August 1979

radio communication

journal of the Radio Society of Great Britain

RSGB NATIONAL AMATEUR RADIO EXHIBITION

Alexandra Palace
London
May 1979

As a result of unforeseen circumstances, it has not been possible to publish a report of this year's exhibition.

The editor is grateful to John Horne, G3YCQ, for supplying these photographs at very short notice.

▲ General view of the exhibition

Anton Matthews, G3VFB, (l) and John Ellis, G2FNK, operating the RSGB hf demonstration station ▶

Angela Horne, G4CKQ, admiring a corner of the RSGB stand ▼

Dave Seymour-Wright, G4FBW, (l) and Brian Coleman, G8AZU, at the RSGB bookstall ▼

The RSGB vhf stand ▼

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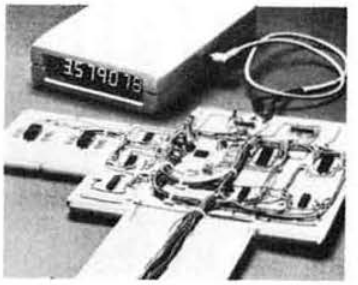

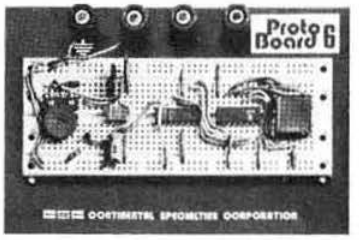

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Fast becoming one of the most popular base station rigs because of its superb performance and advanced technology, the IC-211E leads the field in 2M base stations. With a full synthesizer which employs state of the art technology it provides all you want for full coverage on FM USB, LSB or CW on 2 metres with that extra bit of quality for which ICOM are so renowned, plus the chance to use the latest digital technology and even drive it from your home computer if you wish!
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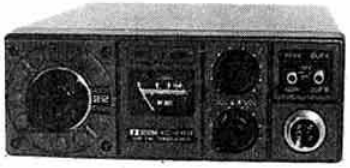
IC-245E
NOW £399 inc.



IC-240
NOW £193 inc.

The IC-240 is the ideal mobile rig for most people. Apart from the fact that it is quite a lot cheaper than most, it is, in fact, more suitable than many to use in the car while driving (and let's face it, it is under those conditions that most mobiles are used). It can be operated with ease without taking your eyes off the road and provides up to 22 channels (which is more than you are likely to need). Being synthesized, of course, there are no crystals to buy for extra channels. Full repeat, reverse repeat and automatic tone burst plus a low power facility are selectable from the front panel. By adding a 'Superscan' at a later date you can obtain full scanning facilities over the whole band at a VERY competitive price.

The IC-240 is a superbly built and very reliable piece of equipment as witnessed by the many thousands in use. All Icom equipment is built to a very high standard and the IC-240 is no exception. It has an excellently sensitive receiver and a very clean transmitter and will give you hours of headache-free pleasurable use—so why not get one now before the price goes up again!

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IC-280E
NOW £250 inc.

★ **WITH SCANNER £260**

As usual, ICOM have kept ahead with technology and have produced their revolutionary new IC-280E which uses a microprocessor to produce frequencies throughout the 2m band at the ideal 25kHz spacing required today. The IC-280 has the ideal advantage of being separable into two parts for easy mounting into today's cars which so often forget to leave space for a rig. The removable front panel, with all controls, is only 3" deep and will fit in any convenient spot—in the glove pocket, on the dash or even on the sun visor! The main part of the set can be mounted anywhere within 4 feet—or even further in many cases—under the passenger's seat is quite handy! Display is of frequency on an LED readout and there are three memories for your favourite channels. These are not cleared when the set is switched off as long as it is left connected to the car battery.
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. . . OR /P FOR THE SUMMER?

IC-215
£162 inc.

The IC-215 is getting more and more popular also as it combines the advantages of a portable, which can be operated anywhere, with the ability to double as a low power base station by virtue of its 3 Watts of output and SO239 antenna connecter on the back. Of course there are facilities to operate it from an external power supply, and if it is fitted with Ni-Cads you can arrange to trickle charge these at the same time. The batteries used are of a sensible size being C type (or UII) instead of the 'penlight' batteries used by most of its competitors. This gives at least three times the operating power when you are away from home which you will appreciate if ever you have run out of battery in the middle of a QSO! It comes already crystalled up for 12 channels, S20, S22 and all the repeater channels 0 to 9. We think the extra power and larger batteries far outweigh the advantages of having the extra channels produced from a synthesizer.
Less VAT = £140.87 With VAT = £162.00

IC-202
£199 inc.

ICOM's range of sideband portables has been recently expanded. The well known and tested IC-202E has now been improved in the form of the IC-202S which has lower side band fitted also and provides sidetone on CW. The receiver has been hotted up making it even more suitable for use as a base station, either barefoot or as a prime mover. The new IC-402 is the 70cm version of the 202S giving the same facilities as its 2m cousin over the range 432-435·2 MHz. Both use a very stable VXO circuit, to give fully tuneable coverage of the band in 200kHz segments and both have extremely clean signals so that using them to drive a linear to the full legal limit presents no problems. We are very impressed with both the 202S and the 402.
The IC-202E was good . . . these are even better!

IC-202S	Less VAT = £173.04	With VAT = £199.00
IC-402	Less VAT = £255.65	With VAT = £294.00

IC-402

OR IF YOU WANT A HAND-HELD—
HOW ABOUT THE AR-240?

IC-202

Although not made by ICOM, we decided to take this exciting new little hand held into stock because it fills the need for a really good portable where size is of prime importance. It has an amazing performance with a truly excellent receiver. A synthesizer is used, with decade switch read out to cover the range 144–148MHz in 5kHz steps and 600kHz repeater shifts and a tone burst are built in. It comes with NiCads, a charger and a telescopic whip antenna—though if you want to make things even neater then you can use the ICOM FA1 flexible helical in place of this. At £195 inc VAT we think this is really good value for money.

AVAILABLE NOW DIRECT FROM HERNE BAY
Less VAT = £173.13 With VAT = £199.00

AR-240

240 Channelizer

We have now a new mod. for the IC-240 which gives 80 Channels, displayed as channel numbers selected on thumbwheel switches.
Kit £37 inc. VAT

Phone—or put a message on the ansafone for further details

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THE 'REMOTABLE' 2m RIG

IC-280

£250
inc VAT

★ WITH SCANNER FOR £260! ★ (Contact us first)

25kHz SPACING OVER THE WHOLE BAND: 3 MEMORIES: LED READOUT: BUT MOST IMPORTANT—ICOM QUALITY

Icom's new 2 meter mobile has a detachable microprocessor controlled head, easy to read LED's and a new style meter set in a brushed aluminium front panel.

The 280E comes as one radio which can be mounted in the normal manner but as an option the entire front one third of the radio detaches and can be mounted in that small location in the car (such as the glove pocket) where other sets are just too large to fit, while the main body tucks neatly out of sight several feet away—such as under the passenger's seat. No longer do you have to mount a radio in a position where it is poised all ready to smash your right kneecap should you have an accident!

With the microprocessor head the IC-280E can store three frequencies of your choice, which are selected by a four position front panel switch. These frequencies are retained in the 280E's memory for as long as power is applied to the radio. Even when power is turned off at the front panel switch the programmed memories are maintained; and the 600kHz repeater shift is always retained.

It goes without saying that the usual high quality engineering for which Icom are renowned is found in the 280E. There are no nasty shortcuts to try to keep the price down to the detriment of performance.

It includes the latest innovations in large signal handling FET front ends for excellent intermodulation performance and good sensitivity at the same time. The IF filters are crystal monolithics in the first IF and ceramic in the second, providing narrow band capacity for today and tomorrow's crowded operating conditions. Modular PA construction with broad band tuning provides full rated power across the full 2 meter band.

FROM **THANET ELECTRONICS** OF COURSE

ICOM®

DON'T WORRY—WE GUARANTEE ALL SOLID-STATE RIGS

1 IC-211E 2m All-mode

Covering the full 2 metre band with fully synthesised multi-mode operations, the IC211E is the most advanced, highest quality 2 metre transceiver available anywhere. The IC211E comes complete with ICOM's single-knob frequency selection and two digital VFO functions, standard features at no extra cost.

The large weighted flywheel knob mounted with low friction ball bearings is used to drive an optical chopper to provide pulses to the synthesisers LSI, which shows a full 7 digit readout. A breaking mechanism, which operates electrically, engages to provide a smooth feel at slow speeds; and a "dial lock" button holds the reading at the time it is pushed, even though the knob continues to rotate.

The IC211 incorporates computer compatible interface via the 24 pin accessory socket on the reat panel which enables PIA connection for the microprocessor buff.

The IC211's synthesiser steps are displayed, with positively no time lag, backlash or uncertainty in display stability, in increments of 100Hz or 5kHz from 144-146MHz. Any offset for repeater use can be programmed.

SMALL ENOUGH FOR MOBILE!

The IC211 contains both 240vac and the 13.6vdc power supplies and has a built-in high SWR autopower control. Variable output power contributes to the IC211's versatility. Output between 500 milliwatts and 10 watts may be front panel controlled on FM.

More of the maximiser's built-in standard features include: a pulse type IF noise blanker; front panel discriminator meter, SWR meter; VOX with adjustable VOX gain delay and antivox; CW monitor volume level; and semibreak-in CW operation.

And your new IC211 carries the THANET 1 year warranty backed by spare parts and technical expertise if bought directly from us.

COMPARE THE IC211 WITH THE OTHERS! £549 inc. VAT

2. Computer compatible

IC-701 HF £899

ICOM's superior LSI technology takes the lead in Amateur HF. The extremely compact **IC-701** delivers 100 watts output from a completely solid state, no tune (broad band design) final, on all modes and all bands, from 160-10 M. With single knob frequency selection and *built-in dual VFO's,* the LSI controlled **IC-701** is the choice in computer compatible, multi-mode Amateur HF transceivers.

The **IC-701's** single frequency control knob puts fully synthesised instant tuning at a single finger tip. **WIDE** bandspread, with 100Hz per division and 5kHz per turn, is instantly co-ordinated between the smooth turning knob and the synthesiser's digital read-out with positively no time lag or backlash (no waiting for counter to update: less operator fatigue). And at the push of the electronic high speed tuning button, the synthesiser flies through megacycles at 10kHz per step (500kHz per turn).

The computer compatible **IC-701** LSI chip provides input of incremental step or digit-by-digit programming data from an external source, such as the microprocessor controlled accessory which will also provide remote band selection and other functions.

Full band coverage of all six HF bands, and continuously variable bandwidth on filter widths for SSB, RTTY, and even SSTV, help to make the **IC-701** the very best HF transceiver ever made. **IC-701** includes two CW widths, all of this standard at no extra cost.

Sold complete with the high quality electret condenser base mic (SM-2), the **IC-701** is loaded with many ICOM quality standard features. Standard in every **IC-701** are *two independently selectable, digitally synthesised VFO's at no extra cost.* Also standard are a double-balanced schottky diode 1st mixer for excellent receiver IMD, and RF speech processor, separate drop times for voice and CW VOX, optionally continuous RIT, fast/slow AGC, efficient IF noise blanker, fast break-in CW, and full metering capability.

from THANET of course.

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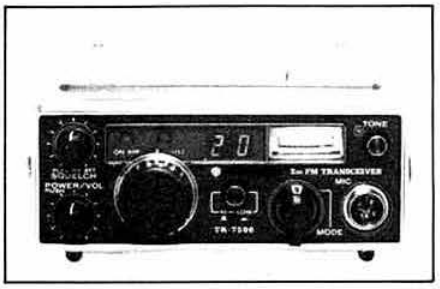
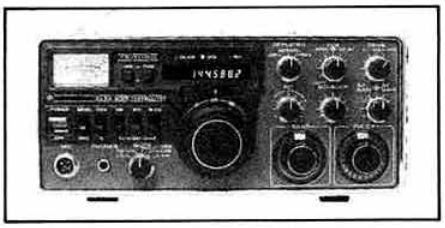


TRIO TR7500 The sensible one, £240 inc. VAT

The TR7500 gives you the ultimate FM mobile rig. Full band coverage 144–146MHz in 80 channels at 25kHz spacing—and no programming or crystals due to the use of an advanced synthesiser. Dial indication is commonsense itself; if you want S20, simply turn the dial to 20; R7, turn to 7, no need to remember complicated frequency plans. If you are operating on a repeater and you wish to listen on the input frequency or operate reverse repeater, simply touch one switch; there is no knob twiddling involved. Should you need a 1·6MHz shift—that's also available on the synthesiser—but remember, you may qualify for the WACS Award (worked all cop shops!).

Potent performance in a package not much larger than the TR-2200 with 15-18 Watts transmitter output and better than 0·2μV sensitivity together with the unparalleled Trio quality and attention to detail make the TR7500 the *sensible* man's choice.

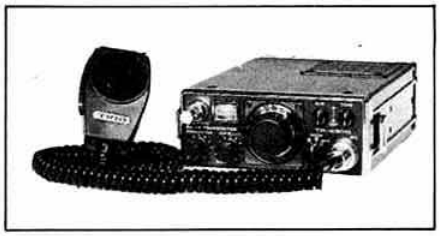


TRIO TS700S £549 inc. VAT

This is the ultimate TS700 with every possible extra. Full 2 metre coverage on VFO or 22 crystal controlled channels with digital readout on all modes to 100 Hz using the Trio exclusive easy on the eyes readout rubes. Built-in Vox and break-in CW with keyed sidetone. Low power facility for all modes in case you don't need the full 15–18 Watts normally given by the TS700S. Better than ever receiver performance, particularly in strong signal handling when compared to other equipment, and a built-in switched RF preamplifier. Automatic tone burst with repeater and reverse repeater shifts for no fuss use of 2 metre repeaters.

The remote VFO700S offers for the first time in a VHF rig the facility of splitting transmit and receive frequencies by any amount and also operation on two different transceive frequencies at the touch of a switch (invaluable for monitoring net frequencies or OSCAR checking). The VFO will also give VFO control of the TR7010 with a small adaptor unit.

All in all the TS700S is the best, so see it soon at your nearest stockist; you will not be disappointed.



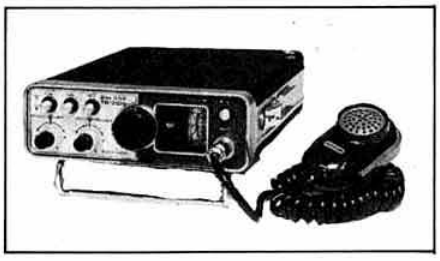
TRIO TR2300 £199 inc. VAT

The TR2300 is a remarkable package which combines all the advantages of a portable station with those of a sophisticated mobile set. With the TR2300, you get full band coverage from 144–146MHz in fully synthesized 25kHz channels together with 600kHz repeater shift (and reverse repeater if required) with automatic 1750Hz tone burst.

The dial is directly calibrated in frequency and has switched illumination for ease of use at night.

The transmitter puts out a very clean signal at a power of one watt, and the receiver is very sensitive, in fact better than many big rigs. The external power and external antenna sockets allow one to use it as a fixed station when desired.

The TR2300 is amazingly small, much smaller than its predecessor the TR2200GX and uses a more sophisticated case design and modular construction making a really rugged rig. It comes complete with carrying case, shoulder strap, battery charger, external power cord, etc. Needless to say, you don't need any crystals!



TRIO TR7010 £193 inc. VAT

Work real DX with ease on 2 metre SSB and CW. The TR7010 combines a high performance receiver with a 10 Watt transmitter and provides mobile or fixed station capability at low cost. Supplied ready to operate from 144·1–144·34MHz, the TR7010 covers all CW, SSB and beacon activity. 48 channels with 5kHz spacing plus VXO and RIT provide continuous coverage. Operation in other parts of the 2 metre band can be carried out by a simple crystal change and no re-alignment is required.

Single conversion using an IF of 10·7MHz with a first class crystal filter gives outstanding selectivity. Wide range amplifed AGC and newly developed FET devices in the RF and mixer stages allow maximum sensitivity to be used with freedom from overload due to adjacent signals. The single conversion transmitter using fully balanced mixers generates a beautifully clean signal with crisp audio quality.

Join the SSB gang and work real DX. Send for full details now.

TRIO TR3200 £190 inc. VAT

70cm FM repeaters are now so numerous and so efficient that it's almost possible to go anywhere in the country and still be within range of one. As many operators are finding, you don't need high power to be successful, and the TR3200 70cm portable/mobile rig provides the perfect solution to the search for a go-anywhere rig.

The TR3200 power output is two watts or more, switchable to 400mW, it has a really good receiver, a high gain ¼ whip antenna and top performance under all conditions. Use it portable on the internal battery pack or mobile using an external antenna and power from the car. Supplied with three channels fitted, carrying case, shoulder strap and all accessories, the TR3200 is the complete 70cm FM answer.

Drop us a line and ask for full details, or better still, come along and see the TR3200 and all the Trio range in comfort.

SEND 50p IN STAMPS FOR COMPLETE CATALOGUE AND ANTENNA BOOK
PLEASE SPECIFY ANY PARTICULAR INTEREST AND WE WILL SEND FULL INFORMATION

LOWE ELECTRONICS Ltd

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THEN MAYBE ADD THE MATCHING PSU FOR HOME USE

and you have an equally great fixed station. PS20 **£52** inc VAT

OR MAYBE ADD THE EXTRA VFO

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SP120 £25.50;
AT120 £69 inc VAT

OR MAYBE EVEN LOOK AT THE NEW TS120S WITH 200 WATT PEP
TS120S £495; PS30 £98 inc VAT

TS120V—TS120S THE SYSTEM APPROACH FROM TRIO

For personal attention on the SOUTH COAST contact JOHN, G3JYG; for equally helpful advice in SCOTLAND contact SIM, GM3SAN. We now stock the PET 2001 series computer at new low prices. SIM, GM3SAN is particularly clever in this area, so why not contact him if you're in SCOTLAND. He'll be glad to help. The addresses appear below.

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THE ALL NEW TS 180S

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- ★ ALL SOLID STATE
- ★ 200W PEP
- ★ VARIABLE POWER
- ★ PASSBAND TUNING
- ★ NEW DIGITAL FREQUENCY CONTROL
- ★ NEW COMPRESSOR
- ★ NEW STANDARDS OF PERFORMANCE

GET READY FOR THE NEW HF LEADER

Well chaps, Trio have done it again. We proudly introduce the new top of the line HF transceiver from the people who lead the field.

The all new TS180S will delight the most demanding user with its combination of high power, small size, all solid-state design and an array of features like no other transceiver has had before.

The digital frequency control system is an operators' dream since it allows split frequency working, displays frequency dispersion, has multiple memories which not only store any frequency but also allow shifting around the memorised channel and much, much more.

Every facility you ever wanted is included in the HF dream machine – the TS180S from Trio

TS180S complete with digital frequency control £825 inc VAT

All Trio equipment is available from the following authorised Trio dealers
LOWE ELECTRONICS LTD, 119 Cavendish Road, Matlock, Derbys. Tel: 0629-2430 or 2817
Note: Partridge Electronics are approved Trio receiver stockists

SOUTH LONDON COMMUNICATIONS HOUSE 20 Wallington Square WALLINGTON SM6 8RG Telephone No. 01-669 6700	**LANCASHIRE** STEPHENS-JAMES LTD 47 Warrington Road LEIGH Telephone No. 0942 676790	**YORKSHIRE** LEEDS AMATEUR RADIO 27 Cookridge Street LEEDS LE2 3AG Telephone No. 0532 452657	**WILTSHIRE** PACE ELECTRONICS 9 Lime Kiln Wootton Bassett, Nr. SWINDON Tel. No. (0793) 850056
NORTH LONDON RADIO SHACK LTD 188 Broadhurst Gardens LONDON NW6 3AY Telephone No. 01-624 7174	**BIRMINGHAM** WARD ELECTRONICS Soho House, 362-364 Soho Road BIRMINGHAM B21 9QL Telephone No. 021 554 0708	**WALES** M.R.S. COMMUNICATIONS LTD 76 Park Road Whitchurch, CARDIFF Tel: No. 0222 616936	APPROVED TRIO DEALER

Any other firm offering Trio products is not an officially authorised Trio dealer and Trio equipment purchased from such a company is not backed by the Trio service and spares organisation in the U.K.

WATERS & STANTON ELECTRONICS

LOOK! 12½kHz or 25kHz +25 watts

FDK MULTI-700E

£229 inc. VAT & delivery

What can one say about a transceiver that has proved to be so perfect in design. Truly a concept that looks to the future as well as the present. Its powerful 25 watts ensures better coverage than its competitors and its 25kHz stepped frequency synthesizer means no more xtals to buy. And to match its powerful output two receiver RF stages are provided that typically give about ·3uv or better for 20db NQ. Reliable repeater operation is ensured by a crystal controlled tone burst and a pre-wired 600kHz shift. Listening on the input of the repeater or reverse repeater operation is obtainable at the flick of a single switch and the 25 watts output is continually variable down to 1 watt. A remarkable transceiver at a remarkable price—little wonder more and more people are saying, "I'm using a Multi-700E at this end, O.M." And one final point, it also tunes in 12½kHz steps and with the specially designed receiver filter 12½kHz operations is immediately possible. **IN STOCK NOW—ORDER TODAY.**

NEW MULTI-3000 2m ALL MODE TRANSCEIVER

The Multi-3000 is the new 2 metre all mode transceiver to leave the FDK factory. It features 15 watts of FM/SSB/CW with a host of features that keeps it in the forefront of value-for-money VHF transceivers.

The design retains the switch selected synthesizer which can be used for FM to select any channel quickly and accurately. The synthesizer tunes in 10kHz steps and a separate control inserts the 5kHz digit as necessary. Complete coverage from 144 to 148MHz is provided and the three separate knobs for 1MHz, 100kHz and 10kHz digits make QSYing extremely rapid.

FDK's dual vfo facility is retained employing a separate flywheel drive with direct digital readout. Thus the switched synthesizer may be left on ones favourite FM channel and the vfo used to tune around the band. In the FM mode two tuning rates can be selected. The "rate of tuning" switch gives either 10kHz or 1kHz steps. The former for rapid QSYing and the latter for final tuning to the desired frequency exactly on any 1kHz multiple. On SSB and CW the same tuning control gives steps of either 1kHz or 100Hz. In this mode the digital display reads accurately to the nearest 100Hz. Tuning has never been easier! And that's not all. A memory button enables one to lock the last frequency (even down to 100Hz on SSB) and then carry on tuning around the band. At any time the memory button can be pressed to return to the original stored frequency and pressing it again returns you to the frequency you had just QSY'd from. In all, 3 frequencies can be stored, one on the switched synthesizer and 2 on the manual digital dial. Furthermore the memory is not lost when the equipment is disconnected from the supply cord.

Repeater operation is taken care of by a pre-wired 600kHz shift and this also operates an automatic crystal controlled tone burst.

All the usual features you are likely to need are also included: tone-burst defeat, VOX, Mic gain, AF and RF gain, noise blanker, receiver incremental tuning, fast and slow AGC, High/Lower power switch, squelch, also internal pre-sets for VOX gain, delay and anti-vox. The power supply is designed for 240 volts AC or 12 volts DC operation and projected price is **£519** inclusive of VAT. Another superb piece of engineering at a very reasonable price—FDK of course.
£519 inc. VAT & delivery—available end of June.

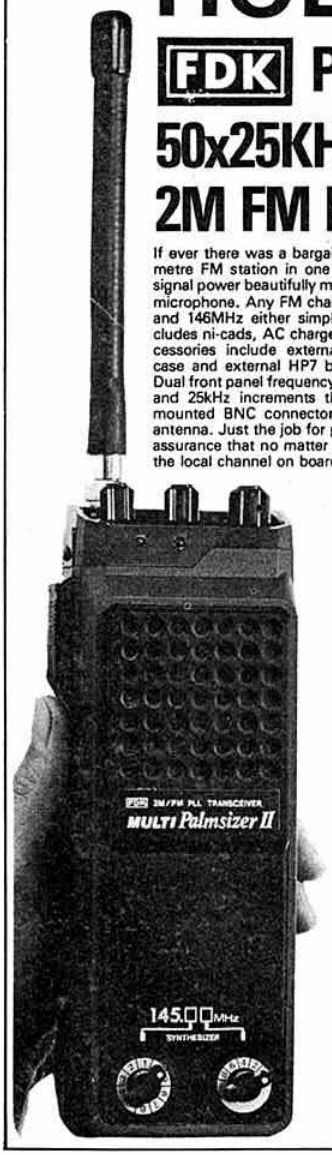
WATERS & STANTON ELECTRONICS

HOLD IT!

FDK PALMSIZER

50x25KHz CHANNEL 2M FM HAND-HELD

If ever there was a bargain this has to be it. A complete 2 metre FM station in one hand-held package. 1½ watts of signal power beautifully modulated by the built-in condenser microphone. Any FM channel can be selected between 145 and 146MHz either simplex or repeater. The package includes ni-cads, AC charger and helical whip. Additional accessories include external speaker/microphone, carrying case and external HP7 battery pouch for prolonged use. Dual front panel frequency selectors combine to give 100kHz and 25kHz increments throughout the band, and a top mounted BNC connector permits the use of an external antenna. Just the job for putting in one's briefcase with the assurance that no matter where you are you'll always have the local channel on board.



For a limited period only, complete with accessories:

£159

(inc VAT at 15%)

COMPARE ITS VALUE
COMPARE ITS FEATURES

- ★ Cigar lighter plug
- ★ External DC cord
- ★ Over one watt output
- ★ AC charger included
- ★ 50 channel capability
- ★ Simplex or ±600kHz switch
- ★ BNC aerial socket
- ★ Flexible whip supplied
- ★ Xtal controlled tone-burst
- ★ Ni-cad battery pack supplied
- ★ High quality condenser microphone

SEND FOR YOURS TODAY

SPECIAL OFFER

Due to bulk purchasing we can offer the following Shure microphones at special prices, all including VAT at the new rate. All are brand new, boxed current models with 12 month's guarantee.

Now you can buy Shure quality at bargain prices.

'201' HAND MICROPHONE	**£11.75**
High impedance type	
'444' DESK MICROPHONE	**£27.50**
High impedance type	
526T Mk II DESK MICROPHONE	**£36.35**
High or low impedance/variable output	

Please add 75p P&P to order.

DenTron GLA-1000

10-80m 1200W LINEAR
LOW COST, SMALL SIZE, BUT . . .
. . . BIG VOICE **£295 inc VAT**
DELIVERY FREE IN UK

This beautiful HF linear covers 80 to 10 metres and has its own built-in 117/234V power supply. Its diminutive size means less table space needed but without sacrificing power capability. Weighing in at just 24 pounds it measures only H.5 7/16" × W.11" × D.11" with room to spare inside. An almost silent fan ensures cool running whilst the little power house generates 1200 watts input on SSB or 1kW DC for CW. RF drive required is approx. 80 watts and the amplifier can be instantly switched in or out of circuit. Comprehensive metering monitors HF volts, PA current and output RF voltage. Altogether a linear we can thoroughly recommend at a price you can afford—just **£295** delivered.

DenTron NEW HF-200A

DELIVERY JULY
80-10m 200W TRANSCEIVER

Prov. Price **£399** Inc. VAT & del.

MATCHING AC PSU AVAILABLE

A natural development from DenTron had to be the birth of a transceiver. Small, compact and powerful—it's simply that! Measuring only 4" high × 10" wide it makes both ideal fixed or portable stations with its 200 watts input capability. Simplicity coupled with performance was the formula—that's why you won't find a single tuning control on the front panel, apart from the VFO. Simply select the band and operate. Its nominal 13·6 V DC supply requirement draws 750 m/a on receive with full audio output and 20 amps on voice peaks or CW. A matching AC power supply is also available for both 234 volts and 117 volts and a remote VFO is also being produced. So if you're the kind of operator who wants less in the way of gadgetry and more in the way of performance per £ take a closer look at the HF200A—we have a feeling you'll like what you see!

WATERS & STANTON ELECTRONICS

MAIL ORDER!

Yes, we do run one of the most efficient services in the UK. Just look at our stock! Either send us your cheque or PO adding carriage if shown in brackets, or telephone your Barclaycard or Access number. We'll get the goods to you by the quickest route. Heavy items by Securicor and smaller packages by parcel post. All sent at *our* risk and, of course, guaranteed. It pays to deal with an established company like ours—try us and see.

WE ARE NOW APPROVED TRIO STOCKISTS

YAESU

FRG7 General Coverage Receiver	£214.00 (N/C)
FRG7000 Digital deluxe receiver	£375.00 (N/C)
SP101 Matching speaker	£21.75 (N/C)
YO100 Monitor scope	£159.00 (N/C)
FT301 160-10m Solid state	£591.00 (N/C)
FP301 AC PSU	£112.00 (N/C)
FT901DE 160-10m digital transceiver	£802.00 (N/C)
FT901DM 160-10m digital transceiver	£981.00 (N/C)
FT7 80-10m 10w transceiver	£305.00 (N/C)
FT7B 80-10m 50w transceiver	£431.00 (N/C)
FP12 12 amp PSU	£74.35 (N/C)
FT202R 2m hand-held (3 ch's)	£101.00 (N/C)
NC1 AC charging hod.	£18.90 (N/C)
YM24 Ext. mic/speaker	£16.60 (N/C)
FT227Rx 2m 10w transceiver	£244.75 (N/C)
FT225RD 2m All modes digital	£612.00 (N/C)
FL2100B 1200 watt 80-10m linear	£356.00 (N/C)
FT101Z 160-10m transceiver	£574.00 (N/C)
FT101ZD 160-10m transceiver	£660.00 (N/C)

LOWE RECEIVER

SRX30 0·5-30MHz AM/SSB/CW	£178.00 (N/C)

ICOM (NOTE NEW PRICES!)

IC215E 2mFM 3 watt 12 chs	£162.50 (N/C)
IC202S 2m SSB 3 watt portable	£199.00 (N/C)
IC240 2m 22 ch's 10 watts	£193.00 (N/C)
IC280E 2m FM 80 ch's 10 watts	£250.00 (N/C)
IC211E 2m All mode transceiver	£549.00 (N/C)

MICROWAVE MODULES

MMT 432/28-S transverter	£136.75 (N/C)
MMT 432/144-R transverter	£173.50 (N/C)
MMT 144/28 transverter	£90.75 (N/C)
MMC 144/2-4; 4-6 or 28-30 IF	£20.70 (N/C)
MMC 144/28 LO converter	£23.00 (N/C)
MMC 70/28 converter	£20.70 (N/C)
MMC 70/28 LO converter	£23.00 (N/C)
MMC 432/28 S converter	£30.55 (N/C)
MMC 432/144 S converter	£30.55 (N/C)
MMC 1296/144 or 28 converter	£32.00 (N/C)
MMC 28/144 10m up converter	£20.70 (N/C)
MMD 050/500mHz counter	£73.50 (N/C)
MMA 144 2m pre-amp	£14.90 (N/C)
MMD 500P 500mHz pre-scaler	£28.75 (N/C)
MMV 1296 varactor tripler	£34.50 (N/C)
MML 144/100w linear amplifier	£142.50 (N/C)
MML 432/100w linear amplifier	£252.90 (N/C)
MML 144/25W	£44.95 (N/C)

SEM

Europa "C" 2 metre transverter	£114.95 (1.00)
CPS10 AC PSU	£57.45 (1.00)
2m converters	£20.70 (N/C)
70cms converters	£23.00 (N/C)
2m pre-amp	£12.75 (N/C)
2m auto switching pre-amp	£19.40 (N/C)
70cms auto switching pre-amp	£22.40 (N/C)
2m PA3 pre-amp	£6.95 (N/C)
70cm PA3 pre-amp	£9.20 (N/C)
2m 48 watt linear/pre-amp	£60.90 (0.95)

HF auto pre-amp 2-40mHz	£14.95 (N/C)
HF pre-amp 2-40mHz	£10.90 (N/C)
HF Z-MATCH ATU 80-10m	£40.25 (1.00)

VHF MONITOR Rx's

TM56B 12v/240 AC auto scan 10 ch's	£106.00 (N/C)
TM56B Marine model	£115.00 (N/C)
SR9 12v DC Amateur model	£60.00 (N/C)
Extra xtals	£2.45 (N/C)

FDK

Multi 3000 2m All mode	£519.00 (N/C)
Multi 800D 2m 25 watts	£289.00 (N/C)
Multi 700E 2m 25 watts	£229.00 (N/C)
Multi Palm II 2m hand-held special package	£139.95 (N/C)
Multi Palm II 70cm handheld	£159.00 (N/C)
M-11/Q16 xtals £5.00 Palm II xtals £2.95	
Multi-Palmsizer 2m synthesised 40 channel hand-held	£159.00 (N/C)

DENTRON

MLA 2500 160-10m 2Kw linear	£699.00 (N/C)
MT3000A 3Kw 160-10m tuner	£280.00 (N/C)
MT2000A 3Kw 160-10m tuner	£180.00 (N/C)
160-10AT Supertuner 1Kw	£99.95 (N/C)
JR Monitor 160-10m tuner 300w	£59.95 (N/C)
W-2 160-10m PEP/SWR meter	£59.95 (N/C)
160-10m "open-wire" doublet	£23.00 (N/C)
1Kw 80-10m linear 240v GLA 1000	£295.00 (N/C)

AR

AR240 Synthesised hand-portable	£199.00 (N/C)

MIZUHO

2m SSB 1 watt portable	£165.00 (N/C)
Extra xtals	£3.00

NAIGAI

2200 2m 500w PIP linear	£485.00 (N/C)

ADONIS MICROPHONES

AM802G Compressor - 3 outputs	£59.95 (N/C)
AM502G Compressor - 1 output	£39.95 (N/C)

ASP MOBILE ANTENNAS

201 - 2m ¼ wave	£3.50 (1.00)
2009 - 2m 5/8th wave	£9.25 (1.00)
677 - 2m 5/8th wave deluxe	£14.95 (1.00)
462-70cms colinear	£8.25 (1.00)
667 - 70cms colinear deluxe	£17.95 (1.00)
Magnetic base and cable	£8.50 (1.00)
"No-hole" boot mounts	£3.75 (0.50)

HF ANTENNAS

HQ-1 20-15-10m mini-quad	£96.50 (2.50)
C4 20-15-10m vertical	£48.50 (2.00)
Mosley 20-15-10m mini-beam 600w	£99.00 (2.00)
Mosley 2Kw version	£129.00 (2.00)
TA32 600 watts 20-15-10m	£81.00 (2.00)
TA33 600 watts 20-15-10m	£118.00 (2.50)
Mustang 2Kw 20-15-10m	£135.00 (2.50)
Hy-gain 12 AVQ 20-15-10m	£43.00 (2.00)
Hy-gain 14 AVQ 40-10m	£60.00 (2.00)
Hy-gain 18 AVT/WB 80-10m	£87.00 (2.25)
Mosley TD3JR 20-15-10m dipole	£26.00 (1.00)
Mosley RD5 SWL ham dipole	£31.00 (1.00)
EL-40X 80-40 Mini dipole	£39.50 (1.00)
HF5 5 band vertical	£41.50 (1.00)

VHF ANTENNAS (JAYBEAM)

4Y/4M 4el yagi	£14.95 (2.00)
C5/2M 5db colinear	£35.65 (2.00)
5Y/2M 5el yagi	£8.85 (1.50)
8Y/2M 8el yagi	£11.50 (1.50)
10Y/2M 10el yagi	£24.75 (2.00)
PBM10/2M 10el parabeam	£29.90 (2.00)
PBM14/2M 14el parabeam	£36.30 (2.50)
5XY/2M X'd 5 element	£18.40 (1.50)
8XY/2M X'd 8 element	£23.00 (2.00)
10XY/2M X'd 10 element	£30.45 (2.00)
Q4/2M 4el quad	£19.10 (1.50)
Q6/2M 6el quad	£25.30 (2.00)
D5/2M 5 over 5	£15.85 (1.50)
D8/2M 8 over 8	£21.15 (2.00)
SVMK vertical Kit	£5.75 (1.25)
UGP/2 Ground plane	£8.15 (1.25)
HO/2M 2m halo	£3.70 (0.75)
HM/2M Above with 24" mast	£4.50 (0.75)
C8/70cm 8db colinear	£45.40 (2.50)
D8/70cm 8 over 8	£17.85 (2.00)
PBM18/70 18 el parabeam	£21.45 (2.00)
MBM/48 70 el Multibeam	£25.00 (2.00)
MBM88/70 88 el Multibeam	£33.30 (2.00)
8XY/70 8 el X'd yagi	£27.70 (1.50)
12XY/70 12 el X'd yagi	£34.20 (2.00)
D15/1296 15 over 15	£26.90 (1.50)

ACCESSORIES

9502 rotator	£51.00 (1.75)
KR400 rotator	£97.00 (2.00)
AR40 rotator	£54.50 (1.50)
Stolle 2030 rotator	£55.00 (1.50)
Stolle 2010 rotator	£50.00 (1.50)
CDE44 rotator	£109.00 (2.00)
HAM-M MkIII rotator	£159.50 (2.00)
Shure 444 microphone	£27.50 (0.75)
Shure 201 microphone	£11.75 (0.75)
Shure 526T microphone Type II	£36.35 (0.75)
Hand morse key	£9.70 (0.50)
EK121 Electronic "Bug"	£31.00 (0.75)
50ohm balun	£11.25 (0.50)
UR67 per metre	£0.62 (0.05)
UR43 per metre	£0.22 (0.03)
5 core cable per metre	£0.30 (0.03)
HP3A high pass filter	£3.00 (0.20)
Drake low pass filter	£18.40 (0.75)
TV1 ferrite rings	£0.35 (0.05)
Plastic antenna insulators	£0.25 (0.05)
Twin SWR meters 3-150mHz	£13.50 (0.50)

JAYBEAM (HF)

TB 3 ele 2kW Beam	£155.00 (2.00)
VR3 Triband vertical	£39.00 (2.00)

Mobile boom mics back in stock again. Ask for details

All prices include VAT at 15%
Carriage costs shown in brackets

MONDAY—SATURDAY 9-5·30 **THE COMPLETE HAM RADIO CENTRE** EARLY CLOSING WED 1·00pm

31 SPA ROAD, HOCKLEY, ESSEX **Telephone (03704) 6835** **Telex 897406**

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Western

YAESU and TRIO/KENWOOD EQUIPMENT

from **Western**

TRIO

FT-101Z/ZD — from £500

- ★ Latest in a famous line of HF transceivers
- ★ Digital frequency readout (ZD model only)
- ★ QRM-beating Variable IF Bandwidth
- ★ High performance RF processor
- ★ Rugged 6146B PAs with RF negative feedback
- ★ Full band coverage 160-10 metres
- ★ Compatible with all '901 accessories

YAESU FRG-7000 — £355

★ Full and continuous coverage 250kHz to 29.999MHz ★ Operation on SSB/AM/CW ★ Switched selectivity and fine tune control for maximum efficiency on SSB ★ Accurate digital frequency readout to 1kHz, using advanced CPU techniques ★ Built-in digital clock with facilities for setting two time zones (GMT and local), selected at the flick of a switch ★ CPU controlled timing clock switches receiver on or off at preselected times; also enables control of external unit such as tape recorder ★ Wadley loop circuitry for minimum drift and maximum stability ★ Simple and accurate frequency selection; easy-to-use colour coded bandswitch and preselector.

YAESU FRG-7 — £203

The general coverage receiver for the SWL with a limited budget. Good all-round performance at a down-to-earth price.

- ★ Full and continuous coverage from 500KHz to 29·999MHz
- ★ SSB/AM/CW operation
- ★ Fine tune control for ease of SSB tuning
- ★ Accurate readout of frequency to 10KHz or better, using MHz and kHz controls
- ★ Wadley loop circuitry for minimum drift and maximum stability
- ★ Operation from mains supply, internal batteries or external 12V DC

FT-227RB — £255

- ★ The latest 2m mobile from Yaesu
- ★ 800 channels 144-148MHz
- ★ Large, clear LED frequency readout
- ★ 4 memory channels (2 simplex, 2 repeater)
- ★ Up/down scanner controlled from microphone
- ★ Quick-release mobile mount

WATCH THESE PAGES FOR EXCITING HF NEWS SOON . . . !!!

TRIO TS-120V — £408
MATCHING PSU—PS20 — £51

Trio's latest for HF Mobile
Join in the mobile scene now that conditions are up!

- ★ Big rig features in a compact package
- ★ Digital frequency readout
- ★ All bands 10 to 80 metres CW/SSB ★ 10 watts output
- ★ IF passband tuning and other fine features.

COMING SOON—TS-120S 100 watt MODEL!

TRIO TS-520S — £539

Yet another Trio bargain from WESTERN! The latest version of this fine HF Transceiver with all the up-to-date features needed by todays amateur but at a realistic price. No frills, just good all-round performance and excellent value at the price.

- ★ Full coverage 10-160 metres, CW/SSB
- ★ All solid-state except driver (12BY7A) and PA which uses rugged and proven 6146B (S-2001A) valves
- ★ Improved speech processor to help in those pile-ups
- ★ Highly efficient noise blanker

TRIO TS-820S — £829

The pacesetting 10-160m Transceiver for the amateur who wants to keep up-to-the-minute! Loaded with features to make your operating even more enjoyable; among these are:

- ★ Advanced PLL circuitry and ultra-stable VFO for accurate and spurious-free frequency control
- ★ Factory-fitted digital readout of TRUE frequency—NOT just a "VFO counter" like some others
- ★ Speech processor gives true RF compression; front panel controlled and fully metered
- ★ IF shift to combat QRM on a busy band

TRIO TL-922 — £789

Want a BIG LINEAR? This is it!
A real powerhouse to complement your station, only needs 80 watts drive for full output.

- ★ 2000 watts PEP input SSB; 1000 watts CW/RTTY
- ★ 2x Eimac 3-500Z in AB2 grounded-grid for cool efficiency
- ★ Blower switch-off delay and full safety interlocks

TR-2300 2M PORTABLE — £193

- ★ The leading 2m portable
- ★ Small, rugged, easy-to-use
- ★ All 80 channels (25kHz)
- ★ Automatic tone-burst
- ★ Charger and case included
- ★ Mobile mount and flexible antenna available
- ★ 1 watt output—10 watt amplifier available

ALL PRICES INCLUDE 15% VAT AND FREE SECURICOR DELIVERY
★ ALL EQUIPMENT CARRIES A TWO-YEAR WARRANTY ★
ICOM EQUIPMENT ALSO AVAILABLE — PLEASE ASK

ACCESS — BARCLAYCARD — DINERS CLUB — HP ARRANGED — PART EXCHANGE

Electronics (UK) ltd

NEW! 10 metre MONOBANDERS from Western

We are proud to announce two NEW additions to the well-known WESTERN DX-series of beam antennas

The DX-103 and DX-105 are no-compromise full-sized monobanders to enable you to make the very best of today's conditions on the 10-metre band

Easy assembly, light weight, good performance —all are yours with WESTERN'S MONOBANDERS!

DX-103

Feed Impedance	50 ohms
Gain	up to 8dB
Front-to Back Ratio	up to 25dB
Power Handling	2kW PEP (SSB)
VSWR	less than 1·3:1
Boom length	14′ 11″ (4·3m)
Max. Element length	17′ 7″ (5·37m)
Windload at 75 mph	44lb (20kg)
Windload at 100 mph	70lb (32kg)
Weight	24lb (11kg)

INTRODUCTORY PRICE £69 inc VAT

DX-105

Feed Impedance	50 ohms
Gain	up to 8dB
Front-to-Back Ratio	up to 25dB
Power Handling	2kW PEP (SSB)
VSWR	less than 1·3:1
Boom length	21′ 2″ (6·45m)
Max. Element length	18′ 3″ (5·57m)
Windload at 75 mph	70lb (32kg)
Windload at 100 mph	123lb (56kg)
Weight	35lb (16kg)

INTRODUCTORY PRICE £89 inc VAT

PRICES are for LIMITED PERIOD ONLY!

DON'T FORGET . . .

WESTOWER (see last month)
ALUMAST (see last month)
EMOTO (write for details)

WESTERN PM-2000 and PM-2001
PEP Wattmeters (Patent Protected)
WESTERN TRIBANDER BEAMS
. . . ALL AVAILABLE from WESTERN and AGENTS

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CONTRARY TO WHAT OTHERS WOULD HAVE YOU THINK . . .
WE PROMISE to service or repair any equipment we have supplied
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WE ARE independent and so is our pricing policy
WE BELIEVE in freedom of choice and competitive pricing
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Scotland: Alan Cameron, GM3OGJ, Alloa (0259) 214653
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Opening hours:
LOUTH: 9–12; 1–5pm Mon–Fri. By appointment Sat 9–12.
LEICESTER: May's Hi-Fi, Churchgate (Tel: 0533-58662). Mon–Sat 9–6pm; closed Thurs.

AMATEUR ELECTRONICS UK

AEUK – Your number one

AS FACTORY APPOINTED DISTRIBUTORS WE OFFER YOU— WIDEST CHOICE, LARGEST STOCKS, PROMPTEST DEAL AND FAST, SURE SERVICE RIGHT THROUGH —

YAESU

THE SUPERB FT-101Z AND FT-101ZD TRANSCEIVERS ARE NOW APPEARING IN LARGE NUMBERS ON THE H.F. BANDS FOR THE SIMPLE REASON THAT THEY REPRESENT THE BEST VALUE FOR MONEY AVAILABLE TODAY BUT PRICE NOTWITHSTANDING MANY OPERATORS ARGUE THAT THE RECEIVER PERFORMANCE IS SUPERIOR TO ANYTHING THEY HAVE HANDLED BEFORE—CALL, 'PHONE OR WRITE (PLEASE SEE FACING PAGE) FOR FULL DETAILS.

FT101ZD Series High Performance Transceiver

FULL COVERAGE
Full band coverage is provided on the FT-101ZD: 160 through 10 meters, plus WWV/JJY reception on 5MHz. Teamed with the FTV-901R transverter, operation can be extended to 72, 144, and 430MHz from your desk top.

CLEAN OUTPUT SIGNAL
With today's crowded bands, we all have the responsibility to keep our transmitted signal free of spurious radiation. YAESU engineers have included RF negative feedback, for a clean output signal.

STATE OF THE ART NOISE BLANKER
The all-new noise blanker is extraordinarily helpful in reducing the level of impulse noise. The blanking level may be adjusted from the front panel.

RF SPEECH PROCESSOR
A high-performance RF speech processor is built into every FT-101ZD, providing an increase in your average talk power of approximately 6dB. The processor level can be adjusted from the front panel, for optimum signal enhancement.

WORLD-WIDE POWER CAPABILITY
The FT-101ZD has provision for operation from a variety of AC voltages, from 100 to 234 volts. When you're travelling, you'll never need a heavy, bulky transformer for operation with your FT-101ZD. A DC-DC converter is an available option, for mobile operation. The FT-101ZD is small enough to qualify as carry-on baggage on most airlines, and is equipped with a strong, side-mounted handle for ease of carrying.

VARIABLE IF BANDWIDTH
Using two 8-pole crystal filters with superior shape factors, the FT-101ZD variable bandwidth system is a valuable tool on today's crowded bands. With the turn of a dial, high-pitched SSB "buckshot," or unwanted CW signals, can be eliminated from the IF passband.
Compare for yourself: other systems use a single filter in the IF; though you can move away from one interfering signal, you may move into more QRM. The YAESU design actually varies the bandwidth, *eliminating* the QRM. Other manufacturers would have you spend hundreds of pounds on different filters for 2.1kHz, 1.8kHz, 1.5kHz, 800Hz, 500Hz, etc. With the FT-101ZD, you have continuously variable bandwidth—from 2.4kHz down to 300Hz.

DIGITAL PLUS ANALOG READOUT
The FT-101ZD features digital plus analog frequency readout. The display features big, bright LED digits, for maximum readability. For extra savings, the economy model FT-101Z gives you the same precision analog display, at a significantly reduced cost. You can add the digital display later, if you wish.

INTERFACE WITH 901 SERIES COMPONENTS
Your FT-101ZD may be used with all of the exciting FT-901DM series accessories. The FV-901DM synthesized, scanning VFO provides storage and recall of up to 40 frequencies, in addition to its 3-speed scanner and auto scan function. Sae for information on other accessories.

HOW TO REACH US (EASY PRIVATE PARKING ON OUR 70ft. 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 complex. Take third turning off to Lichfield. One mile further on follow A4040 to the right and within 100 yds. veer again to the right, approximately one mile further on brings you to the Fox & Goose. Turn right and see preceding directions.
FROM THE WEST AND SOUTH/WEST. Follow M5 then M6 to Spaghetti Junction (see above). Alternatively, leave M5 at junction 4 or 3 and proceed to inner ring road. Turn South on ring road and leave on A47 (East). We are located three miles from this point.

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

Access

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

Access

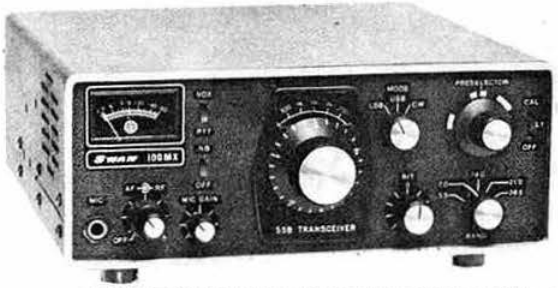
AMATEUR ELECTRONICS UK

source for YAESU MUSEN

THIS MONTH WE FEATURE THE HIGH TECHNOLOGY CPU-2500RK 2M F.M. TRANSCEIVER WHICH IS ONE OF THE MOST SOPHISTICATED UNITS AVAILABLE ON THE MARKET TODAY. 36p IN STAMPS BRINGS YOU THE LATEST YAESU GLOSSY CATALOGUE WHICH GIVES FULL SPECIFICATION TOGETHER WITH DETAILS OF THE EVER-GROWING YAESU RANGE—AND AS AN ADDED BONUS YOU WILL GET OUR CREDIT VOUCHER VALUE £3.60—A 10-1 WINNING OFFFER!

Here's our 10–1 winning offer—if you'd like the full Yaesu catalogue just send us 4 × 9p stamps (36p) and we'll send you Yaesu's fully illustrated brochure together with our Credit Voucher for £3.60 against your eventual purchase. A couple of 9p stamps will bring you the FT101Z, Atlas or Swan leaflets or our current used equipment list.

NEW! ADVANCED TECHNOLOGY from SWAN ELECTRONICS



100 WATTS MINIMUM OUT !

100MX—THE DE-LUXE MOBILE RIG WITH ALL THE EXTRAS

Solid state HF transceiver. 100 watt PEP and CW output, 80M–10M. Broadband design featuring noise blanker, VOX, 25KHz calibrator, CW sidetone, semi-break in CW, RIT, built-in speaker. Ultra stable PTO frequency source. Operates directly on 11 to 15 VDC, USB, LSB, CW operation. 9MHz 8 pole crystal IF filter. 4W Audio O/P.

UNBEATABLE PERFORMANCE—UNBEATABLE VALUE £459 PLUS VAT

THIS IS THE RIG FOR THE MAN WHO INSISTS ON THE BEST

ATLAS RADIO INC.

AS DIRECT IMPORTERS AND MAIN AGENTS WE OFFER THE FAMOUS ATLAS 210X and 215X TOGETHER WITH ALL ACCESSORIES FROM STOCK.

BRANCH: AMATEUR ELECTRONICS, UK—COASTAL, CLIFTONVILLE, KENT, KEN McINNES, G3FTE, THANET (0843) 291297. 9 a.m.-10.30 p.m.

BRANCH: AMATEUR ELECTRONICS UK–SCOTLAND, 287 MAIN STREET, WISHAW, LANARKSHIRE, GORDON McCALLUM, GM3UCI. TELEPHONE WISHAW 71382. (EVENINGS CARLUKE 70914)

AGENT: WALES & WEST—ROSS CLARE, GW3NWS, CAERLEON, NEWPORT. (CAERLEON 422232)—ONLY 20 MINUTES OVER THE SEVERN BRIDGE.

G3FIK

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021-327 1497
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SMC

DEPEND UPON

ASCOT ANTENNAS

This is a complete range of mobile antennae and accessories developed and manufactured in the United Kingdom.

