June/July 1980

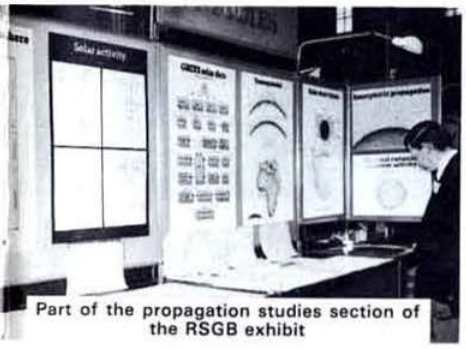
radio communication

journal of the Radio Society of Great Britain

AP80 Some views of the 1980 RSGB National Amateur Radio Exhibition

RSGB President Peter Balestrini, G3BPT (second from left) and Mrs Balestrini talking to visitors on the Raynet stand

The AMSAT-UK stand manned by secretary Ron Broadbent, G3AAJ (right) and two other AMSAT-UK members



Part of the propagation studies section of the RSGB exhibit

An admiring visitor to the Royal Signals stand

A future JOTA operator?

Camera men

Camera targets

TRIO IN SOUTH LONDON
CATRONICS FOR TRIO
TRADE UP TO TRIO AT CATRONICS

R1000
COMMUNICATIONS RECEIVER

R1000 Brief Specification

Frequency Range:	200KHz-30MHz
Modes:	AM, USB, LSB, CW
Sensitivity:	<2MHz: 5μV >2MHz: 0.5μV for 10dB S+N/N on SSB
Digital Readout:	to 1KHz
Clock:	Quartz controlled
Price:	**£298.00**

Catronics

The message we are saying is that Catronics Ltd is an authorised Trio dealer with the full service and spares organisation backed by Lowe Electronics Ltd

COME TO

THE CENTRE FOR

TR9000
2M COMPACT ALL MODE

TR9000 Brief Specification

Frequency Range:	144-146MHz
Modes:	USB, LSB, FM, CW
RF Output Power:	10 watts
Sensitivity:	SSB/CW 0·25μV for 10dB S/N FM 0·25μV for 12dB SINAD
Frequency Control:	Digital, phase locked VCO
Memories:	5 built in
Scanning:	Auto-25/12·5KHz/100Hz
Price:	**£235.00**

SECOND HAND EQUIPMENT

We always have a selection of used equipment in stock, currently as follows:

Drake 2C	£120
TR2200GX	£115
TR2200G	£100
TS700	£300
TS700G	£350
TR8300	£160
TM56B	£75

TR2400
2m SYNTHESIZED PORTABLE

TR2400 Brief Specification

Frequency Range:	144-148MHz
Mode:	FM
RF Output Power:	1.5 Watts min.
Sensitivity:	1.0μV for 30dB S/N
Display:	LCD
Memories:	10 built in
Scanning:	Auto in 5KHz steps
Price:	**£235**

AMATEUR RADIO

TR7600
400 CHANNEL FM MOBILE

TR7600 Brief Specification

Frequency Range:	144-148MHz
RF Output Power:	10 watts
Sensitivity:	0·4μV for 20dB quietening
Frequency Control:	Synthesizer in 5KHz steps
Repeater Shift:	+ or - 600KHz or 1MHz
Memories:	1 (6 with RM76)
Scanning:	with RM76 only
Price:	**£199.50**, **£240** with RM76

APPROVED TRIO DEALER

BARCLAYCARD VISA

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

Access

CATRONICS LTD, DEPT T6, COMMUNICATIONS HOUSE,
20 WALLINGTON SQUARE, WALLINGTON, SURREY SM6 8RG. Tel: 01-669 6700.
Shop/showroom open Monday-Friday: 9.00-5.30, closed for lunch: 12.45-1.45. Saturdays: 9.00-1.00.

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LOWE ELECTRONICS Ltd

APPROVED TRIO DEALER

TRIO TR2300

£166.75 inc. VAT

Nicad Pack £10.35 inc **VB2300 £49.45 inc**

Trio have always been acknowledged leaders in the field of portable VHF equipment and this leadership is amply demonstrated by the TR2300. Following the long established TR2200 line, the TR2300 combines all the virtues of small size, ease of use and rugged go-anywhere construction but introduced for the first time, full band coverage in 25kHz steps from the same advanced synthesiser used in the TR7500. This provides all 80 FM channels from 144–146MHz together with 600kHz repeater shift (and reverse repeater if requested). Automatic tone burst is provided for repeater operation thus catering for all operational needs.

The high sensitivity receiver section uses a combination of effective RF filters providing optimum cross modulation rejection across the entire band. An extra low profile speaker uses a samarium cobalt magnet to reduce equipment size whilst improving speaker efficiency and clarity of reproduction.

The remarkable asset of the TR2300 has to be it's unexcelled versatility. Using the carrying case and shoulder strap, you can take the 2300 anywhere, powered by the rechargable ni-cad batteries, and this is certainly the way that most operators use the rig. Sit the 2300 on top of a 12V dc supply at home, however, using the power cord provided, and you have a terrific home station FM rig.

If you want mobile operation, slot the 2300 into an MB1 mounting bracket, possibly add the matching VB2300 amplifier and you have a really high performance mobile transceiver—and being so small, the TR2300 fits almost anywhere. The front panel layout was designed for ease of operation and the back illuminated dial is so easy to read that it's a delight to use.

TR2300—truly the transceiver for all seasons.

Now—if you insist on a handheld, and don't need the versatility of the 2300, take a look at the new TR2400.

TR2400

£210.45 inc. VAT

(includes Nicads, charger & helical aerial)

The TR2400 is a futuristic 2 metre FM handheld transceiver incorporating a large LCD frequency display, 400 channel operation from 144–146MHz, 10 memory channels and a host of frequency control systems (including scanning) all designed around a microcomputer. The sophisticated design makes the TR2400 the ideal handheld to meet all repeater or simplex operation for the 2 metre man.

1. Large LCD digital frequency readout. Clearly readable even in direct sunlight, with black illumination for night use. Virtually no current drain (unlike LED displays) so display stays on all the time. Shows RX and TX frequencies and memory channels. Also included in display are indicators for "on air", "memory recall", "battery status" and "lamp".
2. Frequency control functions. Keyboard entry of any frequency from 144–146MHz in 5kHz increments. Up/down manual scanning from 144–146MHz in single or fast continuous 5kHz steps.
3. 10 memories (retained by battery backup), one of which can be used as a non-standard repeater shift. Automatic scanning of all 10 memory channels is provided, and scanning can be for a busy channel or the next free channel.
4. Full repeater operation and also instant reverse repeater operation at the touch of a switch. Proper auto tone burst provided.
5. Fast 1½-hour base charger and stand with full external microphone facilities available.
6. Lock switches are provided to prevent misoperation of the keyboard and also to disable the press to talk switch.

7. Power output of over 1·5W to a BNC aerial connector (flexible whip supplied as standard). Decent size batteries for long operating time.
8. Superb mechanical design in the Trio tradition of top engineering, based on a die cast frame for real drop-proof performance.
9. Supplied complete with Nicad pack, charger, rubber helical aerial—ready to go.
The TR2400 is the best available; would you expect less than the best from Trio?

It's a little more expensive than it's competitors—but oh so far ahead in performance.

THE TRIO 2 METRE TWINS

LOWE ELECTRONICS Ltd

TRIO TS180S

£679.65 inc VAT
(including DFC memory unit)

Trio's TS180S with DFC is an all solid-state HF transceiver designed for the DXer, the contest operator, and all other Amateurs who enjoy the 160 through 10-metre bands. The following features prove, beyond doubt, that the TS180s is the finest rig available!

Digital Frequency control (DFC) including four memories and manual scanning. Memories are usable in transmit and/or receive modes. Memory frequencies to be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. It's almost like having four remote VFOs!

All solid-state . . . including the final. No dipping or loading. Just dial up the frequency, peak the drive, and operate.

High power . . . 200W p.e.p./160W dc input on 160-15 metres, and 160W p.e.p./140W dc on 10 metres. Also covers more than 50kHz above and below each band (28-30MHz), WARC, etc., and receives WWV on 100MHz.

Improved dynamic range.

Single-conversion system with highly advanced PLL circuit, using only one crystal with improved stability and spurious characteristics.

Built-in microprocessor-controlled large digital display. Shows actual VFO frequency and difference between VFO and "M1" memory frequency. Blinking decimal points indicate 'out of band". Monoscale dial, too.

IF shift . . . Trio's famous passband tuning that reduces QRM.

Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional)

Automatic selection of upper and lower sideband (SSB NORM/SSB REV switch).

Tunable noise blanker (adjustable noise-sampling frequency).

RF AGC ("RGC"), which activates automatically to prevent overload from strong local signals.

AGC (selectable fast/slow/off).

Dual RIT (VFO and memory/fix).

Three operating modes—SSB, CW and FSK.

Improved RF speech processor.

Dual SSB filter (optional), with very steep shape factor to reduce out-of-passband noise on receive and to improve operation of RF speech processor on transmit.

13·8 VDC operation.

TRIO TS120V/S

TS120V £347.30 inc VAT

TS120V	£347.30	TS120S	£432.40
PS20 4 Amp	£44.85	PS30 20 Amp	£85.10
AT120	£55.20	MC355 mic	£13.80
SP120	£25.30	TL120 linear	£128.80
VFO120	£89.70		

THE SYSTEM APPROACH

What do we mean by the "System Approach"?

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

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

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

TAKE A GOOD LOOK AT THE PRICES!!!

THE GREAT HF LINE-UP BY TRIO

LOWE ELECTRONICS Ltd

TRIO

R1000

£298.00 inc VAT

THIS PRICE INCLUDES DC KIT FITTED

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

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

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

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

For the first time in mid-price receiver, a true noise blanket is provided to remove pulse type ignition noise.
To minimise front end overload, a step RF attenuator is included which gives 0·6dB attenuation in four steps.

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

TRIO

R820

£690.00 inc VAT

The R820 represents the ultimate receiver for the amateur radio operator, with more facilities than ever before available in a ham band receiver. The R820 covers all current amateur bands from 160 to 10 metres as well as the 49, 31, 25, 19 and 16 metre broadcast bands. Typical sensitivity of 0·15 microvolts for 10dB S/N ratio gives you an idea of its performance, and the combination of the famous Trio pass-band tuning (IF shift) system together with fully variable bandwidth makes it easy to dig down in the noise and hear signals that the others can't.

Using a separate IF system at 50kHz to provide a stable notch filter gives the operator a guaranteed 50dB notch depth (minimum), and using a further IF shift system makes the notch frequency tunable without degrading its performance.

Everything that you need in a receiver is given to you in the R820—switchable AGC time constants, RIT, noise blanker, adjustable noise threshold, all mode AM, CW, USB, LSB, RTTY provision, RF attenuator in 10dB steps, full tranceive operation with the TS520 or TS820 series equipment, digital readout with hold facility, true S meter calibration in S units *and* microvolts, and so much more.

A detailed leaflet is available from your authorised Trio dealer and we can supply an unbiased test report from QST. Contact us now for full information on the superb R820 from Trio.

THE FINEST RECEIVERS AROUND

LOWE ELECTRONICS Ltd

TRIO TR9000

2 metre MULTIMODE

£365.00 (approx)

If you sat down at some time and designed your ideal 2 metre multimode rig, you probably laid down the specification for the new Trio TR9000. I believe that this transceiver will satisfy the needs of every radio amateur, combining as it does small size (same as the TR7600), light weight (same as the TR7600), and powerful performance.

As you can see, the TR9000 has a complete array of facilities including all mode operation, noise blanker, RIT, 5 memories, twin digital VFOs and digital frequency readout to 100Hz. Now for the smart parts.

The TR9000 is based on a 100Hz synthesiser controlled either by a photo microsensor on the main dial or by the remote up/down microphone. On FM, the operator has instant selection of either 25kHz steps (for convenient mobile use), 12·5kHz steps (for future use), or 100Hz steps (for continuous tuning). On SSB and CW, the synthesiser steps are automaticaly switched to 100Hz and the digital display is extended to match.

A special feature is the search facility on SSB which tunes the whole band, and the scan facility on FM which scans in 25kHz or 12·5kHz steps, stopping momentarily on any received signal. The scan may then be held by touching the HOLD button or depressing the PTT switch on the microphone.

The TR9000 has so much to offer, it's bound to be yet another leader from Trio. Contact us soon for further details.

TRIO

NEW! TS770E

2 metre and 70 cm MULTIMODE

£763.00 inc VAT

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

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

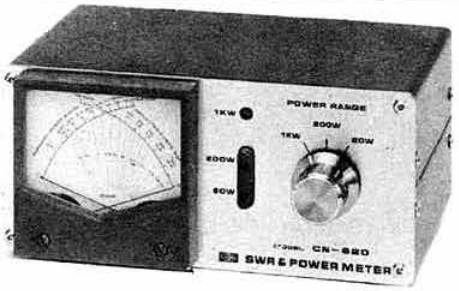
The TS770E gives you a single package to replace all those boxes you use right now. Performance and convenience on VHF and UHF are yours today with the TS770E.

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

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

THE COMPLETELY NEW APPROACH TO VHF/UHF

LOWE ELECTRONICS Ltd



CN-620 SWR & POWER METER

The CN-620 is a radical departure from the accepted norm for in-line power and SWR measurements and represents a considerable improvement over all existing power meters.

The system is based on a crossed needle twin meter, one needle indicating forward power, the other reflected power. The point at which the two needles cross indicates the SWR existing on the system. In one instrument, you combine power and SWR measurement with high accuracy and simplicity of operation.

The CN-620 is simply inserted into any 50 ohm coaxial line. No adjustments are necessary in order to use the instrument. The CN-620 covers the frequency range from 1·8-150MHz and can measure power as low as 400mW reflected and as high as 1kW forward using three easy to read ranges. With the CN-620, doubt in measurement is a thing of the past and once you have used the CN-620, all other power meters will seem old fashioned.

£52.81 inc VAT

CN-620 SPECIFICATION	
Frequency range	1·8-150MHz
Line impedance	50 ohms
Power ranges forward	20W, 200W, 1kW
Power ranges reflected	4W, 40W, 200W
Through power rating	1kW CW, 2KW P.E.P. 1·8-30MHz 250W CW, 500W P.E.P. 140-150MHz
Min. power for SWR measurement	5W
Connectors	SO239
Size	165 × 75 × 97mm

At last, a safe reliable rotator capable of continuous use without going up in smoke! For some time we have been trying out many rotators in the search for something better than usual and we believe we found it in the Daiwa DR7500 series. You can see from the photograph that the quality of construction in the rotator is very good indeed but the most interesting bit of the system is the DC7001 controller.

Basically, the whole system is a closed loop servo which is self aligning and self correcting. The resistance element in the rotator head is part of a bridge which, if unbalanced, drives a reversible motor in the controller, via a high gain amplifier to turn a balancing resistor (and the indicator pointer) until the system is rebalanced. In practice, what this means is that using the left/right switches on the controller drives the rotator in the usual fashion and the indicator follows the rotation smoothly, quietly and with spot-on accuracy all the time. Further point—the usual rotator system has its end stops at south and if like me you like to work DX from Africa, it's b- - - -y annoying to have to swing the beam all the way around from 5 degrees E of S through 350 degrees to point 5 degrees W of S. With the DC7001, you can have the end stops anywhere you like, just choose your least favoured direction.

Power to the rotator motor is split phase 24V ac so there's no dangerous voltage up the mast. Load carrying and turning torque of the DR7500 is more than adequate for a 3 element tribander and if you really need a big brute there is the DR7600 with even higher ratings. Really, we have found nothing to compare to the Daiwa DR7500 and we are sure that you will agree that it is a new step forward in rotator systems.

DR7500 **£108.10** including VAT. DR7600 **£154.10** including VAT.

Note: The rotators are supplied complete with control box and both upper and lower mast clamps.

P.S. There's a new fully automatic ATU now from Daiwa. It's magic! Give it a few watts of RF and little motors whizz round and tune for best SWR. Has a CN620 built in too!

AUTHORISED DEALERS IN THE UK

Yorkshire	Leeds Amateur Radio
Birmingham	Ward Electronics
South London	Catronics Ltd
North London	Radio Shack Ltd
Lancashire	Stephens-James Ltd
Wales	M.R.S. Communications Ltd
Essex	Waters & Stanton Electronics
Sussex	Bredhurst Electronics

REMEMBER. Only an authorised Trio dealer can give you the service, spares and advice that you may need, and only an authorised dealer can give you full advantage of the regular meetings between the distributor and Trio factory personnel at which there is a constant exchange of information and advice.

Everyone is talking about the new Lowe credit card scheme, following its introduction at Leicester. This is the new, easy way to have the rig you wanted right away and avoid any future price rises. How does it work? You simply agree to pay a fixed amount each month and you then get instant purchasing power of 24 times the payment. For example, a payment of £10 gives you £240 of credit, more than enough to buy that TR2400, aerial and accessories. No fuss and no hefty deposits needed. A further advantage is that as the payments continue, your credit is automatically extended to allow further purchases. Why not send for full details right away and join the growing numbers who hold the Lowe blue card—the way to have tomorrow's equipment today. A major advance to your purchasing power.

THE WAY TO HAVE TOMORROW'S EQUIPMENT TODAY

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

LOWE ELECTRONICS Ltd

TS520SE

VOTED "MY FAVOURITE TRANSCEIVER" BY RADIO AMATEURS WORLDWIDE

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

Of course, the bare figures cannot tell you just how nice the TS520SE feels in use, nor can they tell you the pleasure of hearing other operators saying "never heard better audio OM, what rig are you using?"

The TS520SE standard specification includes CW wide/narrow switching (using the optional 500Hz filter), semi breakin keying with sidetone, PTT or VOX operation, really effective noise blanker, switched AGC time constants, 5 function metering, switched RF attenuator, RIT, speech processing for punchy transmit audio, fixed channel facilities, 25kHz calibrator, fan cooled PA, internal loudspeaker, and of course the TS520SE will take all the wide range of current matching accessories including the DG5 true frequency digital readout, the VFO520S remote VFO unit, the SM220 station monitor scope and panoramic display and so on.

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

THE TS520SE COSTS £437 INCLUDING VAT.

Now tell me if that's not value for money.....

SPECIFICATIONS

GENERAL

Frequency Range:	160 meter band-1·8 to 2·0MHz 80 meter band-3·5 to 4·0MHz 40 meter band-7·0 to 7·5MHz 20 meter band-14·0 to 14·35MHz 15 meter band-21·0 to 21·5MHz 10 meter band-28·0 to 28·5MHz 28·5 to 29·1MHz 29·1 to 29·7MHz WWV 15·0MHz (receive only)
Mode:	SSB (USB, LSB), CW
Antenna Impedance:	50 to 75 Ohms
Frequency Stability:	Within ±1KHz during one hour after one minute of warm-up, and within 100Hz during any 30 minutes period thereafter
Tubes and Semiconductors:	Tubes. 3(2 × 6146B, 1 × 12BY7A Transistors..... 52 FETs..... 19 Diodes..... 101
Power Requirements:	120/220 V AC, 50/60Hz
Power Consumption:	Transmit: 280 Watts Receive: 26 Watts (with heater off)
Dimension:	333 (13-1/8) wide × 153 (6·0) high × 335 (13·3/16) deep mm(inch)
Weight:	16·0kg (35·2lbs)

TRANSMITTER

RF Input Power:	SSB:200 Watts PEP CW: 160 Watts DC
Carrier Suppression:	Better than 40dB
Sideband Suppression:	Better than 50dB
Microphone:	High impedance microphone (50k Ohms)
AF Response:	400 to 2,600Hz

RECEIVER

Sensitivity:	0·2μV for 10dB (S + N)/N
Selectivity:	SSB: 2·4kHz/-6dB, 4·4kHz-60dB CW: 0·5kHz/-6dB, 1·5kHz/-6dB (with optional CW filter)
Image Ratio:	Better than 50dB
IF Rejection:	Better than 50dB
AF Output Power:	2 Watts (8 Ohms load, with less than 10% distortion)
AF Output Impedance:	4 to 16 Ohms

HOKUSHIN AERIALS

From the makers of our popular HF5 vertical, we have a complete range of vehicle aerials for VHF and UHF use. All the whips terminate in a PL259 plug so that you have complete flexibility, and any aerial in the range will fit the RG4M base or the magnetic mount. The 2E, 2NE, and 430E have a quick foldover joint at the base so that you can drive in and out of your garage without dismantling the aerial.

2E	2M 5/8, 3·4dB gain foldover whip	**£6.50** inc VAT
2NE	2M 7/8, 4·5dB gain foldover whip	**£11.00** inc VAT
430E	70cm 5/8 + 5/8, 5·5dB gain	**£10.00** inc VAT
HS-F1	2M rubber helical on PL259 plug	**£3.95** inc VAT
320	2M stainless quarter wave on PL259	**£1·50** inc VAT
RG4M	Base for all above units including 4 metres of cable ready terminated in PL259	**£3.00** inc VAT
GSS	Heavy duty gutter/boot mount to take RG4M base	**£3.15** inc VAT
MB5	Magnetic mount complete with 5m of cable and PL259	**£7.95** inc VAT

Also two really great base station aerials

GPV5	High performance 2m base station colinear. Forget the S ...MJ ...M and R ...OR ...R	**£22.00** inc VAT
GDX2	3dB gain over the range 50-480MHz. The classic wideband aerial. 500W p.e.p.	**£36.80** inc VAT
HF5	Our original success. 5 band vertical 80-10m with great performance, great savings only	**£41.40** inc VAT

Great News!

The AR240 is back in town but with higher battery capacity, provision for separate microphone and the hot performance (better than 0·2μV for 12dB SINAD, and 2W output on TX) that you all appreciate.
PRICE? Even better value at £168 inc VAT (price includes Nicads, charger, etc).
It has a new name too – the AR240A.

144-148MHz synthesized FM Hand-Held

SEND 48p IN STAMPS FOR COMPLETE CATALOGUE AND ANTENNA BOOK

PLEASE SPECIFY ANY PARTICULAR INTEREST AND WE WILL SEND FULL INFORMATION

HEAD OFFICE AND SERVICE CENTRE

CHESTERFIELD ROAD, MATLOCK, DERBYS. TEL: 0629-2817 or 2430. TELEX 377482. OPEN 9-5.30 TUES-SAT. PHONE IN 9am-9pm

For personal attention on the South Coast contact John, G3JYG, 16 Harvard Road, Ringmer, Lewes, Sussex. Ringmer 812071.

For equally helpful attention in Scotland contact Sim, GM3SAN, 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771 0364.

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

ANNOUNCING A NEW COMMUNICATIONS COMPUTER

TONO THETA 7000E

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

THETA 7000E. SOME OF THE OUTSTANDING FEATURES
VHF and Composite video output provided

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

£640.00 inc

THE ICOM SIDEBAND PORTABLES

IC-202S £169 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 = £146.96**	**With VAT = £169.00**
IC-402	**Less VAT = £210.43**	**With VAT = £242.00**

IC-402 £242 inc.

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

Scotland – Jack GM8GEC (031-665 2420)

Wales – Tony GW3FKO (0874 2772) **Burnley** – (0282 38481) **Midlands** – Tony G8AVH (021-329 2305)

North West – Gordon G3LEQ (Knutsford (0565) 4040) **Yorkshire** – Peter G3TPX (022678 2517 Evenings) (0226 5031 Day)

H.P. TERMS AVAILABLE

BARCLAYCARD VISA

FROM THANET OF COURSE

Access

PAUL
G3VJF

ICOM

IT'S THE FASTEST MOVER YET, SO TRY TO CATCH ONE!

