forecasts based on 27-day recurrence have not proved very accurate."

The following kindly provided information for this section of *MOTA*: G5JL, G3s GIQ, GVV, HEQ, IGW IMW, KSH, LOL, LPS, NWG, GM3PPE, G3YRM, G4s DSE, GXL, JBH, G4JVG/SM0, GW4KGR, and RSs 1066 and 31301.

Stations listed in italics were using cw.

1·8MHz. **0600** *K9GB.* **2300** *UA6YAO, UT5AB, UC2AFI.*

3·5MHz. **0000** *OX3AX.* **0500** FG7BG, HI8JAG, *LU3EED,* NP4A, W0MJ. **0600** CT2AK, TG9AL, TI5EWL, VE6WQ, VE7IG, W0WP, XE1SO, 7X2LS, 9Y4NP (QSL to W3HNK). **0700** ZLs 4AP, 4FW. **2100** OY9R, 4U1ITU. **2300** *TF3IRA.*

7MHz. **0000** *4K1A, K9EF/8R1.* **0100** *TR8JM.* **0500** A35TW, C6ADV, FP0FXP, *UA1PAL, W6-W7, 5N20DOG, 5W1CW, ZL.* **0600** KL7Y, VE8YQ, 8R1RBF. **0700** HK0FBF, *K6UD,* TI9CF, VP5WW, *ZL1, ZL2.* **0800** N2BA/HI8, *JA8IMN.* **1700** KC6YC. **1800** *JH3VKT.* **2000** *JAs 1AEA, 0DMX, UA9-UA0.* **2100** *JA2XW, ZD8TC, ZS5DE.* **2200** *W7LPF/DU2, FP8AA,* VS5s DD, *RP, ZD8KM, 4U1UN, 8Q7BB.* **2300** *EA8AK,* EP2TY. FM7WS, FR7BP/T, *FY7BC, HI3JEI, OH0MA, PY0PO/0,* UJ8JCL. *VP5B, VU2BX,* XT2AW (QSL to KN1DPS), *4K1OC, 5Z4YV, 9Y4VU.*

14MHz. **0000** *DJ1US/ST3, VU2BK.* **0600** VK9NC. **0700** *C6ABC, FO8HA,* KC6s CG, JC, *KH6, SV0BM* (Crete). **0800** AH8A, KA6HIQ/KHs, KL7, T3AT, VK9NL, *VS5RP.* **0900** HK0EHM. **1500** *ZL.* **1600** *EA9HG,* HS1AMG (QSL to KA7DQQ), *VK2BQQ, VQ9NN.* **1700** 5N8THG. **1800** *VK9NC,* 9G1GX (PO Box 4216, Accra). **1900** KC6YC,

KL7IBM, VP8SU, VS5LH, *5N20DOG.* **2000** AP2MQ, CE9AF, *FG0FIS/FS7,* VP5B, VP8SB, *5T5AY,* WB4ZNH/5X. **2100** KL7H, *TR8IG.* **2200** SU1ER, VP8PP, YL6A. **2300** *A4XIV, CE, VP2VDH, VS5RP, 4K1A.*

21MHz. 0700 JA, VK, ZL. **0800** DU6JF, FR7BE, HM9A, *KL7EU, ZD8TC,* 9V1VV. **0900** HM, JA, VE8MC, ZB2CV, ZL. **1000** HL1XT. **1100** WB1GDQ/9K2. **1200** *G4CNY/VP9, VS6JR.* **1400** *A7XE,* 9G1NO. **1500** *HS1SD* (PO Box 11/588, Bangkok), KC6s, YC, ZR, *VP2KAQ.* **1600** *HK0BKX,* VS6CT, *ZK1DR,* 3B6CD, G3JKI/5A. **1700** AP2MQ, CE9AF, *HS5AID* (QSL via AG6D), KC6ZR, *TA2TA,* W6-W7. **1800** FG0FIS/FS7 (QSL to K6LPL), KH6BB, VP8SU. *ZS3DP, WB4ZNH/5X.* **1900** TJ1AY, ZD7HH, *4U35UN* (QSL to W2MZV). **2000** VP8PK, *ZL.* **2100** D68AP, K5LBU/ST0, XT2AW. **2200** FP0GAP.

28MHz. 0800 *KC6YC, 5N0MAS* (QSL to JR1SSH). **0900** *JA, VK, YJ8SS, ZL.* **1000** *CR9B,* S83ST, VK9ZG, 8Q7AV. **1100** A9XCX, *P29CH,* AI5P/SV5 (Kos Is—QSL to W3HNK), *VP2MGT* (QSL to VP2MO), 4S7KK. **1200** A7XD, KC6YC, VK6WC, G3AAE/VP9. **1300** *FR7BT,* J3AK, TG4HX, *VE8AAA,* WB4ZNH/5X. **1400** AP2MQ, KC6ZR, *5T5NC.* **1500** J28CC, K5LBU/ST0, *W6KG/SV9,* YC1BCI. **1600** *KH6AP,* S83W, SV0BL (Rhodes), VP2VGR. **1700** PA0FM/PJ3. **1800** VP8SU. **1900** *FP8AA.* **2000** VP2KAQ, XE3D.

Thanks are also due to all who have contributed to this month's column and also to the following for information: *QRZ DX* **(K5FUV),** *DX'press* **(PA0TO),** *CQ Magazine* **(W1WY),** the *Ex-G Radio Club Magazine* **(W3HQO),** the *DX Bulletin* **(K1TN),** the *Long Island DX Bulletin* **(W4UL/W2IYX),** *DX News Sheet* **(Geoff Watts),** and *Long Skip* **(VE3FRA).**

Please send all information for **February** issue **to reach G3FKM no later than 2 January** and for **March** issue by **30 January.** □

HF propagation study

Predicted hpf + luf in megahertz for December 1980

	00	02	04	06	08	10	12	14	16	18	20	22
Suva (s)	1713	1712	1811	1707	1705	3108	3608	3507	2605	1706	1511	1413
Wellington (s)	1613	1512	1611	1409	2906	3108	3408	3207	2504	1607	1211	1412
Osaka	1409	1410	1410	1511	3211	3010	2009	1908	1408	1608	1208	1209
Hong Kong	1208	1010	1212	2114	4315	4213	3309	2605	1903	1704	1205	1007
Sydney (s)	1212	1015	1217	2118	3617	3212	3207	3203	3002	1704	1208	1010
Moscow	1003	902	1002	1203	3404	4505	4506	4104	3302	1902	1203	1103
Bangkok	1307	1309	1312	2614	4916	5114	5311	4406	3403	1904	1405	1306
Singapore	1408	1409	1312	2915	4716	4615	4511	4406	3502	2102	1504	1406
New Delhi	1403	1405	1307	2910	4812	4612	4509	3505	2802	1902	1503	1403
Perth	1511	1613	1416	3119	3720	3618	3514	3307	3103	2403	1605	1508
Teheran	1503	1603	1403	3106	4909	5209	5008	4605	3502	2402	1703	1503
Colombo	1504	1607	1410	3113	4915	4916	5113	4708	3704	2503	1704	1504
Bahrain	1603	1703	1504	3007	4910	4611	4610	4406	3502	2802	1803	1703
Cyprus	1503	1602	1402	2305	4408	5109	4708	4505	3702	2802	1703	1604
Aden	1804	1805	1506	3010	4713	4615	4614	4408	3602	3103	2004	2005
Seychelles	1902	1805	1609	2912	4413	4712	4611	4607	3905	3102	2202	2102
Mauritius	1903	1806	1610	2812	4113	4312	4211	4008	3805	3202	2402	2202
Nairobi	2103	1903	1605	2709	4512	4714	4613	4609	4004	3303	2603	2303
Malta	1303	1302	1202	1303	3505	4207	3907	3806	3405	2504	1603	1403
Salisbury	2203	2003	1705	2509	4113	4315	4614	4512	4108	3405	2803	2403
Cape Town	2402	2203	1806	2810	3812	4013	4113	4112	3909	3505	2902	2602
Lagos	2404	2203	1903	1905	4509	4812	4614	4513	4210	3607	3104	2603
Suva (l)	2413	2313	2011	1907	3006	3109	3109	2708	2405	2907	3111	2713
Gibraltar	1302	1102	1002	902	2303	3504	3404	3304	3003	2302	1602	1402
Ascension	2404	2303	1903	1806	4010	4613	4615	4516	4314	3809	3104	2704
Wellington (l)	2412	2212	2111	1709	2606	2609	2209	2008	2106	2408	2611	2612
Dakar	2402	1402	1902	1803	4106	4810	4612	4512	4310	3807	3103	2702
Adelaid ls	2607	2405	2005	1506	3307	3509	3610	3711	3811	3511	3410	3109
Las Palmas	2003	1803	1602	1400	3002	4705	4508	4408	4207	3505	2703	2203
Falklands	2407	2205	2005	1608	3012	3617	3621	3722	4021	3817	3213	2609
Rio de Janeiro	2405	2104	2004	1606	2909	4314	4417	4518	4517	4014	3210	2707
Buenos Aires	2305	2104	2004	1604	2707	3813	3918	4319	4518	4116	3212	2708
Sydney (l)	2116	2014	1912	1509	2208	2713	2518	2222	2024	2222	2520	2618
Lima	2104	2002	1902	1503	1905	2908	5009	4912	4712	4512	3211	2608
Barbados	2103	1902	1802	1500	1702	2907	5013	4715	4314	4111	3208	2505
Bogota	2003	1802	1702	1503	1705	2308	5009	5112	4412	4112	3111	2507
Jamaica	1902	1702	1502	1403	1705	1908	4509	5011	4612	4512	2910	2206
Bermuda	1902	1702	1502	1403	1605	2208	4809	5111	5011	4610	2908	2204
New York	1606	1506	1306	1506	1605	1907	3409	5011	5012	4410	2308	2007
Mexico	1605	1602	1302	1403	1605	1608	2108	4708	5011	4312	2312	2009
Montreal	1509	1508	1608	1508	1608	1810	3311	5013	4913	4212	2210	1909
Denver	1405	1502	1402	1503	1605	1708	1708	3107	4908	3710	2010	1808
Los Angeles	1406	1503	1502	1503	1405	1608	1608	2907	4508	3310	2011	1609
Vancouver	1206	1604	1702	1703	1705	1708	1708	1807	2606	2607	1808	1508
Iceland	908	908	908	1007	1207	2307	3608	3808	3208	2108	1308	908
Honolulu	1411	1608	1704	1703	1605	1508	1308	1207	1305	2107	1810	1412

First two digits are hpf, last two luf; luf 00 indicates data not available.

Propagation predictions

Because of seasonal changes, conditions usually worsen during December compared with the previous months. The reasons for this are the decline of the F2 mufs, and the days in the northern hemisphere are already so short that the hf bands will close relatively early.

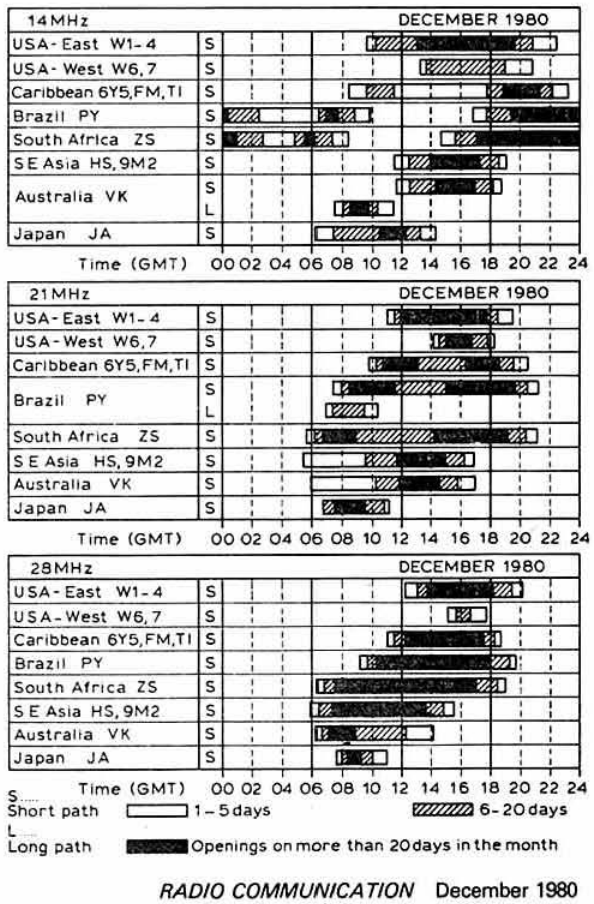
On days without disturbance, **28MHz** will be open in all directions, but traffic with western USA will only be possible on favourable days (days with above average mufs). The possibility of reaching western North America will be greater the further south the UK station is located.

Traffic with all continents will be possible on **21MHz.** Midwinter conditions will allow extra traffic via the indirect (longest) path, especially with South America and East Asia. Traffic via the long path will mainly occur at dawn and dusk.

Because of the low mufs and the long winter nights, **14MHz** will cease to be the night-time dx band which it was during the summer. A noticeable improvement of night-time dx on this band will not occur until the end of February, beginning of March. As on **21MHz,** traffic with various dx regions will be possible on **14MHz** via the indirect path.

As **14MHz** will frequently fade, **7MHz** will become more important as dx band during this time. DX conditions always exist on this band when the longer part of the path lies in darkness. During daytime, **7MHz** will be the ideal band for traffic with Europe and for local traffic, which will not be interrupted by the dead zone. The seasonal condition of low static favours dx traffic on both **7** and **3·5MHz;** the latter band will at times be interrupted by the dead zone just before dawn.

The provisional sunspot number for September 1980 from the Swiss Federal Observatory was 154·5. On 2, 3 and 27 September the daily number exceeded 230. The predicted smoothed numbers for January, February and March 1981 are 131, 139 and 127 respectively.



swl news

Bob Treacher, BRS32525 *

FIRST, season's greetings to all readers, and the hope that the festive season brings joy and goodwill.

Next, a reminder to all newer members that all correspondence for this feature should be sent to the address at the foot of the column and not to the editor at Chelmsford.

G2DYM has sent full details of his antenna products, after one of his antenna systems was mentioned in the October issue. Anyone who is interested in obtaining these brochures is invited to send a large 10 by 7in sae to G2DYM, "Cobhamden Castle", Uplowman, Nr Tiverton, Devon.

Countries tables

With 1981 nearly upon us, a reminder that a countries table will be run on the same lines as this year. For those who have joined the Society since the beginning of the year, briefly the rules are very simple: the table reflects the number of countries taken from the ARRL Countries List (note the change from the 1980 rules) heard on each band from 1·8–28MHz between 1 January and 31 December 1981. Simply keep a list by the receiver and note each new country heard on each of the bands. The starting score for 1981 will be 200 (again, note the slight change). Let your scribe have *the totals only* (not a list) for each band, giving a total and indicating the mode(s) used. The all-time list will continue, appearing every three months (March, June, September and December) and hopefully this will continue to thrive. The starting score remains at 500, and those with a 500-plus score in 1980 will automatically be included in this list.

A challenge

We all know how easy it is to log 100 different countries on 14MHz, but how about logging 100 countries on either 7 or 3·5MHz during one month. Your scribe would be interested to hear from any listener who manages to do this during January 1981, when conditions on these two bands can be exceptional, and some exotic long-distance dx can be heard around sunrise and sunset. A hint for those interested in trying to achieve such a feat—the most popular channels on 7MHz ssb for dx working which are relatively clear of bc QRM are 7,059 and 7,085kHz. On 3·5MHz, 3,789kHz is an extremely popular channel on the west coast of the USA and for the Far East dx (excluding Japan which cannot transmit lower than 3,793kHz on ssb). No prizes for anyone who manages the 100 on either band, but it will be a good exercise in monitoring the lower bands and of course for boosting those all-time scores.

Newcomers

Several newcomers to introduce this time. The first is not really a newcomer, being BRS1066, but after many years of inactivity "Brad" Bradbury has again taken up the hobby with a Yaesu FR101S and an 84ft long wire which is indoors. He prefers listening to the cw mode and includes a score for the table.