All antennae are rugged, designed to withstand extremes of weather using: fine stainless steel whips, A100 nylon bases, chrome-plated brass ferrules, heat-treated silver-plated beryllium copper contacts and polished stainless steel shock springs.

PICK THE TYPE ($\frac{1}{4}\lambda$ 0dB $\frac{5}{8}$ & $\frac{1}{2}\lambda$ 3dB)

$\frac{1}{4}\lambda$	340	STANDARD BASE : 60–550MHz		£2.10
	310	SWIVEL BASE : 60–500MHz		£3.50
	344	SPRUNG BASE : 60–120MHz		£5.55
$\frac{5}{8}\lambda$	440	STANDARD BASE	145MHz	£3.50
	330	SWIVEL BASE	145MHz	£4.45
	341	SPRUNG BASE	145MHz	£6.65
$\frac{1}{2}\lambda$		STANDARD BASE	145MHz	£4.80
	350	FINE TUNE BASE	145MHz	£7.15
	351	SPRUNG 350 BASE	145MHz	£8.25

SELECT THE WHIP (Stainless steel)

057	127cm TAPERED: $\frac{1}{2}$, $\frac{5}{8}$, & $\frac{1}{4}$ 70MHz	£1.95
056	63·5cm PARALLEL: $\frac{1}{4}\lambda$ 144–432MHz	£0.95

CHOOSE THE MOUNT

(Mag. Mount & Assemblies c/w 4·5m 50Ω Coax)

$\frac{1}{4}$ or $\frac{5}{8}$	085	STANDARD CABLE ASSEMBLY MOUNT	£2.80
	095	FIBREGLASS MOUNT TO SO239	£2.10
	092	MAGNETIC MOUNT	£8.95
$\frac{1}{2}\lambda$	084	STANDARD CABLE ASSEMBLY MOUNT	£4.15
	088	COWL MOUNT TO SO239	£4.95
	091	MAGNETIC MOUNT	£9.80

ADD AN ACCESSORY (if required)

(Mounts fit all standard cable assemblies)

098	GUTTER CLIP MOUNT	£4.75
093	BOOT LIP MOUNT	£2.90
031	BLANK OFF COVER $\frac{1}{4}\lambda$ and $\frac{5}{8}\lambda$	£0.80
044	BLANK OFF COVER $\frac{1}{2}\lambda$ only	£0.45

LIKE THE PRICES? THEN:

ADD VAT 15% + CARRIAGE (Long ants. 95p, Accs. etc. 50p)

Ascot antennas are available; mail order from SMC HQ in Totton, personal callers to any branch (Leeds, Chesterfield, Woodhall Spa), SMC agent or reputable amateur radio dealers throughout Britain.

SOUTH MIDLANDS COMMUNICATIONS LTD

OSBORNE ROAD, TOTTON
SOUTHAMPTON SO4 4DN

Telex: 477351 SMCOMM G
Tel: Totton (0703) 867333 (3 lines)

SMC

THE ORIGINAL

VERSATOWERS

TELESCOPIC & TILTOVER

STRONGER

WINDSPEEDS UP TO 117mph

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.
Available between heights of 25 to 120ft post, base plate, wall, fixed base or mobile on high-speed trailers.
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.*

P40ft £276.75 +VAT 15%

P60ft £335.90 +VAT 15%

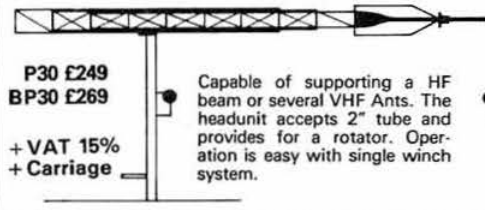
STANDARD SERIES POST MOUNTING

P40HD £416.20 +VAT 15%

P60HD £472.50 +VAT 15%

HEAVY DUTY SERIES POST MOUNTING

NEW 30FT · 10ft SECTIONS



P30 £249
BP30 £269

+VAT 15%
+Carriage

Capable of supporting a HF beam or several VHF Ants. The headunit 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

Telex: 477351 SMCOMM G
Tel: Totton (0703) 867333 (3 lines)

KYOKUTO

KYOKUTO DENSHI COMPANY LIMITED

KDK FM2016E 2m FM DIGITAL SYNTHESIZED TRANSCEIVER

The KDK FM-2016E is a 12V DC two meter FM transceiver for mobile and base station use. It has been compactly designed with emphasis on maintenance and ease of use by using the latest CMOS IC digital PLL circuitry.

Rx 144·000–148·995MHz and Tx 144·000– 145·995MHz.

Direct readout of operating frequencies by large size LEDs.

The most commonly used, 100kHz and 10kHz, switches are mounted coaxially. These will not go below the 0 or above 9 position facilitating frequency changing by feel only, for "eyes-on-the-road" motoring and use by those with impaired sight.

An electronic memory using CMOS RAMs (Random access memory ICs drawing only 25nA!) allows any four out of the 1,000 channels to be written-in (stored) at a flick of a switch. An auto-charging back up NICAD battery maintains the RAMs contents after disconnection from the power.

+·6 and −·6 positions of the mode switch provide for normal repeater operation. In position 1T–2R the set Tx's on the frequency in memory channel 1 and Rx's on memory channel 2 (likewise the 3T–4R position). This provides for non-standard shifts, and is also convenient for use in conjunction with up-converters.

The memory may be scanned in the "closed" mode, (the scanner will stop at the first channel in use) or in the 'open' mode, (stopping at the first empty channel). Scan-hold allows transmission immediately the scanner stops.

Dual-gate MOS-FETs are used for the RF and mixer to provide superior inter-modulation characteristics with high sensitivity. Performance is held constant across the wide frequency range covered, by automatic electronic tuning.

A monolithic crystal in the first IF and a commercial quality 15-pole ceramic filter in the 2nd IF provides extremely sharp selectivity. The 2nd IF is built with discrete components to keep stray coupling to a minimum and a ceramic discriminator has been adopted for excellent temperature stability and long-term alignment.

The RIT (Receiver incremental tuning) and centre zero meter are useful for contacts with off-frequency or drifting stations.

The single conversion transmitter uses a balanced mixer, five stages of electronic tuning, and a four-stage low pass filter for a clean, spurious-free signal.

The ultra-modern silicon transistor in the final will survive even an infinite VSWR.

Power: HIGH (15 Watts) and LOW (1 Watt), is selectable by a front panel switch (useful with a linear).

Direct FM of the VCO results in superb audio.

A two mode (burst or continuous) tone generator is adjustable from 1,750 to sub-audible frequencies.

A 5-pin "DIN" connector is provided on the rear panel for a KDK SC-12A SELCALL (tone encoder-decoder) unit, headset-microphone combinations or similar.

NEW LOW PRICE £250

SEE ONE TODAY
(£217.39 + VAT 15%)

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

South Midlands

TWENTY-ONE YEARS OF

WHY BUY YOUR YAESU MUSEN FROM SMC?

The two-year guarantee? The factory back-up? The free Securicor service?
The security of dealing directly with the largest authorised importer?
The spacious, very well equipped, ably staffed, test and service facility?
The knowledge that we carry tens of thousands of pounds of spare parts?
Our discreet "Instant" HP? Our personal export documentation scheme?
Our in person, or over the phone, time saving, credit card acceptance?
Our honest advice and evaluation of part exchange equipments' worth?
Our deep interest and knowledge of most facets of our common hobby?

Whatever the reason; heartfelt thanks to all our customers for making us, SMC, the biggest, and we sincerely hope, the very best in the business.

FT202R illustrated with OPTIONAL YH24 MICROPHONE/ SPEAKER UNIT

NO CHANGE IN RETAIL PRICE
WE ARE PAYING THE EXTRA VAT
FT202R £99 inc

£86.09 + 15% VAT
POST FREE

For under a hundred pounds inc, the handiest hand-held, c/w helical whip, tone burst, case, crystals S20, 21, 22.

YM24	External Microphone/Speaker	£14.50 + 15% VAT	£16.68
NC1	Mains Charger for Ni-Cd Cells	£16.50 + 15% VAT	£18.98
PA1	12V Power Supply Basemaster	£16.50 + 15% VAT	£18.98
AA	Ni-Cd Cell 'AA' 500mAh—set	£7.20 + 15% VAT	£8.28
XTAL	Per Pair of ex-stock Range	£4.00 + 15% VAT	£4.60

★ FT207R ★ NEW HAND-HELD ★

A microprocessor-controlled, fully synthesised transceiver with 3W output. All frequency entry is from the front panel keyboard, 12½kHz steps with digital readout to 500Hz. 4 memory plus priority channel, up/down and memory scanning, repeater splits, etc, etc. E&OE

EE EXTRAVAGANZA—CHECK OUR BIRTHDAY ARITHMETIC

FT101EE	£503.00	FT101EE	£503.00	FT101EE	£503.00	FT101EE	£503.00
FTV250	£185.00	YO601B	£134.50	YO101	£169.50	FV101B	£85.50
VAT 15%	£103.20	VAT 15%	£95.62	VAT 15%	£100.87	VAT 15%	£88.27
	£791.20		£733.12		£773.37		£676.77
Pay	£691.20	Pay	£683.12	Pay	£728.37	Pay	£636.77
Save	**£100.00**	**Save**	**£50.00**	**Save**	**£45.00**	**Save**	**£40.00**

SOUTH MIDLANDS COMMUNICATIONS LIMITED.

OSBORNE ROAD, TOTTON
SOUTHAMPTON, SO4 4DN

Hours of business:
9-5.30; Monday-Saturday

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AGENTS

G3ZUL	Brian	Stourbridge	(03843) 5917
GM3ZBE	Alex	Aberdeen	(065183) 328
GM8GEC	Jack	Edinburgh	(031665) 2420
GI3WWY	Mervyn	Tandragee	(0762) 840656
GW3TMP	Howarth	Pontybodkin	(035287) 846/324
GW4GSW	Alan	Swansea	(0792) 24140

Communications Ltd

PROFESSIONAL EXPERIENCE

YAESU

SMC SUPER SAVER STATIONS

FT225RD + NAG144

Multi Mode Transceiver – Quality Linear amp

£615.25 + £492.20

Total £1107.45 inc. VAT

★ **Pay £999 Save £108.45**

OFFER VALID THROUGH AUGUST ONLY AND SUBJECT TO AVAILABILITY

FT223 + A351H + T3-170L

2m FM Transceiver – ½ Wave Antenna – Reflectomer

£160.42 + £16.50 + £12.94

Total £189.86 inc. VAT

★ **Pay £169 Save £20.86** ★

FT200B + FP200 + FS500H

Transceiver – Power Supply – Peak Reading Wattmeter

£403.65 + £79.35 + £67.85

Total £550.85 inc. VAT

★ **Pay £499 Save £51.85** ★

A SPECIAL OFFER TO OLD CUSTOMERS

If you bought your FT221(R) from SMC then:
Tell us the serial number, give us fifty pounds
and a YC221 Digital Readout is yours.
Normal Price £83.38 Save £33.38

'301 WONDERS – CHECK OUR BIRTHDAY ARITHMETIC

FT301SD	£528.00	FT301SD	£528.00	FT301SD	£528.00	FT301SD	£528.00
FP301D	£162.50	YO301	£167.00	FV301	£86.00	FL110	£130.00
VAT 15%	£103.57	VAT 15%	£104.25	VAT 15%	£92.10	VAT 15%	£98.70
	£794.07		£799.25		£706.10		£756.70
Pay	£744.07	Pay	£754.25	Pay	£666.10	Pay	£721.00
Save	**£50.00**	**Save**	**£45.00**	**Save**	**£40.00**	**Save**	**£35.00**

Access

S.M.C. (Jack Tweedy) LTD
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GET AHEAD . . . GET A HANSEN

A full range of 14 purpose designed accurate SWR-Wattmeters: PEP Meters, Auto SWR meters, Mobile Types-RMS meters for HF, VHF and UHF. (Add VAT 15% THIS MONTH POST FREE)

FR HEAD/REMOTE INDICATOR FS711

Directional coupler 3" × 2¼" × 1¼"
Illuminated Indicator 5" × 2¾" × 1¼"
VSWR 1-3:1 ±3%, Power + 10%

FS711H	2-30MHz	20 & 200W	£28.00
FS711V	50-150MHz	20 & 200W	£28.00
FS711U	430-440MHz	5 & 20W	£28.00

PEAK READING WATTMETER FS 500

Peak reading Flat response
Power RMS and PEP ±7%
SWR Measurement 1-5:1. Size 8" × 4" × 5¼"

FS500H	1·8-60MHz	20 & 200KW	£59.00
FS500V	50-150MHz	20 & 200W	£59.00

PEAK READING WATTMETER FS60*M

Power RMS & PEP Flat Response VSWR 1-3: 1, 6¼", 2¾", 4¾".

FS601MP	1·8-30MHz	20 & 200W	£40.00
FS601MO	1·8-30MHz	200 & 2KW	£40.00
FS602M	50-150MHz	20 & 200W	£40.00
FS603M	430-440MHz	5 & 20W	£40.00

FLAT RESPONSE METER FS30*M

RF power + 10% FSD
SWR Measurements 1-3:1 ±3%
Size 6¼", 2¾", 4¾"

FS301MP	2-30MHz	20 & 200W	£27.00
FS301MO	2-30MHz	200 & 2KW	£27.00
FS302M	50-150MHz	20 & 200W	£27.00

PEAK READING AUTO SWR FS700

Peak reading Flat response
Automatic SWR, 1-4:1 & 1-20:1
Power RMS and PEP. Size 8" × 4" × 5¼"

FS700H	1·8-60MHz	15, 150 & 1·5KW	£68.00
FS700V	50-150MHz	15 & 150W	£68.00

SMC TRAPPED DIPOLES (Post 45p) VAT 15%

S500W	£23.00	P500W	£27.00
HP1KW	£25.00		

MOSLEY TRI-BAND BEAMS (Carriage £3.50) VAT 15%

TA33	£95.00	TA32	£64.00
Mustang	£118.00	Mustang 2	£95.00

GEM QUAD FIBREGLASS QUAD (Carriage £2-£9) VAT 15%

G22E	£124.00	GQ4E	£249.00
GQ3E	£187.00	CK1Q	£63.00

G WHIP HF MOBILE (Carriage 90p) VAT 15%

Tribander	£18.80	LF	£5.50
Multimobile	£21.60	MM	£5.50
Flexiwhip	£13.00	FF	£5.50
Basemount	£3.40	Telescopic	£2.40

ROPES (Carriage extra) VAT 15%

3 mm	£0.18	X150	£10.85
4 mm	£0.22	7X18g	£4.00

WIRE & BRAIDS (P&P extra) VAT 15% per yard

14	£0.13	BRAID	£0.13
7/036	£0.18	100ft.	£4.00
7/044	£0.24	7/029	£0.13

CABLES RF FEEDERS (Carriage extra) VAT 15%

UR67	£0.42	UR39	£0.27
UR57	£0.45	T3278	£0.24
302 75	£0.10	UR43	£0.17
306 300	£0.12	UR76	£0.17

AERIAL INSULATORS (Post extra) VAT 15%

SMCP2 3" Polyprop ribbed	£0.37	SMCP1	£1.55
1¼" Porcelain ribbed	£0.33	3"	£0.38

DIPOLE CENTRES (P&P extra) VAT 15%

AJU Polyprop c/w clamp	£0.85	CCJ2 c/w plug etc	£3.85
Porcelain (twin flat)	£0.38	CCJ1 heavy duty	£5.95

COAX PLUGS (UHF) (P&P 20p) VAT 15%

PL259	Standard UHF plug	£0.48	SO239E	Free, angle 58/U	£0.88
UG175/U	Reducer RG58/U	£0.12	PL258	Back-back, fem.	£0.79
UG175/U	Reducer RG59/U	£0.12	PL274	Back-back, chs.	£0.93
PL259R	'Reduced' plug	£0.58		Back-back, male	£1.20
PL259SL	'Solderless' RG8/U	£0.55	M359	Angle (1M + 1F)	£0.93
PL259SS	'Solderless' RG58	£0.55		'T', 3 female	£1.48
PL259P	Push-on plug	£0.69	M358	'T', 2 fem. 1 male	£1.20
PL259E	Elbow RG58	£0.83		4-way (3 fem. + 1 m)	£1.85
	Panel mount PL259	£0.93		SO239/Car + phono	£0.60
SO239F	4-hole Socket	£0.42		SO239/2·5mm	£0.69
SO239T	2-hole Socket	£0.42		SO239/3·5mm	£0.69
SO239NI	Socket 'nut'	£0.51	255/U	SO239/BNC male	£1.53
SO239NO	Socket 'nut'	£0.51	273/U	PL259/BNC fem.	£1.53

JAYBEAM 70(4m), 144(2m), 432 (70cm) (Carr about £1) + VAT 15%

D5/2m	£13.80	PBM10/2m	£26.00
D8/2m	£18.40	PBM14/2m	£31.60
5XY/2m	£16.00	D8/70	£15.50
8 XY/2m 8	£20.00	PBM18/70	£18.70
10XY/2m	£26.50	MBM48/70	£21.80
5Y/2m	£7.70	MBM88/70	£29.00
8Y/2m	£10.00	12XY/70	£29.80
10Y/2m	£21.50	4Y/4m 4	£13.00
14Y/2m	£27.50	PMH2/70	£5.90
Q4/2m 4 element quad	£16.60	PMH2/C	£5.20
Q6/2m	£22.00	PMH2/2m	£6.85

BANTEX VHF WHIPS (Carriage typically 95p) VAT 15%

B5	£7.75	70¼	£4.90
BGAfg	£9.10	Trunk	£5.50
BGAss	£8.30	Mag	£10.00
B5U	£5.00	Stand	£0.50
144¼	£4.30	UCL	£8.00

CUSHCRAFT VHF OMNI (Carr. 90p) VAT 15%

Ringo Ranger gain ARX 6dB (over ½) ultra low angle radiation, excellent 50 ohm match. Uses 3 × ¼λ in phase and ¼λ stub. 145MHz version approx 9' 6" (& 1¼lbs) 432MHz approx 3' 6" (illus. left)

ARX2 Ringo Ranger 145MHz	£21.50	ARX450 Ringo Ranger 432MHz	£21.50
AR2 3dB Ringo Vert	£12.75	ABW144 2m Big Wheel	£14.50
AR25 QRO AR2	£15.00	ABW12S ABW harness	£7.30
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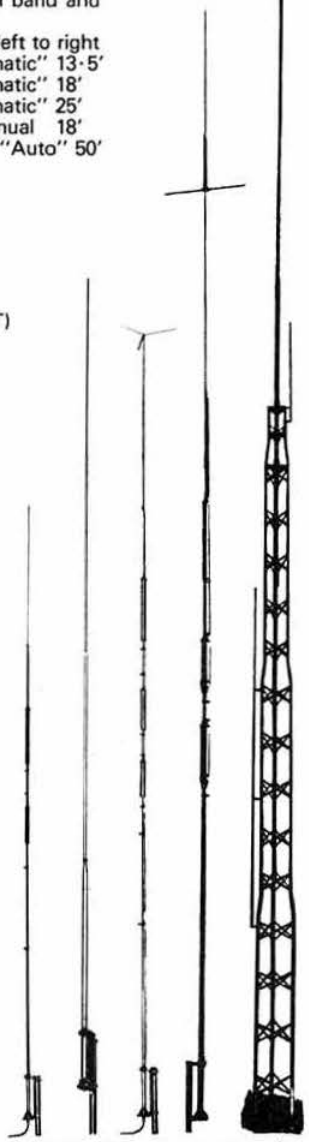

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Founded 1913 — Member society, International
Incorporated 1926 — Amateur Radio Union

PATRON: HRH The Prince Philip, Duke of Edinburgh, KG

The national society representing all UK radio amateurs

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

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UK corporate: £10, including VAT — **Overseas: £10**

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COMPOSITION OF RSGB ZONES

Zone A: Regions 1, 2 and 18
Zone B: Regions 3, 4 and 5
Zone C: Regions 7, 8, 16 and 19
Zone D: Regions 6, 9, 17 and 20
Zone E: Regions 10 and 11
Zone F: Region 15
Zone G: Regions 12, 13 and 14

COMPOSITION OF RSGB REGIONS

Region 1 Cheshire, Cumbria, Greater Manchester, Isle of Man, Lancashire, Merseyside.
Region 2 All that part of Humberside north of River Humber, North Yorkshire, South Yorkshire, West Yorkshire.
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.

QTC
amateur radio news

WARC

The first hundred documents for WARC have been received from the ITU, and it is now possible to assess the attitudes towards the amateur service. There will be many more documents to come, but those already received are sufficient on which to base some necessarily general comments.

Insofar as support for the amateur service is concerned it is apparent that IARU Region 2 offers more than the other two regions. In any analysis of this type there are, of course, exceptions, but the proposals coming from Region 2 countries generally show good support for amateur radio.

On a band-by-band basis there are the following brief comments:

1·8MHz

The Arabian Gulf states propose 1,800–1,859kHz exclusive.
Norway proposes 1,800–1,850kHz exclusive.
The UK proposes 1,809–1,914kHz exclusive.
France proposes no allocation in this band.
The USSR wishes to be included in footnote 3488/194, and has recently opened the segment 1,850–1,950kHz to the amateur service.
Switzerland, Chile and Ecuador propose 1,800–1,850kHz exclusive.
Greece proposes 1,800–1,820kHz exclusive.
A number of countries propose no change to the existing allocation.

3·5MHz

There are very many differing proposals, most of which seek to divide the existing allocation into exclusive and shared segments. Several CEPT member countries (eg Austria, West Germany, France) propose 3,500–3,520 exclusive and 3,520–3,800kHz shared.

7MHz

There are no proposals to reduce the 7·0–7·1MHz band in Region 1, but a number of proposals seeking to allocate 7·1–7·3MHz in Region 2 to broadcasting. There is a small number of proposals to extend the lf band edge to 6,950kHz, while Canada and Cuba propose an extension to 6,900kHz.

10, 18 and 24MHz

Support for the new bands is rather disappointing and generally increases with frequency, although the Netherlands and El Salvador propose 10MHz allocations but not the two higher bands. France and West Germany do not support any of the proposed new bands, whereas Australia, Botswana, New Zealand, Philippines, UK and USA propose three new allocations.

14, 21 and 28MHz

Almost all the proposals seek to retain the present allocations, although Chile, New Zealand, Philippines and USA propose a lower limit of 20,950kHz for the 15m band.

144–146 and 430–440MHz

There are no proposals to reduce the 144MHz allocation. For 432MHz Norway and Sweden propose 432–438MHz, with the Netherlands supporting 433–438MHz. Generally, in Region 1, 432–440MHz is the preferred band.

Higher frequency bands

Broadly, many of the Region 1 proposals are similar to those of the UK, although for individual bands there are some which it is hoped will be rejected, eg the French proposal for 1,248–1,260MHz only. For this band the USSR supports 1,260–1,300MHz. There are proposals for amateur satellite service windows in all bands between 1,215MHz and 24GHz (where there is an existing allocation). One of the tasks now occupying the IARU WARC team is to determine the segments acceptable to the majority of ITU member countries.

Enquiries are often made as to the possible decisions of the WARC affecting the amateur service. Such questions are often difficult to answer because of the political undertones which may prejudice an issue to which the answer seems obvious in engineering terms. However, the writer's reaction is one of cautious optimism.

A summary of the ITU proposals has been prepared and circulated to members of the RSGB Council, and the Telecommunications Liaison and IARU committees. A limited number of copies is available to club secretaries and may be requested from the writer.

WARC is scheduled to run from 24 September to 30 November at the International Conference Centre, Geneva. The amateur service will be represented by an IARU team led by Noel Eaton, VE3CJ, and by individual radio amateurs serving on national delegations, eg Algeria, Australia, Canada, West Germany, New Zealand, Norway and the UK.

G2BVN

Radio Communication delivery survey

As many members are aware the delivery pattern of the Society's journal is erratic to say the least. In order to obtain information for yet a further approach to the Post Office all members are asked to complete the form which will appear with the September issue of *Radio Communication*. On the reverse side of the address label carrier will be a questionnaire which, it is hoped, members will complete and return to Society headquarters. This is the only way in which positive information concerning the delivery of the journal to all parts of the UK can be obtained, and members' co-operation will be appreciated.

Callsigns

The ITU has provisionally allocated the callsign series H8A–H9Z to the Republic of Panama.

"Radio Transmitters and Modulation Techniques"

The Institution of Electrical Engineers, in association with the IERE and the RSGB, is organizing a conference on "Radio Transmitters and Modulation Techniques" to be held at the IEE, Savoy Place, London, on 24–25 March 1980.

Subjects to be covered at the conference include: transmitters for communication (fixed and mobile), broadcasting, television, and navigational aid; improvements in transmitting valves; impact of power semiconductors on transmitter designs; new methods of modulation; exploitation of Doherty and pulse-width modulation and other methods for the purpose of higher efficiency; transmitter control/tuning, protection and safety; common antenna working (filters and other means); linearity control; frequency and signal generation; automatic monitoring and correction; and spurious frequencies and noise radiation.

Telecom 79

The 3rd World Telecommunication Exhibition will be held between 20 and 26 September in Geneva. On the afternoon of Saturday 22 September there will be an amateur radio seminar held in the Palais des Expositions commencing at 1430. The speakers and subjects will be:

Dr D. S. Evans, G3RPE — microwaves
Mr T. Lott, VE2AGF — narrow band voice modulation
Dr K. Meinzer, DJ4ZC — Phase 3 satellites

After the lectures there will be a reception hosted by the West German national society, DARC. All radio amateurs are cordially invited. Tickets are not required.

Belgium—change of address

The new address for matters concerning the amateur service, including reciprocal licences, is: M le Directeur General, Regie TT—CNS, 31e etage—Tour Madou, Place Madou 1, 1030 Brussels.

The following is an extract from the newsletter of the Planetary Association for Clean Energy

"1976 and 1977 were years of unusual phenomena. It started in the spring and summer of 1976 with electro-magnetic emissions originating in USSR and powerful enough to block out BBC broadcasts, along with amateur and other telecommunications systems in Europe and North America. Monitoring arranged by the Planetary Association for Clean Energy in Canada and USA provided photographs of oscillograph patterns and other data which established that these emissions could penetrate Faraday cages. It also indicated that the fundamental wave was of Extremely Low Frequency (elf) and capable of affecting brain waves in the human being. Indeed a number of persons were found who suffered severe headaches, nausea and other symptoms simultaneously with these emissions. Sometimes at night these emissions were accompanied by a blueish fluorescence in the sky and by small radius displays similar to the aurora. In some parts of Britain the fluorescence was accompanied by a humming sound. Incidentally the same sights and sounds accompanied the huge power failure in New York of July 1977.

"Other phenomena that took place in this period, coincidentally with the Russian emissions, were a series of earthquakes and striking changes in weather patterns in various parts of the world. Earthquakes occurred in China on 28 July 1976 (Tangshan which took 650,000 lives), in the Philippines (16 August 1976) and on 24 November in Eastern Turkey. For example, the Chinese earthquake was accompanied by fluorescence, the hum and radio interference blocking the short wave band."

NEW BOOK

(Published in August)

Amateur Radio Operating Manual
edited by R. J. Eckersley, G4FTJ

This new book covers the essential operating techniques required for most aspects of amateur radio from 1·8 to 432MHz, and provides a comprehensive set of operating aids.

Chapter titles: *The amateur service; Setting up a station; Operating practices and procedures; DX; Contests; Mobile, portable and repeaters; Amateur satellites; RTTY; SSTV; Special event stations.*
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Nominations for election to the 1980 RSGB Council

The Society's Articles of Association require Council to notify all members who are entitled to vote of those Council members who retire at the end of each year. The Council members retiring on 31 December 1979 are as follows:

ORDINARY MEMBERS
Dr D. S. Evans, G3RPE, who will accept nomination for re-election.
Mr C. H. Parsons, GW8NP, who does not intend to stand for re-election.
Mr R. F. Stevens, G2BVN, who does not intend to stand for re-election.

ZONAL MEMBERS
Zone A
Mr B. O'Brien, G2AMV, who will accept nomination for re-election.
Zone B
Mr J. Anthony, G3KQF, who will accept nomination for re-election.
Zone E
Mr D. H. Adams, GW3VBP, who does not intend to stand for re-election.*
Zone F
Mr W. F. McGonigle, GI3GXP, who will accept nomination for re-election.

*Note that Mr Adams was co-opted on to Council in January 1979

NOMINATION PROCEDURE

Any qualified member of the Society (ie a corporate member for not less than three years, immediately prior to nomination) may be nominated to fill the vacancies on Council which arise from the retirement of Council members.

Any 10 or more fully-paid-up corporate members may nominate any qualified member for Council by delivering, *in one closed envelope,* to the secretary of RSGB, their respective nomination in writing. (As a safeguard it is recommended that more than 10 members nominate candidates.) The written consent of the nominated member to accept office if elected must also be enclosed. Any individual member may only nominate one candidate for election.

Nominations, indicating whether for ordinary or zonal membership, should be addressed to: The Secretary, RSGB, 35 Doughty Street, London WC1N 2AE, and must arrive not later than 10 October 1979. Members standing for election as zonal members must be resident in the appropriate zone, as must those who make such nominations. In the same envelope nominees should include biographical details for publication in *Radio Communication* at the time the nominees are announced.

In 1978 Council introduced a scheme whereby prospective Council candidates could address the membership at the time of the Council election. Council has decided to continue this experiment during the 1980 Council election, in the following format: (a) each candidate is allowed a maximum of 150 words to express the information he or she would like to convey. Details in excess of the maximum will be cut to 150 words. The candidate may also supply a suitable black and white photograph (head and shoulders); (b) bona fide statements will receive the absolute minimum of editing consistent with good style and factual accuracy; (c) candidates must declare any commercial interests in the field of amateur radio.

Amtor, an improved radioteleprinter system, using a microprocessor

by J. P. MARTINEZ, G3PLX*

FOLLOWING the application of video display techniques to amateur radioteleprinter operation, the author turned to the field of microprocessors, using a 6800 system to perform many of the functions of conventional rtty equipment, but it soon became clear that the mpu was capable of more complex tasks. Quite by chance his curiosity about odd, regular chirrupping noises heard on the 3·5MHz band led to the "discovery" of a highly reliable radioteleprinter system, described in CCIR Recommendation 476, and used commercially for maritime communications and in other situations where duplex operation is not possible. The parallel with amateur radio operation was obvious, and so, after further study of the literature, the author's mpu was programmed to implement CCIR 476 in conjunction with existing rtty equipment.

A copy of this program was sent to Dave Wicks, G3YYD, who has a similar mpu, and a few days later, on 9 September 1978, the first contact on this mode took place on 144MHz over the 200km path between G3PLX and G3YYD. At that time operation was under the licence clause which permits "data transmission" on this band, but subsequently, at the author's request, the RSGB approached the Home Office to ask if the definition of rtty could be extended to include this and similar modes. The Home Office has agreed that any rtty mode defined by CCIR documents can now be used by amateurs on any band where rtty is permitted.

This article is presented as a description of Amtor† (Amateur microprocessor teleprinter over radio). A program is given, in a form which can be understood both by readers not familiar with mpu programming, and by those with mpus or home computers who can easily translate the program into machine instructions.

First principles

Imagine two stations, A and B, in simplex voice communication, who wish to exchange messages reliably in spite of a poor path. They might devise a system whereby sending station A, sends three words, then cuts carrier, and B acknowledges with either the word "roger" or "no copy". Then A sends either the next three words or repeats the last three, as appropriate. If A does not hear a "roger" or "no copy" from B, he must ask B to repeat it, perhaps saying "repeat your acknowledgement", or some similar phrase that B cannot confuse with message text. However, if B fails to copy this phrase, and thus replies "no copy", then the system breaks down, as A cannot then determine if this is the requested repeat, or an indication that the repeat request itself was not copied. If A and B are human operators, they can usually sort out the confusion.

*11 Marchwood Court, Broadsands Drive, Gosport, Hants.

†There is no generic name for this system, so the name Amtor was coined to avoid confusion with commercial implementations of CCIR 476, which use trade names such as Spector, Sitor and Microtor.

The Amtor system operates by sending blocks of three teleprinter characters at a time, in a burst of frequency-shift-keyed data, with the acknowledgement signals sent in a similar way in the reverse direction. Its solution to the above problem is a cunning way of encoding the "roger" and "no copy" signals, which are replaced by two signals called Control 1 and Control 2. When B is receiving good copy, he acknowledges with Control 1 and Control 2 signals alternately after each block, and if an erroneous block is received, he repeats the same control signal as last time. If A sends a "repeat your acknowledgement" block, B obliges by doing so. This is exactly what he would do if a block was received with an error, and so it matters not if the "repeat your acknowledgement" block itself was received with an error.

In the voice communication example above, B knows when errors have occurred because he cannot recognize a word. This is efficient because the set of recognizable words is small compared with the set of possible sounds that B might hear. The only errors that will escape through such a link are those in which noise transforms one recognizable word into another. The classic message "send reinforcements we are going to advance", received as "send three and fourpence we are going to a dance", was obviously sent over a voice link. The probability of such errors can be reduced by careful choice of words. In a teleprinter system the set of possible words becomes the set of 32 standard teleprinter characters, normally transmitted by all the combinations of five data elements. In Amtor seven data elements are used, giving 128 possible combinations. Only 32 of these are recognized as characters, and

Table 1. Translation of CCIR 476 code to standard teleprinter characters. The codes are transmitted right-hand bit first, and logic 1 corresponds to the higher of the two radiated rf frequencies in the frequency-shift-keyed signal

Amtor code	Letters	Figures	Amtor code	Letters	Figures
100 0111	A	–	100 1110	U	7
111 0010	B	?	011 1100	V	=
001 1101	C	:	010 0111	W	2
101 0011	D	wru	011 1010	X	/
101 0110	E	3	010 1011	Y	6
001 1011	F	%	110 0011	Z	+
011 0101	G	@	111 1000	carriage return	
110 1001	H	£	110 1100	line feed	
100 1101	I	8	101 1010	letter shift	
001 0111	J	bell	011 0110	figure shift	
001 1110	K	(	101 1100	space	
110 0101	L	)	110 1010	blank	
011 1001	M	.			
101 1001	N	,	110 0110	RQ	
111 0001	O	9	011 0011	beta	
010 1101	P	0	000 1111	alpha	
010 1110	Q	1			
101 0101	R	4	110 0101	Control 1	
100 1011	S	'	110 1010	Control 2	
111 0100	T	5	101 1001	Control 3	

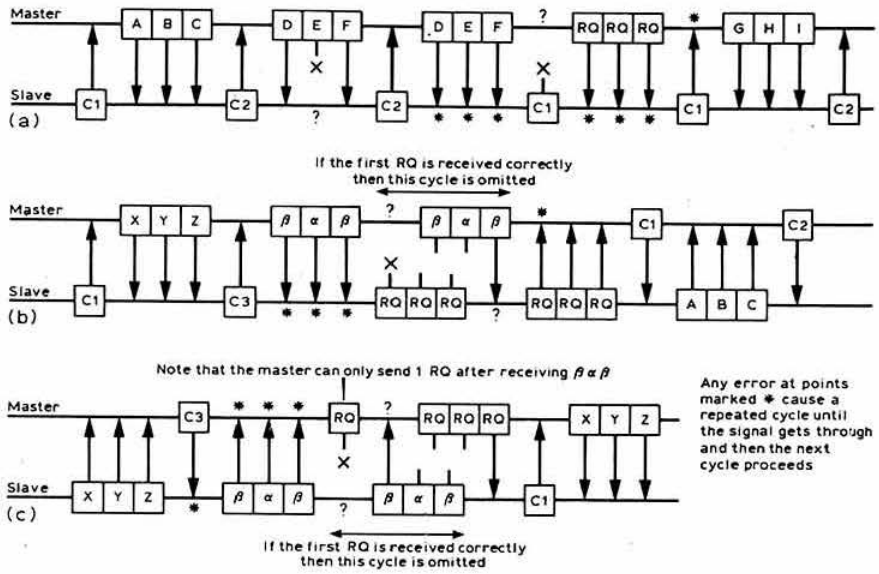

Fig 1. (a) Master sending to slave, with errors. (b) Change-over from master to slave sending. (c) Change-over from slave to master sending

reception of any of the others must be due to error. Careful choice of which 32 codes are used can minimize the possibility of noise transforming one into another. One would not, for example, include two codes which only differed from each other by one element. The method of choosing the codes is to use only those which have three "0" elements and four "1" elements, as this makes it easy to check for errors at the receiving end by simply counting the "0" elements. There are in fact 35 such combinations, and 32 of these are thus translated directly into standard teleprinter characters. Of the remaining three, one is used as the "repeat request" character, known as the RQ character; one is an idle character, known as beta; and the third, known as alpha, is also an idle character but has a control function which is described in the next paragraph. The Control 1 and Control 2 characters, together with a third, Control 3, are also seven-element codes conforming to the three zeros rule, but since these are only sent in the reverse direction, they are never confused with message characters. The conversion from Amtor code to standard teleprinter characters is shown in Table 1.

If, at the end of a message from A, B now wishes to send a message, a reliable method of controlling the change-over must be used, to prevent errors during the change-over period resulting from both stations trying to transmit at the same time. In Amtor, when B wishes to start his message, he stops acknowledging with Control 1 or Control 2, and sends Control 3. When, and only when, A receives this, he sends a block consisting of the three characters beta, alpha, beta. When, and only when, B copies this, he changes to transmitting blocks and receiving control codes. The timing of the various signals is arranged so that in this condition, with both stations now sending blocks, one character in each block is in the position expected by the other to be a control signal. Thus B is receiving beta when he is expecting a control signal, and so sends a block of RQ characters. Only when A receives one of these as a control signal does he know for certain that B has changed to transmit, and so he himself changes over, completing the process with no risk of doubling. In practice, B anticipates by sending RQ as soon as he receives beta-alpha-beta, thus cutting out one repetition cycle if there are no errors. Because of the staggered timing requirement, the two stations cannot be identical. Fig 1 shows the timing arrangements of the two stations, identified as master and slave, and shows the repetition cycle and change-over sequences.

Performance

By virtue of the error-detect-and-correct mechanism, Amtor will be very much better than a conventional radioteleprinter system. The effect of a path which is subject to fading or intermittent interference is only to slow down the message. There are still occasional errors due to noise transforming one valid character into another. A full analysis of this is beyond the scope of this article, but a simplified analysis can give some idea of what Amtor can do, by assuming that the path alternates between very good and non-existent. With only random

Table 2. Amtor performance, using the assumption that the signals in both directions alternate between perfectly good and non-existent

Percentage of time that signal is usable	Percentage of transmitted message received correct	Number of spurious characters printed, as percentage of transmitted message length	Time taken as multiple of the 100 per cent signal case
100	100	0	1
90	99·9	0·2	1·11
80	99·8	0·5	1·25
70	99·7	0·8	1·42
60	99·5	1·2	1·66
50	99·2	1·9	2
40	98·8	2·8	2·5
30	98·2	4·4	3·3
20	96·8	7·5	5
10	93	16·9	10
5	85·2	35·6	20
2	61·7	91·8	50
1	22·7	185·5	100

noise in the receiver, all 128 seven-element patterns are likely to occur equally, with 34 of these being acceptable (the RQ character, although valid, is treated the same as an error), and the chances of a complete block being accepted by mistake is $(34/128)^3$, or 1·9 per cent. Thus the receiving printer will be idle for 98·1 per cent of the time, and printing rubbish for 1·9 per cent of the time when there is no signal present, compared with 100 per cent correct copy and no rubbish when the signal is good. From this it is possible to calculate the proportion of rubbish received over paths of various proportions of good signals to bad. In the reverse direction, a similar analysis shows that 0·8 per cent (1/128) of the transmitted message escapes into thin air when there is no path present. The combined effect of these residual errors is shown in Table 2.

Synchronization

In conventional teleprinter systems the receiving decoder is synchronized by the start element in the received signal itself. This would be unacceptable in Amtor, for the two stations would soon get out of step when signals faded. Amtor signals have no start or stop elements, and the receiver must know by some other means when to sample the input for the elements of a character or control signal. The problem of achieving this can be divided into two; getting into synchronization at the start of a contact, and keeping it in sync thereafter. If both stations derived their timing from a common source, such as a standard frequency broadcast, the latter problem would not exist, but this is not always possible. Crystal oscillators can provide accurate reference frequencies, but some arrangement must be made to remove timing drift between the two references, no matter how small the frequency error. This is done by the receiving station comparing the actual and expected times of the transition edges between logic levels in the received signal. Any long-term tendency for the transitions to become earlier or later than expected triggers a shift in the local timing to correct this tendency, and thus keep the local timing in step with the distant station. The action of this correction can be made slow enough to prevent spurious corrections when the signal is not present. Instability can result if both stations attempt to lock on to each other in this way, and so only the slave station does so, locking both his receiver and transmitter timing to the master.

The system is brought into sync initially by the master station sending a characteristic sync block repeatedly. The slave station continuously scans the incoming data stream until it recognizes this sync pattern in a run of 21 successive received elements, at which point it stops scanning and checks that following blocks are also valid sync patterns (in case the first one was by pure chance in random noise). It then enables its transmitter, and replies with a control code. The master meanwhile has been scanning its own incoming data stream during the gaps between transmitted blocks, and it stops when it recognizes a valid control code in a run of seven, checks a few more in the following cycles to make sure, and then changes over to the normal mode. Sync blocks contain one RQ character, and so will not print out at the slave station. Odd and even blocks have the RQ character in a different place in the block; the reason for this is associated with a selective calling system in which the four other characters in each pair of blocks form a unique number. There is no application for this in amateur radio, but the odd/even format must be retained for compatibility, and the four characters can be chosen arbitrarily from any of the 34 other valid ones.

Timing considerations

Commercial systems are intended to interface with the international telex network using standard teleprinters working at 400 characters/min, or one character in 150ms. This defines the block cycle time as 450ms. The data within blocks and control signals is sent at 100 elements/second (100 bauds); a block thus takes 210ms, and a control signal 70ms, leaving 450–210–70 = 170ms in which neither station is transmitting. It would seem reasonable to leave a gap of 85ms between each transmission, but now that this system can be used by amateurs on the hf bands, it is prudent to consider the effects of distance between stations.

The velocity of radio waves is 300km/ms, and so the slave station will receive his signal from the master delayed by this amount, and on top of this the slave's reply will also be delayed, resulting in the master's receive signal being 2ms late for every 300km separating the two stations. At a distance of 12,750km, this signal will only just arrive before the master has to transmit in the next cycle. If the slave replies immediately, instead of leaving an 85ms gap, then the maximum range available is 25,500km, enough to allow contacts with the antipodes with about 18ms to spare at each end for change-over, but not enough for high orbit satellites or moonbounce.

Since the author's initial experiments were over short distances on 144MHz, and the change-over performance of the equipment was not known, the 85ms timing was adopted. If Amtor became widely used, further work might be needed to check that worldwide communication was possible with typical amateur equipment. Break-in morse code techniques may prove useful here.

Hardware

Building an Amtor system with logic would be a formidable task. However, modern mpu or home computer systems make it very easy, and since the home computer will most likely have been bought for other purposes as well, also very cheap. Apart from the mpu, most of the hardware will already be found in an rtty enthusiast's shack, namely a terminal unit for converting received frequency-shift-keyed tones to logic levels, a tone keyer for the reverse process, a teleprinter or video display unit, and of course the appropriate radio equipment. To change to Amtor, the wires between the terminal unit/keyer and the teleprinter are cut and the mpu inserted between the ends. The only other hardware needed is the provision of a crystal-controlled frequency standard; in the author's system, chosen to be 1kHz already available from a calibrator. Since Amtor operates at 100 bauds, it might be necessary to widen the terminal unit filters to handle this speed rather than the normal 45 bauds.

If the mpu to be used already includes a vdu, this can be used as it stands instead of using a separate teleprinter. Reference should be made to the mpu handbook or to the supplier about methods of connecting inputs and outputs to it, but the connections to the terminal unit, keyer, a TRANSMIT push-button, an indicator lamp, and the transmit-receive control line, can all be made through one eight-bit parallel port, and the connections to the teleprinter or vdu through either a serial port or through another parallel port via a uart circuit. The 1kHz timing signal is connected to the mpu's interrupt request line. The size of memory needed to store the program may vary from one mpu type to another but, as a guide, the author's 6800 needed just over 1k bytes, which is about average. Some memory is also needed for the keyboard buffer, to store characters typed in the

event that errors cannot be corrected as fast as the message is typed in.

Software

Since different types of microprocessors have widely different sets of instructions, a list of the author's 6800 program instructions would not be intelligible to users of other mpus, and, by the nature of mpu machine code, it may not even be easy for 6800 users to understand the program. The approach taken has been to describe the program steps in plain language form. Readers already familiar with programming their own mpus should have little difficulty in assembling a working program, and those with no programming experience will be able to follow the logical steps involved without needing any specialized knowledge of the subject. The program, listed in this way, is given in Appendix 1, with some notes and explanation of some of the terms used appearing in Appendix 2. Not included in the program are instructions to initialize the status of the mpu and the program variables before starting the program. For example, the keyboard buffer must be set EMPTY before starting, to prevent transmission of random characters before typing commences. If, like the author's unit, the vdu is an ASCII code device, the TRANSMIT push button (to trigger the change-over to transmit) can be replaced by the use of one of the ASCII control keys, as also can the RESYNC function, and the indicator lamp can be replaced with the BELL character on the vdu. This lamp or bell is used to signal to the sending operator each time a block is correctly received by the distant receiving station.

Operating practice

From the operator's point of view, Amtor is little different from conventional rtty, the error-correcting system needing no intervention from either operator. The procedure adopted so far has been as follows:

The first station to call starts his system as a master station, to send the sync pattern. While waiting for a reply, he can type his first message. This need not be a conventional CQ or sked call, as only after another station has tuned in, started his system as a slave and achieved sync will this first message be transmitted and received by the replying station. The contact then proceeds in the conventional way, with each station inviting the other to transmit at the end of his over. If the path is poor, it may be a few moments after the final "K" has been typed in before it is received at the far end, and the receiving station then presses his TRANSMIT button to start the change-over process. In fact the receiving station can do so at any time during the other's message, to interrupt him, or break in.

The transmitting station is assured that his message is being copied by the flashing lamp or bell. If after a period of prolonged loss-of-signal the lamp fails to flash, indicating loss of synchronization, then both stations must restart their programs (without re-initializing program variables) to resync. A remarkable feature of the system is that when sync is re-achieved in this way, the original direction of message flow will automatically re-assert itself, and the remainder of the interrupted message will be sent with no more than the occasional random error. The end of a contact must be signalled by the last station to receive switching off first, as only he knows when he has copied the end of the other's final remarks. In use on 144MHz between G3PLX and G3YYD, using 10W to 10dB antennas over a 200km path, Amtor has transformed contacts from being practicable on about 50 per cent of attempts, to 100 per cent. During typical contacts it is estimated that only 10 per cent of the received errors are due to system failures, the rest being due to poor typing! The message speed only slows down below typing speed when conditions are very poor indeed.

Conclusions

Amtor is an ingenious modern radioteleprinter system which has considerable advantages over present-day amateur practice. In spite of its complexity, it can readily be implemented, with little additional hardware, with the sort of home computers and mpu kits that are now finding their way into many amateur stations. It is the author's view that the use of microprocessors in this way could be an area in which amateurs can make significant contributions to the art and science of radio communication.

Acknowledgement

The author would like to thank Dave Wicks, G3YYD, for his help in getting Amtor working on the air, and for his assistance with the preparation of this article.

Appendix 1. Amtor program

0. Go to line 120 to start as a slave station, or to line 150 to start as a master

Main program loop. Lines 1-11 receive, 12-18 change to transmit, 19-29 transmit, 30-34 change to receive.

1. Go through "receive block" sub-routine.
2. If TRANSMIT flag is set high, go to 12.
3. If any of the characters now in RECEIVE BUFFER is an RQ character, go to 7.
4. If any of the characters now in RECEIVE BUFFER does not have three "0" elements, go to 7.
5. Translate the three characters in RECEIVE BUFFER from CCIR 476 code, and store them in the output buffer (for transfer to the printer by the interrupt program).
6. Invert the RECEIVE BLOCK INDICATOR flag.
7. If the RECEIVE BLOCK INDICATOR is now high, go to 10.
8. Go through "transmit control signal" sub-routine, sending Control 1.
9. Go to 1.
10. Go through "transmit control signal" sub-routine, sending Control 2.
11. Go to 1.
12. Go through "transmit control signal" sub-routine, sending Control 3.
13. Go through "receive block" sub-routine.
14. If the three characters now in RECEIVER BUFFER are not beta-alpha-beta, go to 12.
15. If this station is a slave, go to 18.
16. Go through "transmit control signal" sub-routine, sending the RQ character.
17. Go to 19.
18. Go through "transmit block" sub-routine, sending three RQ characters.
19. Go through "receive control signal" sub-routine.
20. If this control signal is the same as THE LAST ONE, go to 28.
21. If this control signal is Control 1, go to 26.
22. If this control signal is Control 2, go to 26.
23. If this control signal is Control 3, go to 30.
24. Go through "transmit block" sub-routine, sending three RQ characters.
25. Go to 19.
26. Store this control code in THE LAST ONE.

27. Move the next three characters from the top of the keyboard buffer into TRANSMIT BUFFER, translating them to CCIR 476 code in the process, and flash the indicator lamp (if KEYBOARD BUFFER is empty, use a beta character).
28. Go through "transmit block" sub-routine, sending the three characters in TRANSMIT BUFFER.
29. Go to 19.
30. Go through "transmit block" sub-routine, sending the characters beta-alpha-beta.
31. Go through "receive control signal" sub-routine.
32. If this control code is not an RQ character, go to 30.
33. Clear TRANSMIT flag to low.
34. Go to 7.

"Transmit block" sub-routine

40. If CLOCK is not equal to BLOCK TRANSMIT TIME, go to 40.
41. Change radio equipment from receive to transmit.
42. Wait *X*ms (*X* is the time it takes for the changeover).
43. Fetch first character.
44. Go through "transmit character" sub-routine.
45. Fetch second character.
46. Go through "transmit character" sub-routine.
47. Fetch third character.
48. Go through "transmit character" sub-routine.
49. Change radio equipment from transmit to receive.
50. Return.

"Transmit control signal" sub-routine

60. If CLOCK is not equal to CONTROL TRANSMIT TIME, go to 60.
61. Change radio equipment from receive to transmit.
62. Wait *X*ms.
63. Go through "transmit character" sub-routine.
64. Change radio equipment from transmit to receive.
65. Return.

"Transmit character" sub-routine

70. Set BIT COUNTER to 7.
71. Shift character bit-pattern to the right, the right-most bit going out to the transmitter keyer.
72. Wait 10ms.
73. Subtract 1 from BIT COUNTER.
74. If BIT COUNTER is not equal to zero, go to 71.
75. Return.

"Receive block" sub-routine

80. If CLOCK is not equal to BLOCK RECEIVE TIME, go to 80.
81. Set BIT COUNTER to 21.
82. Go to 100.

"Receive control signal" sub-routine

90. If CLOCK is not equal to CONTROL RECEIVE TIME, go to 90.
91. Set BIT COUNTER to 7.
92. Go to 100.

"Receive" sub-routine

100. Wait 5ms.
101. Set RECEIVER ACTIVE flag high (used by interrupt program).
102. Set PHASE equal to −5 (used by interrupt program).
103. Shift the input from the receiver terminal unit into the left-most bit of the RECEIVER SHIFT REGISTER, the other bits all moving to the right by one bit (note, this register is 21 bits long).
104. Subtract 1 from BIT COUNTER.
105. If BIT COUNTER is zero, go to 108.
106. Wait 10ms.
107. Go to 102.
108. Clear RECEIVER ACTIVE flag low (stops timing correction activity by interrupt program).
109. Transfer the three groups of seven bits now in RECEIVER SHIFT REGISTER into the three locations of RECEIVER BUFFER, leaving RECEIVER SHIFT REGISTER intact (note, some right-shifting is needed since mpu locations are eight, not seven bits long).
110. Wait 5ms.
111. Return.