THE MOBILE OF CHOICE FROM THE WORLD FAMOUS

ICOM STABLE — THE IC-255E

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

We have had a poke around one of these little beauties and are certain that ICOM, yet again, have come up with a winner. As you can see it has the expected smart ICOM appearance. Features include:-

- ★ Crystal controlled Tone Burst
- ★ Full band coverage—extendable to 148MHz if required
- ★ Four digit LED display
- ★ 25 Watts output or TW low power
- ★ A superb receiver using grounded gate FET front end
- ★ Scanning over a user programmable range
- ★ Memory scan
- ★ Stop on empty or busy channels
- ★ Tuning in 25kHz or 5kHz steps
- ★ 5 Memories—retained while the power is connected to the rig
- ★ Built-in 600kHz Repeater Shift
- ★ Alternative programmable shift
- ★ Reverse Repeater facilities
- ★ RIT (±3kHz) for those off channel stations
- ★ Scan control from the microphone (an optional mic available shortly)
- ★ Good loud audio
- ★ Optically coupled tuning between control knob and CPU
- ★ Multiway 24 pin socket on back for touchpad, computer, or external control (note the current RM3 cannot be used but a new version is to be introduced)
- ★ Rugged modular PA (Guaranteed of course!)
- ★ Mobile mount which can be padlocked

Please note that from THANET you get a full year's warranty on *all* parts and labour (including PA's). Orders direct to us are despatched free using registered first class post.

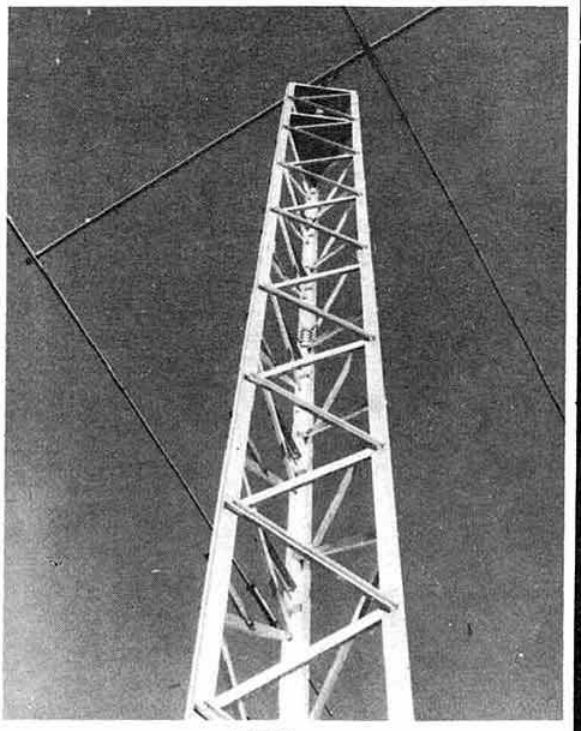
FROM **THANET** OF COURSE

Electronics (UK) ltd

THE UNIQUE ALUMAST

"THE TOWER THAT COMES IN A TUBE"

The **ALUMAST** is a 15" (375mm) wide triangular cross section lattice sectional aluminium mast based on a 10ft (3.05m) section length. It is supplied "knocked-down" in a tubular carton for ease of transport, but can easily be assembled needing no special tools or skills, The system includes top plate with bearing sleeve, rotor plate and a choice of a fixed base frame (FB-1) or one with hinge joints (HB-1) to enable the mast to be pivoted at ground level. Guy brackets are available for use at heights above 30ft.



- ★ Made from high strength corrosion resistant alloy using WESTERN'S EXCLUSIVE 'W' section leg extrusions.
- ★ Easy assembly using bolts and "Nyloc" locking nuts for security.
- ★ Free-standing to 30ft (9.15m) with a typical tri-bander plus VHF/UHF antennas.
- ★ Heights to 250ft (75m) with appropriate guy configurations (ask us for quotes).
- ★ Lightweight—only 25lb (11kg) per 10ft (3.05m) section.
- ★ 30ft (9.15m) mast is delivered in a tube only 10ft 6in (3.2m) long. 6in (0.126m) dia.

A COMPLETE 30ft (9.15m) MAST for £240.35

375/PSS/3; HB-1; RMP-1; TP-1

FULL PRICE LIST

375/PSS/3	30ft mast (3 sections)	£184.00
375/PSS/1	Additional 10ft section	£ 62.68
HB-1	Hinged base unit	£ 31.05
FB-1	Fixed base unit	£ 21.85
RMP-1	Rotor mounting plate	£ 12.08
TP-1	Top plate with sleeve	£ 13.23
GB-1	Guy brackets (set of 3)	£ 11.50

All prices include carriage and VAT at 15%

DEALER ENQUIRIES WELCOME

DESIGNED and MANUFACTURED in GREAT BRITAIN by Western

BUY BRITISH AND HELP THOSE BALANCE OF PAYMENT FIGURES!

★ ★ ★ SPECIAL SUMMER OPENING HOURS ★ ★ ★

For the benefit of personal callers we are OPENING ALL DAY ON THE SECOND SATURDAY EACH MONTH from MAY to OCTOBER. This is in addition to our normal hours of 9–12; 1–5 on weekdays.

Telephone enquiries will be taken by our answering machine as usual.

MAKE A NOTE OF THE DATES NOW!
12 July; 9 August; 13 September; 11 October, 9 a.m. to 5 p.m.
COME and BROWSE over the gear, or natter over a COFFEE!

Western Electronics (UK) ltd

HEAD OFFICE (All Mail/Enquiries)
FAIRFIELD ESTATE
LOUTH, LINCS, LN11 0JH
Tel. Louth (0507) 604955

Our Agents
Southern: Alan Paxton, G4BIZ, Southampton, Hants (0703) 582182
N. Ireland: Les Lyske, GI3CDF, Newtownards (0247) 812449
Scotland: Jim Henderson, GM4HKW, Falkirk (0324) 25559

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.

Western

THE Western "NEW GOODIES" PAGE . . . .

NEW FROM TRIO-KENWOOD — TR-9000

A superb new multimode 2m transceiver with all the expected Trio/Kenwood quality. FM/SSB/CW operation. 10 Watt capability. This beautiful transceiver is much the same size as a normal mobile rig but packs so much more into a small space. Put your name on the list now, there's bound to be a rush!

NEW FROM YAESU — FT-707

Yaesu's latest masterpiece—the FT-707 "Wayfarer". An up-to-date, compact HF rig that nevertheless leaves nothing out that the serious operator needs. Don't let the size fool you—this rig is as "big at heart" as many much larger sets!

FT720

The modular concept for VHF/UHF FM. Two transceivers—one control box. Mix and match how you like. These two new ones from Yaesu enable remote or local control of two bands (2m and 70cm) from one control unit using a switching box or independent control with each transceiver having its own control unit.

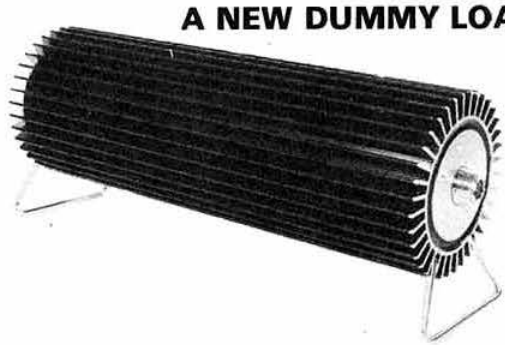
A NEW ROTOR

A new rotor at a reasonable price for those lightweight VHF/UHF beams. Silent control box, robust construction, good value for money! Needs 5-wire control cable. Mast bracket included.

PRICE £29.95

5-way cable 25p/metre

A NEW DUMMY LOAD



A high-power finned, sealed oil-filled dummy load. Take 300 Watts continuous or 1,000 Watts intermittent. Suitabl for HF or VHF. Fitted SO239 socket and chrome stand. N need to buy the oil—it's already in. Ex-stock NOW! N station should be without one!

PRICE ONLY £29.95

ACCESS and VISA ACCEPTED, HP ARRANGED, PRICES INCLUDE VAT
PHONE AFTER HOURS and use our ANSWERING MACHINE

★ ★ SUMMER SATURDAY ALL-DAY OPENING ★ ★
REMEMBER THESE DATES . . . .
12 JULY — 9 AUGUST — 13 SEPTEMBER — 11 OCTOBER (9am-5pm)

Western Electronics (UK) Ltd
HEAD OFFICE (All Mail/Enquiries)
FAIRFIELD ESTATE
LOUTH, LINCS, LN11 0JH
Tel. Louth (0507) 604955. Telex: 56121 West G.

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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: 0533-58682).
Mon-Sat 9-6pm; closed Thurs.

WATERS & STANTON ELECTRONICS

FDK MULTI-750E

2m ALL MODE

PLUS 70cm OPTION!

£299 inc VAT

OPTIONS

AC Power Supply Model: SP-750
This is matched for use with the Multi-750/700 series of transceivers and provides an output power of 6amps at 13·8V DC continuous. A heavy duty transformer with highly reliable components ensures long and trouble-free use. It may be used as a base station power supply for Multi-750 + Expander-430 or Multi-700EX 25W FM transceiver. The complete unit weighs 5kg and has inputs for 100/IM/240 volts.

UHF Transverter Model: Expander-430
This unit is an optional transverter for use in conjunction with the MULTI-750A/E in order to provide UHF operation in the frequency range 430-440MHz. REPEATER, SIMPLEX, CROSS-BAND and SATELLITE COMMUNICATIONS are possible on any mode.
Simply connect up the EXPANDER-430 to your MULTI-750A/E for 2 metre or optional 70cm, and VHF/UHF combined operation. Features built-in R.F output power High/Low and OFF switch, TRANSMIT/RECEIVE indicators.

MULTI-750E

Send sae for colour leaflet

SPECIFICATIONS

GENERAL
Frequency range ..... 144·000-145·999·9MHz (MULTI-750E).
144·000-147·999·9MHz (MULTI-750A).
Frequency selection ..... Each 100Hz or 5kHz step Main dial rotary knob or Up/Down counter microphone switch at any modes.
Operation mode..... FM: Reactance Mod. (F3), USB/LSB: Balanced. (A3J), CW: Carrier Keying (A1).
Antenna impedance ..... 50-52 ohms (unbalanced).
Power supply..... 11-15 Volts DC (Neg. ground), 13·8 Volts nominal.
Power consumption ..... 3 Amps @ 10W Transmit,
2 Amps @ 1W Transmit,
0·8 Amps @ Audio Max on RX,
0·4 Amps @ AF squelched.
1·5mA @ Back-up (typical).
Operation temperature .... − 10°C to + 60°C (degree).
Frequency stability ..... Less than 500Hz after 1-30 min, and less than 200Hz after 1 hour.
Dimensions ..... 163W × 73H × 260D in mm.
Weight ..... Approx 2·6kg (without Acc's).

TRANSMITTER
RF output power ..... 10W at High, 1W at Low (by rear SW).
Max deviation ..... + / − 5kHz (Factory pre-set).
Unwanted spurious..... Less than − 60dB.
Carrier suppression ..... Better than 40dB below carrier.
Sideband suppression..... Better than 40dB below carrier.
Mic impedance ..... 500-600 ohms dynamic microphone with Up/Down counter switch and PTT function switch.

RECEIVER
Receiving method ..... USB/LSB & CW: SIngle-superheterodyne, FM: Double-superheterodyne.
Intermediate frequency.... 1st: 10·7MHz, 2nd: 455kHz.
Sensitivity..... SSB/CW: − 8dBμ at S/N 10dB, FM: − 4dBμ at 20dB Noise Quieting.
Spurious image rejection .. Better than 60dB.
Selectivity..... SSB/CW: More than 2·2kHz at − 6dB, Less than 6kHz at − 60dB.
FM : More than 15kHz at − 60dB, Less than 25kHz at − 70dB.
Audio output power ..... More than 1·2 Watts at 10% THD.
Audio impedance ..... 8 ohms.

NOTE: The specification rating may change without notice due to technical improvement.

The Multi-750 is an amazingly priced all-mode 2 metre base or mobile station that you will be proud to own. The unit comes to you complete with microphone, 12V DC cord and mobile mounting bracket. And coming later in the year will be the SP750 and Expander-430 modules that, fitted together with the M750E will provide 230V AC operation on both 2 metres or 70cms at the touch of a button. Direct digital readout on the M750E of 144-146 (diode programmable to 148MHz) and 430 to 440MHz is automatic as is the change of repeater shift from 600kHz to 1·6MHz whenever 70cms is selected. Dual VFO control means one VFO on 70cms and one on 2 metres—even Tx on 70cms and Rx on 2 metres is possible—and the price—provisionally SP750—**£55**, Expander-430—**£160** approx ie 2m/70cms 12V DC/230V AC, complete module system will cost approx **£500**!

FDK products are distributed by:
FDK UNITED KINGDOM, WARREN HOUSE, MAIN ROAD, HOCKLEY, ESSEX, ENGLAND.

WATERS & STANTON ELECTRONICS

£99.95

FOR A HANDHELD?
YES . . . AND INCLUDING NI-CADS & AC CHARGER

PALM II £99.95* inc. vat
PALM IV (70cms) £159* inc. vat

Both units come complete with all accessories and fitted S20, 22/SU20 plus 600kHz and 1·6MHz shifts. Extra channels £3 each.

*If xtal controlled toneburst not required please deduct £10.

SAE FOR LEAFLETS

IT'S NEW! . . .

AND LOOK AT THE PRICE!

FDK MULTI-700EX

144–146MHz 25 WATTS
12½kHz & 25kHz STEPS
4 PRIORITY CHANNELS
CHANNEL SCANNING

ALL FOR
£199 INC VAT

The Multi 700EX is the new, improved version of the Multi 700E transceiver. This 25 watt FM transceiver provides top performance at a very modest price. The uncluttered front panel makes for safer driving—too many gimmicks means higher prices and less operational convenience. Frequency selection is in 12½kHz and 25kHz steps (the new European standard—so be warned!) but for club channels, etc., there is provision for two crystal controlled channels. Two additional channels can also be diode programmed for permanent retention and the bright LED display gives true frequency readout of both transmit and receive frequencies. Repeater operator is selectable at the flick of a switch, as is reverse repeater operation. A 1·6MHz shift can also be programmed on a diode matrix board, thus permitting shifts of 600kHz and 1·6MHz to be instantly selectable. Send SAE for full details.

STOP PRESS

TM56B VHF SCANNING RECEIVER BACK IN STOCK!

12V DC/240V AC SEND FOR LEAFLET

AMATEUR BAND MODEL £106 INC VAT

MARINE BAND MODEL £115 INC VAT

WATERS & STANTON ELECTRONICS

DenTron HF200A
80–10M 100 WATTS
SOLID STATE
TRANSCEIVER
£395 inc VAT
12vDC/230vAC

144 MHz!
NAGAI
2200 LINEAR
£429
inc. VAT
(Securicor £4.50)
Sae for colour brochure

* 240v AC
* 4CX-350F tube
* Receiver pre-amp
* 10–13 watts drive
* SWR meter built-in
* ★ 500W PEP input
* ★ 400W FM/CW input
* ★ Fan cooled
* ★ 12v DC output—3 amps
* ★ Covers 144–146MHz

ROTATOR DISCOUNTS!

CHANNEL MASTER 9502
IDEAL FOR 2M OR 70CMS.
USES 3 CORE CABLE
PREVIOUS PRICE £55.80
OFFER PRICE £43.50 inc. VAT
(Carriage £2)

SPECIAL OFFER

SKY KING SU 2000 VHF ROTATORS
(USES 3 CORE CABLE)
£29.95 inc. VAT!
Carriage £2 extra
MATCHING 3 CORE CABLE 16p per metre

DenTron . . .
FOR BIG SIGNALS
WE ARE SOLE FACTORY APPOINTED DISTRIBUTORS

IN STOCK NOW!
DenTron
MLA 2500B
160–10m 2kW PEP
£695 inc. VAT
and delivery

Send 25p for complete DenTron HF Catalogue

NEW 'B' VERSION NOW IN STOCK
FITTED HIGH/LOW POWER SWITCHING

* 1kW DC continuous
* ALC circuit
* 3 speed cooling
* Military specifications
* 234v/117v AC
* 2 of EIMAC 8875 tubes
* R.F. Wattmeter (incl. p&p)
* Size 5½" × 14" × 14"
* Weight 47lb.
* Ideal for SSTV/RTTY
* 3rd order down 30dB +
* 40 watts drive for 1kW

160–10m ATU's also in stock

DenTron GLA-1000
10–80m 1200W LINEAR

£295
inc VAT
& DELIVERY

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.5⅜" × 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.

CLIPPERTON "L"
160–10 METRES
2kW INPUT
£459

The Clipperton 'L' amplifier is a completely self-contained unit covering all amateur bands and uses 4 × 572B tubes. Forced air cooling ensures long tube life and makes it ideal for contests, RTTY, SSTV etc. This linear was used in the famous Pacific Clipperton expedition and as sole authorised UK importers, our stock comes direct to us from the factory in the U.S.A.

WATERS & STANTON ELECTRONICS

TRIO

APPROVED TRIO DEALER

NEW LOW PRICES ALL MODELS STOCKED

24 HOUR DELIVERY—
—FROM THE PEOPLE YOU CAN TRUST

ALL PRICES INCLUDE 15% VAT

TRIO **TS120V £347**
TS120S £432

SOLID STATE RIG RELIABLE AT LAST

Up until now there has been a natural reluctance to accept solid state HF rigs as anything but a second rig or mobile unit with dubious reliability of the PA devices. Now at last the new TS120 series gives you 80-10 metre coverage at either 10 watts output or 100 watts output. Digital readout and variable selectivity are just two features that put them in a class above any other solid state rig we know of (apart from the TS180S)—even those costing nearly £1,000. The TS120 will put to shame many of the older valve PA designs and can confidently be regarded as a good reliable base or mobile station—and no tune-up means instant QSY from band to band at the flick of a switch.

TRIO **TS520SE £437 inc VAT**

NEW LOW PRICE UNBEATABLE

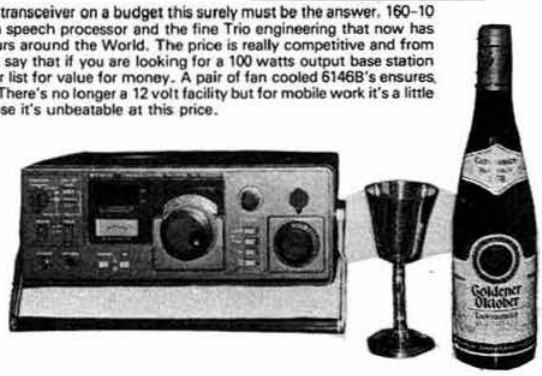
For the operator that wants an HF transceiver on a budget this surely must be the answer. 160-10 metres (full coverage) with built-in speech processor and the fine Trio engineering that now has become a legend amongst amateurs around the World. The price is really competitive and from tests we have carried out we must say that if you are looking for a 100 watts output base station the TS520SE should be top of your list for value for money. A pair of fan cooled 6146B's ensures high efficiency and good linearity. There's no longer a 12 volt facility but for mobile work it's a little big these days—for base station use it's unbeatable at this price.

NEW TRIO **R1000 RECEIVER**

YOUNG—BUT VERY MATURE!

Every one is individually tested by us and despatched by Securicor

£298 inc VAT—A REAL WINNER



NEW! TS770E 2m/70cm
£763 inc VAT

NEW TRIO TR9000

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

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

NEW

TRIO

TR2400 £210 inc VAT

The new TR2400 really does eclipse all other hand-helds in its sheer technology. There's no other model that can approach its performance. The large LCD readout has low current drain and the 1-5 watts output is a good compromise between effective communication and reasonable battery drain. 10 memories, automatic scanning, instant reverse repeater operation, 16 key touch-tone encoder, 144-148MHz etc etc . . . all adds up to the new leader in hand-helds . . . the Trio TR2400. Get your Barclaycard or Access cards ready for this one . . . half its fascination is operating it—the other half is owning it.

DELIVERY BY SECURICOR
Order by post or telephone with confidence – you'll receive your order in 72 hours by Securicor.

'Such nice people'

WATERS & STANTON

OUR BEST ADVERTISEMENT . . . IS OUR NAME!

MAIL ORDER – Anywhere in UK
HEAVY PARCELS – Securicor
OTHER PARCELS – Parcel Post or British Rail
All goods sent are covered free by our own insurance
PLEASE PHONE FOR QUOTATION ON ANY ITEMS NOT LISTED
VERY COMPETITIVE PRICES ON YAESU

TRIO

TS820S 160-10m transceiver 200w digital	£791.00 (3.75)
TS820 160-10m less digital	£669.00 (3.75)
SP820 External speaker	£37.95 (1.50)
TS520SE 160-10m transceiver 200w	£437.00 (3.75)
SP520 External speaker	£17.25 (1.25)
VFO520S External VFO	£98.90 (3.75)
TS120S 80-10m Solid state 200w	£432.00 (3.75)
TS120V 80-10m Solid state 10w	£347.30 (3.75)
PS20 AC PSU (TS120V)	£44.85 (3.75)
PS30 AC PSU (TS 120S & TS 180S	£85.10 (3.75)
MB100 Mobile mount	£17.00 (0.75)
AT120 3-30MHz ATV	£55.00 (4.50)
AT200 1-8-30MHz ATU	£82.80 (1.50)
MC50 Desk microphone (Super!)	£24.15 (1.50)
MC30S Noise cancelling hand mic.	£13.80 (0.50)
TR7600 2m FM + RM76	£220.00 (4.50)
TR2300 2m FM portable 80ch.	£166.75 (3.75)
MB2 Mobile mount (2300)	£17.25 (1.00)
TS180s 160-10m solid state transceiver	£679.00 (3.75)
TR3200 70cm portable 3 ch. fitted	£164.00 (3.75)

YAESU

FRG-7 General coverage receiver	£198.00 (N/C)
FRG-7000 Digital readout receiver	£357.00 (N/C)
FT101Z Transceiver	£546.00 (N/C)
FT101ZD Transceiver	£628.00 (N/C)

NEW STOCKS!
EL40X 80/40 MINI-DIPOLE
70ft, Balun Fed **£35.50** inc VAT

MICROWAVE MODULES (NEW PRICES)

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 144/28 30 converter	£21.85 (N/C)
MMC 144/28 LO converter	£24.15 (N/C)
MMC 70/28 converter	£21.85 (N/C)
MMC 70/28 LO converter	£24.15 (N/C)
MMC 432/28 S converter	£29.90 (N/C)
MMC 432/144 S converter	£29.90 (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	£69.00 (N/C)
MMA 144 2m pre-amp	£14.90 (N/C)
MMD 500P 500mHz pre-scaler	£23.00 (N/C)
MMV 1296 varactor tripler	£34.50 (N/C)
MML 144/100w linear amplifier	£142.50 (N/C)
MML 432/100w linear amplifier	£228.00 (N/C)
MML 144/25w	£48.30 (N/C)
MML 432/50w	£113.75 (N/C)

SEM

2m converters	£23.00 (N/C)
70cms converters 144 IF	£23.00 (N/C)
2m pre-amp	£14.95 (N/C)
2m auto switching pre-amp	£21.73 (N/C)
70 cms auto switching pre-amp	£24.73 (N/C)
2m PA3 pre-amp	£8.00 (N/C)
70cm PA3 pre-amp	£10.00 (N/C)
2m 48 watt linear/pre-amp	£66.70 (0.95)

All pre-amps fitted SO239 sockets

HF500W FWD/REF Power Meter	£29.17 (N/C)
HF auto pre-amp 2-40mHz	£16.68 (N/C)
HF pre-amp 2-40mHz	£11.73 (N/C)
HF Z-MATCH ATU 80-10m	£45.00 (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 Marine model	£48.00 (N/C)
Extra xtals	£2.45 (N/C)

FDK

Multi 3000 2m All mode	£395.00 (N/C)
Multi-750 2M FM/SSB/CW	£299.00 (N/C)
Multi 7000EX 2m 25 watts	£199.00 (N/C)
Multi 750 FM/SSB/CW 10W	£299.00 (N/C)
Multi Palm II 2m hand-held special package	£99.95 (N/C)
M-11/Q16 xtals	£5.00
Palm II xtals	£3.00
Multi-Palmsizer 2m synthesised 40 channel hand-held	£149.00 (N/C)
Multi Palm IV 70cms	£159.00 (N/C)

DENTRON

MLA 2500 160-10m 2Kw linear	£699.00 (N/C)
MT3000A 3Kw 160-10m tuner	£275.00 (N/C)
MT2000A 3Kw 160-10m tuner	£175.00 (N/C)
160-10AT Supertuner Plus	£115.00 (N/C)
JR Monitor 160-10m tuner 300w	£59.95 (N/C)
W-2 160-10m PEP/SWR meter	£59.95 (N/C)
MT 200A Transceiver	£399.00 (N/C)
1Kw 80-10m linear 240v GLA 1000	£295.00 (N/C)

AR

AR240A Synthesised hand-portable	£135.00 (N/C)

MIZUHO

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

NAIGAI

2200 2m 500w PIP linear	£429.00 (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 Mini-beam 600W 10-15-20	£99.00 (2.00)
Mosley 20-15-10m mini-beam 600w	£99.00 (2.00)
Mosley 2kW version	£129.00 (2.00)

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

TA32 600 watts 20-15-10m	£89.00 (2.00)
TA33 600 watts 20-15-10m	£133.40 (2.50)
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	£35.00 (1.00)
Mosley RD5 SWL ham dipole	£36.30 (1.00)
EL-40X 80-40 Mini dipole	£27.50 (1.00)
HF5 5 band vertical	£41.50 (1.00)

VHF ANTENNAS (JAYBEAM)

4Y/4M 4el yagi	£17.20 (2.00)
C5/2M 5db colinear	£40.00 (2.00)
5Y/2M 5el yagi	£10.25 (1.50)
8Y/2M 8el yagi	£13.25 (1.50)
10Y/2M 10el yagi	£28.40 (2.00)
PBM10/2M 10el parabeam	£33.60 (2.00)
PBM14/2M 14el parabeam	£40.80 (2.50)
5XY/2M X'd 5 element	£20.70 (1.50)
8XY/2M X'd 8 element	£25.80 (2.00)
10XY/2M X'd 10 element	£34.30 (2.00)
Q4/2M 4el quad	£21.50 (1.50)
Q6/2M 6el quad	£28.50 (2.00)
D5/2M 5 over 5	£18.30 (1.50)
D8/2M 8 over 8	£24.85 (2.00)
SVMK vertical Kit	£6.60 (1.25)
UGP/2 Ground plane	£9.35 (1.25)
HO/2M 2m halo	£4.25 (0.75)
HM/2M Above with 24" mast	£5.05 (1.00)
C8/70cm 8db colinear	£45.40 (2.50)
D8/70cm 8 over 8	£20.45 (2.00)
PBM18/70 18 el parabeam	£24.75 (2.00)
MBM/48 70 el Multibeam	£28.20 (2.00)
MBM88/70 88 el Multibeam	£37.50 (2.00)
8XY/70 8 el X'd yagi	£31.05 (1.50)
12XY/70 12 el X'd yagi	£38.50 (2.00)
D15/1296 15 over 15	£30.95 (1.50)

ACCESSORIES

9502 rotator	£43.50 (2.00)
KR400 rotator	£105.80 (2.00)
AR40 rotator	£59.80 (1.50)
Stolle 2030 rotator	£55.00 (1.50)
Stolle 2010 rotator	£50.00 (1.50)
Stolle 2050	£40.75 (1.50)
SWL ATU	£16.50 (0.75)
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	£10.50 (0.50)
MM202S Safety microphone	£20.95 (0.50)
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)

SPECIAL OFFER
SRX30 Receivers £158

MONDAY – SATURDAY 9-5·30 **WATERS & STANTON ELECTRONICS** EARLY CLOSING WED 1·00pm

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Bredhurst electronics

ALL PRICES INCLUDE VAT & CARRIAGE

CALLERS WELCOME MON–SAT 9–5.30.