*79 Granby Road, Eltham, London SE9 1EH

1980 hf countries table

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	193	219	236	131	112	26	917	ssb
RS42604	187	204	177	142	123	23	856	ssb
BRS43475	147	185	207	94	79	18	730	ssb/cw
A8808	156	185	174	84	87	17	703	ssb
BRS8841	129	161	214	100	86	2	692	ssb/cw
ARS42503	75	132	133	98	57	3	498	ssb
BRS35943	97	97	93	76	85	5	453	ssb
BRS18529	49	95	155	74	59	15	447	ssb
A9191	81	106	127	56	24	10	395	ssb/cw
BRS43273	112	119	105	34	20	0	390	ssb
BRS41992	66	84	146	31	46	13	386	ssb
BRS40705	100	109	105	40	23	0	377	ssb
BRS44395	62	131	90	51	29	12	375	cw
ARS42591	52	89	129	31	64	0	365	ssb
BRS1066	43	100	99	51	37	12	342	cw
BRS42559	55	79	113	38	31	5	320	ssb
BRS20185	81	85	94	20	27	2	309	ssb/cw
BRS40293	56	94	97	30	23	0	300	ssb
BRS40634	31	101	68	20	17	0	237	ssb
ARS43457	39	61	76	27	24	1	228	ssb/a.m.
ARS43261	54	50	75	20	18	0	217	ssb
BRS43135	24	48	74	22	30	9	207	ssb
BRS40814	42	21	57	26	15	4	165	ssb
ARS43496	1	38	66	22	21	2	150	ssb

All-time countries table

Station	28	21	14	7	3·5	1·8	Total	Mode
G3KMA	298	317	322	241	173	41	1,392	ssb/cw
BRS17567	282	317	350	181	226	34	1,390	ssb/cw
BRS25429	256	294	325	217	217	47	1,356	ssb
BRS32525	249	291	311	211	238	38	1,338	ssb
BRS25901	252	290	321	191	195	22	1,271	ssb
BRS35943	232	274	297	198	218	30	1,249	ssb
G3MCS	278	293	303	142	118	18	1,152	ssb
A8808	221	260	290	137	155	43	1,106	ssb
BRS8841	212	245	302	138	155	11	1,063	ssb/cw
G3ALI	180	206	299	162	184	0	1,031	ssb/cw
G3GIQ	276	306	314	69	25	20	1,010	ssb/cw
RS42604	218	229	210	159	133	26	975	ssb
G3IGW	169	188	214	187	127	82	967	ssb/cw
G4FAM	179	210	217	155	112	29	902	ssb/cw
BRS43475	178	220	233	120	101	31	883	ssb/cw
G3ZBA	152	165	272	120	126	0	835	ssb/cw
A9191	144	187	232	72	95	11	731	ssb
ARS41426	161	163	145	87	104	28	688	ssb/cw
BRS20185	150	151	196	45	48	6	596	ssb
ARS41386/GJ	129	146	140	53	38	5	511	ssb

Craig Moore, BRS44774, joined the Society in July and uses the receive side of an FT200 into a 100m long wire. He submits an interesting list of dx heard since July, including VK2AGT/LH, VP8SB, 4S7CF and 5N20ARV.

Anthony Cross, BRS44982, uses a Yaesu FRG7000 with only a 40ft long wire at a height of just 12ft. However, his QTH is 480ft asl which he feels is of help! He mentions HL9WP, VR6TC, VP8SU and ZF1MA on 14MHz, S83W (Transkei) and TA4A on 28MHz, and 5N20DOG, the special prefix apparently commemorating the 20th anniversary of Nigeria.

Michael Chace, RS43446, mentioned good conditions on 3·5MHz towards the end of September, copying CT2, W1, K4 and ZL3 with an HRO and 33ft of wire.

Finally, we have E. W. Stannard, BRS44936, who recently bought a Trio R1000 receiver. He has a number of antennas to choose from, but from the stations listed he has some trouble in reading the callsigns correctly; this art will come with practice.

October diary

With no really exotic dx trips in the early part of the month, the bands seemed fairly ordinary, but for those prepared for the unexpected some tasty morsels appeared. Perhaps the most unexpected logging reported, taking account of the time of year—mid-October—was that of KC6YC (Western Carolines) on 7MHz ssb at 1558 on 19 October. He was also active on

3,804kHz later in the evening, but the time of year and the QRM and QRN defeated G-ears (as far as your scribe is aware). That would have been a very choice piece of dx on 3·5MHz. Perhaps signals from that part of the world will be audible in G around the turn of the year.

Mark Mullins, RS42604, simply found enough time to update his scores, and mentioned HK0FBF (PO Box 842, San Andres Isla, Colombia) on 21MHz as his best dx of the period.

Dave Stewart, BRS40293, has added a Datong FL2 filter unit to his receiving set-up, and reported W6, W7 and VK stations on 7MHz between 0400 and 0500.

Michel Delvaux, ARS42503, commented on the amount of dx available on the Round Table Net on 14,170kHz each evening; he mentioned HM1EJ, PZ1BK, J3HH and J28AZ.

John Goodrick, BRS44395, entered the Y2 Contest (the WADM-DX Contest that was) during October. He also provided details of some good dx on 28MHz—HI8CMH, PJ2MI, TR8IG and VS9GY.

John Doughty, BRS40705, commented that he has many dx stations to his credit but, remarkably, needs many European countries on 28 and 21MHz. Some of the nearer European countries are very difficult to hear on those bands due to the longer skip experienced, and are only audible on "backscatter", or during sporadic-E openings during the summer, in particular on 28MHz.

Larry Hoult, BRS42559, has finished experimenting with different antenna systems and now has an indoor active dipole in the loft.

Peter Boyce, ARS43457, reported "O" levels successfully negotiated and more time for the hobby. He entered the Cray Valley Contest—his first serious attempt at contest operating—which he found very enjoyable. With the help of G4IQR he now has a Microwave Modules 144MHz converter for use with his Trio JR310. Several local amateurs also helped him calibrate the receiver.

David Hawes, A9191, entered the 21/28MHz Contest and found some good dx to supplement the many USA stations on 28MHz. Conditions were not as good as for the past two years, but all the USA call areas were audible on both bands, while FK8CR, YJ8NPS, JT1AN, 7P8AC, UA1PAL, UH8HAI and VS6CT were the pick of the best on 28MHz.

Paul Tittensor, A8808, wrote with the news that he is back at Liverpool University. He was hoping to make a flying visit home for the CQ WW DX Contest to monitor the lower frequency bands to improve his all-time scores on those bands.

Robert Small, BRS8841, sent his usual precise summary of band conditions. He was pleased with his October haul, with several new countries logged on several bands. W6KG/SV9 was a new one on 3·5MHz cw, while on 7MHz he managed VS5DD and XT2AW. 21MHz provided FR0DZ/G and VP1FB; and on 28MHz he unearthed HK0FBF and VP8SB. Quite a good haul!

ZB2CV and G4CWS/ZB2 were active from Gibraltar between 16 and 23 October. They will be pleased to confirm all correct listener reports, which should be sent to G3SXE and G4CWS, QTHR.

Many reports of exotic QSL returns this time, but just picking out the best, we have TN8AJ, VP8ZR, 3C1MM, FW8SC, A22DW and 9G1JX. Readers will also see a huge increase in entries for the all-time table, which is extremely encouraging. Keep your ears open and keep adding to the list.

Information for the **February 1981** issue should reach your scribe by **27 December.** □

microwaves

Charles Suckling, G3WDG *

Martlesham round table

The round table meeting held at Martlesham Heath on 19 October attracted over 60 amateurs, including visitors from Holland and Belgium. The comprehensive set of test equipment provided seemed to be much in demand before lunch; many people had brought along equipment to be measured. Visitors also had a chance to inspect the very interesting propagation information being gathered from stations monitoring the Martlesham 1·3GHz beacon, GB3BPO.

During the afternoon lecture session, Graham Clarke of BTRC gave an introduction to fin line, which is one of the several microwave pcb techniques becoming increasingly popular professionally. It is also quite attractive for amateurs, and could provide an alternative to waveguide for a number of applications, particularly filters. Next, G3WDG reviewed current techniques for 10GHz narrow band, including the design, construction and tuning-up of the G3JVL transverter. The advantages of narrow band were outlined, and details were given of some paths worked recently using narrow-band equipment. The talk ended with a live demonstration of 10GHz ssb by G3WDG and G4KGC, and G3YGF showed how his phase-locked Droitwich frequency standard can be used for very high accuracy frequency setting on 10GHz.

Thanks indeed to the Martlesham group for organizing a most enjoyable meeting—plans are already being made for next year's event.

Tropo dx on 1·3 and 2·3GHz

The spell of excellent conditions on 3 and 4 October gave a number of stations the opportunity to work some remarkable dx on 1·3 and 2·3GHz. G4BYV (Norfolk) worked OK1KIR/P, OE9PMJ/P, HB9ABN, HB9RG, HB9MDR/P and DJ9PC on 1·3GHz, as well as OK1KIR/P on 2·3GHz. This is possibly the first contact between G and OK on 2·3GHz. Signal reports exchanged were 55 and 57. G3LQR is also believed to have worked OK1KIR/P on 2·3GHz. These contacts bring G4BYV's QTH square totals to 40 on 1·3GHz and 13 on 2·3GHz.

G3AUS (Devon) is reported to have worked OK1KIR/P on 1·3GHz, which may well be a new European record.

1980 10GHz Cumulative Contest

The results and a full report of this contest are given in "Contest news" this month. One point raised in a number of logs concerns the talkback frequency on 144MHz. Many stations report heavy QRM on 144·33MHz—all too often stations not operating in the contest QSY "up 30" after calling on 144·3MHz, leading to interference problems with contest stations. It has been suggested that the microwave calling frequency be moved lower down the band (to 144·18MHz for example) to alleviate this problem.

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*31 Oakwood Road, Chandler's Ford, Hants SO5 1LW.

G3YGF (right) receives the Alpha Cup from G3RPE

Some stations have also remarked that it seems to be becoming common practice to QSY a long way from the calling frequency once a test has been started. This makes it difficult to keep track of what is going on; it might be better if everyone could stay within, say, 10–20kHz of the calling frequency whenever possible.

As was announced earlier in the year, Alpha (UK) Ltd kindly agreed to present a cup to the leading UK station in this contest. The photograph shows the first presentation of this award, to G3YGF, who was not only the leading UK station, but also the overall winner.

1·3GHz eme news

The September 432/1,296MHz eme activity weekend provided the Oxford group (G3YGF, G4CNV, G4KGC and G3WDG) with their first chance to try out G4CNV's new 6×7289 UPX4 type pa on eme. Some teething troubles prevented its use during a sked with VK5MC soon after moonrise, but this station was copied in QSO with DJ4AU just before the sked. The main problem with the amplifier was that it would only produce about 150W, with very low efficiency, as well as showing some signs of instability. Therefore it was decided to continue operation with the single 2C39 "driver", which was persuaded to give 60W output. Some reasonable echoes were heard at this power level.

Later in the night K2UYH and VE7BBG were heard calling CQ, but repeated calls with the single 2C39 brought only QRZs in reply. The UPX4 was given another chance, and its 150W output was just sufficient to enable both stations to be worked, in the space of only 15min.

After the moon had set, G3YGF and G4CNV got to work to sort out the UPX4. It turned out that the output loop as originally specified was too small, giving insufficient loading. A larger one was fitted, and the amplifier then produced about 450W output, at 60 per cent efficiency, with 13dB gain.

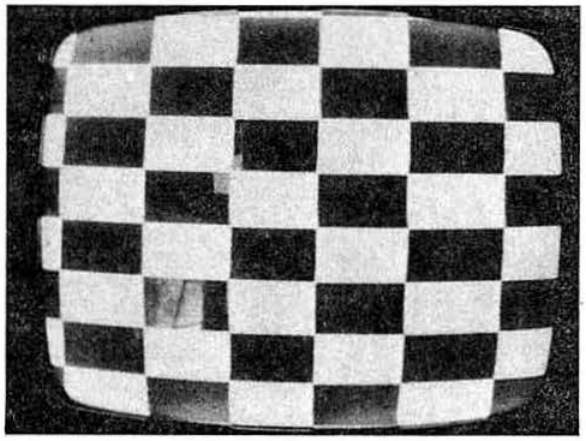
A number of stations have been busy working on 1·3GHz eme equipment during the last few months. G3LTF has completely rebuilt his dish, which as a result now has a very accurate profile again. A new preamplifier, using a Plessey GAT5 gasfet, has been commissioned, yielding a lower noise figure than his parametric amplifier. PA0SSB has also been working on his antenna, replacing the old chickenwire surface material, which was so rotten that it was beginning to fall off the dish.

Other stations hoping to be on 1·3GHz eme soon are W7GBI and WB5LUA, who have both recently completed 25ft dishes, YU1PKW (40ft dish) and SM4DHN. Africa should also be represented on 1·3GHz eme in the near future by ZE5JJ, who has just completed a most remarkable homebuilt optical shaft encoder system for antenna azimuth/elevation read-out. The 11-level Gray code wheels, which took some 35 man-hours to draw, give a read-out accuracy of 0·2–0·3°, necessary since his 32ft dish has a beamwidth of only 1·5° at 1·3GHz. He already has in hand a 100W output pa and low-noise bipolar preamp, and only has to build a feed for the dish.

At the time of writing, a number of stations are known to be preparing for the SK2GJ tests scheduled for 25 and 26 October. At least four stations in the UK are ready, apart from those already on 1·3GHz eme, and the writer has heard of two in New Zealand. The SK2GJ group are planning at least one more test after this one, possibly in 1981.

10GHz tv

Television operating on 10GHz seems to be one aspect of this band which has so far received little attention. However, F0AAL of the Geneva group has been very busy recently exploring this mode. Very good picture quality has been obtained using fm in a 2·5MHz bandwidth, with a Gunn transmitter and afc controlled receiver.



A test signal received on 10GHz by F0AAL

The photograph shows a test pattern received over a local path from F6FYI. The best dx so far is 25km, and it is hoped to increase this in the near future by using larger antennas than their 30cm dishes.

Microwave newsletter

Readers will no doubt be very interested to hear that a regular microwave newsletter is now being produced by G3YGF, G4CNV and G8RHI. Past issues have covered news of the 10GHz Cumulative Contest, as well as a number of short technical items. The newsletter is being continued throughout the winter months, roughly every six weeks, and the authors would be very grateful for news or technical items for inclusion. Anyone wishing to contribute or get on the mailing list should write to Julian Gannaway, G3YGF, Department of Engineering Science, Parks Road, Oxford. □

contest news

Summer 1·8MHz Contest 1980 results

This year's event attracted 52 entries, a decrease of three compared with last year. Conditions appear to have been worse this year, and although ZD8TC was known to be active, nobody managed to contact him. Logs were generally very good. Most points were lost through incorrect callsigns being logged.

The winning station, G3YDX, had 133 contacts, G3PDL had 134, and G3RPB had 131. Activity was higher this year with over 200 stations appearing in the contest. This no doubt accounts for the much higher scores, with the top nine stations scoring more than last year's winning station.

In the overseas section Denmark had a clean sweep of the certificates. In the UK section, certificates of merit go to G3YDX, G3PDL and G3RPB.