Slave station start-up and resynchronization entry point

120. Set CONTROL TRANSMIT TIME to 85 (or less for dx, see text).
121. Set BLOCK TRANSMIT TIME to 85 (or less for dx).
122. Set CONTROL RECEIVE TIME to 380.
123. Set BLOCK RECEIVE TIME to 240.
124. Clear NUMBER OF CORRECT SYNC BLOCKS to zero.
125. Go through "receive block" sub-routine.
126. If SYNC BLOCK INDICATOR flag is high, go to 129.
127. If the three characters now in RECEIVE BUFFER are in the form (1) valid character, (2) RQ character, (3) valid character, go to 139.
128. Go to 130.
129. If the three characters now in RECEIVE BUFFER are in the form (1) valid character, (2) valid character, (3) RQ character, go to 139.
130. Clear NUMBER OF CORRECT SYNC BLOCKS to zero.
131. Add 1 to NUMBER OF SYNC ATTEMPTS.
132. If NUMBER OF SYNC ATTEMPTS is less than 45, go to 135.
133. Clear NUMBER OF SYNC ATTEMPTS to zero.
134. Wait 1ms (this ensures that the system does not get stuck scanning in exact antiphase with the distant master).
135. Set CLOCK to 440 (ie as if there was just one bit left to receive).
136. Set BIT COUNTER to 1.
137. Go through "receive" sub-routine (this shifts in one more bit).
138. Go to 126.
139. Invert SYNC BLOCK INDICATOR flag.
140. Add 1 to NUMBER OF CORRECT SYNC BLOCKS.
141. If NUMBER OF CORRECT SYNC BLOCKS is less than 4, go to 125.
142. Go to 7.

Master station start-up and resynchronization entry point

150. Set CONTROL TRANSMIT TIME to 380.
151. Set BLOCK TRANSMIT TIME to 240.
152. Set CONTROL RECEIVE TIME to 85.
153. Set BLOCK RECEIVE TIME to 85.
154. Clear NUMBER OF CORRECT CONTROLS to zero.
155. Invert SYNC BLOCK INDICATOR flag.
156. If SYNC BLOCK INDICATOR flag is high, go to 159.
157. Go through "transmit block" sub-routine, sending (1) any valid character, (2) an RQ character, (3) any valid character.
158. Go to 160.
159. Go through "transmit block" sub-routine, sending (1) any valid character, (2) any valid character, (3) an RQ character.
160. Go through "receive control signal" sub-routine.
161. If the received control signal is Control 1, go to 172.
162. If the received control signal is Control 2, go to 172.
163. If the received control signal is Control 3, go to 172.
164. Clear NUMBER OF CORRECT CONTROLS to zero.
165. Add 10 to CONTROL RECEIVE TIME and to BLOCK RECEIVE TIME.
166. If CONTROL RECEIVE TIME is less than 170, go to 169.
167. Subtract 169 from CONTROL RECEIVE TIME (this ensures that only the interval 0–170 is scanned, and that the system never gets stuck scanning in exact antiphase with the distant slave).
168. Go to 155.
169. Set BIT COUNTER to 1.
170. Go through "receive" sub-routine (this moves in one more bit during the next 10ms).
171. Go to 161.
172. Add 1 to NUMBER OF CORRECT CONTROLS.
173. If NUMBER OF CORRECT CONTROLS is less than 4, go to 155.
174. Go to 20.

Interrupt program, independent of main program, triggered every 1ms by the 1kHz timing reference signal

500. Add 1 to CLOCK (clock thus counts the milliseconds).
501. If CLOCK is less than 450, go to 503.
502. Set CLOCK to zero (keeps clock repeating in 450ms cycle).
503. If RECEIVER ACTIVE flag is low, go to 523 (prevents timing correction when no signal is expected).
504. Add 1 to PHASE (phase counts from −5 to +5 between the centre of one bit and the centre of the next bit).

505. If the input from the terminal unit is the same as THE LAST INPUT, go to 523 (ie if there has been no transition within the last millisecond).
506. Add PHASE to ACCUMULATED PHASE ERROR.
507. Store the terminal unit input level in THE LAST INPUT.
508. If ACCUMULATED PHASE ERROR is less than 512, go to 516.
509. Subtract 1,024 from ACCUMULATED PHASE ERROR (transitions too late).
510. If this station is a slave, go to 514.
511. Add 1 to CONTROL RECEIVE TIME (delay master receive times).
512. Add 1 to BLOCK RECEIVE TIME.
513. Go to 523.
514. Subtract 1 from CLOCK (put slave's clock back).
515. Go to 523.
516. If ACCUMULATED PHASE ERROR is greater than −512, go to 523.
517. Add 1,024 to ACCUMULATED PHASE ERROR (transitions too early).
518. If this station is a slave, go to 522.
519. Subtract 1 from CONTROL RECEIVE TIME (advance master receive times).
520. Subtract 1 from BLOCK RECEIVE TIME.
521. Go to 523.
522. Add 1 to CLOCK (put slave's clock forward).
523. If transmit change-over button is not closed, go to 525.
524. Set TRANSMIT flag high.
525. If the output buffer is empty, go to 528.
526. If the vdu/teleprinter interface is still sending a character, go to 528.
527. Send the next character from the output buffer to the vdu/printer.
528. If there is no character waiting at the keyboard interface, go to 531.
529. Fetch the character from the keyboard.
530. Add this character to the bottom of the keyboard buffer.
531. End of interrupt program: return to main program.

Appendix 2. Notes and explanations relating to Appendix 1.

1. Words or phrases in small capitals refer to program variables stored in ram locations within the mpu. Those described as flags take on only two values, while others may take one or more eight-bit bytes of memory.
2. On meeting the instruction "Go through sub-routine", go direct to the place named, carry out the instructions there until a "return" instruction is met, then continue with the instruction after the "go through sub-routine" instruction.
3. A pulse on the mpu's interrupt request line causes the mpu to temporarily stop whatever it is doing, and start the "interrupt program", which it follows until the "return to main program" instruction is encountered, when it carries on with whatever it was doing. In this program, the interrupt routine is triggered every 1ms and only takes about 100μs to complete, leaving plenty of time for the main program. The two programs can thus be thought of as being completely independent of each other, except that they can both use the same set of variables.
4. In an "If . . ." statement, a jump is made to the stated line number if the "if" condition is met, otherwise the next line in the program is carried out. In some of these instructions, the jump is to the current line, thus repeating the test over and over again. This does not result in an endless loop, since one of the variables in the test (CLOCK) is being changed continuously by the interrupt program.
5. The "wait" instructions in various parts of this program should be synchronized to the 1kHz reference signal, perhaps by carrying out the "wait for interrupt" instruction, available in many mpus, for a specified number of times.
6. So that no text is lost on a change-over or a resync operation, it is important that the routines that transmit specific blocks, such as beta-alpha-beta, blocks of RQs, or sync blocks, should not destroy the characters in TRANSMIT BUFFER, and the keyboard buffer must not be altered or cleared. The variables RECEIVE BLOCK INDICATOR, THE LAST ONE, and TRANSMIT flag must not be altered during a resync operation. □

NEW PRODUCTS

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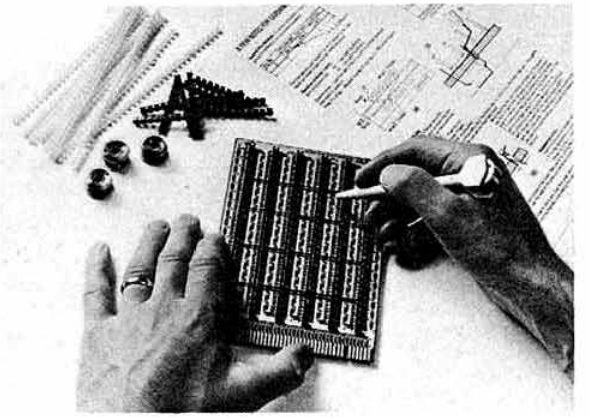


The Roadrunner kit in use

Roadrunner systems are normally supplied in kits which include a circuit board, a wiring instrument, distribution strips and spare bobbins of wire in four different colours. However, individual components are available separately. A typical Roadrunner introductory kit retails at £9.88 excl VAT, incl p&p, from TJB Associates, Unit 116, Blackdown Rural Industries, Haste Hill, Haslemere, Surrey GU27 3AY. Tel 0428 52445.

Holdings FT101 improvement kit

Holdings of Blackburn now offer a kit for improving the older FT101 transceivers for all models up to and including the FT101E. The kit comprises a replacement driver valve, an improved fet for the front end and two zener diodes for a mode to improve the agc action. The literature accompanying the kit sets out a simplified alignment system. The price of the kit is £3.50 including postage.

Further information from Holdings, Mincing Lane, Darwen Street, Blackburn BB2 2AF. Tel 59595.

A cmos keyer with memory

by E. B. GRIST, G3GJX*

THE current availability of cmos static rams at reasonable prices has made it possible to take amateur keyer design a step forward by rearranging well-tried existing logic circuits and adding memory facilities. Several different methods of construction are described.

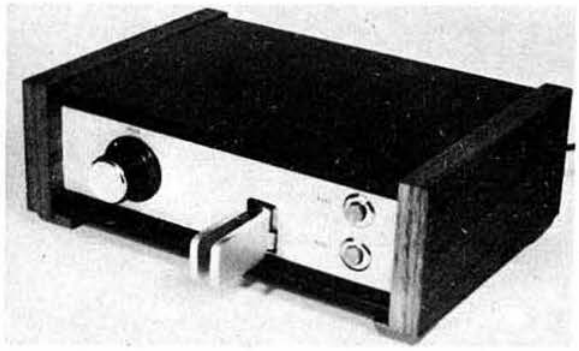
Design features

(1) A fully automatic circuit offering a choice of iambic squeeze-keying or traditional single-paddle modes, plus a dot store for more relaxed sending.
(2) A memory to do the CQ chores during contests and field days. Easily written, altered or erased as needed, it will hold CQ CQ CQ DE G3GJX/P G3GJX/P three times plus AR K.
(3) A cut-in facility so the operator may curtail a long call at an appropriate moment by sending AR K on the paddles. The memory is then reset and ready for further use.
(4) The equipment runs for months on a 9V battery, and stand-by current can be as low as 0·5μA, even with memory data retained. There is no need to switch off.
(5) The complete circuit can be built with all new parts for as little as £15 (plus suitable box and choice of paddle/s). Alternatively it can be built as a regular keyer without the binary counter and memory chip. These can then be plugged in later *without further wiring changes.*

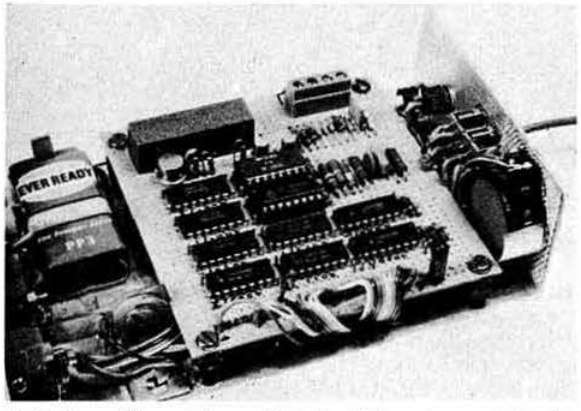
Circuit description

The arrangement of the logic used in this keyer is based upon the writer's earlier single-paddle circuit [1] and a subsequent design by G3RVM which incorporated iambic squeeze-key and dot store facilities [2]. Additional gate and flip-flop packages have been added to support a memory chip and binary counter. Readers seeking a more detailed explanation of the morse-forming logic or the iambic and dot stores than appears in this article are referred to [1] and [2]. The squeeze-key technique, with its economy of finger movements, has many devotees and is well described in [2]. The circuit diagram appears in Fig. 1.

A gated multivibrator is formed by IC7a and IC6c. D7 and R10 combine with C6 to provide a smaller time constant during the positive swing than do R11 and RV1 during the negative period, and the output has a mark/space ratio of about 1:10 which avoids a tendency to lengthen the first dot. IC7a is cross-coupled with IC7b to form a NAND r/s flip-flop to prevent the multivibrator being gated off while the output is still high. Closing the dot and/or dash paddle contacts pulls down the high level at pin 12 of IC7d and/or pin 6 of IC2b, causing the output/s to change, which, through IC6a, IC1d and IC2c, starts the multivibrator.



The author's twin-paddle keyer, showing the speed control and push buttons to read or reset the memory



A single paddle prototype. Note the high component density made possible by the use of a wiring pen system (see text)

Components list

R1, 2, 3, 8, 9	1MΩ	**C1, 2, 3**	1nF polyester
R4, 5	100kΩ	**C4**	1μF tantalum
R6	12kΩ	**C5**	2·2nF ceramic
R7	270kΩ	**C6**	0·1μF polyester
R10	68kΩ	**C7**	0·1μF tantalum or polyester
R11	220kΩ	**D1-4**	Bridge rectifier (RS* 262-141)
R12	2·2MΩ	**D5, 6, 7**	1N914 or similar
RV1	470kΩ linear	**TR1**	BC477 or similar pnp Si
IC1, 7	4011	**S1**	DPDT slide
IC2, 8	4001	**S2**	DP on-off (may be combined with RV1 speed control)
IC3	4040		
IC4	6508 (see text)		
IC5, 9, 10	4013	**PB1, 2**	Push button N/open
IC6	4000		

RLA Coil: RS* type 3 (349-030 two 1·6k windings in parallel for 800Ω. Reed: RS* 6-RSR-A

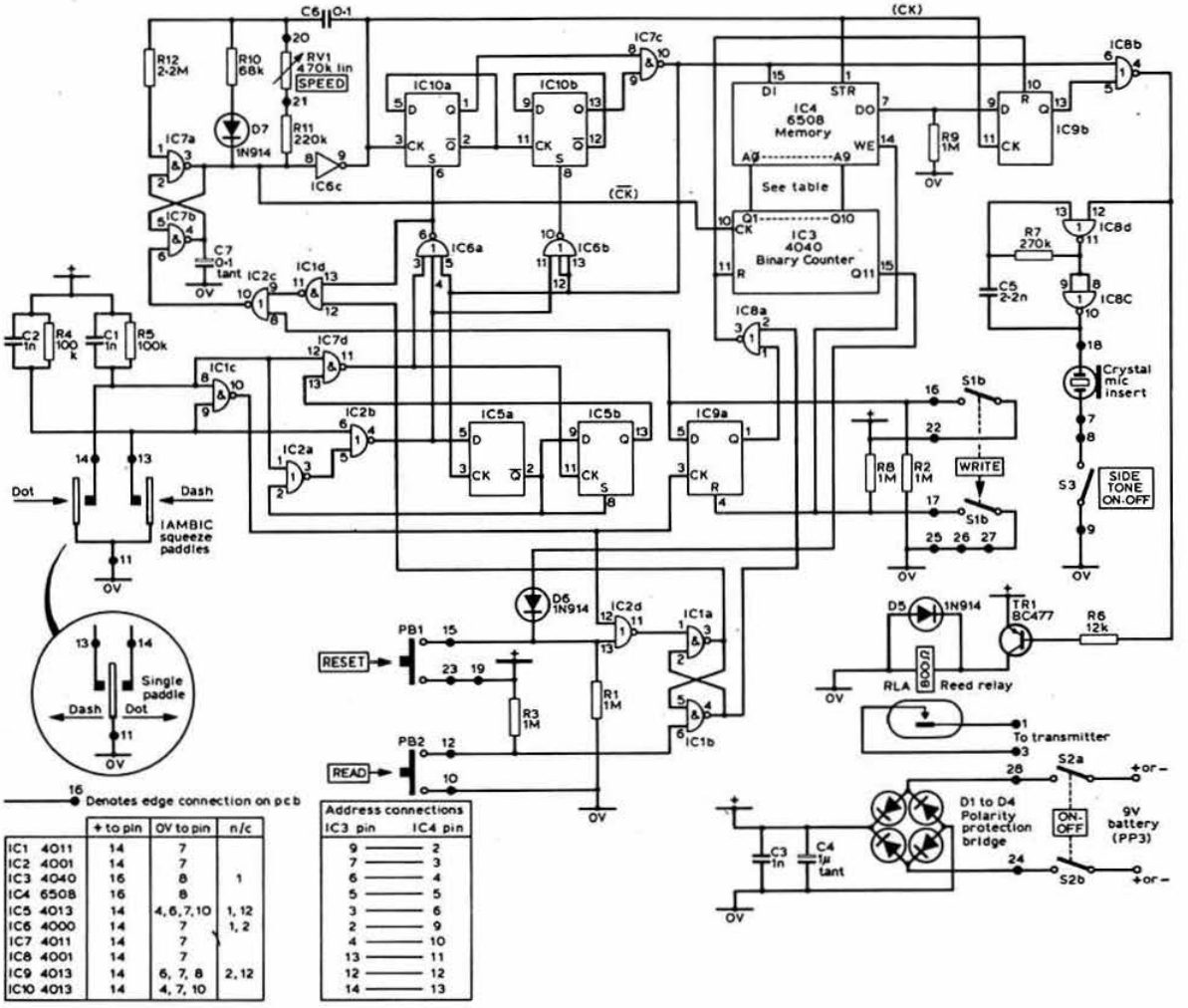
Black aluminium box with wooden ends, type BE22, from Basic Electronics Ltd, 18 Epsom Road, Guildford, Surrey.

Crystal microphone insert, size to choice.

Memory ics available as below:
Intersil IM6508A-IJE, Intersil IM6508CJE, from Andis Components Ltd, Etwall Street, Derby DE3 3DT.
Harris HM3-6508-5 (equivalent to IM6508CPE) from Memec Ltd, Thame Park Ind Estate, Thame, Oxon OX9 3RS.

*RS Components Ltd, 13-17 Epworth Street, London EC2P 2HA.

*37 The Shimmings, Boxgrove Road, Guildford, Surrey GU1 2NQ.



	+ to pin	0V to pin	n/c
IC1 4011	14	7	
IC2 4001	14	7	
IC3 4040	16	8	1
IC4 6508	16	8	
IC5 4013	14	4, 6, 7, 10	1, 12
IC6 4000	14	7	1, 2
IC7 4011	14	7	
IC8 4001	14	7	
IC9 4013	14	6, 7, 8	2, 12
IC10 4013	14	4, 7, 10	

IC3 pin	IC4 pin
9	2
7	3
6	4
5	5
3	6
2	9
4	10
13	11
12	12
14	13

Fig 1. Keyer circuit diagram

IC10a and b are D-type flip-flops used in the now-familiar manner to generate dots (pin 6 low, pin 8 high) and dashes (pins 6 and 8 low). Both Q outputs are added and inverted in IC7c to produce morse output at pin 10 (see Fig 2). This output is routed to pin 6 of IC8b and to NOR gates IC6a and b to ensure self-completing dots and dashes. C7 is included to slightly delay the turn-on of IC7a, avoiding a potential glitch if the morse output goes high before the multivibrator has fully regenerated.

When the paddles are being used for sending, pin 5 of the NOR gate IC8b is held low, and inverted morse output appears at pin 4. A logic 0 (mark) turns on the sidetone oscillator IC8c and d, driving the crystal microphone insert used as a speaker, and turns on TR1, which in turn drives the reed relay to key the transmitter.

Morse output from pin 10 of IC7c is also connected to the clock input of IC5a, which is a D-type flip-flop used as the iambic store. The positive edge of each dot or dash clocks IC5a so that the $\overline{Q}$ output goes low if a dash is selected and high if the dot paddle is pressed. Gates IC2a and b ensure that, if the operator's next action is to close both paddles, the keyer will send the opposite to that which was previously keyed. Keeping both paddles closed generates alternate dots and dashes. These are the essential requirements for iambic sending.

Used with a single paddle, IC5a serves only to drive the D and SET inputs of IC5b, another D type flip-flop used as a dot store. This circuit makes it possible for the operator to key a dash and then to move the paddle to the dot position, while the dash is still being sent, without losing the dot. Paddle movements become less critical and errors are reduced. The dot store operates in both twin- and single-paddle modes. With the $\overline{Q}$ output of the iambic D-type IC5a at a 1 (the situation after a dot has been keyed) the high input to pin 8 of the dot store IC5b sets the Q output to a 1. When a dash is being sent, the output of IC5a goes low and this is applied to the D input of IC5b. During this time, if the dot contact is closed, pin 11 of

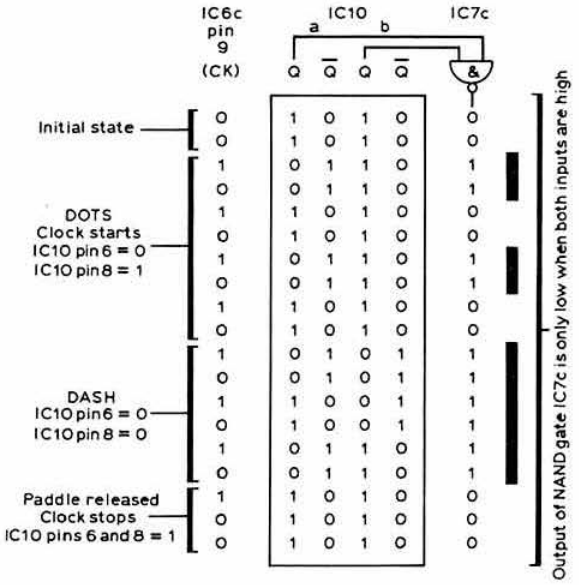


Fig 2. Truth table for morse letter "U"

IC7d goes to a 1 and the 0 at the D input of IC5b is clocked to the Q output. This holds the output of IC7d to a 1 and starts the dot sequence at the multivibrator and IC10a. The beginning of this dot clocks IC5a and the $\overline{Q}$ output goes high, setting IC5b again as already described.

The 6508 memory chip IC4 is a cmos 1024 × 1 ram in a 16 dil package. Each cell can be addressed in sequence by connecting the outputs of the first 10 stages of a 4040 12-stage binary counter, IC3, to the memory inputs A0 to A9. The binary addresses are decoded and loaded on the 6508 by the falling edges of the clock pulses at the STROBE input, pin 1. Because the 4040 needs time to ripple through, and to ensure that the outputs reach a steady state before being loaded at the 6508, the binary counter is clocked by the multivibrator from the input of the inverter IC6c ($\overline{CK}$) and the memory is driven from the output of the inverter (CK). Morse output from IC7c is connected to the 6508 DATA INPUT, pin 1. The WRITE ENABLE input, pin 14, is held high during reading or stand-by, and low when writing. DATA OUTPUT, pin 7 features three-state buffering to permit common bussing (not applicable here) and this means that pin 7 goes to a high-impedance condition when STR = 1 and/or WE = 0. Fig 3 shows the stored data for the morse letters DE, and the form taken by the DATA OUTPUT when reading. To fill-in the high-impedance portion of the cycles, a D-type flip-flop, IC9b, is clocked by the rising edges of the STROBE input. This latches the output and restores the morse, which, via IC8b, gates the sidetone oscillator and relay driver transistor.

IC1a and b form an r/s flip-flop operated by the READ and RESET push-buttons. Pin 3 is normally high, which ensures a 0 at pin 11 of IC1d and a 1 at pin 6 of IC7b, so that the multivibrator is not gated on. Pin 4 of IC1b is low, which, through IC8a, holds the reset inputs of the 4040 and IC9b to a 1. When the READ button is pressed the r/s flip-flop changes state, pin 3 goes low, leading to a low at pin 6 of IC7b, and the multivibrator is started. Pin 4 of IC1b goes high and the output of IC8a falls to a 0, releasing the 4040 and IC9b which are then clocked by the $\overline{CK}$ and CK outputs. Memory data is latched by IC9b, and the reed relay is keyed. During the READ function, closing either the dot or dash paddle contacts produces a 1 at the output of NAND gate IC1c which, through IC2d, changes the state of IC1a and b, stops the multivibrator, resets the 4040 and IC9b, and returns the keyer to its initial state. In this way a long call being read from the memory may be curtailed by the operator touching the paddles at an appropriate time. Pressing the RESET button during reading similarly resets the logic. The stored data in the memory is retained.

The Q11 output of the binary counter IC3 is routed via a

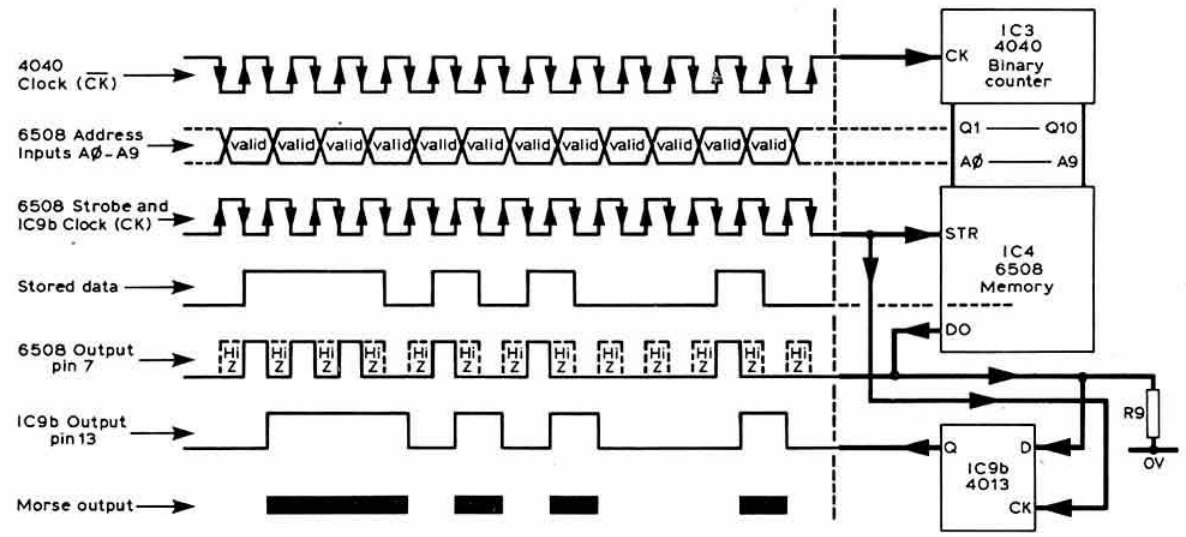


Fig 3. Memory reading mode. Logic sequences for morse letters DE (address settling times exaggerated for clarity)

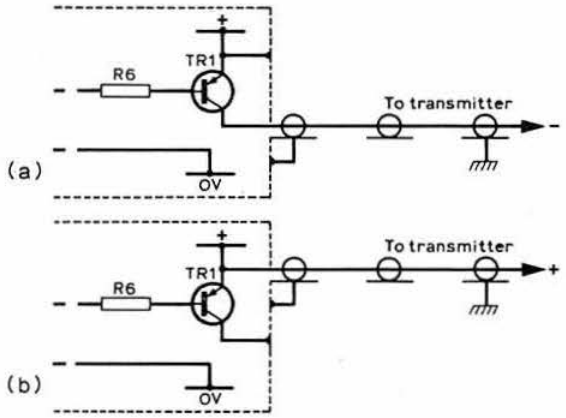
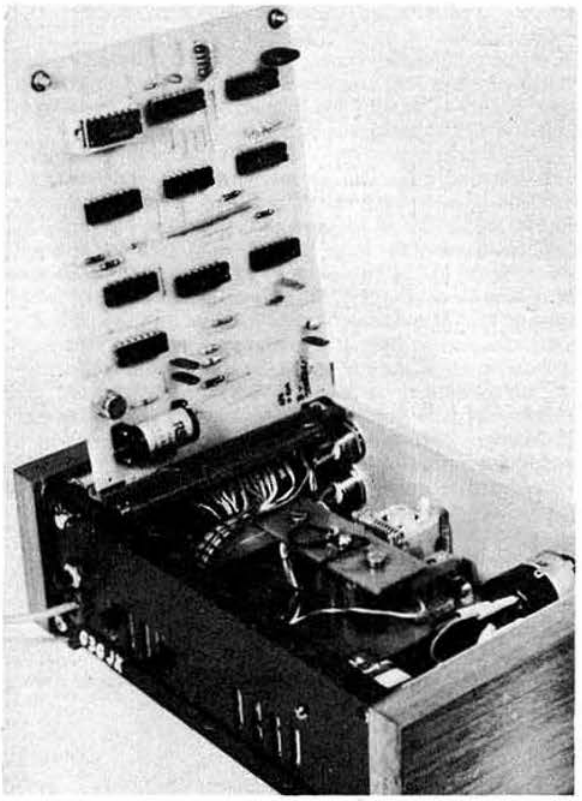


Fig 4. Relay-less keying for modern transmitters. (a) For negative lines, only the keyer positive rail should be earthed to the case. (b) For positive lines, both + and − rails *must be isolated from the case.* In both arrangements the paddle contacts must be isolated, making the scheme most suitable for all-enclosed construction. BC477 will handle up to 70V at 50mA or more

diode to IC2d so that, when a count of 1,025 clock pulses occurs during a READ cycle, and the memory contents would otherwise start to be read a second time, IC1a and b change state and resetting takes place. This prevents a stored call, which may not occupy all the memory space, being sent a second time at the wrong moment, when the operator may be listening for a reply during the period of no output when the paddles have not yet been touched.

During the WRITE operation the multivibrator runs continuously. This is necessary to ensure that the spaces between letters and words are recorded correctly in the memory. No difficulty was experienced in sending properly in this mode, and many operators have said that they notice no difference when writing. At the same time it is important that the memory addressing does not start as soon as the WRITE switch is closed, otherwise unwanted spaces will be recorded before the operator has time to begin sending. IC9a ensures that writing does not begin until the operator starts keying, and consequently that all recorded calls start as soon as the READ button is pressed. When the WRITE switch is closed, memory input WE and the reset to IC9a are pulled low, the D input of IC9a is high and, via IC2c, the multivibrator is started. At this time the Q output of IC9a is low and IC8a is still holding the 4040 reset high. Closing either paddle contact causes the output of IC1c to go high, clocking the 1 at the D input of IC9a to the Q output and releasing the 4040 reset. While writing, the sidetone oscillator and relay driver continue to be gated, so that the transmitter may be keyed during this process if desired. The WRITE switch should be opened as soon as writing is completed. Existing data in the memory can be over-written in tape recorder fashion, but a short call written over a long one will produce a useless combination.

Memory erasure occurs when the battery supply is turned off and the paddle contacts are closed for a few seconds to leak off the charge on C4. Using the 6508A-1, consuming less than 1μA on stand-by, it is possible to switch off the keyer for several minutes without loss of data, provided the paddles are not touched. For field days and contests, where the keyer is to be used by several operators, this is useful to guard against accidental erasure.



Rear view of the keyer with a pcb in a hinged edge connector. Switches control memory writing and sidetone on-off

Accidents of a different kind are prevented by the diode bridge D1-4, which ensures correct supply polarity whichever way the battery is connected. A 9V supply was chosen for convenience, but the circuit will work well from a 6V battery, albeit for a shorter time, and permit some economy in the choice of a memory, as explained later.

When only bias keying is employed, as in most modern transmitters, it is possible to dispense with the reed relay, with a considerable saving in supply current and a four-fold increase in battery life. Fig 4 gives two arrangements to suit fully-enclosed construction.

Constructional details

The type and size of box, together with the style of paddles, are choices closely connected with the method of wiring up the keyer. The photographs show a squeeze-key version built in an aluminium case with wooden end-pieces. The paddles devised by the author are strictly "one-off" but adequate. Other possible enclosures include die-cast boxes and the Vero G-range cases. Non-metallic boxes are best avoided because of the absence of screening from rf, and lack of weight. Separate paddle units with lengthy difficult-to-screen leads are not recommended, especially for field days. Ferrite beads can help but there is no substitute for the fully-screened approach,

including grounding to the case of any metal paddle parts which protrude.

Commercially-made single- or double-paddle units are available from at least two *Radio Communication* advertisers, and a number of ideas for home construction have appeared in *Technical Topics* during the last two years [3].

Fig 5 gives the layout of a single-sided printed circuit suitable for homebrew production. An edge connector is included but, if directly-wired connections are preferred, the artwork (or the finished board) can be trimmed to exclude this and the additional holes and pads which have been provided can be used. The component layout appears in Fig 6. Photosensitive laminate with developing and etching compounds is readily available as a kit and readers wishing to use Fig 5 should find a local photocopying shop able to make a positive transparency quite cheaply, making sure this is the system which guarantees 1:1 copies without shrinkage. A smaller layout and the avoidance of wire links would have resulted from a double-sided design but might have made home reproduction of a good board too difficult. [4].

Except for the memory chip IC4, where a socket is useful, the other ICs may be directly soldered into the board if desired, taking the usual care about handling cmos packages. As an alternative to a pcb, several sorts of prototype boards are available with ready-made pads and supply lanes. Connections can be made with insulated wire, and sockets can be used if required, but the result is rather bulky and untidy.

A more elegant approach is to use a wiring pen ("Roadrunner WDS" is easily-available at low-cost [5]) in which a fine polyurethane-coated conductor is fed from the tip of a wiring pen between the points to be connected, carrying the wire in and around plastic "combs" fitted between the ics. The coating on the wire melts and fluxes out when soldered, thus avoiding stripping. The author has used this method on numerous projects and has found it quick and reliable provided a sufficiently hot iron is used (390–400°C). It permits a very high component density and is inexpensive if regular 0·1in Veroboard is used, with track breaks to leave pads like the much more costly boards.

The circuit may be wired, or the pcb assembled, without the 4040 and 6508 memory, and will work as a single- or dual-paddle keyer as previously described. The READ and RESET push buttons and the WRITE switch are not required, but all other resistors and components should be retained to avoid leaving any floating inputs. The preferred memory ics are the Intersil IM6508A-1 (which is suitable for up to 12V and has a stand-by current of less than 1μA) or the less-costly IM6508A (stand-by current could be up to 10μA.) The much cheaper IM6508C (7V maximum, up to 1mA stand-by) should not be chosen unless a 6V battery is used and the keyer is switched off when not in use. Sources of supply appear in the components list.

Whether a pcb is used or not, care should be taken to check all connections after assembly. Most problems are due to a wiring error. Gates and other inputs left floating show as a higher-than-normal stand-by current to the board, a current which fluctuates wildly when a finger touches the pin in question. If the stand-by current is correct but other malfunctions occur, trace the logic sequence described earlier. In cmos circuits a

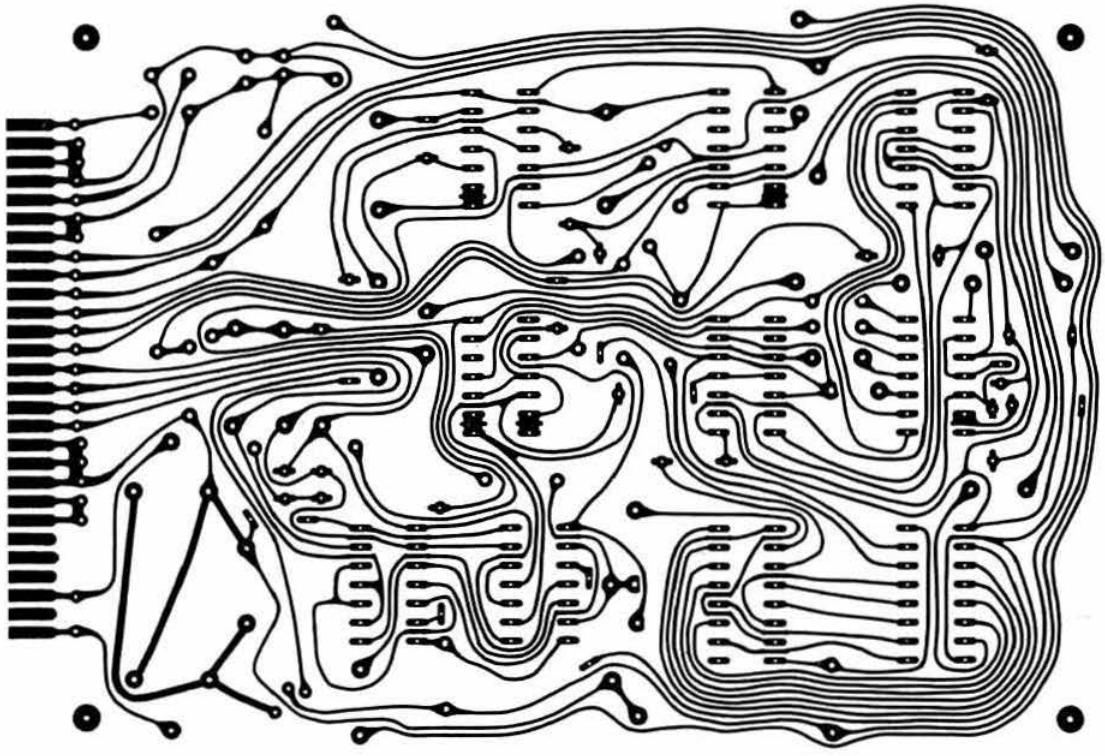


Fig 5. PCB copper side

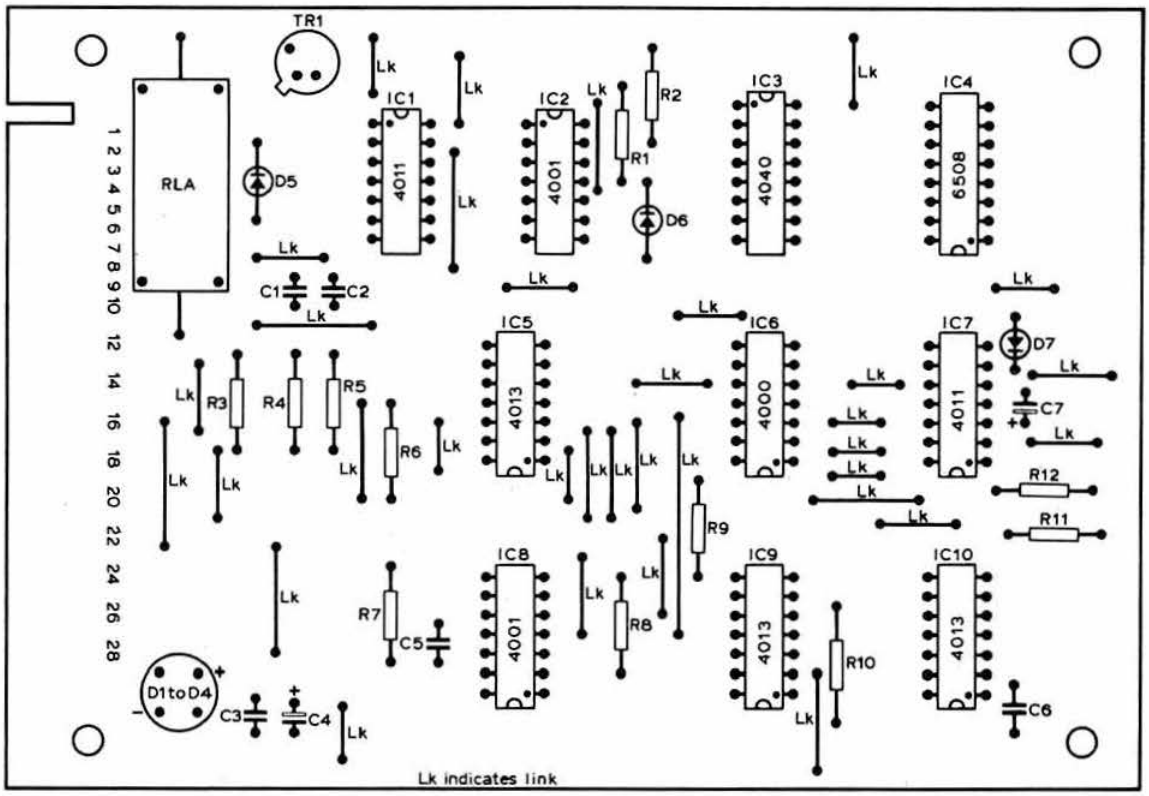


Fig 6. PCB component side

logic 0 is at 0V and a 1 is at the positive rail voltage, so a high-impedance voltmeter is all that is needed to carry out a step-by-step analysis, but make allowance for the effect of all pull-up or pull-down resistors (R1–5, R8 and R9).

Using this circuit, six keyers have been built by the author and other Guildford amateurs during the last 18 months, and have proved their value during NFD and other contests. For would-be constructors hesitating because of a lack of experience of cmos logic, there are some excellent non-mathematical books now available [6] [7].

References

[1] "A fourth generation cw keyer using cmos ics", E. B. Grist, G3GJX. *Radio Communication* September 1976.

[2] "The ultimate keyer?", C. I. B. Trusson, G3RVM. *Radio Communication* May 1977.

[3] "Technical Topics", Pat Hawker, G3VA. *Radio Communication* February, April, May and September 1977, April and October 1978.

[4] *Printed circuit assembly,* M. J. Hughes and M. A. Colwell. Newnes Technical Books, 1976.

[5] "Roadrunner WDS". See "New products" page 719, this issue.

[6] *CMOS Cookbook,* Don Lancaster. Howard Sams Inc, USA.

[7] *110 CMOS Digital IC Projects for the home constructor,* R. M. Marston. Newnes Technical Books, 1976. □

NEW PRODUCT

Ambit 96640 vhf nbfm monitor receiver

This vhf monitor can be supplied to cover any 2MHz in the region 30 to 180MHz, by use of the appropriate colour-coded coil set. Within the 2MHz span, nine crystal-controlled channels are selected using dc switching (which may be either from ground or Vcc to accommodate various types of scanner circuitry). Each channel is individually trimmed, and uses low cost fundamental mode crystals in parallel resonance mode. The rf and mixer stages use the latest dual-gate mosfets, followed by an eight-pole crystal filter. The i.f. and detector stages combine muting and a 100mW on-board audio amplifier to drive a small loudspeaker.

The basic unit is supplied as a pcb assembly, excluding crystals, either ready-made (996640) or as a diy kit (96640). The desired frequency range should be stated when ordering—although crystals are not supplied by Ambit. The range covered includes various private and public services, the 144 and 432MHz amateur bands, and vhf marine frequencies.

Kit price for full nine-channel operation is £34.25 + VAT. Further information from Ambit International, 2 Gresham Road, Brentwood, Essex. Tel 0277 227050.

The "Tele-Scope"

by W. D. ANDREWS, GW2DHM*, and
J.KÖPPEN, DF3GJ, GW5BPC**

General description

In this article the authors describe an easy-to-build adapter that turns a television receiver into an oscilloscope. Although it is not designed to compete with a normal oscilloscope, it can provide an inexpensive means of displaying dc and audio frequency signals on the tv set's large screen. It is a high-input impedance millivoltmeter, which also shows the waveform of the signal, and is, therefore, very useful for making measurements while setting up, adjusting, or fault-finding in audio and slow-signal digital circuits.

Basics of operation

In a normal oscilloscope the sawtooth voltage of a time-base oscillator is applied to the X-plates, and the amplified signal to be measured to the Y-plates, so that the cathode ray tube's electron beam moves on the screen according to the signal's waveform. In a tv set, however, the electron beam scans the whole screen by 625 lines in two half-frames, each lasting 1/50th of a second. It is not possible to control the position of the spot on the screen, but it is possible to control its brightness at any given moment. All the adapter has to do is to convert the input signal into a pattern of pulses which switches the intensity of the luminous spot in order to create an impression similar to the picture on an oscilloscope's screen. This is done as follows:

Consider each half-frame consisting of 312 horizontal lines, each of which takes the electron beam 64μs to write. Each line begins with a line synchronization pulse, lasting about 4μs, which represents an instant of time which may be used to look at the input signal and to sample its voltage. The next step is to convert this voltage into a pulse which switches the brightness from, say, black to white. The time delay between the start of this pulse and the sync pulse is controlled by the voltage sample in a linear fashion. For instance, zero volts corresponds to zero time delay, hence there will be a bright spot at the start of the lines (left-hand edge of the picture), 5V corresponds to 30μs

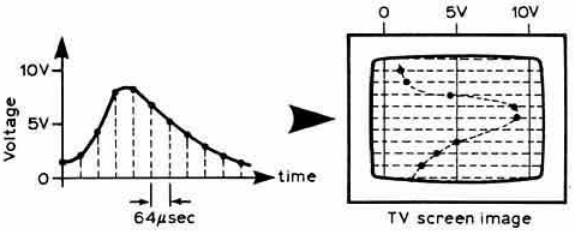
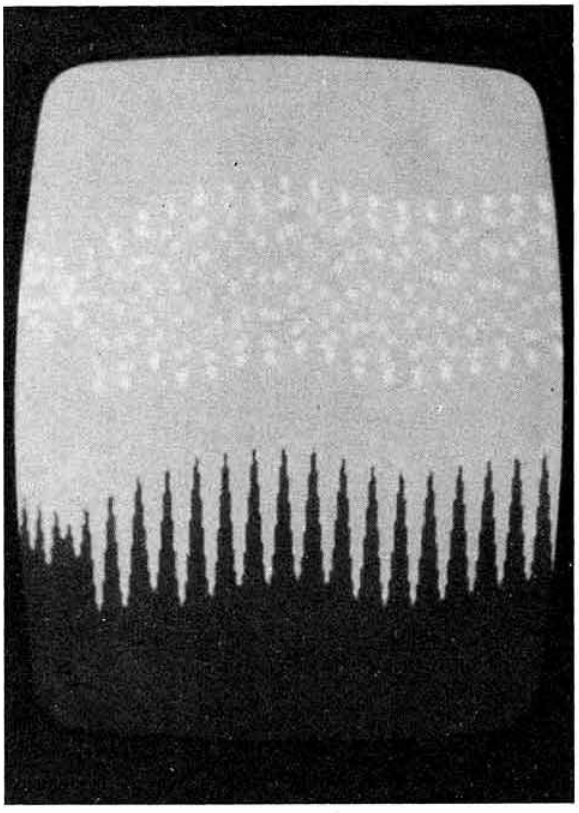


Fig 1. How the "Tele-Scope" works. Every 64μs the input voltage is measured and the result is displayed as a dot on each horizontal line of the tv picture



Audio frequency signal. Note the difficulty of distinguishing the waveform from the display using bright dots (top) compared with the display using the border bright/dark (bottom)

(centre of the picture), and 10V to 60μs (right-hand edge). The duration of the brighten-up pulse is short, so that the spot created will be a small one.

If the input signal is constant, say 5V, the sampled voltage will also be constant, as will the time delay: 30μs. This means that in each line there will be a bright spot just in the centre of the picture, creating the impression of a thin bright vertical line halfway across the screen. When the voltage increases, the line will appear to move to the right; when it decreases, the line will

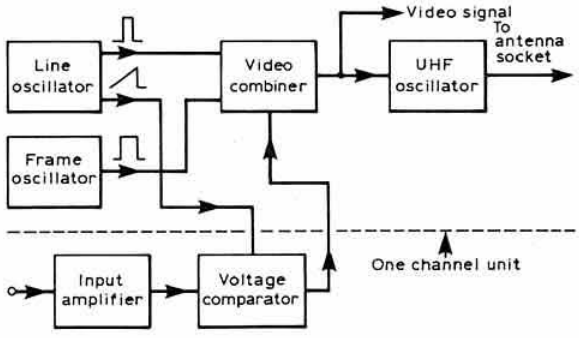


Fig 2. Block diagram of the "Tele-Scope"

*69 Fairwater Grove West, Cardiff CF5 2JN.

**Viernheimer Weg 47, D-6900 Heidelberg, W Germany.

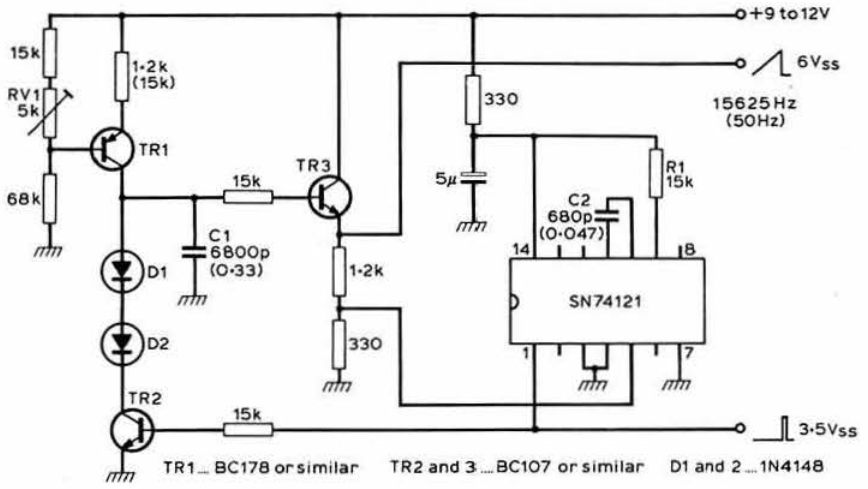


Fig 3. Sawtooth oscillators. All ics are viewed from the top

move to the left. If the input signal varies quickly with time (Fig 1), the line will appear to be distorted or deflected to assume the shape of the input signal's waveform as the voltage is measured and its value converted to a time delay at each sampling instant.

Circuit description

Fig 2 shows the block diagram of the complete circuit: two oscillators operating at 50Hz and 15,625Hz provide the vertical and horizontal sync pulses as well as sawtooth voltages, and give a strictly linear correspondence with time of the position on the screen. Both oscillators are identical except for the frequency determining components (Fig 3): C1 is charged by a constant current source (TR1), and therefore the voltage across the capacitor rises linearly with time. RV1 is used to set the charging current, and hence the rate at which the voltage increases. A buffer amplifier, TR3, and a voltage divider are used to feed this voltage into the input of an SN74121 monostable multivibrator. If the voltage at the input pin rises above 1·6V, which corresponds to about 6V across C1, the ic sends out a positive-going pulse whose length is determined by the combination R1/C2. As the voltage across C1 increases to a value above 6V, the ic's output pulse will drive TR2 into conduction, which discharges C1 instantaneously. After that, TR2 is switched off again, and C1 will start to be charged again. Therefore the voltage across C1 will have a sawtooth waveform, rising slowly from near 0V to about 6V, from where it quickly drops down again; this is equivalent to the flyback of the tv set's deflection oscillators.

At the time the voltage drops, the multivibrator SN74121 sends out a pulse which is used to synchronize the tv set's deflection generator. This is done by including these pulses in the composite video signal as sync and blanking pulses. Incidentally, C1 must not be fully discharged, as this will cause some distortion at the left and upper edges of the displayed picture. The reason for this is that the op-amp comparator described below is driven by a voltage close to one of its supply terminal voltages. Three silicon diodes in the collector lead of TR2 help to cure this by preventing discharge to 0V.