2 METRE MULTIMODE

TR9000

£345 INCLUDING VAT & CARRIAGE

Trio have done it again! The latest product to appear is the exciting 2 metre all-mode TR9000 transceiver. . . complete with a host of new features. Combining the convenience of FM with long distance SSB and CW in a very compact, very affordable package, the TR9000 is the answer for any serious 2M Amateur Operator. Because of its compactness, the TR9000 is ideal for mobile installation. Add on its fixed station accessories and it becomes the obvious choice for use in your shack.

TS120V/TS120S

TS120V £347 **TS120S £432**

For the HF operator who wants either a base station rig that he can use for mobile operation or vice versa, the TS120 range is the optimum choice. Either the 120V with 10 watts output, or the 120S with 100 watts will give outstanding performance in any environment. The modular unit approach adopted for this series means that you can start with the basic rig and add units such as external VFO, speaker, matching PSU or 100 watt linear as your needs (and funds) grow. Come and try this marvellous little rig—you will be really impressed with its performance as hundreds of proud owners can testify.

THE ULTIMATE VHF RECEIVER — BEARCAT 220

Have you ever wanted a VHF receiver that will cover all bands with facilities such as scanning, lockout of unwanted signals, programmable memories, priority channel checking, etc, etc, etc.

Well, now there is a set on the market that will do all this and much more. The Bearcat 220 covers 4M, 2M, aircraft band, marine band, business band and 70cm amongst other frequency bands. It has up to 20 memories which can be programmed from a front panel keyboard. These can be scanned or locked out from scan as required, and any of them can be set to any frequency in the set's coverage. Normal mode is FM, switching to AM for the aircraft band. It is also possible to search entire bands or frequency segments between selected upper and lower limits.

SPECIFICATIONS:

Coverage	66 - 88MHz	Power: 240v AC or 12v DC
	118 - 136MHz	Antenna: Built-in telescopic or external
	144 - 148MHz	Size: 10½" × 3½" × 8"
	148 - 174MHz	Built-in speaker
	420 - 512MHz	Weight 5 lbs

FOR ONLY £258
INC. VAT & CARRIAGE

ACCESS ● BARCLAYCARD ● INSTANT H.P. ● PART EXCHANGE

FREE FINANCE ! ! !

Money today is expensive, very expensive. Unfortunately many people ask only "what are the repayments" when entering into an agreement. We take Access and Barclaycard over the 'phone, sure it costs us a few per cent, but it permits speedy despatch of your order and if you pay your statements promptly there are no charges, but use it for credit at 2·25% per month means an effective annual equivalent rate of 30.6%!!! Get yourself hooked on a "budget plan scheme" where you pay a fixed amount by banker's order—whether you use your credit facility or not (remember you get no interest on a credit balance)—you are tied to one retailer and will be paying say 1¾% per month (23% per annum), so if you put down £10 today and pay £10 a month that £240 radio will finally be yours in 1983!

Now, with SMC's prices much the same or a little lower than 18 months ago and inflation forecasts of 23%, this must be a good time to buy—and owning one of the best communications equipments in the world has never been easier than with SMC's new credit scheme....Free Finance.

How does it work?

Simple:—6 months—pay 20% down, split the balance into 6 parts
OR 12 months—pay 50% down, split the balance into 12 parts.

Give us a ring for full details (subject to clearance and a minimum of £100 invoice). We will help you to enjoy a regular priced Yaesu, KDK, Gem Quad, Ascot, SMCHS, CDE, Hy-Gain, Stolle, SMC, Leader, Hansen, MFJ, KLM, Mirage, Nag, Hi-Mound—tomorrow!

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ASCOT

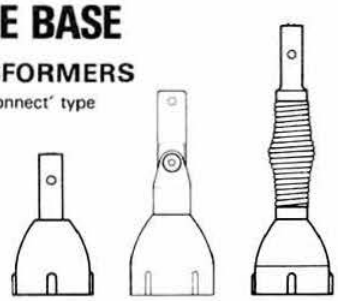
THE FIVE-EIGHTS ANTENNA A SIX POINT GUIDE!

1 PICK THE BASE

BASE TRANSFORMERS

Screw on 'quick disconnect' type

- ★ 130-175MHz
- ★ 3dB Gain
- ★ 5MHz Band
- ★ 1·5:1 max
- ★ 100W Rated
- ★ 50 ohm nom.
- ★ A100 nylon
- ★ Chrome plated
- ★ Stainless spring
- ★ Beryllium Cu.



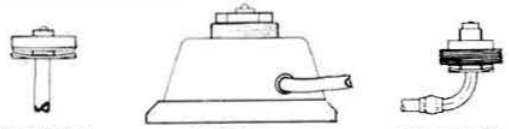
STANDARD (440) £3.50 | SWIVEL (330) £4.45 | SPRUNG (341) £6.65

2 CHOOSE THE MOUNT

all fit the above

BASE CONNECTORS

All c/w 4.5m coax



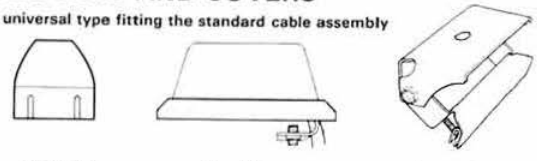
STANDARD (085) £2.80 or MAGNETIC (092) £8.95 or FIBRE-GLASS (085LR) £3.35

3 ADD AN ACCESSORY

(if required)

MOUNTS AND COVERS

universal type fitting the standard cable assembly



Blank-off (031) £0.80 and Boot-lip (093) £2.90 or Gutter clip (089) £4.75

4 SELECT THE WHIP

STAINLESS STEEL GROUND TAPERED

(057) 127cms long £1.95

5 ADD THE CARRIAGE

Mail order is offered direct from SMC HQ and the Branches.
Carriage £1.00 complete antennas or £0.50 for accessories any quantity.

6 ADD THE VAT+15%

An illustrated leaflet on the full range of ¼λ and ½λ antennas is available

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HANSEN

PEP & LEVEL RESPONSE IN-LINE WATTMETERS

The FS700 series are flat frequency response, peak envelope power and R.M.S. in-line wattmeters with many novel features. The most notable being the 'power independent' SWR scale—no forward power calibration knob, just a direct reading SWR scale.
Get into the Hansen habit today.

Specifications	FS700H	FS700V
Freq. Range	1·8-60MHz	50-150MHz
Power FSD	15, 150, 1·5kW	15, 150W
V.S.W.R.	1:1 to 4:1 and 1:1 to 20:1	
Accuracy	±7% of FSD	
Impedance	50-52 Ohms	
Connectors	SO239	
Power	240 Volts AC 50Hz	
Weight	3·3lbs (1·5Kgs)	
Size overall	8" × 4" × 5¼" (205 × 100 × 140mm)	
Size Meter	2" × 3¾" (51 × 97mm)	
Time Const.	PEP follow 4 seconds PEP Hold 600 seconds	

FS700H or FS700V **£68.00**

FS500

PEAK READING WATTMETER
Power RMS and PEP ±7% FSD
SWR Measurement 1-5:1
Size 8" ×4" × 5¼"

FS500H	1·8-60MHz	20, 200 & 2kW	**£59.00**
FS500V	50-150MHz	20 & 200W	**£59.00**

FS60*

PEAK READING WATTMETER
Power RMS & PEP ±10% FSD
SWR measurements 1-3:1 ±3%
SIZE 6¼", 2¼", 4¼"

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**

Hansen Wattmeters are available from reputable amateur radio dealers throughout Britain.

Mail order service (£0.75 post and packing) is offered direct from SMC or any branch.

The range encompasses level response wattmeters and remote indicator types. Please contact your local stockist for further details.

NB. All prices exclude VAT at 15%

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VERSATOWER

TELESCOPIC & TILTOVER RADIO TOWERS

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

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

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

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

The sample of prices exclude VAT and delivery

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

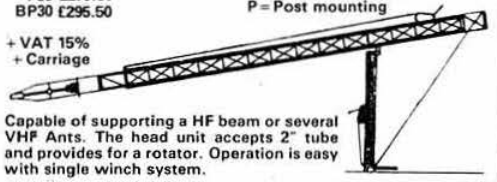
80-85-100-120' and MOBILES PRICES ON APPLICATION

NEW '30ft': 10ft SECTIONS

P30 £279.00
BP30 £295.50

BP = Baseplate mount
P = Post mounting

+ VAT 15%
+ Carriage



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

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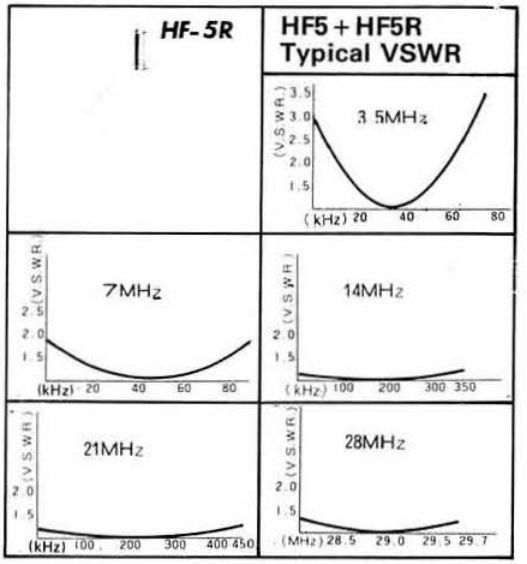
SMC-HS

FIVE BAND VERTICAL ANTENNA

Only 15' 9" high (4.8m) and around 1⅝" in diameter (4.2cm). This remarkable new antenna operates on 80, 40, 20, 15, and 10 metres. Power handling of 500W PEP on 10, 15 and 20m and 200W PEP on 40 and 80m, within its 1.5:1 V.S.W.R. bandwidth.

The SMCHF5 weighs only 6lb 6ozs (2.9kg) and is suitable for mounting at ground level on a good earth post (with or without radials) or in an elevated position with wire radials or better still the SMCHF5R.

THE SMCHF5R Radial kit, with power handling capabilities of 150W PEP weighs only 4lbs (1.8kg) and is the perfect answer to restricted locations, consisting as it does of five solid rods of similar length 6' 6"-7' 3" (2.05-2.2m) sloping at 45° to the antenna.



SMCHF5V and SMCHF5R are available from reputable amateur radio dealers throughout Britain.

SMCHF5V £35.00 + 15% VAT, £40.25 Ex-works
SMCHF5R £25.65 + 15% VAT, £29.50 Ex-works

Carriage–Antenna or radial or both together
SECURICOR DELIVERY £3.30 + 15% VAT, £3.80
RAIL DELIVERY £1.50 + 15% VAT, £1.73

Check out our exciting new range of mobile and VHF colinear antennas today.

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South Midlands

SMC & YAESU FOR HF—SMC & YAESU FOR HF

FT707 NEW SOLID-STATE TRANSCEIVER

The FT707 'The Wayfarer' is an ultra-compact solid-state transceiver covering 80-10m, including 30, 17 and 15m—all factory installed, with 100W output (IOW model) 50% out developed in 3:1 VSWR, digital (bright LED's in mode sensitive counter) and analogue readout, status at a glance (from string LED and single displays) 16 poles of crystal filtering continuously adjustable IF bandwidth 2·4kHz to 300Hz. Noise blanker of most advanced design using local AGC loop, Schottky diode ring module, power transistor buffers, ultra-clean low noise local oscillator are combined to produce, size and price not withstanding: *probably the best receiver you have ever used.*

FT707 Transceiver 100W	£455.00	FV707DM Ext. Dig. VFO	£157.00	FP707 12 Volt P.S.U.	£95.00	MMB707 Mobile Mounting	£12.00
FT707S Transceiver 10W	£425.00	FC707 Antenna Turner	£63.00	MR7 Rack Mount Cabinet	£11.50	YM35 Scanning Microphone	£11.00

FT107M SOLID STATE TRANSCEIVER

FT107M

All solid state transceiver. 160-10M (+WWV Rx and 2 Aux). 12V DC. SSB, CW, FSK and AM. 240W PIP. The fan cooled (thermostatically controlled) no tune "broad band" power amplifier delivers 75% power output into 3:1 VSWR. Analogue and digital readout to 100Hz. Sensitive and with excellent dynamic range (hard driven schottky diode ring mixer). Continuous variable bandwidth 300Hz to 2·4kHz plus optional "basics" of 350/600Hz and 6kHz. Full equipment includes: audio peak/notch filter, full metering including SWR, RF speech processor, advanced noise blanker, semi break-in with side tone, VOX, clarifier on Tx, Rx, or both, 20dB attenuator etc. The optional memory system provides 12 stored channels (with fine tuning), and offers scanning from the microphone. The store employs DMS—digital memory shift—to allow tuning, via a photo interrupter of any of the memorised frequencies (equivalent to 13 VFOs!!).

FT107M Transceiver	£660.00	FV107 Ext. VFO	£80.00	FTV107 Transverter frame	£96.50	YM34 Mic. desk	£18.50
MEM/DMS Memory	£87.00	FC107 Antenna Tuner	£92.50	430-440 70cm module	£158.50	YM35 Mic. hand. scan	£12.50
FP107E AC PSU Extnl.	£92.50	SP107 External speaker	£24.00	144-148 2m module	£88.50	YM36 Mic. noise cancel	£11.75
FP107 int. AC PSU	£85.00	FTV107(2) Transverter	£181.50	50-54 6m module	£68.50	YM37 Mic. Hand	£7.50

FT901DM THE SUPERB PERFORMER

FT901DM

160-10m (+WWV Rx), 12 and 234V (PSU Built-in). SSB, AM, CW, FSK and FM (Tx & Rx), 180W. PIP, 80W FI. Analogue 1kHz and Digital to 100Hz. Sensitive, ¼µV with AGC controlled Mosfet RF, to push pull FET RF, Balance active mixer, push pull IF amp, to crystal filter then noise blanker. Continuously variable selectivity 300Hz to 2·4kHz and fixed 350/600Hz, 2·4kHz, 6kHz and 12kHz (at 6dB), 80dB cross mod rejection, 90dB desensitisation immunity (at 20kHz off at 14MHz). Audio Peak and separate notch tuning. Negative RF feedback on 6146B output stage (−31dB 3rd order). RF processor, VOX, Curtis electronic keyer, tune button (10sec on full power), PLL VFO with memory for any Tx, Rx or T/Rx frequency, Modular plug-in construction, permeability tuning (for new band allocations) 25kHz calibrator, 20dB switchable attenuator, sidetone, clarifier and an advanced noise blanker are all features of the FT901.

FT901DM Transceiver	£800.00	YVM-1 Video Monitor	£125.00	FTV901 Transverter	£245.00	FC901 Antenna Tuner	£115.00
FT901D Transceiver	£710.00	YO901 Monitorscope	£240.00	430-440 70cm module	£160.00	FL2100Z Linear Amp.	£355.00
FT901DE Transceiver	£700.00	YO901P YO901 with pan	£280.00	50-54 6m module	£60.00	FV901DM Synth. Ext. VFO	£215.00
YR901 Morse/TTY reader	£395.00	PAN KIT Mod kit	£47.00	70-74 4m module	£75.00	SP901 External speaker	£24.00

FT101ZD PERFORMANCE AND ECONOMY

FT101ZD

A hybrid HF transceiver. 160-10M (+WWV Rx + Aux). 234V AC and 12V DC (inbuilt inverter option). SSB, CW and AM. 180W PIP from a pair of 6146B with negative feedback. Analogue and "mode sensitive" digital readout to 100Hz. Continuously variable IF bandwidth 300Hz-2·4kHz plus optional "basic fixed" of 350/600Hz. Full equipment includes:— adjustable level RF processor, advanced adjustable level noise blanker, front panel adjustable VOX, semi break-in with side tone, 0-10-20dB attenuator, switchable AGC, Slow/fast/off, clarifier (RIT) selectable on Tx, Rx or both etc., etc.
The FT101ZD is compatible with nearly all the FT901 accessories listed above—morse reader and video display, monitor scope with panadaptor, 3 band transverter, ATU, linears, speakers, and a choice of synthesized or conventional (NEW FV101Z) external VFOs

FT101ZD Transceiver Digital £575.00 FT101Z Transceiver Analogue £500.00 Count Analogue/Dig. kit £80.00 FV101Z £110.00

FT7B MOBILE AND BASE TRANSCEIVER

FT7B & YC7B

A compact all solid state HF transceiver. 80-10M. (full 2MHz coverage of 10 with optional crystals). USB-LSB CW-AM. 100W PIP (A3j and A1), 25W (A3). VFO control with clear analogue scale to 1kHz, plus an optional digital readout unit that can be conveniently sited above the transceiver, on the dash or steering column. The front panel remains remarkably uncluttered for a transceiver boasting a; crystal calibrator, vox, clarifier, side tone, and an excellent audio peak filter for CW. A mosfet RF stage for sensitivity, and a schottky diode ring mixer for dynamic range provides a level of receivers performance that outclasses "competitive" (?) transceivers. Supplied complete with mobile bracket, microphones, leads, plugs, etc. The FT7B provides the economic answer to world wide communications from home or from the car.

FT7B Transceiver £375.00 . YC7B Digital Readout £60.00 FP12 12V 12A PSU £67.00 YD148 Desk Mic. £18.50

PRICES EXCLUDE VAT (15%) BUT INCLUDE DELIVERY—SECURICOR/POST IN THE UK

SOUTH MIDLANDS COMMUNICATIONS LIMITED.

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A	G3ZUL	Brian	Stourbridge	(03843) 5917
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N	GI3WWY	Mervyn	Tandragee	(0762) 840656
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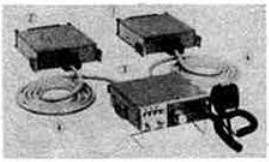
Communications Ltd

SMC & YAESU FOR VHF—SMC & YAESU FOR VHF

YAESU

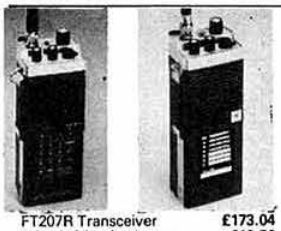


FT720R NEW 'REMOTABLE'

The FT720R is a new concept in mobile FM. Take a neat 'remotable' control head (2m or 4m of extension cable and your choice of 2m (10 or 25W) and 70cm 10W main units. Add if you wish a switching box and both 2 and 70cms are available from the one money and space saving controller.

The package offers sophisticated microprocessor PLL control system, optical coupled tuning, 5 memory channels, priority channel, up/down scanning from the mic (stop on busy or empty), auto or man. Tone burst up/down repeater shift and a string of yellow and red leds for power out and S meter etc.

FT720R Control head £130.00
S72 Switching box £47.50
E72S 2m cable £20.00
720RV Transceiver 10W 2m £148.00
E72L 4m cable £23.50
720RVH Transceiver 25W 2m £153.00
720RU Transceiver 10W 70cm £179.00



FT207R–FT202R: 2m HANDHELDS

The FT207R is a microprocessor controlled synthesized handheld that offers 12·5kHz channel steps!! 4 memory channels are provided and these may, as can the whole band, be scanned. Any one of the memories can be used as a priority channel. Simply operate as normal on any frequency, designate one of the memories as priority, and every few seconds, for a few milliseconds, the set will check occupancy of the channel. All frequency entry is by the keyboard (which includes touch tone). The readout displays frequencies (to 100Hz), memory channel number and 'P'. Switches are provided for keyboard lock (prevents accidental operation) and display 'time-out'. A 600kHz shift, and any programmable split, is available, both of course plus and minus. Memory back-up is provided but can be switched off for long-term storage. 2.5W + 200mW outputs and a whole host of accessories complete the brief specification of this exciting transceiver.

The FT202R is an economical 6 channel handheld physically similar to the FT207R.

FT207R Transceiver £173.04
NC-1A Slide-in charger £16.50
NC-2 Charger eliminator £34.50
NC-9C Small charger £6.50
NBP-9 Nicad pack spare £14.50
FBA-1 Pack/charger adaptor £2.25
YM24 Speaker/mic £14.50
FLC1 Heavy duty case £18.00
AA Nicads, each £0.87
FT202R Transceiver £103.50
NC-1 AC charger '202 £16.50
PA-1 12V PSU '202 £16.50

CPU2500 MICROPROCESSOR CONTROLLED

The CPU2500 family are 2 metre FM transceivers available in 25W or 10W output form with keyboard or standard push tune microphones. CPU stands for Central Processing Unit and it is this microprocessor that governs the synthesizer functions. Frequency control is possible either by rotating the main tuning knob (optically coupled), by using the up/down push buttons on the front panel, by using the up/down buttons on the microphone or by tapping in the data on the keyboard microphone. Plus and minus 600kHz repeater shift and any split (up to 4MHz) can be programmed in. Four memory channels with back-up are provided and these may be scanned, as can the whole band, the scanner stopping at the first vacant or occupied channel. The SMC stepper (St) provides 25kHz steps between 145-146MHz (and entry of 5kHz direct from the keyboard) rather than the 10kHz (+5 up) synthesizer steps only, when it is switched into circuit.