Thanks to G3XTJ, G6LX and OK1KUA/P for their most useful check logs. *G3WPF*

UK SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	G3YDX	652	17	G3YEE	481
2	G3PDL	651	18	G3YMC	472
3	G3RPB	636	19	G3ZGC/A	462
4	G3SYM/A	633	20	G2MJ	461
5	G3GRS/A	628	21	GM3OXC	435
6	G3IGW	625	22	G4ELZ	434
7	G3PEK	612	23	G4BVY	432
8	G3SSQ*	591	24	G4ILW	408
9	G3XEP*	588	25	G3ZNH/A	375
10	G3SJE	568	26	G3XZK	356
11	G6BQ	555	27	G3VRY*	341
12	G4DJX	526	28	G4AYM*	314
13	G3XTT	523	29	G4HZF	296
14	G3PFZ	508	30	G3HKO	279
15	G4DDL*	507	31	G4EBK	244
16	G3SNX	482	32	G3MCX	199
			33	G8RZ	195

*Multi-operator

OVERSEAS SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	OZ1W	440	11	OH2BBM	200
2	OZ1LO	420	12	SP9DH	189
3	OZ7YY	402	13	OZ6XT	186
4	DL0EP	331	14	HB9BNB	179
5	OZ3Y	319	15	OK2PAW	175
6	OK1DWF	313	16	OK1DWC	153
7	OL8CLL	238	17	OK1KTW	146
8	DF4NJ/P	223	18	OL5AZY	59
9	OK1KPA	209	19	OK2BWM	40
10	OL3BBN	205			

RSGB HF Contests Championship 1979–80 results

Posn	Callsign	Contests 1	2	3	4	5	6	7	8	9	Total
1	G3FXB	70	60				100				230
2	G3PDL	0	25		35	30	50		30	35	205
3	G4CNY		50				80		50		180
4	G3MXJ	80					90				170
5	G3YDX	50				35				40	125
6	G3PEK						30		60	10	100
7	G4BUO	0	20		30	5	0		25		80
	GM3ZSP				40	40					80
9	G3SEM	0		60							60
	G3ZEM					10			50		60
	G4FAM		30					30			60
12	G3RPB					25				30	55
13	G3SYM				20					25	45
14	G2QT	0		20			20				40
	G4FNL		10	30							40
	G3IGW		0		10		0			15	25
16	G3ILO		0			0	0	25			25
	G3XTJ					15	10				25
19	G5CMX	0	0	15							15
	G3SJE					0	0		5	5	10
20	G4BWP	10				0					10
	G4DUW		0	0			0		10		10
23	G3XTT	0	0	0	5		0				5

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

Awards
The G2QT trophy to A. J. Slater, G3FXB. Runner-up certificate to P. F. Linsley, G3PDL.

10GHz Cumulative Contest 1980 results

Activity levels on 10GHz reached an all-time high this year, with the biggest entry so far, and 88 different stations appearing in the logs. This was despite what can only be described as weather best forgotten: to quote from F8WN: "20 July—I don't remember weather like this—Niagara Falls!—144MHz antenna quickly taken down because of thunder—retreat to the car—10GHz equipment blown away by wind, and flooded too, a pity!—car flooded—OM flooded!"

From the adjudicators' point of view, it was obvious that a large number of stations had used ngrs to calculate distances (see *Microwaves*, September 1980), with a great improvement in accuracy. However, quite a few had not read the rules carefully enough. The contest exchange was supposed to be report, QTH and QTH locator, not ngr. NGRs should be exchanged on 144MHz for the purpose of calculating beam headings. Also, a number of stations were unaware of the "half-points for one-way contacts" rule, and that in the case of working the same station twice in one day, only the longer distance contact counted for points. No points were deducted this year from stations not giving QTH locators if ngrs were exchanged, but please get it right next year! The main loss of points came from errors in reports and serial numbers.

This year an increasing use was made of narrow-band equipment, which undoubtedly helped a number of stations to increase their scores. For some, eg fixed stations, narrow band was the only means of making contacts. In the listing below, narrow-band capability is indicated as "nb", and wide-band as "wb".

Congratulations to the overall winner, G3YGF/P, who also wins the new Alpha Cup for being the leading UK entry, and to the runner-up, G3ZME/P. Certificates of merit go to G8ADP, as the leading fixed station, F8WN/P, as the leading overseas entry, and G3YJH/P as the highest-placed station which has not won a certificate before in this event. *G3WDG, G4KGC*

Posn	Callsign	Points	QSOs	Points from best period	Km of best dx (two-way)	Mode(s)
1	G3YGF/P	3,701	47	1,770	175	wb, nb
2	G3ZME/P	2,889	35	1,052	151	wb
3	G3YJH/P	2,003	32	962	105	wb
4	GW3PPF/P	1,616	20	636	162	wb, nb
5	F8WN/P	1,256	13	808	198	wb
6	F1AXP/P	1,067	11‡	871	150	wb
7	G4CNV/P	1,042	16	449	121	wb, nb
8	F6DLA/P	954	10	398	130	wb, nb
9	G4ETU/P	900	17	702	182	wb
	G2DSP/P	900	17	702	182	wb
11	G8SHF/P	887	17	400	89	wb
12	G3FYX/P	818	12	310	114	wb
13	G3PFR/P	806	11	507	128	wb
14	G8RHI/P	761	15‡	449	117	wb, nb
15	G3RZD/P	753	17	368	73	wb
16	G8EXL/P	615	12	315	88	wb
17	G8GKV/P	602	14	389	120	wb
18	G4HUP/P	596	10	178	143	wb
19	G8ADP	576	11	266	149	nb
20	G4EBF/P	490	11	220	88	wb, nb
21	G3WDG/P	378	8‡	195	95	wb, nb
22	F6FBE/P	280	4†	280	111	wb
23	G8CXK/P	250	8	127	83	wb
24	G4KGC/P	183	5†	183	59	nb

† from one period
‡ from two periods
Check logs from G6XM/P, GM3FYB/P, G3KSU/P, GM3HYX/P, G3RPE/P and G3MWQ/P are gratefully acknowledged.

September 144MHz Trophy and SWL Contest results

Excellent propagation conditions, with the majority of stations making contacts in excess of 1,000km, were offset by uncomfortable weather conditions for many of the portable contestants.

Less than half the entrants chose to score their logs laboriously in points per kilometre for entry into the IARU event.

The considerable number of interesting comments received included a suggestion for height asl sections or penalties. This proposition has been considered by the committee on numerous occasions. The

following fact is deemed significant: it is now more than seven years since a station sited above 200ft asl has won VHF NFD.

The Mitchell Milling Trophy goes to the Wulfrun Contest Group, GW8BHH/P, the Thorogood Trophy to GJ4ICD, and the GM4HAM Trophy to GM3PXK. Runners-up certificates go to GW3UNU and G3NAQ. A special certificate goes to F1ANH, who scored a staggering 13,672 points operating single operator portable.

Check logs received with thanks from: G3BPM, G8JGK, G2MI, F0GBY/P, G8VIY, G4EYL/A. *G5HD*

SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	GJ4ICD	9,628	648	YJ70	F0GBY/P	835
2	G3NAQ	6,209	464	ZL34	EA3JA/P	1,057
3	G8LUA	3,908	337	AL30	F1EVA/P	1,095
4	GJ4JWA	3,763	294	YJ70	F0SW/M	803
5	G8SFM	3,545	303	YL39	EA3JA/P	1,087
6	DK3UZ	2,674	124	EN20	F1ANH/P	1,059
7	G4ARI	2,437	223	ZM24	EA1TH/P	1,173
8	G3PBV	2,435	111	YK32	EA3JA/P	1,033
9	G8RBY	1,628	169	ZM16	F1BUT	1,068
10	G8GXE	1,594	164	ZL48	EA2EI	912
11	G8RXK	1,451	142	ZL28	EA3JA/P	1,142
12	G8TAK	1,390	193	ZL50	EA3JA/P	1,193
13	G8IFT	1,345	110	YM50	F6FNL/P	1,050
14	G3OHC	1,324	98	ZM31	EA1TH/P	1,150
15	G8JXV	1,286	112	ZL60	F6EVA/P	963
16	G4AGQ	914	96	ZL66	F1BUT	899
17	G8LXY	818	104	ZL09	F2LY/P	808
18	G3ORX	687	41	YL49	EA3JA/P	1,050
19	G8GGG	682	74	ZL24	F1FIB/P	965
20	G8OMI	577	71	ZM41	F6FNL/P	1,030
21	G8PUC	329	63	ZL37	F2LY/P	794
22	G8NMQ	251	33	ZL37	F1BUT	924
23	G8TZJ	216	30	YN07	G8SDS/P	357

MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	GW8BHH	16,121	950	YM44	EA3JA/P	1,194
2	GW3UNU	15,691	949	YN75	F0GBY/P	1,254
3	GW4ERP	14,759	904	YN75	F0GBY/P	1,257
4	F1ANH	13,672	750	YI26	DK3UZ	1,050
5	G3WRS	13,190	785	ZO46	EA1TH/P	1,370
6	G4BWG	12,174	791	AL45	EA1TH/P	1,065
7	G4DEZ	10,964	743	AL34	EA1CR	1,047
8	GW3OXD	10,654	663	YM54	F6CVQ	1,120
9	G4BPO	10,376	773	AM67	EA3ADW	1,162
10	G3PMH	10,039	701	AN61	F1BUT	1,108
11	G6HH	9,104	676	AK03	EA1TH/P	982
12	G4APA	8,734	650	ZL15	F0GBY/P	1,088
13	G8KMY	7,596	578	ZM29	DL0OB	855
14	G8WGT	7,548	538	AN61	DF9RJ	1,025
15	G3EFX	7,496	621	ZL06	EA1TH/P	1,094
16	G4DZO	7,189	493	AK11	EA3AW	1,057
17	G8SDS	7,184	519	YK28	EA3JA	998
18	G3ZIG	6,868	597	AM46	F1BLL/P	1,008
19	G3YMD	6,733	569	AL76	EA1TH/P	1,044
20	G5MW	6,428	574	AL43	F8BG	878
21	GW8WDC	6,332	544	YN65	EA3JA	1,269
22	G8GBY	6,086	452	ZN18	EA1TH/P	1,302
23	G4JTY	5,922	441	YK27	DL0BQ/A	1,040
24	G4HRY	5,470	468	ZM63	EA1TH/P	1,113
25	G4CDJ	5,456	468	ZK54	EA3LL	1,123
26	G5BK	5,437	504	ZL11	HB9ARI	1,070
27	G8TFI	5,435	517	AL56	EA1TH/P	1,080
28	G3XNO	5,293	422	ZN12	EA2EI/P	1,205
29	G8IUT	5,125	478	ZN74	EA1TH/P	1,220
30	G3UES	4,331	436	ZL66	EA3JA	1,012
31	G4FEV	4,255	448	ZM68	EA1TH/P	1,120
32	GM3PXK	4,063	340	YP25	F6CJG/P	1,160
33	GW4AEC	3,688	189	XM10	F6EVA	1,223
34	GD4IOM	3,671	251	XO67	F6FNL/P	1,298
35	G4EKT	3,174	222	ZN10	F6BHI/P	1,241
36	G8WYR	3,119	293	ZN12	F1BMI	1,294
37	G3GJL	2,813	286	YM70	F0GBY/P	1,130
38	G8OHM	2,441	356	YM50	EA1TH/P	1,002
39	G4JFW	2,355	298	ZM35	F6FNL/P	1,049
40	G8SDK	2,265	191	AM64	EA1CR/P	1,113
41	G6UT	2,167	169	AL12	EA3JA/P	1,057
42	GM8DVD	1,932	152	YP66	F6CJG/P	1,115
43	GI4DBB	1,690	110	WP77	F1FIB	1,406
44	G4FVL	1,507	195	ZL59	F6FNL	875
45	G4KDF	1,456	127	AN51	F2LY/P	942
46	G8IZR	1,310	114	YN38	EA1TH/P	1,271
47	G8KAX	1,192	100	AL32	EA2EI/P	956
48	F0CRI	1,026	48	ZD53	GW4ERP/P	1,085
49	GM4CAN	1,009	94	YQ08	G4DZO/P	701
50	G8VCD	968	112	ZN52	F6FNL/P	1,008
51	G8WUJ	946	90	ZL71	F1FIB/P	911
52	G8RQZ	922	73	AK22	F6FVA	900
53	G8SZO	823	121	ZL58	F2LY/P	758
54	G3UDN	729	103	ZM63	HB9MM/P	831
55	G8HHQ	724	87	ZL74	F1BMI/P	753
56	G4DDL	590	92	ZL47	F1BMI/P	749

LISTENERS

Posn	Station	Points	QSOs	QRA	Best dx	Km
1	RS32525	2,796	298	AL41	EA3JA/P	1,005
2	RS15822	1,309	155	ZL40	F6EVA/P	960
3	RS26003	970	72	YO23	F6EVA/P	1,347
4	RS44000	227	23	ZL23	F2LY/P	836

Affiliated Societies Team Contest 1981 rules

1. The general rules for RSGB hf contests, published in the January 1980 issue of *Radio Communication,* will apply.
2. **When.** 1300 to 1700gmt, Sunday 11 January 1981.
3. The Affiliated Societies Team Contest is a competition between teams of stations, each team or teams representing an RSGB affiliated society. Each such society is encouraged to enter as many stations and teams as it can.
4. **(a)** A society entering one team will have its placing determined by the aggregate scores of the five highest scoring stations in its team. **(b)** A society may enter more than one team. The aggregate scores of the five highest scoring stations will be placed in team "A", the next five highest scoring stations placed in team "B", etc.
5. **(a) Eligible entrants.** Each operator must be a member of the society he represents, but need not be a member of the RSGB. **(b)** Each station may be single- or multi-operator, but no operator may use more than one callsign during the contest period. **(c)** All stations representing a society must be operated within 50 miles of the normal society meeting place. **(d)** No station may represent more than one society. **(e)** In the case of a society with national coverage, eg RNARS, each team may define a different society meeting place, but this should be a place of recognizable significance, eg a naval base. For all purposes, other than the indication of affiliation, each such team entry will be considered to be entirely separate.
6. **Contacts.** CW (A1), only in the band 3,510 to 3,590kHz.
7. **Exchanges.** RST, serial number commencing with 001, and "AFS". Stations active during the contest, but not submitting an entry, are requested not to send "AFS".
8. **Scoring.** Five points for each contact; plus five points for each "AFS" received, subject to confirmation by corresponding log entry.
9. **Logs.** Column 5 to be headed "AFS received".
10. **Entries**
    (a) Each individual entry shall conform to the general rules. All such entries from one society are to be sent in one package to RSGB HF Contests Committee, c/o R. S. Unsworth, 105 Clarendon Road, Hazel Grove, Stockport, Cheshire SK7 4NS. Packages underpaid and bearing postage-due stamps will be returned to the sender. **(b)** Each package must include a declaration signed by an officer of the society that each entrant is a member of that society. **(c)** There should also be included a note stating the number of teams representing the society. If the package does not contain this information it will be presumed that the society wishes to enter only one team. **(d)** Packages must be postmarked not later than 26 January 1981.
11. **(a)** An individual entry will be invalid if more than 20 per cent of the points claimed are for contacts with members of the entrant's own team. **(b)** If it is clear that an entrant has deliberately failed to send "AFS" to certain stations, then the entry will be disqualified and the points claimed by his team for contacts with that entrant will be disallowed.
12. **Awards**
    (a) The Edgware Trophy will be awarded to the leading affiliated society. **(b)** A certificate of merit will be awarded to the station having the highest individual score.

RSGB Cumulative Activity Periods 1981 rules

1. **Aim.** To provide training and practice for potential contest operators.
2. **Eligible entrants.** Members of the RSGB or members of any RSGB affiliated society.
3. **Periods.**
   1·8MHz 2000-2200gmt Monday 5, Tuesday 13, Wednesday 21, and Thursday 29 January 1981.
   3·5MHz 1000-1200gmt Sunday 4, Saturday 10, Sunday 18, and Saturday 24 January 1981.
4. **Sections.** CW (A1), single-operator only.
   (a) 1·8MHz.
   (b) 3·5MHz.
5. **Frequencies.** 1·8MHz: 1,810-1,860kHz. 3·5MHz: 3,540-3,590kHz.
6. **Contest call and exchange.** CQ TEST. Exchange RST and serial number, starting at 001 for each period.
7. **Scoring.** One point per contact.

8. Special conditions. Entrants may operate in as many of the above periods as desired, and a station may be worked once in each period. The scores from any two periods on an individual band are added to give a band score. An entry may be made for each band. Individual scores will be tabulated by band. In addition there will be an overall club tabulation, and logs to be included in a club score should clearly indicate the name of the club on the cover sheet. Logs should include all contacts made during the activity periods, even if they are not included in the overall score. A log may contain all periods operated on a particular band but there should be separate logs for each band. Entries must be sent, postmarked not later than Monday 16 February 1981, to: R. L. Glaisher, G6LX, 279 Addiscombe Road, Croydon, Surrey.