The signal to be measured is fed into the input amplifier (Fig 4). Its input can be switched to ac or dc coupling; a simple 1MΩ potentiometer is used as an input attenuator, although the input resistance may be raised to 10MΩ, commonly found in vtvms, since the fet source follower provides a high input resistance. A series resistor and two silicon diodes offer protection against voltages up to 100V. A 709 type operational amplifier raises the signal from about the 100mV level to an output of 6V. Another 1MΩ potentiometer serves as a shift control that can move across the screen the line which corresponds to zero input voltage. The output of the amplifier ic is fed into one input of the voltage comparator, Fig 5. Again a 709 is used, but its frequency compensation network was chosen for faster operation. Its other input is connected to the 15,625Hz line sawtooth oscillator. The output of the

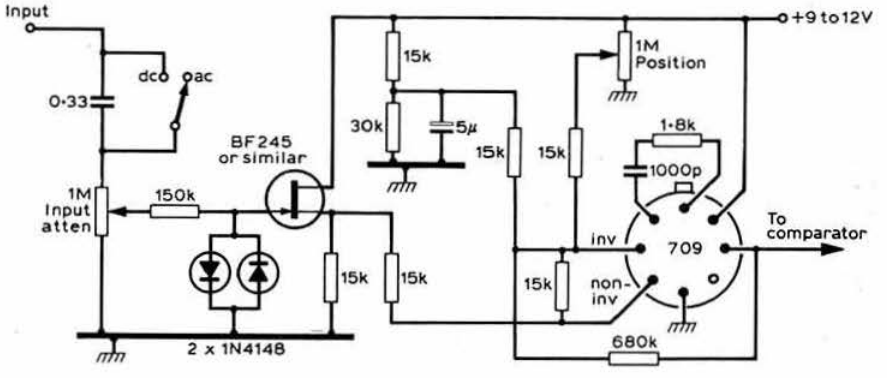


Fig 4. Input amplifier

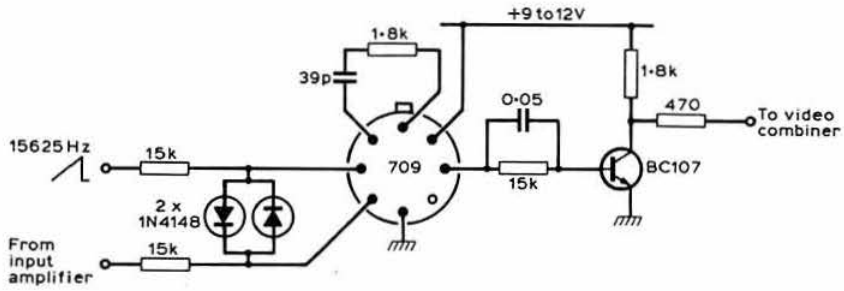
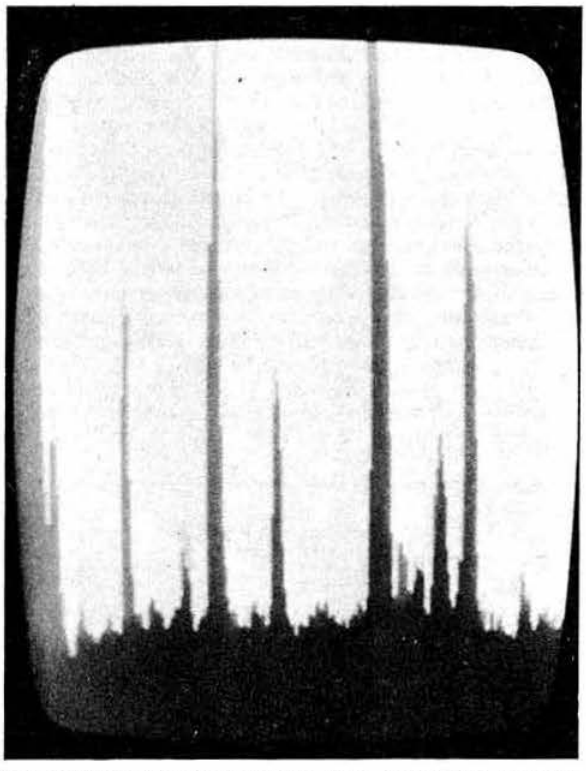


Fig 5. Voltage comparator

comparator will be near 0V if the voltage at the inverting input is larger than that at the non-inverting input—by, typically, at least a few millivolts. It will be near + 12V if the voltage at the inverting input is smaller than that at the other input.

Imagine now a voltage of, say, 3V being applied to the inverting input. The other input is fed by the line sawtooth, which goes from 0 to 6V in 60's. Therefore, for the first 30μs after the start of the sawtooth this voltage will be smaller than 3V, and thus the comparator's output will be close to ground. But it will change over to + 12V as the sawtooth becomes equal to 3V, and it will remain so until the flyback of the sawtooth. If the voltage at the inverting input is now increased or decreased, the comparator will change its state later or sooner than 30μs after the sync pulse. But this is nothing but the conversion of a voltage into a time delay.



The spectrum from 0 to 20MHz, using a spectrum analyser module. The largest "pip" is the 16MHz broadcasting band, followed in strength by the 9·5 and 19MHz bands

Thus the moment at which the comparator changes over is that at which to switch the tv set's electron beam "bright". This is done by putting together a complete video signal by adding an appropriate amount of the comparator output to the sum of the vertical and horizontal sync pulses (Fig 6). The output of the video combiner is a composite video signal with the white level at + 12V, sync level at 0V, and black level at 2·5V. This signal may be fed into a video monitor or the final stage of a transistorized portable tv set (at DF3GJ). An alternative method is to modulate a vhf or uhf oscillator to feed the tv set's antenna socket (GW2DHM). In doing so there is no need for any construction inside the tv set, and one also avoids the problem with the live chassis. A suitable uhf oscillator, operating in Band 5, is shown in Fig 7; its output is maximum when the video is minimum.

In practice it was found to be hard to follow a curve representing a rapidly changing signal, which takes only 10 points or so to cross the whole screen. It is much easier if a change from dark to bright is used instead of a narrow spot to mark the curve. With the resistor values shown in the video combiner there is also a softer contrast that is much less tiresome to watch than a stark black/white contrast. However, one may easily produce a dot-pattern by inserting a 500pF capacitor between comparator output and video combiner. Furthermore, if one leaves out the inverter following the comparator ic, one will invert the contrast (black dots on a white screen etc!).

Set-up and testing

It is a good idea to start with the uhf oscillator. When the "video" input is grounded, it should oscillate. This can be seen by monitoring the collector current, which should be a few milliamps, dropping a bit each time the "hot" end of the "coil" is touched. Tune it with the trimmer to a frequency clear of any tv station; this can be observed on the tv set, which will show a black picture only when it is tuned to the frequency of the oscillator. Some sets possess ac coupling in the video amplifier, and on these a white "flash" should be seen each time the oscillator is turned off.

Next, build both sawtooth oscillators and make sure that they are working on roughly 50Hz and 15kHz (high impedance

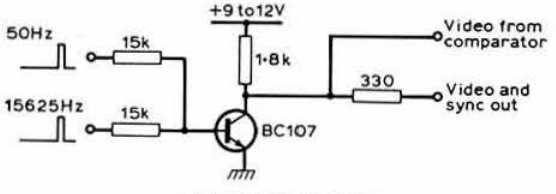


Fig 6. Video combiner

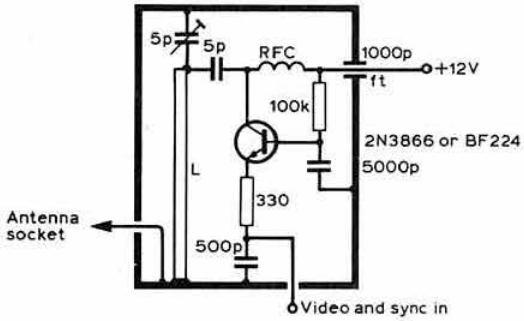
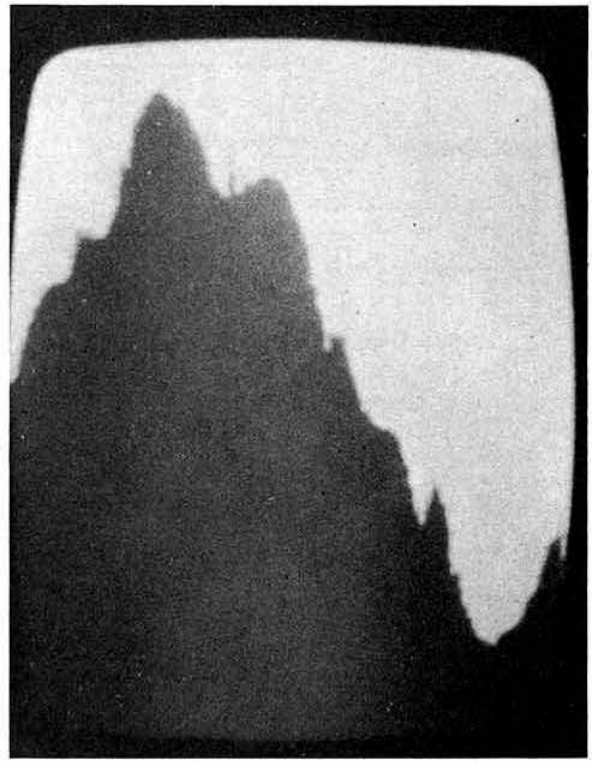


Fig 7. UHF oscillator. RFC: 20t 34swg on 15kΩ resistor. L: 1·5in long 19swg copper wire

headphones). After building the video combiner, one has a small tv transmitter that only transmits the sync pulses. (Beware of tvi!) One should be able to see them as *black* dots or stripes on the tv screen. By adjusting the frame oscillator frequency, one should be able to get the set to hold on the horizontal bars. Adjusting the line oscillator will finally untilt the picture, and black vertical bars will appear on the left and right, to which the set will lock.

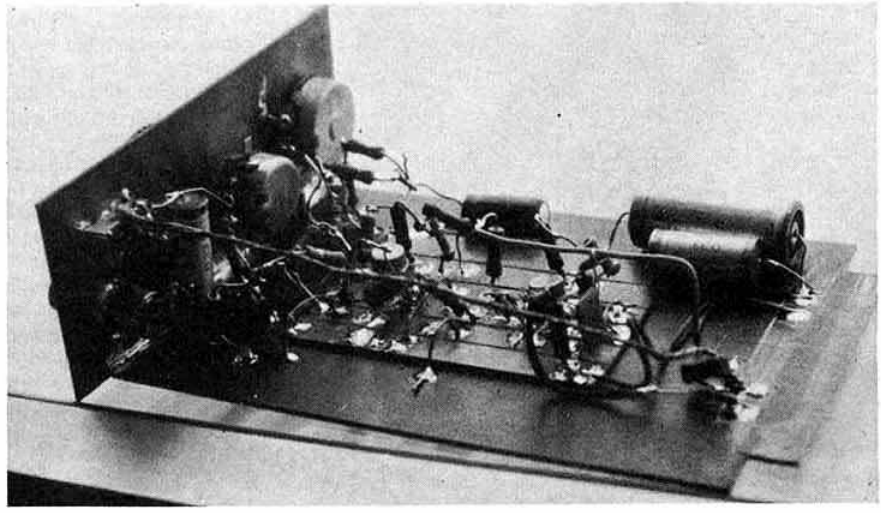
Once this has been done, one should start with the voltage comparator, feeding its signal input with the wiper of a potentiometer (10kΩ or larger) between +12V and ground. In this way one can check the action of the comparator. The picture should now consist of the left-hand side being dark and separated by a sharp border from the white area on the right. When the potentiometer slider is moved, the position of the border will change accordingly. The assembly of the input amplifier will complete the "Tele-Scope".

Both building and layout are not critical, since most of the circuit deals with low frequencies. Construction may be done on Veroboard (GW2DHM) or "free-style" above the ground plane of a pcb (DF3GJ). It is advisable to put the uhf oscillator into a screened box to prevent rf spillage. Also one should take care to by-pass the supply rails with 0·1 and 10μF capacitors to discourage the rather sharp spikes and pulses from travelling



50Hz mains hum

into other parts of the circuit. Since the input impedance is rather high, one should also avoid any pick-up of mains hum. It is a good idea to put the sawtooth oscillators into one module and the input amplifier/comparator into a separate one. Accessories can then be built later and added to the whole unit. Such an assembly, consisting of a one-channel unit, a two-channel unit, a wobbulator, and a spectrum analyzer is in operation at DF3GJ.



The "Tele-Scope": input amplifier and comparator combined in one module

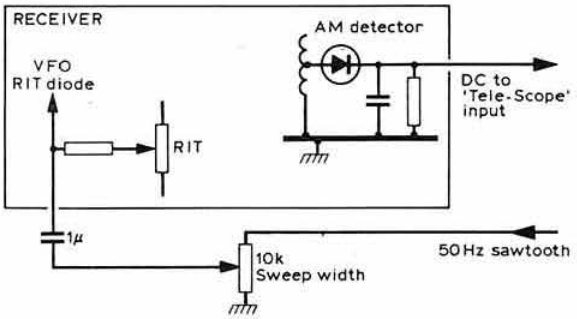
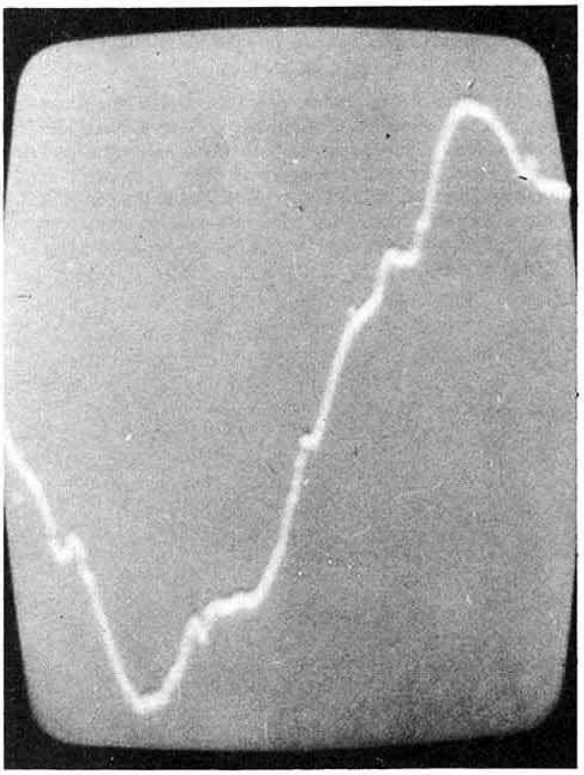


Fig 8. Principle of panoramic receiver

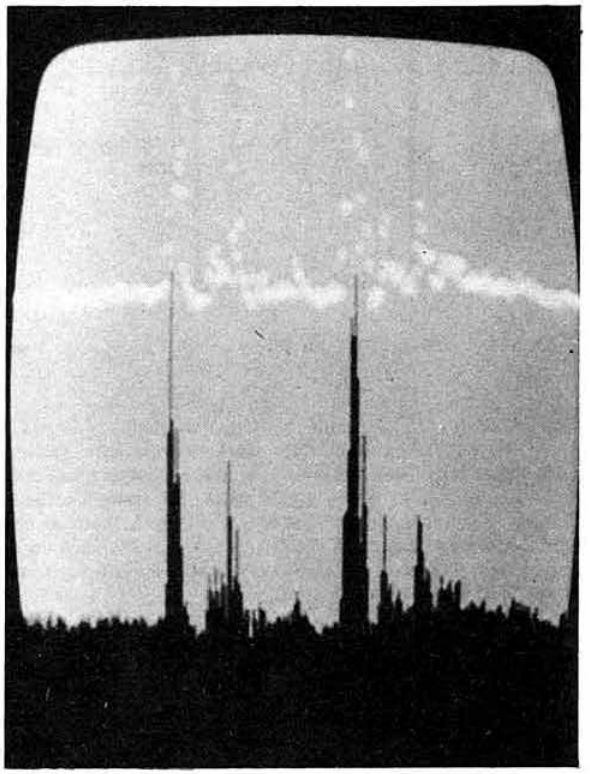
Operational comments

The "Tele-Scope" is usable as a dc and audio frequency oscilloscope having a *fixed* time base running at 50Hz. So one does not have the convenience of a real 'scope which can be synchronized to, or triggered by, the input signal. Hence it will produce stable pictures only if the frequency of the analysed signal is an exact multiple of 50Hz. Nonetheless it can be used to look at audio signals, eg to measure the output amplitude of an amplifier and to check whether the signal is being clipped.

Since the line frequency of a tv set is faster than the frame frequency, the lines have to be used as time instants to sample the input signal. Thus the time axis runs from top to bottom instead of from left to right as in ordinary oscilloscopes. One may turn the tv set around, or bend one's neck until it aches, or simply get used to time running from top to bottom. At DF3GJ the "Tele-Scope" is used frequently as a substitute for an oscilloscope, so it does not matter any more in which direction time flows.



50Hz mains hum, displayed using a single bright dot on each tv line



High resolution (20kHz bandwidth) panoramic display of the 16MHz broadcasting band. The display using bright dots (top) would be quite difficult to interpret

The "Tele-Scope" provides a sawtooth voltage which corresponds closely to the instantaneous position on the screen, and therefore it is very easy to build a panoramic receiver (Fig 8). Apply the 50Hz sawtooth via a capacitor to the rit control line of a receiver, if it uses a capacitance diode in the vfo, and connect the "Tele-Scope" input to the output of the a.m. detector. Similarly, one may build a proper wobbulator and use it as the local oscillator; some of the photographs were made with such a set-up. A wobbulator also makes swept frequency measurements possible, such as displaying the frequency response of a filter: the wobbulator's rf signal is fed into the filter input, whose output is rectified and the dc signal measured by the "Tele-Scope". Since one can see changes in the filter curve as they happen, this is a most useful tool while adjusting and tuning a filter.

Finally it should be mentioned that by building additional amplifier comparator modules and connecting their outputs to the common video line, the large and bright screen of a tv set can be turned into a multi-channel oscilloscope, which is useful for checking digital circuits, monitoring a number of audio channels, or even a number of panoramic receivers. □

swl news

Bob Treacher, BRS32525 *

Antenna systems

Many people remark that a receiver is no better than its antenna, and some listeners who connect an odd length of wire to the receiver are disappointed with the results. This can be avoided if care and thought is given to the erection of as good a receiving antenna as circumstances permit. Those listeners with no garden or a restricted space obviously have more problems than most. Every indoor antenna will pick up electrical appliance noise due to the screening and attenuation effect of roof tiles, walls, pipes etc, which not only diminish the strength of the signal received but will also cause this undesirable interference. For listeners who experience problems with antenna design, due to lack of garden or space, a brochure which discusses the choice and erection of antennas, antenna layout, dipole characteristics, flexi-dipoles, full wave loops, groundplanes and tuning procedures, and which tries to visualise all the possible circumstances in which listeners may find themselves, is available on receipt of a large sae (13 by 8in minimum) from G2DYM, HF Telecommunications Ltd, Uplowman, Tiverton, Devon.

DX rumours

G3ZAY has spoken to SM4CNN regarding rumours of some legal activity from Albania being heard soon. SM3VE and SM4CNN have approached the Albanian authorities but at the time of writing the necessary permission had not been received. If any activity occurs from this approach, it is unlikely to take place until at least early August.

The Manahiki trip by ZL1ADI did not happen; but quite unexpectedly, VE1AIH and VE1AST activated Sable Is (VX9) for two days in early June, signing VE1AIH/1 on ssb and VE1AST/1 on cw. The trip took many by surprise, but a number of Europeans were able to delete this one from their wanted list. Rumours suggest that this was an experimental operation on the hf bands only, with a possibility of an all-bands expedition appearing later in the summer. All QSLs go via VE1AIH.

Another rarity which appeared was JF1IST/7J1 from Okino Torishima. Conditions for the trip were not too good, and signals into the UK were not very strong. However, another rumour suggests that JA3CMD will be signing 7J1 in August.

At the time of writing, an expedition to Revilla Gigedo Is (XF4) was imminent; callsign is rumoured to be XF4MDX. The grapevine also suggests that ex-TR8AC and ex-TR8GDC will soon be heard from SU-land. UK1PAA, Franz Josef Is, is apparently active on QRP cw only into a vertical. His preferred frequency is 14,030kHz, and he favours mainly early morning operation. SM0AGD/XW8 had also been heard on 14MHz. QSLs via SM3CXS.

It is reported that K1MM, of 1S1DX fame, will be touring Africa in late November, and he is exploring the possibilities of operating C9 and 5R8. OE6MBG is also reported to be looking into a dx trip to 3V8 in August. Considering your scribe's comments last time about the apparent lack of dx trips, it is amazing what information comes to light during the course of one month!

*79 Granby Road, Eltham, London SE9 1EH.

1979 HF countries table

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS35943	151	173	211	101	103	7	746	ssb
ARS8841	148	152	227	73	76	3	679	ssb/cw
BRS25429	160	152	192	76	78	21	679	ssb
RS41426	89	95	92	52	67	18	413	ssb/cw
A9191	59	82	144	63	49	9	406	ssb
BRS25901	79	88	120	38	41	6	372	ssb
BRS34740	79	81	77	30	37	7	311	ssb
ARS41386/GJ	50	94	84	37	12	1	278	ssb
ARS39784	77	57	83	26	23	2	268	ssb
BRS41333	73	87	52	18	35	2	267	ssb/cw
BRS40293	53	52	74	40	35	0	254	ssb
BRS40814	58	59	84	34	17	0	252	ssb
BRS20185	71	47	93	14	23	1	249	ssb
BRS39161	51	39	91	9	18	2	210	ssb
ARS41554	29	53	65	18	36	3	204	ssb
BRS40292/GU	40	32	41	17	25	2	157	ssb
BRS27421	0	0	100	22	19	1	142	ssb
BRS40705	41	42	36	7	12	1	139	ssb
ARS40133	28	31	34	7	14	0	114	ssb
BRS40292	27	15	34	10	22	2	110	ssb
A9107	32	27	35	0	13	0	107	ssb
BRS41136	35	29	30	4	5	0	103	ssb/cw

June blues

A lack of good conditions seemed to make tuning the bands a little ordinary during June. The 28MHz band produced only occasional openings to South America and the Near East, plus the usual summer appearance of many Europeans, inaudible throughout the rest of the year, because of the longer skip conditions. The 14 and 21MHz bands both produced dx capabilities late in the evenings, but the Pacific on 14MHz seemed poor, with the usual strong signal from P29JS struggling to make an impression through the QRN. The 7MHz band proved interesting after 0100, but 3·5MHz seems to have slipped into its usual summer slumbers. However, this is only a general summing up, as our reporters have extracted some life from the bands.

Robert Small, ARS8841, has his father to thank for now being able to tune 1·8MHz—he has purchased a Trio TS520S and, when not chasing dx himself, allows Robert to listen. The 1·8MHz band will not be at its best until the autumn, when the dx-window around 1,825–1,830kHz will be worth monitoring for ssb signals, and around 1,80½–1,805kHz for dx cw. Robert mentioned ZK2VE, 6T1YP (Sudan) and J7DAO on 14MHz but also complained about the generally poor conditions.

Ian Marquis, RS41426, on the other hand, reports an interesting month: ZS3AK, CN8CP, TI2CA and 7X2DG were heard on 7MHz, and FH8CL, FO8DT, KC6GF and 9M8UG on 14MHz. Ian's exams are now over, so he reports more listening time available. David Hawes, A9191, reports VK0PK on Macquarie Is as his pick of the month. Rod Hunt, BRS41333, recently erected a $\lambda/2$ dipole which has given him some improvement in signal strengths received.

Eric Hall, BRS27421, is concentrating on inter-G dx on 3·5 and 7MHz and is trying to hear all the UK counties. In view of the millennium celebrations on the Isle of Man in early July, it is unlikely that that country will appear on any wanted lists for many a year. A Cambridge University Wireless Society group headed by G3ZAY, G3ZHL and G4BNE was scheduled to operate GT6UW from Peel using an FT101 and KW1000 linear into a Mosley Mustang at 30ft on a tower loaned by G3JHI.

(Continued on page 745)

The XJK

by M. P. HUGHES, G3KBH*

IN the field of radio, amateurs are always trying to squeeze a quart into a pint pot, and antennas do not escape their attention. But although the antenna featured in this article was first described more than 40 years ago, it has not, unfortunately, received much attention. The author has taken the liberty of calling it the XJK (with apologies to Dr Kraus), since it can be considered as a close relative of the half-wave '8JK.

The XJK is an efficient, compact antenna that matches well to standard coaxial cable and is easily tuned over a wide frequency range. It is horizontally polarized, but lacks any marked horizontal directivity. In the vertical plane, however, it is relatively insensitive to high-angle radiation. Because it is small it can be used indoors on the hf bands, and because it is tunable it can be used on more than one band. It may also have applications as an omni-directional horizontally-polarized antenna on the vhf bands.

The relationship to the '8JK is suggested in Fig 1, which shows that by bending the ends of the dipoles of an '8JK around to the centre of the structure, an angular figure-of-eight is formed. This is the basic shape of the XJK, and it is convenient to feed the antenna at the centre of one of the dipoles. Correct phasing is maintained if the left-hand end of each element is connected to the right-hand end of the other. At the centre of the structure, where the elements cross over, the conductors crossing in one direction must be insulated from those crossing in the opposite direction. A variable capacitor connected between the conductors where they cross over will tune the antenna to frequencies below its unloaded, self-resonant frequency.

The current distribution along the conductors is such that, during any half-cycle, it flows in only one direction around the structure (Fig 2). The XJK thus approximates, very roughly, a loop antenna with a symmetric current distribution. There is no radiation along the axis of such an antenna, since the radiation from any section of the loop is cancelled by the radiation from the section diametrically opposite. For the same reason there is a null in the vertical direction in the radiation pattern of a horizontal XJK. In fact it remains relatively insensitive to incoming radiation from all high angles. This effect gives the antenna a considerable advantage for dx reception when short-skip signals, which arrive at high angles, are liable to be troublesome on horizontal dipoles and other simple antennas.

The current loop, or magnetic dipole, is the dual of the electric dipole. Some other well-known antennas also approximate magnetic dipoles; for instance, the cloverleaf with four small loops, and the halo with just one loop. In fact the XJK can be thought of as a pair of halos sharing a common capacitor.

The impedance at the centre of each element of an '8JK, constructed from $\lambda/2$ dipoles with a spacing of $\lambda/5$, is about 20Ω. When the dipoles are bent to form an XJK, the impedance changes very little. If simple folded dipoles are used, the impedance is multiplied by four, and thus presents a good match to standard coaxial cables. When the XJK is tuned to frequencies below its self-resonant frequency by the addition of capacitance at the cross-over, the impedance drops, but not drastically. Over a two-to-one tuning range the impedance is roughly proportional to frequency. A reasonable match to 50Ω feedline can be maintained over this range, provided that the antenna is tuned to resonance by careful adjustment of the capacitor.

As the frequency is reduced further, the Q of the XJK, like that of any small antenna, will increase ever more rapidly. Problems in the form of very sharp tuning, ohmic losses in the elements, and arcing at the cross-over capacitor will eventually be encountered. Even with very careful design, these effects will probably limit the usefulness of the XJK to a frequency range somewhat less than three-to-one.

The XJK is a balanced antenna, so a balun is required if it is to be fed properly from coaxial cable. Baluns such as the bazooka or Pawsey stub can be used for single-band operation, whereas a ferrite transformer is probably the most convenient for multiband operation. If the efficiency of the ferrite turns out to be too low (that is, if it gets hot during transmission) then a choke, formed by coiling a length of coaxial cable close to the feed point, may prove a satisfactory compromise. Otherwise a set of balun coils will be required.

Construction

The method of construction suggested here is very simple, and is intended for indoor use. Cut a piece of plastic lighting flex some 5 to 10 per cent shorter than one wavelength at the highest frequency of operation for which the antenna is required (for 21MHz this is about 43ft). Cut this flex into two exactly equal lengths, strip all eight ends, twist the exposed pairs of conductors together, join the two pieces to form a single loop, and then solder. Locate the centre of one of the folded dipoles so formed, cut *one* of the conductors and

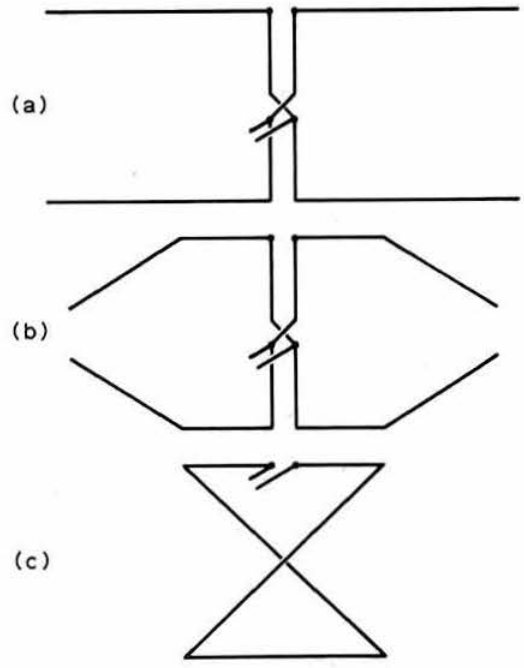


Fig 1. Development of the XJK from the half-wave '8JK. (a) Standard '8JK arrangement. (b) The ends of the elements are bent towards the centre. (c) The basic XJK with opposite ends of the elements joined across the centre. Feedpoint moves to the middle of one of the elements

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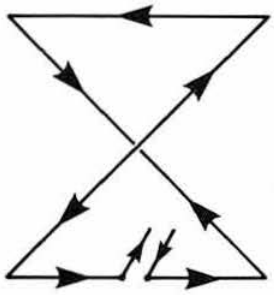


Fig 2. Instantaneous current flow in the XJK

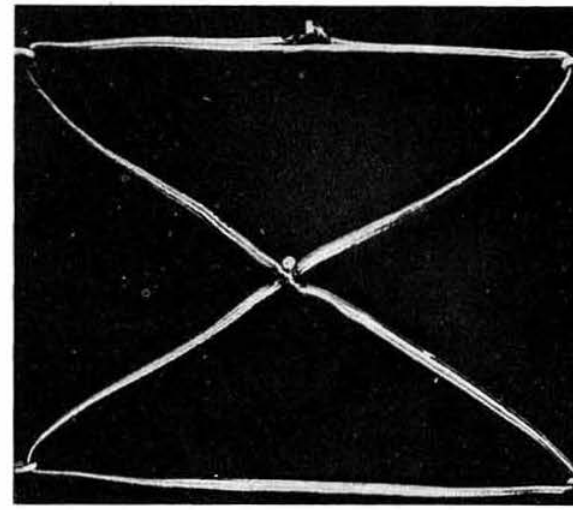
remove 0·25in of insulation on each side ready for connection to the feeder. Twist the loop to form an angular figure-of-eight so that the soldered ends of the dipoles are all located where the wires cross over, and the feedpoint is at the middle of one of the sides. Connect a small transmitting-type variable capacitor between the exposed conductors at the cross-over. (The author has used glass piston trimmers quite successfully.) The antenna should look something like that in the photograph. The end of the bazooka can be seen connected to the feedpoint.

Indoors, the flex can be pinned to the ceiling of a room, or looped over hooks screwed into the rafters in the attic. To give reasonable element spacing, the hooks should form a square of about $\lambda/5$ per side. (For 21MHz a 9ft square is about right.) If the cross-over needs support, care must be taken to ensure that it is adequately insulated. One possibility in the attic is to use nylon string fixed to a rafter directly above the central point. Indoor antennas have the advantage of being immune to wind damage, but they have to be carefully sited to minimize coupling with domestic electrical wiring.

Outdoors, a more robust construction is called for, and standard wire-antenna techniques described in the handbooks should be applied. Support for the antenna could be provided by four poles at the corners of the appropriate size square or, if convenient, the house might provide one or more points for support. A self-supporting XJK would allow the parts of the elements forming the cross-over to be used as a robust pair of booms. The author has experimented with a self-supporting XJK made out of copper tube for 144MHz, but all the others he has built were made of wire and needed additional support. The first few he made were mounted on one set of spreaders taken from a cubical quad that had seen better days. The spreaders were arranged so that they all pointed up and away from the single point of support, and the wires for the XJKs were tied to them with nylon string.

To avoid having to support the cross-over outdoors, the central capacitor could be a lightweight combination of a fixed and a small variable, or alternatively the total length of wire used for the antenna could be reduced and made up by a length of twin lead connected between the cross-over and a remote capacitor which could rest on a support closer to the ground. Actually, even if the wires do sag quite a lot towards the cross-over, it will not affect the performance of the antenna very much. To ensure reliable operation out of doors, all connections should be protected from the weather. A small plastic box and plenty of sealing compound will usually give satisfactory protection to the capacitor.

The length of wire and size of square needed for operation on a particular frequency can be estimated by scaling the figures the author has given for 21MHz. For example, the ratio between 3·5 and 21MHz is six, so the total length of wire needed is 6 × 43ft, or about 258ft, and the size of the square is 6 × 9ft, or about 54ft. It is interesting to note that this last figure is less than the element length for a full size 7MHz dipole and, moreover, such an XJK would function quite efficiently on top band. However, in practice, a halo might be a better bet on top band.



Model of the XJK made from lighting flex and fed with coaxial cable through a bazooka

One or two points should, perhaps, be emphasized. First, the actual length of the antenna is not critical. Generally speaking it should be the longest length that will fit into the available space, but not much more than $95\lambda/100$ at the highest operating frequency. Second, the actual shape of the antenna is not very important. The aim should be to keep the arrangement as square as circumstances will allow. The antenna should be brought to resonance by adjusting the capacitor at the cross-over. (Resonance can be detected with a gdo, a bridge, or by checking for minimum vswr on the feedline.) The lowest frequency of operation may be limited by the swr that the transmitter can tolerate, although bandwidth, ohmic losses in the elements, and excessive voltages at the cross-over capacitor will become ever more important as the frequency is reduced.

The author used XJK antennas of various construction for almost 10 years, and their performance has been perfectly satisfactory. Comparisons he has made on 21MHz between an XJK and a dipole at the same height show that short-skip signals are much stronger on the dipole (often by a ratio of 30dB or more), whereas the XJK generally produces slightly stronger signals on dx. Measurements have also shown that the bandwidth is about one per cent for the unloaded antenna, and retuning is necessary to maintain full efficiency over even the narrow hf bands. However, this limitation is common to many antennas.

Conclusion

The XJK is a simple, compact antenna that is very easy to build, and one that can be tuned and operated efficiently over a two-to-one frequency range. It has considerable advantage over the horizontal dipole for dx work, and should prove attractive when the effort required to provide a few decibels of forward gain is unwarranted. □

technical topics

Pat Hawker, G3VA

EVERY year amateur transceivers seem to shrink smaller and smaller, and become lighter and lighter. For mobile and portable operation this is fine—and the QRP enthusiasts get a kick out of the Lilliputian scale of their tiny rigs. But increasingly one wonders whether, in the normal domestic context, small really is beautiful. Our hands and fingers do not get correspondingly smaller, nor does our sense of scale.

There can be ergonomic problems when lots of knobs and switches are crammed on to a small, and now often rather crowded looking, panel. Admittedly, with digital displays and modern electronics, there is no longer any fundamental requirement for large and mechanically-complex tuning dials and mechanisms; tuning capacitors can be replaced by tiny diodes; we could use just a single pocket-calculator-type keyboard to enter all our tuning and operating instructions into microprocessor-controlled equipment. And, of course, sheer economics dictates that the "black boxes" use the minimum of costly metal-work and compact money-saving cabinets.

But is there not, in all this, an unexplored psychological problem to be overcome? Do operators obtain the same sense of enjoyment from cigar-box-sized equipments as they do from the old-style, relatively bulky rigs of yesteryear? It is said that in the early 'twenties some American amateurs were reluctant to replace spark with valve transmitters—partly because of the satisfying sense of real "power" that was experienced when keying spark. And personally I well remember how 35 years ago in those immediate post-liberation weeks in Paris, when at night there was still plenty of stray shooting going on, that an HRO and bulky transmitter in front of the window gave a reassuring feeling of "body armour" while the S-meter light allowed one to copy traffic without becoming a sitting target! One suspects RAF operators must often have felt the same about the old R1155/T1154 combination.

We cannot, of course, turn the clock back to large knobs and glowing dials. But sometimes I wonder if designers of amateur equipment ever really think about just what makes a rig attractive to operate!

Balanced harmonic mixer

During 1977 (*TT* April, July; and in *ART6*) attention was drawn to a harmonic product detector for direct-conversion receivers using the anti-parallel diode configuration as suggested by V. Polyakov, RA3AAE, in the Russian magazine *Radio* (December 1976). This resulted in considerable interest in such circuits for both detector and mixer applications from hf to microwaves.

In *Radio* (No 3, 1979 p24) RA3AAE comes up with an interesting variation which is less critical of oscillator injection voltage, and which, in effect, is a more balanced arrangement, whereas the earlier circuits were unbalanced and semi-balanced. Thanks to translation guidance from Sid Dunn it is possible to provide an outline of this supplementary article.

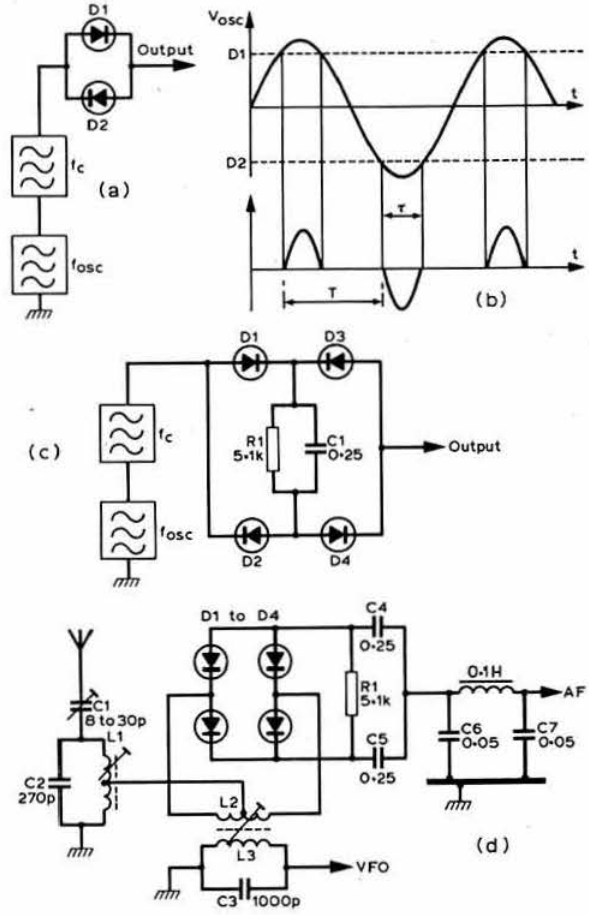


Fig 1. (a) Basic form of the harmonic back-to-back diode mixer as previously described. (b) For optimum results the injection voltage needs to be fairly critically adjusted so that the diodes conduct for approximately half of the total period. (c) By applying a bias voltage (due to the action of R1-C1) it is possible to make performance much less dependent upon oscillator drive voltage. (d) Balanced arrangement which is used by RA3AAE for a 3·5MHz direct-conversion receiver and which provides good isolation between oscillator and antenna

RA3AAE points out that, for optimum performance, the original circuit arrangements require the oscillator injection voltage to be fairly critically adjusted so that the conduction period is approximately half the total period; if the voltage is much higher or lower than this value the conversion ratio will be reduced. For germanium diodes an oscillator voltage between 0·6-0·7V is optimum.

However, he notes that by applying bias to the diodes it is possible to make performance virtually independent of oscillator drive conditions. RA3AAE shows that this can be done, although the resulting circuit configuration departs from the earlier straightforward back-to-back connection of the diodes. His balanced arrangement as used for a direct-conversion receiver is shown in Fig 1(d). This provides good isolation between oscillator and antenna (about −54dB), as well as being able to cope with strong input signals. He claims

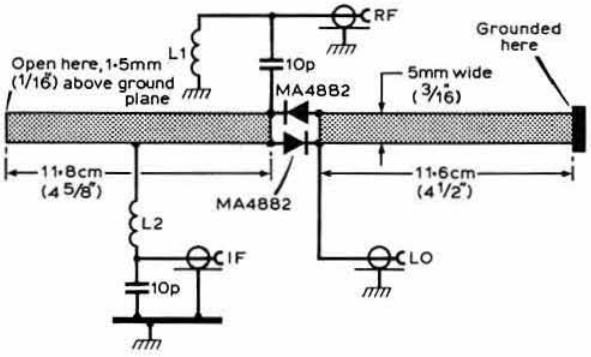


Fig 2. The WA0RDX 1·3GHz twin-diode harmonic mixer as described in the February 1979 *TT*, p131, Fig 5, but redrawn to make clearer the "stripline" nature of the resonators, which consist of brass strip 5mm wide mounted 1·5mm above the ground plane

that the performance remains essentially the same for oscillator injection between 1 and 4·5V.

The circuit as shown is intended to form the front-end of a simple 3·5MHz direct-conversion receiver with the vfo on 1·75MHz, but clearly this basic configuration might be worth investigating for other product detector or mixer applications. Optimum sensitivity is stated to be of the same order as the earlier RA3AAE arrangements.

John Hazell, G8ACE, has pointed out that the drawing of WA0RDX's uhf anti-parallel diode mixer as reproduced in *TT* (February 1979) may have confused some readers, due to differences in the drawing office conventions used for *Radio Communication* and *Ham Radio*. What may have been taken to be two separate parallel "lines" are really single flat strips of brass shim spaced from the 3mm (⅛in) aluminium chassis, forming, in effect, "stripline" resonators. The dimensions and spacing are as given in the caption in the February issue. To set the record straight, Fig 2 shows a revised drawing.

Souping-up 28MHz reception

Because it is now widely accepted that low front-end gain is a "must" for receivers of wide dynamic range, the traditional technique of souping-up the sensitivity of older receivers on 21 and 28MHz has tended to fall into disfavour. There is no doubt that one degrades rather than improves a sensitive receiver by adding a preamp, and the favoured approach today is to put an attenuator rather than an amplifier in front of a receiver.

Yet there are many situations in which a preamp *is* an eminently sensible way of improving weak-signal performance of old or low-cost receivers, as many of those using Oscar could confirm.

In *QST* (March 1979, pp19-20) Doug DeMaw, W1FB, describes a simple add-on preamp using a single jfet device in a common-source circuit that provides an unconditionally stable 15dB or so of gain by using degenerative feedback: Fig 3. Toroidal input and output transformers are used with a decoupling network in the power supply leads to prevent signal energy reaching the amplifier by this path. Construction should not prove unduly critical provided that the usual rf amplifier precautions are taken. W1FB's unit was built on a double-sided pcb (with one side forming a ground plane) mounted in a 1½ by 1¼ by 3⅛in aluminium box.

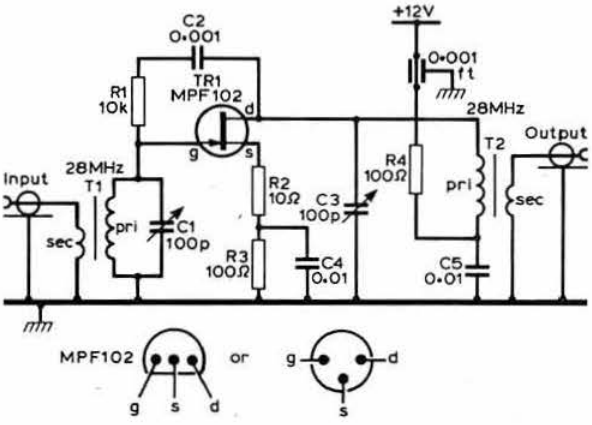


Fig 3. Jfet preamplifier for 28MHz (or 21MHz) using degenerative feedback to improve stability in the high-gain common-source configuration. C1, C3: 100pF mica compression trimmers (nominally set about 45pF). T1, T2: 0·6μH with 1½-turn link windings. Typically 12 turns of No 24 enam on T50-6 powdered-iron toroid cores (for 21MHz add two turns to main windings). MPF102 or HEP F0015/HEP802, 2N4416 jfets can be used (E300, U310 devices would give slightly better performance but are recommended only for the most demanding applications)

Ceramic filter bfo

Jan Martin Noeding, LA8AK, is surprised how few amateurs seem to use a ceramic filter, such as the Murata CFU455B, as the frequency-determining circuit of a 455kHz bfo. While the idea was noted in *TT* back in July 1965, that is a very long time ago. The only journal in which the technique is advocated at all regularly appears to be the magazine *Elektor*, where LA8AK has noticed ceramic resonators being used not only at 455kHz but also at 4·5, 5·5, 6·0 and 10·7MHz. Since filters are also

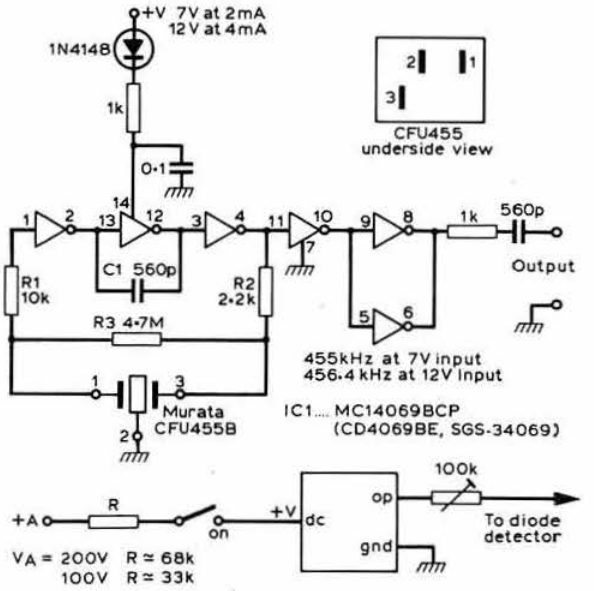


Fig 4. LA8AK's 455kHz bfo using ceramic resonator

available at 10·240MHz, LA8AK points out that they could also be used for the second oscillator in double-conversion 10·7MHz/455kHz nbfm receivers.

The circuit shown in Fig 4 provides a simple add-on bfo for an old receiver, and the cmos ic is used simply on the grounds of availability, since almost any other oscillator circuit or device could be used. Frequency is trimmed by means of C1 (without this capacitor the frequency will be about 468kHz). Capacitors shunting the input and output of the filter have little effect on the frequency tracking/trimming. R1 and R2 need to have a sufficiently high value in order to achieve good stability, and LA8AK suggests they could possibly be of higher value than shown, although he has not tried or needed this.

Quad versus Yagi

Two detailed articles in *Ham Radio* have raised again the long-standing controversy of quad versus Yagi, and have cast considerable doubt on the validity of some of the pro-quad arguments that have held sway during the past decade. In summary they provide convincing support for the view that a two-element quad can be roughly the equivalent of a three-element Yagi (both in practice providing up to about 6dB forward gain), but suggest there is little or no basis for the belief that three- and four-element quads are correspondingly superior to a Yagi array, or that the quad form of structure automatically provides an additional 2dB forward gain. Nor, it would seem, is it true, as so often stated, that quad arrays provide better low-height performance than Yagi arrays.

In *Ham Radio* March 1979 (pp12-24) Les Moxon, G6XN, provides what could be the definitive article on "high performance small beams" bringing together much advice on the question of element loading; correctly phasing element currents and the use of neutralizing wires; a three-element miniature beam design based on the VK2ABQ principle; and the use of linear resonators.

His article includes a realistic discussion of array gain and, for example, he comments: "It is unfortunate that many wild claims have been made for the quad, some of them involving professional journals and computer studies. It needs to be stressed that measurements are very difficult and computers need to be asked the right questions. The habit of accepting figures without checking them against ordinary common sense is not confined to the novice! In fact, as I have found, *better low-angle gain is obtained by omitting the lower halves of quad loops and using the upper halves as inverted V or U elements.* This increases the mean height by 2·4m (8ft) at 14MHz; low-angle gain for a flat unobstructed site being proportional to antenna height; this more than offsets any slight loss of free-space gain for heights up to about 21m (70ft)!

"The real advantage of the quad is the large amount of extra gain (3-4dB) obtainable by using the 14MHz elements at 28MHz with resonators so that they become a bi-square, but this is rarely exploited." (See *TT* April 1979.)

In "Quads versus Yagis revisited", *(Ham Radio* May 1979, pp 12-21) Wayne Overbeck, N6NB, reports on an extensive series of measurements of the gain of large hf beams. While it must be stressed that accurate gain measurements are extremely difficult to make on full-scale beams, it is interesting that N6NB comes to many of the same conclusions as G6XN, as the following extracts indicate:

"Cubical quads do *not* 'come into their own' at low heights. At any given height the vertical angle of radiation of quads and Yagis is virtually identical. The old idea of better low-height performance should be recognized as the myth that it is."

"In the uhf region, the performance of quads and Yagis may not deteriorate at the same rate."

"The data would support the conclusion that a two-element quad is superior to a two-element Yagi, but that larger-size quads are inferior to comparably-sized Yagis."

"If your quad really delivers 2dB more than my Yagi, I'll publicly recant the conclusions presented in this article."

All of this adds up to advice already given in *TT,* but not yet widely followed in practice: height gain is often the critical factor in performance—and this is achieved more easily with a lightweight two-element array, whether Yagi or quad; "nesting" elements affects performance much more than many people believe, and throws away, for example, the extra gain of a bi-square loop; and, finally, forget about that three- or four-element quad that you have always dreamed of putting up one day.

The new Plessey SL6700c

From Peter Chadwick, G3RZP, who is a principal applications engineer at Plessey Semiconductors, come first details of a brand-new member of the well-known SL600/SL6000 family of ic devices specifically developed for radio communication applications. This is the 18-pin SL6700 which contains most of the heart circuitry for a.m. or a.m.-ssb receivers or an ssb generator, including a double-balanced mixer, i.f. amplifiers and a multivibrator developed as a specialized noise blanker. The device features good dynamic range and low power consumption (less than 60mW), and it is possible to visualize this device finding many uses in amateur radio equipment.

In effect the ic incorporates six circuit blocks (Fig 5):

(1) Amplifier 1 (agc controlled) with input on pin 18 and output on pin 3.

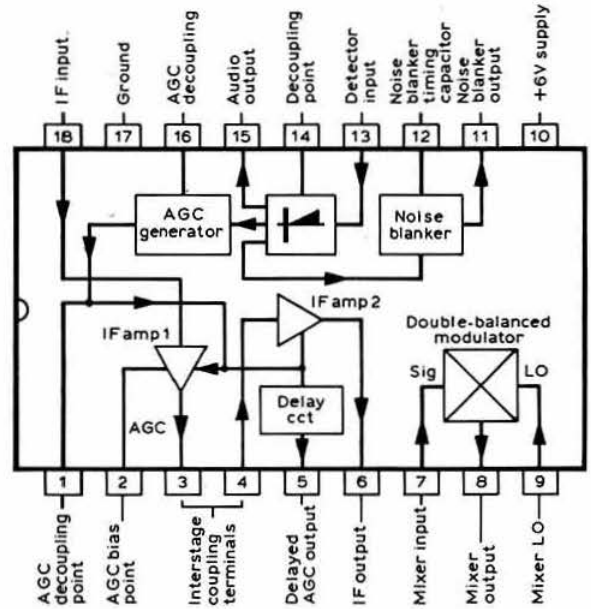


Fig 5. Functional block diagram of the new Plessey SL6700c device

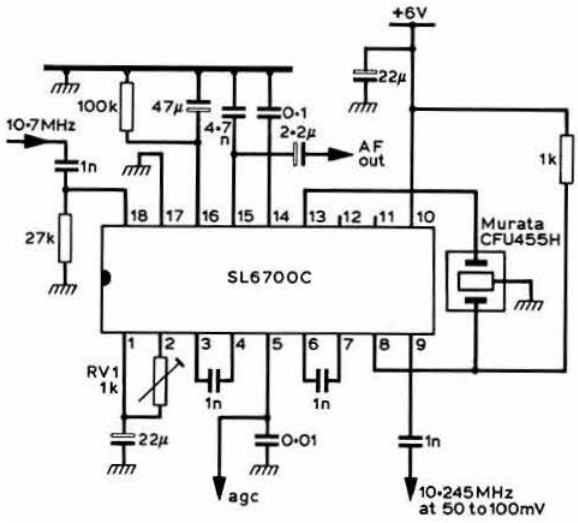


Fig 6. Possible arrangement for 10·7MHz/455kHz double-conversion a.m. i.f. strip. RV1 sets delayed agc threshold with linear full-wave detector

(2) Amplifier 2 (also with agc control but with lower signal handling range than **(1)**) with input on pin 3 and output on pin 5.

(3) Double-balanced mixer with input on pin 7, oscillator input on pin 9, and output on pin 8 (the output is an open collector, and the mixer has a third-order intermodulation intercept point of about −9dBm).

(4) A monostable multivibrator, used in the initial development as a specialized form of noise blanker, connected to pins 11 and 12.

(5) An amplifier and detector, input on pin 13, with af output on pin 15.

(6) An agc amplifier with delayed output (output on pin 5).

Among the applications for which circuits have already been developed are:

(a) Double conversion i.f. strip with 10·7MHz first i.f. and 455kHz second i.f., and using a Murata CFU455H ceramic i.f. filter. Sensitivity is typically 5µV rms for 10dB snr, and it will accept signals up to 100mV. First i.f. can be as high as 25MHz, and the form of detector has the advantage of producing carrier-derived agc, being a full wave detector which is extremely linear (Fig 6).

(b) A.M. broadcast receiver with an external npn transistor used as the local oscillator; for an a.m. receiver covering hf, additional sensitivity can be obtained by using an SL1610c rf amplifier which also improves image rejection.