CPU2500R 25W standard £292
CPU2500St 25W c/w stepper £319
CPU2500RKS 10W key mic £292
CPU2500RKSSt 10W key, stepper £319
CPU2500RK 25W key mic £308
CPU2500RKSt 25W key, stepper £335
CPU2500RS 10W standard £272
CPU2500RSSt 10W c/w stepper £299

FT227 SYNTHESIZED MOBILE TRANSCEIVER

The FT227s are 10W output 2 metre transceivers whose receiver performance—sensitivity and immunity to overload has become the standard against which others are compared. They use a signal knob (photo interrupter) to control the synthesizer, which basically turns in 10kHz steps with a 5kHz 'fill in' oscillator.

FT227RXS is an FT227R fitted with SMC's scanner. This maintains all the normal features of the 227 but the neat internal installation provides automatic tuning from 145 to 146 in 25kHz steps. When finding an occupied frequency the scanner pauses for about seven seconds and if not held will move on. A flick of the P.P.T. will lock out one (or all) unwanted channels next scan around.

FT227RBXSt is an FT227RB fitted with SMC's stepper. A four channel memory is provided in this model and tuning may also be accomplished by push buttons on the microphone. A single push moves the transceiver 25kHz, hold the button down for ½ second and it scans the band until a station is found.

FT227RXS Transceiver £252.17
FR227RBSt Transceiver £247.83
FP4 12V 4A PSU £35.00
YD148 Desk mic £18.50

FT225RD MULTIMODE 2 METRE TRANSCEIVER

144–146–148MHz. USB, LSB, AM, FM, CW (semi-break-in with side tone). Smooth dual speed VFO control and 11 (×4) crystal channels. Simplex and (auto tone burst) repeater, 600kHz and auxiliary shifts both up and down. Single signal mix, with phase locked conversion oscillator, for spurious free output. Mains 234–100V 50/60Hz and 12V DC for world wide portability. Excellent selectivity, SSB 2.4kHz with 1.75: 1 SF, FM 12kHz at −6dB. High sensitivity with modern MOSFET RF stage. Good strong signal handling by careful gain distribution, mixer and crystal filter design. High power output 10W AM, 1-25W CW and FM, SSB 25W + + with great reliability and low IMD's. Mode sensitive digital readout to 100Hz and easy to service superior plug in board construction. Front panel controls for: SSB mic gain, FM power, squelch, 'Vox/Mox sensitivity, noise blanker, AGC, readout brightness, meter functions (S/centre plus relative power) etc etc. Digital and Analogue versions and memory option.

FT225RD Transceiver £485.00
FT225R Transceiver £445.00
MEM memory option £85.00.
COUNT Counter R/RD £50.00

PRICES EXCLUDE VAT (15%) BUT INCLUDE DELIVERY—SECURICOR/POST IN THE UK

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Leeds 16. Yorkshire.
Leeds (0532) 782326
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S.M.C. (Jack Tweedy) LTD
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150 Horncastle Road,
Woodhall Spa, Lincolnshire
Woodhall Spa (0526) 52793
9-5: Tues Sat (+appointments)

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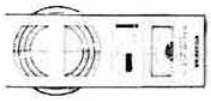
Communications Ltd

SMC FOR ALL YOUR STATION REQUIREMENTS

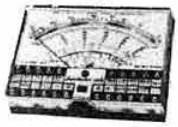
YAESU



DIP OSCILLATOR
1·5 250MHz on fundamental c/w earphone, battery, 6 plug in coils 1–15MHz crystal test, 2kHz modulation.
LDM815 (p&p foc) **£45.00**

V.H.F. LINEAR AMPLIFIER
80W out for 10W nom drive. 145MHz 12V (circa 10A). Switchable; SSB/FM Hang time. RF or man cont. Low noise pre-amps
RC1 Remote control (p&p £0.40) **£15.00**
B108 Amplifier (p&p foc) **£99.00**

WATT METERS
Through line. 1.8–54MHz. SWR scale.
LMP885 20, 200, 1000W FSD (p&p foc) **£51.00**
Absorption 1·8–500MHz
LDM880 5, 2, 120W FSD (p&p foc) **£79.00**

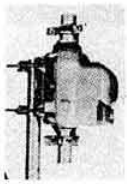


MULTIMETERS
20K ohms per volt. 1000X overload on ohms Plug in range selection.
80 Microtest 40 Ranges (p&p foc) **£16.50**
680G Supertest 48 Ranges (p&p foc) **£24.50**
680R Supertest 80 Ranges (p&p foc) **£32.00**

VHF/UHF SWR/POWER METER
Power 10W FSD on 50 (70), 144, 432MHz VSWR. Calibrated to 3:1 50 ohms
Detachable RF head/indicator unit
UH74 (p&p £0.60) **£12.75**

DIGITAL MULTIMETER
1- 10- 1000- 10000. ACV-DCV-ACmA. DC-mA, Ohms. 10M ohm input impedance, AC & DC. Automatic zero and polarity.
ME521 (p&p foc) New Low Price **£38.26**

COAXIAL RELAYS
12V dc operation, 50 ohms. 1kW PEP @30MHz 50dB isolation at 1 GHz. 0.2dB loss at 0.5GHz.
CX540D 3 BNC Sockets (p&p foc) **£18.50**
CX530D 3 BNC + 1 'N' (p&p foc) **£18.50**
CX520D 3 'N' sockets (p&p foc) **£18.50**



AERIAL ROTOR 'OFFSET TYPE'
Carriage UK, post free, all models
CDE manufacture
Silent self-calibrating control box
AR30—"Dial and push" **£41.00**
Stolle manufacture
Silent automatic control box. Turning shaft passes through rotator (as illustrated)
2050 Memomatic control box with moving light gives indication of beam heading during rotation period **£37.50**
2010—"Dial up direction" control box with excellent synchronization **£45.83**

POWER SUPPLY
12V dc regulated supply,
240V 50/60Hz input
3 Amps cont. 5 Amp peak 3 × 4½ × 6". 3½lbs
ODR123C (Post free) **£13.50**

V.H.F. LINEAR AMPLIFIER
160W out for 15W maximum drive. 145MHz. 12V dc (circa 18A). RF or manual switching. SSB/FM Excellent heat sink – over temp, trip out/reset.
PA 15-160BL (Post free) **£178.50**

COAX SLIDE SWITCHES
50 ohms impedance SO239 sockets
TWS120 1 in 2 out (p&p 20p) **£5.75**
TWS150 1 in 5 out (p&p 30p) **£10.50**
TWS220 2 in 4 out (p&p 30p) **£10.85**

ANTENNA COUPLER
3.5–30MHz. 50/75 ohm Coax (VSWR<5:1) and Single Wire (10–250 ohms) transformed to 50 ohms. To 500W PIP SSB
Wattmeter 20+250W FSD meter
LAC895 (p&p foc) **£92.00**

HF/VHF SWR METER
Twin Meter. 3.5 to 170MHz. 50ohms.
SWR. Calibrated to 3:1
Relative Power. SO239 sockets
T3-170L (p&p £0.60) **£11.25**

DIGITAL FREQUENCY COUNTER
100kHz to 30MHz. 12V dc operation. 5-7 segment displays resolves to 10Hz.
Only 6½ × 2½ × 5½"
RT75D (p&p 50p) New Low Price **£38.26**

TRANSVERTERS, SOLID STATE
MMT28/144 10m, 2m, 1F 10W out **£79.00**
MMT70/144 4m, 2m, 1F 10W out **£79.00**
MMT144/28 2cm, 10m 1F 10W out **£86.00**
MMT432/28.S 70cm, 10m, 1F Satellite shift **£119.00**
MMT432/144R 70cm, 2m, 1F Repeater shift **£151.00**
MMT1296/144 23cm, 2m, 1F 1·3 R.F. **£139**

ANTENNA ROTATORS 'BELL TYPE'
Carriage UK (Post or Securicor) free.
AR40 Silent self-calibrating control box to 3sq ft ant wind area **£52.00**
BT1 4 pre set plus manual control to 5sq ft ant wind area **£79.00**
Continuous readout on large meter
Superior brake mechanism
CD45 to 8½sq ft ant wind area **£99.00**
Ham IV to 15sq ft ant wind area **£145.00**
T2X to 30sq ft ant wind area **£199.00**

HIGH EFFICIENCY VHF VERTICALS (illustrated right)
RINGO RANGER: 6dB gain over ¾λ ground plane. Uses 3 phased ¼λ and ⅛λ stub. Ultra low angle radiation. No radials required.
ARX2 144MHz 9'6" tall, 1¾lbs (p&p £1.00) New Low Price **£20.00**
Other Cushcraft VHF antennas – horizontal and vertical in stock.
All at 10% off list prices!!!

QUARTZ & CERAMIC FILTERS
QUARTZ 3·18, 9, 10·7Mhz centre frequency; 350/600Hz, 2·4/6/12kHz, 6&8 pole
CERAMIC 455kHz centre frequency
2/4/6/12kHz, 9&11 poles
Prices: Ceramic **£5–£11** Crystal **£16–£22**

NB. ALL PRICES EXCLUDE VAT 15%

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BARCLAYCARD VISA

KYOKUTO

KYOKUTO DENSHI COMPANY LIMITED

KDK 2025 2m SYNTHESIZED 25w TRANSCEIVER

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

The KDK FM2025E is a 12V DC two-metre FM transceiver for mobile or base station use. Although packed with more features than any previous model, operation is even easier, by using a "custom built" microprocessor.

Digital frequency synthesis provides full band coverage 12·5kHz or 25kHz steps. "Single knob" frequency selection is by an optically coupled encoder plus a dialling speed switch that increases the tuning steps tenfold to facilitate the selection of widely spaced frequencies.

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

The 2025 embodies the best non-lockout scanner available. It seeks occupied or empty channels and a flick switch hold facility enables immediate transmission on a desired frequency. The scanner functions on both memory channels and across any selected portion of the band; scan limits are defined by two of the memory channels.

Dual gate UHF MOSFETS in the RF and mixer provide superior intermodulation performance with high sensitivity maintained over the band by auto varicap tuning.

A monolithic crystal filter in the first IF and a commercial quality 15-pole ceramic filter in the second IF provides extremely sharp selectivity. A one-chip multifunction IC provides all the second conversion circuitry.

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

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

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

THE 2025 IS AVAILABLE DIRECT FROM THE IMPORTERS AT £250
(INCLUDING VAT AND SECURICOR DELIVERY) OR FROM ANY OF THOSE LISTED

AMATEUR RADIO EXCHANGE, 2 Northfield Road, London, W13	D. P. HOBBS, 13 Benedicts Street, Norwich	RADIO SHACK LTD, 188 Broadhurst Gardens, London NW6 3AY
AMATEUR RADIO SHOP, 4 Cross Church Street, Huddersfield HD1 3PT	L. HARDIE, 542 George Street, Aberdeen	SMC (JACK TWEEDY) LTD, 150 Horncastle Road, Woodhall Spa
J. BIRKETT, 25 The Strait, Lincoln	HOLDINGS LIMITED, Mincing Lane, Blackburn BB2 2AF	SMC (JACK TWEEDY) LTD, 79 Chatsworth Road, Chesterfield
BREDHURST ELECTRONICS, Handcross, West Sussex	LEYS AND DUNCAN, 19 Low Street, Banff	SMC (NORTHERN) LTD, 257 Otley Road, Leeds 16
C. B. ELECTRONICS, 771 Ormskirk Road, Wigan	LOWE ELECTRONICS, Chesterfield Road, Matlock	SOUTH MIDLANDS COMMUNICATIONS LTD, Osborne Road, Totton, Southampton

SMC

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CABLE: 'AERIAL' SOUTHAMPTON
TELEX: 477351 SMCOMM G

Complete Audio/Tuner Kits

Mk III FM Tuner series

Carriage for Mk III tuner £3 inc

The Mark III series FM tuner has been updated, and now includes a centre zero tuning meter as standard. The instruction manual has been meticulously revised, enabling easy assembly by constructors of various levels of experience - a preview copy may be purchased for £1.00.

Mark III A series 'Reference series' tuner modules .....£171.35 inc.
Mark III B series 'Hyperfi' modules, with switched IF BW, pilot cancel decoder .....£198.95 inc.

A matching synthesiser unit will be made available later this year, and can be retrofitted to either version. All versions include digital frequency readout/clock, VU deviation meters, 6 preset stations, 10 turn pot manual tuning, toroidal PSU, output level adjustment, 110/240v AC input. Full alignment service available.

Power Amplifier

Style and performance - with a real 'belt and braces' PSU design.

After a couple of preview comments, it seems that many of you are waiting to hear about the matching HMOSFET power amplifier for the Mk III tuner. Well, it's out at last - complete with twin toroidal PSUs for comfortable 80W RMS per channel, over 100W peak, but limited by thermal shutdown of the HMOS. 10W-100W log LED output peak indicator, DC offset protection and switch-on pause relay. AC or DC input coupling, direct or relay protected output terminals. The works.
Only one version of this item: Complete kit .....£178.25 inc. Carr. £5.

Preamplifier

More features and facilities, thanks to DC switching and control design

Previewing the most comprehensive audio preamplifier yet..... DC switching of 7 inputs, plus two tape in/outs. 2 low pass, 2 high pass active filters, genuine volume related loudness, 1dB channel matching, with DC volume, balance, bass and treble controls. Suitable for bus/remote control, tape dubbing, switched monitor etc. 80dB S/N+, THD -75dB or better. Pluggable PU equalization boards, tone control override. Price for complete unit about £149 ex VAT.

Radio/Audio/Communications Modules

LW-MW-SW-SW DC tuned and switched

91072- All switching of bands by a single pin to gnd. Varicap tuned, with LO output for synth. MW/LW version or MW/LW plus 1 or 2 SW bands
MW/LW: £15.58 +1SW £16.73

VHF Tunerheads

Europes largest stock range for broadcast and communications. Probably also the world's – details in the catalogues and PL. Specials are also supplied in the region 30-220MHz.

Pilot Cancel PLL Stereo decoders

944378-2 £26.45

Again, Europe's widest range of stereo decoders including pilot cancel PLL types. The pic shows the 944378 - pilot cancel including post decoder 26/38kHz filtering and muting preamp output

Switched bandwidth FM IF strips

Broadcast FM IF strips for all occasions, including the new 911225 - with diode switched narrow filter option, ultra linear phase ceramic filters, 84dB S/N, and 0.04% THD (40kHz deviation). Plus usual things like AGC, AFC, dev. mute, level meter drive. £23.95 (supplied in screen can with 0.1 edge connection system) Also the 7230 hyperfi series - as the 911225, but with slope controlled AFC that operates in conjunction with signal level - and an extra IF amp stage for DXing.

Various digital frequency displays

The World's largest range of receiver DFMs is now joined by the DFM7 (shown) - and L shaped version of the DFM3 with remote display mount connector possibility . 1kHz SW resolution with 455kHz or 10.7MHz offsets, 100Hz res up to 3.9999MHz, and VHF to 299.99 MHz in 10kHz steps : £41.75

Semiconductors

Radio/Communications ICs

FOR COMPLETE LISTINGS – SEE OUR NEW PRICELIST

CA3089E	2.11	HA1197	1.61	SD6000	4.31
CA3189E	2.53	CA3123E	1.61	TDA4420	2.59
HA1137W	1.95	TDA1072	3.09	MC1330P	1.38
HA11225	2.47	TBA651	2.53	MC1350P	1.38
HA12412	2.81	TDA1090	3.51	KB4412	2.24
KB4420	1.95	TDA1220	1.61	KB4413	2.24
TBA120S	1.15	TDA1083	2.24	KB4417	2.53
KB4406	0.80	TDA1062	2.24	MC3357P	3.16

SL1610	1.84	SL1626	2.80
SL1611	1.84	SL1630	1.86
SL1612	1.84	SL1640	2.17
SL1613	2.17	SL1641	2.17
SL1620	2.50	SL6600	4.31
SL1623	2.80	SL6640	3.16
SL1624	3.77	SL6690	3.68
SL1625	2.50	MC1496	1.44

VARICAP DIODES.....
A section from our PL:

BA102	0.35	16:1 ratio AM tuning	
BB204	0.41	KV1215 9v triple	2.93
BB105	0.41	KV1211 9v dual	2.01
BB109	0.31	KV1225 25v triple	3.16
MVAM2	1.93	BB212 9v dual	2.25

POWER MOSFETS

100W PA's made simple

Since pioneering the 100W complementary MOSFET technique - Hitachi have developed a range of output devices and drivers that ought to revolutionise opinions and attitudes towards the design of all LF amplification systems. We have a new 48 page application note (£1.50 inc) and complete sets of parts, modules and now the new complete PA system (see above).

2SK133	120v N-ch 100W MOSFET £6.33	2SJ48 Pch complement	£6.33
2SK135	160v N-ch 100W MOSFET £7.29	2SJ50 Pch complement	£7.39
PA101B	Kit for 100W MOSFET PA less Heatsink £16.10. (£23 inc heatsink/bkt)		

ULTRA LOW NOISE PU PREAMPLIFIER

The HA12017 is the last word in PU preamps, and general low noise audio design. It is an SIL IC, with 86dB S/N in RIAA configuration, 10v RMS output capability, 0.002% typ THD at 10v RMS output (imagine the overload margin !!). It comfortably supercedes discrete circuit designs in terms of price/performance, and takes the art beyond the TDA1042's capabilities. (Replaces HA1457) £1.80 each - or an RIAA application: PCB with two ICs for £5.75. Complete with Rs&Cs £9.95.

Radio Control ICs

We have various RC ICs, including NE544 NE5044, and two new ones from OKI

KB4445 - 4 channel dig.prop. FM TX IC. 30mW out (amplifyable) -£2.30 inc
KB4446 - 4/5 ch. dig. prop FM RX IC. Suits KB4445 or RCME syst. £2.65.
KB4445/6 pair: £4.75. New 8 page data sheet 35p + SAE. More RC ICs in list

CMOS, LPSNTTL, TTL, MPU: Listings in the new pricelist.

Most CMOS is available in low volume - also LPSN. Standard linears and TTL OK.

Things like ICM7216B, ICL8038, 8080A, 6800P, 2708, NE555,NE556, etc

Coming Soon.....

Contain yourselves, RF fans ! Not yet ready for a full launch until autumn, but previewed here:-

SSB transceiver system : 10kHz to 1000MHz !!

A modular VLF to UHF SSB TX/RX system at last. With the correct first mixer, the basic PCB covers 10kHz to 1000MHz - using LO fed from ext. source (Our 2 IC Mullard synth for instance) and RF PA for TX OP. 0.2uV basic sensitivity in HF, Typ cost for HF synth SSB RX will be less than £200. Add an RF PA for full TRX for another £50. See one in our foyer, and marvel.

Components

Crystal Filters

Most popular types are available ex-stock, and in quantity.

10.7MHz	25kHz Channel spacing 8pole	£16.67
	12½kHz "	£17.82
	2.4kHz SSB "	£19.78
	Monolithic dual roofing filter	£2.30
34.5MHz	1.3dB loss, 80dB stopband HF first filter in synth. RX	£36.80
RC XTALS	FM pairs (no spilts)	£3.74
	AM pairs "	£3.57
USB/LSB	Xtals for 10.7SSB filter	£2.88 ea

Piezo Sounders

The most efficient warning sounders yet

The latest thing in electro-acoustic efficiency. 1mA of drive from CMOS will give an SPL of 83dB - 10v RMS drive from CMOS uses 3mA for 100dB SPL at 4.8kHz (88dB at 1.65kHz)
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LCD DVM

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CM174: 13mm, 12hr, min/sec stopwatch £14.32 ea
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Zone G. G. I. Knight, GM8FFX

REGIONAL REPRESENTATIVES

Region 1—W. M. Furness, G3SMM
Region 2—D. Smith, G4DAX
Region 3—H. S. Pinchin, G3VPE
Region 4—*(Post vacant)*
Region 5—R. E. G. Kendall, G8BNE
Region 6—F. S. G. Rose, G2DRT
Region 7—D. A. G. Pedder, G3LFX
Region 8—D. N. T. Williams, G3MDO
Region 9—H. W. Leonard, G4UZ
Region 10—P. Jones, GW4HAT
Region 11—P. H. Hudson, GW3IEQ
Region 12—F. Hall, GM8BZX
Region 13—A. B. Givens, GM3YOR
Region 14—C. W. Tran, GM3WOJ
Region 15—I. Kyle, GI8AYZ
Region 16—M. S. Appleby, G3ZNU
Region 17—H. G. Cunningham, G8FG
Region 18—W. Ricalton, G4ADD
Region 19—R. J. Broadbent, G3AAJ
Region 20—B. L. Goddard, G4FRG

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Audio tape and slide library co-ordinator
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Awards managers
hf—P. Miles, G3KDB
vhf—Jack Hum, G5UM

Emergency communications manager
P. Balestrini, G3BPT

HF manager
E. J. Allaway, G3FKM

Intruder Watch organizer
(Post vacant)

Observation Service organizer
D. M. Pratt, G3KEP

Microwave manager
D. S. Evans, G3RPE

Slow morse organizer
M. A. C. MacBrayne, G3KGU

Telecommunications liaison officer
R. F. Stevens, G2BVN

Trophies manager
P. A. Miles, G3KDB

VHF manager: T. P. Douglas, G3BA

Video tape and film library co-ordinator
J. Anthony, G3KQF

Correspondence to RRs and honorary officers should be addressed directly to them (QTHR).

RADIO SOCIETY OF GREAT BRITAIN

35 Doughty Street, London WC1N 2AE
Telephone 01-837 8688

Founded 1913
Incorporated 1926
Member society, International 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.

GENERAL MANAGER AND SECRETARY
D. A. Evans, G3OUF

EDITOR
A. W. Hutchinson

ANNUAL SUBSCRIPTION RATES

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

Associates under 18: £4. — **Students aged 18 to 21: £6**
(Student applications should give the member's age at last renewal date and include evidence of student status)

Affiliated societies: £10 (including *Radio Communication);*
£6 (excluding *Radio Communication).*

RSGB NEWS BULLETIN SCHEDULE

INTENDED RECEPTION AREA	NORMAL READER	RESERVE READER	LOCAL START TIME
Frequency: 3,640kHz. Mode: SSB			
NE Scotland	GM3HGA	GM3VEY	1130
Frequency: 3,650kHz. Mode: SSB			
SE England	G2MI	G4ARZ	0900
Midlands	G2CVV	G8QZ	0930
SW England/Wales	G8ML	G3JFH	1000
N Ireland	GI3GAL	GI3SXG	1030
NE England	G5VO	G3MCF	1100
E Scotland	GM4CUZ	GM4FLP	1430
Frequency: 3,660kHz. Mode: SSB			
Central Scotland	GM3TCW	GM3ULP	1130
Frequency: 7,047·5kHz. Mode: AM			
UK	G3LEQ	G2CVV	1100
Frequency: 144·250MHz. Mode: SSB. Horizontal polarization			
SW from Midlands	G3BA	G3KQF	0930
NE from S Devon	G3CHN	G3PBV	1000
NW from Manchester	G3SMT	G4IAL	1000
NNW from Cleveland	G8LIC	G8FTZ	1000
W from Carlisle	G8DVD	G8OAU	1030
SE from Lincoln	G8OFQ	*(Vacancy)*	1030
SW from London	G3FZL	G3IIR/G3VAG	1030
S from Aberdeen	GM8GHV	GM3ZBE	1030
W from Bristol	G4CJZ	G8NNU	1100
W from Bangor, Co Down	GI3TLT	GI3SXG	1130
Frequency: 145·525MHz (S21 FM). Vertical polarization			
Jersey	GJ8KNV	GJ4ICD	0930
Cornwall	G2ABC	G3NPB	0930
Hampshire, north	G8CKN	G3PZN	0930
Suffolk	G3ZNU	G4FSG	0930
Leeds	G3SPX	G3PSM	0930
Co Down	GI3WEM	GI4DOR	0930
Edinburgh	GM4EHO	GM8PKQ	0930
E Cornwall/S Devon	G3ZYY	*(Vacancy)*	1000
Londonderry	GI2DHB	GI4AHD	1000
London	G3FZL	G3IIR/G3VAG	1000
Birmingham	G3PWJ	G3BA	1000
Lincolnshire	G8OFQ	*(Vacancy)*	1000
Tyneside	G4FUT	G3WNR	1000
Glasgow	GM4HCO	GM4CXM	1000
Elgin	GM4ILS	*(Vacancy)*	1000
Southampton	G8LVC	G8ADM	1030
E Sussex coast	G8SC	G3ZFE	1030
Bristol	G4CJZ	G8NNU	1030
Manchester	G3LEQ	G3JWK	1030

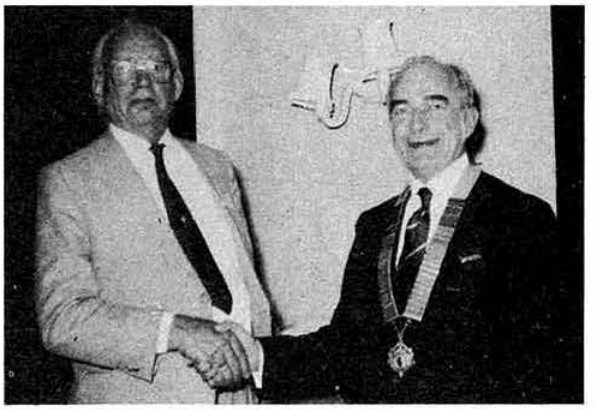
"ALLY PALLY" 1980

This year's RSGB National Amateur Radio Exhibition held at Alexandra Palace, London, on 9/10 May was again highly successful. Over 60 commercial exhibitors supported the event and reported that trade was good, and the number of visitors exceeded 6,600. Once again excellent talk-in stations were in operation, and the Grafton and Southgate clubs are thanked for their outstanding assistance.