The Commonwealth Contest 1981 rules

TRANSMITTING SECTION

1. The general rules of RSGB hf contests, to be published in the January 1981 issue of *Radio Communication,* will apply.
2. When. From 1200gmt on Saturday 14 March 1981 to 1200gmt on Sunday 15 March 1981
3. Eligible entrants. Members of the RSGB resident in the UK and radio amateurs licensed to operate within the British Commonwealth or British Mandated Territories.
4. Contacts. CW (A1) only, in the 3·5, 7, 14, 21 and 28MHz bands. Contacts may be made with any station using a British Commonwealth callsign, except those within the entrant's own call area. UK stations may not work each other for points. In accordance with IARU recommendations contestants are requested to confine their operations to within the lower 30kHz of each band.
5. Scoring. Each completed contact will score five points. In addition, a bonus of 20 points may be claimed for the first, second and third contacts with each Commonwealth call area (as listed in the accompanying table) on each band. All British Isles stations (G, GB, GD, GI, GJ, GM, GU and GW) count as one call area.
6. Logs. Separate logs are required for each band. Each band log should be separately totalled and should include, at the end, a check list of call areas worked on the band. Logs must include gmt, callsign of station worked, RST/serial number sent, RST/serial number received and points claimed. Separate band totals should be added together and the total claimed score entered on the cover sheet.
7. Entries. Entries may be single- or multi-band. Single-band entries should show contacts on one band only; details of contacts made on other bands should be enclosed separately for checking purposes. Multi-band entries will not be eligible for single-band awards.

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

Entries should be addressed to D. J. Andrews, G3MXJ, 18 Downsview Crescent, Uckfield, East Sussex TN22 1UB, England. Adjudication of this contest will commence on Monday 18 May 1981. Any entry received after this date may be excluded from the contest. Overseas stations are therefore advised to forward their logs by airmail.
8. Awards. To the winner, the BERU Senior Rose Bowl; to the runner-up, the BERU Junior Rose Bowl; and to the leading UK station, the Col Thomas Rose Bowl. Certificates of merit will be awarded to: (a) first, second and third placings in home and overseas multi-band sections; (b) the leading home and overseas single-band entries on each band; and (c) the leading station in each overseas call area.

RECEIVING SECTION

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

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

COMMONWEALTH CALL AREAS

The following call areas are recognized for the purpose of scoring in the 1981 Commonwealth Contest:

A2	Botswana
A3	Tonga Is
A5	Bhutan
C2	Nauru
C5	Gambia
C6	Bahamas
G/GB/GD/GI/GJ/GM/GU/GW	
H4	Solomon Is
J3	Grenada
J6	St Lucia
J7	Dominica
P2	Papua New Guinea
S2	Bangladesh
S7	Seychelles
T2	Tuvalu
T3	Kiribati
VE1	
VE2	
VE3	
VE4	
VE5	
VE6	
VE7	
VE8	
VK1	
VK2	
VK2	Lord Howe Is
VK3	
VK4	
VK4	Willis Is
VK5	
VK6	
VK7	
VK8	
VK9	Christmas Is
VK9	Cocos Is
VK9	Norfolk Is
VK0	Heard Is
VK0	Macquarie Is
VK0/VP8*	Antarctic
VO	
VP1	
VP2A	Antigua, Barbuda
VP2E	Anguilla
VP2K	St Kitts, Nevis
VP2M	Montserrat
VP2S	St Vincent
VP2V	British Virgin Is
VP5	Turks & Caicos
VP8	Falkland Is
VP8	S Georgia
VP8	S Orkney Is
VP8	S Sandwich Is
VP8	S Shetland Is
VP9	
VQ9	Chagos
VR1	British Phoenix Is
VR6	
VS5	
VS6	
VX9	Sable Is
VY1	Yukon
VY0	St Paul Is
VU	India
VU	Laccadive Is
VU	Andaman & Nicobar Is
YJ	
ZB2	
ZC4/5B4	
ZD7	
ZD8	
ZD9	
ZE	
ZF	
ZK1	Cook Is
ZK1	Manihiki
ZK2	Nuie
ZL1	
ZL2	
ZL3	
ZL4	
ZL	Auckland & Campbell Is
ZL	Chatham Is
ZL	Kermadec Is
ZM7	
3B6/3B7	Agalega & St Brandon
3B8	Mauritius
3B9	Rodriguez Is
3D2	Fiji
3D6	Swaziland
4S7	
5H3	
5N2	
5W	Samoa
5X5	
5Z4	
6Y5	
7P8	
7Q7	
8P	
8R	
9G1	
9H	Maltese Is
9J2	
9L1	
9M2	W Malaysia
9M6/9M8	E Malaysia
9V1	
9Y4	

*All calls operated from Commonwealth controlled areas of the Antarctic (VK0, VP8, ZL5 etc) count as one call area.

70MHz CW Contest rules

1000–1500gmt 18 January 1981

The following general rules, published in the January 1980 issue of *Radio Communication,* will apply: 1, 2, 3, 4b, 5a, 6b, 7a, 8, 9a, 10a, 11a, 12–22.

All entries and checklogs to: VHF Contests Committee, c/o Mr G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23.

432MHz Fixed Contest rules

1000–1500gmt 8 February 1981

The following general rules, published in the January 1980 issue of *Radio Communication,* will apply: 1, 2, 3, 4a and c, 5a, 6a, 7a, 8, 9a, 10a, 11a, 12–22.

All entries and checklogs to: VHF Contests Committee, c/o Mr F. Mathews, G8ACJ, Easedale, Woodway, Merrow, Guildford, Surrey.

144MHz Low Power Contest May 1980

Due to postal problems, the entry from G8VER/A was not included in the results tabulation. The claimed score from that station was 554 points and the best dx was DF2JC at 505km.

Contests calendar

6–7 December	TOPS CW Club *(Rules in November issue)*
7 December	144MHz Fixed *(Rules in October issue)*
13–14 December	Hungarian CW *(Rules in December issue)*
13–14 December	ARRL 10 Meter *(Rules in December issue)*
14 December	RAFARS Members 1980 *(Rules in December issue)*
28 December	Canada 1980 *(Rules in December issue)*
4, 10, 18, 24 January	Cumulative Activity Periods (3·5MHz) *(Rules in December issue)*
5, 13, 21, 29 January	Cumulative Activity Periods (1·8MHz) *(Rules in December issue)*
11 January	Affiliated Societies Team 1981 *(Rules in December issue)*
18 January	70MHz CW *(Rules in December issue)*
23–25 January	CQ WW DX 160
31 January–1 February	French CW
7–8 February	7MHz (Phone) *(Rules in August/September issues)*
8 February	432MHz Fixed *(Rules in December issue)*
14–15 February	PACC 1981
21–22 February	ARRL DX (CW)
28 February–1 March	7MHz (CW) *(Rules in August/September issues)*
28 February–1 March	French (Phone)
***7–8 March**	144/432MHz & SWL
7–8 March	ARRL DX (Phone)
14–15 March	Commonwealth *(Rules in December issue)*
21–22 March	Bermuda 1981
21–22 March	CARF (Phone) Commonwealth
21–23 March	BARTG Spring RTTY
28–29 March	CQ WW WPX SSB
4 April	1,296MHz Trophy & SWL
5 April	432MHz Trophy & SWL
26 April	144MHz CW
***2–3 May**	144/432/1,296MHz & SWL
24 May	144MHz Low Power & SWL
7 June	70MHz & SWL
4–5 July	VHF NFD & SWL
2 August	144MHz QRP & SWL
11–12 August	Meteor Scatter
16 August	70MHz Trophy & SWL
***5–6 September**	144MHz Trophy & SWL IARU VHF (144MHz)
***3–4 October**	RSGB UHF/SHF IARU UHF/SHF
October/November	432MHz Cumulatives 1,296MHz Cumulatives
25 October	70MHz Fixed
***8 November**	144MHz CW
6 December	144MHz Fixed

* IARU co-ordinated date

BARTG Spring RTTY Contest 1981 rules

0200gmt Saturday 21 March–0200gmt Monday 23 March 1981

The rules of the contest are the same as published on page 1169 of the December 1979 issue of *Radio Communication*.

Copies of the rules, logs and summary sheets may be obtained from Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middx EN1 4DX.

RAFARS Members Contest rules

Sunday 14 December 1980, 1400–1800gmt.

1. **Bands:** 1·8, 3·5, 7, 144 and 432MHz.
2. **Points:** 432MHz = 6, 144MHz = 5, Other frequencies = 4 — points per QSO
3. **Mode:** Any mode of transmission.
4. **Award:** Plaque to winner.
5. Entries to RAFARS HQ, RAF Locking, Weston-super-Mare, Avon BS24 7AA, by 28 February 1981.

obituaries

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

Mr P. Conway, EI3Z

Patrick Conway died in August. He had read the news bulletin of the Irish Radio Transmitters Society for over 12 years.

He was highly regarded as an "old timer" on the bands, and was interested in early radio equipment, which he collected. He was especially active on 3·5MHz where he was to be found most days at 1200gmt.

We have also been advised of the deaths of:
Mr C. L. Davies, RS32298, in March;
Mr V. R. Duvall, RS39655;
Mr J. H. Gifford, RS4179, on 20 September.

Looking ahead

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

6 December—RSGB AGM, IEE, Savoy Place, London.
10 January 1981—RSGB Presidential Installation, Queen Hotel, Chester.
11 April 1981—RSGB National VHF Convention, Sandown Park Racecourse, Esher, Surrey.

Mobile rallies calendar

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

26 April 1981—Southend & DRS Mobile Rally, Southend Airport Exhibition Centre, Aviation Way, Southend-on-Sea, Essex. Many attractions, including licensed bar, refreshments, parking for 300 cars, aircraft museum, talk-in station, bring-and-buy stall. Details from F. Thorogood, G8ORV, QTHR, tel Southend-on-Sea (0702) 616239.

12 July 1981—Worcester & DRS Rally, formerly Upton Rally. **New venue:** Droitwich High School, Droitwich, Worcs, three miles from M5, junction 5. Further information will be announced later. Details from Tony Blisett, G8NSL, QTHR, tel Worcester 620507 or Mike Tittensor, G4EKG, QTHR, tel Evesham 41105.

The editorial staff extend their best wishes to readers and contributors for a joyful Christmas and a happy New Year

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* mailing label addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for £1 for every 40 words or part thereof. They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

Closing dates in 1980 for issues in brackets: **19 December (February).**

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Advertisements for 27MHz equipment will not be accepted.

Warning. Members are advised that they should, as far as possible, ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement. The "purchase" of goods legally owned by a finance company could result in the "purchaser" losing both the goods and the cash paid.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.

Do not post to RSGB HQ or Advertising Representative

Commencing with the January 1981 issue, "Members' ads" order forms will be printed on the reverse side of the address label carriers used to mail *Radio Communication*. This will serve the dual purpose of carrying proof of membership and avoid the necessity of cutting the form from a page. As members will receive one of these forms every month, they are asked always to use them when submitting "Members' ads" and not to submit them as letters, postcards, etc.

FOR SALE

AR88LF, recently overhauled, in superb cond, £75, no offers. G8MPK. Tel Blackpool 68757, after 6pm.

FT202R, comp with nicads, h/b stand, S20-22, R3, R7, S14, £85. G8LMS, QTHR. Tel 0924 469288.

KW Atlanta vfo, 4A psu, pas, new, some spare valves, Shure 444 mic, handbook, circuits, all in good cond, buyer collects, £195 ono. G3TQP, QTHR. Tel 0952 612159 (Shropshire).

PA module type 437BGY/L, suitable 2m, 12V, 150mW i/p, 25W o/p, new, unused, with info, £18. MM 23cm rx converter, 28MHz i.f., £20. MM 70cm rx converter, 28MHz, i.f., £15. G3ONP, QTHR. Tel Wolverhampton 788459.

FT101, looks as new, no leads or accessories, belonged to late G6CU, £260. Tel Christchurch (Dorset) (0425) 72441.

TS120S, £395. Mobile mount, £13. MC30S mic, £10. G-whip tribander, and 80m, £28. All five months old. TE15 gdo, £25. All plus carriage. G3VEJ, QTHR. Tel Burntwood 2340.

FTDX401, £200. FT101 cw filter, fan, vgc, £250. Trio RX599 a.m./fm, ssb, 160, 2m, £140. Carriage extra. Allen, GW8TR, QTHR. Tel 0497 820971, evenings.

Super hf QTH, six miles east of Norwich, three bedroom bungalow, garage, shack, double glazing, ch, quarter acre paddock with tower and wood pole, no tvi, very low noise level, £29,000; phone for leaflet. Buffham, G3TMA. Tel Norwich 712548.

Yaesu CPU2500RK, 25W 2m tx/rx, four memory channels, scans 10 and 25kHz steps, keypad mic, superb cond, inc manual, £280 ono. Mamiya 330F, incl case, grip holder, accessories, as new, orig packing, only five films through, offers £150 ono. Tel Nantwich (0270) 64050.

TS510, PS510, £120. New valves, spares, except pas, minor fault but usable, genuine enquiry will receive explanation. Buyer collects. Fan for FT101, £8. G2DRW, QTHR. Tel Coventry 597135.

Tonna 2m 9-el Yagi, £10. AR10 rotator, 40ft cable, £20. Buyers collect above. Lunar 2m rf switched low noise pre-amp, £20. 2m 3W fm tx board, £25. 2m bandpass filter, max 20W, £5. G8RWG, QTHR. Tel Camberley (0276) 32195.

TS520 tx/rx, reasonable cond, £240. FL2000B linear, £80. G3YZZ, QTHR. Tel Littlewick Green 2791, evenings only.

Shack clearance: TA33JR tribander, £40; Daiwa DR7500 heavy duty rotator and round controller, boxed, as new, £70; ETM 2b electronic keyer, £20; AR40 rotator and controller, £25; 8Y2M antenna, £7. G4HKE, 119 Hoo Marina, Rochester, Kent ME3 9LE.

Jaybeam 48-el multibeam, 70cm, £15. 5-el 2m, used internally only, £5. 4S6 scope, £75. 6W valve amp, £5. MMC 432/144S, half price, £15. 5/8 whip, £3. 144MHz RM3 program for Icom 701-245E, £50. IC245E, as new, vgc, £310 plus carriage. G8ESK. Tel Bradford 45611.

Brand new items: HQ1 mini-quad, boxed, never erected, £70. G-whip tribander 1m antenna, 80m coil, Hustler stainless bumper mount, lf whip, £30 the lot. Reace RT750 0-30MHz freq counter, clear six-segment display, very nice unit, £35. ASP201 2m $\lambda/4$ /M whip, incl magnetic base, cable, PL259, never used, £8. Stereocode processor (*Radio Communication*, January '76), very effective, £12. All items, never used. Carriage extra. G4GTU, QTHR. Tel Steve, Rustington (West Sussex) 4123.

Miscellany to clear: Jaybeam 8Y/2M, new, £8. VCR139A, £2.50. Teleprinter spares, 240V series motor for 7ERP, £3.50. Regulator contact, brush sets, £1.50 pair. All spares are new. Polarized relays, £1 each. 12V 4PCO relays with covers, 85p each. Valves, send sae for list. Two unfinished model boats for rc, £10 each. 29 Glowplug engine, not yet run in, £10. Carriage extra all items or collect. G3GOT, QTHR Chelmsford. Tel Terling 229.

PET 8k cw Nicomtech cw/rtty tape and interface unit, £300. G3LWM, QTHR. Tel 0279 56347, evenings, 0279 723156, day.

FT200B incl psu/spkr, comp with spare pair pa valves, G3LLL rf clipper, £225. YD844 desk mic, £15. Microwave Modules freq counter, £35. Sentinel auto preamp, hf, £12. HF5 vertical antenna, £30. Buyer pays carriage. G4JNW. Tel Les, 0924 452303.