(c) A.M./ssb/cw i.f. strip, where the SL6700c is used in conjunction with an SL1621 agc generator: Fig 7. The two gain-controlled amplifiers are cascaded; because of the limited frequency response of the arrangement the i.f. should not be greater than 1·6MHz. For cw a sharp filter can be placed between pins 3 and 4. The a.m. and ssb outputs should be kept completely separate with switch selection; the bfo is switched off during a.m. reception. It is claimed that unlike some other ics offering rather similar facilities, the SL6700 has proved remarkably "tame" and, provided sensible layout and good earthing are used, there should be no problem of instability. The total consumption of the SL6700/SL1621 combination is typically 90mW, making this approach a means of providing high performance in a battery receiver.

(d) SSB generator, which is recognized as being an unusual application for a device designed for use in receivers: Fig 8. It is stated that adequate quality ssb can be achieved without time-consuming adjustments. The SL6700c is used in conjunction

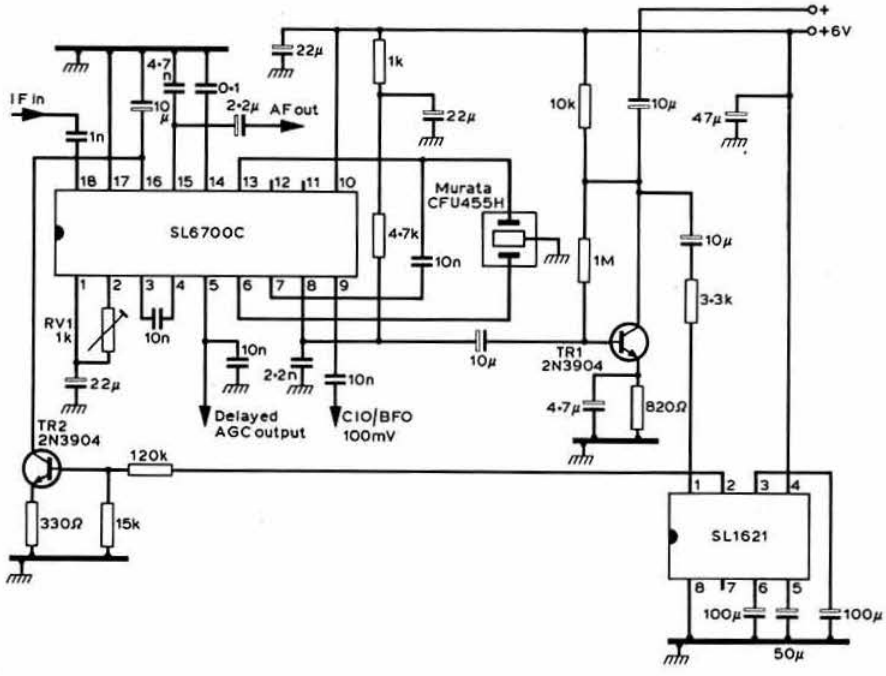


Fig 7. Use of SL6700c for a.m./ssb/cw i.f. strip. A narrowing of the passband for cw reception can be achieved by replacing the capacitor between pins 3 and 6 with a selective filter such as a quartz crystal or single ceramic resonator, with pin 4 decoupled to earth by 2,200pF capacitor (455kHz) or about 470pF (1·4 or 1·6MHz)

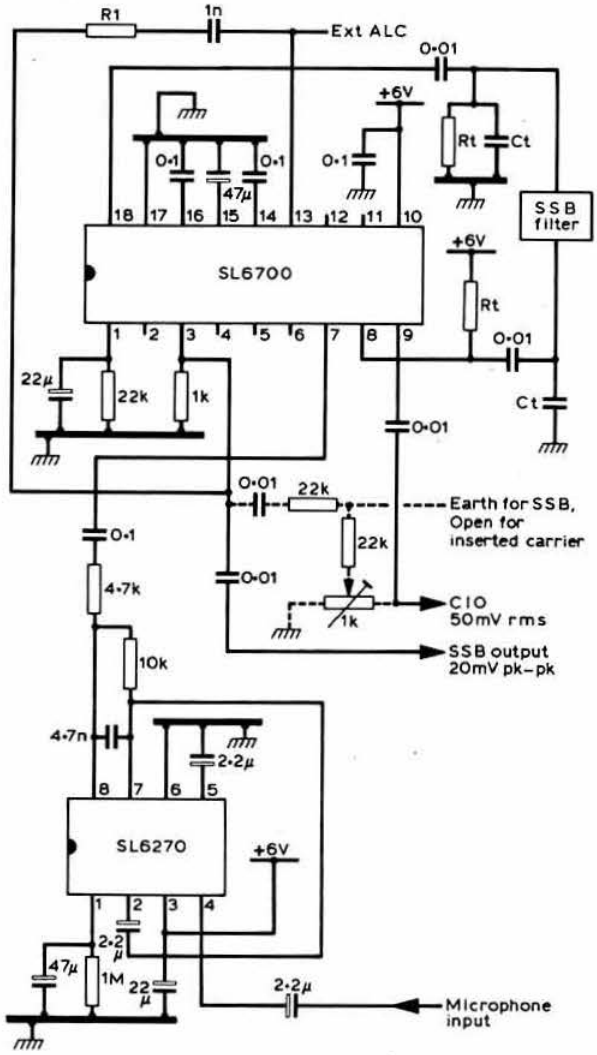


Fig 8. Use of SL6700c in an ssb generator capable of adequate performance without adjustments. Suitable for 455kHz ssb filters (Rf 2·7kΩ, Ct 360pF) or with increased carrier leak at 1·4MHz (Rt 1kΩ, Ct 15pF). R1 sets alc threshold and varies from 47kΩ at 1·4MHz to 120kΩ at 455kHz, depending on the desired output and amount of alc required. The 47μF capacitor for the SL6270 should not be reduced in value, as otherwise distortion occurs

with the SL6270 voice-operated gain-adjusting device to maintain constant output level over a wide range of inputs. The mixer is used as a balanced modulator (20dB carrier suppression which can be increased by another 20-25dB by the ssb filter). Typically a 455kHz ceramic, mechanical or crystal filter can be used. For transceivers it is considered that switching the SL6700 would be too complex to be economical, and the use of two SL6700s with a switched filter is recommended.

(e) Model control 27MHz receiver functioning with supply voltages down to 4·5V.

Altogether this new member of the Plessey family of ic devices looks as though it should prove a most useful addition.

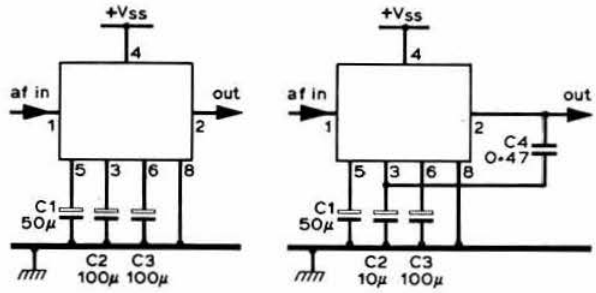


Fig 9. Circuit modification to improve operation of SL621/SL1621 agc generators. By adding 0·47μF capacitor the rise time on C3 is decreased, but the noise rejection continues to work since the bootstrapping is effective only at high frequencies

G3RZP also provides details of a very simple method of improving the SL621c/SL1621c agc generator systems where it is found that the fast agc is applied at a rate fast enough to prevent initial overload, but the response of the slow agc has proved to be too slow. This consists of adding an 0·47μF capacitor (C4) between pins 3 and 2; it bootstraps the output amplifier to hold C3, thus decreasing the rise time on C3 but still enabling the noise rejection to work, since the bootstrapping is effective only at high frequencies: Fig 9.

More on zip-cord antennas

Since preparing the item about the use of zip-cord electric cable (*TT* May 1979) some further information has appeared. Jerry Hall, K1TD, *QST*'s technical editor, asks in his March issue: "Zip-cord antennas—do they work?" The main attraction of this approach is the low-cost (about 6c/ft for twin-cable in the USA). In view of the opposing views on the use of such cable as a replacement for coaxial cable, K1TD bought a 100ft roll and tested it in the ARRL laboratories. Characteristic impedance of his sample proved quite close to the 100Ω suggested by ex-G3VBZ although differing slightly with frequency: 107Ω at 10MHz; 105Ω at 15MHz; and slightly less at 29MHz. Velocity factor proved to be 69·5 per cent.

The "bad news" proved to be appreciable attenuation when checked under correctly matched conditions: an estimated under 1dB at 3·5MHz; about 1·7dB at 7MHz; measured 4dB at 15MHz; and measured 7·5dB at 28MHz. Based on additional attenuation due to the mismatch (and consequent increase in swr) when used to power a dipole whose feedpoint impedance at low heights may be under the nominal 73Ω, K1TD feels that up to 100ft of zip cord could prove acceptable on 3·5MHz; up to about 50ft acceptable on 7MHz; but for longer lengths of feeder and/or higher frequencies his verdict is "look out".

However, K1TD sees no objection to using zip cord for the radiating element, and draws attention to the "electrician's knot" that prevents a zip-cord antenna from further unzipping itself under the tension of suspension: Fig 10. To tie the knot, first use the right-hand conductor to form a loop, passing the wire behind the unseparated zip cord and off to the left. Then, adds K1TD, pass the left-hand wire of the pair behind the wire extending off to the left, in front of the unseparated pair, and thread it through the loop already formed. Adjust the knot for symmetry while pulling on the two dipole wires. Incidentally,

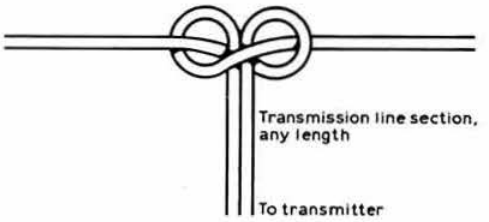


Fig 10. Electrician's knot prevents a zip-cord antenna from unzipping under tension

antennas of this type, with a dipole length of 5ft, are quite often used for Band 2 vhf/fm broadcast reception.

G3DMC reports that the transparent zip-cord available from Currys and Woolworth stores is effective when used as a four-wire feeder to a low-slung 3·5MHz vee antenna. He writes:

"Opposites are commoned at either end, the two lengths being taped in a neat square with plumbers' thin ptfe tape that clings without adhesive. The vee from eaves to fence has a very low impedance, which I would put at about 20Ω. Coupling to the transmitter coaxial cable output is via a ferrite ring balun in the shack (an old RSGB *Handbook* design modified by peeling back turns to achieve a correct match). The result is virtually unity swr when driven with a low-power (7W) transmitter, and brings in contacts with Sweden and Finland since erected three years ago."

Incidentally it should be remembered that with a high-loss feeder the swr at the transmitter end may appear deceptively low.

FT101 and strong signals

The world-wide popularity of the FT101 series of hf transceivers has been achieved in spite of the recognized tendency of the receiver section to suffer from overloading and cross-modulation in the presence of strong signals. Richard Thurlow, G3WW, recently drew my attention to the work of C. J. Donoghue, ZL2BAF, who has analysed the problem, pinpointed its prime source, and devised what appears to be a very effective modification which costs only pennies to those prepared to delve inside the black box. And even if you do not own an FT101 there is food for thought in this illustration of how a simple design "fault" can affect the performance of equipment. The article "Modifications to the FT101 to cure strong signal overload" appeared first in *Break-in* March 1978, then *Amateur Radio* November 1978, and most recently in a supplement to the March 1979 issue of the *International Fox-Tango Club Newsletter*. It applies to a high percentage of FT101 Mk2, FT101B and FT101E models, and the following notes use the maker's component designations.

ZL2BAF located the main source of the non-linearity problem as arising from the operation of transistor Q2 (2SC784R) on circuit board PE1183B i.f. unit. A study of the agc biasing arrangements for this stage showed the reason: since Q2 is a bipolar transistor it needs to be forward biased, and in normal operating conditions forward bias is obtained from the agc rail by means of a potential divider: 27kΩ (101E 22kΩ) and 3·9kΩ resistors. As the agc voltage drops with increasing signal, so the forward bias applied to the transistor decreases, reducing its gain. However, as Q2 is a silicon device it requires at least 0·65V on its base (with reference to the emitter) and this implies that the minimum voltage at the top of the potential divider must be greater than about 5V. When the agc is forced below this value, the transistor cuts off and introduces severe non-linearity in the signal path.

ZL2BAF found that the trouble could be minimized very simply by providing a small fixed bias current to the base of Q2. However, further work resulted in a rather more elegant and effective modification of the agc arrangements, after which the receiver "refused to show any signs of overload right up to full output of his signal generator, about 50mV".

ZL2BAF continues: "The most brutal test was devised. This was to modify another FT101 in the same way, with both equipments then installed in their vehicles (both were normally operated mobile). With the cars parked alongside each other contact was made at full power. Although the antennas were only about 8ft apart and the overload protection lamps on the rear of the transceivers were flashing brightly with rf, the audio was clean and easy to resolve even with rf gain full on and the S-meter reading about 40dB over S9. Cross-modulation has disappeared and the FT101 works happily with other local amateurs on the same band, unless they are very close together."

Step-by-step details of this modification are set out by ZL2BAF as follows:

Remove af unit PB1189 (2nd board from left when viewed from front of set) by undoing two screws and carefully rocking the board endwise while lifting it up. This board is removed to gain access to i.f. board PB1183B on the extreme left of the set.

Remove two screws holding vertical metal shield supporting this board, and ease it up and out complete with shield. Remove shield. Locate Q2, on top edge of board, and its associated base bias resistors (R10/R11 in FT101B and 101E; R16/R17 in 101 Mk2). Remove these resistors *carefully*. The board is double-sided printed circuit with plated-through holes, so use solder-sucker or solder-wick and not too much heat. R10, 11 are 22kΩ and 3·9kΩ in 101E; 27kΩ and 3·9kΩ in 101B, while R16, 17 are 27kΩ and 3·9kΩ in 101 Mk2.

Replace R10(R16) with 1·8MΩ resistor; do not replace R11(R17). Make sure no specks of solder remain on the board. Re-assemble i.f. board to shield and re-fit, then re-fit af unit.

Remove screw securing noise-blanker board PB1182 (PB1292 in FT101E and 101B). For 101 Mk2 locate Q2 and bias resistors (R5 4·7kΩ and R2 22kΩ). Remove these resistors with similar care to above. Replace either R6 or R2 with 1·2MΩ, leaving no resistor in one position. Connect base-end only at this stage. For 101B and 101E locate pin 3 on edge connector and isolate it from pin 2 by cutting copper connection between them. Solder the free end of the 1·2MΩ resistor to pin 3 and re-fit board. On the 101 Mk2 the noise-blanker board is mounted on top of the vfo unit with wires connecting it to the main equipment. Find a suitable anchor point (fit a solder lug) and connect agc end of the 1·2MΩ resistor to it, with a wire to the agc rail under the chassis. Re-fit board.

Remove bottom cover and internal speaker panel. Locate pin 13 on i.f. unit edge connector socket (this is agc rail). Solder a wire to pin 13 and route this to noise-blanker board edge connector socket. Isolate pin 3 from earth, and connect agc wire to pin 3. Then re-assemble.

Switch on. Tune to 14,200kHz. Turn on calibrator and peak preselector for maximum S-meter reading. Locate S-meter adjust control on i.f. board and set to S9. It should then be possible to check agc voltage, which should be 4±0·25V.

That completes the modification which should result in a receiver of respectable dynamic range. □

4-2-70

Graham Knight, GM8FFX*

Oil field operation on 144MHz

Two separate oil fields were activated during June. LA1EKO is the callsign assigned to a club station manned by 15 Norwegian operators who work on the Eko Fisk platform, which is located in QTH square BQ37f. Operation during June was on fm with a 6-el quad antenna 100m asl, and many simplex and repeater contacts were made from this exotic locator square. By the time this appears in print LA1EKO will be equipped for cw and ssb operation on 144MHz, and the group hopes to be able to participate in tropospheric and auroral openings. They should certainly do well from their location in the middle of the North Sea.

GB2NCP was the callsign assigned by the Home Office to Les Anderson, GM3ZXH, for operation from the Ninian Central Field, which is approximately 150 miles east of the Shetland Islands. GM3ZXH and fellow radio operator Tony Rigby, G8MPT, used cw, ssb and fm on 144MHz from the platform, and worked over 40 stations—including many G, GM and LA. Most of the contacts were made on fm, and they frequently took advantage of the sea path to work through the GB3GN and GB3PI repeaters. Several G, GM and LA stations were worked direct, but unfortunately there were no auroral openings during the period of the special GB2NCP licence. GM3ZXH was interested to read in the June *4-2-70* of Gordon Mitchell, G4AIQ, who is a radio technician on the Conoco gas platform, which is located well to the south of Ninian in the BN QTH locator. GM3ZXH is also arranging to take a 144MHz receive converter with him during his next spell of duty offshore and, like G4AIQ, he hopes to report the various stations he hears from this unique location to *4-2-70*.

Oxford University expedition

The annual Oxford University Radio Society expedition will take place this year between 24 August and 10 September. The group will be using the call GM3OUR/P, and operation will be from the Mull of Galloway for the first seven days, and then from a site near Peebles for the 144MHz Open Contest on the weekend of 1–2 September. Operation will continue from the Peebles site until 10 September. G3YGF, G4GFX, G8LYB, G8RHI and G8RPV are going on the expedition, and doubtless all hands will be needed in view of the fact that full power will be used on 144 and 432MHz, and that the antenna system will consist of four 16-el Tonnas for 144MHz and four loop Yagis for 432MHz.

The Oxford University group has built a reputation for reliability during previous years' expeditions, and this year's improved system seems destined to be an outstanding success. Schedules can be arranged by contacting G8LYB, QTHR, or by writing to the Oxford University Radio Society at their new premises at 62 Banbury Road, Oxford OX2 6PN.

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432MHz openings

There were several tropospheric openings to the Continent during June. Dave Jarrell, GM5CSY, who recently arrived from the Azores where he was licensed as CT2BS, has been enjoying operating during the lifts with his Microwave Modules transverter running 10W output. GM5CSY remarks on the strength of the signals from the Continent, and reports working 30 overseas stations in three hours on 3 June. He uses a KLM 16-el longhorn antenna, which has a gain exceeding 15dB and is unusual in that it has three driven elements. It certainly works well, as the list of DL, ON and PA0 stations contacted prove. GM5CSY finds it interesting to compare operating from Scotland with operating from Pensacola in Florida—his home base. There, a contact over 800km means working out of state, whereas QSOs over the same distance from Scotland enable an operator to work half-a-dozen different countries. GM5CSY has been very busy since his arrival in Scotland, digging the foundations for a tower, mixing concrete, and making the phasing lines for a big antenna system. He should soon have four of the KLM 16-el antennas at the top of the tower, where he intends fitting two heavy-duty motors, one to rotate the array and one for vertical elevation. Once this system has been installed GM5CSY intends to make a special effort at 432MHz auroral contacts, which will no doubt please the Chalmers University group at SK6AB.

Icelandic operation on 144MHz

At the time of writing this report, well-known Norwegian vhf operator LA6HL is just completing a holiday, in Iceland, which included operation on 144MHz with 150W of power to a 14-el Yagi antenna. Unfortunately news of this expedition did not reach *4-2-70* in time for inclusion in last month's *Radio Communication*, but those operators who check the GB2RS news bulletin transmissions will have had a timely warning of this interesting TF expedition. The expedition in 1978 by the Glenrothes & D ARC group proved that it was possible to have ms and auroral contacts from Iceland with stations as far away as Germany.

GM8GQP recently spent a holiday near Banff, and noted that the OY6VHF beacon on 144·885MHz from square WW76d was very strong during the first week of June. GM8GQP, who was using a Parabeam from a 500ft asl site, bemoans the fact that although he was running 300W of ssb, and the OY beacon was S8, no stations could be worked to the north. Knowing there was no beacon on 144MHz from Iceland, GM8GQP also turned the Parabeam vertical, looking for signals from the TF repeater. Despite the obvious excellent conditions in that direction no signals from TF could be heard—GM8GQP wonders whether any readers of *4-2-70* in Iceland would be interested in putting a beacon on the air. GM8GQP kindly offers to assist by providing a solid-state amplifier for such a beacon. The OY6VHF beacon is already proving to be most useful for ms, aurora and tropospheric openings—a beacon from TF would certainly be a useful indicator and might reveal some auroral openings we miss altogether at present.

RTTY schedules with LA

LA3EQ has just returned to civilian life after a two-year period in military service. Jan is now running a 4CX250B amplifier on 144MHz, and has recently been a very good signal on ssb during an expedition to the rare square DU23f. LA3EQ is now

home again and has set up a comprehensive rtty system with which he is very keen to run schedules with British rtty stations. Operators seeking schedules can write to Jan c/o GM8FFX. LA3EQ has also recently purchased a VHF Engineering solid-state amplifier, and he intends to run the rtty system from some high sites on the Norwegian coast near Stavanger.

Repeater channels

Some operators who have received their copies of the 1979 *International VHF-FM Guide* (see details last month) have written to express their concern at the choice of new repeater channels in France. The guide mentions that a proposal had been made to have repeater inputs in the region 144·725MHz to 144·875MHz with outputs 600kHz higher. Roy Stevens, G2BVN, the secretary of IARU Region 1, has informed *4-2-70* that this proposal has been deferred by the French national society, REF, pending a meeting between West European vhf managers.

Other keen-eyed readers have noticed a repeater designated R-2 with the callsign OE5XKL, 2,100m asl in GH square, which is listed as having an input on 144·850MHz, and another repeater, OE9XVH, 2,817m asl, is quoted as having an input on 144·875MHz. Readers point out that repeaters on these lower frequencies are well outside the IARU band plan and encroach on the all-mode section and on the frequencies allocated in this country to Raynet. Gordon Adams, G3LEQ, has also been looking at the new guide with interest, and wonders whether readers have further information on OE7XZI, a linear repeater located at Zugspitze in square FH45c at 2,980m asl; the guide lists it as having an input on 144·375MHz and an output 1·200MHz higher at 145·575MHz. Can any reader give further information on these three intriguing Austrian repeaters.

Greece worked on 144MHz from Scotland

Late news last month reported briefly on GM8BVD working SV1DH on 144MHz ssb during the spectacular Es opening on 2 June. GM8BVD was running 10W output from a Trio TS700 feeding a Tonna 16-el, and he reports that SV1DH came back to a CQ call. GM8BVD had noticed some Edinburgh stations calling CQ on the calling frequency, and he decided to move down to 144·290MHz and put out a call there. SV1DH in Greece replied and 5/9 reports were exchanged over a distance calculated to be 2,836km—probably a new Es record on the 144MHz band. The contact took place at 1610gmt, and SV1DH was also heard but not contacted by GM4COK in Edinburgh, and by GM5CSY in Inverbervie, which is 90km further north. GM8BVD was particularly pleased to be called by SV1DH as he had not previously contacted any stations outside the British Isles. However, during the subsequent tropospheric opening, GM8BVD went on to work 63 Continental stations, but none even half the distance of the contact with Greece.

Return of G8CIW

Back in the early 'seventies, Derek Hilleard, G8CIW, ran high power on 144MHz ssb from an elevated site in London. He was very active and a very consistent strong signal on the band. After a long absence Derek is back on 144MHz with a new callsign, G4CQM, and a new QTH at Beacon Hill in Surrey. As the name suggests this is another high location, this time 220m asl with an excellent take off in all directions. G4CQM has decided to run QRP this time, and with just 8W to a 16-el he has already worked GM, GW, GJ, GU, EI, F, PA0, DL, ON, YU and IT9. Derek feels that running low power will be something of a challenge, and he is looking forward to working all his old friends from the G8CIW days. Over the last few days G4CQM's signals have certainly been strong in Aberdeen, usually about four S-points better than the GB3VHF beacon on 144·925MHz.

70MHz schedules wanted

Roger Thomas, GW4BCD, located at Porthcawl in Mid Glamorgan, has written to *4-2-70* to say he is again active on 70MHz and is willing to keep cw or ssb schedules with any operator—anywhere. GW4BCD believes he is the only station active on cw and ssb in South Wales, although he does mention a regular fm net of stations in the Port Talbot area who operate around 70·26MHz. GW4BCD can always hear the GB3SU beacon from Buxton on 70·695MHz but hears very few amateur signals. GW4BCD's station is all home built, with a QVO6-40A in the final, feeding a 4-el beam at 30ft. Operators wishing to make schedules can write to Roger Thomas, GW4BCD, 13 Northways, Porthcawl, Mid Glamorgan, South Wales.

Expedition to 4U1ITU

Richard Staples, G4HGI, joined PE1CJN and PA3AHD for the June 144MHz expedition to 4U1ITU—the station at ITU headquarters in Geneva. Unfortunately there was almost a 100m run of UR67 coaxial cable feeding the 9-el·Tonna antenna, and inevitably this meant higher-than-expected losses on both transmission and reception. Despite this setback many contacts were completed on meteor scatter, and a contact with G4CBW in Manchester is believed to have established a new first on 144MHz. G4DSC, G4FUF, G4CMV, GW4CQT and GW4HDF were subsequently worked on ms, and several contacts were completed with stations in Norway, Sweden and Finland. The best dx contacts of the expedition were with CT1WW in Portugal and with UR2RQT in Estonia. After several days of successful operation the expedition's activities were curtailed due to audio breakthrough on the audio system providing translation facilities to an ITU meeting. Nevertheless the expedition gave many operators their first contact with 4U1, and follows on well from last year's expedition by the same group to the Shetland Islands.

144MHz tropospheric openings

There were many lifts on 144MHz during June mainly associated with high pressure areas and coastal ducting. Many stations on the east coast enjoyed several different openings to the Continent, and some fm operators have written to *4-2-70* about Continental repeaters appearing on normally quiet channels. There seems to have been a large increase in the number of operators on 144MHz cw, and some very-long-distance dx has been worked on this mode. G3UNU, at the University of Nottingham, has been working many stations well into France on this mode, and cw signals from G3SPJ and G3FPK have been strongly received at Aberdeen. GM3UU reports calling CQ once on cw and being answered by a huge pile-up of stations, who behaved in a very orderly manner and waited patiently for GM3UU to work his way through 43 contacts from just a single CQ call. On ssb G4DDN, at Weston-super-Mare, took advantage of the June lifts to work six Scottish stations, and GU8FBO, GJ3YHU and GJ8KNV were other outstanding signals in Scotland. Conditions on 17 June were so

good that GM8PUM worked six countries with just 1W of ssb, and he reports S5 signals from the Cornish beacon GB3CTC on 144·915MHz. On 18 June GM8FFX worked F1BYM (ZE52f) near Bordeaux—a distance of 1,423km.

Sporadic-E reports

Many reports have been received about the *Es* openings at the end of May and at the beginning of June. It is interesting to compare the stations worked by operators in different parts of the country, and a study of the dx worked reveals that while GM8BVD was making a record-breaking contact with SV1DH other operators were also working each other by sporadic-E. Sheila Williams, G8KPL, of Dalton-in-Furness, Cumbria, fired up a new TS820 exciter, transverter and 4CX250B amplifier to work 9H1BT in Malta. Sheila's contact took place on ssb, and reports of 5/4 were exchanged from locator square YO65f to HV03f; the contact took place at 1553gmt on 29 May. Three days later, on 1 June, GW4CQT worked a string of IC, I0 and IW stations, and, much farther north at Middlesbrough, G8LIC used ssb to contact I0EIO (GB14c), I0FHZ (GC21f), and IW0AKA in GB13b.

On 2 June the *Es* opening occurred at 1610gmt, which enabled the GM to SV contact and GM3UU was able to work YU1OIA at the same time. G8LHT, in Doncaster, is another who was active at this exact time, and he worked F1JG in locator CD24g with 5/6 reports being exchanged both ways. G8LHT had earlier worked YU2CUT in KF66e at 1050gmt on the same day. A little later, around 1650gmt, G4FUT used cw for *Es* contacts with YO3IS (KF18e) HG5KKG and YU1NWN KE36e. Between 1700 and 1709gmt GM4COK had cw QSOs with YU1NWN and YU1NAJ in KE13c, but these distances did not equal the QRB to SV1DH, who GM4COK heard working GM8BVD, but the Greek station faded out before a QSO could be attempted. It would greatly assist the Propagation Studies Committee if operators who were fortunate enough to participate in this *Es* opening could forward copies of the QSOs in their log so that these exceptional contacts can be evaluated.

Jon Dougherty, G4FUT, in Sunderland, has been very active on the 14·340MHz vhf net and has kindly sent in these details of further sporadic-E openings in June. At 1440gmt on 4 June YU1NWN worked many LA, SM and EA stations, while a little later, at 1534gmt, SP1JX had a contact with EA3XS. Perhaps the most unusual report came from Barry Titmarsh, GM8SAU, who is located in square WR44b in far away Benbecula. GM8SAU had a contact on ssb with SM0IOT on 3 June between 1434 and 1440gmt, and shortly after this a station signing OH2BRU was fleetingly contacted. GM4DSZ in Aberdeen was checking for *Es* television signals at the same time and he reports a very short opening on 50MHz to SM at the same time. The opening was so brief that GM4DSZ is certain it was not a normal tropospheric opening.

Fast- and slow-scan television

The latest edition of *CQ-TV*, the journal of the British Amateur Television Club, is a 30-page booklet full of information for both the slow- and fast-scan television enthusiasts. The "Television on the air" column gives details of a number of club members who are active on 432MHz, and mentions Arthur Bevington, G5KS, at Oldbury, near Birmingham, who transmits colour television and is often received by operators in the Cannock and Stafford areas. G5KS has an all-home-made station which includes a remotely-controlled camera which can be operated from the usual operating position. Another operator mentioned is Trevor Brown, G8CJS, in Leeds, who uses a Microwave Modules transverter and a 150W amplifier. Andrew Emmerson, G8PTH, in Canterbury, reviews an American-made kit by PC Electronics for a 10W solid-state television transmitter. G8PTH has been using this transmitter to work G8BRD and G8EQZ at Rainham, 25 miles away. The journal also covers many of the technical aspects of atv work, including articles on video pulse generators, video and sync combiners, and an excellent page detailing the equipment needed to start a simple amateur television station. Enquiries about membership of the British Amateur Television Club should be sent to Brian Summers, G8GQS, 13 Church Street, Gainsborough, Lincolnshire.

Meteor scatter

Many contacts were made by 144MHz operators with the assistance of the June Lyrids meteor shower. LA6HL reports a completed contact with OE5KE which took just 9min, and another successfully-completed contact with the dxpedition to 4U1ITU. LA6HL reports that the longest burst of the June Lyrids lasted 65s and coincided with his contact with Geneva. GM4COK in Edinburgh had less luck with incomplete contacts with several stations, including one in Portugal. G3IMV, at Milton Keynes, almost managed a complete cw contact with RA3YCR in locator square RN52F, but unfortunately "rogers" were not exchanged. Outstanding signals were heard during the shower from SM3BIU on cw and F1JG on ssb. Dave Price, GW4CQT, in South Wales, was another operator to get a 100 per cent QSO with 4U1ITU on 7 June, and earlier in the week, on 2 June, GW4CQT worked OH0JM on cw.

Parachute portable

Is well-known vhf operator, Roy Andreang, G4CMT, the first person to enjoy contacts on the 144MHz band while dangling on the end of a parachute? G4CMT has operated from some unusual places before—like the top of the bridge over the Humber at Hull—but this time he worked stations on 144MHz while making a parachute jump on 14 April. Despite it being G4CMT's first jump he managed to work several stations on S22 fm using a Yaesu FT202R and a helical antenna. Between

G4CMT (l) being presented with his Scout wings for five parachute jumps by Lt Col J. Brewster, Scout county commissioner for Humberside. G4CMT has raised nearly £600 for charity by making sponsored jumps

G4CMT's portable rig set up at the Scout camp at which he received his "wings"

14 April and 15 May he made more jumps and worked 55 stations while descending to ground level. G4CMT is a Scout leader and was recently awarded his Scout "wings". His jumps have resulted in considerable press and radio coverage; one descent was also broadcast live on another vhf station, but on a lower frequency—that of "Radio Humberside".

New *Guide to Repeater Licensing*

The RSGB has produced a new *Guide to Repeater Licensing* which is available from headquarters and has been drawn up to assist groups contemplating making an application for a repeater licence. The guide gives comprehensive notes on preparing a repeater proposal, advises on the details required regarding site clearance, and the essential emergency closedown procedure. Eleven of the pages are devoted to a repeater questionnaire which details the various technical parameters required for British repeaters.

New repeaters

Two new repeaters have commenced operation on Channel RB0 (input 434·600MHz, output 433·0MHz) one, GB3NY, is located in North Yorkshire and came on the air on 17 June, and the other is GB3SO which went into service at 1945gmt on 1 June. GB3SO is located at Boston in Lincolnshire, in QTH square AM09b, and runs 6W from a site 27m agl.

Interest has been expressed in a vhf repeater to be located in the Hawick area. This part of the border region of Scotland has no repeater coverage at present, and GM4EZJ has recently received the Society's new *Guide to Repeater Licensing* and is at present investigating the possibility of making an application for another vhf repeater.

Repeater of the month—GB3MN

The latest vhf repeater to come into service is GB3MN on Channel R2 (input 145·050MHz, output 145·650MHz), it uses a 2-el vertical-beam antenna and is sited near Stockport. The transmitter is a modified Inoue IC240, and the repeater system makes extensive use of the latest microprocessor techniques and is fully solid-state with no relays. The repeater can be accessed by a standard 1,750Hz toneburst of 250ms duration, a high and low indicator is incorporated, and over-deviation results in a pulsed tone being transmitted over the repeated signal. The UK FM Group (Western) already look after eight other repeaters, and in the light of their experience with the other units they have designed a special logic system for GB3MN. Following initial tone access, speech of less than 5s will cause the repeater to have a 1s hang time; speech of more than 6s will cause the repeater to send a K, and it will then have a hang time of 5s. The logic has also been designed to send less callsigns than many other repeaters, GB3MN will identify at least every 10min, but the logic has been programmed so that there will be at least 3min between each identifying sequence.

This interesting logic system has been evolved around a Texas TMS9980 mpu, and the program is stored in 1k byte of an erasable programmable read-only memory, a TMS2708. Gordon Adams, G3LEQ, admits to being mystified and fascinated at the same time while watching several pages of program being "written" into the eprom, which has several advantages over using a standard ram. An eprom-based memory can be erased using an ultra-violet light, and alterations to GB3MN's logic could be made in the future with a "prom burner" which enables a program to be changed without resorting to using a soldering iron or changing dozens of diodes. The UK FM Group (Western) is fortunate in having members capable of writing the necessary program and with the equipment for "burning in" these up-to-the-minute devices.

The GB3MN repeater also features audio-derived agc, and this has been used in an attempt to solve some of the problems associated with different deviation levels. After the first four weeks of operation an over-deviation indicator will be switched on which will superimpose a pulsed tone on signals, and operators will then know they have to adjust their deviation settings. A tone-notch filter will ensure a minimum of blips and bleeps, and the time-out is 90s. Further details on all the UK FM Group (Western)'s repeaters can be obtained from the secretary, Gordon Adams, G3LEQ, who rightly praises the work of John Clifford, G4BVE, Ron Harrison, G8DVR, Peter Torry, G3SMT, and Keith Hampson, G3WFW, in designing and constructing such a state-of-the-art repeater as GB3MN.

Grapevine

Alex Dunn, GM8DMZ, now has four 8-over-8 slot-fed Yagis for 144MHz—64 elements at 70ft . . . G5CSZ in Harrogate is in the process of expanding his antenna system to eight 16-el Tonna antennas, making a total of 128 elements on 144MHz . . . G4FXW using a dish antenna on 432MHz . . . Interesting to see the repeater status report which appeared in February's *4-2-70* being reprinted in the GB3SN Newsletter even with the GM8FFX typing errors still included . . . Long-distance lorry driver G8EOP has a large fm/ssb 144MHz station on his 32-tonner and probably the highest mobile antennas in the UK . . . Discussion at recent Zone G meeting about remote base operation . . . G3LEQ interested in a 432 to 28MHz repeater . . . GB3MN must be the highest technology repeater on the air at the moment . . . G3WDG travelled 500 miles to pick up a length of very-high-grade coaxial cable to give him just 1dB more system gain. But as Charlie rightly points out, that is 2dB on echoes from the moon . . . Richard Staples, G8MME, is part of the expedition team at 4U1ITU . . . Aberdeen Club put on GB3TFY from near Teacher's Whisky distillery and gave away miniatures of the 12-year-old malt as QSL cards—GM3VEY still recovering from his job as QSL manager.

(Continued on page 745)

microwaves

Charles Suckling, G3WDG *

Microwave listener reports

It is perhaps no surprise that there are few swls who spend their time listening on the microwave bands, due to the relative difficulty of chance reception on these frequencies where antenna beamwidths tend to be quite small. However, with increasing activity, regular listening on 1·3GHz can bring rewarding results, as demonstrated by Harold Meerza, BRS34348, of Chatham. He found few dx stations during the April contest, except for good signals from G8HVY (Dorset) at 235km. May proved better, with several PA stations heard on the 8th, including PA0QHN at S9 who was requesting reception reports of his beacon. On 12 May, good conditions to the west produced S6 signals from G3FYX (Bristol) on cw and ssb, and on 16 May G8ART (Northants) was heard at S6 on a.m. and S9+ on ssb.

Harold has been experimenting with a multiple-rod dish to a design by WA9HUV, but results have so far been rather disappointing, although more work remains to be done.

RS41733 (Chiswick) has also written in with his plans for 1·3GHz reception, and is currently building a G3JVL antenna. Another listener getting ready for 1·3GHz is RS40625 (Warks), who hopes to use an array of four G3JVL loop-Yagi antennas.

The writer would be pleased to hear from any other swls active or contemplating activity on the microwave bands.

10GHz Cumulative Contest

Good conditions and excellent weather made the second 10GHz Cumulative Contest activity period a big success. At least one "first" was achieved, between GJ8KNV/P and F6DLA/P. A number of attempts were made to cover the G – GJ path, but were not successful on this occasion. A number of other cross-channel contacts were made, including contacts between F6DLA/P and G3JHM/P, G3RZD/P (ex-G8BDJ), G8GKV/P and G3IW/P. F3LP/P also had contacts with these stations. G3IW/P also received F8WN/P, and G3JVL was copied by F6DLA/P. Conditions were also very good on 144MHz, with a lot of participants working dx on 144MHz in parallel with 10GHz!

More activity on 10GHz ssb

G3JHM has supplied details of some recent tests he has made on 10GHz ssb. On 10 June good signals were received from G3BNL/P over the non-optical path from Farringdon to Old Reading Hill. Signals on cw were 20dB above noise, and 10dB on ssb. G3BNL is using a different system to the G3JVL mixer. In his equipment 100mW of 10,224MHz is fed to a throughline mixer using a BXY41E diode in reduced height guide; 20mW of 144MHz ssb is also applied to the diode, resulting in 65mW p.e.p. output on 10,368MHz. G3JHM notes that the stability of his own equipment is excellent—frequency calibration is always within 10kHz from day to day.

G3JHM has also heard G8ADC/P on ssb over a line-of-sight path. He also made his first two-way ssb QSO recently, with G3JVL.

The Oxford University group has also been busy, and a second IC202/G3JVL mixer system has been put together by G3YGF and G8RHI. The availability of a second system has enabled some interesting tests to be carried out, including some mobile work. G8RHI operated the 6W output G3YGF equipment at the 100ft agl Engineering Science Building site, while G3YGF used the other mixer with a ground-plane antenna mounted on his Land-Rover. Good signals were obtained all round Oxford while mobile, even off the back of the 20dB horn antenna in use at G8RHI/A. G3YGF/M noticed an effect similar to that observed by G3WDG during mobile reception of the GB3IOW 1·3GHz beacon: this was the presence of extra signals on each side of the carrier, attributed to the different Doppler shift obtained from reflections off objects behind and in front of the vehicle.

G3YGF remarked that the most satisfying result was obtained while driving round a roundabout, the signal rising and falling in frequency corresponding with the vehicle moving towards and away from the transmitter. The shift in frequency was about ±1kHz, and he was so fascinated by this that several circuits of the roundabout were made!

On a rather less happy note, the daily G3YGF – G3JVL 10GHz troposcatter tests have had to be temporarily suspended due to the withdrawal of site facilities to G3YGF. However, it is hoped to find a new home for the equipment in a different part of the building, and to restart the tests as soon as possible.

1·3GHz repeaters

A number of proposals have been received by the Microwave Committee for fm repeaters on the 1·3GHz band. As these all envisage the use of different systems there has been much discussion recently to formulate a common approach. To this end a provisional plan has been produced by the committee, and summarized in a committee paper by G3WDG.

The basic proposals are that the 1·3GHz repeater scheme would allow, as far as possible, the use of existing 432MHz repeater equipment, requiring only new crystals on transmit, and a tripler and receive converter to be added to the mobile for 1·3GHz repeater operation. Repeater output frequencies would be just above 1,297MHz, with inputs around 1,290MHz. It is stressed that this is only at the discussion stage, and anyone interested in the subject is invited to obtain a copy of the paper from the RSGB general manager, and then send their comments to the writer for consideration by the committee.

New round table meeting place

For some time the regular venues for microwave round table meetings have been Winchester and Sheffield. A new location has been offered by the Martlesham group, at Martlesham Heath, and the date of the first meeting is 30 September. One important difference between this meeting and the others is that it will be a ticket-only affair. The reason for this is that it is necessary to satisfy the establishment's security requirements that guests are known in advance, so that they can be checked off on arrival. If you intend to attend the event, please apply

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for tickets to G3RHP, Church Farm House, Otley, Ipswich, Suffolk, in good time so that tickets can be issued before the meeting. More than one ticket can be sent to one applicant, but please include individual names and callsigns of those for whom the tickets are intended.

An ambitious programme is planned, although exact details have yet to be fixed. In the morning a general discussion will be held, with members of the Microwave Committee being present to discuss band plans, talk-back frequencies, repeaters, contests etc. In the afternoon lectures will be held on a number of topics, including propagation research and moonbounce.

It is intended to have a comprehensive set of test equipment available for checking receivers and transmitters, including automatic noise figure measurement equipment (input frequencies 30MHz and 144MHz), spectrum analysers, frequency counters, power meters, sweepers etc. Visitors are invited to bring along any equipment they wish to have measured.

The meeting will open at about 10am and will have an open-ended finishing time, so there should be plenty of time for everything. Refreshments will be available, including sandwiches at lunchtime. Further details of the meeting can be obtained nearer the date from G4FSG. □

4-2-70

(Continued from page 743)

VHF band plans

Every month your scribe receives letters about the band plans. The letters usually fall into two categories—those who write to complain that their pet frequency has been arbitrarily "given" to a repeater or beacon, and those who write to complain about operators who do not observe the band plans. The first category usually refers to a long-gone band plan often more than 10 years out of date, and frequently end their letters of complaint with a triumphant "Anyway, I do not see the IARU band plan in my licence". The second category is equally vocal, even to the extent of sending tape recordings of amateurs in local QSO on meteor scatter calling frequencies, with a request for the "offenders" to be named in *Radio Communication*. To be truthful, your scribe files all these letters in the same place—to be taken out and read with bemused interest during poor vhf conditions. Facts must be faced, the band plans are not mandatory, they are recommendations for the benefit of all vhf operators.

If your scribe had ignored the passage of the last 10 years he would still be on 145·926MHz, talking to no-one but upsetting many up-to-date operators. Circuits for vxos have been around since before any band plans and it really is a pretty lame excuse to claim "I only have one crystal". Operators complaining about the band plans will have to realize that it will be 1980 in just over four month's time, and that now is as good a time as any to make the simple modifications to the station equipment to enable them to remain on friendly terms with the vast majority of their fellow amateurs. The recent articles on band planning by G3SEK and G3BA are recommended reading to these latter-day Rip-Van-Winkle-type operators. □

SWL news

(Continued from page 731)

The group will be pleased to QSL all accurate swl reports, and cards should be sent to G3ZAY at 41 Enniskillen Road, Cambridge CB4 1SQ.

Andrew Oakley, RS39673, is planning to build a communications receiver after completing his exams. He recently made a G5RV, and the first station heard was XE1OW, who returned a QSL to Andrew within two weeks. Another of Andrew's ventures for the summer months is to build a kite antenna (*Radio Communication*, May 1979) to fly to a height of 150ft

SLPs

Please note that the next slps are on 4 August, between 1000 and 1200gmt on 21MHz cw; and on 2 September between 1300 and 1500gmt on 28MHz phone. All details to Dave Whitaker, BRS25429, "Hillcourt", 57 Green Lane, Harrogate HG2 9LN.

A write-up of several earlier slps will appear next time.

Finale

Contributions for the October issue will be gratefully received, and should reach your scribe by 24 August. □

RAE courses 1979–80

Belfast. College of Technology, College Square East, Belfast BT1 6DJ. Licensing conditions, operating practices, procedures and electronics theory, Tuesdays 5.30–8.30pm; morse instruction and practice for prospective GI4s, Thursdays 6–8pm; commencing 18 September. Enrolment early September. Further details from the college, tel 27244.

Birkenhead. North Wirral College of Technology, Electrical Engineering Department, Borough Road, Birkenhead. Thursdays, commencing 13 September. Enrolment 3–5 September. Further details from Department of Electrical Engineering, or D. Owen, G4GGB, course tutor.

Doncaster. Doncaster Metropolitan Institute of Higher Education, Waterdale, Doncaster DN1 3EX. Details from D. Smith, Head of Department of Electrical and Electronic Engineering, tel 0302 22122.

Farnborough. North and West Farnborough Further Education Centre, Cove School, St John's Road, Farnborough, Hants. Thursdays, commencing 20 September, 7.30pm. Morse proficiency course, commencing Monday 17 September, 7.30pm. Further information from J. Brett, principal at the centre, tel Farnborough 42397.

Langley. Langley College of Further Education, Station Road, Langley, Slough SL3 8BY. Operating techniques (with college station G3XPL), Mondays 5.30–7pm; morse, Mondays 7–8.30pm; theory (with full laboratory facilities), Thursdays 7–9pm. Enrolment 11–12 September, 12.30–8pm. Further details from E. C. Palmer, senior lecturer Engineering and Construction Department, at the college, tel Slough 49222.

Loughton. Loughton College of Further Education, Borders Lane, Loughton, Essex. Tuesdays, commencing 18 September, 7–9.30pm. Enrolment Monday–Wednesday 10–12 September, 6.30–9pm. Further details from Mr K. Gardner at the college, tel 01-508 8311.

Leamington Spa. Mid-Warwickshire College of Further Education, Warwick New Road, Leamington Spa CV32 5JE. Thursdays, commencing 20 September. Enrolment 6–7 September, 9am–12 noon, 2–4pm, 6–8pm. The course will last for approximately 30 weeks. Further details from the college, tel 0926 311711.

Manchester. North Trafford College, Talbot Road, Stretford, Manchester M32 0XH. Theory, Thursdays 6.30–9pm; morse, Mondays J. Birkinshaw at the college, tel 061-872 3731.

Northampton. Duston Adult Centre, Duston Upper School, Duston, Northampton. Tuesdays, commencing 25 September, 7–9pm. Enrolment 5–6 and 10 September. Fee £11. The course will last for 24 weeks. Further details from D. F. Watton, course instructor, 353 Billing Road East, Northampton NN3 3LL.

the month on the air

John Allaway, G3FKM *

AT the time of writing, the publication date of the Society's new *Amateur Radio Operating Manual* was drawing near. It will be of great use to all those who take interest in on-the-band activities, be they hf, vhf, uhf or microwave, and contains a wealth of information of interest to readers of *MOTA*. One of the matters mentioned in the book is S-meter readings, and it points out that in the original RST code the "S" was followed by a number which was an indication of loudness as assessed by the person listening and was not a figure (accurate or otherwise) read out from a meter. For practical purposes this seems still to be a sensible way of doing things, unless actual electrical measurements are required for the purpose of equipment or propagation evaluation. There really are times when a fully readable signal does not move the meter needle and "S0" does mean no signal!

Andrew Bedford, G4BMS, has received a number of QSL cards from the USA for contacts he is supposed to have made on 21MHz cw. He points out that he is a ship's radio officer and is not very active when on leave as he likes to get away from radio.

BRS12234 has learned that K2MJM has his rotary beam at a height of 200m above ground in central Manhattan. Could this be a record?

Disruption in the Birmingham postal area has caused problems with incoming information, and should *MOTA* be shorter than usual this month, readers are asked to accept your scribe's apologies.

DX news

Last-minute news of an operation from Okino Torishima was received far too late for inclusion in last month's column. The call was JF1IST/7J1 and it is believed that the 50-ton craft which carried the expedition crew of six—only two of whom were amateurs—had severe problems with unsuitable weather. Those who visit the HF Convention in September will see just how difficult it is to land at, and stay on, the semi-submerged reef!

The TY9ER callsign is apparently owned by a German who will be in Dahomey for some time, and who will be much more active soon when his equipment is fully assembled. QSLs for Rudy go to DL8DC (see "QTH Corner").

FR7ZL operated from Tromelin Is as FR7ZL/T between 11 February and 27 March, and QSLs for this period should be requested from N4NX who has now received logs up to 4 March. N4NX does not deal with requests for QSLs for any other of Guy's operations.

C5ABK has been worked on 14MHz ssb and says that he has a permit to operate from Guinea Bissau for two weeks during December. There have been doubts about the correctness of TH8JM's call, and he is awaiting confirmation that it should be TL8JM. Those looking for a contact with the Central African Republic might look for TN8BL, who is often to be found on Tuesdays and Sundays at 2100 on 14,220kHz, and an hour later on 21,290kHz, frequently with help from TR8RG.

Franz Josef Land is currently being represented by UK1PAA who has been worked on Mondays, Tuesdays and Wednesdays from 0430 to 0630, and again at around 1400 between 14,020 and 14,030kHz. The station has also been noted on 21,020kHz. UK1PAB is located on Novaya Zemlya.

ZK2VE is a new station on Niue, and will be on the island for one year. He has been worked on 14MHz ssb. VR1BE is also new and has been logged on 14, 21 and 28MHz ssb. ZL5MC is located at Scott Base, Antarctica, and should be QSLd via ZL2HE. VK0XU, on Macquarie Is, is known to use 21MHz, and has been worked in the UK on 21,015kHz around 0900.

The Russian ski-expedition station U0K was reported to be at the North Pole in mid-June.

A note in *DX News Sheet* says that it is likely that on 12 July the three countries: British Phoenix Is (VRIP), Gilbert Is (VR1) and VR3, will be deleted from the ARRL DXCC list and be replaced by the newly-independent Kiribati.

DX'press has established contact with PA0JGR and confirmed that PA0JGR/A6X does have an official licence and is operating legally, as it A6XJA. However, it does seem that there is some illegal A4 activity.

Tim, BV2B, is often to be found on 14,218 or 14,250kHz between 1200 and 1400 on Wednesdays.

SP5AUC (via *Long Skip*), who is at the Polish Embassy in Rangoon, says that there is absolutely no chance of amateur radio activity from Burma in the near future. OZ1CRH did not appear from Afghanistan and, in view of that country's current problems, it seems unlikely that there will be any YA signals on the amateur bands in the immediate future.

KC6AT, in the Western Caroline Is, is often to be found around 14,285kHz from 0800.

DL7FT (Frank Turek, (1) Berlin 47, Petunienweg 9, W Germany) acts as QSL manager for the following stations: EA6's AR, AS, BG, BH and BJ, FC9UC, ST0RK, SV1DB/A

Gloria, VE7DAD, operates a TS520 with a TA33 beam, and also holds the marine call VE0MEI

*10 Knightlow Road, Birmingham B17 8QB

RSGB HF CONVENTION

Organized by the RSGB HF Committee

**Pavilion Suite Complex,
The Warwickshire County Cricket Ground,
Edgbaston, Birmingham**

Saturday 15 September 1979

- A social event in comfortable surroundings
- Interesting film and lecture programme
- Saturday evening dinner
- Ample free car parking on site

For programme details, see *Radio Communication* June 1979, p543. Guests present at the evening dinner will include Noel Eaton, VE3CJ, IARU president; and Dick Baldwin, W1RU, ARRL general manager.

TICKETS

**Convention only: £1·50
Convention and dinner: £5·50 (single), £10 (double)**

Ticket applications should be sent to S. H. Jesson, G4CNY, 181 Kings Acre Road, Hereford HR4 0SP, and should be accompanied by an sase. Cheques/POs should be made payable to "RSGB HF Convention". Early application is advised as the number of places is limited.