The RAIBC stand. A report on the RAIBC agm held during the exhibition is on page 599 of this issue

The complex of RSGB stands in the centre of the hall attracted a great deal of interest, and as usual the bookstall, manned by a hardworking band of RSGB staff and volunteers, was a focus for many visitors who bought a considerable number of books and other goods. The other RSGB stand adjacent to the bookstall was divided into sections, each skilfully displaying a particular aspect of the Society's activities—hf, vhf, microwaves, Raynet, propagation studies, interference, and, not least, membership services.

Yoichi Kumahara, JA1MKH, export director of FDK, travelled from Tokyo to visit the exhibition and is seen here with Jeff Stanton (l) and Peter Waters (r) in front of the FDK display on the Waters & Stanton Electronics stand



VERON president Philip Huis, PA0AD, being greeted by Peter Balestrini, G3BPT

Specialist amateur radio groups were also well represented, with stands occupied by AMSAT-UK, British Amateur Radio Teleprinter Group, British Amateur Television Club, British Young Ladies' Amateur Radio Association, Radio Amateur Invalid & Blind Club, Royal Naval Amateur Radio Society, Royal Signals Amateur Radio Society, and the Scout Association. Displays were also mounted by the Home Office, Directorate of Radio Technology, IBA (Oracle) and Marconi Instruments.

Diane Parker, G8VVV, the RSGB's 25,000th member, receiving her special membership certificate from RSGB President Peter Balestrini, G3BPT

The lecture "Wire aerials" by Louis Varney, G5RV, arranged by the HF Committee, was extremely popular, with standing-room only on both days. The introductory talks on amateur radio arranged by the Education Committee were also well attended.

All those who contributed to making the exhibition a success are thanked by the Society for their efforts on its behalf.

On the evening of the first day of the exhibition there was a small social gathering attended by the Society's guest of honour at the exhibition, Philip Huis, PA0AD, president of the Netherlands national society VERON; members of Council, and RSGB headquarters staff. At this event Miss Diane Parker, G8VVV, who had recently become the Society's 25,000th member, was presented with a special membership

PA0AD in conversation with Roy Stevens, G2BVN, after conferring honorary membership of VERON on G2BVN

certificate by the President, Peter Balestrini, G3BPT. The certificate had been signed by the Society's Patron, HRH Prince Philip, Duke of Edinburgh, KG, and this unique document will no doubt be treasured by G8VVV.

A second presentation, a certificate of honorary membership of VERON to Roy Stevens, G2BVN, was made by the VERON president, PA0AD. VERON thus became the latest in a number of societies which have honoured G2BVN for his immense efforts on behalf of amateur radio at both national and international levels.

QTC
amateur radio news

SUBSCRIPTIONS

In January 1979, when the decision to increase subscription rates from 1 July 1979 was taken, it was expected that no further increases would be necessary for two years. Since then inflation has continued at an even greater rate. At its meeting on 13 March 1980 Council approved an increased subscription rate to be effective from 1 October 1980. From that date the rate for home corporate members will be £12.50 per annum and there will be proportionate increases in other rates. At the same time Council approved an extended age limit for student membership. Details of this may be obtained by application to the secretary at RSGB headquarters.

P. F. D. Cornish, G3COR
Honorary treasurer

Printing delays

At the time the notice on page 474 of the May issue of *Radio Communication* was written, production was already over a week behind schedule due to the effects of a national dispute in the printing industry. This delay was further extended by a complete shut-down in production just as the issue was passed for press.

In the absence of a settlement at national level our printers were successful in reaching a local agreement which allowed production to restart after a break of almost two weeks. The accumulated delays resulted in the May issue being almost five weeks late.

When it became obvious that there was no possibility of publishing the June issue until several weeks after the due date, it was decided to produce a bumper issue combining the editorial content of June and July. By so doing it is hoped that the after-effects of the dispute, which are still being felt, will be overcome and that this June/July issue will be in members' hands by the end of June.

Members' ads rate increase

Resulting from the late delivery of the May issue of *Radio Communication*, members did not receive the intended advance notice of the increase advised on page 474 of that issue. Consequently the operative date was deferred until 1 July, and all Members' ads received before that date but paid for at the old rate have been accepted.

Radio Communication extracts for the blind

Extracts from *Radio Communication* are available on cassettes for blind members. A small charge is made to cover the cost of cassettes and wallets. For details contact G3LAZ, tel 0582 65017.

ANOTHER HONOUR FOR G2BVN

The RSGB is pleased to announce that Roy Stevens, G2BVN, was appointed a Member of the Order of the British Empire (MBE) in HM The Queen's Birthday Honours List.

This justly deserved honour is yet another tribute to the untiring efforts of Roy Stevens in the cause of amateur radio.

QSL Bureau

G4HAA to G4HZZ series. Due to pressure of work, G4HGI has relinquished the post of sub-manager for this series. Mrs J. M. Brakespear, "Baytrees", Little Sutton Lane, Slough, Bucks SL3 8AN, has been appointed to succeed him.

The QSL Bureau will be closed throughout the month of August, and members are asked not to despatch mail to arrive at the bureau during that period.

GB2RS

The GB2RS schedule published on page 594 in this issue has been amended in respect of "W of Bristol", "Bristol" and "County Down".

Over 1,400 GB2RS questionnaires had been returned by the end of May, and it will take some time to analyse the results. A full report will be published in due course.

REGIONAL REPRESENTATIVES

REGION 4

Valid nominations for this appointment have been received in respect of:
Mr M. Shardlow, G3SZJ; nominated by C. H. Saunders, G8NLP; R. H. Webster, RS30300; S. J. Hodgetts, G4FAE; R. J. Buckby, G3VGW; and J. Anthony, G3KQF.
A. Wright, G4EPN; nominated by J. Hum, G5UM; R. Norman, G4JPO; F. Monk, G3AKP; N. J. H. Grassby, G4CPY; and J. B. Pepper, G4EPA.

Corporate members residing in Region 4 (Derbyshire, all that part of Humberside south of the River Humber, Leicestershire, Lincolnshire and Nottinghamshire) are invited to vote for one of these candidates by sending a postcard in the following form addressed to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE, to arrive not later than 31 July.

I ....., being a fully paid-up member of the RSGB resident in Region 4, wish to record my vote in favour of

Mr ..... as representative for Region 4.

Signed .....

Callsign or BRS number .....

Address .....

REGION 10

The result of the ballot for a representative for this region was:

P. Jones, GW4HAT ..... 61 votes
J. Lawrence, GW3YJL ..... 9 votes

Mr P. Jones was therefore elected as representative for Region 10.

REGION 20

One nomination only was received to fill the vacancy in this region, in respect of Mr B. L. Goddard, G4FRG.

At its meeting on 31 May, Council approved the appointment of Mr B. L. Goddard as representative for Region 20.

RSGB slow morse practice transmissions

Mr R. Hyde, G3ZDW, who had been making 144MHz slow morse practice transmissions from Swinderley, Lincoln, has moved QTH and the transmissions have been discontinued.

Transmissions from G3WNR on 1·975 and 144·725MHz have been suspended until September. G3WNR, QTHR, invites comments regarding times and frequencies when the transmissions are resumed.

Loss of the Phase 3A satellite

The second test start of the ESA Ariane rocket was scheduled for 23 May 1980 from the space centre at Kourou, French Guiana. The time for the start of the hour-long countdown had been so chosen that the rocket was scheduled for lift-off at the commencement of the window, ie at 1130utc. However, after approximately 58s the computer interrupted the countdown for the first time. A second countdown, in which the whole starting procedure was repeated from 6min before lift-off, was likewise unsuccessful with the computer interrupting the proceedings approximately 53s before the planned start. Around 1248utc a tropical storm arrived and caused a further delay, but finally Ariane lifted off from the launch pad at 1429:42·34utc.

According to first reports an alteration in pressure in one of the four Viking-V motors of the first stage was noticed 7s later, and during the period between 60 and 100s after the start this motor failed completely due to fuel pressure variations. Further developments have not been explained with any certainty at the present time. Reports speak of unequal power in the motors causing the rocket to go off course and self-destruct. Ariane fell into the sea about 600km down-range.

On the day after the disaster at Kourou, Dr Karl Meinzer, DJ4ZC, the initiator of the project, said:

"The project has suffered a great setback but it is not dead. The knowledge learned during the development work can be applied unaltered to further satellites. The material is also partly to hand, our present problem is to find a suitable launch possibility."

Comments from national AMSAT groups throughout the world indicate a desire to commence construction of the Phase-3B satellite as soon as the necessary funds can be found.

IARU

During its recent meeting the IARU Region 1 Executive Committee considered the decisions of WARC 1979 and other important matters, all of which will require discussion and decision at the IARU Region 1 conference in April 1981.

10·1–10·15MHz allocation

The Region 1 Executive Committee recommends that the new amateur allocation 10,100–10,150kHz be used for cw communication only.

This recommendation was made for the following reasons:

(i) To accommodate as many stations as possible in a small band which is allocated to the amateur service on a secondary basis worldwide;

(ii) Because of the fast growing amateur population; and

(iii) to avoid harmful interference to the fixed service which uses this allocation on a primary basis.

18 and 24MHz allocations

The Region 1 Executive Committee agreed that:

(i) a proposal should be made to the 1981 conference to set up an hf working group; and

RSGB NATIONAL MOBILE RALLY

Woburn Abbey, Bedfordshire
(Coach Park Site)

Sunday 3 August 1980

From 10am

Attractions will include a large trade exhibition, RSGB bookstall and enquiries stand, grand raffle, Raynet stand, BARTG stand, and a bring-and-buy stand. All will be under cover.

Bring-and-buy this year will be charged at **£1 per table per hour**, which will enable members to sell direct. Tables will be offered on a first-come first-served basis.

The RSGB makes no charge for entrance to the rally but all visitors must pay for entrance to Woburn Park, in which the rally takes place, at **50p PER PERSON.**

All the normal Woburn attractions will be available at small extra charges. Various bars and cafés are available nearby.

How to get there:

Via the M1—Leave the M1 from north or south at intersection 13, **not 12 as signposted.** Turn left off motorway and follow signposts through Husborne Crawley to Woburn Abbey.

From the south via the A5—Turn right at Hockliffe and follow the A50 to Woburn.

From the north via the A5—Turn left at A418, five miles south of Fenny Stratford, and follow to Woburn.

From other directions make for the points indicated above and proceed as indicated.

Avoid routes signposted to "The Wild Animal Kingdom" or "Game Reserve". The rally takes place in Woburn Park and correct routes are signposted to "Woburn Park" or "The Abbey". Also watch for RSGB signs.

Usual **talk-in** facilities will be in operation by Dunstable Downs RC on 1·8, 70, 144 and 432MHz.

(ii) this working group should then consider, as a matter of urgency, a band plan for the new allocations at 18 and 24MHz.

Radio communications during natural disasters

The attention of national societies is directed to Resolution BN. Where an emergency communications organization does not exist the wording of this resolution provides an opportunity for a national society to approach its administration in order to establish conditions for an emergency organization.

Consideration should be given as to whether it is desirable to standardize the conditions applying to emergency organizations within Region 1. Also is it desirable to set up a Region 1 organization to assist national organizations?

Financial matters

(i) The contribution to AMSAT was increased to 10,000 Swiss francs for 1980 only.

(ii) 5,000 Swiss francs were transferred to Fund 4 (promoting amateur radio in developing countries).

(iii) The heavy expenditure of WARC 79 has been met without danger to Region 1 finances.

(iv) For 1981 the contribution per licensed member is reduced to 80 Swiss cents. In 1980 the contribution is 1 Swiss franc.

Operation in Italy

A temporary authorization for the use of an amateur radio station by alien citizens, including those of the UK, may be granted by the Italian administration. Conditions for the issue of a temporary authorization include:

(1) The authorization will not be granted for more than three months.

(2) The original authorization cannot be extended. However, on expiry a fresh application may be submitted. The total duration of consecutive authorizations will not be greater than 12 months.

(3) Applications for temporary authorizations must be made out on the official form. A revenue stamp of 2,000 lira plus 670 lira for postage must be included. Should these not be available, international reply coupons for the same amount may be used. The present nominal value of an irc is 220 lira each.

(4) An alien who intends staying in Italy for more than one year may obtain his own amateur radio certificate and subsequently apply for the amateur station licence which will then be granted according to the procedure laid down for Italian nationals.

Copies of the official application form may be obtained from G2BVN.

The above information came from the reciprocal licensing department of the Italian national society, ARI. Further information concerning paragraph (4) may be obtained from Manuel F. Calero, I4CMF, Via Giorgione 16, I-40133 Bologna, Italy.

Licence figures

The latest figures received from the Home Office give the total number of UK licensed amateurs at just over 28,000. The Home Office also advises that when the G8-plus-three-letters series is completed it will use the G6-plus-three-letters series for Class B licence holders.

Stolen equipment

On or about 3 April 1980 from shack of Mr G. B. Phillips, G3XTZ: Trio TS820 hf ssb transceiver fitted with digital readout and cw filter, serial number 610800; Shure 444 desk microphone with four-pin plug for TS820; S. G. Brown Classic-type stick microphone with four-pin plug for TS820; Motorola System 500 a.m./ssb transceiver, serial number SSM 23688, and fist microphone; black fist microphone with four-pin plug for Yaesu FT221R; stereo headphones with mono jack plug.

Information to Staines, Middx, CID, or G3XTZ, 46 West View, Great SW Road, Bedfont, Middx. Reward of £100 for information leading to recovery of equipment.

At Easter from car of Mr L. Taylor, G8JXT, parked near *HMS Belfast* in London: Trio 2200GX, serial number 540245, crystals for R2–R7, S20–S23, S0 and S18, modified with red l.e.d. to backlight channel switch; homebrew 40W pa incorporating preamp and 7W audio amp, in unlabelled black box with finned heatsinks, four l.e.d. indicators and three toggle switches on front panel. Information to G8JXT, QTHR, tel Brentwood (0277) 212489.

On 8/9 April from car of Mr T. E. A. Rowe, G8NNU, in Bristol: Multi 800D, serial number 05615; Kenwood noise-cancel microphone, digital dashboard display; 5dB colinear mag mount 70cm. Information to G8NNU, 68 Cobourg Road, Montpelier, Bristol B56 5HX.

Radio Amateur Old Timers' Association

The twenty-second annual reunion of RAOTA was held in London on 25 April 1980, when there was an attendance of 33. The small attendance was in some part due to the closing down of the Underground stations from early evening.

At the annual general meeting it was decided that the next reunion will be a luncheon to be held in Brighton, Sussex, on Saturday 2 May 1981, to coincide with the end of the IARU Region 1 Conference to be held there during the preceding week. No details of venue have yet been settled but members are asked to note the date and place.

The honorary secretary of RAOTA is Miss May Gadsden, 79 New River Crescent, London N13 5RQ. Tel 01-882 1272.

Can you help?

The South London Science Centre, Wilson Road, London SE5 8PD, is seeking a lecturer for an RAE course to commence in September. Any suitably qualified radio amateur who would be interested in running this course is asked to contact Mr J. M. Osborne, G3HMO, at the above address.

RAIBC

The annual general meeting of the Radio Amateur Invalid and Blind Club was held at the Alexandra Palace on 10 May 1980 and was attended by five of the club's committee members and 28 club members.

Opening the meeting, the chairman, Mr W. A. Scarr, G2WS, paid tribute to the tremendous service and untiring devotion to the club which had been given throughout the year by the secretary, Mrs Frances Woolley, G3LWY. Thanks to her outstanding contribution, the club had steadily expanded and was now firmly established, with its future assured.

Mr Scarr stressed the need for a wider understanding and appreciation of the club's aims and activities. Many RSGB members were unaware of the club's existance, and many of these would be anxious to assist in the work if they knew that their practical help was needed. Radio clubs in many parts of the country were performing a great service by assisting handicapped members in their localities to participate fully in the pleasures of amateur radio. The up-dating of the training programme for blind RAE candidates to meet changing technology and new examination techniques must be given urgent attention by the club in the near future.

The treasurer, Mr J. A. Carter, G3KYH, reported a healthy financial position, with a balance of £2,830. Contributions had been received from many sources, and aid given to members during the year had totalled £1,159. Due to increased printing and postage costs, it would be necessary to increase the minimum £1 annual subscription to the club's magazine *Radial* in 1981.

The secretary, Mrs F. E. Woolley, G3LWY, reported that 114 eligible members had joined the club during the year, as well as 18 local representatives, and as the result of a letter circulated by the RSGB, 22 more affiliated clubs had pledged their support. *Radial* was issued eight times a year and had a distribution of approximately 1,000, including 50 cassette copies made by members for the benefit of blind members.

A revised tuition course for blind candidates for the RAE was available on cassettes, and there was a steady increase in the number of blind members who were qualifying in both the "A" and "B" categories. The use of five Datong morse tutors donated by friends of the club was proving most successful. During the year a further 14 receivers had been loaned to members as well as five hf and four vhf transceivers. The club nets on 3·5MHz (G4IBC); the Cheshire Homes net on 7MHz and the Birmingham group 144MHz nets were a popular means of contact between members.

The annual RAIBC picnic, run by the Southampton RSGB Group at Broadlands Estate, Romsey, Hants, each summer, drew increasing numbers of members and friends. The event this year will take place on Sunday 20 July.

A unique amateur radio occasion took place at Finedon, Northants, on 22 March when Canon J. P. Beaumont, BA, G4JPB, officiated at the wedding of the RSGB President's younger son, Richard, to Helen Humphries. L to r: RSGB President Peter Balestrini, G3BPT, Mrs Jane Balestrini, Richard Balestrini and his wife, bridesmaid Tara Humphrey, and Canon John Beaumont, G4JPB

A modern frequency counter

by MIRKO VOZNJAK, YU1AD*

THE design philosophy behind this project was to construct a compact frequency counter using the latest technology, to cover the range from af to 30MHz and having a number of optional features which might or might not be incorporated according to personal choice. Unlike most counters described in periodicals in the UK during the last few years, it provides resolution as high as 0·1Hz up to, say, 3·5MHz, and is not "50Ω only" input impedance. Furthermore, it rejects the use of a 1MHz crystal for the time base. It allows the whole spectrum of the divider frequencies to be used for the calibration of receivers or oscilloscopes, at the same time permitting any external frequency to be used as a time base. If range extension to vhf is desired, by using an add-on prescaler, the necessary auxiliary power is available from the counter.

At the beginning of the development of the project, the author was faced with the usual problem of whether to use a system with discrete ics or to use one of the recent cmos lsi chips for the basic counter. There is quite a wide range of chips, so the second solution involves the selection of the most appropriate lsi chip. Since the author decided to use the lsi chip he tried to achieve the best performance: cost ratio possible, and selected the National Semiconductor MM74C926. For about £5.30 the MM74C926 provides:

(*a*) a four-digit counter, with built-in latches, decoders and segment drivers, to give direct drive to the common cathode l.e.d. display;
(*b*) multiplex operation, with a completely self-contained 1kHz oscillator;
(*c*) carry-out feature, for easy cascading;
(*d*) cmos with 5V working voltage; and
(*e*) compact 18-pin dil package.

In addition, the counter advances at the negative edge of the signal; transfer and reset are active when the appropriate pin is high; and the upper frequency limit is a minimum of 2MHz, typically 4MHz—from four specimens which the author has examined, none was lower than 3·5MHz.

Circuit description

A block diagram of the complete counter is given in Fig 1. The input signal is fed into the preamplifier where, after being amplified, it is shaped to get a square wave of appropriate level. After that the signal can be fed either to the main counter gate, for frequencies of, say, at least 3·5MHz, or into a divide-by-10 prescaler for frequencies of up to at least 35MHz, although the original counter was designed for frequencies up to 30MHz.

Opening and closing of the main gate is affected by the control logic, which in turn is operated by the crystal-controlled time base. The control logic also supplies the necessary pulses for transferring signals from counters to latches, and for resetting the counters after that transfer occurs. An adequate power supply is therefore provided.

Input amplifier-shaper (Fig 2)

The input amplifier is fairly simple but still offers very good performance. At the input there is a familiar diode-limiting safety circuit, which is quite adequate for normal practice. To achieve high input impedance an E300 fet (TR1) is used as a source follower in its simplest form. However, there is a drawback; the circuit attenuates the input considerably, and attenuation increases with frequency. To keep the sensitivity well below 100mV, which was one of the aims of the development, some form of effective amplification is needed. The ic used for this purpose is an LM733 video amplifier (IC1) which offers three choices of gain: 10, 100 and 400 for appropriate bandwidths of 200, 100 and 50MHz—in this case it is used with the gain of 10, which is quite adequate. Connecting it for a gain of 100 resulted in a tendency towards instability with higher level signals. Using this arrangement the overall input sensitivity of the counter is 20mV up to 1MHz, slowly rising to 30mV on 20MHz, and to 60mV on 30MHz, which is the designed limit. Above 30MHz it rises rather sharply, being 300mV at 38MHz, which is the top frequency of that particular counter chip, ie the fundamental top frequency is 3·8MHz.

The shaper is based on a Schmitt trigger, which is formed around TR2 and TR3 and is buffered by TR4. To ensure adequate performance at the high frequency end, high-speed transistors must be used, and the ZTX313 gives the best price:hf performance (f_t 600MHz) ratio. To optimize operation at the hf end of the counter, there is a preset resistor (R11) which should be adjusted for the best sensitivity while still maintaining reliable counting on the highest frequency. To simplify power supply requirements, ie to avoid a complementary type of supply which would normally be required for IC1, a +5/+10V system is adopted. To operate IC1 correctly, 10V are required, and this voltage is also applied to TR1 to improve

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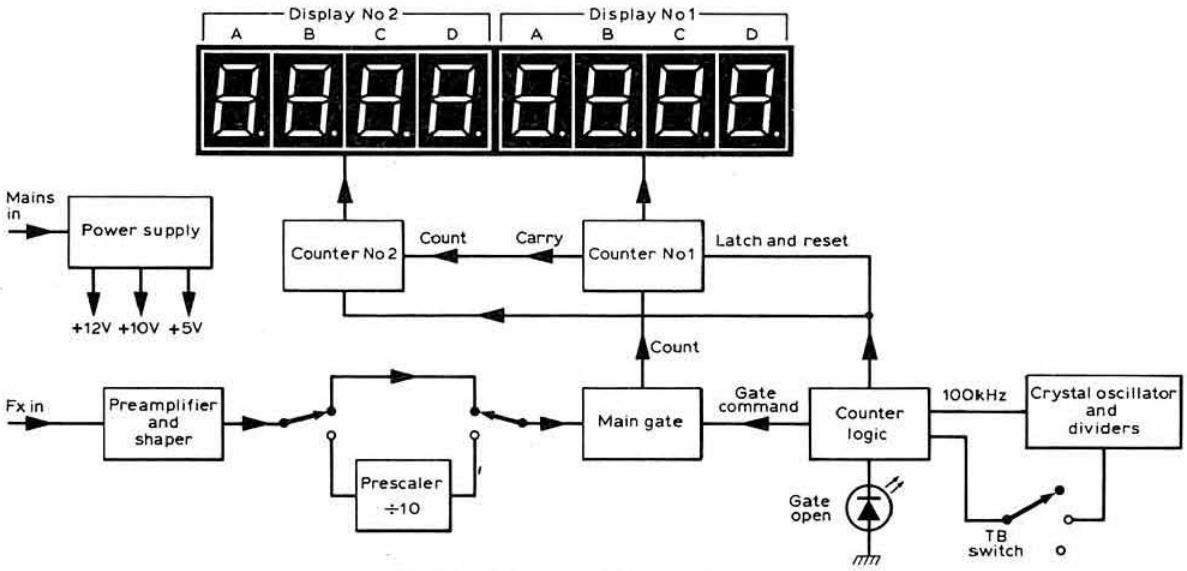


Fig 1. Block diagram of the complete counter

the dynamic characteristic of that stage. Although +5V can easily be obtained from the main +5V rail, the author preferred to use a separate zener so as to isolate the amplifier from the main circuit as much as possible. For the same reason a separate +5V regulator (100mA type) is used to supply the Schmitt trigger to ensure maximum immunity from the noise which can appear on the main +5V rail, and which can lead to false triggering and, hence, faulty reading.