FT401B, FV401, spare valves: 6KD6, 6GK6, 7360, all Toshiba, in first class cond, any trial, genuine reason for sale, £300 ono. Turnbull, G4ESA, 26 Livingstone Road, Southsea. Tel Portsmouth 28688.

Valves: EL34; 5R4; 813; 807; VR150; 6V6; others not listed, offers invited. Sommerkamp FT100B rx, £90. Sommerkamp FL200B ssb tx, £110. Tel 0272 656783.

Semi-detached two bedroom bungalow, gas ch, radiators, double-glazed throughout, aluminium framed replacement windows, own drive to detached garage, small secluded garden, elevated position in pleasant close, Eastwood, Leigh-on-Sea, Essex, £24,950. G4IVE. Tel Southend (0702) 528518, or 529188.

VJ90SSB: solid-state 144MHz amplifier, ssb/fm, 90W out for 10W in, new, boxed, £80. SB301, cw filter, £80. G3VBL, Thorncliffe, 5 Royalty Lane, New Longton, Preston, Lancs PR4 5JD. Tel 0772 612289.

IC22A, fitted R4-10, mounting clip, £100. 8-el Yagi, £7.50. Ground plane, £5. Mag mount, 5/8 whip, £12.50. G8PLE, QTHR. Tel 01-550 3706.

KW2000A, ac, psu, Shure mic, KW Q-multiplier, not used since overhaul, £160. G6TC, QTHR. Tel Wolverhampton 732002.

FT101ZD, as new, no mods, mic, fan, manual, comp with 14AVQ, £510 ono. V. Parrott, 89 Hazelbank Road, Catford, London SE6. Tel 01-697 0795.

Exchange KW2000/B, 160-10, exc cond, for TS700S or FT221R or stereo hi-fi system. Shure 526T desk controlled response mic, transistor preamp, mint cond, £29. G2BTY, QTHR. Tel 0872 863198.

FT227R, used little, mobile mount, 5/8 mag mount whip, £180. G3JAF, QTHR. Tel 0590 73232.

Photographic Bowen Illumitran 3c slide duplicator, comp, as new, cost today about £330, sell for £150 or swap (cash adjustment) P40-P60 tribander, heavy duty rotator, or w.h.y.? G4KDZ. Tel Tony, Grays, Essex (0375) 78783.

Creed 7ERP, cover, fitted new ribbon, adjusted, good cond, £30. Creed 6S6, still with orig spares bag, £10. AR88 with fm discriminator 's' meter, revalved, £60. 'Emsac' 2-10m converter, professionally built, £30. G4IAC NOT QTHR. Tel Hampton 2745, evenings.

FT202R, mint cond, nicads, charger, boxed, as new, £80. G8LGE, QTHR. Tel 0924 825025.

Emigrating: any sensible offer secures following: FT207R, TS520S, FL2100B, g-whip, miniquad, homebrew hf QRO linear, QRO parts, test equipment, tools, electric welder etc, list available. G4IQT. Tel Luton 881323.

Trio R820, the ultimate receiver, fitted YG88A a.m. filter, SP820 spkr, used few hours only, cost £762, a bargain at £575. Mizuho system rack containing AX1 Sky Changer six-channel antenna/rx selector, KX2 Sky Coupler antenna tuner, AP11 audio processor, DX008D programmable up-down digital frequency counter, the lot cost £220, never used, gift at £120. Trio CO1303D 75mm oscilloscope, mint, used little, cost £132, sale at £55. Tel Bulls Green 219 (Herts).

FT101, mic, cw filter, fan, all cables, £250. QM70 28-144 high power transverter, £75. QM70 28-432 transverter, £75 or all three as comp station, £375. AR40 rotator, brand new, £50. Tel Worcester (0905) 20135.

Yaesu FTV901 transverter, 2m, 70cm modules, suitable for FT901, FT101Z, hardly used, £325. Multi 700E, mint, £145. Elf 2 computer, keyboard, vdu monitor, Brooks t/u, comp ASCII, Baudot rtty station, manuals, any demo, £300. P40 Versatower, motor winch, TH3JNr beam, offers invited. G4CEQ, QTHR. Tel Downland 55908.

Datong audio filter FL1, £30. Active dipole antenna, £10. PSU, 13V, 200mA mpu, £3. Joystick antenna, system 'A', £15. General coverage rx, NC121, 550kHz-30MHz, £5. Superb hi-fi system, spkr units, £150. SAE details, prefer collections. McConnell, 415 Charter Avenue, Coventry CV4 8BB.

Collins S-line, 32S3 tx, 516F2 psu, £390. 75S3C rx, £330. 312B4 station control, £90. Manuals, cables, spare valves. Will cover new amateur bands in addition to existing bands. G3BFR NOT QTHR. Tel 045 36 3994, evenings

Trio R1000, six months old, in exc cond as used little, £245. Tel Horsham 67908.

FRG7 rx, no mods, fine tune, manual, orig packing, mint cond, £150. Buyer collects or pays carriage. Butcher, Countryways, Great Mongeham, Deal, Kent. Tel Deal 2834.

Trio TS520, mint cond, orig packing, £330. Will haggle. GW3YKZ, QTHR. Tel 0633 858314.

Radio Communication: May 1975 to November 1980, no binders, good cond, offers. Tel Walton-on-Thames 26124.

HW100 80-10m, 180W, matching spkr, psu, superb cond, any trial, £150 ono. Consider part exchange. Wanted: 2m and 4m transverters. G3RIR, QTHR. Tel 04555 4522.

MM 144/432 transverter, £90; MM 144 dual output preamp, £10. MM 144 converter, 2-4MHz i.f., £10. Jaybeam MBM46, 70cm antenna, £12. G4DSC, QTHR. Tel Ripon 2230.

B2 cw tx/rx, new cond, headset, coils, collectors item, £50. QQVO640, QQVO620, £15 pair, or separate. Heathkit Mohican GC1U portable rx, 550kHz, 30MHz, needs attention, comp with handbook, £30. Buyer collects. G3LJT, QTHR. Tel Billericay 25244, evenings.

Complete operational station: Racal RA117 rx, RA218 sb adaptor, £300. Racal MA79 exciter, £250. Homebrew pa, £100. Telequip scope S54AR, £100. All fitted in Imhof table cabinets, or £600 the lot. G4IUN. Tel Camberley (0276) 32697, after 5pm.

Icom IC245E, all mode 2m mobile, keypad in perfect cond, £280 ono. *Wanted:* vhf or uhf pocket pager, Pye PG1 or similar. G8SDC, 175 Spies Lane, Halesowen, Worcs BG2 9ST.

Creed 7ERP, ST5 tu, tape reader, handbook, etc. NR56 rx, all fb, good cond, £100, or exchange for wkg Liner 2, w.h.y.? Doherty, 149 Acworth Crescent, Luton LU4 9JB.

Complete station, KW2000E ac/dc psu, handbook etc, Yaesu mic, swr/power meter, 160-10 atu, Amtech 300, SMC trap dipole, balun key, £400 ono over £350. Will deliver and demonstrate locally. G4DCW. Tel 0274 493834.

TV camera, studio type, viewfinder, comp with psu, ccu, cables, circuits, four lens, lens box, £160. Pye colour four tube teleline camera, £300 ono. Philips 26in colour monitor, £40. Tektronic tv waveform monitor type 525, £25. G8GQS, QTHR. Tel 0427 3940.

TS520S, as new, 500Hz cw filter, £390. Yaesu FL200B tx, 80-10m, 240W input, exc cond, £90. KW low pass filter, uhf sockets, £6.50. G4IBG. Tel Hove (0273) 731391.

Part finished micro rtty/cw terminal, keyboard, psu, mpu card, r.a.m., rom, sim pe champ, £60. Heath RA1, cal, spkr, £30. Telequip D43 scope, wkg, £70. All above with data/manuals. Tel 0705 596 058, evenings.

Swan 100MX tx/rx, 80-10m, 100W output, all solid-state, mint cond, boxed, £350 ovno. FRG7 digital readout rx, also mint, £140. Selling to get IC720. G3UZI, QTHR. Tel Horsham (0403) 66327.

Heathkit Marauder HX10 80-10m ssb tx, in exc cond, cw 240/110V double wound transformer, can be seen working, buyer inspects and collects, £120 ono. GW3UZS, QTHR. Tel 0222 491046.

Shugart SA400 disc drive, Versafloppy 1 S100 single density controller board, BIOS p.r.o.m. incl, drive OEM manual, service manual, alignment diskette, box 10 diskettes, as new, hobby use only, £300. Andrews, G8AVR, QTHR. Tel Templecombe (Somerset) (0963) 70587, evenings.

TenTec Omni, May 1980, series B, analogue model, 500 cycle cw filter, £550. Regulated 13·8V psu, £15. FT101B, 250 cycle cw filter, low mileage, £320. Both rigs "one owner". G3RUG. Tel 061-439 7183.

NEC CQ110E tx/rx, 160-10m, ssb, fsk, a.m., cw (incl cw filter), built-in psus 110-240V, 12V, digital readout, fan, exc rig in mint cond, costs over £800 new, £395 for quick sale. Moving house. G4BKM, QTHR. Tel Denham (0895) 834358.

Pye Pocketfones, wkg SU8, comp batteries, manual, £30. MM 70cm converter, £15. 40W 220V Honda petrol generator, £28. 14AVT vertical, £22. G8XWI. Tel Alan 021-445 2088, after 4pm.

Sommerkamp FL200B ssb/cw/a.m. 80-10m hg tx, mic, manual, spare unused pair Toshiba 6JS6C pas, nice cond, £100. G4IPW NOT QTHR (North Manchester). Tel Dave, 061-764 4511.

IC240, complete, as new, £130. FT101E, in good order, £395. G3GHS, QTHR. Tel 01-399 6293.

Vanguard AM25B high band, £10. Solartron 10MHz scope CD513/2 with manual, spare valves, £35. Hygain l.e.d. scanner mic, new, with data, £5. Sullican precision inductance bridge, £50. Carriage negotiable. *Wanted:* Shure 444. G3ROG, QTHR. Tel Martinstown (Dorset) 372.

FT101B tx/rx, a.m./cw/ssb, vgc, orig packing, used little, no mods, £300. 577 Westwood Heath Road, Coventry CV4 8AA.

Crystal filter, QC1246AX, cf 9MHz, bw 2·4kHz, new, unused, suitable for G3ZVC/1600 tx/rx, (*Radio Communication*, September 1974), £23. Lots of 4 pin, 5 pin and octal valves. SAE for list. 74 Woodride, Orpington, Kent. Tel Orpington 29586.

FT221R, vgc, fitted preamp, handbook, leads, etc, £330 ono. G8TMV. Tel Worthing (0903) 201776.

Gem quad, 2-el, slightly damaged, requires few parts, £60. Prefer buyer collects. G4BKE, QTHR. Tel Winchester (0962) 61133.

TS520 cw filter, VFO520, as new, £395. TenTec 247 antenna tuner, £28. Datong FL1 filter, £49. Trio LF30A hf low pass filter, £12. G4CQK, QTHR. Tel Walton-on-Thames 27199.

Q4/2M beam, £10. RAF radiocompass rotator, suit 2m beam, control box has indicator and 4A regulated supply, suit loft use, or outdoors with cowling perhaps, £20. G4IOK, QTHR. Tel Witney 4867.

Codar AT5 tx, 160/80, comp with mobile psu, control box, heavy duty mains psu, control panel, Partridge atu, TCS12 tx, matching Collins rx, all above in wkg order with circuits, £100, G4FMH, QTHR. Tel 0272 697687.

Trio TS520, mains/12V, 250Hz cw filter, mic, orig packing, handbook, Covercraft dust cover, immac, £350. G3GGL, QTHR. Tel Bewdley (Worcs) (0299) 403372.

IC22A, five repeaters, five simplex, mobile mount, £120. Buyer collects. G8LZ, QTHR. Tel Maidstone 54461.

Heathkit RG1 gen cov rx, 600kHz-32MHz, needs slight attention, comp with manual, £55 ono. G3JBU, QTHR. Tel 0604 401800.

Petrol charging unit, 12V, 80W, four stroke, lightweight, economical, used little, £30. Tel Crayford 528915.

Trio 2200G, channels fitted: S0, S20-23, R5-6, R6R, R7, cw charger, nicad, mic, handbook, ac psu, (home-made), £95. Tel 0443 832244.

Hokushin HSHF5 five-band trap vertical antenna, used little. KW E-Zee Match antenna tuner, vgc, note pre-KW Decca model. *Aircraft Illustrated* in yearly binders, No 1—Dec 1974. Reasonable offers please. Prefer buyer collects. G3RDU, QTHR.

KW2000, 12V dc psu only, £80. Prefer buyer inspects/collects, but will deliver Devon/Cornwall. G3RFY, QTHR. Tel Bude 2635, 9am-5pm, Bude 2329, after 6pm.

Two Pye am Bantams, 145MHz, nicads, vgc, £55 each or £100 the pair. Four new xtals for 130·1/130·4MHz glider channels, £25, or eight for £45 extra. GU3HKV, QTHR. Tel Guernsey (0481) 47278, 6-7pm only.

Yaesu FRG7, as new cond, £135. Star 550 amateur band rx, double super, presentable appearance, works fb, £40. Buyer collects if poss. Timms. Tel Preston 743098, evenings.

Trio R1000 rx, as new, boxed, £225. Datong D70 morse tutor, £37. Liner 2, fitted preamp, good cond, £95. G4 forces sale. G8PSY, QTHR. Tel Hatfield 65182.

KW Vespa, needs attention. Pye Vanguard on 4m, 70·260, Pye Vanguard, 2m, all with control gear, DX409 tx, CR150/3 rx. GM3WJE, QTHR. Tel Letham Angus (081) 514.

FRDX400, 160-2, ssb, a.m., fm, narrow cw filter, £150. 2200GX, 12ch, 2 or ½W, case, nicads, charger, mobile mount, £100. 2m Packer wavemeter, £13. M. Pitt. Tel 021-743 7417, office hours.

RXs: Geloso G4/216 hambands, 2m converter, £60. Eddystone 740 gen cov, £25. Datong speech processor, neat homebrew case, connectors for HW101, £25. Cowl gill motor, £7.50. 10m Labgear cubical quad, £7.50. G3XEF, QTHR. Tel Whitchurch, Bristol (0272) 837529.

Trio TR7010 ssb cw tx/rx, comp with mobile mount, desk stand, power lead, mic, £125. G8MLJ, 48 Mill View, Ferrybridge, Knottingley, West Yorks. Tel 0977 85580.

Racal RA117 0·5-30MHz, 30 bands, slow motion bfo, bandwidth 100Hz-13kHz, six stages, matching preselector MA197B, MM 2m converter, manuals with both, £350. Buyer collects. Cookman, 11 Cranbourne Street, Chorley, Lancs PR6 0LH.

FT200/FP200, immac, £200 ono. Pye Ranger 2m/a.m., manuals, £5. G4DAU, QTHR. Tel Nailsea (Bristol) 852304, evenings or weekends.

FRG7 digital readout, £155. Eddystone 770 Mk2, mint, £155 or offers. Delivered south England. Rowat, 8 Brownbaker Court, Neath Hill 5, Milton Keynes MK14 6JH.

FT707 tx/rx, mains psu, YM36 noise cancel mic, absolute mint cond, £440 ono, or exch FT101Z. G3PY, QTHR. Tel Glossop 61062.

Liner 2, £90. 2m linear, 50W, unused, £40. TF2203 portable scope. 15MHz bandwidth, £65. Avo sig gen, 2-250MHz, £40. Freq counter, prescaler, £30. GWM boards, 2m fm tx/rx in case, mic, £60. G3ZVC board, audio/reg board assembled, unused, £60. Six-el Jaybeam, 2m quad, £15. All exc cond. G4ECR. Tel Hemel Hempstead 62812.

Unused bargain, Yaesu FL110 linear, Avanti 10m dual polarity quad, 30m UR67, boxed, unused, cost £245, accept £150. Icom IC245E 2m multimode, 240V psu, £250. MMT28/144 transverter, as new, £60. G3SEV, Essex. Tel 0702 585548.