(operator Frank, 24–26 April 1973 only), TA2AE, XW8BP (1969–74), XW8CN, ZA2RPS, 3A2s CN and 3A0CU, 3V8BZ (to end of 1971).

Colin Thomas, G3PSM, will be in Gibraltar from 13 August for two weeks. His callsign will be ZB2BS and he will be found usually 20 to 25kHz above band edges. QSLs go to his home QTH.

Dxpeditions

West Coast DX Bulletin mentions the probability of an extensive South Pacific expedition by a group of W0s tentatively aimed to start during August and lasting some months. The Northern Cook Is, Tonga, Wallis and Fiji island groups are being mentioned among others. More information will be available later.

There is a chance that a group of Greek amateurs will visit Mt Athos during the summer. However, should this not take place OH2BH hopes to go there some time in September.

Top band

W1BB's spring *160 Metre DX Bulletin* reported that the winter season had been rather poor, but perhaps as expected due to the high level of solar activity. Stew points out that propagation predictions are useless for this band, and that the only real way to success is to monitor the band constantly. There are now a number of highly-specialized stations with modified equipment and receiver preamplifiers, and last winter's net which was maintained by G3SZA, K1PBW and ZL2BT, for periods sometimes exceeding an hour—on ssb—was an entirely new feature. Dxpeditions are increasingly using the band, and a plea is made to them to pay attention to their antennas and earthing systems. An interesting point is raised concerning DHJ, which has often been used as an indicator of conditions, because it is believed that the station now normally runs very low power except at the times when it is transmitting gale warnings. The same applies to OSN on 1,831kHz.

News from overseas

Martin Broadway, G4CFI, has written to say that he has been operating as ST2HF and ST0HF from the Sudan for several months. This has produced a large request for QSL cards and, although he has managed to deal with most of the ST2HF requests, he has had problems with the printing of the ST0HF ones. He would like to apologize to any readers who are waiting patiently for them, and says that he hopes that the difficulties will have been resolved by the time he next returns to the UK in September.

The Radio Club at the Electro-Technics Faculty, 71000 Sarajevo, Yugoslavia, is anxious to contact any university or college in Britain which has a similar faculty and an interest in amateur radio. The club's callsigns are YU4EXA and YU4ETF, and those interested are invited to write to the above address. The telephone number is 71 521677 (extension 47).

Awards

INORC Award

This celebrates the first ship to shore experiment conducted by Guglielmo Marconi, and is a 41 by 32cm picture of the *Carlo Alberto* in colour. It may be obtained by making contact (or hearing) at least seven members of the INORC since 30 October 1976. Valid stations include the following: I1s BQE, BWI, DNX, DKF, EZA, JNL, MQ, PIM, YEH, YRL, ZB; I2s BVS, DMK, DUO, GHD, VZD, CSJ, HTO; I3s SLB, WFU, I4RZJ; I5s EGE, GKO, PIW, TBH; I6s LWK, PQO; I7s PHH, ZCZ; I8s AOH, CXU; IC8CQF; IT9s AGA, AJZ, DHR, DYP, FQF, JSK, KMU, NMW, PBR, PLM, RHK, VPP, XNM; I0s JGL, FFO, OAL, PAB, ZMI; and IS0XBL. Send log extract plus $US3 or 30 ircs to I2BVS, Sig Enzo Pannuzzi, Via Ponte Nuovo 109/4, 20128 Milano, Italy.

The Arabian Knights Award

Proof of having contacted at least 10 Arab countries, one of which must be JY1 or JY2, since 1 January 1971, in the Arabian Net, which is held every Friday on 14,250kHz from about 0600.

The Silver Award

For those who have confirmed contacts with at least six different JY prefixes. Applicants for either of the above awards should send their QSL cards (photocopies are accepted) plus 10 ircs to the Award Manager, PO Box 1055, Amman, Jordan. Application forms may be obtained from this address or from WA3HUP (please include four ircs).

Slovak National Insurrection 35th Anniversary Award

This is being offered by the Central Radio Club of Czechoslovakia to those who make contact with stations in Slovakia, (OK3, OL8 - OL0) between 2300 23 August and 2300 31 August. Three or more diplomas will be awarded to the top three or more highest scorers in each country. Send list of QSO details to CRC, CSSR, PO Box 69, 113 27 Praha 1, Czechoslovakia, to arrive by 15 September.

Contests

The Scandinavian Activity Contest 1979

1500 15 September to 1800 16 September (CW).
1500 22 September to 1800 23 September (Phone).

CW section will be restricted to the following frequencies: 3,505–3,575, 7,005–7,040, 14,010–14,075, 21,010–21,125 and 28,010–28,125kHz. Phone sections will be as follows: 3,600–3,650, 3,700–3,790, 7,050–7,100, 14,150–14,300, 21,200–21,350 and 28,400–28,700kHz. There are single-operator, multi-operator/single-transmitter, and multi-operator/multi-transmitter sections and all are all band. Non-Scandinavians work Scandinavians and send RS/T plus serial QSO number (from 001). European stations count one point per QSO (non-Europeans score three points for contacts made on 3·5 or 7MHz). The multiplier is the number of call areas worked on each band added together. Portable stations in LA and OZ count as call area LA0 or OZ0 respectively. The prefixes used for Scandinavia are LA/LB/LG/LI (Norway), JW (Svalbard and Bear Is), JX (Jan Mayen), OF/OG/OH/OI (Finland), OH0 (Aaland Is), OJ0 (Market Reef), OX (Greenland), OY (Faeroe Is), OZ (Denmark), and SJ/SK/SL/SM (Sweden). Not all these are in Scandinavia but are valid for this contest. Logs should show: date, time, station worked, sent and received numbers, if multiplier, and points. Use separate logs for each band, enclose summary sheet with usual declaration, and post no later than 15 October to SRAL Contest Manager, OH2QV, Box 306, SF-00101 Helsinki 10, Finland.

The VK/ZL/Oceania Contest

1000 6 October to 1000 7 October (Phone).
1000 13 October to 1000 14 October (CW).

Stations in the rest of the world work Oceania with special emphasis on VK/ZL for the multiplier. Exchange RS/T plus serial QSO number (from 001). Contacts with VK/ZL count two points, with others one point. Final score is total QSO points multiplied by the sum of VK and ZL call areas worked on each band. (Note that single-band entries are also accepted.) Logs should show date, time, station worked, numbers sent/received, band, QSO points, and separate sheets should be used for each band. Include a summary sheet showing the scoring, name and address (in block letters), and a signed statement that all rules and regulations have been observed. Logs must reach VK6NE, WIA Contest Manager (VK/ZL), 388 Huntriss Road, Woodlands, W Australia, 6018, Australia, no later than 31 January 1980. Results may be obtained by enclosing an irc with the log.

GB2FJE in the 1979 WPX SSB Contest. L to r: G4GIR, G4DRS and G4BWP

First International Contest for 28MHz Portable Stations

1200 1 September to 1600 2 September.

Stations must take a four-hour continuous break. SSB and cw. Frequencies 28,000–28,200kHz and 28,500–28,700kHz. Exchange RS/T, serial QSO number from 001, plus ITU zone (UK is 27). A station may only be worked once—either on cw or ssb. Two categories: fixed and portable. Contacts with own country count two points, with other countries in same continent five points, and with other continents 10 points. Multiplier is one for each ITU zone worked. Logs must show time, station worked, number sent/received, if multiplier, score. Log forms may be obtained from San Remo ARI Section, PO Box 114, 18038 San Remo, Italy, in exchange for an irc, they must be sent to this address postmarked before 31 December 1979. Logs should be compiled separately for ssb and cw. Copies of rules are available from G3FKM.

The All Asia Contest

1000 25 August to 1600 26 August (CW).

Apologies for the fact that in the rules for these contests printed on page 544 of June *Radio Communication* the phone and cw sections were transposed. The cw section will take place on 25/26 August.

Results of the 1978 cw event show that in the multi-band category G4CP scored 45,872 points, **GM3OXC** 23,025, G3ESF 21,297, G2AJB 2,232, G4DNV 1,984, and G6NK 1,449. **G3TXF** won a certificate on 21MHz with 20,644 points and **G3OCA** on 7MHz with 70.

The European DX Contest

0000 11 August–2400 12 August (CW)
0000 8 September–2400 9 September (Phone)

3·5 to 28MHz. Single-operator multi-band, and multi-operator single-transmitter sections only. Only 36h operation by single-operator entrants and the 12h break may be taken in not more

QTH CORNER

FG0DDV/FS	via W2QM, D. Beckwith, 151 Whitney Av, Pompton Lakes, NJ, 07442, USA.
HB0AFI, HB0AYX, HB0BOI	via HB9MM, USKA Radio-Amateurs Vaudois, Box 3705, CH 1002 Lausanne, Switzerland.
HV2VO	Vatican Observatory, Vatican City.
J28AL	G. Baris, BP 758, Djibouti.
TY9ER	via DL8DC, R. Lux, Heuswellerstr 114, 6680 Neunkirchen Saar, W Germany.
VP2MBS, VP2VBC, VP2VDL	via VE1ASJ, G. A. McLellan, 2318 Rothesay Rd, E Riverside, St John, NB, E2H 2K5, Canada.
XF4MDX	PO Box 21-167, Mexico 21, DF, Mexico.
SM0AGD/XW8	via SM3CXS, J. Svensson, Berghemsv 11, S-86021 Sundsbruk, Sweden.
ZB2BS	C. J. Thomas, G3PSM, 36 Chelwood Crescent, Leeds LS8 2AQ.
ZB2EY	via DL5NJ, J. Baumbach, Worzeldorferstr 164, 8500 Nuremburg, W Germany.
ZK2VE	via W7PHO, W. Bennett, 18549 Normandy Terrace SW, Seattle, 98166, USA.
5W1BY, 5W1CA	Islands Dxpedition, PO Box 263, Papakura, New Zealand.
JF1IST/7J1	JA1HQG, Yoshio Arisaka, 4-3-9 Yuigahama, Kamakura, Kanagwa 248, Japan.

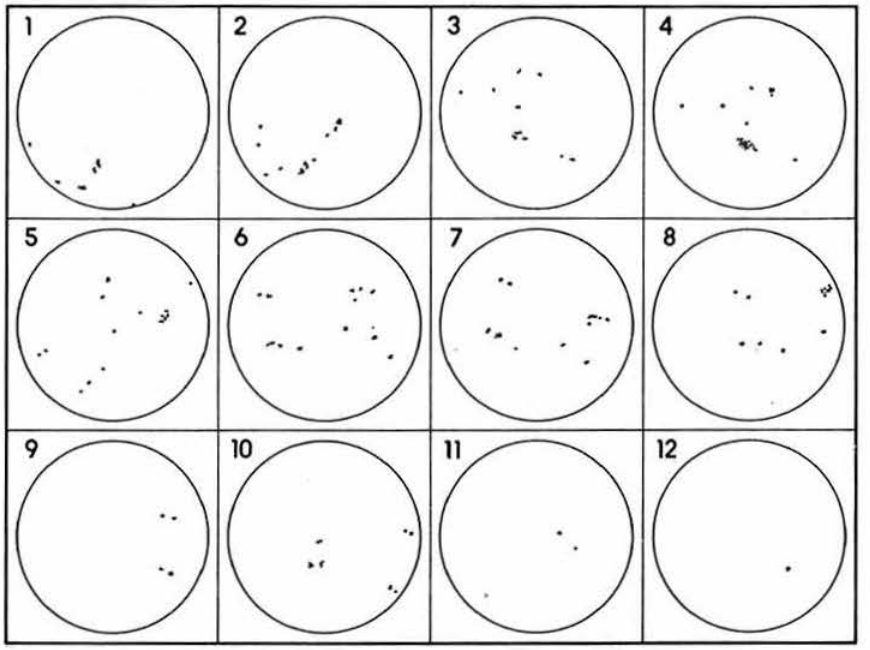
RSGB QSL Bureau, G3DRN, 30 Bodnant Gardens, London SW20 0UD

VISUAL SUNSPOT RECORDS

Dr Arthur C. Gee, G2UK, recorded the sunspots shown here, on the dates given below, with the aid of a 3in Maksutov telescope.

(Readers are reminded that it is dangerous to look directly at the sun through a telescope or binoculars.)

1. 1 June 1979
2. 3 June 1979
3. 6 June 1979
4. 7 June 1979
5. 8 June 1979
6. 9 June 1979
7. 10 June 1979
8. 12 June 1979
9. 15 June 1979
10. 17 June 1979
11. 18 June 1979
12. 19 June 1979



than three periods. Exchange RS/T plus serial number (from 001). One point per contact and one point per "QTC". Multiplier is (for Europeans) ARRL DXCC countries plus JA, PY, VE/VO, VK, W, ZL and ZS call areas, and UA9 and UA0. The multiplier on 3·5MHz may be multiplied by four, on 7MHz by three, and on 14, 21 and 28MHz by two. Final score is total QSO points plus QTC points, times the total multipliers from all bands added together. QTC points are received from non-Europeans and consist of details of their previous QSOs—time, callsign and QSO number received. A QTC may only be transmitted once, and up to 10 may be received from any one station. Official log and summary forms are available (self addressed envelope plus ircs, please) from the DARC Contest Committee, D-895 Kaufbeuren, PO Box 262, W Germany, to whom completed logs should be posted no later than 15 September (for cw) or 15 October (for phone).

Band reports

This section has been decimated by postal delays and, by the published closing date, reports had only been received from G3AAE, G3IMW, G3KSH, GM3LYY, G4BUO, G4QK, G5JL, BRS31301 and BRS38934—to whom many thanks! Conditions in general seem to have been rather mediocre and no outstanding days have been reported.

Stations listed in italics were using cw.

3·5MHz. 0300 DF3YS/W1, K2BT.
7MHz. 0400 *CE3BWT.* **0500** *CO8RCE, ZL, ZS6AL.* **2300** *CX3AL, VQ9KK, SM0AGD/XW8.*
14MHz. 0500 *HD1A* (= HC). **0600** VE7, VK, XE, ZL. **0700** *FM7WE,* VR6TC. **0800** VK0PK. **0900** ZK1AA. **1500** OX3TO. **1800** *JA8AQN/JD1, SM0AGD/XW8.* **1900** JF1IST/7J1. **2000** AP2TN, *FP8FJ, VE1AST/1* (Sable Is). **2100** FM8BM, *HM1DH, P29EJ, VP8AI,* VP8HA. **2200** *K0DX/DU2,* J7DAO. **2300** VE1ASI/1 (Sable Is).
21MHz. 0500 *VE6, VE7, W6, W7.* **0600** *KH6,* WA7JRL/SU (QSL to W8LZV). **0700** *FY0EOO* (QSL to F6DQM), *J28AY.* **0800** *HC2SL, J28AG, JT1KAA.* **1500** VE1AIH/1 (Sable Is). **1600** J28BN/P. **1700** VQ9KK, XT2AV, YC1BMI. **1900** D4CBC, KX6PP. **2200** VP2s VDL, VEM.
28MHz. 0600 *CN8AN.* **0700** 9Y4AB. **1800** VP2VDL. **2100** *HH2KS.*

Thanks to all who contributed to this month's effort, and also to the editors of *CQ Magazine* **(W1WY)**, the *Ex-G Radio Club Magazine* **(W3HQO)**, *DX News Sheet* **(Geoff Watts)**, *Long Skip* **(VE3FRA)**, the *West Coast DX Bulletin* **(WA6AUD)** and *DX'press* **(PA0TO)**.

Please send items for **September** issue to reach G3FKM by **10 August** and for **October** by **7 September**—but to arrive much earlier if at all possible! □

Propagation predictions

It is regretted that, in common with other items delayed in the mail, the propagation predictions for this month were not received from Germany by the final copy deadline.

The provisional sunspot number for May 1979 from the Swiss Federal Observatory was 134·6. On 14/15 May the daily numbers exceeded 200. The predicted smoothed numbers for September, October and November are 154, 153 and 151 respectively.

HF propagation study

Predicted hpfs (MHz × 10) for August 1979

GMT =	00	02	04	06	08	10	12	14	16	18	20	22	24
Aden	255	239	257	333	368	359	371	359	365	331	294	271	255
Ascension	257	267	257	242	350	371	382	387	408	369	351	268	257
Bahrain	241	213	256	319	356	347	347	332	348	305	267	253	241
Bangkok	178	180	251	301	307	319	308	303	308	332	256	224	178
Barbados	265	233	223	210	243	308	322	307	315	310	327	301	265
Bermuda	243	218	192	167	192	275	300	294	300	300	307	274	243
Bogota	256	230	205	205	243	249	313	300	307	307	319	293	256
Buenos Aires	282	270	248	241	220	308	348	357	359	356	348	312	282
Cape Town	256	180	128	321	371	371	403	409	384	422	345	282	256
Colombo	229	200	256	317	348	342	332	324	343	305	255	244	229
Cyprus	225	204	227	290	324	319	322	308	319	285	265	235	225
Dakar	295	282	252	258	337	357	359	371	378	384	352	310	295
Denver	205	192	180	153	153	159	218	243	256	268	281	242	205
Fairbanks	153	178	191	230	230	230	204	216	216	210	204	204	153
Falklands	282	244	252	237	163	308	355	362	365	364	351	312	282
Gibraltar	169	150	153	171	211	219	221	216	219	210	213	176	169
Hong Kong	187	180	246	286	307	304	298	291	299	289	251	213	187
Honolulu	153	172	185	224	230	230	205	186	218	262	249	218	153
Iceland	145	135	128	157	190	200	199	200	205	208	199	164	145
Jamaica	247	220	199	180	218	243	304	296	301	300	309	279	247
Lagos	314	282	260	300	364	369	394	403	435	435	357	328	314
Las Palmas	248	229	219	229	291	312	314	314	314	314	300	268	248
Lima	268	243	232	218	274	196	329	328	326	322	332	305	268
Los Angeles	178	185	180	166	153	128	180	230	262	275	268	243	178
Malta	191	172	180	224	263	262	266	256	263	237	235	199	191
Mauritius	230	205	256	346	371	371	384	371	384	357	307	281	230
Mexico	224	205	186	147	218	192	249	288	288	294	294	256	224
Montreal	218	205	185	153	178	249	274	275	284	290	290	253	218
Moscow	164	148	172	232	248	252	249	248	251	276	211	188	164
Nairobi	257	260	256	336	374	371	387	356	382	332	282	256	257
New Delhi	201	186	255	307	326	329	317	307	329	294	255	230	201
New York	228	208	188	153	166	244	276	281	289	294	294	256	228
Osaka	205	205	235	252	277	285	281	276	252	227	214	214	205
Perth	225	199	256	315	345	341	332	298	255	214	194	174	225
Rio de Janeiro	291	279	252	248	205	356	355	359	357	357	352	313	291
Salisbury	295	280	255	333	378	378	403	397	435	403	328	308	295
Seychelles	256	247	256	337	368	361	357	365	331	307	295	279	256
Singapore	201	186	255	307	326	329	317	307	329	332	255	230	201
Suva (s)	178	178	218	230	262	262	262	268	268	249	237	204	178
Suva (l)	335	295	257	295	295	243	218	192	178	159	357	333	335
Sydney (s)	187	180	246	286	307	304	291	265	227	196	190	213	187
Sydney (l)	271	248	234	220	282	232	180	166	150	141	252	305	271
Teheran	229	200	256	317	348	342	332	324	343	305	255	244	229
Vancouver	159	178	178	205	199	192	211	218	204	230	243	224	159
Wellington (s)	218	205	237	243	275	281	270	230	205	178	230	218	218
Wellington (l)	308	282	257	256	211	192	161	128	128	167	321	319	308

Bands recommended are those between hpf and half hpf.

your opinion

IDENTIFICATION

The Editor
Radio Communication

Sir—In your June issue Mr H. R. Millard, G8LWK, starts his letter "One would think the RSGB would have enough on its plate putting its house in order rather than" etc.

You cannot get away with an unsubstantiated derogatory remark like that Mr Millard.

As a member of the RSGB for approximately 40 years I consider that our Society is now serving the amateur community more effectively than it has ever done: and that includes during the five-year period when I had the privilege of serving as a member of Council.

Come on, Mr Millard; detail your grievances, or better still come forward and offer some of your spare time, as other members whose efforts you are criticising, have done. Or are you just a knocker?

J. D. Kay, G3AAE

Sir—I have read with great interest, the letters from G8LWK and G8MOO in your June issue on the subject of identification.

As one who has "hunted with the hounds" and now "runs with the fox", may I make the following points? Persons operating mobile or portable would do well to have the following in their possession:

(1) car documents, driving licence, insurance certificate, MOT certificate (if required);
(2) a photocopy of the amateur radio licence issued to them (or at least the first page);
(3) mobile log book, a specimen QSL card, and a copy of the call book with their particulars in it.

The above documents should be quite sufficient to satisfy any police officer as to one's identity and authority to operate amateur radio equipment.

I feel that the idea that local police stations keep details of licensed radio amateurs is not really a very practical one.

In conclusion, I know of two Kent police sergeants who are licensed amateurs; the gospel is starting to get around.

P. J. Poole, G4EVY
Ex-special constable, Metropolitan Police;
Ex-special sergeant, Kent County Constabulary, (1960-1975)

144MHz OPERATION

The Editor
Radio Communication

Sir—I hate to introduce a complaining note to your columns, but I can hold my ire no longer!

I live in just about the most easterly part of England and can, therefore, work hordes of Continentals at almost any time. Much of my time in the shack is thus spent monitoring the calling frequency for Gs to the west of me. There are long periods when the calling frequency is occupied by QSOs between Gs and between Gs and Continentals. I did a rough census during a listening period of two hours, during which the channel was unusable for 55 minutes. The offending station was R5 S6 off the back of his beam and, worst of all, held a well-known university radio club callsign.

So, please gents, there are acres of space to occupy—do not clobber the calling frequency; if he will not QSY others cannot use the frequency. Incidentally, I have noticed that many Continental stations do not understand "QSY", so it might be better to ask him to "move to another frequency". Also many do not recognize 144·30MHz as a calling frequency, and occupy it for long periods—so, you European lads, please take note.

Lastly—you chaps in the west of England—how about beaming towards Suffolk occasionally.

Paul Newman, G8HUU

ANTENNAS

The Editor
Radio Communication

Sir—How big is a TH6DXX? Would a four-el quad really look gigantic on a 40ft mast? Which is bigger, a two-el quad or a tribander?

I raise these questions as I have never seen any hf antenna farm at either a rally or exhibition. Most amateurs do not have an opportunity to see a selection of erected hf antennas. Why cannot I be given an opportunity to actually see a large hf antenna floating in the air open for inspection.

These large pieces of metal cost a lot of money and yet retailers expect me to spend on the promise that my neighbours will not commit hari-kari. Of course it is more trouble, but many people would probably reach into their pockets instead of day-dreaming if given a preview.

So come on, all you members of the trade, do you want my money or not.

J. J. Wilkins, GW4GEA/VP1JJ

Sir—It would appear that the rather low technical standards of vhf fm are reaching the ssb segment. In particular, the use of dipoles, slim-jims and other low-gain antennas, even in the vertical mode when virtually all serious operation is horizontally polarized.

Very large gains can be achieved when even medium-gain Yagis are used at both ends, as the total gain is the product of the individual gains. Stacked Yagis at one end and a dipole at the other is not as efficient as a single Yagi at both ends, as stacking can, at most, only double the total gain.

If two stations are making a marginal contact, each using 10W to an eight-el, the same two would require 1kW into dipoles to make the contact. If 14-el Parabeams were used the figure would be 10kW! If both also switched from ssb to fm the last figure could well be towards the megawatt region.

So, why do a few ssb operators and the majority of those on fm spend a fortune on a rig and then feed it into a wire coathanger?

Maybe the widespread use of Yagis on fm would be unpopular in some quarters, as it may force the use of true nbfm and narrower channel spacing. Perhaps, also, the repeaters could then be left for the mobiles.

B. C. Clowes, GW4HBZ

Will the RS(T) system last until judgement day?

by R. HERZER, DL7DO*

During the early days of amateur radio, the RS(T) system as a means of giving information to a contact—referring to readability, signal strength and, as far as cw mode is concerned, tone quality—turned out to be both a valuable and reasonable system. All the equipment in use was homebrew of course, as were a lot of the components. The performance and reliability of components, and the achievable gain of valves, were limited to rather low levels; measuring techniques were at a more-or-less primitive technical level, and, moreover, the whole business was quite an expensive one. Indeed, it was necessary and valuable to know—because it could not otherwise be easily ascertained—whether one's signal produced a "rather strongly audible, ie S7" audio output; whether one's oscillator performed in such a way that "very good readability—R5" could be attested, and that the ripple-smoothing components of the power supply allowed a report like "tone with absolutely pure dc quality—T9". Such information really meant an "enrichment of knowing", using the communication theorist's definition of "information".

Is this true any longer, when we are almost in the 'eighties? The author definitely does not believe it is because:
(a) What commercially-produced equipment nowadays will produce other than T9 quality in general?
(b) What is the use of a signal strength report at all, provided that one can really copy the operator at the other end 100 per cent—regardless of what an S-meter reading from 0 to 9 and some psychologically pleasing decibels may say?

There remains R-Readibility to characterise the only parameter that really counts: information loss. But what is the use of a scale of 1 to 5? Does one know the difference between "good readability—R4" and "very good readability—R5"? Who has never heard highly embarrassing reports like "You are five and nine, old man, but please just repeat your name and QTH; I lost this in some QRM by a local around the corner".

The author puts forward an idea, therefore, which he thinks might be worthwhile throughout the entire cw world—and the phone world as well; that is, the final deletion of the archaic, redundant and—in this day and age—absolutely senseless RS(T) system, and substituting a very simple system which—neglecting aesthetic aspects because we are not allowed to broadcast music anyway—takes account of the one and only parameter relevant to the transmission of information, ie information loss.

For "To copy or not to copy, that is the question!" is it not?

The author's idea is for a "Q-System", in which "Q" stands for transmission quality in a more general sense, which implies tone quality, skill of fist (or voice), QRM/QRN situations, QSB, frequency stability and so on. The scale which he thinks would be absolutely sufficient for a relevant information exchange between QSO partners is:
Q1 = At no time sufficient transmission quality: no copy.
Q2 = Some of the time sufficient transmission quality: partial copy.
Q3 = At all times sufficient transmission quality: full copy.

Intermediate report stages such as Q1/2 or Q2/3 could of course be used, and for those interested in the "why" of given reports there is always the opportunity to ask a contact to explain his report in a more detailed way—eg "Q2 = QSB es sum QRM" and so on.

The author feels that this system would result not only in a considerable reduction in contest and logging duties, but also in avoidance of exchanging mostly dishonest and/or nearly 100 per cent redundant information. In this sense the suggested system as a contribution in the fight against "air-pollution in amateur radio" is worth discussion.

By common consent, arguments such as "But we never did this before!", "Why change a system we've used for so many years?" and "Good Lord, my QSL cards—there are still 5,000 in stock—all showing RST!" etc, are no arguments at all! □

*Duesseldorfer Str 15, D-1000 Berlin 15.

raynet

Robert Bullard, G8NMW*

Alexandra Palace exhibition
Once again Raynet was present at the RSGB National Amateur Radio Exhibition at Alexandra Palace in May, and the venture proved to be very successful. Many people visited the stand, where enquiries about membership, the possible formation of an emergency network in India, and groups and controllers were dealt with, in addition to the usual sale of supplies.

The exhibition also saw the introduction of the laminator (a device for sealing membership identity cards in a plastic wallet). The committee has been discussing this matter for some time, with hopes that the RSGB's own laminator and membership-card processor could be utilized for Raynet use. Due to technical matters this would not have been a viable proposition, so Raynet now has its own small laminator, held by the hon registration secretary. It is hoped that within the next two years all Raynet groups will have taken advantage of the facility of having their cards laminated. The main advantages are: (1) The card becomes more durable and will not be damaged by exposure to damp and constant handling. (2) Details on laminated cards cannot be altered (attempts to do so will destroy the card) and thus user services will more readily accept them for identification purposes. (3) With the aid of a clip the card can be worn while on exercise or at incidents.

We were able to offer the laminating service at 15p per card (clip extra). The price through the post, either as a special service or at renewal, has been advised to group controllers. The laminator will be in use at the Woburn Rally this month; only cards bearing a photograph of the member will be laminated.

Raynet motorcycle riders
It has come to the notice of the committee that Raynet personnel who ride motorcycles in conjunction with their Raynet exercise or incident operations are **not** at present covered by the Raynet insurance policy. In order that this situation may be rectified, would all members who use their machines in connection with Raynet activities please advise Mike Barker, G8CAC, 3 Burley Close, Desford, Leics, immediately, of their name, age, address, group of Raynet to which they belong, and details of their machine.

Green lights
Much has been talked about on this matter but little, if anything, has been put into print. The following information comes from Geoff Lear, GW2HPG, of West Glamorgan, who is a committee member:
"Road Traffic Act 1972 Section 70". No vehicle shall show (a) a red light to the front, or (b) to the rear any light other than a red light, or a white light for, and when reversing.
"Road Vehicles Lighting Regulations 1971". Regulation 64 (1) states: The provisions of the Road Transport Lighting Act 1957 shall be varied to permit the following vehicles to show one or more blue lights: (a) police, (b) fire brigade, (c) ambulance, (d) fire salvage vehicle, (e) forestry and local authority fire vehicles, (f) bomb disposal vehicles, (g) Ministry of Defence vehicles, (h) blood transfusion vehicles, (i) Coastguard vehicles, (j) mines rescue vehicles. The same regulations allow the following vehicles to show an amber coloured light: (a) road clearance vehicles, (b) breakdown vehicles, (c) road maintenance vehicles, (d) vehicles used to inspect, clean, maintain, adjust, renew or install any apparatus which is on, under, or over any road, or for any purpose incidental to any operation as aforesaid.

Geoff says, "No provision is made for the use of green coloured lights, but it is clearly an offence to show a green light to the rear of a vehicle used on a road (the definition of a road covers the verges alongside a road, and the central reservation) no matter what vehicle it may be, Raynet or otherwise. Should a lamp be constructed only to show a green light to the front of the vehicle, no offence would be committed under these regulations, but it may be possible to confuse this vehicle with that of a doctor on an emergency call, since this is the colour being adopted by the medical profession as their emergency light."

Thank you Geoff, for researching this information. □

*12 Moriston Road, North Brickhill, Bedford.

contest news

April 70MHz Contest results

Once again a 70MHz contest brought many stations on to the band, including your adjudicator for the first time in five years. With band conditions described as mainly poor to average, it was very surprising to see the leading stations making over 50 contacts. Log keeping was of a good standard and very few points were lost after inspection.

Congratulations must go to the two leading stations GM3WOJ/P and G3UUT/P, who had convincing leads over the other competitors.

G4BEL

SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	G3UUT/P	575	53	ZO55	100	G3WXC	400
2	G3UKV	297	43	YM28	120	GM3YOR	371
3	G3XBY	264	44	ZM52	110	GM3YOR	420
4	G2AMV	248	32	YN55	10	G3DAH	360
5	G3VPS/P	242	44	AK11	25	GM3WOJ/P	526
6	G3SPJ	227	51	AL41	120	GM3WOJ/P	485
7	GD2HDZ	219	23	XO68	80	G4APL	425
8	G4APL	212	50	ZL60	50	GM3WOJ/P	480
9	G3NPI	211	45	ZM75	30	GM3WOJ/P	385
10	G3PWK	209	34	AM42	100	GM3WOJ/P	422
11	G3TWG	128	36	ZL37	90	GM3WOJ/P	465
	G3FIJ	128	22	AL05	80	GM3WOJ/P	485
13	GM3YOR	127	13	YO65	50	G3BTO	555
14	G3LVP	112	29	AL33	50	GM3WOJ/P	490
15	G3YMC	103	35	ZL47	5	G3UUT/P	324
16	G4BAO	85	19	AM61	20	G3UUT/P	240
17	G4CMU	63	21	ZL60	25	G3UUT/P	350
18	G3FME	48	10	ZK15	72	G3UUT/P	400

MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	GM3WOJ/P	628	49	XO26	133	G3BHW	540
2	G3PFM/P	385	53	YK09	50	GM3WOJ/P	452
3	G3JEQ/P	267	57	ZL77	50	GM3WOJ/P	475
4	G4EGU/P	228	50	AL51	20	GM3WOJ/P	503
5	G3TAL/P	178	26	ZK13	100	GM3WOJ/P	—
6	G3FJE/P	142	45	ZM79	50	GM3WOJ/P	410
7	G3PJX/A	105	33	ZL68	1	G3UUT/P	325

May 432/1,296/2,304MHz Contest results

Although timed to coincide with Continental activity, this contest was not a success. Poor conditions, and a minimal time lapse since the previous similar contest, were probably the main reasons.

The committee had realized that the appearance of a moonbounce contact in a contest log was imminent, so the QSO in G4DGU's log came as no surprise and was accepted. Similar contacts in future will also be accepted. The general rules are to be amended as well, so that only stations complying with the standard licence power restrictions will be eligible.

Certificates will shortly be received by single-operators G3NNG and G3TDG, and multi-operator stations G8PUB, G4FSG and G4EEE.

G5HD

2.304MHz MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4EEE/P	238	7	ZL54	G4ROZ/P	82
2	G3ROZ/P	199	2½	AL51	G4EEE/P	82

1.296MHz SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3TDG	1,949	27	AL51	PA0EZ/A	367
2	G8ITS	50	6	ZL40	G3TDG	25
3	G8IFT	44	2	YM50	G3ONP/P	38
4	G8CTT	39	2	AL41	G8POF	42

1.296MHz MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G4FSG/P	3,123	22½	AM67	PA0NYM/P	322
2	G3ONP/P	2,751	22	YM48	G3DAH	283
3	G4GLN/P	2,466	38	AL51	G4FXW	270
4	G3ULT/P	968	17	ZL54	G3TDG	92
5	G3AMW/P	523	7	ZN18	G3ONP/P	199

432MHz SINGLE-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G3NNG	10,732	72	ZL33	PA0EGW	485
2	G8KAX	4,656	47	AL32	PA0EZ/A	395
3	G3BPM	4,292	40	ZL48	PA0EZ/A	395
4	G4DGU	2,422	12	ZL24	SM6CKU	1,079
5	G8IFT	1,516	13	YM30	G8PUB/P	232
6	G8ITS	581	20	ZL40	G3NNG	102
7	G8CTT	575	9	AL41	G3UBX/P	220
8	G3RND	553	6	ZK14	G8AGU	166
9	G3ILO	191	2	YL29	G3AKF/P	96

432MHz MULTI-OPERATOR

Posn	Callsign	Points	QSOs	QRA	Best dx	Km
1	G8PUB/P	30,416	104	YK21	DJ9DL	761
2	G4BPO/P	28,302	132	AM67	DJ0OX	633
3	G3AKF/P	12,986	102	ZL54	PA0EZ/A	456
4	G3UBX/P	11,741	83	YM48	PA0WRC/P	571
5	G8SFI/P	11,413	57	ZO55	G8ABP	468
6	G4ALE/P	6,353	60	AL51	PA0EZ/A	380
7	G8GBY/P	5,718	43	ZN18	G8PUB/P	416
8	GW4HBK/A	4,925	29	YL34	PA0EZ/A	575

144MHz Fixed Contest December 1978 results

A good number of entries was received for this contest, split evenly between the single- and multi-operator sections. Although there was high activity on fm, only one entry was received for Section C, from G8LHW who gained 82 points. Quite a number of dx stations were worked by most stations.

The writer apologizes for the delay in publishing these results, but this has been caused by the originals being lost in the post.

G4CUT

SECTION A

Posn	Callsign	Points	QSOs	QRA	ASL	Best dx	Km	Ant
1	G8KMW	2,450	308	AM51	100	DK5VF	575	10Y
2	G3BDQ	1,771	207	AK04	360	DF3BL	475	6Ω
3	G8IWA	1,565	189	ZN18	125	F1FBK	607	14P
4	G8JHL	1,325	205	YN39	249	F1EHY	525	16Y
5	G4CJG	1,049	122	ZO22	600	F1DPU/A	675	8S
6	G8LEF	951	136	ZN21	900	F1DPU/A	553	10P
7	GJ8ORH/A	947	90	YJ60	400	F1IC	668	10P
8	GM8MJV	830	86	YR80	—	G6GN	622	16Y
9	G3NAQ	702	160	ZL34	600	DB3KL	591	16Y
10	G8NRP	609	126	ZL24	150	ON8GB	504	2×9Y
11	G4CMU	538	151	ZL60	430	GD4GNH	440	8E
12	G8FUL	528	129	ZL58	160	PE1BTE	413	14E
13	G8IFT	527	115	YM50	700	G4CJG	250	8Y
14	G8MZV	487	102	YL10	150	GM8MJV	575	5Ω
15	G8PUB	477	145	AL32	33	DF1JC	450	8Y
16	G8KAX	473	135	AL32	95	F6CTT	417	6E
17	G8OPR	460	99	ZL63	190	G4CJG	384	6Ω
18	G4HLX	447	112	ZM41	550	GI4GVS	354	6S
	G3UFB	447	123	ZL19	290	GD4GNH	392	8Y
20	G8KWG	413	83	ZL32	312	F6CTT	396	8Y
21	G3LCH	404	140	ZL50	155	GI4GVS	540	10Y
22	G4GGV	396	125	ZL37	120	F6EOQ	370	10LY
23	G4EZT	360	128	ZL37	140	PE1CON	362	4Y
24	G4GSA	354	54	YK38	990	G8IWA	362	6Ω
25	G4EUR	353	77	YL50	350	F6CTT	370	8Y
26	G3XWZ	299	62	ZN64	470	GM8MJV	425	10Y
	G8LZP	299	69	YL10	150	GM3PXK	442	6Ω
28	G4FRK	295	50	YN05	20	G3BDQ	390	8Y
	GW4GXD	295	67	YN54	637	GM8MJV	435	10Y
30	G3FIJ	292	50	AL05	150	G4CJV	355	10LY
31	G4GZJ	286	95	ZM41	525	G8GPO	240	6Ω
32	G8IZD	280	74	ZL07	400	G4CJE	300	5XY
33	G8NNJ	274	98	AL31	60	F1EBK	300	5E
34	G4HHJ	272	52	YM77	240	G3BDQ	268	8Y
35	G3VJG	264	102	ZL40	440	F1DDA/P	297	10LY
36	G4HMF	255	40	AM76	320	DJ7CL	435	10Y
37	GW4EAI	250	52	YL25	720	F6CTT	435	6Ω
38	G8PDW	241	101	ZL49	88	G8JHL	260	4Ω
39	G4FDF	225	53	ZM39	10	G4CJG	248	8Y
40	G8DXD	215	52	YM69	122	G3BHW	265	8XY
41	G3XKZ	210	54	ZM53	200	G3BDQ	220	8S
42	G4GBA	177	40	AM76	65	G2SU/P	276	4Ω
43	G8ITS	153	85	ZL40	56	G8IWA	256	6Ω
44	G8NQP	148	38	ZL71	250	GD4GNH	396	H
45	G8AEE	147	31	YN19	600	G4DGA	290	6Y
46	G8CTT	144	56	AL41	240	G2SU/P	285	8Y
47	G8OMI	131	43	ZM41	470	G8OCN	205	4Ω
48	GM4HCO	99	15	—	—	G3FVA	—	8Y
49	G8IUY	93	49	ZL56	—	G4CMV	256	8Y
50	G4GJW	73	47	ZL40	50	G8CUL	109	4Ω

SECTION B

Posn	Callsign	Points	QSOs	QRA	ASL	Best dx	Km	Ant
1	G3ZIG	2,823	269	AM35	180	DG4ED	619	10Q
2	G3UNU	2,659	340	ZM04	250	F1CYB	674	2×16E
3	G8AWZ	2,314	210	AM07	125	DD0OB	597	10Q
4	G8CUL	1,898	258	ZL23	420	DF7KL	615	14LY
5	G8IQO	1,862	169	AK12	100	DJ6CA	570	14P
6	G4CMV	1,732	237	ZN32	850	DK5VF	670	5Y
7	G4DGA	1,618	274	ZL58	250	DB2EU	583	4×14E
8	G2SU/A	1,607	198	ZN11	1,200	F1BBI	635	16E
9	G4DEZ	1,323	219	ZL34	250	DL9GSA	590	2×16E
10	G3OUR	1,309	233	ZL14	100	DL9GSA	579	16E
11	G2PI	1,236	240	ZM14	—	DD1QS	564	4Q
12	G3OUL	1,082	160	YN46	150	F1DPU	525	14E
13	G3YMD/A	994	127	AL67	480	DK5VF	440	14P
14	G4DSP	814	139	ZM20	0	F1DPU	470	8Y
15	G4HRS/A	805	179	ZL80	450	F6CTT	405	10Y
16	G8PPS	787	111	AM55	130	GM3PXK	505	16E
17	G8FMG	773	167	ZM78	120	GI8JPG	430	16E
18	G8CSA/A	732	191	AL31	300	GI8EWM	526	2×14P
19	G8KUC	668	108	AL56	—	DJ0QZ	464	14P
20	G3IGQ	640	158	ZL68	200	G4CJG	392	14P
21	G2DYM	606	97	YK04	900	PA0AD	555	5S
22	GD4GNH	578	66	XO67	750	F1DPU	628	14P
23	G8NPO	574	159	ZL38	225	PA0JSL	380	10XY
24	G3UER	563	105	ZN35	50	F1EBK	560	8S
25	G4GCT	550	94	YL48	280	F1DPU/A	320	8Y
26	G4AOL/A	542	145	ZL46	—	F6DTE	323	8Y
27	G8OLI	503	157	ZL38	100	DF1JC	519	2×6Q
28	G4GTN	481	149	AL62	320	G2SU/A	325	6Q
29	G8KHN	465	75	ZK21	200	G4CJG	452	13Y
30	G8KQN	457	77	AK02	175	DB5JF	453	8Y
31	G8LVQ	453	93	ZN13	450	GM8MJV	359	6Q
32	G4FWC	448	108	ZM32	250	F1EBG	497	10Y
33	G8OCT	444	100	ZM74	400	GM8MJV	608	6Q
34	G8JVM	425	88	ZL31	400	F6CTT	460	2×6Q
35	G8LHR	375	91	ZM57	370	F1DPU/A	405	10P
36	G8PLY	338	66	YN19	850	GM8MJV	379	12E
37	G8GPO	319	49	ZO34	30	G6GN	350	14P
38	G8NYL	318	68	YN68	100	G3BHW	332	6Q
39	G8RAF	294	62	YL56	—	G4CJG	378	6Q
40	G8HTH/A	292	76	ZM41	425	G4CUS	232	10LY
41	G8JAY	290	74	YL10	140	G4CJG	312	16Y
42	G4CRA	269	70	AL15	—	F1DPU/A	—	6Q
43	G3FVA	262	58	YN49	100	GM8MJV	375	14Y
44	G8NMG	208	58	YN56	100	G3ZIG	290	8XY
45	G8NPF	196	94	AL31	196	G8LEF	248	5XY
46	G8GHR	180	46	ZM79	140	G4CJG	300	6Q
47	GM3PXK	118	17	YP11	500	G4DGA	525	10Q
48	GW6GW	78	26	YL25	700	F1DPU/A	335	10Y

Affiliated Societies Team Contest 1979 results

The popularity of any contest is gauged by the number of entries received, and the success of the ASTC has again been proven in this, its fourth year. By 31 January a total of 330 logs, representing 77 club entries, had landed on the writer's hall floor, and the postman's job satisfaction could only be restored by having his Christmas tip guaranteed—not just promised.

Just over 22,000 two-way contacts were completed, and the time taken for each QSO was under a minute—one QSO per kilohertz every 52s to be exact!

How ASTC has grown

	1976	1977	1978	1979
Number of club entries	51	51	61	77
Number of individual entries	230	218	291	330

The leaders

A close result this year with just 50 points separating the top two teams, although they showed a clear lead over the rest of the field. Congratulations to Stockport RS A team which retained the Edgware Trophy by winning for the second year running—G3WPF, G3NOM, G3PEK/A, G3FYE and G4BUX were again responsible for another consistent effort. The newly-formed East Barnet Amateur Radio Contest Group gained second place, despite losing one of its team for the last hour. Like Stockport, albeit with fewer cw enthusiasts, Cray Valley RS is another large club which, although 36th in 1978, arrested the hiccup and jumped to third place this year.

Other newcomers to the top 10 included Guildford & D RS, Verulam ARC and Gravesend RS, who replace White Rose RS, Maidstone YMCA ARS and Surrey Radio Contact Club in the seventh, eighth and tenth positions respectively.

The leading individual was G4FAM, of Cray Valley, with a checked score of 1,640 points, with G3WPF, last year's winner, being runner-up with 1,585 points.

Contests calendar

4–5 August	G-QRP Club QRP CW *(Rules in April issue)*
5 August	DF Qualifying Event Salisbury *(Rules in July issue)*
11–12 August	European Meteor Scatter *(Rules in May issue)*
11–12 August	European DX CW *(Rules in August issue)*
18–19 August	MARTS SEANET WW DX Phone *(Rules in June issue)*
18–19 August	9th SARTG Worldwide RTTY
19 August	70MHz *(Rules in June issue)*
19 August	DF Qualifying Event Slade *(Rules in July issue)*
25–26 August	All Asia CW *(Rules in June and August issues)*
1–2 September	IARU Region 1 VHF *(Rules in June issue)*
1–2 September	144MHz Open and SWL
1–2 September	SSB Field Day *(Rules in May issue)*
1–2 September	1st International for 28MHz Portable Stations *(Rules in August issue)*
8 September	BARTG VHF RTTY *(Rules in August issue)*
8–9 September	International ATV Activity *(Rules in April issue)*
8–9 September	European DX Phone *(Rules in August issue)*
15–16 September	Scandinavian Activity CW *(Rules in August issue)*
16 September	BARTG VHF RTTY *(Rules in August issue)*
16 September	RSGB Region 1 VHF *(Rules in July issue)*
16 September	DF Final Rugby
22 September	AGCW-DL VHF CW *(Rules in June issue)*
22–23 September	Scandinavian Activity Phone *(Rules in August issue)*
October–November	432/1,296MHz Cumulative
6–7 October	VK/ZL Oceania DX Phone *(Rules in August issue)*
6–7 October	IARU Region 1 UHF/SHF *(Rules in June issue)*
6–7 October	G-QRP Club QRP CW *(Rules in April issue)*
6–7 October	432/1,296/2,304MHz
13–14 October	VK/ZL Oceania DX CW *(Rules in August issue)*
14 October	21/28MHz *(Rules in May issue)*
21 October	70MHz Fixed
21 October	21MHz CW *(Rules in July issue)*
3–4 November	144MHz CW
10–11 November	2nd 1·8MHz
10–11 November	Esperanto Contest (ILERA). *(Details from G4MR QTHR.)*
17 November	All Austria 1979
24–25 November	BATC SSTV
2 December	144MHz
1980	
2–3 February	7MHz Phone *(Rules in June and July issues)*
23–24 February	7MHz CW *(Rules in June and July issues)*

Equipment

It was a foregone conclusion that Japanese equipment would again dominate the scene, but the extent of its popularity was only fully realized when a survey of gear used was completed. Of the rigs used, 186

G3PZF keeping fingers crossed that signals are being read, during the Affiliated Societies Team Contest. Several years of inactivity on the key called for generous use of QRS and QSZ, but a few points were gained to add to the Verulam ARC score

were Japanese, 86 British and 41 American, while 14 of the remainder were homebrew. On the antenna side, 70 per cent of entrants opted for the "tried and tested" dipole; verticals and long wires also figured quite highly.

Logs

As usual, the majority of logs were legible and well presented. The writer was amused by some of the "running commentaries" written at the side of contacts—one entrant evidently took much care in doing this, as he promptly forgot to indicate the duplicates! Failure to copy callsigns correctly led to considerable points loss, such as the misreading of the numeral three for four and vice versa; even the appearance of six G7 callsigns in one log did not go unnoticed! Unmarked duplicates exacted heavy penalties once again, and entrants are reminded that *four* times the contact value is deducted where duplicates are not marked.

Due to the high entry this year, the ASTC bonus could be confirmed 99 per cent of the time by the corresponding log, and scores overall have increased accordingly.