One point should be mentioned. It will be noticed that rather high values of coupling and decoupling tantalum electrolytic capacitors are used in the entire preamplifier stage. This is necessary if the sensitivity is to be properly maintained down to 10Hz and lower. The lower limit of the counter is 3Hz at 100mV, while on 10Hz it is still 20mV.

Prescaler, mode and function switching (Fig 3)

The signal from the preamplifier-shaper is fed to the wiper of mode switch S1, in the first position of which the signal is passed through, ie not prescaled. In position 2 the signal is divided by 10 by IC2, a 7490AN—the AN means that it is preselected and guaranteed to operate safely up to at least 42MHz.

Prescaler switching could be done with the aid of gates, but the author found that this could be simplified by using mechanical switching, while still keeping the leads as short as possible. This is achieved by constructing a small pcb, carrying IC2 and signal conditioning IC3, and mounting it directly on S1, as if adding an additional wafer. In this way the leads are not longer than about 2cm, and simplified switching is achieved.

Before entering the main counting gate, regardless of whether it is prescaled or not, the signal passes through IC3. This chip belongs to the so-called interface family of ics widely used in the computer field. In fact it is an eight-pin dil-packed dual two-input NAND gate (similar to one half of a 7400), but the output of each gate drives a separate transistor with open collector configuration. With an external collector resistor of

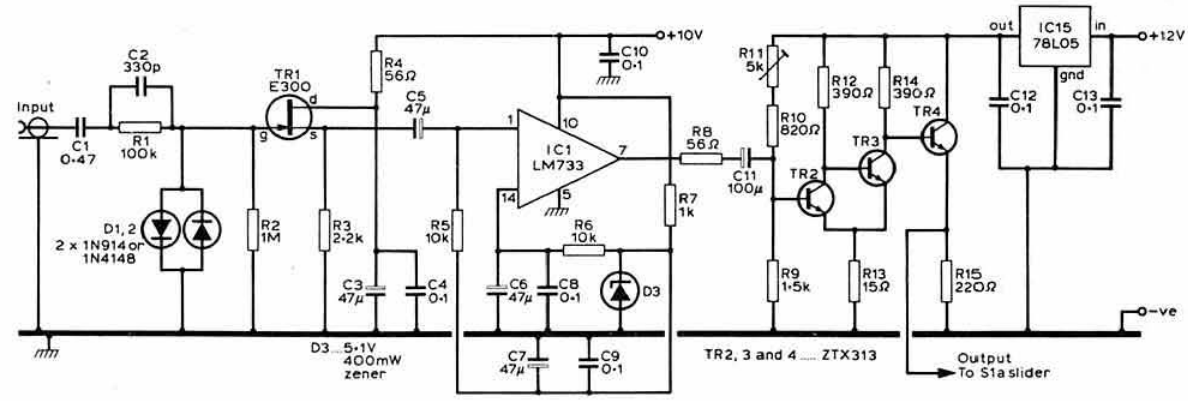


Fig 2. Input amplifier-shaper

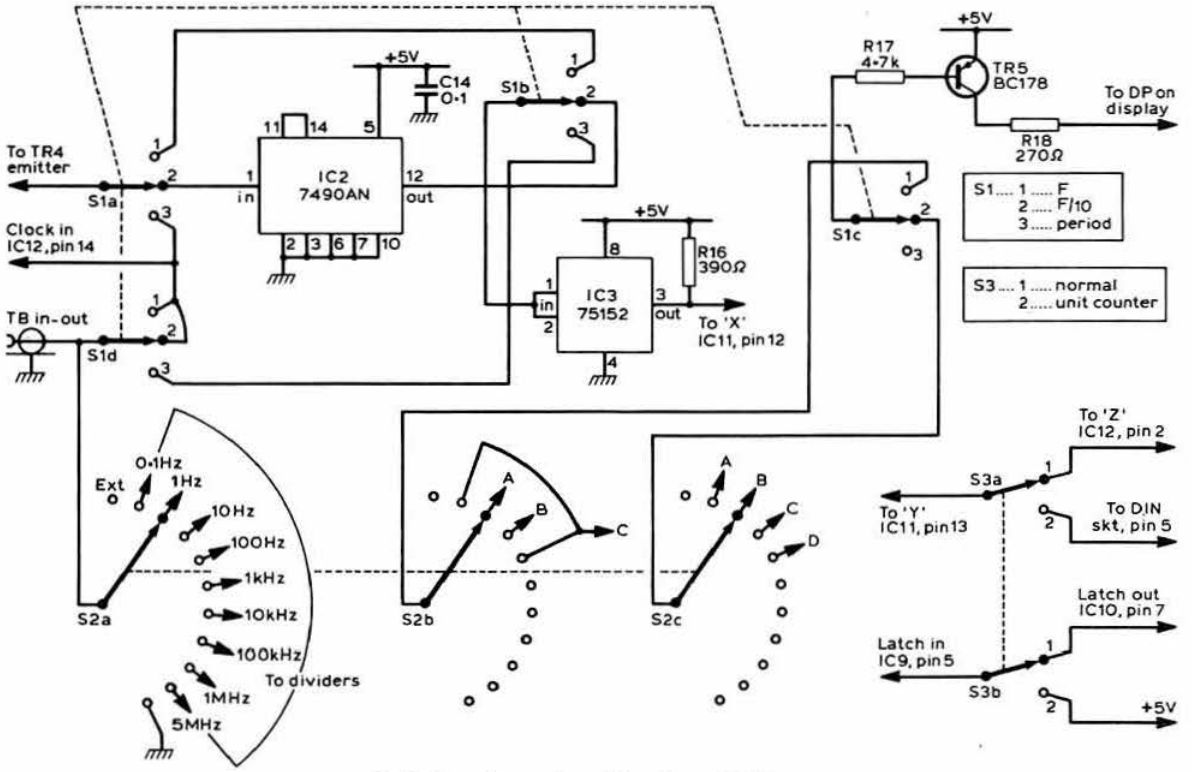


Fig 3. Prescaler, mode and function switching

rather low value, in this case 390Ω, the logic signal becomes very determined, ie when it is "0" it is very close to the ground potential, and when it is "1" it is almost at full +5V potential. This is very important for perfect drive of the counter cmos chip. In position 3 of S1 the prescaler is again disconnected, and the input signal and that of the time base are interchanged, where the time base signal is fed into the input of IC3, while the input signal is fed into the input of the control logic. This is a condition for period measurement. If this is not necessary, it can easily be abandoned by limiting S1 to two positions and rerouting the time base signal directly into the control logic.

S2 is a time base selector. Ordinarily, selection of four frequencies would be sufficient, ie 0·1, 1, 10 and 100Hz. However, since this is also the time base output selector, when the time base is to be used for receiver or oscilloscope calibration, all divider frequencies plus the 5MHz crystal oscillator frequency can be selected. There is also one position labelled EXT, to be used with an external time base. This is particularly useful if an "off-air standard" with its own divider chain is required. This input can also be used for frequency ratio measurements; the maximum frequency to enter and perform ratio measurements is around 2MHz. Otherwise the actual time base selection for normal operation is 0·1, 1, 10 and 100Hz. This gives the same resolution for direct operation, and 1, 10, 100 and 1000Hz for prescaled operation. Two additional wafers of S2 are used for programming the decimal point on the display. Two programs are provided: direct and prescaled operation. The decimal point always shows kilohertz, except for the 0·1Hz position in direct operation, when it shows the decimal of 1Hz by displaying the penultimate decimal point on the display.

Since the decimal points used on the displays are connected in parallel, ie providing multiplex operation, a separate decimal point driver has to be used; in this case this is TR5, whose base is connected to the common cathode on which the decimal point is to be shown.

One more mode available is unit counting, when the counter is acting as a cumulative counter, and S3 is used to switch to it. With one set of contacts the main gate opening control is shifted from control logic to pin 5 of a DIN socket on the back plate of the instrument, which also carries a power supply outlet for auxiliary purposes (vhf prescaler etc). By making this line "1" or "0" (+5V or ground), the unit counter can be started or stopped. For precise operation a bounce-free switch is needed, and this can be nothing more than a simple flip-flop built into a hand-held case with start and stop buttons, and supplied from the counter power supply. To enable the display to follow the unit counting, the second section of S3 disconnects the latch control from control logic and permanently applies +5V to them, so enabling continuous transfer from counters to the latches and, by this, to the displays. Another point is that when the counter is in unit counter mode, the control logic has to be disabled completely, since it will regularly reset the counters and spoil unit counting. Hence the extra position on S1, which connects the clock input of the control logic to ground.

As with period mode, if unit counting is not required simply abandon S3, connect "Y" and "Z" points together, as well as

"latch in" and "latch out" on the main pcb, and connect the wiper of S1a directly to "clock in" also on the main pcb.

Control logic

The control logic circuit (Fig 4) is a novel one. Normally the control logic should carry out the following functions:

(*a*) open the main counter gate, at the rate of the preselected time base;

(*b*) after closing the gate, send a pulse to transfer data from counters to latches, to be displayed; and

(*c*) send a second pulse to reset the counters, so that the new count can begin after the next opening of the counter main gate.

In practice, a flip-flop is normally used to control the opening of the gate and, after closing it, the first monostable is triggered, sending the pulse to transfer data from counters to latches, and after that the second monostable is triggered to send a reset pulse to the counters. This means that passive RC components have to be used in monostables for proper pulse timing, which is a factor that the author does not like. He firmly believes in the discipline of the crystal-controlled time base, and the result is as shown. It is based on the cmos ic 4017, which is rather similar to the classic ttl 7490 (decimal to bcd converter) and 7441 (1-in-10 decoder) "squashed" into one ic package.

If a clock signal is applied to pin 14 of IC12, the first positive edge will shift pin 2 into high and, through S3, open the main gate, and counting will commence. The next positive edge of the clock will bring pin 2 low, so counting will stop, but pin 4 becomes high and, since pin 13 (clock enable) is connected to pin 4, the system will be locked in this position. However, the high state of pins 4 and 13 is also applied to pins 4 and 5 of IC11, connected as an inverter. This will bring pin 15 or IC10 (reset) to low, IC10 will be activated at the rate of 100kHz brought in from the divider chain, and all 10 outputs of IC10 will be swept at that rate. The third step of this sweep (pin 7) will send a 10μs pulse to perform the transfer, the fifth pulse (pin 1) will reset the counters, the seventh pulse (pin 6) will reset

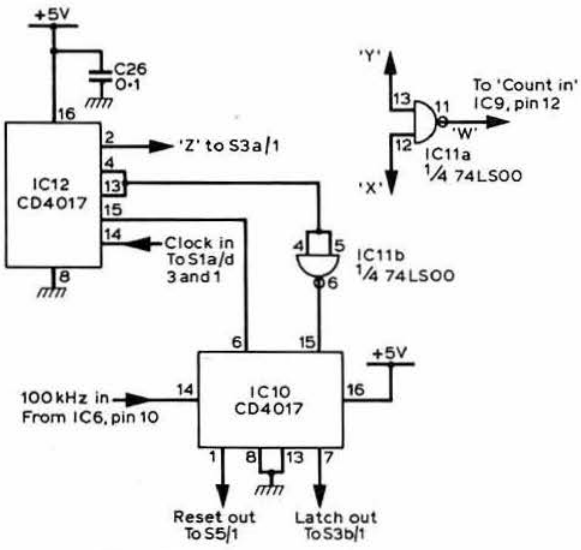


Fig 4. Control logic and main counter gate

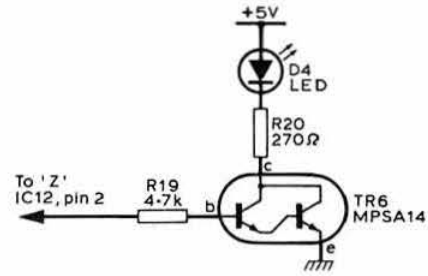


Fig 5. "Gate open" device

IC12, and the whole process can begin again as soon as the next positive edge of the clock arrives at pin 14 or IC12. It can easily be seen that the entire system is remarkably safe. First, the manufacturer specifies for the 74C926 that the minimum length of the pulse for transfer and reset should be 200ns, and as in this case it is 10μs, there is quite a margin. Second, the pulses used from IC10 are so spaced that there is a margin of two at the beginning and end, and a margin of one between the used pulses. This means very high immunity to the transients.

It is very desirable to have information about the state of the main counting gate. To achieve this a simple l.e.d. indicator, with TR6 as the high input impedance driver, is used (Fig 5). This is a particularly useful device when operating on 0·1 or 1Hz time base steps. The time base consists of a classic crystal oscillator and its associated buffers and frequency dividers. Contrary to the common practice of using a 1MHz crystal, the author strongly recommends the use of a 5MHz crystal, since this is a clean AT cut exhibiting at least double the high stability of a 1MHz crystal in a wide temperature range.

Crystal oscillator

To achieve maximum stability of the oscillator, the greatest attention must be paid to the quality of the associated components in the oscillator. For that reason the shunt capacitors (C20 and C21, Fig 6) must be silvered mica types, and new, good-quality trimmer capacitors (C18 and C19) must be used. Using two trimmers is justified, the large one is used for coarse tuning, and the small one for fine tuning.

The author's intention was to use cmos ics in the whole multiplier chain but, after some experimenting using the latest locmos (with improved hf response), both 4017 and 4518 refused to work on 5MHz with the available drive and 5V supply. It was necessary to increase the supply in a very narrow region between 7·5 and 8V to enable these two, which was far too critical, and for that reason a 74LS90 (IC4) was chosen for the first divider. Having derived 1MHz, there is no problem in using cmos ics for the rest of the divider chain. IC5 is used to make things even, and after that IC6, IC7 and IC8 (dual divide-by-10 ics) make another six dividing stages, down to 0·1Hz—an excellent economy!

Following the usual practice, provision for an external frequency standard of 1MHz is achieved with an extra bnc socket and S6, which disconnects the first divider from the rest of the chain so that an external 1MHz standard can be applied. When S6 is closed, the bnc socket is a convenient outlet for the 1MHz signal to check the proper operation of the entire instrument by feeding the signal into the input socket.

The crystal oscillator and its buffers are supplied with a separate +5V source, using another monolithic regulator, 100mA type, for the same reason as with the Schmitt trigger in

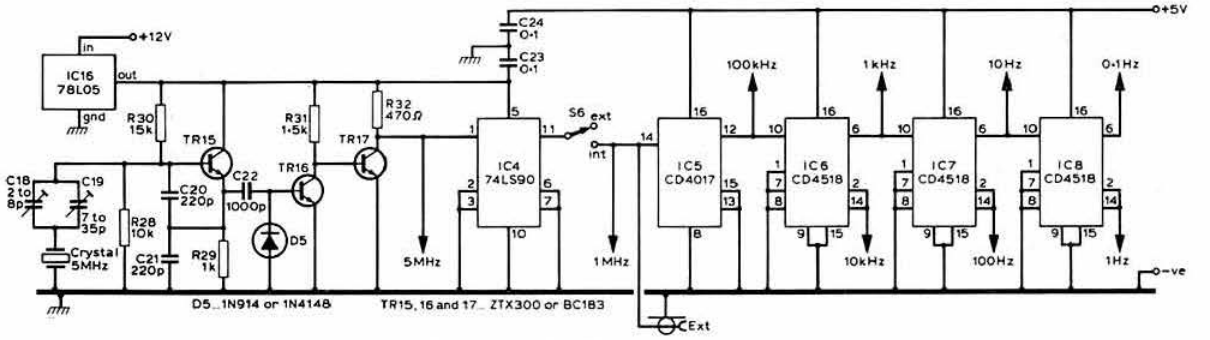


Fig 6. Crystal oscillator with dividers

the input stage, ie to isolate it from any irregularities on the rather heavily-loaded main +5V rail.

Counter blocks

Fig 7 shows one of the counter blocks. Using the carry-over facility, two identical blocks are cascaded, each driving its own multiplex-wired four-digit display (National Semiconductors type NSB3881, with 0·3in high digits). The limiting resistors for each group of segments are each 56Ω, as the best compromise between comfortable brightness and keeping the dissipation of the drivers in the chip well within limits. For the same reason Darlington pairs are used to drive the common cathodes; this gives solid drive without loading the chip, the Darlington pairs having high input impedance. With this arrangement the chip remains cold after hours of continual operation, which promises a happy and long life for the ic and high reliability in operation.

The manual reset facility of IC9 has certain limitations. This is due to the fact that reset affects only the counters and does not influence the latches. This means that at slow time base speed the reset button has to be pressed for a considerable time to keep the counters in the reset state during the clock counting cycle, ie to keep the counters at 0000, and to wait until the next cycle, when the latch transfer pulse will be sent, so that the 0000 status from the counters will be transferred to the latches and also to the displays. This means that for all practical

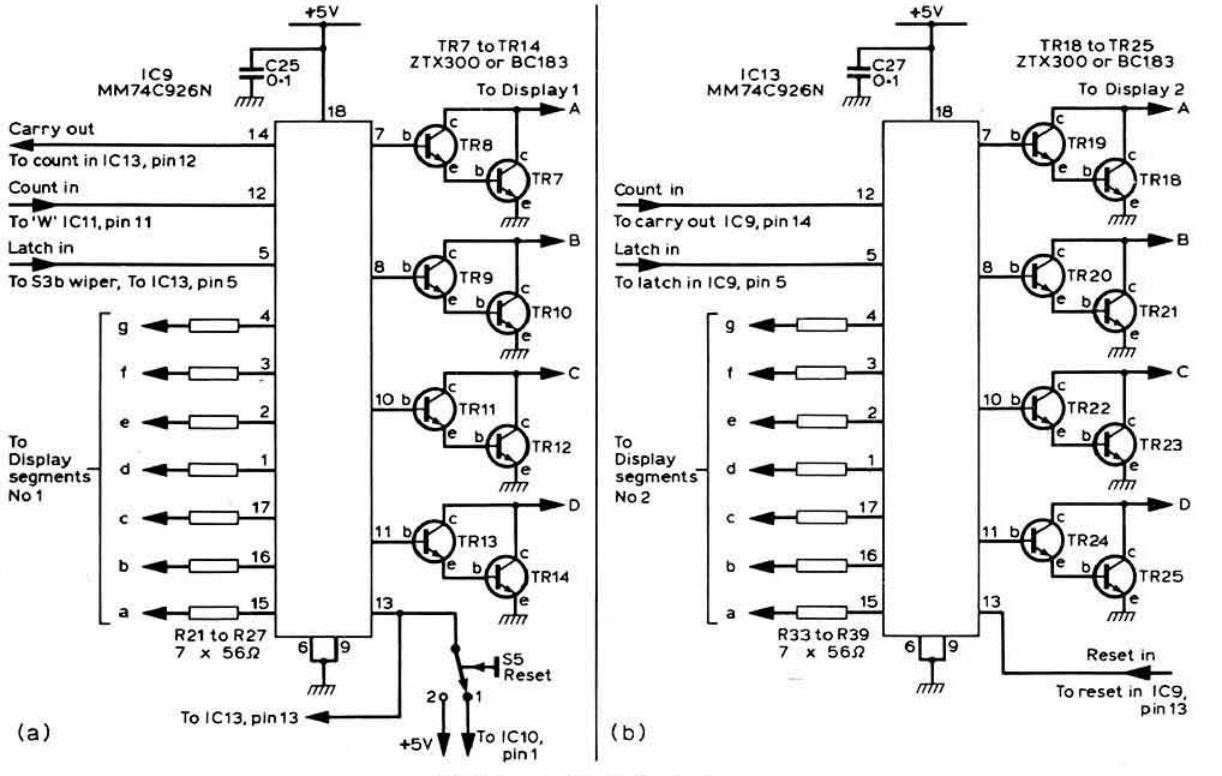


Fig 7. Counter block circuit diagram

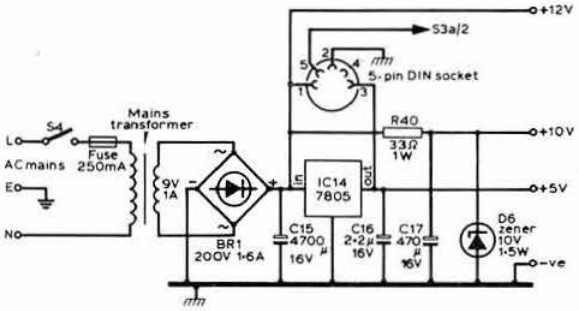


Fig 8. Power supply circuit

purposes the manual reset facility is useless on a 0·1Hz time base, while on 1Hz there will only be a small delay, the button will have to be pressed for only a short time, and the delay will be unnoticeable.

Integration between two counting blocks is very simple. Both "latch in" and "reset" are connected in parallel, as are the +5V power and ground. "Carry out" output from the first block is simply connected to "count in" of the second. Each block drives its own segments and the cathodes of its own display.

For those who need to economize, it is possible to save money by restricting this counter to only four digits by eliminating the second counting block altogether. This will involve an overflow type of operation, but it will in no other way degrade the performance of the instrument. With this in mind the main pcb carries only the first counter block, while the second block is on a separate pcb conveniently mounted above the first. Some change in decimal point programming will also be needed, but this involves only small wiring changes on S2b and S2c wafers.

Power supply (Fig 8)

The power supply is standard, with the exception that for IC1 a 10V zener-stabilized supply is provided. The 7805 monolithic, 1A plastic-type regulator (TR14) is used for the main +5V rail. This device is directly mounted on the chassis, providing the main grounding point of the power supply. A second ground is at the input bnc socket, where the input side of the input stage is grounded. Total current measured at the output of the bridge rectifier is around 0·5A, which is quite a low figure compared with ttl-type counters.

Construction

The entire circuitry is divided into six separate pcbs. The main pcb carries the crystal oscillator with dividers, first counter block, control logic, decimal point driver and "gate open" circuit. The second pcb carries the input preamplifier-shaper; the third, the second counter block; the fourth, the power supply; and the fifth is a convenient mounting for two displays (or, if cut in half, one display). The additional pcb for already-pcb-mounted displays is needed because in the original version the displays were not easy to mount, as there was no space for a mounting hole. One more small pcb is needed: that on which the prescaler wafer is mounted.