4m fm handheld tx/rx, xtals for 70·26, 70·355, 70·375, o/p 300mW, nicad, handset or f/mic, diagrams, £29 ono. 2m Heathkit HW20 tx/rx, tx vfo or xtals, rx, DL6SW conv, handbook, wkg order, offers. G3SLI, QTHR. Tel 0734 479850.

FT101, £220 ono. TR7200G, £100 ono. G3UEY, QTHR. Tel Pershore 3037.

14AVQ/WB, new cond, one year old, £30 ono. Advance industrial regulated power supply, 30/50V, £20 ono. *Wanted:* KW109, KW107 or E-Zee Match or similar unit. G3FJA NOT QTHR. Tel Ruislip (08956) 39235.

Yaesu FR50B rx, 10-160m built-in spkr, calibrator, full wkg order, mint cond, orig packing, manual, £90. 10m ground plane, radials, £5. G4BLS, QTHR. Tel Hailsham (0323) 845298.

Heath HW101 ssb/cw tx/rx, 10-80m, matching PS23 ac pwr supply, cw filter, £200 ono. G4DAB, QTHR. Tel 01-440 1208.

FRG7 comm rx, fine cond, manual, no mods, accept £120 for quick sale. J. M. Meek, 4 Byways, Strode Road, Clevedon, Avon. Tel 871039.

Yaesu FT202R, six channel handy, NC1 fast charger, nicads, as new, boxed, £100. Mosley Mustang Mk2 three-element beam, fb cond, £95. J. L. Barry, 10A Henbury Close, Torquay, Devon. Tel 0803 312879.

FTDX401, FV401, vfo, UD844 mic, CD44 hf rotator, control box, lot, £300. Gen cov rx, 200kHz-30MHz, five bands, Murphy admiralty bfo, filter, manual, £35. Telytype KSR35 (like KSR33) spares, set manuals, £125. All good. Tel Farnham Common (02814) 4497.

FRG7, superb cond, manual, plugs, property late swl, £130 ono. G3IJI. Tel 0602 653634, evenings 6-10pm.

IC260E 2m all mode tx/rx, mint cond, incl mobile brkt etc, £280. MacLeod, GM4DZX, QTHR. Tel 041-959 4455, after 6pm or weekends.

Swan 350C tx/rx, 80-10m, 520W p.e.p. input, new driver/pa, cw psu, £275 ono. MMC144/28, £17. G4HLM, QTHR. Tel 01-952 0665.

Trio TR7010 ssb 2m tx/rx, still in orig box, J-fet preamp, Jaybeam 5-el Yagi, all for £130 ono. G8SEO. Tel Guildford 61057.

Six band linear, two 4CX250B, *Radio Communication,* September 1974 design, unfinished project, most parts incl eht, rf section almost comp, reason for sale—bargain found, £55 ono. G3RWL, QTHR. Tel 01-366 4297.

Collectors: Admiralty hf wavemeter, G61, oscillator G35, handbooks, calibration charts, c.1940, total wt 50kg approx, offers over £65. Marconi sig gen TF390G, 3-20; 75-150MHz, £30. Old GPO polarized relay, brass case, £10. Carr extra. GM3LGU, QTHR. Tel 036 987341, evenings.

Trio TS510/PS510 80-10m tx/rx, good cond, £220. Pye Europa 2m fm tx, 25W, xtalled 3ch, £35. For G3ZVC exciter owners, switched preselector, vfo, xtal osc/mixers for 10-160, £55. Reel/reel tape deck, remote control, electronics psu, £18. G3WUN. Tel Rochdale 57353.

Tamaphone, synthesized 2m fm tx/rx, 10W/1W, mobile, portable, cw helical, telescopic λ/4, shoulder strap, mobile mount, orig box, nicads few cycles, versatile, clean, efficient, mint, £215. Hokushin 7/8λ and magmount, £12, or £220 the lot. G4HWB, QTHR. Tel 061-205 3336.

Pye radiotelephone clearout: Hanicambridge hiband fm, £25. AM bantam loband, case, battery charger, £15. PF5, cw battery, case, £20. PF2UH, cw battery, case, £25. Radiotelephones ITT uhf Starmobile MF5, comp with mobile mount, loudspeaker, £35. Three lowband fm Lancons, £10. B44 in wkg order, £10. Pair PF1s, batteries, £20. Liner 2, good cond, accessories box, 40673 rf, mixer, PA3 preamp, recently realigned, £110. Pye Pocketfone 70 PF3, 2W handheld, xtalled on S20, S0, R6, helix case, battery charger, car adaptor, £60. McLay. Tel Kelvedon 71330, home, 01-723 7000, ext 3330, business hours.

Microwave Modules MMT144/28 transverter, good cond, £60 ono. 432MHz IN4387 varactor diode tripler, 18W o/p, £15 ono. RSW tuned lines, silver plated for QQV06-40A 144MHz pa, £5. Bases: two ceramic, £1 each; two ptfe, £2 each.

Lafayette transistor comm rx, 10-2,000m, wkg order, homebrew tx, 160m, 7W, cw/A3 mains, needs slight attention. *Wanted:* atu 10-80m, 500W, p.e.p. or FC707 arrangement. BC221, with power supply. Wavemeter 10-160m. Berwick, 778 Newport Road, Cardiff CF3 8DG.

TL911 Trio linear, not wkg, but good if repaired, £80 ono. TM56B vhf fm rx, vgc, £50 ono. G3YZZ, QTHR. Tel Littlewick Green 2791, evenings only, or Slough 23921, wkg days.

FT200, FP200, full 10m coverage, good cond, FV200 external vfo, £240. MM432/28 transverter, EDL432 50W linear, blower, little used, £80 each, £150 the pair. MM 1,296MHz conv, 28MHz i.f., £20. AR88LF, £20 ono. G3NHE, QTHR. Tel Dinnington (090 978) 5744.

KW2000A, mains, 12V dc psus, renewed 6146s, spare valves for other stages, full manuals, collection/delivery by mutual arrangement. G3VJZ. Tel York (0904) 55125, evenings and weekends.

FT200, FP200 psu, all 10m xtals, as new cond, matching transverter, solid-state Europa, 10W, together £275. GM3WIJ, QTHR. Tel 0224 37019.

FTDX401, £215. FT7 with FL110, handbooks, orig packing, £330. Palomar hf mobile 200W linear amplifier, £65. All in first class cond. G3FYF, QTHR. Tel 04867 4901, evenings.

KW Viceroy, psu control unit, KW77 rx, both rough, need attention, £30 or mutual agreement. Cannot deliver. G4HLJ, QTHR, Edenbridge, Kent.

FT401B tx/rx , £220. QM70 transverter, £55. pair £270 ono. Europa B, £50. TC10 Mk2, all mode, TC7 rx, pair £90 ono. Datong morse tutor, new, £40 ono. Manuals for all equipment. G8LGR. Tel Swindon 826364.

Grundig valve voltmeter, MV20 3mV-300V, in 11 ranges, type 6079 ac mains 110-220V, as new, unused, offers. GM3GG. Tel 02612 5751.

Video terminal, mains powered, uhf output, built round Xitex board, keyboard, encoder, 64×16 ASCII uppercase/lowercase/scientific display format, RS232/20mA loops, 110/300 band, £100. A. Andrews, G8AVR, QTHR. Tel Templecombe (Somerset) (0963) 70587, evenings.

Yaesu FT7, matching FL110 linear, exc mobile, portable or base station for hf bands, 10 or 100W p.e.p. output, as new, £370. G4GAH, QTHR. Tel Wallingford (0491) 37188.

Yaesu FRG7 rx, exc cond, fine tune, manual, MM 144MHz converter, offers around £140 for both. G8WRV, 35 East Street, St Neots, Cambs.

Wartime Hallicrafters, choice of two. *Wanted:* urgent, pre-war Jones or *ARRL Radio Handbook.* 6V Mallory Vibrapack, matching Parmeko plate transformer and lfc or similar. Wartime metal 6L6 and 866Jr. G4IMT, QTHR. Tel Marshfield 254.

S100 boards, 64k Ohio scientific 2MHz dynamic r.a.m., full, £170. Ithica Z80 cpu, £70. SSM I04, £70. Twelve slot motherboard, fitted six sockets and passive terminations, £15. A. Andrews, G8AVR, QTHR. Tel Templecombe (Somerset) (0963) 70587, evenings.

TS520 tx/rx, vgc, fitted cw filter, dc/psu, leads, mic, new driver and pa valves, handbook, orig packing, £350. G4ECI. Tel John, 061-439 3831.

FT227R, 2m fm tx/rx scanner, perfect cond, orig packing, £180 ono. G8MLC, QTHR. Tel Cowes 293038, after 7pm.

FT75, 24 cw, two phone xtals, offers. Buyer collects. M. S. Bulmer, Searchlight Workshop, Newhaven, Sussex.

Xitex morse tx/rx, MRS100: self-contained single chip microcomputer, ASCII or Baudot capability, variety of interfaces accommodated, auto cr/lf in copy mode, sending rate of 1/150wpm, set from keyboard, comp manual, £130. Post paid. Michaelson. G3RDG, QTHR. Tel 01-455 8831.

Yaesu FT901DM tx/rx, as new, £675. Trio 120S, new, £375. Yaesu FT207R, NC2 charger, £175. Drake R4C, blanker, filter, £325. Tempo 80W linear, £60. Hygain HT18 10-80 vertical, unused, £140. TA33 beam, new, £95. Gem quad, 2-4, £90. Tel Bournemouth 510400.

Microwave Modules converters; 432MHz, £15; 1,296MHz, £18; both 28MHz i.f.. AC/mains power pack, stabilized, suitable BC221, £3. Bentley, 27 De Vere Gardens, Ilford, Essex. Tel 01-554 6631.

Lowe SRX30 communication rx, 0·5-30MHz, as new cond, comp with handbook, PW test report, orig packing etc, £130. Reason for sale, purchase of hf tx/rx. G4KCR. Tel Harrogate (North Yorkshire) 871960.

Trio 7200G, virtually as new, mobile mount, manual, orig packing, fitted 19 channels, R0-R7, S14, S16, S18-S23, S0, S24, 144·710, 10W, £130 ono. Pocketfones PF1, two pairs, one pair in presentation case, xtalled for SU8, nicads, manuals incl, need slight attention because of dry joints, £23 per pair. Spare 18V, two 9V nicads, £4. HT stabilized power supply, Airmec 705, 0-500V, 0-250mA, £7. *Wanted:* mobile mount for 2200 series. G8MRQ NOT QTHR. Tel Nottingham (0602) 277952.

Lattice mast, ground post, tiltover, winch up, 25-36ft, £50. G4FEU, QTHR Southwell.

RTTY Creed auto tape tx, good wkg order, £20. G3BXI, QTHR. Tel Great Easton (037 184) 235.

KW202 rx, exc cond, £135 ono. One of each vhf/uhf Bird Thru-line elements, exchange for one 2/30MHz element. G8IPW, QTHR. Tel Brookwood 2251, evenings.

Yaesu FT207R portable, mains charger, three months old, £150. Realistic DX300 rx, nine months old, used little, £150 ono. Mr X. Iona, 1 Gordon Road, Edmonton N9 0LX. Tel 01-803 6678, evenings.

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FL200B, FR508 hf rig, £300 ono, will split. FT227R, tx/rx, fully modded, £200. G4BSK, QTHR. Tel West Drayton 43400.

Drake SSR1 gen cov rx, nine months old, pristine cond, £145. Will send Red Star. Mistofsky, GM4KLO, Dunallan, Elphinstone Road, Giffnock, Glasgow G46 6TF. Tel 041-639 2729.

Orig AR88 spkr, comp with watch fitting, £16. Matching spkr for HQ170/180 rxs, £20. Both mint. Low voltage tif 230V input, sec: 18V 6A oil-filled, MoD spec, high quality, brand new, £10. All carriage extra. *Wanted:* B40 ssb converter. Tel 0995 40387.

Drake R4C, T4XC, AC4/MS4 pwr supply/loud spkr, W4 output/swr meter, Shure 444, all exc cond, £600. Buyer inspects and collects please. G3CDR, QTHR. Tel 07375 55024 (Surrey).

KW202 rx, 160–10m, a.m., ssb, cw, mint cond, manual, has Q-multiplier as standard (peak notch), £110. G4FJU, QTHR. Tel Walsall (0922) 31675.

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JR599 Trio custom special rx, 250/12V operation, 160/2m, wwv, comp all modes, 100/25kHz calibration, rit, orig cond, no modifications, handbook, £165. G3TTZ, QTHR. Tel 0272 773204.

TR2200GX, immac cond, R3–7, S20–22 fitted, comp with nicads, charger, carrying case, handbook, orig packing, £105. G8DKI, QTHR. Tel Swindon (0793) 721467.

Heath HW101 hf tx/rx, psu, xtal filter, £200. Amtech atu, £15. Doram 50MHz meter, £30. G4GZM, 30 Teignmouth Road, Torquay. Tel Torquay (0803) 34222.

FT101ZD, full spec model, used little, comp as new, mic, etc, £480. Microwave Modules 144MHz ssb transverter, £45. Demonstration if required at Hemel Hempstead. G4FSY, QTHR. Tel 0442 59970.

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TS820S tx/rx, SP820 spkr, both like brand new, orig packing, manual, Securicor delivery, £550 ono. GI3YDH, QTHR. Tel Belfast 793913.

FT200/FP200 (black), good cond, all ten, mic, handbook, £215. I. D. Hawkins, G4FXD, Rankin Hall, Elmswood Road, Liverpool L18 8DG.

R300 rx, exc cond, amateur band spread, immac, offers. Pocketphones PF1, xtal SU8, £35 ono. Pair R220LB rx, 19in rack, £5. GW8YEY. Tel Barry (S Glam) (0446) 737814.

Linear power amp, hf, 80–10m, single 813, heavy duty power supply, three spare 813s, £100. Buyer collect. G3BXI, QTHR. Tel Great Easton (037 184) 235.

Bearcat 220FB scanning rx, 66–512MHz, marine, aircraft, amateur bands, hardly used, £185. GDX2 Discone wide band omni-directional antenna, 50–480MHz, gain 3dB, cost £43, take £25. Sony icf 5,900W double conversion portable, mw, fm, three shortwave, 4–28MHz, calibrated bandspread, xtal marker, ssb, hardly used, cost £89, accept £50. Sony icf 7600 portable fm, mw, five shortwave bandspread, cost £96, accept £50. All boxed. East, G4IOF. Tel 01-486 8286.

FT101E, mint cond, orig packing, £410. QM70 28–144MHz high power transverter, mint, £70. G3EHG, QTHR. Tel Wolverhampton 700609, after 6.30pm.

Drake TR4C and MS4 spkr/psu, 14AVQ, handbook, diags etc, £325 ono. Tel Chapel End 394397.

IC202, comp with nicads, 144·0–144·4, 145·8–146·0, lsb, orig packing, £140. GM4FOU, QTHR. Tel 031-445 2292.

FT101, exc cond, 160m, fan, spare pas, boxed, rx fitted double balanced mixers (no surgery), performance equals FT101E, £330. Compatible 2m transverter if required, £50. 160m transistor a.m./cw tx/rx, good modulation, £20. G3TSO. Tel Tetbury (0666) 53425.

Electrolytics TCC/Plessey 400μf 325V, wkg use 10 for 3,000V supply or 20 for better regulation, £8 post free or £14 for 20. G3FNJ, QTHR.

Hallicrafters S20R rx, 550kHz–45MHz, £15, ono. 2m 8-el Yagi, near new, £8. G4DMS. QTHR. Tel 0327 50632.

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Manuals, diagrams, etc, buy or loan for Collins tx/rx CMX46159. Hammerlund HQ120. Geloso "Frequenza" tx. All postal charges refunded. Mr R. Beckett, 34 Greenfield Road, Hoyland, Barnsley, Yorks S74 9PD.

Private collector requires any books, magazines or information on vintage wireless. Anything interesting purchased. John, G4GMA. Tel Kidderminster 515405.