SOCIETY TOTALS

Posn	Society	Total	Stations contributing to score					Number of entries
1	Stockport RS (A)	6,575	G3WPF	G3NOM	G3PEK/A	G3FYE	G4BUX	5
2	East Barnet AR Contest C	6,525	G3RTE	G3YDX	G3XTJ	G3TLX	G3UGK	5
3	Cray Valley RS (A)	5,905	G4FAM	G4BXT	G3XRX	G3RZP	G2MI	5
4	Addiscombe ARC	5,805	G3UFY	G3RQZ	G3SJX	G4CDY	G4ALE	5
5	Government Communications ARC (A)	5,485	G3SSO	G8DV	G3FXA/P	G3MZV/P	G2HDU	5
6	Crawley ARC	5,480	G3TIR	G3JKF	G3YVR	G3GRO	G3MGL	7
7	Guildford & D RS	5,370	G3KMO	G6GS	G3IAF	G3SYM	G3PJX	9
8	Verulam ARC (A)	5,170	G4AFS/A	G4DUS	G3JKS	G4BOU	G3JKB	5
9	Bracknell ARC	4,955	G4ALG/A	G3YMC/A	G4DDL	G3XVR/P	G4AUC/A	6
10	Gravesend RS	4,920	G3OHP	G4BUO	G3DCV	G3JLB	G3ORC	5
11	Surrey Radio Contact C	4,895	G3BFP	G3IAS	G6LX	G3EUE	G4FUU	8
12	Leicester Polytechnic ARS	4,845	G3SDC	G4FIE	G3ORY	G4EWT/A	G3RIR	6
	Shefford & D RS	4,845	G3FJE	G4DRS	G4GIR	G4GJM	G2DPQ	6
14	Hereford ARS (A)	4,775	G3HVX	G4CNY	G4HKF	G3WRQ	G3ESY	5
15	Grimsby ARS (A)	4,105	G4DVP	G3VIP	G2AJB/A	G3HTI/A	G4EBK	5
16	White Rose RS (A)	4,050	G3PSM	G3ZBA	G3YEE	G4FIM	G3WSZ	5
17	Stockport RS (B)	3,980	G3KAF	G3SNX	G4HIU	G3RUG	G4ECI	5
18	Martlesham RS (A)	3,955	G3RPB	G3RHP	G3YCY	G3TZE	G3ZNU	5
19	Norfolk ARC	3,785	G3LDI	G3TMA	G3OGE	G4GVR	G3IOR	8
20	RNARS Portsmouth	3,666	G3JFF	G3LIK	G3JZV	G3IFF		4
21	Leicester RS	3,540	G4ERT	G4CWY	G3PBC	G4GVC	G3HYH	6
	Maidenhead & D ARC	3,540	G3WYK	G3FVC	G3TWG	G4GGV	G3ZLQ/A	6
23	Thames Valley ARTS	3,530	G3JEQ	G3OGP	G3AIV	G3GHS	G2KI	6
24	Echelford ARS	3,395	G3KKQ	G3MCK	G3ZXA	G2FNK	G4CNN	6
25	Plessey Nottingham RC	3,375	G3SJJ	G3ZIX	G4CBQ			3
26	Horsham ARC	3,325	G3TNO	G4FUP	G3SWC	G3PYC		4
27	Edgware & D RS	3,250	G3VW	G3GC	G3SJE	G3SHY		4
28	Sutton & Cheam RS	3,235	G3DNJ	G2DMR	G4CWH	G4EOI		4
29	Glenrothes & D ARC	3,010	GM3ZSP	GM4ALK	GM4EJI	GM3PFQ	GM4FSF	6
30	Oxford & D ARS	2,970	G4AZN	G3ZZR	G4CYV	G3JLE	G8IB	6
31	Cardiff RSGB Group	2,770	GW3NJW	GW3GHC	GW5BI/A	GW3UTE	GW3LAD	5
32	Southdown ARS	2,760	G3SJV	G3WQK	G3KLX	G8SC	G3YYF	5
33	RNARS *HMS Belfast*	2,710	G4HMS	G4FRN	G3PZP	G3TKO	G3OZY	5
34	Grimsby ARS (B)	2,655	G3IYT	G3RSD	G3ZSF/A	G4FMW	G4GAB	6
35	Maidstone YMCA ARS	2,650	G3ZSU/A	G3ORH	G4GIK	G4GFU		4
36	Conway Valley RS	2,605	GW3GRY	GW3MDK	GW3JI	GW3HGL	GW3YLZ	5
37	Stourbridge & D ARS	2,570	G6OI	G4GME	G4IP	G3KZG		4
38	Scarborough ARS	2,520	G4FLM	G4BP/A	G3CAA	G3LCG/A		4
39	Bangor & D ARS	2,440	GI3TLT	GI3SXG	GI4CIE	GI3KDR	GI3GAL	5
40	Bury RS	2,395	G3BRS/A	G4FOT	G4GOM	G4FQE	G4FKZ	5
41	Guernsey ARS	2,185	GU5CIA	GU3HFN	GU4EON			3
42	Dunstable Downs RC	2,080	G4ENA	G3HJF	G3BLP			3
43	Farnborough & D RS	1,995	G3VAA	G3MKG	G4FON	G3TMQ		4
44	Swansea ARS	1,975	GW3OAY/A	GW3INW	GW4BIQ			3
45	Reigate ATS	1,955	G3BBR/A	G3ZRF	G4DMO			3
46	Government Communications ARC (B)	1,945	G3SNN	G3LEJ	G3AGF			3
47	Aberdeen ARS (A)	1,915	GM3DZB/P	GM3ZBE	GM3BSQ	GM3VEY	GM4FDD	5
48	Crawley Court AR Group	1,900	G3OGY	G3LMH	G3HRH	G4HHZ	G3BEZ	5
49	RNARS Yeovilton	1,895	G2KV	G3BEC	G4DVK	G3CMH	G4DEP	6
50	Leyland Hundred AR Group	1,785	G3JMZ	G3HKU	G3VYV	G3XII	G3WYY	5
51	Coulsdon ATS	1,760	G3ZMF	G3FTQ	G6HC	G4FIT		4
52	Hereford ARS (B)	1,730	G3RJB	G4FFD	G4GMO	G4FCA		4
53	Reading ARC	1,725	G3WGV	G4ELY				2
54	Stockport RS (C)	1,620	G4FAS	G4GRU	G4BJU	G3RZJ	G4FTP	5
55	Hornsea & D ARS	1,545	G3ZRS	G4CHH				2
	Merthyr Tydfil ARC	1,545	GW3MPB	GW4FXF				2
57	Verulam ARC (B)	1,480	G3YLG/A	G4COZ	G3VSQ	G2AIA	G3WFM	6
58	Clifton ARS	1,380	G4DBW	G3JKY				2
59	Bromsgrove & D ARC	1,245	G4AAL	G2CLN	G3NOY			3
60	Kingsway Technical College ARC	1,175	GM3ZXE	GM4CUZ	GM4BAG			3
61	SE Kent YMCA RC	1,150	G3OWQ	G3MLO	G3YXX	G4EGQ	G3YMD	5
62	Torbay ARS	1,145	G4ELZ	G3LHJ	G3SNU			3
63	White Rose RS (B)	1,140	G3XEP	G3FCW	G4FKS	G4HSZ		4
64	RNARS Rosyth	1,115	GM3KPD	GM3UM	GM4DQK			3
65	Cray Valley RS (B)	940	G3IMK	G3SXE				2
	Dumfries & Galloway RC	940	GM3WOJ	GM3MSG	GM3KEL			3
67	Macclesfield & D RS	920	G3LDT	G4FPJ				3
68	Haverhill & D RC	785	G3TWX	G3XZY				2
69	RNARS Faslane	690	GM4GIF	GM4ELV	GM4FVQ			3
70	RNARS Chatham	670	G4CZD	G3WP				2
71	Lincoln SWC	655	G3ZDW					1
72	Martlesham RS (B)	490	G4EVN	G3ZQU				2
73	RNARS Plymouth	395	G3VNG	G6UR				2
74	Stockport RS (D)	335	G4FFW	G3DNX	G3NUQ			3
75	South Birmingham RS	330	G4EYD					1
76	Aberdeen ARS (B)	210	GM4BKV	GM4DSZ	GM4CHX	GM4GYR	GM4HIG	5
77	RNARS Culdrose	155	G3GQS					1

Check logs acknowledged, with thanks, from G3LCS, G4GBA and GW4EVL.

INDIVIDUAL SCORES

Posn	Callsign	Score	Society
1	G4FAM	1,640	Cray Valley RS (A)
2	G3WPF	1,585	Stockport RS (A)
3	G3SJJ	1,530	Plessey Nottingham RC
4	G3FJE	1,525	Shefford & D RS
5	G3NOM	1,520	Stockport RS (A)
6	G3RTE	1,510	East Barnet ARCC
7	G3SSO	1,470	Govt Comms ARC (A)
8	G3YDX	1,410	East Barnet ARCC
9	G3PEK/A	1,375	Stockport RS (A)
10	G3UFY	1,370	Addiscombe ARC
11	G3RQZ	1,365	Addiscombe ARC
12	G3KMO	1,350	Guildford & D RS
13	G3OHP	1,335	Gravesend RS
	G3SDC	1,335	Leicester Poly ARS
15	G3BFP	1,305	Surrey Radio Contact C
16	G3XTJ	1,300	East Barnet ARCC
17	G3KKQ	1,290	Echelford ARS
18	G4BXT	1,285	Cray Valley RS (A)
19	G3TIR	1,275	Crawley ARC
20	G3LDI	1,265	Norfolk ARC
21	G3SJX	1,260	Addiscombe ARC
22	G3IAS	1,255	Surrey Radio Contact C
23	G4AFS/A	1,245	Verulam ARC (A)
24	G4HMS	1,240	RNARS *HMS Belfast*
25	G3RPB	1,230	Martlesham RS (A)
26	G8DV	1,225	Govt Comms ARC (A)
27	G4BUO	1,220	Gravesend RS
28	G3TLX	1,215	East Barnet ARC C
29	G4ALG/A	1,205	Bracknell ARC
30	G3PSM	1,200	White Rose RS (A)
	G3YMC/A	1,200	Bracknell ARC
32	G3HVX	1,190	Hereford ARS (A)
33	G3TMA	1,185	Norfolk ARC
34	G6GS	1,180	Guildford & D RS
35	G4DDL	1,175	Bracknell ARC
36	G3JKS	1,170	Verulam ARC (A)
37	G4CNY	1,165	Hereford ARS (A)
38	G4DRS	1,150	Shefford & D RS
39	GW3NJW	1,145	Cardiff RSGB Group
40	G4DUS	1,140	Verulam ARC (A)
41	G3XRX	1,125	Cray Valley RS (A)
	G6LX	1,125	Surrey Radio Contact C
43	G3DCV	1,120	Gravesend RS
44	G3ZIX	1,110	Plessey Nottingham RC
45	G3JKF	1,095	Crawley ARC
46	G3UGK	1,090	East Barnet ARCC
47	G3JFF	1,085	RNARS Portsmouth
48	G3FYE	1,075	Stockport RS (A)
	GW3OAY/A	1,075	Swansea ARS
50	G3LIK	1,065	RNARS Portsmouth
51	G3DNJ	1,060	Sutton & Cheam RS
	G3YVR	1,060	Crawley ARC
	G3ZRS	1,060	Hornsea & D ARS
54	G4CDY	1,055	Addiscombe ARC
	GM3ZSP	1,055	Glenrothes & D ARC
56	G3GRO	1,050	Crawley ARC
	G4GIR	1,050	Shefford & D RS
58	G3TNO	1,040	Horsham ARC
59	G3IAF	1,035	Guildford & D RS
60	G3FXA/P	1,025	Govt Comms ARC (A)
61	G2DMR	1,020	Sutton & Cheam RS
	G4BUX	1,020	Stockport RS (A)
63	G3RZP	1,015	Cray Valley RS (A)
	G3VAA	1,015	Farnborough & D RS
	G3WYK	1,015	Maidenhead & D ARC
	G4FIE	1,015	Leicester Poly ARS
67	G3WGV	1,010	Reading ARC
	G3ZSU/A	1,010	Maidstone YMCA ARS
69	G3MGL	1,000	Crawley ARC
	G4FUP	1,000	Horsham ARC
71	G3JEQ	990	Thames Valley ARTS
	G4AZN	990	Oxford & D ARS
73	G4AAL	975	Bromsgrove & D ARC
74	GW3MPB	970	Merthyr Tydfil ARC
75	G3ORY	960	Leicester Poly ARS
76	G3TR	955	Crawley ARC
	G4ERT	955	Leicester RS
78	G3KAF	950	Stockport RS (B)
79	G3FVC	945	Maidenhead & D ARC
	G3VW	945	Edgware & D RS
	G4ENA	945	Dunstable Downs RC
	G6OI	945	Stourbridge & D ARS
83	G3JZV	940	RNARS Portsmouth
84	G3RHP	925	Martlesham RS (A)
	G3SYM	925	Guildford & D RS
	G4BOU	925	Verulam ARC (A)
87	G3SJV	920	Southdown ARS
88	G3MZV/P	915	Govt Comms ARC (A)
	G4CWH	915	Sutton & Cheam RS
90	G4GJM	900	Shefford & D RS
91	G3GC	885	Edgware & D RS
92	G3PJX	880	Guildford & D RS
	G3SWC	880	Horsham ARC
	G3ZBA	880	White Rose RS (A)
	G4DVP	880	Grimsby ARS (A)
96	G3SJE	870	Edgware & D RS
	G3SNX	870	Stockport RS (B)
98	G3BBR/A	865	Reigate ATS
99	G4HIU	860	Stockport RS (B)
100	G4HKF	855	Hereford ARS (A)
	G6RC	855	Crawley ARC
102	G2HDU	850	Govt Comms ARC (A)
103	G2MI	840	Cray Valley RS (A)
	G3VIP	840	Grimsby ARS (A)
	G3ZZR	840	Oxford & D ARS
106	G2AJB/A	835	Grimsby ARS (A)
107	G3ORH	825	Maidstone YMCA ARS
	G3SNN	825	Govt Comms ARC (B)
109	G3WRQ	820	Hereford ARS (A)
	G4EWT/A	820	Leicester Poly ARS
111	G4GME	815	Stourbridge & D ARS
112	G3HTI/A	810	Grimsby ARS (A)
	GU5CIA	810	Guernsey ARS
114	G2KV	805	RNARS Yeovilton
	G3OGP	805	Thames Valley ARTS
	G4FLM	805	Scarborough ARS
	GW3GRY	805	Conway Valley RS
118	G3JLB	800	Gravesend RS
	G4CWY	800	Leicester RS
120	GM3WOJ	795	Dumfries & Galloway RC
121	G3EUE	790	Surrey Radio Contact C
	G3RUG	790	Stockport RS (B)
123	G3LEJ	780	Govt Comms ARC (B)
124	G3OGY	775	Crawley Court AR Group
	G3YEE	775	White Rose RS (A)
126	GW3INW	765	Swansea ARS
127	G3YCY	760	Martlesham RS (A)
128	G4ALE	755	Addiscombe ARC
129	G3ESY	745	Hereford ARS (A)
	G3XVR/P	745	Bracknell ARC
131	G3TWG	740	Maidenhead & D ARC
	G4EBK	740	Grimsby ARS (A)
	G4GIK	740	Maidstone YMCA ARS
	GU3HFN	740	Guernsey ARS
135	G4CBQ	735	Plessey Nottingham RC
	G4DBW	735	Clifton ARS
137	GI3TLT	730	Bangor & D ARS
138	GW3GHC	725	Cardiff RSGB Group
139	G4IP	720	Stourbridge & D ARS
140	G3RIR	715	Leicester Poly ARS
	G4ELY	715	Reading ARC
142	G3HJF	705	Dunstable Downs RC
143	G3PBC	695	Leicester RS
	G4BP/A	695	Scarborough ARS
145	G3JKB	690	Verulam ARC (A)
146	G3IYT	680	Grimsby ARS (B)
	G4ELZ	680	Torbay ARS
148	G3MCK	660	Echelford ARS
149	G3ZDW	655	Lincoln SWC
150	G3JKY	645	Clifton ARS
	G5OD	645	Guildford & D RS
152	G3BRS/A	640	Bury RS
153	GU4EON	635	Guernsey ARS
154	G4AUC/A	630	Bracknell ARC
155	G3ZXA	625	Echelford ARS
156	G3RJB	620	Hereford ARS (B)
	GW5BI/A	620	Cardiff RSGB Group
158	G3RSD	615	Grimsby ARS (B)
	G3ZMF	615	Coulsdon ATS
160	G3AIV	610	Thames Valley ARTS
	G3TZE	610	Martlesham RS (A)
	G4GVC	610	Leicester RS
163	G3FTQ	605	Coulsdon ATS
	G4FIM	605	White Rose RS (A)
	G4FRN	605	RNARS *HMS Belfast*
166	G3JMZ	600	Leyland Hundred ARG
167	G3CAA	595	Scarborough ARS
168	G3WSZ	590	White Rose RS (A)
	GM4ALK	590	Glenrothes & D ARC
170	G3GHS	580	Thames Valley ARTS
	G3IMK	580	Cray Valley RS (B)
	GI3IFF	575	RNARS Portsmouth
172	G3ZRF	575	Reigate ATS
	G4FFD	575	Hereford ARS (B)
	GW4FXF	575	Merthyr Tydfil ARC
176	G3PZP	570	RNARS *HMS Belfast*
177	G3YHG	565	Bracknell ARC
	G3ZSF/A	565	Grimsby ARS (A)
	GW3MDK	565	Conway Valley RS
180	GI3SXG	555	Bangor & D ARS
181	G3SHY	550	Edgware & D RS
	G3ZDD	550	Guildford & D RS
183	G2KI	545	Thames Valley ARTS
	G3WQK	545	Southdown ARS
185	G3KLX	535	Southdown ARS
	G3OGE	535	Norfolk ARC
	GM3KPD	535	RNARS Rosyth
188	G2FNK	525	Echelford ARS
189	GW3JI	520	Conway Valley RS
190	G3LDT	515	Macclesfield & D RS
	G4DMO	515	Reigate ATS
	G4FOT	515	Bury RS
193	G4ECI	510	Stockport RS (B)
194	GM4EJI	500	Glenrothes & D ARC
195	G4FMW	490	Grimsby ARS (B)
	G4GVR	490	Norfolk ARC
	GM3ZXE	490	Kingsway Tech ARC
198	G3TWX	485	Haverhill & D RC
	G3XEP	485	White Rose RS (B)
	G4CHH	485	Hornsea & D ARS
	GI4CIE	485	Bangor & D ARS
202	G3HKU	480	Leyland Hundred ARG
	G3HYH	480	Leicester RS
	G3YLG/A	480	Verulam ARC (B)
	GM3DZB/P	480	Aberdeen ARS (A)
206	G3MKG	475	Farnborough & D RS
207	GM4CUZ	470	Kingsway Tech ARC
208	G4CYV	465	Oxford & D ARS
	G4GGV	465	Maidenhead & D ARC
210	GM3UM	460	RNARS Rosyth
211	G3BEC	455	RNARS Yeovilton
212	G4FAS	450	Stockport RS (C)
213	G3ORC	445	Gravesend RS
	GM3PFQ	445	Glenrothes & D ARC
	GM3ZBE	445	Aberdeen ARS (A)
216	GM3BSQ	440	Aberdeen ARS (A)
	GM4GIF	440	RNARS Faslane
218	G3LMH	435	Crawley Court AR Group
	G4CQZ	435	Verulam ARC (B)
220	G3BLP	430	Dunstable Downs RC
	G3FCW	430	White Rose RS (B)
	G3ZNU	430	Martlesham RS (A)
	G4CZD	430	RNARS Chatham
	G4GOM	430	Bury RS
225	G3JIP	425	Thames Valley ARTS
	G3LCG/A	425	Scarborough ARS
	G8SC	425	Southdown ARS
228	G4FUU	420	Surrey Radio Contact C
	GM4FSF	420	Glenrothes & D ARC
230	G3OWQ	415	SE Kent YMCA RC
	G4EVN	415	Martlesham RS (B)
232	G4FQE	410	Bury RS
233	G3PYC	405	Horsham ARC
	G4FPJ	405	Macclesfield & D RS
235	G4FKZ	400	Bury RS
	GW3HGL	400	Conway Valley RS
237	G3LHJ	395	Torbay ARS
238	G3ZJS	375	Leicester RS
	G3ZLQ/A	375	Maidenhead & D ARC
	G4GRU	375	Stockport RS (C)
241	G4DVK	370	RNARS Yeovilton
	GM3VEY	370	Aberdeen ARS (A)
243	G3JLE	365	Oxford & D ARS
244	G3SXE	360	Cray Valley RS (B)
245	G3MLO	355	SE Kent YMCA RC
	G3VYV	355	Leyland Hundred ARG
247	GI3KDR	350	Bangor & D ARS
248	G3AGF	340	Govt Comms ARC (B)
	G6HC	340	Coulsdon ATS
250	G3YYF	335	Southdown ARS
	G4BJU	335	Stockport RS (C)
	G4DWE	335	Guildford & D RS
253	G4EYD	330	South Birmingham RS
254	GI3GAL	320	Bangor & D ARS
255	GW3YLZ	315	Conway Valley RS
256	G3IOR	310	Norfolk ARC
	G4GMO	310	Hereford ARS (B)
	G8IB	310	Oxford & D ARS
259	G3HRH	305	Crawley Court AR Group
	G4GAB	305	Grimsby ARS (B)
261	G3XZY	300	Haverhill & D RC
262	G4CNN	295	Echelford ARS
263	G3VNG	290	RNARS Plymouth
264	G3VSQ	285	Verulam ARC (B)
265	G4FON	280	Farnborough & D RS
266	G3MPN	275	Norfolk ARC
	G3RZJ	275	Stockport RS (C)
268	G4BNT	260	Grimsby ARS (B)
269	G3WP	240	RNARS Chatham
	G4EOI	240	Sutton & Cheam RS
	G4EOL	240	Norfolk ARC

Posn	Callsign	Score	Society
272	G3CMH	230	RNARS Yeovilton
273	G3TMQ	225	Farnborough & D RS
	G4FCA	225	Hereford ARS (B)
275	G2AIA	220	Verulam ARC (B)
	G2DPQ	220	Shefford & D RS
	G5CMX	220	Maidenhead & D ARC
278	G4HHZ	215	Crawley Court AR Group
	GM4BAG	215	Kingsway Tech ARC
280	G4FIT	200	Coulsdon ATS
281	G3AHB	190	Echelford ARS
	G3BLS	190	Oxford & D ARS
283	G3YXX	186	SE Kent YMCA RC
	G4FTP	185	Stockport RS (C)
285	G3TKO	180	RNARS *HMS Belfast*
	G3XII	180	Leyland Hundred ARG
	GM4FDD	180	Aberdeen ARS (A)
288	G2CLN	175	Bromsgrove & D ARC
	G4DYC	175	Norfolk ARC
	GM4BKV	175	Aberdeen ARS (B)
	GM4BRM	175	Glenrothes & D ARC
292	G3BEZ	170	Crawley Court AR Group
	G3WYY	170	Leyland Hundred AR
	G4FKS	170	White Rose RS (B)
295	G4BCY	165	Guildford & D RS
296	G3GQS	155	RNARS Culdrose
	G4EGQ	155	SE Kent YMCA RC
	G4FFW	155	Stockport RS (D)
	G8TB	155	Surrey Radio Contact C
	GW3UTE	155	Cardiff RSGB Group
301	G3DNX	150	Stockport RS (D)
	GM4ELV	150	RNARS Faslane
303	G3FWR	140	Surrey Radio Contact C
	G4ARI	140	Leicester Polv ARS
305	GW4BIQ	135	Swansea ARS
306	GW3LAD	125	Cardiff RSGB Group
307	GM4DOK	120	RNARS Rosyth
308	G3OZY	115	RNARS *HMS Belfast*
309	G6UR	105	RNARS Plymouth
310	G3MCX	100	Surrey Radio Contact C
	GM4FVQ	100	RNARS Faslane
312	G3NOY	95	Bromsgrove & D ARC
	G4EYR	95	Shefford & D RS
314	G3KZG	90	Stourbridge & D ARS
315	GM3MSG	80	Dumfries & Galloway RC
316	G3ZQU	75	Martlesham RS (B)
	G4GFU	75	Maidstone YMCA ARS
318	G3SNU	70	Torbay ARS
319	GM3KEL	65	Dumfries & Galloway RC
320	G3WFM	60	Verulam ARC (B)
321	G4HSZ	55	White Rose RS (B)
322	G3PZF	50	Verulam ARC (B)
323	G3YMD	40	SE Kent YMCA RC
324	G4DEP	35	RNARS Yeovilton
325	G3NUQ	30	Stockport RS (D)
	G4FYT	30	RNARS Yeovilton
327	GM4DSZ	15	Aberdeen ARS (B)
328	GM4CHX	10	Aberdeen ARS (B)
329	GM4GYR	5	Aberdeen ARS (B)
	GM4HIG	5	Aberdeen ARS (B)

A few more facts and figures

	1976	1977	1978	1979
Winning club score	4,191	5,488	6,442	6,575
Leading individual score	1,155	1,403	1,592	1,640
Number of stations scoring over 1,000 points	16	29	45	70

Ir. conclusion

No change in the rules is envisaged by the HF Contests Committee after yet another successful club contest. Indeed, if present trends continue, an extension of the cw segment of 3·5MHz would appear necessary by 1980! Entrants are thanked for their support and comments. The next ASTC will be on 13 January 1980. *G4FAM*

Note: As G4FAM both adjudicated this year's ASTC and won the individual listing, his log was double checked by another member of the HF Contests Committee, Ron Glaisher, G6LX.

11th BARTG VHF/UHF Contest rules

1. Duration. 1800-2300gmt Saturday 8 and 0700-1200gmt Sunday 16 September 1979.

2. Bands. 144 and 432MHz. Crossband contacts, and contacts via a repeater or satellite, will not be valid.

3. Operators. Licensed amateur radio stations within Zones 14 and 15 who are permitted to use rtty as a mode of communication. Portable operation is allowed but must be from one location or within one kilometre for the whole of the contest. Contest logs from swls will also be welcomed.

4. Contacts. Stations may not be contacted more than once on any one band during the entire period of the contest, but an additional contact may be attempted with the same station if the other band is used.

5. Messages. Messages shall consist of the following:

(a) Time of start of contact, in gmt, to consist of a full four-figure group. The use of the expressions "Same" or "Same as yours" are not permitted.

(b) RST report. Normal three-figure group.

(c) Message number. This will consist of a three-figure number starting from 001 for the first contact made, and consecutive from this number, irrespective of the band in use. Numbers will continue in sequence throughout the total period of the contest.

(d) QRA locator (normal five-symbol locator) is preferred, or QTH given either as a town or as a bearing and distance, in kilometres, from a town (max 25km). The town must be identifiable on a 1:500,000 tourist or route planning map.

6. Scoring. All two-way rtty contacts will score in accordance with the distance chart below. Each band must be scored separately. There will be no multipliers applied to the scores from the two bands; positions will be calculated as a proportion of the band leader's total points for that band, and overall dual band totals will apply by the addition of the proportions; eg if a station wins one band and has 50 per cent of the leader's score on the other band, his total will be 150 out of a possible maximum 200.

Proof of contact may be required in certain cases where the station worked does not appear in any other contest log received.

As part of the contest is being run concurrently with the IARU Region 1 rtty contest, logs for submission to this contest shall be scored at one point per kilometre. All entries for the IARU contest should *NOT* be sent to BARTG but to each country's national organizer. Thus, only UK entries for the IARU contest should be sent to BARTG.

Distance chart

0- 50km scores 1 point	250-300km scores 11 points
50-100km scores 3 points	300-350km scores 13 points
100-150km scores 5 points	350-400km scores 15 points
150-200km scores 7 points	400-450km scores 17 points
200-250km scores 9 points	450-500km scores 19 points

and *pro rata* on 50km circles

7. Logs. Each band shall be entered on separate A4 size log sheets and be accompanied by a cover sheet similar to the form 427. In addition, a summary sheet should accompany the entry to summarize multi-band or single-band entries. The log entry shall contain: date, time of start of contact, RST report sent, message number, time received, callsign of station worked, his RST and message number (these may be combined, eg 599001), QRA and/or QTH received, estimated distance and points claimed. It will be helpful if the entrant's own QRA is included at the top of every log sheet.

8. Awards. Certificates will be awarded to the top scorers and runners-up in each of the following sections:
(1) Single-operator stations, UK and Europe
(2) Multi-operator stations, UK and Europe
(3) Short wave listeners, UK and Europe
} see additional note (d)

The judges' decision will be final and no correspondence can be entered into in respect of entries or logs received after the closing date for entries.

All logs must be postmarked no later than Saturday 13 October to qualify
Send logs to BARTG VHF/UHF Contest Manager, Chris Plummer, G8APB, 148 Porter Road, Brighton Hill, Basingstoke, Hants RG22 4JT, England.

Additional notes.

(a) In order to achieve maximum compatability and to implement IARU recommendations, speed of 45·45 bauds and CCIT 2 code (standard Murray code) should be used, although other speeds and codes may be used (if you can find anyone to work).

(b) To avoid confusion and congestion around the recognized rtty calling frequencies, and to make more effective use of the bands, the use of vfo operation by participating stations is encouraged.

(c) Stations who are crystal controlled are recommended to announce the fact when calling CQ.

(d) Single-operator stations may be fixed or portable but must be set up and operated by one operator only, otherwise entry must be made under the multi-operator section.

obituaries

The Society records with regret the deaths of the following radio amateurs:

Mr W. E. C. Bensley, G2UN, on 26 May 1979;
Mr F. P. Guthberlet, G3JLJ, on 7 April;
Mr A. Homer, RS38315, in December 1977;
Mr H. Keeves, G3CVS, on 24 March.

Looking ahead

9 September—IoW Get-together, Alverstone Manor, Shanklin, IoW.
15 September—RSGB HF Convention, Birmingham.
22 September—Scottish VHF Convention, Dundee Technical College, Dundee.
30 September—Sixth Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent.
12-14 October—World Association of Christian Radio Amateurs and Listeners Conference, Willersley Castle, Derbyshire. Details from: WACRAL Secretary, 13 Ferry Road, Warme, Hull HU7 5XU.
13 October—EI/GI Convention, Ballymascanlon Hotel, Dundalk, Eire.
8-10 November—Amateur Radio Retailers Association National Amateur Radio Exhibition, Granby Halls, Leicester.

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 75p (stamps not accepted) 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 1979; **30 Aug, 27 Sept, 25 Oct, 22 Nov, 27 Dec.** No guarantee of inclusion in a specific issue can be given, other than the first possible issue after receipt.

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.

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS.

Do not post to RSGB HQ or Advertising Representative

FOR SALE

KW trap dipole (G8KW), 80-10m, balun, good cond, reason for sale—lack of space, £15. Prefer buyer collects or pays carr. G3SWP, QTHR.

IC22A, fitted 15ch, S16-24, R3-8, xtal toneburst, mic, mobile mount, handbook, spare mic insert and audio output ic, exc cond, perfect wkg order, £155. P. Martin, "Oakcroft", Kingston Lane, Preston, Sussex. Tel Rustington 73145.

SB401 tx, SB303 rx, separates, in superb cond physically and electronically, together or separately, offers. G5AVA, QTHR. Tel 051-677 5409.

Yaesu FR101 rx, 160-2m, mint cond, £325. 14AVQ vertical trap antenna, C5/2M 2m colinear, both two months old. *Wanted:* tower, approx 58ft. Tel Russ, Leicester (0533) 899958.

Multi 800D, exc wkg order, 25W, digital, memo box, etc, £250. Roberts, 6 Seaburn Drive, Houghton-le-Spring, Tyne & Wear. Tel 0783 843563.

KW202 rx, matching spkr, handbook, £150. G3XSA, QTHR. Tel 01-529 3518.

FT101 Mk2, 10/160, fan, cw filter, spare o/p valves, £295. Tel Parbold 2412 (Wigan).

Shure 444 mic, £20 ono. GW3YTL, QTHR. Tel Knighton (Powys) 528030, evenings.

Racal RA17L, side-band adapter RA63, as new, in Imhof case, handbooks, £400. Racal drive unit MA79G, in Racal desk cabinet 21in high, £200. G3UWD, QTHR. Tel 07782 2498.

Trio JR599 custom special, used little, £165 ono. Realistic DX160 gen cov rx, new, cost £130, £95 ono. L. D. Ireland, 16 Cathebedrow Road, Carnhell Green, Camborne, Cornwall TR14 0NA. Tel Praze 236.

TRS80 computer level 2, 4k ram keyboard unit only, use a tv, incl all manuals, £265. *Wanted:* AM10D on 2m, why? G4GKB, QTHR. Tel Warwick (0926) 43868.

Three Ultra Cub hi-band fm hand-sets, charger, batteries, will modify 2m, the lot, £150 ono. Homebrew 2m QQVO6-40 linear, tuned lines, 100W plus out, £40 ono. G3CON, QTHR. Tel Cheltenham 514357.

Joybeam TAS 5/8 mobile antenna, £7. Telford 2m converter, i.f. 28-30MHz, £9. G8JBK, QTHR. Tel Grays Thurrock 70074.

FDK Multi 800D synthesized 2m fm tx/rx, 1-25W o/p, mic frequency up/down control, comp, in orig box, mobile mount, handbook, service manual, £240 ono. Tel Storrington (Sussex) 3982.

NAG144 linear amp, as new, £370. Multi 2700 all mode 2m tx/rx, as new, £330. Emotator 1103MXX hd rotator, as new, £140. 2m 10-el crossed Yagi, £20. Jaybeam 2m colinear antenna, as new, £22. G4EPN, QTHR. Tel Sapcote 3404.

TS510 tx, scruffy and faulty but TLC would put it right, first £100. Buyer collects. G3KVM, QTHR.

IC202, xtals for 144·0-144·6 and 144·8-145·0, good cond, £125. EC10 Mk1 S-meter fm detector, £45. 70cm 46-el multibeam, £7.50. G8ADP, QTHR. Tel Alton 62316.

Swan 350C tx/rx, 400W p.e.p., new pa, psu, vgc, £300. Avo 8, Mk3, clean, £30. Wier 500 Mk3 dvm, £20. Avo transistor analyser, batt powered, £20. G4HLM, QTHR. Tel 01-952 0665, after 6pm.

Holiday hotel, 100yd Blackpool cliffs and Queens Promenade, comp shack, 60ft tower, 2-el 40m and 4-el 20m Yagis, 160 dipole, ideal location, sun and tv lounges, residential licence. G3TSL, Bryngarth Private Hotel, 26 Shaftesbury Avenue, Blackpool North Shore. Tel (0253) 52453.

FT200, FP200, all 10m xtals, as new, £230. G3GJX electronic keyer, built from Doram kit, £7.50. Home-made 4m valve transverter and transistor converter, £15. G3NKL, QTHR. Tel Longridge 2511.

Pye Pocketfone battery charger, automatic type C203, takes up to 12 receiver and 12 transmitter batteries. Yaesu FRG7 gen cov rx, analogue, little used since new October '78, offers. Write. G8LFP, QTHR. Callers by appointment only.

FRG7 comm rx, no mods, vgc, £150. *Wanted:* HQ1 Minibeam; FL110 or similar solid-state hf linear; info on mods to FT7 for full 10m cov. G4GED, NOT QTHR. Tel 01-357 2627, day time; or 01-578 4484, evenings.

Strumek 80ft four-section heavy-duty tower, incl electric winch, as new, £600. Wind speed and direction indicator, as new, £55. G4EPN, QTHR. Tel Sapcote 3404.

R&S uhf millivoltmeter, £75. Marconi TF801C, serviced, calibrated, £145. TF144G, exc, £25. Q-Fiver, £5. B2, £40. Filters: 10·7MHz, fm, £4.50; Collins 250kHz, mechanical, ssb, £12; 1·6MHz xtal, 200Hz, cw, £4.50. Londex coaxial relay, £4.25. Many other items, dc to microwave. G2CPM, QTHR. Tel Newbury 40464.

Sony TR8460 aircraft band rx; Yaesu FT202R hand-held, 6ch, nicads; both mint; parabolic antenna, stereo amplifier, infra-red binoculars, Pocketfone rx (RB4); keyboard, electronic keyer, hf mobile whip, psus, aeronautical charts; much more; lists available. G8IYK, 120 Birmingham Road, Redditch, Worcs.

Eagle Star SR550 communication rx, bands 160, 80, 40, 20, 15, 10, 6, xtal calibrator, handbook, £50. T. Dawson, Green End Farmhouse, Pegsdon, Nr Hitchin, Herts. Tel Luton 881356, evenings and weekends.

Trio TR7100 mobile tx/rx, S0, S20-23, R3, R5-7, automatic toneburst, other fitted channels, mic, $\lambda/2$ mobile whip, handbook, all in perfect wkg order, handbook, £120. G4ALQ. Tel Ashford (Middx) 44440.

TR2200GX, fitted 12ch, R0-7, S20-23, nicads, helical, charger, orig packing, £120. Multi-U11, 70cm, fitted 11ch, £220. Transformers: 9V and 21V at 5A, £4; 12V at 2A, £1.50. Jaybeam 144MHz crossed dipoles, £4. G8KMV, QTHR. Tel 0438 54689.

Heathkit: IG102 sig gen, £25; IM18U vvm, £20; manuals, leads, new cond. Unbuilt uhf tv sig strength meter kit, orig *Practical Television* instructions by C. Bradley, £10. Cambridge calculator, £5. Unit in 13 by 3 by 2in die-cast box marked A56152, filter unit DES 12, rx rf 30MHz lp, serial 3014, £2. Lafayette HA55 aircraft rx, 108-136MHz, £20. HRO coil, 3·5-7·3MHz, part b/s 7MHz, needs attention, £1. Plus postage. G3MQY, QTHR (Hants). Tel Ringwood 4625.

Collins S-Line, mint cond, 32S-3, 75S-3A, 516F-2, 312B-4 stn control, SM-Z mic, £600. Teletype, 7B, £5. 12AVQ, £25. Audio osc, £15. High power atu, £25. Standard Vibroplex key, £7. Kleinschmidt tty, needs attn, £5. Jackman. Tel Worcester (0905) 20040.

Hy-Gain 12AVQ, triband, vertical, £26; KW E-Zee match atu, £21; both almost mint. Post paid. G3SYL. Tel Basingstoke (0256) 51141.

Heath SW717 four-band amateur rx, good cond, £40. Olivetti Editor 4 electric typewriter, perfect cond, little used, £120. NR56VF 2m monitor rx, 144-146MHz, vfo, xtal controlled chs R5-6, S20-21, S23, £40. Tel Stone (Staffs) (078 583) 2873, after 6pm.

Late G6QM: pair Pocketfones SU8 xtals; TR2200G, Kenwood pa; Minimitter top 2-7; Heathkit HW7, HW30 (Two-er); Class D wavemeter; many sundry items, valves, components, etc; offers. Mrs Mathews, 62 Ashlands Road, Hesters Way, Cheltenham. Tel 0242 45936.

Liner 2, preamp, £100. G4DEV, QTHR. Tel 01-850 3304.

Atlas 215X, 220CS ac console, little used, vgc. Tel 0642 614378, after 7pm.

Eddystone rxs: 770R, £110; 730/4, £110; S750, £70. GEC BRT402, £75. Telequipment tv sig gen, £10. Taylor multi test-meter, £20. *Wanted:* marine vhf radio telephone. Tel Alnwick 2487.

Nascom computer, in nice cabinet, heavy-duty fan-cooled protected psu, cuts interface, B-bug, cassette, all data books, £250. 8K dynamic ram (4027), £40. 100 double balanced mixers, type MC1496L, £50. UHF Storno, £20. G3TGF, QTHR. Tel Orpington 26802.

Emigrating to W5: mint cond IC215, three months old, nicads; Creed 7E teleprinter, good wkg order, silencing cover; RSGB *Teleprinter Handbook*; PF1 rxs for spares; various transformers for callers; offers? G8RFM, 55 Stagsden Road, Bromham, Beds. Tel 02302 3759.

AR88LF, £40. Uniden 2030, 2m, fm, £125. TCS13 rx, £12.50. Gone hf transceive. *Wanted:* manuals, Geloso G209, and Heath GC1U Mohican, buy or borrow. Jackson, G4HYY, Castle Lodge West, Halifax Road, Todmorden, Lancs. Tel Todmorden 5342.

Swan 350, ac psu, handbook, spare new pair 6HF5s, driver, 7360 relay, £240. G3XVD, QTHR. Tel Bordon (Hants) 3689.

Bantam, R0, R4-5, R7, S20, S22, toneburst, optional interconnecting 15W pa, mobile psu, six-months-old nicad pack, nicad charger, λ/4 whip, £80. Ringo Ranger 2m tx/rx, £110. G3SZU. Tel 0533 865726.

Trio TS500, PS500, wkg but known faults declared, hence haggling starts at £110. Single phase 1hp electric motor, £16. Buyer to collect. G4HHB (Sussex). Tel 044 46 45182.

Pye base stn, 25W on 2m, ready converted, built-in psu, QQVO3/20 pa; 6CW4 nuvistor converter, 2-4MHz i.f., works well; £12 ea. G3VST, QTHR. Tel Crayford 521383.

50ft BXI tilting and extending tower, comp with winches, rotator, coaxial, control cables, 3-el beam, dismantled, buyer collects, £125. Richardson. Tel Ponteland 22147, evenings and weekends.

Yaesu FL2100B, linear, 1200W input, exc cond, £200. Buyer please collect, or will deliver reasonable distance. G3PY, QTHR. Tel Glossop 61062.

FT101 (FT277), absolutely mint, unmarked, used only for test, any inspection invited, first reasonable offer considered. E. Parvin, "Cherry Croft", Beechway Close, Upper Poppleton, York YO2 6JE. Tel York (0904) 794680.

HW12A 80m tx/rx, h/b ac psu, Heath spkr, mic, handbook, pair new output valves, various others used and new, £110 ono. Racal frequency counter CT488, not wkg, 6CL3, new, offers. GW4DWX, QTHR. Tel Welshpool 2068, evenings only.

TA33 Junior E model (2in) masts, dismantled, ready for collection, £35. P. C. Fry, G4AKG, NOT QTHR. Tel 01-657 7413.

Eagle RP218 variable psu, 0-18V at 1A, twin meters, instruction, circuit diagram, exc cond, £18. Tel Oxford 43634, after 6pm.

FR101D rx, all bands, all modes incl broadcast, 4m, 2m, different xtal filter for each mode, many other facilities, £400, incl delivery. Tel 0787 280651 (W Suffolk).

Hammarlund HQ180A full cov rx, in exc cond, £150. YO100 monitorscope, by Yaesu, mint, £90. G3PRS, QTHR. Tel Cuffley 4110.

Trio 9R59DS, good cond, incl handbook, £45. WS19 set, modified for double side-band, not sure if wkg, offers. CBM SR1800 scientific calculator, rechargeable batteries, charger, £12 ono. Buyer collects. G4FTG, "Silver Cedars", High Bannerdown, Batheaston, Bath. Tel Bath 859910.

Quartz 16 10W 2m tx/rx, five months old, little used, immac, R3-7, RR6, S0, S16-18, S20-23, orig packing, accs, £145. GM3HBT, QTHR. Tel Larkhall 883306, after 6pm.

Magnum Six processor for KWM2 or S-Line DOW key, 220V relays, Hallicrafters R48 spkr, Seco swr meter, exc, as new, £20. Katsumi processor, new, £5. Ham-M spares, HRO-60 cabinet, £10. Turner +2 transistor mic, Trio ham clock, £10. AR88 valves. G3DAM, QTHR.

HF aluminium quad spider, optimum spacing, bamboos, £25. *Wanted:* rotator, AR22 or similar. Ackerley, G3RIR, 24 Macaulay Road, Lutterworth, Leics. Tel 04555 4522.

FTDX505, exc cond, prefer buyer inspects/collects, £250 ono. G3OQA, QTHR. Tel Windsor 60695, after 6pm.

Drake, half price, TR46, £275; AC4, £60; MN4, £55; DC4, £70; Hustler mobile, comp, £30; audio compr, £15; rf meter, £10; Heath d/load, £10; lp filter, £10; incl mic, leads, meters, fixed and mobile, lot, £500. G3XKB, QTHR. Tel 0234 870526.

2m 4-el quad, £10; SEM auto preamp, £8; Joystick and tuner, £5; all good. Buyer collects. G8OVQ, QTHR. Tel Tiptree 816677.

FT221R multi-mode 2m tx/rx, tripler, MM converter for 70cm, £350, incl delivery. Tel 0787 280651 (W Suffolk).

AR88, matching spkr, 2m conv, spare valves, good cond, £55. Buyer collects. A. Jenkinson, 8 Low Grange Crescent, Belle Isle, Leeds, Yorks LS10 3EA.

QM70 2m converter, £12; Slim Jim, £10; fm discriminator module, with fixing instructions for FRG7, £5; all items hardly used. Buyer collects SW London. D. Mathews. Tel 01-876 7868.

FT200/FP200 tx/rx, under three years old, all 10m, £265. Shure 444 mic, £18. Liner 2, PA3, unmarked cond, £80. G2BUP, 8 Springfield, Norton St Philip, Bath. Tel Faulkland (037 387) 432.

Tower, 40ft, wooden, £20. Buyer collects. G4CLF, QTHR. Tel Cheltenham 23834, evenings.

2m mobile, Kyokuto Digital 2 tx/rx, fully synthesized, digital readout, scanner, toneburst and repeater shifts, 48W power amp, 5/8 whip, £200 ono. G8BZN, QTHR. Tel 0455 35621.

Shack clearance: Eico 753 mains psu, 150W 3-band, £75; G2DAF linear, pair 813s, mains psu, £40; Creed 7D, £15; 6S6 reader, £10; terminal unit, £20; 2m transverter, 100W, £15; Microwave Modules 2m converter, £18. G3NWL, QTHR. Tel Winchester 3593.

FT227R fm tx/rx, modified for repeater input monitoring and toneburst on repeat only, perfect cond, 5λ/8 magnetic mounting antenna, £195; exch for TR2300 considered. GW8JOJ, c/o "Little Wern", Mitchel Troy, Monmouth, Gwent.

Trio rx QR666, 170-30MHz, dual gate fet rf stage, double i.f. conversion, exc appearance, wkg order, all leads, manual, £100 ono. Tel Hove (0273) 731391.

FT101 Mk2, 160-10m, matching ext vfo and ls, protective front panel skin not removed since new, £350. Trio 2200GX, 12ch, mint, maker's accessories, packing, etc, £150. G3PRS, QTHR. Tel Cuffley 4110.

Collins KWM2, late round emblem series, Walters rejection tuning, mint cond, little used, £700. R4C, 1·5 filter, 10 and 160 xtals, 50ft tower, raising motor, cover, absolute bargain, £25. Various USA mobile antennas, mounts, coils, new, offers. G3DAM, QTHR.

TR2300, nicads, charger, three months old, vgc, £175. 2m amplifier, ETI design, 1W in, 10W out, in die-cast case, £15. Linear amplifier, homebrew 2 × 813s grounded grid, 2·5kV psu built in, extra 813s, £70. Further info available. GM3ZSP, QTHR. Tel Kinghorn 890003, evenings.

KW2000A, mains psu, fully operational, £175. G3SHS, QTHR. Tel Potters Bar 58058.

IC202E, £150; TR2300, £150; MMT 432/144R transverter; Yaesu FRDX400, 2-4m conv, £120; all ono. Spencer, G3ILO, 49 Rosebery Road, Dursley, Glos GL11 4PT.

Canadian 52 set gen cov rx, 1·75-16MHz, £15. CR300, 15kHz-25MHz, requires overhaul, £5. 31 set, £5. RF24, £2. G3YXW. Tel 01-903 9441.

Kenwood twins R559D and T599D (Trio in UK), one of the ultimates in separates rx/tx combination, mint cond, recent acquisition from ZL, offered as new, £850 ono. Brand-new spkr for FT101E, £15. G3SIP. Tel Horncastle (06582) 7086.

SCC 2m fm hand-held, 2W rf output, fitted 3ch, comp with carrying case, telescopic whip, brand-new nicads, mint cond, £100, incl postage. G4IBZ, G8RBZ QTHR. Tel Worksop (0909) 4312.

Drake TR7/DR7-PS7-FA7-AUX7 program, two modules, SL6000 a.m. filter, MN7 atu, up-dated by suppliers, as new, eight months old, service manual, today's price £1,256, nearest offer to £900 secures. Buyer collects. G3SYJ, QTHR. Tel Ipswich 622942.

Sony TC510 tape recorder, 7½/3¾ case, DEACS Jap equiv NAGRA, £315. Bolex H8 camera, £75. Chorehorse 12V 300W generator, £28. Many other mics, amps. Owner going 432. Prefer buyer collects. J. R. Gomer, 55 Hythe Hill, Colchester. Tel Colchester 68848, day.

FT200, ac pu, vgc, £200. MM conv, 144/2, new, £12. 3½in 'scope, slight attn, £10. QQVO6/40, £3. Buyer of main equip collects. G3JDN, QTHR. Tel Reigate 40646, after 6pm.

FT301, FP301, 100W, hf, ssb, tx/rx, £475 ono. Wilson, 104 London Road, Purbrook, Portsmouth, Hants. Tel 07014 50086.

Atlas 210X, latest model, boxed, as new, protected battery lead, £350; psu, Atlas transformer, ETI meter, approx 7 by 7 by 5in alloy case, 8lb, £50; both incl postage; will separate. Pitts, "Westmoors", Trezelah, Gulval, Penzance, Cornwall.

Heathkit DX100U tx, 150W, a.m./cw, little used, £40 ono. Buyer collects. G3GNB, QTHR. Tel Wokingham (Berks) 782598.

FT101E, SP101, mint cond, on air less than 10h, orig box, manual, leads, plugs, etc. £450 ono. GW4HMK/DA1VW. Tel Caerphilly (Mid Glam) (0222) 830 544.

Heath DX100U 200W a.m./cw tx, 10-160m, used regularly, as new, £45. Icom IC700 rx, 10-80m, fet front-end, ssb, cw, a.m., good cond, £70. G4BVB. Tel Callington 3527, day time.

AR30 rotator, HB9CV 2m beam, incl cables, vgc, used indoors only, £35. *Wanted:* galvanized tower, rotator, suitable for 3-el hf beam, why? Twin keying paddle. G4GTU, QTHR. Tel Rustington 4123.

Exch: 2200GX, mint cond, full xtals, case, nicads, charger, helical antenna, mobile mount; for TR7200G, must be in vgc; or sell £145 ono. G3WHQ, 27 Albert Road, Sandiacre, Nottingham NG10 5BU. Tel Nottingham 394769.

Multi U11, xtalled two simplex, five repeater channels, comp with mounting kit, 48-el beam, £200 ono. Pye Compact 8 1·88-15MHz ssb portable tx/rx, 1/10W p.e.p., £50 ono. G4FZM. Tel Biggleswade 312836, evenings.

TV studio monitors, Peto Scott, mono: one wkg, £15; one not wkg, £8; or the two, £20. Camera, 625-line, lens, rf modulator, £20. Pair 4CX250s, uhf bases, 1,200-0-1,200 transformer, £30. Jaybeam, 70cm, 8-o-8, unused, £8. Discone, £1. 70cm converter, G8AYN, needs xtal, £5. Homebrew 2m a.m. tx/rx, Eddystone 898 dial, 2m converter, 2-4MHz tunable i.f., 2W tx strip, needs xtals and af amp, £15. G4HUP, NOT QTHR. Tel Stoke-on-Trent 642507.

Racal RA117 rx, RA218 ssb adapter, RA37 If adapter, MA168B divers unit, all like new, manuals, some spares, the lot, £350. Trio TR7500, hardly used, £180. Buyers collect. G3RNV, QTHR. Tel 061-477 0315.

Trio TS700, as new, perfect cond, £300. CDE rotator, £35. 5-el Yagi, £5. Trio BPF2 filter, £15. GW8IQC, QTHR. Tel Rhiwderin 4708, after 6pm.

W40 Versatower, free homebrew 3-el 20m beam, £125. Buyer collects. G3FRB, 2 Chestnut Grove, Wilmington, Dartford, Kent. Tel Crayford 524693.

EMI professional 19in colour monitor, solid-state, needs some parts to service, manual, £79. Collect. Pye U450L, tx, £28; rx, £22. GEC 70cm tx/rx kit, as GWM advert, £18.50. Two Ultra 3A4/LB, charger, £70. Two TEAC TD700 professional stereo tape transports, 10½in reels, 3¾, 7½, 15in/s, four heads for two- and four-track, virtually as new, £220 ea. TEAC A650 stereo, dolby, solenoid, front load cassette machine, £265. ½ × 10½in computer tapes, 25p plus p&p. Antenna wire, double insulated, stranded tinned copper, 150ft, £1.95; 500ft, £5.25. Transformers, 500V 360mA, 315V 160mA, 50V 50mA, 6·3V 9A (12·6V 4·5A), £5.80. 50, 70, 144MHz Mk5 converters, ac psu, internal, £16 ea. *Radio Handbook* (W6SAI), 16th edn, £5. 1962 ARRL *Handbook*, £5. G3LGK, QTHR. Tel 0773 833142.

Standard C146A hand-held tx/rx, case, 5ch, separate mic, nicads, charger, £105; Yaesu FT2FB tx/rx, 12ch, £100; both nice cond, handbooks, boxed. G3WEX, QTHR. Tel 021-354 4265.

Eddystone 640, fair cond, wkg, matching spkr, handbook, offers. Prefer buyer collects. G3JGW, QTHR. Tel Cuffley 5080.

FDK2700, £350. MMT144/432, £100; psu, £12. MMC144/2, £12. SEM 40W pa, £25; psu, £15. GW3TMP 10m preamp, boxed, £5. 2m high power bandpass filter, £10. Low power bandpass filter, £6. BNC coaxial relays, £5. G8FAK, 32 Springfield Way, Cranfield MK43 0JN.

KW202, spkr, manual, believed to be one of the last made, in exc cond, no mods, £180. Adelman, 40 Formosa Street, London W9. Tel 01-286 3172.

FT200/FP200, just three months off test bench, £230. Stewart, GM8OKA, 49 Glenmuir Crescent, Logan, Cumnock, Ayrshire. Tel 0290 21378.

Yaesu FT227R, scan, comp with ASP 5/8 mobile whip, mag mount, £190. *Wanted:* hf tx/rx. G4HTX, 50 Severn Way, Bedford MK41 7BH. Tel 0234 43348.

AR88, R1155, the pair, £75; will separate. G3RRA, QTHR. Tel 0276 25040.

KW2000A, ac psu, ptt mic, circuit, handbook, KW Q-multiplier, good cond, £170. Prefer buyer collects. G3WQ, QTHR (Selby).

IC215, mobile mount, helical, channels R0-9, RR0, S20-23, £135 ono. MM transverter, 432/28, £85 ono. G4FMD, QTHR. Tel Malcolm, Great Dunmow (0371) 3119.

Yaesu FR101S rx, 160-10m, six bc bands, 2m, 4m, £300. Datong active antenna, £25. SP400 spkr, £10. P. Davies (E Finchley, London N2). Tel 01-883 2182, evenings.

Europa-B transverter, integral coaxial c/o relay, £65. Microwave Modules converters: 144/28LO, £15; 432/28, £22. *Wanted:* any information on heatsink mounts for CCSI conduction cooled tetrodes, similar to 4CX250. G4BLT, QTHR. Tel Wakefield (0924) 863378.

TS700G, auto tb, £310 ono. Eddystone EC10 Mk1, £36. Miranda DX3 35mm slr camera, ic ttl metering, few filters, vgc, £100. G8JNZ, QTHR. Tel Erith 30991, weekends; or 01-240 2424, weekdays.

Eddystone T836 variable capacitor, 112pF, 3kV wkg, brand-new, one only, £6.50, incl p&p. G3SEF, QTHR. Tel 0922 415369.

HAL devices, DKB-2010, RVD-1005, also key-edit 12in video monitor, all brand-new, unused, comp with manuals, bargain price, £550. HAL ST-6, meter, mint, £120. J. L. Barry, 10a Henbury Close, Torquay, Devon. Tel Torquay 312879.