Regarding the pcb for the input amplifier, in the prototype development process, two versions of pcbs were made: one plain, single-sided, and the other a so-called "ground plane" type. After careful testing the author got the impression that the "ground plane" version was marginally better than the plain one in one respect; the Schmitt trigger was smoother in its threshold area. To produce a "ground plane" type, a double-

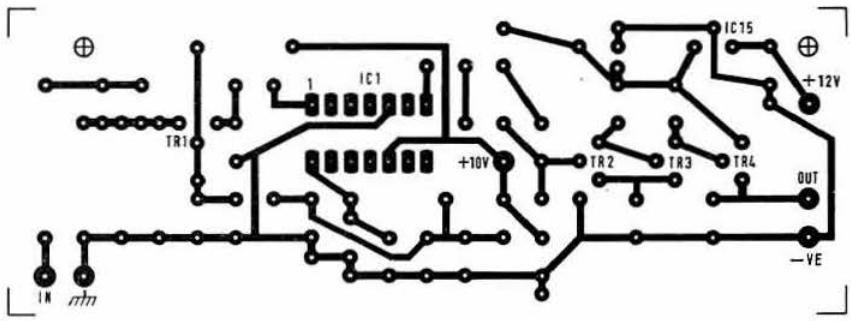


Fig 9. Input amplifier pcb layout

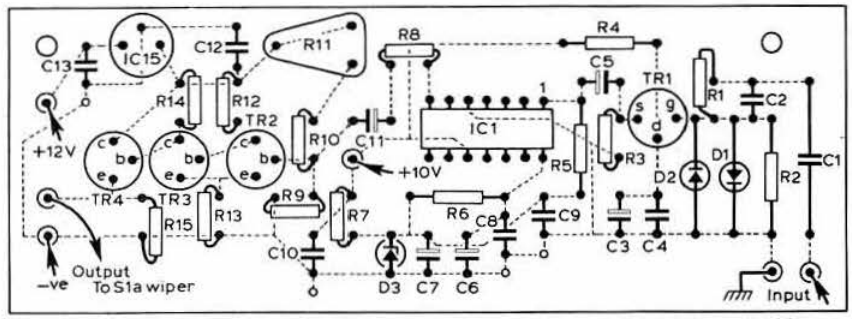


Fig 10. Input pcb component and wiring layout

Viewed from component mounting side ------ indicates copper track on reverse side

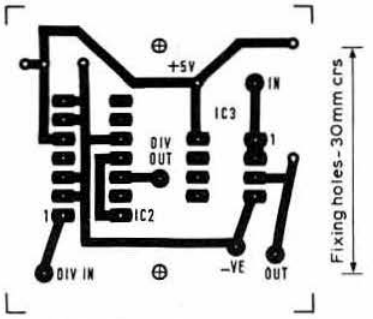
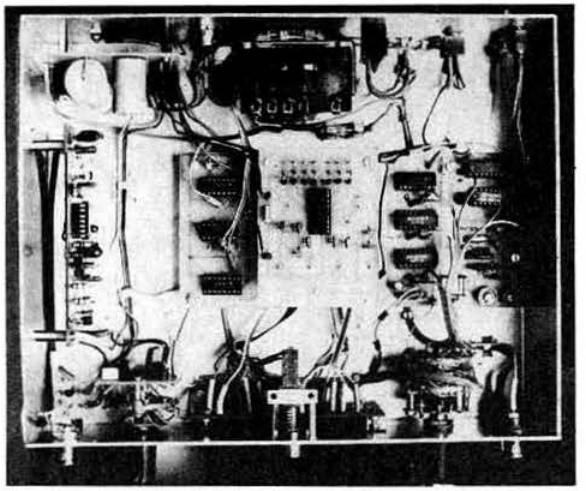
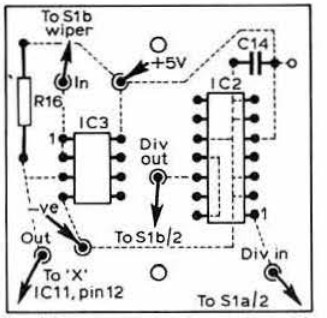


Fig 11. Prescaler pcb layout



Interior view



Viewed from component mounting side
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Fig 12. Prescaler pcb component and wiring layout

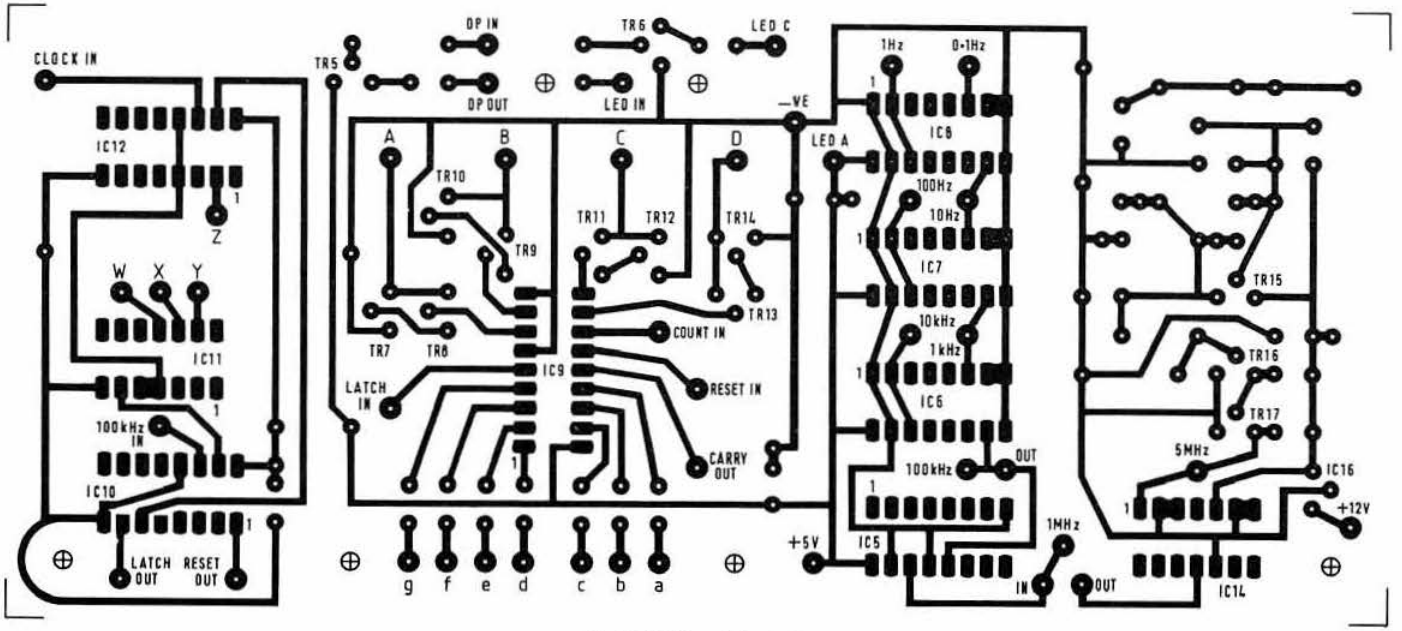


Fig 13. Main pcb layout

sided copper-clad board is used; one side carries the normal circuitry pattern, while the reverse side is masked during the etching process, so that the copper is left intact. After etching, all holes on the intact side for the contacts which are not grounded should be countersunk with a 0·125in hand-drill bit, while the grounding points should be kept intact. Component wires on these points should be soldered on both sides of the board.

General instructions for placing the components and wiring the pcbs:

1. Where a resistor post is indicated on the pcb and there is 0·2in between the holes, the resistor must be mounted vertically. The same applies to diodes. If the distance between the holes is 0·5in the resistor or diode must be mounted horizontally.
2. For 0·1μF decoupling capacitors, widely used to prevent instabilities on all pcbs, there are always two alternatives: 0·2in between holes for ceramic plate type capacitors, and 0·3in for Siemens polycarbonate type which is becoming increasingly popular.
3. To ensure maximum stability of the crystal oscillator, use extra care in mounting the mica shunt capacitors. Since wire spacing varies greatly on mica capacitors currently obtainable in the UK, there is a wide selection of holes on their fixing post, so that any capacitor can be properly mounted.
4. The 470μF electrolytic in the 10V supply on the power supply pcb is a pcb type. Since there is also a wide variety of pin spacing, there is a choice of three to cope with most types.
5. To connect wires to pcbs, Veropins (0·1in matrix type) are used. Since they are a double-ended type, it is possible to solder them on the top (component) side or on the bottom (copper) side of the pcb. This gives maximum flexibility in wiring.
6. All pcbs are mounted with the aid of hexagonal pillars, having holes with 6BA thread. The main pcb requires three 0·5in types, while the rest (second counter block to the main pcb, and the input and power supply pcbs to the chassis) use 0·625in pillars. Quarter-inch 6BA bolts are used, cheese type on the pcb side of the mounting, and countersunk type on the chassis side.

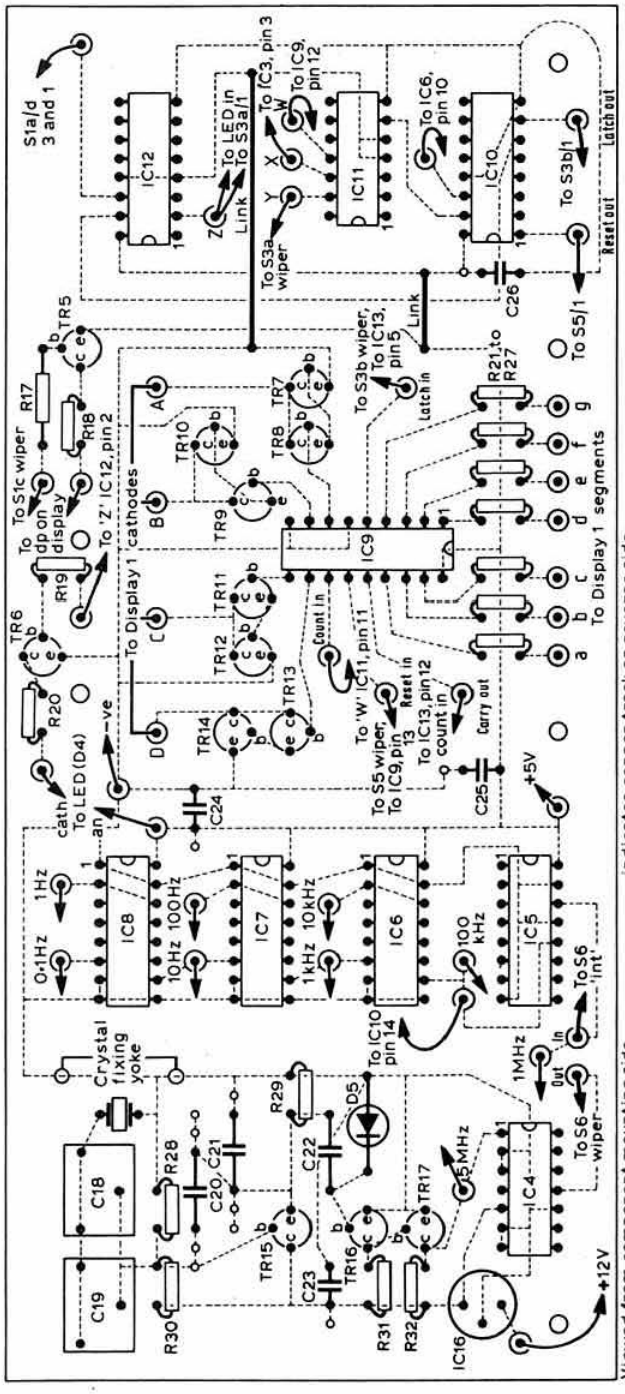


Fig 14. Main pcb component and wiring layout

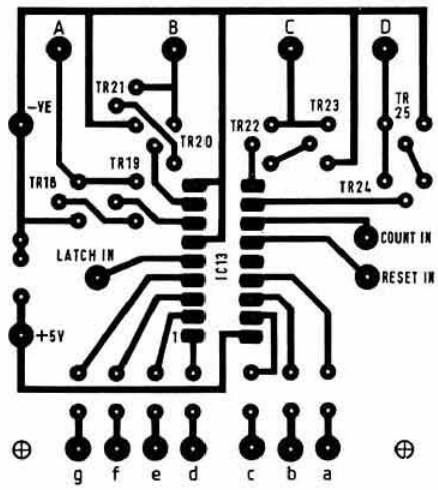
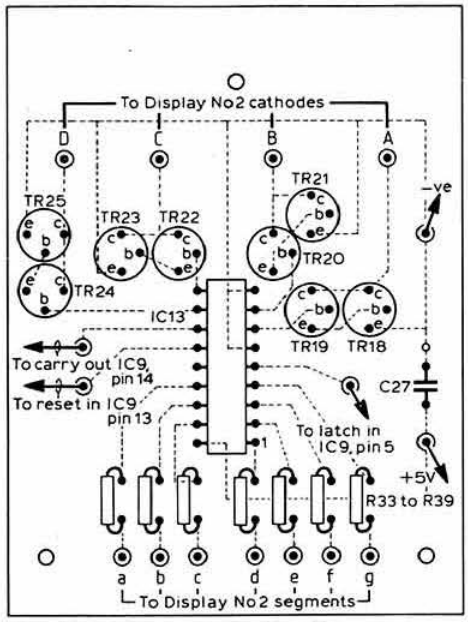


Fig 15. Add-on counter block pcb layout



Viewed from component mounting side
-------- indicates copper track on reverse side

Fig 16. Add-on counter block pcb component and wiring layout

7. The author used ic sockets for all ics, their use for expensive counter chips (at least) is a good policy.
8. As far as wiring is concerned, the author found multicoloured 10-way ribbon cable the most suitable. It can easily be brought down to any number of ways, and the colour coding is a very considerable help in faultless wiring. Self-adhesive aluminium cable clips will hold the wiring harness neatly to the chassis.
9. Mounting the four-digit display modules on their pcb requires a little care. First insert pieces of bare wire into holes 1 and 16 on the pcb and solder them. Then, on the reverse side of the pcb (non-copper side), carefully insert the display module so that the wires are protruding from holes 1 and 16. Press the display module firmly against the pcb, and solder the wires on the module. Now add the wires for the 14 remaining contacts, one by one, and solder them on both sides, ie pcb and module. If it is decided to have an eight-digit counter, repeat for the second display module

To house the instrument the author used a simple and cheap solution; an aluminium chassis, with bottom plate, 10 by 8 by 2·5in, can be made into a nice instrument cabinet with just a small amount of effort. First, after drilling all the holes, submerge the chassis and bottom plate in a hot concentrated solution of caustic soda for about 30min, then remove with the aid of plastic tweezers and rinse thoroughly. When completely dry, mask all holes on the inside of the chassis with masking tape. Also mask the outer area of the bottom plate rim which normally drops into the chassis. These can now be painted; the author used aerosol car paint and grey primer. Paint the external side of the bottom plate first. Only the front and back plates of the chassis need be painted, and give an overlay of paint about 5mm wide on the top and side plates. When the paint is dry, lettering is carried out, and a transparent lacquer protective spray applied.

Countersunk bolts are used, made flush with the top and side plates, so that they can be covered with simulated woodgrain paper (Con-Tact). The original edge of the paper should be used on the front side, carefully lined up to allow a 2mm strip of painted area on the top and side plates to be exposed. This

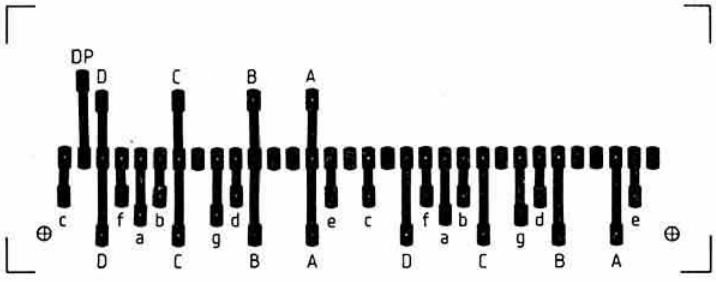
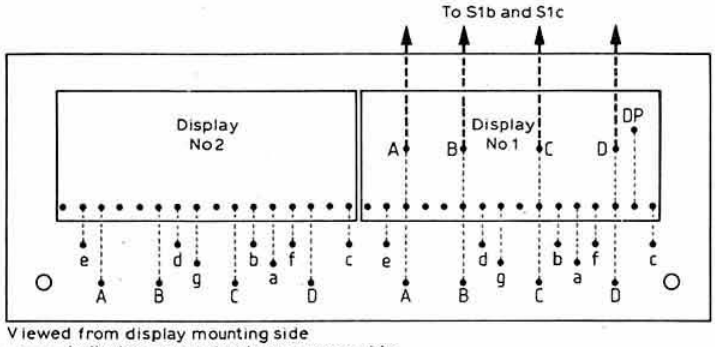


Fig 17. Display mounting pcb layout



Viewed from display mounting side
---------indicates copper track on reverse side

Fig 18. Display pcb component and wiring layout

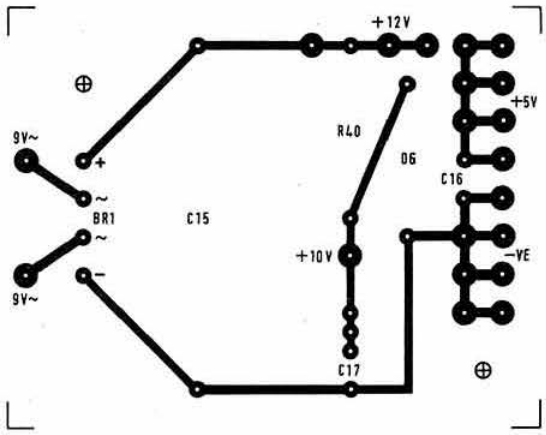


Fig 19. Power supply pcb layout

gives a good smooth transfer from paint to the paper. The back edge should be trimmed using a ruler and a modelling knife, again leaving a 2mm margin of paint on the top and side plates. On the bottom edges of the side plates the paper is again cut with the knife, working against the edge.

One thing remains to be done: fixing the bottom plate to the chassis. Simply drill four holes (two in the front plate and two in the back plate) around the bottom edges, and use self-tapping screws (6BA equivalent), which will go into the rim of the bottom plate. This method is satisfactory, except that frequent removal of the bottom plate will wear out the holes in the rim. An alternative method is to use riveting nuts or, if these are unobtainable, glue nuts to the inner side of the rim with Super Araldite. Before glueing, roughen all six sides of the nuts (6BA), with a file, and do the same to the area of the rim around the fixing position of the nuts—this is very important to ensure that the nuts are glued properly. Then take four 6BA bolts and tighten all nuts in place. After that, with the aid of a piece of stiff wire, carefully apply Araldite around the nuts,

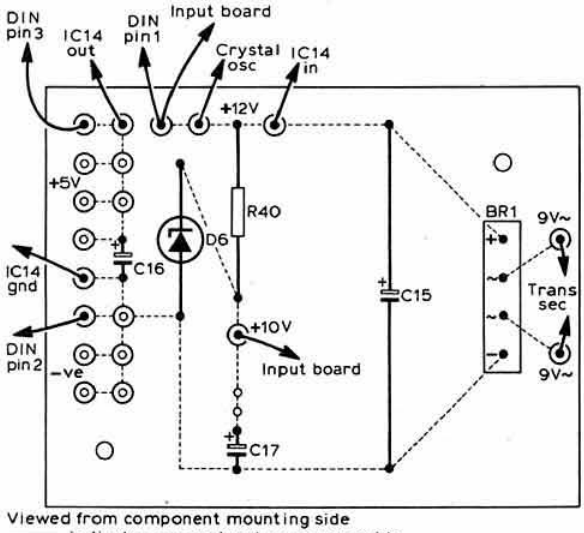


Fig 20. Power supply pcb component and wiring layout

taking care not to let any of it come into contact with the bolts. After, say, two hours of drying, remove the bolts and the bottom plate is ready for permanent fitting. Use glossy nickel-plated bolts, with plain washers of the same quality, to fix the bottom plate to the chassis. The same applies for fixing the display pcb to the front plate; this will greatly enhance the appearance of the instrument.

Components list

R1	100kΩ	**C1**	0·47μF/250V C280 p
R2	1MΩ	**C2**	330pF cp
R3	2·2kΩ	**C3, 5, 6, 7**	47μF tb
R4, 8, 21-27, 33-39	56Ω	**C4, 8, 9, 10, 12, 13, 14, 23-27**	0·1μF/100V cp or pc
R5, 6, 28	10kΩ	**C11**	100μF/10V tb
R7, 29	1kΩ	**C15**	4,700μF/16V e
R9, 31	1·5kΩ	**C16**	2·2μF/16V tb
R10	820Ω	**C17**	470μF/16V e
R11	5kΩ mini trimpot	**C18**	2-8pF ct
R12, 14, 16	390Ω	**C19**	7-35pF ct
R13	15Ω	**C20, 21**	220pF sm
R15	220Ω	**C22**	1,000pF ps
R17, 19	4·7kΩ	cp = ceramic plate. e = electrolytic.	
R18, 20	270Ω	ct = ceramic trimmer. p = polyester.	
R30	15kΩ	pc = polycarbonate. ps = polystyrene.	
R32	470Ω	sm = silvered mica. tb = tantalum bead	
R40	33Ω 1W		

All resistors except R40 are 0·25W

D1, 2, 5	1N914 or 1N4148 silicon diode	**IC1**	LM733
		IC2	7490AN
		IC3	75152
D3	5·1V/400mW zener	**IC4**	74LS90
		IC5, 10, 12	CD4017
D4	L.E.D., red 0·125in	**IC6, 7, 8**	CD4518
		IC9, 13	MM74C926N
D6	10V/1·5W zener	**IC11**	74LS00
		IC14	7805·5V/1A*
TR1	E300 Siliconix	**IC15, 16**	78L05·5V/0·1A*
TR2, 3, 4	ZTX313		
TR5	BC178		
TR6	MPSA14		
TR7-25	ZTX300 or BC183		

BR1 Bridge, silicon, 200V/1·6A

*Monolithic regulator, plastic

S1 Single wafer, 4-pole, 3-posn, break before make
S2 Triple wafer, 1-pole, 12-posn, break before make
S3 Miniature toggle, 2-pole, 2-way
S4, 6 Miniature toggle 1-pole on-off
S5 Push-button, non-latching, 1-pole changeover

Displays NSNSB3881, 2-off
Mains transformer Secondary 9V/1A
Sockets BNC 3-off, DIN 5-pin/180°, 1-off

Sundries: mains cable with anchor; chassis mount fuse holder plus 250mA slo-blo fuse; Veropins, 0·1in type; ic sockets (if used) 8-pin 1-off, 14-pin 4-off, 16-pin 6-off, 18-pin 2-off; pillars with 6BA tread 0·5in type 5-off (three for main pcb and two for push-button switch), 0·125in type 7-off (two for power supply pcb, two for input pcb and three for add-on pcb); 6BA bolts, 0·25in and 0·5in long, cheese and countersunk types; two arrow knobs.

Acknowledgements

The author would like to express his gratitude to Livingston Hire Ltd, particularly to Mr P. M. King, technical director, for allowing him to use all necessary instruments and facilities of Standards Laboratory.

Catronics Ltd can supply pcbs and all components for this project, and the chassis with the bottom plate is obtainable from H. L. Smith, 287/289 Edgware Road, London W2. □

Amtor, the easy way

by J. P. MARTINEZ, G3PLX*

THE Amtor radioteleprinter system described by the author in *Radio Communication*, August 1979 has proved to be extremely effective, as used on the air by amateur stations who have been able to program their home computers to run the system. However, it became clear from feedback from readers of the article that few amateurs have acquired the appropriate programming skills. It was therefore decided to design and construct a small microprocessor-controlled unit with only the minimum number of components necessary to run the Amtor system. With the software pre-programmed into a read-only memory, and made available commercially in this form, the unit could be built and operated by any amateur who already operates with conventional rtty.

Program improvements

Since the article was published,a number of improvements to the system have evolved, and these have been included in this design. Most of these improve the operating convenience of the system, by including more of the facilities described in CCIR Recommendation 476 which were omitted in the original program to keep it simple. These improvements are:

1. If contact between the two stations is lost for 15s, then both drop back to their respective synchronizing routines automatically, without waiting for the operators to do this manually, although the manual facility is retained.
2. The change in direction of sending can now also be done by the sending station ending his message with the two characters +?. This is, in effect, an automatic version of the traditional "K" at the end of an over.
3. The synchronizing procedure previously used, which relied on the slave station recognizing *any* valid sync pattern from the master station, was not quite the same as described in CCIR 476, although compatible with it. CCIR 476 requires the slave to recognize only a *specific* sync pattern. The idea of the relaxation was to remove the need for both stations to agree on the four arbitrary characters in the pattern. However, this relaxed system has proved to be rather slow to lock under poor conditions, and so the proper system has been reinstated. It is suggested that for all normal purposes the four characters used should be CQCQ, although this design allows any characters to be chosen by the user. The possibility exists for using, say, the last four letters of the callsign of the station being called, if the activity on Amtor became high enough to warrant action to prevent unwanted replies to a pre-arranged "sked" call.