FT101ZD, in exchange for FT221RD plus YC221, eleven xtals and cash adjustment. No dealers. G3BYY, QTHR. Tel Wraysbury 2007.

Urgent: Racal RA17 Mk2 manual, purchase or loan, offer £10 purchase of £5 to copy, return. G3OGS, QTHR. Tel Biggin Hill 73736, after 7pm.

KW107 atu or FC901. Robinson, G4KKZ. Tel Launceston 3012.

Liaison with university ARS with view to combined entry in VHF NFD 1981. Must have 1,296MHz equipment and power. Secondhand TH6DXX, suitable rotator. The Secretary, UCNWARS, GW3UCB, QTHR.

Brass morse key, by aspirant G4. G8JQS, QTHR. Tel Biggin Hill 72785.

RAE correspondence course. Have you passed and no longer need yours? Please tel 021-443 4662, ask for Les.

One variable attenuator control for Marconi af attenuator type TF338B, or complete unit. TF340 audio power meter, must be suitable for Marconi No 23, 229μA meter. Meter for CT38 avo vvm. Any information, handbooks, calibration details, RCL component bridge CT375. Impedance and return loss measuring set type 601A. Solartron audio signal generator CO546. One type N or 1S1 Tektronix sampling unit. G4EWW, QTHR. Tel 0676 32086, home, 0203 26034, work.

Handbook circuit diagram for loan and photocopying, postage refunded for: Telequipment Serviscope type; KW Victor tx. Consider purchase of AR88D with manual, offers to G. Haylock, G2DHV, QTHR. Tel 01-300 1649.

Pin connections and characteristics for valve type QQC03/14. Buy or borrow *Electronics*, 5 June, for article on rc ics. Bovey, 1 Chapel Lane, Dartmouth, Devon TQ6 9BL.

Urgent: capable tech who is willing to overhaul my Eddystone 880/2, it's a beautiful gc rx, has been totally re-valved, but it's still as deaf as a post! London area. Jenkins, 76 Hillfield Avenue, Hornsey, London N8.

Voltmeter, electronic, manual or circuit diagram, CT343, copy and return or pay copying costs. Postage re-imbursed. EM34 for Wayne bridge. G4EJT, QTHR. Tel Great Missenden 4694.

Working 10m rx, Eddystone 840C or similar, rx with 27–30MHz. Cox, 39 Wingfield Avenue, Wilmslow, Cheshire.

Test equipment: scope, sig gen, mod meter, power meter, frequency counter, etc. G8BXB, QTHR. Tel Cambridge 892352.

CDE AR22 antenna rotator control box, prefer wkg order. G8WRV, 35 East Street, St Neots, Cambs.

Sommerkamp/Yaesu SP400 spkr to match FRDX500/400 rx. G3TSS, QTHR. Tel Corbridge 3125.

KW2000E or similar 10–160m tx/rx. G8YUB, 39 Sandy Lane, Stretford, Manchester M32 9DB. Tel 061-865 2535.

Tower or mast, possibly telescopic, TR1 band beam, rotator, job lot or separates. Mint 2m multimode. *For Sale:* two Olivetti TE300 printers, wkg well, offers. Buyer collects. Tel Chester (0244) 374584.

RM3 or similar controller for Icom 245E or info on scan module. G8PRR. Tel 01-340 4139.

Vintage Western Electric wireless set/tuner, 1923. Grafton china figure xtal set. Vintage wireless sets, xtal sets, valves, magazines, books, items, damaged sets, pre-1927. Details to R. Frew, G3SEF, 11 Pool View, Great Wyrley, Walsall, Staffs.

Gen cov rx, good and reliable for beginner, can collect. R. Pyatt, 23 Arundel Drive, Orpington, Kent. Tel 20281, after 8pm.

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Noise-Cancelling Mics (Models 577A, 577B)
These Shure Dynamic microphones shut out background noise, permit clear transmission even where the noise level is so great that the operator cannot hear himself talking! The ARMO-DUR® case is lightweight, feels natural to the touch. The 577A is high impedance; the 577B is low impedance.

Communications Microphones by . . .

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P.M. ELECTRONIC SERVICES

PROFESSIONAL AMATEUR

★ COMPLETE CRYSTAL SERVICE ★

PRICES SHOWN EXCLUDE VAT; UK CUSTOMERS PLEASE ADD 15%

70cm CRYSTALS

Due to the much higher multiplication involved (three times that on 2m) all our stock 70cm crystals are to much higher tolerances than our standard range.

We are stocking the following channels: RB0 (434·60/433·00), RB2 (434·65/433·05), RB4 (434·70/433·10), RB6 (434·75/433·15), SU8 (433·20), RB10 (434·85/433·25), RB11 (434·875/433·275), RB13 (434·925/433·325), RB14 (434·95/433·35), SU18 (433·45), SU20 (433·50) – TX & RX for use with: PYE UHF Westminster (W15U), UHF Cambridge (U10B), Pocketfone (PF1) AND UHF PF70 Range, and STORNO CQL/CQM 662 all at **£2.32**. For the U450L Base Stn we have the TX crystals for the above channels. The RX crystals for the U450L Base Stn together with TX and RX crystals for any other 70cm channel (eg RB/SU12 (434·90/433·30) RTTY, SU16 (433·40) SU22 (433·55) etc) for most UHF equipments are availabvle at **£4.48** for crystals up to 63MHz, and **£5.16** for 63 to 105MHz to amateur spec or **£5.26** for up to 63MHz and **£6.05** for 63 to 105MHz to the same closer spec as our stock items. Delivery approx 5/6 weeks.

4m CRYSTALS FOR 70·26MHz – HC6/U

TX 8·7825MHz and RX 6·7466MHz or 29·7800MHz **£2.32**

10·245MHz "ALTERNATIVE" I.F. CRYSTALS-£2.32 For use in Pye and other equipment with 10·7MHz and 455kHz I.F.s to get rid of the "birdy" just above 145·0MHz. In HC6/U, HC18/U and HC25/U.

CRYSTAL SOCKETS – HC6/U, HC13/U and HC25/U (Low loss) 16p each. **10p** P. & P. per order (P. & P. free if ordered with crystals).

CRYSTALS MANUFACTURED TO ORDER

Prices shown are for one off to our amateur specs; closer tolerances are available. Please send us details of your requirements.

A Low frequency fundamentals in HC13/U or HC6/U

Adj. tol. ±50ppm, Temp. tol. ±100ppm 0 to + 70°C

6 to 19·999kHz	**£28.12**	100 to 159·99kHz	**£9.25**
20 to 39·999kHz	**£17.74**	160 to 499·99kHz	**£6.19**
40 to 79·999kHz	**£12.40**	500 to 799·99kHz	**£7.30**
80 to 99·999kHz	**£10.60**		

B High frequency fundamentals/overtones

Adj. tol. ±20ppm, Temp. tol. ±30ppm 10 to + 60°C

†800 to 999·9kHz (fund)	**£9.75**	* 21 to 24·99MHz (fund)	**£6.73**
*†1·0 to 1·499MHz (fund)	**£10.35**	* 25 to 30MHz (fund)	**£8.28**
*†1·5 to 2·599MHz (fund)	**£4.93**	* 21 to 62·99MHz (3 O/T)	**£4.48**
*†2·6 to 20·99MHz (fund)	**£4.49**	* 60 to 105MHz (5 O/T)	**£5.16**
*ø3·4 to 3·999MHz (fund	**£6.21**	* 105 to 125MHz (5 O/T)	**£7.76**
*ø4·0 to 5·999MHz (fund)	**£4.93**	125 to 180MHz (O/T))	**£7.50**
*ø6·0 to 20·99MHz (fund)	**£4.48**	180 to 250MHz (O/T)	**£12.49**

*** Delivery** Normally 5/6 weeks (express available) – all other frequencies 7/8 weeks.
Holders – Low frequencies HC13/U or HC6/U dependent on frequency.
Mid and High frequencies are available in HC6/U, HC18/U or HC25/U unless marked † only available in HC6/U or ø only available in HC18/U and HC25/U.
HC17/U (replacement for FT243) and **HC33/U** (wire end HC6/U) available as per HC6/U above at **30p** extra on HC6/U price.
Unless otherwise specified, fundamentals will be supplied to 30pf circuit conditions and overtones to series resonance.

CRYSTALS FOR PROFESSIONAL USE

We can supply crystals to most commercial and MIL specifications, with an express service for that urgent order. Also for commercial use, eg TV or computer crystals, etc, we can supply at very competitive prices. Please send S.A.E. for details or telephone between 4.30 7pm and ask for Mr Norcliffe.

EXPRESS SERVICE

Many types of made-to-order crystals are available on our "EXPRESS SERVICE" – with delivery of three days on our class "A" service. Telephone for details.

TERMS: CASH WITH ORDER – MAIL ORDER ONLY – S.A.E. WITH ALL ENQUIRIES – PRICES INCLUDE P. & P. (BRITISH ISLES) EXCEPT WHERE STATED – OVERSEAS CHARGED AT COST.

TWO METRE CRYSTALS

CRYSTAL FREQUENCY RANGE USE (TX or and HOLDER) OUTPUT FREQUENCY	4MHz-TX-HC6/U	6MHz-TX-HC25/U	8MHz-TX-HC6/U	10MHz-RX-HC6/U	11MHz-RX-HC6/U	12MHz-TX-HC25/U	14MHz-RX-HC25/U	18MHz-TX-HC25/U	44MHz-RX-HC6/U	44MHz-RX-HC25/U	52MHz-RX-HC25/U
144.4 (433.2)	b	e	b	e	e	b	e	e	e	e	e
144.480	e	e	e	e	e	e	e	e	e	e	e
144.800	c	e	e	e	e	c	c	c	c	c	e
144.850	e	e	e	e	e	e	e	e	e	e	e
145.000/R0T	a	c	a	c	c	b	b	b	a	a	c
145.025/R1T	a	c	a	e	e	b	e	b	e	e	e
145.055/R2T	a	c	a	e	e	b	e	b	e	e	e
145.975/R3T	a	c	a	e	e	b	e	b	e	e	e
145.100/R4T	a	c	a	e	e	b	e	b	e	e	e
145.125/R5T	a	c	a	e	e	b	e	b	e	e	e
145.150/R6T	a	c	a	e	e	b	e	b	e	e	e
145.175/R7T	a	c	a	e	e	b	e	b	e	e	e
145.200/R8T	a	c	a	e	e	b	b	b	a	a	c
145.300/S12	e	e	e	e	e	e	e	e	e	e	e
145.350/S14	e	e	e	e	e	e	e	e	e	e	e
145.400/S16	e	e	e	e	e	e	e	e	e	e	e
145.425/S17	e	e	e	e	e	e	e	e	e	e	e
145.450/S18	a	e	a	e	e	b	b	b	a	a	e
145.475/S19	a	e	a	e	e	b	b	b	a	a	e
145.500/S20	a	c	a	c	c	b	b	b	a	a	c
145.525/S21	a	c	a	c	c	b	b	b	a	a	c
145.550/S22	a	c	a	c	c	b	b	b	a	a	c
145.575/S23	a	c	a	c	c	b	b	b	a	a	c
145.600/R0R	a	c	a	c	c	b	b	b	a	a	c
145.625/R1R	e	e	e	e	e	e	b	e	a	a	c
145.650/R2R	e	e	e	c	e	e	b	e	a	a	c
145.675/R3R	e	e	e	c	c	e	b	e	a	a	c
145.700/R4R	e	e	e	c	c	e	b	e	a	a	c
145.725/R5R	e	e	e	c	c	e	b	e	a	a	c
145.750/R6R	e	e	e	c	c	e	b	e	a	a	c
145.775/R7R	e	e	e	c	c	e	b	e	a	a	c
145.800/R8R	a	c	a	c	c	b	b	a	a	a	c
145.950/S38	a	e	e	c	e	e	e	e	a	e	e

PRICES: (a) **£1.95**, (b) **£2.32**, (c) **£2.50**, and (e) **£4.48**. **AVAILABILITY:** (a), (b) and (c) stock items normally available by return (we have over 5000 items in stock). (e) 4/6 weeks normally but it is quite possible we could supply from stock. **N.B.** Frequencies as listed above but in alternative holders and/or non stock loadings are available as per code (e).

ORDERING: When ordering please quote (1) Channel, (2) Crystal frequency, (3) Holder, (4) Circuit conditions (load in pf). If you cannot give these, please give make and model of equipment and channel or output frequency required and we will advise if we have details.

CONVERTER/TRANSVERTER CRYSTALS – HC18/U.

All at **£3.00**, 38·6666MHz (144/28), 42MHz (70/28), 58MHz (144/28), 70MHz (144/4), 71MHz (144/2), 96MHz (1,296/432/144), 101MHz (432/28), 101·50MHz (434/28), 105·6666MHz (1,296/28) and 116MHz (144/28).

TEST EQUIPMENT FREQUENCY STANDARD CRYSTALS

200kHz and 455MHz in HC6/U **£3.50**
100kHz in HC13/U and 1MHz in HC6/U **£2.95**
5MHz in HC6/U and 10MHz and 10·7MHz in HC6/U and HC25/U **£2.80**.

CRYSTALS FOR MICROPROCESSORS

Please let us know your requirements e.g. 4MHz HC18/U, 1 off, **£2.00**; 100 off, **£1.10**; 1000 off, **99p**; 25,000 off, **50p**.

ANZAC MD-108 DOUBLE BALANCED MIXER

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25 watts—15 Multifunction memory channels—M0-M12 for simplex and ±600kHz repeater offset (M13 for nonstandard offset). Memorizes transmit and receive frequencies independently. M14 priority channel with simplex ±600kHz, or nonstandard offset operation. Priority alert (bleeps when signal appears on M14 priority channel) and push-button operation switch for instant operation on priority channel. Frequency coverage 144-00-145-955MHz in switchable 5kHz or 25kHz steps. Front panel keyboard for selecting frequencies. Auto scan for entire band. **£268.50**

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Full Range of Accessories Available	R1000	£298.00	AT180	£95.45	TL922	£672.75	TR2300	£166.75
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	TS180S	£679.65	TS120V	£347.30	SP520	£17.25	TR9000	£340.10
	SP180	£36.80	TL120	£128.80	TS830S	£640.00	TR800	£270.00

YAESU
FRG7 Receiver £199.00

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TR7 Transceiver and AC PSU £1,242.00
MN7 Antenna Matching Unit £124.20
Other Drake equipment available to order.

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AA1 Audio Module £4.95
AD4 FM Discriminator £5.00
AR20 C.C. FM Receiver £50.00

STABILISED POWER SUPPLIES
Model 122 12-6V 2-5A £15.66
Model 122s 10-15V 2A Single Meter £22.50
Model 125 10-15V 5A £28.00
Model 1210/1 10A 13-5V £65.00
Model 156S 4-15V 6A Twin Meter £40.00
Model 1210S 4-20V 10A Twin Meter £88.00
Model 1220 13-5V 20A £95.00
Maximum ratings quoted.

MICROWAVE MODULES
MMC144/28Lo 2m Converter £24.15
MMC432/28S 70cm Converter £29.90
MMC432/144S 70cm Converter £29.90
MMC1296/28 23cm Converter £32.00
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MMV1296 23cm Tripler £39.50
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MMA144 2m Preamp £14.90
MML144/100 2m Linear Amplifier £142.50
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Bearcat 220FB Scanning Receiver £241.50
Standard C8800 FM Transceiver £252.00
AR22 2m Handheld Receiver £85.00
SX200 Scanning Receiver £239.50

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12AVQ 10-15-20m Vertical Antenna £43.13
14VQ/WB 10-15-20-40m Vertical £60.38
18AVT5WB 10-15-20-40-80m Vertical £87.40

VARIOUS ANTENNA
HF5 vertical 10-through 80m £41.40
Discone 5 Antenna 50-480MHz £36.80
C4X 10-15-20m Vertical £46.00
HQ-1 Minibeam Tribander £96.76
Complete range of JAYBEAM HF AND VHF-UHF Antennas, send 15p for catalogue and price list.