Honda E300E petrol generator, £95. Europa B 4m transverter, £60. Europa 70 70cm receive converter, I/o output, 28-30MHz i.f., £15. GM8BDX, QTHR..

FLDX500, FRDX500, cw fm filters, matching spkr, YD844 mic, Sentinel 2m converter, manuals, prefer buyer collects, £300. KW E-Zee match, £20. Osker SWR200, £15. All carr extra. G4BGE, QTHR. Tel Bracknell 21502, after 6pm.

IC215, R3-9, S20-23, 145·8, auto toneburst, 12 months old, vgc, boxed, all accessories, helical whip, commercial (Coutant) 1A psu, 5-el Yagi, all £155; will split. Deliver up to 50 miles. G8MYX, QTHR. Tel 0993 841305.

TF995A/2 sig gen, £100. TF868/1 LCR bridge, £25. 5BV-7 telegraph trans distortion measuring set, £10. Solartron regulated psu, 0-500V, £5. CT38 electronic multimeter, £12. Eddystone 680X rx, £50. Advance E2 sig gen, £10. G3CBU, QTHR. Tel 0256 58921.

FT101E, cw filter, low pass filter, mobile antenna, base antenna, £450 ono. TR2200GX, 12ch fitted, homebrew 30W pa, charger (12V), £135 ono. *Wanted:* Pye Westminster dual control box, vhf-uhf repeater. G3XDA, NOT QTHR. Tel Market Deeping 345189.

IC3PA, Icom 3A matching psu for IC22A, IC240, etc, mounting bracket for rig, boxed, mint cond, £35. G8CCI, QTHR. Tel Oxford 880229.

Jaybeam D8/2M 8-over-8 slot-fed Yagi, used eight months, £10. About 20ft of very-very-heavy-duty pvc covered tinned copper braiding, weight 9lb, £5. Carr extra on both. G8BWR, QTHR. Tel 0926 498388.

Redifon GR286, fm, 2m, fitted R5, R7, mint cond, £25. 2m 8/8 Jaybeam, £5. 230V ac constant voltage unit, £10. Heath GR78 rx, £50. BC221, LM14, built-in psu, 'scope, af 10-5,000Hz precision output, £20. G3JKV, QTHR.

FT101 nbfm tx/rx units, used, £35; G3LLL speech clipper board, filter, £20; repeater shift unit, £3; all with circuits. *Wanted:* morse tutor, similar to Datong. 44MHz HC6U xtals, 2m. F60 fm tx tray. Portable b/w tv. G8HLJ, QTHR.

Microwave Modules 144/432 transverter, £95 ono. GM8HSY, QTHR. Tel 0324 23860.

FTDX400, FTDX500, 560W p.e.p. tx/rxs, both good cond, with manuals, £225 and £200 respectively. G2FDF, QTHR. Tel Weybridge 45214.

Brookes Electronics frequency display unit, to suit Lowe SRX30, in aluminium case, new, never installed, £31.50. Have bought FRG7. Bond, 19 Alston Drive, Morecambe, Lancs LA4 6QR.

KW Vespa Mk2 tx, output low on hf bands, otherwise ok, £60. Yaesu mic, £6. KW 77 rx, £45. KW lpf, £6. Buyer collect. *Wanted:* Joystick antenna. G3PFE, QTHR. Tel Sleaford (0529) 304233.

Icom IC202, 144·0-144·4, 144·8-145, nicads, charger, no mods, vgc, £150. Still some cheap new components left, sae for list. G8DJM, QTHR. Tel Lye (038482) 4388.

Liner 2, preamp on rx, £100; HW100, ac psu, £150; U450L 70cm base stn, £35; all ono. G3HTT, QTHR. Tel 0278 3698.

FT221R, £310; Datong up-converter, mpu ac adapter, £80; FL1 agile filter/ac adapter, £40; Telford Mk2, 28-30MHz, bat/mains, all mode i.f., £50; all in mint cond. Hy-Gain 2-el quad, tower, £60. G4BNH, QTHR. Tel Shipley 587711.

KW77, some mods completed, fet front-end, mixer, etc, requires tidying to complete, £30; Plus Two MCR1, perfect wkg order, first offer over £25 secures; manuals with both. Buyer collects or carr extra. T. Goodenough, 8 Glencraig Terrace, Fenwick, Ayrshire. Tel Fenwick 677.

Telequipment oscilloscope S32A, 10MHz, £35; another, tatty, £25; Heath oscilloscope IO-12U, 5in, £35; Racal digital counter, SA520, 300kHz, £6; all with manuals. Advance digital counter, 1MHz, £6. Marconi sig gen, TF801D, £40. BSR LO50A bfo, £6. G2BUW, QTHR. Tel Romford 43122.

Kenwood TR-7400A 2m fm tx/rx, syn in 5kHz steps, 25W output, manual, mobile mount, mic, 1,750Hz toneburst fitted, £265 ono. G3OUF, QTHR. Tel 02403 5988.

Cambridge, a.m., boot mount, wkg on 2m, £25. 50-line private telephone exchange, needs 24V to work, has approx 70 relays, offers please. Will deliver locally. Tel Medway 221061, evenings.

Catronics rtty keyboard, 48 keys, £17 ono. G4BKE, QTHR. Tel Winchester 61133.

TTY Creed 7B, £15. DX-160 Realistic rx, almost new, £65. Buyer collects (Wimbledon, London). Tel 01-542 9132, evenings preferred.

FDK Quartz 16, vgc, one year old, £125 ono; may exch or part exch for Liner 2, or other ssb 2m rig in good cond. G8ONU, QTHR. Tel Hitchin (0462) 54642.

Yaesu FT101E, nearly new, ssb and cw filters, all cables, mic, handbook, comp hf stn, £480. Heathkit HW12A 80m ssb tx/rx, mic, HP23B psu, exc cond, only £115. G3WY, QTHR. Tel Evesham 45497.

Icom IC701, PS701, SM2, hf, hardly used, move forces sale, £820. IC245, multimode, vhf, mobile, immac, £330. Yaesu FT101B, good cond, £330. Icom IC240, switching box, psu, £165. Shure 444, £20. Chandler, G4FIR, 16 Harrison House, Brandon Street, London SE17.

Atlas 215 tx/rx, 200W p.e.p., ssb/cw, 160-15m, ideal mobile rig, 12V supply required, good cond, £295. G4IDJ. Tel Leeds (0532) 663094.

FDK Multi 2700 Mk2, all modes, plus Oscar, mint cond, orig case, accessories, £435. G3JEP, QTHR. Tel Exmouth (03952) 4863.

Clare Pendar ASCII coded keyboard, new, £30. Lambda 5V 10A stab psu, new, £30. Three 0-24V 0·5A psus, £3 ea. Buyer collects. Thomas, GW4AXR. Tel Swansea 74671.

IC22A, immac cond, 11ch, orig manual, packing, mobile mount, £125. R. A. Cope, 4 Highland Road, Great Barr, Birmingham B43 7SQ. Tel 021-357 9884, after 7pm.

G3HSC rhythm morse tuition beginners' and advanced records, comp with book, test record, £5. Kyokuto Digital 2, 2m rig, synthesizer, scanner, auto toneburst, cost £321, yours for £225. G8OGZ, QTHR. Tel Flitwick (05257) 4343.

SB101, fitted cw filter, Heath psu, spkr, good order and appearance, handbooks, £200. Unused Heath pto/vfo, £28. Pair new 6146s, £10. Buyer collect or pay carr. G3HIS, NOT QTHR. Tel Wellington (Somerset) (082 347) 6400, after 6pm.

TV 502 transverter, boxed, new cond, £100. Mains intercoms, like new, £15. Shure 444T mic, boxed, like new, £20. G4BQE, QTHR. Tel Rotherham 893575.

WANTED

Trio 2300, Trio 7010, Trio 3200, plus any extras, no mods, state details and price. G8SBU, 52 Miller Drive, Fareham, Hants PO16 7LJ. Tel Fareham 232799, after 6pm or weekends.

TH6DXX Hy-Gain antenna. Spacemark ETM3C keyer. Will the member in Southampton, whose callsign I failed to record, kindly repeat his offer by letter. Both items can now be taken. G4DXC, QTHR. Tel Bingley 3289.

Esperanto for radio amateurs. More than 400 licensed radio amateurs in more than 30 countries in five continents already use Esperanto for international conversational QSOs; these include Japan (more than 100), Brazil (more than 50), USSR (Siberia, Ukraine, Lithuania), Australia, New Zealand, Mexico, USA (incl KH6 and KL7), Israel and most European countries. Write for details. G4MR, QTHR.

TS700G fixed channel xtals; small rotator; Datong AD170; colinear and discone antennas, all freqs considered; barometer, barograph or altimeter; 144MHz preamp and/or linear; ASCII keyboard; obsolete aeronautical or marine charts; any Triton mpu components. G8IYK, 120 Birmingham Road, Redditch, Worcs.

2m tx/rx, toneburst, prefer portable, price to £60 for vgc model. P. de Man, PO Box 170, 2250 AD Voorschoten, Netherlands. Tel (collect) 010-31-1717-6033.

AR88D rx, any info on modifications, bandspread, fm detector, etc, full details please; SSB cw tx, KW, Heath, good order; must be near as transport a problem. All your expenses paid. C. J. Leythorne, Ola Luest, Llanfyllin, Powys, Wales.

Ultra Cub circuit or handbook, purchase or loan. TRW PT4176C capstan power transistor. Wkg Model 8 Mk3 movement. Dawson, G8PYC, 24 Broadwaters Avenue, Thame, Oxon. Tel 084 421 5857.

Circuit diagram of AM258, and modification details to convert 2m fm. G3KAF, QTHR. Tel 061-439 4952.

Codar T28 rx. G3ZCO, QTHR. Tel 0262 78066.

Manual, circuit or any info, buy or copy, for KW500 linear amp. G4FIG, QTHR. Tel Lancing (Sussex) 62134.

Trio 9R59DS rx. Tel Draycott (0602 930) 3390.

Small mast, approx 30-40ft, prefer tilt type. Yaesu FTV250 transverter, other 144-28MHz units considered. Rotator, 2m beam. Tel Ted, Mildenhall 715178, work; or Bury St Edmunds 67738, home.

40ft tower, winch, base, rotator, DX33 or similar beam, KW107, KW109, KW dummy load, or why? *For sale:* IC22A, immac cond, 11ch, R6 input, orig packing, manual, mobile mount, £130 ono. G4FVN, QTHR. Tel (Liverpool) 051-427 1949, after 6pm please.

Postally used pre-1950 QSL cards, still sought by collector, send list or better still send cards for a fair offer, early 'twenties cards especially welcome, but later cards accepted. G3BDQ, "Whitefriars", Friar's Hill, Guestling, Hastings, E Sussex TN35 4EP.

Trio JR500S rx, good cond, with handbook or circuit diagram. G3WL, QTHR. Tel Plymouth (0752) 41613.

Purchase or loan for photocopy, manual for Trio JR500S rx, please state price. G6IF, 1 Squirrel Lane, High Wycombe, Bucks. Tel 0494 20733.

Codar T28, any cond but preferably as minty as possible. Derek Alexander, G4GVM, QTHR. Tel Ilfracombe (0271) 62319.

Helping hard-up friend build G2DAF rx, need: front end; xtals, 9, 12·5, 19·5, 26·5, 33·5, 34, 34·5, 35MHz; Eddystone dial; any offers. G3AMF, QTHR. Tel 01-969 9224.

"The Amateur Radio Handbook", first edition, either printing (December '38 or August '39), RSGB, to complete set, any cond. G4CCW, QTHR. Tel Derek Sheen, 01-651 1410.

SWL requires: cmos xtal calibrator, made to spec by M. E. Theaker in *Practical Wireless*, March '76 (spec provided if required); also good atu and preselector. Clare, 57 Ettington Close, Wellesbourne, Warks CV35 9RJ. Tel Stratford-on-Avon 840272.

JR599 custom special, must be in perfect wkg order. GM6FD, QTHR. Tel 031-332 4216.

Copy of *Microwave filters, impedance matching networks and coupling structures*, by Matthei, Jones and Young, now out of print. 30cm, or longer, coaxial slotted line. Chris Bartram, G4DGU, QTHR. Tel 0235 831330, home; or 0993 2900, work.

4m rx, atu, swr meter; any HRO rx, wkg or not; AR88 rx. R. Cuddington, "Milton Lodge", Milton Bryan, Milton Keynes MK17 9HN. Tel Woburn 545, only evenings please.

Items for B2 (type 3 Mk2) suitcase tx/rx: psu, manual, spares box, antenna, key, headphones, mains plug adapters with conversion pins, etc. Comp B2 Minor (type A Mk3) tx/rx. Suitcase tx/rxs: Mk119, Mk122, Mk128, Mk217, BP5 or T5, AR11 and A3, incomp or damaged items considered. WS62. Belling-Lee mains rf interference filter, 250V/30A. Racal RA117, ssb adapter. Taylor, G3UCT, 27 Glen Road, Fleet, Hants GU13 9QS.

Urgent: Heath 400Hz cw xtal filter, type SBA-301-2; Heath HD-1410 keyer. G4GTU, QTHR (W Sussex). Tel Rustington 4123, evenings.

Special event stations

GB2HEB, 5-17 August
Edinburgh & D ARC will set up a special event station to operate from one site, one mile NE of Upper Bayble in the Outer Hebrides, during the club's expedition to the islands. Further details from GM8MJV, QTHR.

GB2EIF, 14 August-11 September
Edinburgh & D ARC will be operating a special event station from the club's headquarters at the City Observatory, Calton Hill, during the annual international festival held in Edinburgh. Further details from GM8MJV, QTHR.

GB2IDA, 15 August
A special event station is to be operated during the RAF St Mawgan International Air Day, at RAF St Mawgan, Newquay, Cornwall. Attractions for visitors will include displays of RAF hardware, side-shows and the RAFARS. Further details from Sgt P. L. King, G4GFY, RAF St Mawgan, Newquay, Cornwall.

VE3CNE, 15 August-3 September
A station will be operated at an amateur radio display in the Hobbies, Arts and Crafts Building at the Canadian National Exhibition held in Toronto. Operation will be on 3·5, 7 and 14MHz, and all contacts will be confirmed by QSL card.

This annual display of amateur radio will be organized by the Metro Amateur Radio Club of Toronto.

GB2MG, 1-9 September
A special event station is to be set up to commemorate 50 years of MG cars being built at Abingdon, Oxon. The MG Silver Jubilee celebrations will include social, athletic and technical events, as well as the station, and will take place at the MG Car Co Ltd, Abingdon-on-Thames, Oxon. Further details from G4AZN, QTHR.

GB2YME, 9 September
A special event station is to be operated to celebrate the York Model Engineers' Golden Jubilee. It will be located 2½ miles SW of York city centre, on the A64 York to Leeds road. Further details from G3ZDI, QTHR.

GB2SYS, 14-16 September
South Yorkshire Scouts will operate a special event station at the county Cub leaders' camp, South Yorkshire Scouts County Camp Site, Hesley Wood, Chapeltown, Rotherham, S Yorks. Further details from G4GET, QTHR.

Mobile rallies calendar

5 August—RSGB National Mobile Rally, Woburn Park, Beds. Details from G3MVV, QTHR.

12 August—Derby Mobile Rally. Details from Mike Darn, 22 Reservoir Road, Brockwell, Chesterfield, Derbys.

19 August—Preston Mobile Rally, Park Hall Leisure Centre, Charnock Richard, Nr Chorley (new venue—well signposted, just off A49, halfway between junctions 27 and 28 on M6). Doors open 11am. Talk-in on S22. Trade stands, bring and buy, bars, buffet, plenty of car parking. Details from G8KTM, QTHR.

26 August—Torbay Mobile Rally, STC/ITT Social Club, Brixham Road, Paignton. Talk-in on S22. Trade stands, bookstall etc. Details from Mrs Coker, 2 Causeway Cottages, East Street, Ipplepen, Devon, tel 0803 812117.

9 September—Telford Mobile Rally, Telford New Town Centre Malls, Telford, Salop (approached via: A5 off M6, exit 12; A442 from N or S; or M54 from W, follow signs to town centre). Opens 11am. Talk-in via GB2TRG. Attractions include trade stands, exhibits, full on-site catering, licensed premises, bring and buy stands and family attractions. Free coach service to Ironbridge Gorge Open Air Museum, celebrating the bicentenary of the world's first iron bridge. Further details from G8DIR, QTHR, tel Shrewsbury 64273; G8FSV, QTHR, tel Telford 48603; or G3UKV, QTHR, tel Telford 55416.

16 September—Peterborough R&ES Mobile Rally, Walton School, Mountsteven Avenue, Peterborough. Talk-in S22 G3DQW and RB10 via GB3PB, operational callsign to be advised. Usual exhibits, bring and buy. Details from G3EEL, QTHR, tel 65423 or 62881.

30 September—Harlow & D ARS Mobile Rally, Netteswell Comprehensive School, Harlow. Details from G3KEF, 71 Lodge Hall, Harlow, Essex.

7 October—Great Lumley AR&ES Mobile Rally, Community Centre, Great Lumley, Nr Chester-le-Street, Co Durham. Talk-in on 144MHz. All usual attractions. Further details from G4DWM, QTHR.

MEMBER'S AD ORDER FORM

FOR SALE ☐ WANTED ☐ (Tick as appropriate)

- **See Members' Ads page for conditions of acceptance.**
- **Not more than 40 words, including name, address, etc, for 75p.**
- **Do not forget to include remittance and a *Radio Communication* mailing label.**
- **Please write in block capitals, or type.**

Licensed members are asked to use their callsign and QTHR, meaning that their address in the current *RSGB Amateur Radio Call Book* is correct. BRS and A members will, of course, have to provide their name and address.

I enclose cheque/PO for .....
to cover the cost of this advertisement.

Signed .....

Date .....

THE T-1510-S

FULLY SYNTHESIZED

2m TRANSPORTABLE

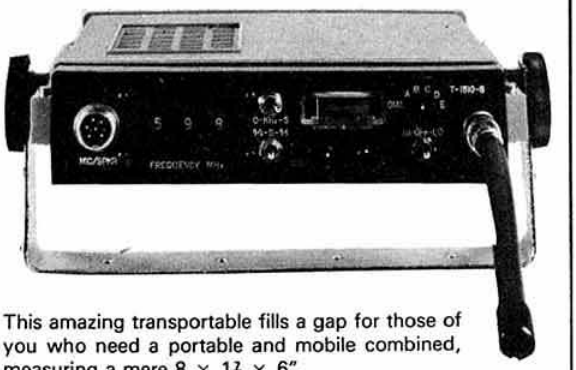
NOW AVAILABLE FROM

LEE ELECTRONICS

400 EDGWARE ROAD, LONDON W2. 01-723 5521. Telex: 298765

FEATURES

- ★ Fully synthesized 144–148MHz in 5kHz steps
- ★ 1 & 12 Watts switchable rf Power
- ★ With Toneburst
- ★ Repeater Offset 600kHz
- ★ Two spare offsets available on the rear
- ★ Your five favourite channels programmable
- ★ Internal batteries Ni-cad or dry cell
- ★ Internal Battery charger for use on 12V
- ★ Rear switching SO239 for Mobile use
- ★ External 12V Power socket
- ★ Supplied complete with mobile mounting bracket, helical, Speaker/Mic and Power lead, etc.



This amazing transportable fills a gap for those of you who need a portable and mobile combined, measuring a mere 8 × 1⅞ × 6".
This unit was originally designed for the commercial market so the performance is superb, outperforming lots of amateur rigs.

Access

ONLY
£199 + 15% VAT

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NEC

QM70

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YAESU

The legal use of amateur radio transmitting equipment requires an amateur licence. Therefore, it is the policy of this organization that amateur radio transmitters, transceivers and amplifiers be sold at retail only to persons who can show that they are properly licensed to operate that equipment.

JUST TELEPHONE YOUR CARD NUMBER OR SEND YOUR CHEQUE WITH ORDER

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MMT 144/Any IF	£88.00
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MMT 432/144	£149.60
MMT 432/144R	£169.88
MMT 28/144	£88.88
MMC 28/144	£20.25
MMC 144/any IF	£20.25
MMC 144/28 LO	£22.50
MMC 70/any IF	£20.25
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MMC 432/144S	£29.90
MMC 1296/any IF	£31.50
MMD 050/500	£69.00
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JAYBEAM

2M Antennas	
5Y/2M 5 el yagi	£9.66
8Y/2M 8 el yagi	£12.25
10Y/2M 10 el yagi	£26.13
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PBM 14/2M parabeam	£37.55
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8XY/2M 8 el x'd yagi	£24.10
10XY/2M 10 el x'd yagi	£31.76
PMH/2C circular harness	£6.15
Q4/2M 4 el quad	£20.17
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D5/2M el slot	£17.00
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HO/2M halo head	£4.20
HM/2M halo mast	£4.98
PMH2/2M 2-way harness	£8.10
PMH4/2M 4-way harness	£18.94
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PBM18/70cm Parabeam	£22.53
MBM48/70cm Multibeam	£26.45
MBM88/70cm Multibeam	£34.62
12XY/70cm 12 el x'd yagi	£35.52
PMH2/70cm harness	£6.93
PMH4/70cm harness	£14.35
C8/70cm 8db colinear	£46.03

YAESU PRICE LIST (inclusive VAT & Carriage)

HF Equipment		FL 110	£144.00
FT 901DM	£995.00	FR 101S	£444.00
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FV 901DM	£240.00	FR 101DD	£685.00
SP 901	£27.00	FRG 7	£210.00
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FC 901	£129.00	FT 7	£297.00
YO 901	£260.00	FT 7B	£421.00
FT101Z	£660.00		
FT101ZD	£840.00	**VHF Equipment**	
FT 101E	£569.00	FT 225RD	£600.00
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SP 101B	£21.00	Memory	£104.00
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FT 301	£575.00	CPU 2500R	£325.00
FT 301D	£656.00	CPU 2500RK	£345.00
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FY 301	£105.00	FT 202	£99.00

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AMTECH CWF 250
A unique CW filter with a stunning performance. Guaranteed to really isolate the rare one in a pile up. An external unit with built-in amplifier and speaker optimized for CW operation. Spkr/Headset output—indicator lamp—12v input—all plugs provided—Fully Guaranteed. Get your score up—get a CWF 250.
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Drive PWR 1, 2 or 3 watts (please state when ordering) output 10w minimum 12w typically 13·5v. Individually tested with spec sheet.
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In line operation—provision for preamp.
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FM Demodulator for FRG 7 Receiver. Full instructions for simple fitting.
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Asp201 ¼W 2m mobile	£3.78
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Asp no hole boot mount	£4.00
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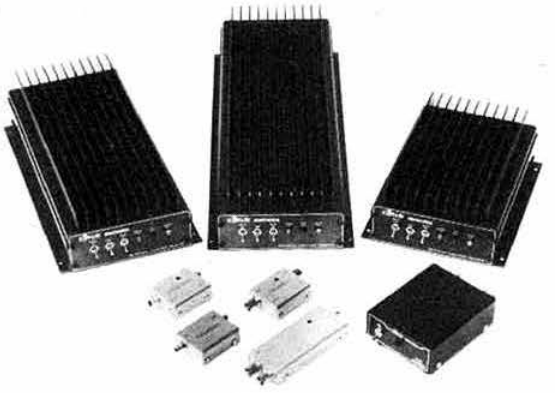

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144MHz	
2M10-80P	80 Watt all mode, Linear/Preamp **£120** + VAT
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PAI144	RF Switching Preamp 1·9 db N.F. **£28** + VAT
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Available either direct from us, the EXCLUSIVE AUTHORISED UK & EUROPEAN DISTRIBUTORS, or from one of our appointed agents: C. B. Electronics, SMC Ltd, Waters & Stanton, Bredhurst Electronics, Crayford Electronics, Amcomm Services, GM3ZBE (Aberdeen) and GM8GEC (Edinburgh): TMP Electronics; See Rad Comm Adverts.

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As appointed Northern agents for VHF Communications, we are pleased to offer their high quality Antenna Rotator Units

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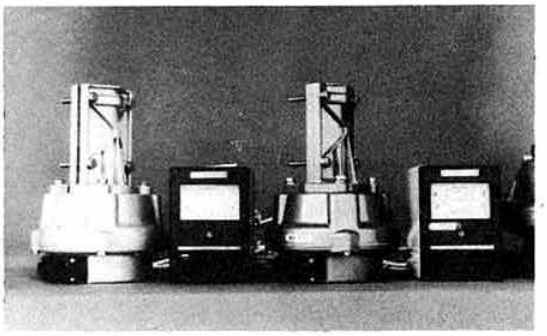

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General purpose low cost Counter without the sacrifice of basic performance
"Check the features we have that some other low cost counters don't have."

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DATONG ELECTRONICS LIMITED

NEW PRODUCT

MORSE TUTOR

The revolutionary new way to practice morse code reception. The DATONG Morse Tutor gives you an unlimited supply of precision morse at the turn of a switch, PLUS built-in oscillator for sending practice.

Now, you can practice receiving morse whenever, and wherever, you like.

The DATONG MORSE TUTOR sends a continuous stream of precision morse in five character groups which never repeat. For optimum learning efficiency it has a calibrated variable speed control plus a separately variable delay facility between characters.

It delivers letters only, numbers only, or mixed letters and numbers. It comes with a built-in tone oscillator for sending practice (key required), built-in loudspeaker, and also a separate earpiece for private listening.

Learn morse, the easy, convenient and self-pacing way with the DATONG D70 Morse Tutor. Supplied complete with battery for only **£37.00** plus VAT giving a total of **£42.55.**

Model D70

Model ASP Automatic R.F. Speech Processor

Our R.F. Speech Processors, using the advanced technique of R.F. clipping, greatly increase your talk power and help your voice punch through the QRM.

They work on any rig, with any speech mode, at any power level, and on any band. Simply connect in series with your microphone to get a really punchy speech signal. MODEL ASP, our latest model, offers for the first time the ultimate convenience of instant push-button selection of the desired amount of clipping and elimination of manual level setting.

Prices: ASP **£65.00** plus VAT (**£74.75** total); RFC **£40.00** plus VAT (**£46.00** total); RFC/M **£21.50** plus VAT (**£24.73** total).

Model UC/1 Up converter

If you already own a good quality ten-metre or two-metre receiver or transceiver you are only £118 away from a really high performance general coverage receiver. Just add the magic ingredient, MODEL UC/1 from DATONG!

You get full coverage in thirty synthesised 1MHz segments from 60kHz (Rugby MSF) to 30MHz, at high sensitivity and with all the facilities and high performance of your existing rig!

For good measure UC/1 also adds two-metre coverage to ten-metre receivers.

Price: **£105.00** plus VAT (**£120.75** total).

Model FL1 Frequency Agile Audio Filter

A versatile add-on unit for communications receivers which helps to extract wanted signals from background interference. It connects in series with the loudspeaker or headphones. The effect is similar to "I.F. passband tuning" for SSB/or RTTY reception, and bandwidth down to 20Hz (with limited a.f.c.) gives an amazing capability for pulling weak CW stations out of the QRM. MODEL FL1 is unique in being able to tune itself when notching out unwanted whistles.

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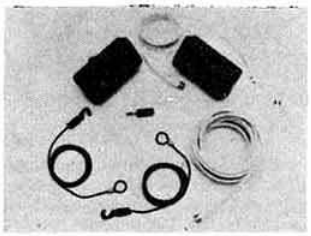
Model AD170 Active Antenna



For sensitive reception right through from MSF at 60kHz to Band 1 TV DX around 50MHz, without the need for an antenna farm, MODEL AD170 is ideal. Designed for loft mounting, MODEL AD170 has no adjustments and needs no external tuning units.

Although only three metres long, MODEL AD170 has the same directional properties as a full size dipole, even at 60kHz.

Price: **£29.50** plus VAT (**£33.93** total); Special price complete with mains power unit: **£33.00** plus VAT (**£37.95** total).

DATONG ELECTRONICS LIMITED

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

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QTY.				
	1N914	100v	10mA	.05
	1N4005	600v	1A	.08
	1N4007	1000v	1A	.15
	1N4148	75v	10mA	.05
	1N4733	5.1v	1 W Zenner	.25
	1N4749	24v	1W	.25
	1N753A	6.2v	500 mW Zener	.25
	1N758A	10v	"	.25
	1N759A	12v	"	.25
	1N5243	13v	"	.25
	1N5244B	14v	"	.25
	1N5245B	15v	"	.25
	1N5349	12v	3W	.25

SOCKETS/BRIDGES

QTY.					
	8-pin	pcb	.16	ww	.35
	14-pin	pcb	.20	ww	.40
	16-pin	pcb	.25	ww	.45
	18-pin	pcb	.30	ww	.95
	20-pin	pcb	.35	ww	1.05
	22-pin	pcb	.40	ww	1.15
	24-pin	pcb	.45	ww	1.25
	28-pin	pcb	.50	ww	1.35
	40-pin	pcb	.55	ww	1.45
	Molex pins .01		To-3 Sockets		.35
	2 Amp Bridge		100-prv		.95
	25 Amp Bridge		200-prv		1.50

TRANSISTORS, LEDS, etc.

QTY.			
	2N2222M	(2N2222 Plastic .10)	.15
	2N2222A		.19
	2N2907A	PNP	.19
	2N3906	PNP (Plastic)	.19
	2N3904	NPN (Plastic)	.19
	2N3054	NPN	.55
	2N3055	NPN 15A 60v	.60
	T1P125	PNP Darlington	1.95
	LED Green,	Red, Clear, Yellow	.19
	D.L.747	7 seg 5/8" High com-anode	1.95
	MAN72	7 seg com-anode (Red)	1.25
	MAN3610	7 seg com-anode (Orange)	1.25
	MAN82A	7 seg com-anode (Yellow)	1.25
	MAN74	7 seg com-cathode (Red)	1.50
	FND359	7 seg com-cathode (Red)	1.25

9000 SERIES

QTY.		QTY.	
9301	.85	9322	.65
9309	.50	9601	.30
		9602	.45

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QTY.	
8T13	2.50
8T23	2.50
8T24	3.00
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74S188	3.00
1488	1.25
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1702A	4.50
AM 9050	4.00
ICM 7207	6.95
ICM 7208	13.95
MPS 6520	10.00
MM 5314	4.00
MM 5316	4.50
MM 5387	3.50
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Z 80 A	22.50
Z 80	17.50
Z 80 P10	10.50
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2102L	1.75
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8080	7.50
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8224	4.25
8228	6.00
8251	7.50
8253	18.50
8255	8.50
TMS 4044	9.95

C MOS

QTY.		QTY.		QTY.		QTY.	
4000	.15	4017	.75	4034	2.45	4069/74C04	.45
4001	.20	4018	.75	4035	.75	4071	.25
4002	.25	4019	.35	4037	1.80	4081	.30
4004	3.95	4020	.85	4040	.75	4082	.30
4006	.95	4021	.75	4041	.69	4507	.95
4007	.25	4022	.75	4042	.65	4511	.95
4008	.75	4023	.25	4043	.50	4512	1.50
4009	.35	4024	.75	4044	.65	4515	2.95
4010	.35	4025	.25	4046	1.25	4519	.85
4011	.30	4026	1.95	4047	2.50	4522	1.10
4012	.25	4027	.35	4048	1.25	4526	.95
4013	.40	4028	.75	4049	.65	4528	1.10
4014	.75	4029	1.15	4050	.45	4529	.95
4015	.75	4030	.30	4052	.75	MC14409	14.50
4016	.35	4033	1.50	4053	.95	MC14419	4.85
				4066	.75	74C151	2.50

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4-1-79

QTY.		QTY.		QTY.		QTY.	
7400	.20	7492	.45	74H20	.25	74LS76	.70
7401	.20	7493	.35	74H21	.25	74LS86	.95
7402	.20	7494	.75	74H22	.40	74LS90	.85
7403	.20	7495	.60	74H30	.30	74LS93	.85
7404	.20	7496	.80	74H40	.35	74LS96	2.00
7405	.35	74100	1.15	74H50	.30	74LS107	.90
7406	.25	74107	.35	74H51	.30	74LS109	1.50
7407	.55	74121	.35	74H52	.20	74LS123	1.95
7408	.20	74122	.55	74H53	.25	74LS138	2.00
7409	.25	74123	.55	74H55	.25	74LS151	.95
7410	.20	74125	.45	74H72	.35	74LS153	1.15
7411	.25	74126	.45	74H74	.35	74LS157	1.15
7412	.25	74132	.75	74H101	.95	74LS160	1.15
7413	.45	74141	.90	74H103	.55	74LS164	2.90
7414	.75	74150	.85	74H106	1.15	74LS193	2.00
7416	.25	74151	.95	74L00	.30	74LS195	1.15
7417	.40	74153	.95	74L02	.30	74LS244	2.90
7420	.25	74154	1.15	74L03	.35	74LS259	1.50
7426	.25	74156	.70	74L04	.40	74LS298	1.50
7427	.25	74157	.65	74L10	.30	74LS367	1.95
7430	.20	74161/9316	.75	74L20	.45	74LS368	1.25
7432	.30	74163	.85	74L30	.55	74LS373	2.50
7437	.20	74164	.75	74L47	1.95	74S00	.45
7438	.30	74165	1.10	74L51	.65	74S02	.45
7440	.20	74166	1.75	74L55	.85	74S03	.35
7441	1.15	74175	.90	74L72	.65	74S04	.35
7442	.55	74176	.95	74L73	.70	74S05	.45
7443	.45	74177	1.10	74L74	.75	74S08	.45
7444	.45	74180	.95	74L75	1.05	74S10	.45
7445	.75	74181	2.25	74L85	2.00	74S11	.45
7446	.70	74182	.75	74L93	.75	74S20	.35
7447	.70	74190	1.25	74L123	1.95	74S22	.55
7448	.50	74191	1.25	74LS00	.40	74S40	.30
7450	.25	74192	.75	74LS01	.40	74S50	.30
7451	.25	74193	.85	74LS02	.45	74S51	.35
7453	.20	74194	.95	74LS03	.45	74S64	.15
7454	.25	74195	.95	74LS04	.45	74S74	.70
7460	.40	74196	.95	74LS05	.45	74S112	.60
7470	.45	74197	.95	74LS08	.45	74S114	.85
7472	.40	74198	1.45	74LS09	.45	74S133	.85
7473	.25	74221	1.50	74LS10	.45	74S140	.75
7474	.30	74298	1.50	74LS11	.45	74S151	.95
7475	.35	74367	1.35	74LS20	.45	74S153	.95
7476	.40	75491	.65	74LS21	.45	74S157	.98
7480	.75	75492	.65	74LS22	.45	74S158	.80
7481	.85	74H00	.20	74LS32	.50	74S194	1.50
7482	.95	74H01	.30	74LS37	.45	74S196	2.00
7483	.95	74H04	.30	74LS38	.65	74S257 (8123)	2.50
7485	.75	74H05	.25	74LS40	.70	8131	2.75
7486	.55	74H08	.35	74LS42	.95		
7489	1.05	74H10	.35	74LS51	.75		
7490	.55	74H11	.25	74LS74	.95		
7491	.70	74H15	.45	74LS75	1.20		

I^2L, LINEARS, REGULATORS, ETC.

QTY.		QTY.		QTY.	
MCT2	.95	LM320K24	1.65	LM373	3.95
8038	3.95	LM320T5	1.65	LM377	3.95
LM201	.75	LM320T12	1.65	78L05	.75
LM301	.45	LM320T15	1.65	78L12	.75
LM308	.65	LM323K	5.95	78L15	.75
LM309H	.85	LM324	1.25	78M05	.75
LM309 (340K-5)	1.50	LM339	.75	LM380 (8-14 Pin)	1.19
LM310	.85	7805 (340T5)	1.15	LM709 (8-14 Pin)	.45
LM311 (8-14 Pin)	.75	LM340T12	.95	LM711	.45
LM318	1.50	LM340T15	.95	LM723	.40
LM320H6	.79	LM340T18	.95	LM725	2.50
LM320H15	.79	LM340T24	.95	LM739	1.50
LM320H24	.79	LM340K12	1.25	LM741 (8-14)	.45
7905 (LM320K5)	1.65	LM340K15	1.25	LM747	1.10
LM320K12	1.65	LM340K18	1.25	LM1307	1.75
LM320K15	1.65	LM340K24	1.25	LM1458	.65
				LM3900	.95
				* LM75451	.65
				NE555	.45
				NE556	.85
				NE565	1.15
				NE566	1.25
				NE567	.95
				TA7205	6.95
				76477	2.95
				95H90	9.95

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2 METRE STOCK CRYSTALS. Price £1.83 for one crystal. £1.74/crystal when two or more purchased.

	HC6/U 30pF TX	HC6/U 30pF TX	HC25/U 25pF and 40pF Tax	HC25/U 20pF and 30pF RX	HC25/U 25pF and 20pF TX	HC6 & 25/U SR RX
R0	4.0277	8.0555	12.0833	14.9888	18.1250	44.9666
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
S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
S21	4.0423	8.0847	12.1270	14.9805	18.1906	44.9416
S22	4.0430	8.0861	12.1291	14.9833	18.1937	44.9500
S23	4.0437	8.0875	12.1312	14.9861	18.1968	44.9583

All Repeater Channels for FT221 in stock plus Yeasu FT2FB, FT2 Auto, FT224, Trio 2200 and Icom IC22A, 215 series crystals for R0 to R7, S20 to S23. Also in stock 4 and 8 MHz TX in HC6/U for 145.8 MHz. Icom crystals TX and RX for 145.25 MHz (S10) and TX for 145.6 MHz (RB14) 44 MHz RX crystals in HC6 and HC25 for 145.8 and 145 (RB10) and HC6 only for 145.475 MHz (S19). Other crystals in stock — send sae for details.

NEW STOCK CRYSTALS £2.52

S15	12.1145	14.9638	18.1718	44.8916*
S16	12.1167	14.9667	18.1750	44.9000*
S17	12.1187	14.9694	18.1781	44.9083*
S18	12.1208	14.9722	18.1812	44.9166*
S19	12.1229	14.9750	18.1843	44.8250*

*HC25 only

4 METRE CRYSTALS for 70.26 MHz in HC6/U at £2.25.
TX 8.78250 MHz RX 6.7466 or 29.78 MHz in stock.

70cm CRYSTALS In Stock
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Pye Pocketfone PF1 or PF70 £4.50 pair or TX £2.25
SU8 (433.2) RX £2.50
RBQ RB2 RB4 RB6 RB10 RB14

CONVERTER CRYSTALS in HC18/U at £2.85. In stock.
38.666, 42.000, 70.000, 96.000, 101.000, 105.666 and 116.000 MHz in stock.

TONE BURST AND I.F. CRYSTALS in HC18/U at £2.25. in stock.
7.168 MHz for 1750 kHz and 10.245 MHz for 10.7 MHz IF's.

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HC6	HC13	HC18
455kHz	100kHz	10.700MHz
1000kHz		
5.000MHz		
10.000MHz		

COMMERCIAL USERS. Crystals can be supplied for MPU, industrial control etc in the range 4-21 MHz fundamental and 3rd OVT 18 to 60 MHz at £1.15 for 100 off. This is only a limited example of our capabilities. Please enquire about other quantities, frequency ranges, watch and sub-carrier crystals. We can supply crystals for marine and land mobile radio telephone use. Send for details.

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MADE TO ORDER CRYSTALS SINGLE UNIT PRICING

	Price Group	Adjustment Tolerance ppm	Frequency Ranges	Price and Delivery A	B
Fundamentals	1	200 (total)	10 to 19.999 kHz	—	£23.00
	2	200 (total)	20 to 29.999 kHz	—	£16.50
	3	200 (total)	30 to 99.999 kHz	—	£10.50
	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
	7	10	2.00 to 2.599 MHz	£4.75	£4.00
	8	10	2.60 to 3.999 MHz	£4.55	£3.70
	9	10	4.00 to 20.999 MHz	£4.55	£3.60
	10	10	21.00 to 24.000 MHz	£6.00	£5.40
3rd ovt	11	10	21.00 to 59.999 MHz	£4.55	£3.60
5th ovt	12	10	60.00 to 99.999 MHz	£5.00	£4.00
	13	10	100.00 to 124.999 MHz	£6.15	£5.20
5th, 7th & 9th ovt	14	20	125.00 to 149.999 MHz	—	£6.00
	15	20	150.00 to 225.000 MHz	—	£7.50

We regret that it has been necessary for us to increase the prices of our made to order crystals, because of increasing costs of supplies and overheads. NOTE the cost of crystals on our B delivery have only slightly increased so should you be able to accept the longer delivery it will be possible to make considerable savings.

Unless otherwise requested fundamentals will be supplied with 30pF load capacity and overtones for series resonance operation.

HOLDERS — Please specify when ordering — 10 to 200 kHz HC13/U, 170 kHz to 170 MHz HC6 or HC33/U, 4 to 225 MHz, HC18 and HC25.

DELIVERY
Column A 3 to 4 weeks (This service is subject to availability)
Column B 6 to 8 weeks
Please note that it is not always possible to provide the A delivery service but a telephone call will confirm its availability.
Any orders received for A delivery when it is not available will automatically be placed on B delivery and a credit note issued for the difference in price.

DISCOUNTS 5% mixed frequency discount for 5 or more crystals at B delivery. Price on application for 10 or more crystals to same frequency and specification. Special rates for bulk purchase schemes including **FREE** supply of crystals used in UK repeaters.

EMERGENCY SERVICE SURCHARGES (to be added to A delivery prices). 4 working days £8, 6 working days £6, 8 working days £4, 13 working days £3 (maximum of 5 crystals on 4 day delivery).

CRYSTAL SOCKETS HC6/U and HC25/U 16p

MINIMUM ORDER CHARGE £1.50

TERMS. Cash with order, cheques and postal orders payable to QSL Ltd. All prices include postage to UK and Irish addresses.

OVERSEAS DISTRIBUTORS.

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Denmark — Asbjorn Jorgensen, Aabrinken 1, Tapdrup, DK800, Denmark.

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MMT 28/144 Transvertor	£79.00
MMT 432/28S Transvertor with Oscar shift	£119.00
MMT 432/144R Transvertor	£151.00

VARACTORS

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FREQUENCY COUNTERS

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M500P 10 Prescaler	£25.00

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MML 144 25W	£39.11
MML432 100W	£220.00
MML144 80W	£120.00

CONVERTORS

MMC 432/28S for Oscar	£26.58
MMC 432/144S for Oscar	£26.58
MMC 70 4m convertor	£18.00
MMC 70 LO 4m convertor	£20.00
MMC 144 2m convertor	£18.00
MMC 144 LO 2m convertor	£20.00
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MMC28/144 up convertor	£18.00
MMA 144/28 Pre-amp	£13.00

All 2m converters can be supplied with IF outputs of 2-4-12-14-18-28MHz 70cm models with IF outputs of 28-14-18- or 144MHz.

YAESU MUSEN (FULL RANGE AVAILABLE) FREE DELIVERY IN UK

FT901DM	£863.00	FT101E	£515.00	FL2100	£311.00	FRG7	£187.00
FT901D/DE	£737.00	FR101D	£525.00	CPU2500RK	£308.00	FRG7D1G	£227.00
FT101Z	£500.00	FL101	£453.00	FT225R	£487.50	FRG7000	£327.00
FT101ZD	£575.00	FT7	£244.45	FT225RD	£535.00	FT301	£515.00
FC901	£115.00	FT7B	£375.00	FT227R	£213.00	FT301D	£588.00
FTV901	£232.00	FL110	£130.00	FT227RB	£229.00	YH55	£8.75
FV901	£232.00	FP4	£35.00	FT227RX	£250.00	YD844	£19.50
YO901	£236.00	FP12	£67.00	FT202	£88.00	OTR24	£16.00

All prices subject to 15% VAT

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Asp629 ¼W 3dB 2m mobile	£7.60	Asp magnetic mount	£8.95	Asp A659 UK 70cm 5dB, base antenna	£22.00
Asp677 ½ 3dB 2m mobile	£13.50	Asp cutter with cable	£6.75		
Universal cutter clip	£4.50				

Post & Package £1.00 + VAT 15%

★ NEW ★ POWER SUPPLIES

Px602 13·8V output, 3A continuous 4A max. Fully protected cutout. Only **£19.95** + VAT.

POCKET MONITOR

This small receiver has 12 xtal-controlled channels. Fitted with 9—S0, S20, S22, S23, S24, R4, R5, R6 and R7, and comes complete with ni-cads, charger and carry case, etc.

£57.95 + 15% VAT
Extra channels available at **£2.50** + VAT

ICOM RANGE

IC701 transceiver and power supply	£792.00
IC215 2M portable	£141.33
IC202S 2M SSB	£176.89
IC402 70cm SSB	£256.00
IC240 2M Transceiver	£168.00
IC245 2M FM/SSB	£354.62
IC211E 2M FM/SSB	£481.77
Xtals for 215/22 p/pair	£4.50
Cases 202/215/402	£6.75
Mobile mounting bracket 202/215	£10.75

LUNAR LINEAR AMPLIFIERS

2M10-80P 2m 10W input 80W Output with 9dB gain pre-amp	£120.00
2M10-150P2M 10W input 150W Output with 9dB gain pre-amp	£177.50
2M3-150 2m 3W input 150W Output with 9dB gain pre-amp	POA
2M25-150P2M 25W input 150W Output with 9dB gain pre-amp	£160.00

★ NEW ★ RANGE OF KEYERS

Send for details

★ NEW ★ 2m MOBILE COLINEAR

6·5dB gain. Optional mounts available. **£32.95** + VAT.

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ALL MODELS IN STOCK

HELICAL ANTENNAS

2m with BNC	£3.85 each
2m with PL259	£3.85 each
2m for IC215, Trio 2200 Gx, standard C146A	£3.50

All + post 25p + VAT

ROTATORS

AR22	£43.00
CD44	£96.00
AR40	£47.50
HAM 11	£129.00
KR400	£85.00

STANDARD RANGE

C146A 2m 2W hand-held transceiver fitted S20 and S23 complete with T/burst and carrying case **£125.00**. C432 70cm 2·2W hand-held fitted 433·20, 433·50 with carrying case, etc, **£169.00**.

SST ANTENNA TUNERS

SST1 Random Wire Tuner	£22.00
SST2 Coax Wire Tuner	£26.75
SST3 Impedance Match unit	£13.50

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2M TX & RX CRYSTAL AVAILABILITY & PRICE CHART

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	36MHz-TX-HC6 & 25/U	44MHz-RX-HC6/U	44MHz-RX-HC25/U	48MHz-TX-HC6 & 25/U	52MHz-RX-HC25/U	72MHz-TX-HC25/U
144.4 (433.2)	b	e	b	e	e	b	e	e	e	e	e	e	e	e
144.480	e	e	e	e	e	e	c	c	c	e	c	e	e	e
144.800	c	e	e	e	e	e	c	c	c	e	c	e	e	e
144.850	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.000/R0T	a	b	a	c	c	a	b	b	c	a	a	c	c	e
145.025/R1T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.050/R2T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.075/R3T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.100/R4T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.125/R5T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.150/R6T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.175/R7T	a	b	a	e	e	a	e	b	e	e	e	e	e	e
145.200/R8T	a	b	a	e	e	a	b	b	e	a	a	e	c	e
145.300/S12	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.350/S14	e	e	c	e	e	c	c	c	e	c	c	e	e	e
145.400/S16	e	e	e	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	e	e	e
145.450/S18	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.475/S19	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.500/S20	a	b	a	c	c	a	b	b	e	a	a	e	c	e
145.525/S21	a	b	a	c	c	a	b	b	e	a	a	e	c	e
145.550/S22	a	b	a	c	c	a	b	b	e	a	a	e	c	e
145.575/S23	a	b	a	c	c	a	b	b	e	a	a	e	c	e
145.600/R0R	a	b	a	c	c	a	b	b	e	a	a	e	c	e
145.625/R1R	e	e	e	e	e	e	b	e	e	a	a	e	c	e
145.650/R2R	e	e	e	c	e	e	b	e	e	a	a	e	c	e
145.675/R3R	e	e	e	c	c	e	b	e	e	a	a	e	c	e
145.700/R4R	e	e	e	c	c	e	b	e	e	a	a	e	c	e
145.725/R5R	e	e	e	c	c	e	b	e	e	a	a	e	c	e
145.750/R6R	e	e	e	c	c	e	b	e	e	a	a	e	c	e
145.775/R7R	e	e	e	c	c	e	b	e	e	a	a	e	c	e
145/800/R8R	a	b	a	c	c	a	b	a	e	a	a	e	c	e
145.950/S38	a	e	e	a	e	e	e	e	e	a	e	e	e	e

Prices: (a) **£1.95** (£2.19), (b) **£2.32** (£2.61), (c) **£2.80** (£3.15), (d) and (e) **£3.92** (£4.41)
AVAILABILITY: (a), (b), (c) and (d) stock items normally available by return (we have over 5000 items in stock). (e) Four 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.

JAPANESE AND AMERICAN EQUIPMENTS

We can supply crystals for **YAESU** FT2F, FT2FB, FT2 Auto, FT224, most of the **ICOM** range and the **TRIO-KENWOOD** range. We can also supply from stock crystals for the **HEATHKIT** KW202 and HW17A.
YAESU FT221 CRYSTALS NOW IN STOCK, ALL AT **£2.80** (£3.15). All popular channels—For repeater use advise xtal frequency required as earlier models have different shift xtals to later FT221R. We can also supply the crystal to give NORMAL "tune to RX" working as FT221R.

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For the RTTY enthusiast we can recommend and supply the **"MCS"** range of products. This includes terminal units. AFS keyers, magnet drivers for TTL interface, telegraph distortion measuring adaptor. RTTY audio processor, power units, etc. For the CW man we have the **"MCS"** CW filter which gives three stages of active filtering. Please send S.A.E. for full details of the **"MCS"** range.

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SPECIFICATION

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Power requirements	:	13.8 volts at 2.8 amps for 25 watts output
Quiescent current	:	75mA nominal at 13.8 volts

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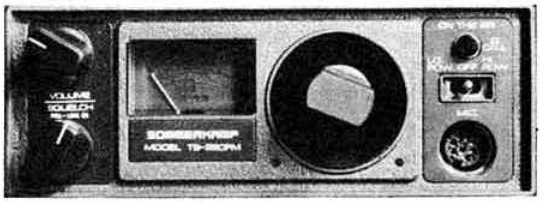

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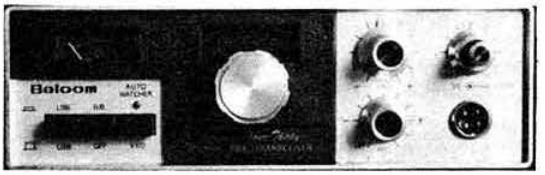

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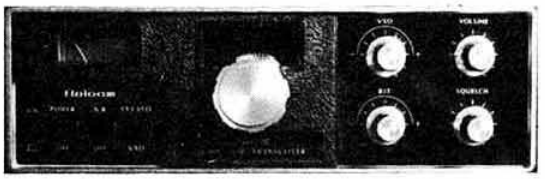

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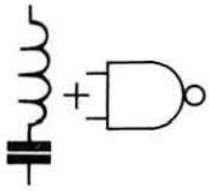

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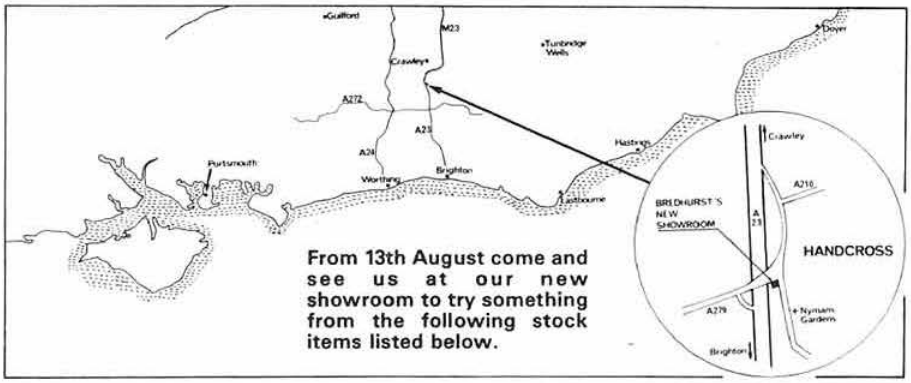

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