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Tribander Helical 10-15-20m £23.00
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NOV. 6, 7, 8—SHOP CLOSED
DURING THIS WEEK

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Multi 700EX Transceiver £199.00
Multi 750 Transceiver £299.00
Palm 2 Portable Transceiver £89.50

SECONDHAND EQUIPMENT
Due to the fact that our secondhand equipment stock changes daily and our adverts are in press weeks before publication we are not publishing a list. A S.A.E. will bring you an up-to-date list or please phone. Good clean equipment wanted and spot cash will be paid. All secondhand equipment carries a three-month guarantee. Items sold on commission basis.

Shop Hours: Mon to Fri 9.30am to 5.30pm
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WOOD & DOUGLAS

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A HAPPY CHRISTMAS to all our customers from the W&D team. Why not treat yourself to one of our range and get a new satisfaction from your hobby over the holiday break.

PROJECT	CODE	ASS'MBL'D	KIT	PROJECT	CODE	ASS'MBL'D	KIT
70cms FM TCVR (0·5W) TX	70FM05T	25.95	17.80	2M Power Amps 1·5W-10W	144FM10A	16.15	12.45
RX	70FM05R	47.25	38.50	144FM10A with full c/o	144FM10B	28.90	22.90
70 cms Multi-channel TX	70MC06T	18.10	11.30	2M Linear Amps 1·5W-10W	144LIN10A	23.35	17.66
RX	70MC06R	26.05	18.60	144LIN10A with full c/o	144LIN10B	30.45	24.55
70cms FM Package (70FM05TR + MC)	70PAC	110.00	82.00	2M Pre-Amp (3SK88/BF981)	144PA3	7.50	6.25
70cms Power Amps 0·05-1W	70FM1	11.25	6.25	2M Pre-Amp (3N204)	144PA2	7.35	6.07
0·5 -3W	70FM3	16.80	11.80	Toneburst	TB2	6.05	3.10
0·5 -5W	70FM5	17.40	12.75	Piptone (12V PTT)	PT1	6.60	3.40
0·5 -10W	70FM10	29.35	20.90	Piptone (Solid State PTT)	PT2	6.65	3.45
3·0 -10W	70FM10/3	18.80	13.95	Piptone 'K' Generator	PTK1	7.85	5.60
70cms Pre-Amp (Bipolar)	70PA2	6.55	5.10	Regulator	REG1	5.95	3.70
70cms Pre-Amp (MOSFET)	70PA3	7.25	6.10	Solid State Relay (2M)	SSR1	4.85	3.16
70cms Pre-Amp/Power Amp	70PA/FM10	39.80	30.80	Solid State Relay (70cms)	SSR2	4.90	3.22
2M FM TCVR (1·5W) TX	144FM2T	30.25	21.15	Microphone Pre-Amp	MPA1	5.15	2.50
RX	144FM2R	49.80	40.70	Noise Filter	SLF1	5.10	3.90
2M Synth TX	SY2T	23.10	17.25	Reflectometer	SWR1	5.60	4.55
2M Synthesiser Mk II	144SY25B	69.70	50.95	CW Filter (Audio)	CWF1	5.85	4.25
2M FM Package (RX + TX + Synth)	144PAC	135.00	102.00	Filters (144, 433, 384MHz)	BPF1	4.85	2.85
2M Synth Mk I Adaptor	SY25PB	10.90	8.25	Pin Switches (144, 433MHz)	PS1	6.20	5.10
2M Synth MK II 70cms Adaptor	SY25S70	5.95	3.65	TVI Filter	70FI6P	3.95	3.05
2M Synth Scanner	PROSCAN1	20.10	14.75	Microwave Drive Source	MD05T	28.35	19.25
2M Synth Display (2 pcb's)	DISP1/2	20.15	15.80	Microwave Driver PA 10W	MD10PA	29.35	20.90

Above is a brief listing of the current product range as full kits. These cannot be split and sold in component parts. We do have, however, many components that are hard to get for the average amateur which include 23cms pre-amp boards and devices (NE64535), diecast boxes, chip resistors (51Ω and 100Ω), PTFE trimmers, Mullard thick film amplifiers (OM335, OM361) etc. A large SAE (A4 size) will bring you the latest lists and new projects. The range is constantly expanding and it is worth giving a call if you have a simple query on TADLEY (07356) 5324 during evenings and weekends. The above prices will be current for 1980 and include VAT at the current rate. Please include 60p on your total order for post and packing. The kits include all pcb components except crystals unless stated otherwise. Suitable boxes and external hardware is not supplied in the kit but some suitable stock is held. Any kit purchased from the range will be gladly serviced but a £2.50 cover charge would be appreciated on larger items. All items in kit form are usually ex-stock either with us or our rally agent J. Birkett of Lincoln. Assembled items unless stock will be 10-14 days from receipt of order, and will be tested and aligned to specification.

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THEY use the latest power transistors rated for infinite S.W.R All modes. R.F. switching, STRAIGHT THROUGH when OFF. Highest efficiency and lowest noise. Pre-amp is the same as the Sentinel 2 metre. See below. SO239s. 13·8 volts.

SENTINEL 30—up to 5W in. 10 times power gain	**£50.00**
SENTINEL 50—up to 16W in. 5 times power gain	**£66.70**
SENTINEL 100—up to 16W in. 10 times power gain	**£126.50**

Available less pre-amp for **£8.00** less. All ex stock.

S.E.M. IAMBIC KEYER "Ive never been able to use one of these before!" Using the famous CURTIS CMOS I.C. Need I say more. Internal PP3 **£34.50**. Ex stock

NEW! THE WORLD'S FIRST CMOS TWIN PADDLE MORSE KEY. Gold plated TOUCH contacts plus CMOS technology for only **£15.00**. Ex stock.

S.E.M. EZITUNE is a new concept to tune your A.T.U. without pressing the transmit button. Keeps whistles off the air and saves your P.A.A. noise generator, 50 Ohms bridge and r.f. switch. Just tune for minimum noise in your receiver. **£28.75*** Ex stock. Join the rush!

SENTINEL 2 METRE AND 70 CMS PRE-AMPLIFIERS
The 2 metre units use a J FET selected for a 1dB gain and 18dB gain. They really make the difference between no copy and Q5.

1. **SENTINEL AUTO 2 METRE PRE-AMPLIFIER**
   Connects straight into transceiver aerial lead and the r.f. switch changes over automatically between transmit and receive—any mode. See above for spec. 12V nominal. **£20.00*** 70cms version **£23.00*** Ex stock.
2. **PA5 AUTOMATIC 2 METRE PRE-AMPLIFIER**
   Same performance as the SENTINEL AUTO but for 240V mains operation. SO239 sockets. **£28.75** Ex stock.
3. **SENTINEL STANDARD 2 METRE PRE-AMPLIFIER**
   Same performance but without the r.f. switching. **£13.22*** 70cm version **£18.00*** Ex stock.

PA3
Miniature 2 metre PRE-AMPLIFIER. Size 1cu. in to fit inside your transceiver. N.F. 2dB. Gain 18dB. 9V-15V. **£8.00** 70cm version **£10.00** Ex stock.

SENTINEL H.F. WIDEBAND PRE-AMPLIFIERS
2-40MHz. 15dB gain. 9-12V supply. Sizes 2¼ × 1½ × 3". We make the following two versions.

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   Performance as above **£10.00*** Ex stock.
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   Same performance as above with an R.F. switch for direct connection in your transceiver aerial co-ax. **£16.93*** Ex stock.

NEW S.E.M. Z MATCH NOW 160-10 METRES. These TRANSMATCHES use an AIR BALUN providing DC isolation to the aerial. 15-5,000Ω BALANCED or UNBALANCED. Up to 1kW. SO239 and 4mm terminals for co-ax or wire feed **£50.00** or S.E.M. EZITUNE fitted. **£69.50** Ex stock.

NEW! SENTINEL LF CONVERTER. 10kHz-2MHz, 28-30MHz IF for BC, Beacons, Marine, etc. **£20.80.** Ex-stock.

S.E.M. EUROPA C2 METRE TRANSVERTER **£125.50** Ex stock.

CONVERTERS
SENTINEL 2 metre converter: I.F.S. 28-30MHz 4-6MHz, 2-4MHz. 2dB N.F. 30dB gain. **£23.00.**
SENTINEL X 2 metre converters—same as above with internal mains supply—**£26.50.**
SENTINEL TOP BAND CONVERTERS—1·8-2·3in. 14-14·5 IF **£20.80**
All converters ex stock.

*Prices include VAT. *Belling Lee sockets standard, SO239 or BNC* **£1.73** *extra. Please ring or write for any information. Twelve months' guarantee. To order: C.W.O. or credit card. Phone your credit number for same day service. BL plugs* **25p**. *PL259 and reducer* **75p**.

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- ★ RF output 100W
- ★ RX Preamp 1·5dB NF
- ★ Gain (RX) 12dB
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- ★ Manual or RF keying

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- ★ Other features as above

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- ★ I.F. 28MHz or 144MHz
- ★ 12V operation
- ★ Drive 5mW to 500mW
- ★ RF output 2·5W to 3W
- ★ RX NF <3·5dB

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432MHz LINEAR TRANSVERTER

- ★ I.F. 28MHz
- ★ 432 to 436MHz
- ★ Drive 5mW to 500mW
- ★ RF output 18W
- ★ RX NF <2·0dB

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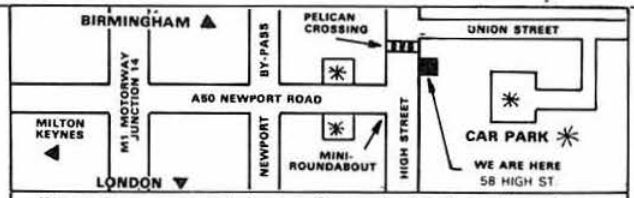

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CHANGES IN ADVERTISEMENT RATES AND SIZES

With effect from the issue of January 1981 the size of Radio Communication will be increased to A4 and the display advertisement format and rate structure changed. For details contact
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Yaesu FT 101ZD	£569	£223	£28.81	£568.72
Yaesu FT 101Z	£488	£190	£24.84	£488.08
Yaesu FT 225RD	£499	£194	£25.43	£499.16
Yaesu FL 2100Z	£362	£180	£15.20	£362.40
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It's just under a year since I first sat down to write a muTek ad. It seems very much longer! In that time we've grown from (almost literally!) a kitchen table operation into a rather more substantial enterprise with our own new factory.

It hasn't been easy, but there have also been some compensations. To see one of our FT221/225 front-end boards help G4BWG/P win the 144MHz section of vhf-nfd was rather gratifying, as was G3POI's success on 144MHz eme using our preamp. Overseas sales visits have brought me into contact with some of the users of the 70% or so of our production that we export, and I've been overwhelmed by the sheer friendliness of our fellow enthusiasts wherever I've been.

1981 promises to be another exciting year. We have new products in both the planning and prototype stages, whilst with our new facility we should have many fewer production problems. Thank you all very much for your support during 1980: we really have been very grateful.

To our customers, agents, friends and even those who trespass against us, Jane and I send our sincere wishes for a very happy Christmas and a peaceful New Year.

The "Moonbeam"
Some of you will have seen this at Leicester. Although this 432MHz long-yagi costs substantially less than anything else on the market, its performance isn't compromised. By passing the savings that we make by supplying the elements uncut along to you, we allow you to use the cash for something more useful like better feeder or even another antenna.

1—£16.50 2—£32.00 4—£63.00 8—£116.00
Carriage—£1.50 per antenna

FT221/225GT front-end board
This board will transform the receive performance of most standard 221's and 225's. The 2dB noise figure and excellent dynamic range performance provide a receiver which will be very significantly more 'crunchproof' than most with receive sensitivity essentially limited by external noise. **£53.87**

1·3GHz low-noise amplifier
This preamplifier uses an NE64535 in a very carefully optimised teflon-glass microstripline design giving a *genuine* noise figure of less than 1·8dB (typically 1·65dB) quite reproducibly without tweaks! By adopting this approach, which requires a fairly sophisticated understanding of low noise amplifier design, we are able to keep our manufacturing costs, which directly influence our selling price, very low.

Our noise figure spec. is very much in line with the device-manufacturer's claims, when the inevitable losses in the input matching network are taken into account. Of course other people claim lower noise figures, although these don't stand-up to rudimentary analysis (unless they've developed some completely new technique—superconducting microstrip perhaps?!) We sleep more soundly by avoiding hi-fi style specmanship and sticking to good engineering practice.

Unboxed (with BNC or SMA connectors) **£22.72** Boxed **£30.81**

144MHz preamplifier
Many of our comments regarding specmanship apply to this amplifier. We obtain nf's of less than 1·5dB (this equates with perhaps 1·1dB in black-box land . . . .) with an associated gain of about 15dB. The pass band is flat to better than ±0·5dB over the 144-146MHz band with greater than 50dB rejection at ±12·5MHz.

Boxed **£17.72** Unboxed **£10.79**

Microwave system components
We haven't really the space this month to list these goodies. We've held back in the production of new data, as several new items have been due for introduction and our move slowed this up rather. It should be available in the very near future.

Kungsimport Antenna Combiners
Prices and other details are listed in previous ads. We now have Ben's dish feeds available at £30 for both the 1·3 and 2·3GHz versions: they really are very well made in brass and are fitted with an integral 'N' connector.

TVI filter
This is a bandpass filter covering the 470—860MHz band, synthesised using microstripline techniques. Many people have found it very useful in dealing with TVI from both hf and vhf transmitters. **£1.80**

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A large selection available ex-stock. Prices are as before, with the exception of the 3SK88 which has now been reduced to **£1.53**

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A few only **PF70** with speaker/mike and battery, **£55.** Batteries, **£10. PYE COMPACT PF1C, £35.**
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0·47/35	14p	4·7/25	15p	15/25	35p	47/6	30p	47/16	60p
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BC547C/8C/9C	7p	BC212L	8p	BFY50/51/52	18p	BSX19/20	15p
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R1	4.0284	8.0569	12.0854	14.9916	18.1281	44.9750
R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
R3	4.0298	8.0597	12.0895	14.9972	18.1343	44.9916
R4	4.0305	8.0611	12.0916	15.0000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	45.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
R7	4.0326	8.0652	12.0979	15.0083	18.1468	45.0250
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S12	–	–	12.1083	14.9555	18.1625	44.8666 *
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S14	–	–	12.1125	14.9611	18.1687	44.8833 *
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S16	–	–	12.1167	14.9667	18.1750	44.9000 *
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S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
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Also in stock: R0 to R7 for FT221 R0 to R7 and S8 to S23 for following: Belcom FS1007, FDK TM56, Multi 11 Quartz 16 and Multi 7, Icom IC2F, 21, 22A and 215, Trio Kenwood 2200, 7200. Uniden 2030 and Yaesu FT2FB, FT2 Auto, FT224, FT223 and FT202.

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	4	200 (total)	100 to 999.999 kHz	–	£6.00
	5	50	1.00 to 1.499 MHz	£9.00	£6.00
	6	10	1.50 to 1.999 MHz	£4.75	£4.20
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	8	10	2.60 to 3.999 MHz	£4.55	£3.70
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Portugal – Sorubal SARL, Rua General Pimenta de Castro, 15-18, Lisboa 5, Portugal.
(Enquiries invited from companies in other countries).

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SD1127	4	12	12	175	£2.10 (1)
2N6080	4	12	12	175	£4.10
SD1143	12	10	12	220	£6.00
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2N6082	25	5·7	12	175	£7.50
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SD1428	45	6·5	12	175	£11.55 (2)
2N5944	2	9	12	470	£5.90
2N5945	4	8	12	470	£7.50
SD1135	5	7·5	12	470	£4.50
SD1136	10	5·5	12	470	£6.75
2N5946	10	6	12	470	£9.50
SD1088	25	6·8	12	470	£16.00 (2)
SD1089	40	4·3	12	470	£22.00 (2)
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NOTE (1) G.Emit. IC202/215 P.A. (2) Controlled "Q" Type

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CHANGES IN ADVERTISEMENT RATES AND SIZES

With effect from the issue of January 1981 the size of Radio Communication will be increased to A4 and the display advertisement format and rate structure changed. For details contact
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