Other improvements involve the facility to monitor the outgoing message as it goes out, allowing the progress, or lack of it, of a contact under bad conditions to be followed more easily. Also eight l.e.d. indicators have been added, which indicate clearly the status of the system. It is now possible, for example, to see whether a holdup is due to errors in one's own received signal, or errors in the other station's received signal, or just due to inattention on the part of either operator!

New modes

In writing the program, it turned out that it would not quite fit into one standard-sized rom, and so two had to be used. The opportunity was therefore taken to use the extra program space to incorporate two additional modes of operation. The original mode will now be referred to as Amtor Mode A, and the other two as Mode B and Mode L.

Mode B is also described in CCIR 476, and is used commercially where messages have to be sent to more than one other station, overcoming the main problem with Mode A, where multiway contacts are not possible. In this mode, the transmitting station sends continuously with no breaks, and sends two streams of seven-bit Amtor characters, the characters of Stream 1 alternating with those of Stream 2. Stream 2 is in fact a repeat of Stream 1, but delayed in time by 350ms. This gives the receiver two chances to copy, either before or after bursts of interference, or fading of up to 350ms duration. The performance of Mode B is thus rather better than conventional rtty, but not as good as Mode A.

Mode L is a listening-only mode, and allows a receiving station to copy either side of a Mode A contact between two other stations. Mode A was never designed for this, and there is no benefit from the error-correcting system at all, but in spite of this, it is quite useful and has been devised by popular request.

Interfaces

This unit connects between the teleprinter or vdu (45 or 50 bauds) of a conventional rtty station, and the fsk receiving converter with its associated transmitter fsk keyer. The transmit-receive changeover on the radio equipment is driven from this unit. The only critical requirement is that the changeover in both directions should take 10ms or less. This is easily achieved by equipment designed for break-in cw or voice-controlled ssb. This fast changeover is not required in Mode B. Two other control lines are provided, which, although not needed for normal operation, allow for expansion of the system capabilities, in ways which will be described later.

Circuit description

Most of the circuitry is on a single board (Fig 1). The crystal oscillator TR1 oscillates at 4,096kHz, and feeds the clock input of the processor chip IC1. This chip has a built-in oscillator, but it was felt that it might not be stable enough for this job, as, apart from its use within the processor and as a strobe for the other chips on the processor bus, this strobe signal, which is divided by four inside IC1, is further divided by 1,024 in IC6. This gives an accurate 1kHz, which determines the whole system timing. The processor is interrupted every millisecond by flip-flop IC7, to run a short program that keeps track of all the time-sensitive functions of the program.

IC2 and IC3 are random-access memory (r.a.m.) chips, used for storing characters from the teleprinter keyboard while they are waiting to be transmitted; 256 characters can be held in this way. There are a further 128 r.a.m. locations inside IC1, used for temporary storage of program variables and also as a 32-character buffer for incoming signals waiting to be printed.

IC4 and IC5 are read-only memories, each containing 1,024 locations, pre-programmed with the Amtor software. ICs 2-5 all interchange information with the processor chip via the

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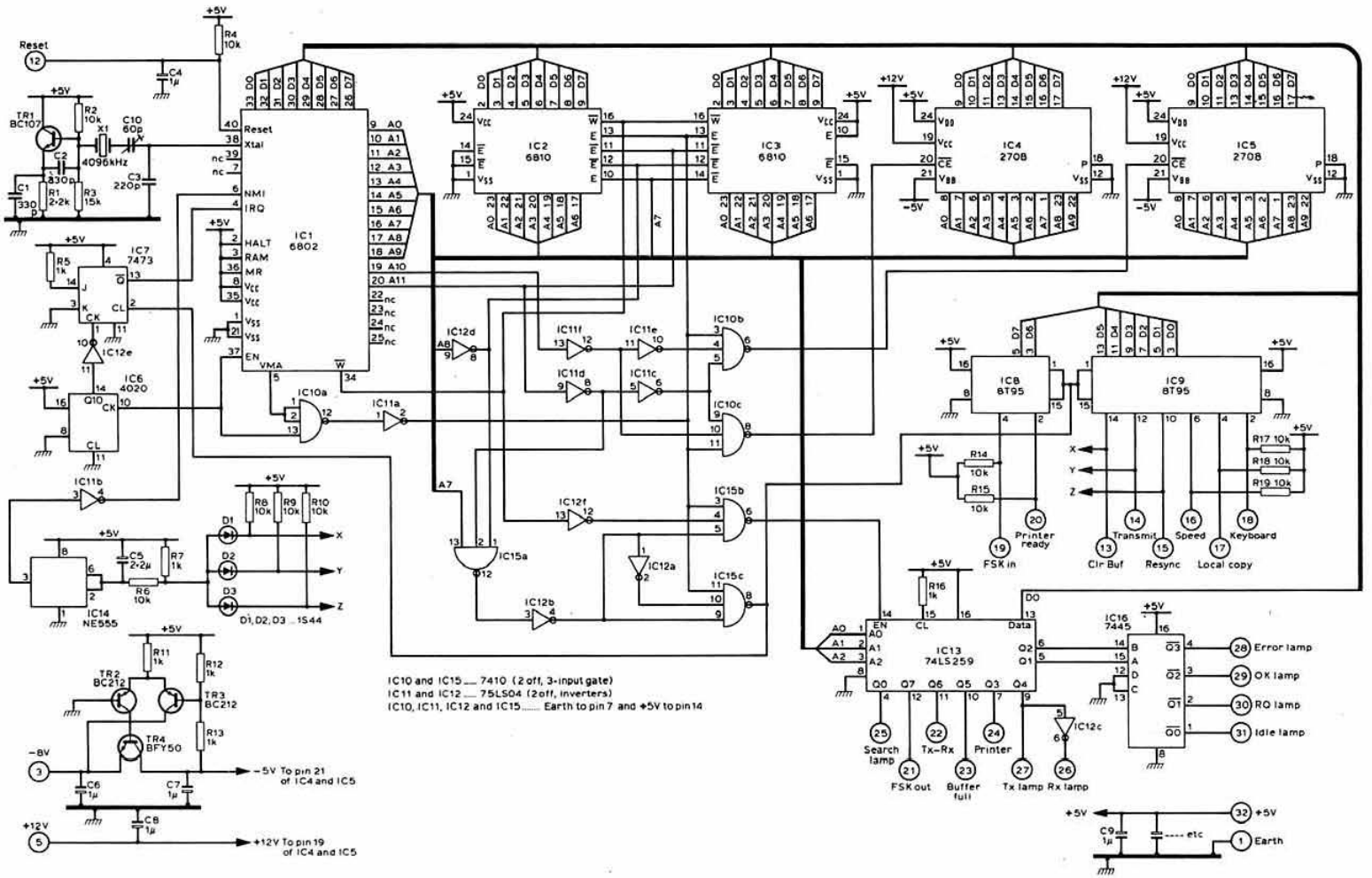


Fig 1. Circuit diagram of the main board. Numbers in circles refer to edge-contacts which interconnect with Fig 2

eight-way data bus, shown for clarity in Fig 1 as one thick line. The individual locations within these chips are selected by the address lines, similarly shown as one thick line.

The inputs and outputs to the outside world are handled by ICs 8, 9, 13 and 16. ICs 8 and 9 are the input buffers and are, in effect, simple switches to gate the eight input signals on to the data bus when commanded to do so by a specific address combination from the processor. The outputs are handled by IC13, which contains eight latches with a common input which comes from one of the data bus lines. The eight latches are selected by the eight combinations of three select lines driven by the processor address bus. This allows the processor to change individual outputs at will by "writing" the appropriate

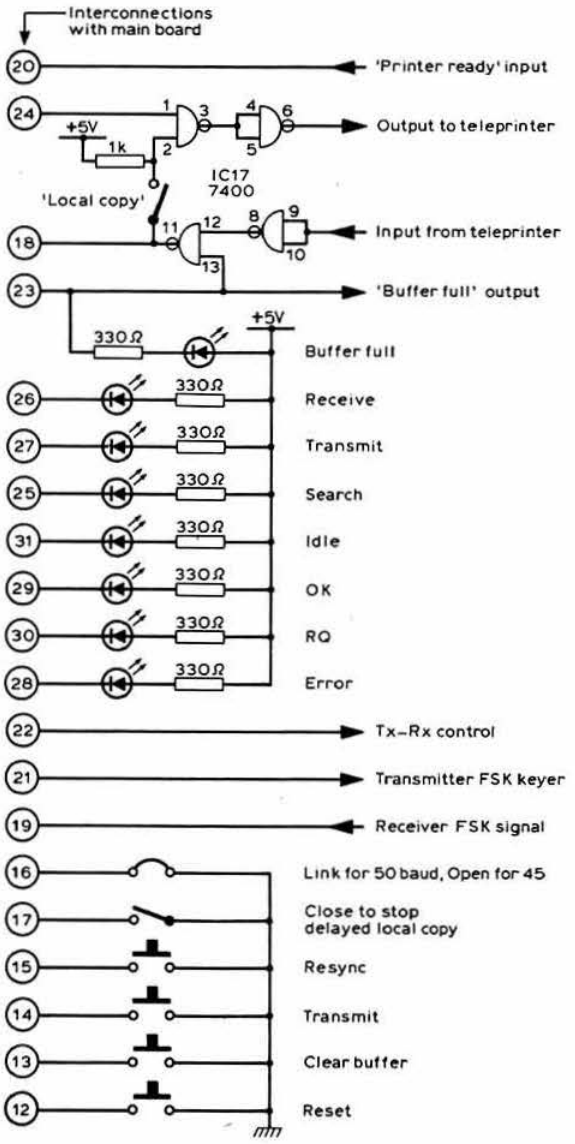


Fig 2. Connections between the main board, the front panel components, and the external equipment

signal into one of eight specific addresses. Two of these output lines are decoded in IC16 so that all four combinations on these lines will light one of four l.e.d. indicators.

All the devices on the bus must be "enabled" in such a way that no two respond to the same address. To achieve this it is not necessary to fully decode the address lines to assign a unique block of addresses to each device. Sufficient decoding is done by ICs 10, 11, 12 and 15, and, in the case of the r.a.m. chips, by gates within them associated with the "E" pins on these chips.

An auxiliary function of the "chip-enable" on the input buffers is to reset flip-flop IC7 after an "interrupt request" by the 1kHz timing signal. One of the instructions in the interrupt program is to read the inputs, and so the negative-going chip-enable pulse clears IC7. This operation ensures that the processor never misses an interrupt even if it is too busy to respond to the interrupt request immediately.

IC14 is connected as a delay and Schmitt trigger, to debounce the front-panel push-buttons connected to edge-connectors 13, 14 and 15. If any of these is pressed, then, after a delay, pin 3 of IC14 goes high. This causes the processor to interrupt into another small program which then looks to see which button is pressed, and takes the appropriate action. TR2, TR3 and TR4 form a regulator for the −5V supply, deriving its reference from the +5V supply.

Fig 2 shows the remainder of the circuitry that is not on the main board, and the external connections. The function of the lamps, buttons and switches will be described later. IC17 is arranged so that, by closing S1, messages entered on the teleprinter keyboard will appear on the printer, except when the BUFFER FULL lamp is turned on by the processor. This allows the operator to see how far his message got before the buffer became full. This circuitry could conveniently be on a board behind the front panel, and could also include any interface level-changing circuitry which may be appropriate to individual requirements, such as printer magnet drivers.

Construction

The author built the prototype on a Vero "eurocard" (Vero part No 10-0581B), using self-fluxing polyurethane wire for the interconnections. All the ics were mounted in holders, in the layout shown in Fig 3. The numbered circles on the circuit refer to the numbers in the 32-way edge connector on this board.

Power supplies

The unit needs +5V at 600mA, +12V at 150mA, and an unstabilized negative supply of about 8V at 110mA. If a −5V supply is already available, this can be used instead, and the −5V regulator circuitry omitted.

Interconnections

The input and output lines are all ttl signals. The keyboard and printer lines are both configured so that the mark, or idle, level is represented by high logic level. The lines to the fsk converter and keyer are configured so that high logic level corresponds to the higher of the two tones in the radio signal. The transmit-receive control line is low on transmit, high on receive. The PRINTER READY line can be left open (high) but, together with the BUFFER FULL line, is available for "handshaking" with such things as tape readers, message stores, or other microprocessor systems. If the PRINTER READY line is pulled low, the Amtor unit will stop printing received text, and will hold it in the internal 32-character buffer. The BUFFER FULL line is a similar signal in

the reverse direction, which goes low when the Amtor unit cannot accept any further message input. This line can be used to control a tape reader or other message source.

Testing

After completing the board wiring and checking that there are no short circuits, apply +5V to the board with none of the ics plugged in. Verify that the crystal oscillator is working, then temporarily connect pins 26–32 of IC1 to earth, and pin 33 to +5V, and then plug in 6802 processor chip IC1. These connections represent the "no operation" instruction, and in this condition the processor simply drives the address lines as a binary counter. Switch on the +5V line, and verify with a counter or a scope that IC1 pin 37 has 1,024kHz on it, the A0 line has 256kHz, A1 has 128kHz, and so on, each succeeding line being half the frequency of its predecessor, down to A15 (IC1 pin 25), which should have 7·8125Hz on it. Follow all address lines to all their destinations on other chips. This checks out the address bus and the processor.

Remove the temporary straps on the data bus, and plug in the IC4 eprom, not into IC4 socket, but into IC5 socket, and also plug in ICs 7, 8, 9, 10, 12 and 13. The IC4 eprom has, in one corner of its memory, a test program which only runs if this chip is plugged into the "wrong" socket. Connect all supplies, switch on, and check the signal on edge connector 25. It should be going up and down at 2Hz, since the test program at this stage is a 2Hz oscillator. This confirms that the processor can communicate with IC5 socket and with IC13. Now plug in IC6 and switch on again. Check that IC7 pin 1 has a 1kHz square-wave. IC7 should now be interrupting the main test program every 1ms. The interrupt test program reads the signals on the eight input lines and transfers these to the eight output lines of IC13, overriding the 2Hz oscillator program. So, to confirm this, and that the input and output wiring is correct, confirm that the signals on IC13 pins 4, 5, 6, 7, 9, 10, 11 and 12 are the same as input signals on edge connectors 18, 17, 16, 15, 14, 13, 20 and 19 respectively. These inputs will assume the high state normally, and can be pulled low by temporarily earthing each pin. Trace the outputs from IC13 through to their respective destinations. Now plug in IC14 and monitor the signal on IC1 pin 4. It should be high, except for brief lows every 1ms, but if any of edge connectors 13, 14 or 15 are taken low, simulating front-panel push buttons, then IC1 pin 4 will go low for about 600ms. This checks the circuitry associated with IC14, and the button-reading interrupt program, which is simulated in the test routine by a 600ms pause, and has priority over the other interrupt, thus causing IC1 pin 4 interrupt request line to stay low.

The parts not tested by this test program are IC16, which can be verified in operation, since it is just a decoder to drive four l.e.ds, ICs 2 and 3, and the wiring around IC4 socket. It remains only to set the crystal on frequency by adjusting C10 with an insulated trimmer for 1,024kHz on pin 37 of IC1, then put the eproms in the right way round, insert the remaining ics, and the main board is ready for connecting to the rest of the circuitry.

Operation

At switch-on, or at any time the RESET button is pressed, the SEARCH, RECEIVE, and IDLE lamps will come on. This is a cue to the operator to enter a single character from the teleprinter, to determine the desired operating mode. The only valid characters are M, S, B and L. Any other character (except "letters", which is ignored) will cause the unit to print the

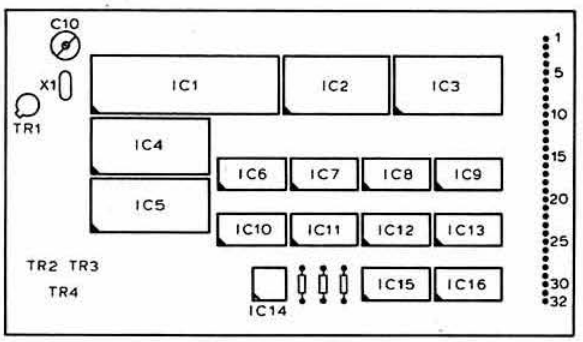


Fig 3. Euro-card layout, top view

word Amtor on a new line, followed by the program version number, and then wait for the correct character. The RESET condition is the only time that the unit will recognize a change in the state of the 45/50 baud speed control line, and so if this is changed while the unit is switched on, then RESET should be pressed. After entering the mode letter, the operation is as described below for the appropriate mode, and the lamps will indicate the status of the system as detailed in Table 1.

Master mode

Type "M" to enter this mode, to initiate a call in Mode A. The operator must now enter four characters, to form the synchronizing pattern. For example, if the call is to be a CQ call, type the four-character group CQCQ. At this point, the unit will start keying the station transmitter, and will search the receiver input for a slave reply in the gaps. When a valid reply is received, operation continues as described under Mode A below.

Slave mode

Type "S" to reply to a call from a master station in Mode A. Again the operator must now enter four characters, this time to form the pattern to which the slave will respond. After these four characters have been entered the unit will start searching the received signal for the programmed sync pattern, and only when this pattern is copied does the unit key the transmitter to reply to the call, after which operation continues in Mode A.

Mode A

On achieving sync the master station is sending to the slave, and any text entered by the master is transmitted. The contact then proceeds in conventional fashion, with the changeover in sending direction being done either by the sending station ending his message with + ? or by the receiving station pressing the TRANSMIT button. If the slave station pressed TRANSMIT before getting into sync then the changeover occurs as soon as contact is established. If either station gets errors in his received signal a repeat cycle takes place, but if 32 repeat cycles take place consecutively then contact is assumed lost and both stations revert to their respective master and slave synchronizing procedures until contact is re-established, when the interrupted transmission will continue from where it left off, with no errors in the printed copy.

Mode B

After typing "B" the unit immediately starts searching for a sequence of Mode B idle signals in the received data, and only when it recognizes these will it print out any following text. Any character that is mutilated in both channels is replaced by

Table 1. Functions of the lamps on the various modes

MODE	LAMP NAME					
	SEARCH	RX	TX	IDLE	OK	RQ	ERROR
B receive	On if no valid signal received	ON	OFF	Idle character received	Good character received	OFF	Uncorrectable error received
B transmit	OFF	OFF	ON	Idle character transmitted	Text character transmitted	OFF	OFF
Master	On until valid slave received then see Mode A	OFF	ON	OFF	OFF	On when receiving slave then see Mode A	On if RQ lamp is off
Slave	On until valid master received then see Mode A	ON	OFF	OFF	OFF	On when receiving slave then see Mode A	On if RQ lamp is off
A receive	Off until 32 consecutive repeats then Mode M or S	ON	OFF	On if received block contains idle	Complete block received	Distant station requesting repeat	Error in received block
A transmit	Off until 32 concecutive repeats then Mode M or S	OFF	ON	On if transmitted block contains idle	Complete block transmitted	Distant station requesting repeat	Error in received control code
Mode L	On until four error-free blocks then like Mode A	ON	OFF	On if received block contains idle	New block received (maybe with errors)	Repeated block (not printed)	OFF

the "all-spacing", or blank character, in the teleprinter output. If the error rate in both channels exceeds 50 per cent the unit stops printing until it again detects a good idle sequence. The error rate detector has a long time constant such that it takes about 4s for the printer to stop when a signal goes off.

On pressing the TRANSMIT button the station transmitter is turned on and sends 10 idle characters followed by any text entered from the teleprinter. As the rate of transmission is slightly faster than the maximum rate at which text can be entered, idle characters are inserted at intervals, always in groups of five or more. This enables distant receivers to resynchronize without losing too much text. To switch back to receive, press RESYNC.

Mode L

On entering "L" the unit searches for any sequence of 21 data bits that would represent a valid Amtor Mode A block, and will print it out, continuing to do so until it has identified four such blocks in a row. Thus the unit will print out some rubbish text until it has locked on to a good signal for four blocks. After this it prints out all blocks, whether containing errors or not, but replacing errors with blank characters, supressing idles and RQ characters, and also suppressing any block which is the same as its predecessor. This is to clean up the copy in the event that the station being monitored has to repeat blocks for the benefit of the station he is working. If 32 blocks in a row have errors in them, then the unit goes back to searching for error-free blocks. If the station being monitored is sending a sync pattern, then the four characters in the pattern are printed out repeatedly, separated by spaces, eg CQCQ CQCQ CQCQ . . .

Mode L is very much a compromise and has some known deficiencies: it occasionally gets into false lock with a signal, especially if it is sending continuous idles, and by virtue of the repeat-block-suppression feature it will not correctly print out, for example, a dotted line.

In all modes, selecting delayed local copy instead of normal local copy will cause transmitted text to be printed out as it is transmitted instead of as it is typed. Text can be entered while on receive, and will be held in the 256 character buffer until it can be transmitted. This is most useful in Mode A, especially under bad conditions. It is not recommended to enter too much in advance in Mode B, as no idle sequences will be inserted while the buffer is emptying. If the buffer fills, the BUFFER FULL lamp will come on, inhibiting further input until either some characters are transmitted or the CLEAR BUFFER button is pressed.

For most purposes it does not matter which teleprinter speed is used at either end of the contact but, in Mode B, if a station with a 50-baud teleprinter is sending at full speed (from paper tape perhaps) to a station with a 45-baud printer, then characters will accumulate in the receiving station's 32-character receive buffer. This will overflow after about 1min, resulting in a loss of 32 characters. To solve this, pauses must be made in the transmission. This problem does not occur in Mode A since, if the receiving station's buffer fills, a dummy request-for-repeat is generated to slow the transmitting station down. Characters then accumulate in the transmitting station's 256-character buffer, eventually lighting the BUFFER FULL lamp and stopping the incoming message. The same applies if the receiving station pulls down the PRINTER READY line for too long.

In all modes the RESYNC button can be pressed at any time to lock on to another signal without waiting for the unit to drop

back to SEARCH on its own. To change modes or alter the sync pattern, press RESET and re-enter the appropriate mode letter. In this case any text still remaining in the buffer is lost.

Troubleshooting the system on the air

Since Mode A requires fast changeover, which may be an unknown factor in some transmitters, the following procedure will help to trace or eliminate problems of this sort. First try out Mode B receive, with another station sending continuous idles, to check the receiving fsk converter polarity, and then with the other station sending the traditional RYRYRY test pattern to check that the fsk converter can respond correctly at 100 bauds. Then try sending in Mode B so that the other station can check that the transmitter keying polarity is correct. If all is well, try slave mode, with the other station sending a CQCQ master call. If the system locks to the distant master but no message comes through, then the changeover from receive to transmit may be taking too long, or the transmitter may be chirping. If contact can be achieved as a slave, but not as a master station, then the receiver may be taking too long to come back on after a transmission. In tracing problems of this sort it will help to use an oscilloscope, triggered externally from the changeover control line. It is also worth checking with a local station that there are no key clicks, as such clicks may well have passed un-noticed under conventional operation.

Conclusion

In spite of the complexity of the Amtor system, and the use of microprocessor techniques, it is hoped that this article has shown that the construction and use of this Amtor unit is not difficult. Experience of the use of Amtor by the author and others, both on hf and vhf bands, indicates that under typically bad conditions of fading and interference, Amtor (Mode A) performs better than any other mode of transmission currently used by amateurs, including morse code.

Postscript

Since starting the preparation of this article, GPW Electronics Limited, Unit B, Newgate Lane Industrial Estate, Fareham, Hants PO14 1BP, tel: 0329 285731, have indicated that they are to make available various kits of parts for this design. The various kit options are as follows:

Amtor kit A. Complete kit of parts including through-plated pcb, microprocessor, all semiconductors, integrated circuits, and all necessary discrete components. Price: £76 + VAT.

Amtor kit B. Part kit comprising through-plated pcb, crystal (4,096kHz) and programmed eproms. Price: £44 + VAT.

Amtor kit C. Programmed eproms only. Price: £17 + VAT.

All kits are supplied with parts list and assembly details. Please send sae for complete kit listing and prices.

All prices above include p & p. □

BOOK REVIEWS

Radio Handbook (21st edition). Edited by William I. Orr, W6SAI. Published by Editors & Engineers (UK Prentice/Hall International). 1,135 double-column pages. Price £12.70.

On my bookshelf, well-worn but still valued, are the 9th (1942) and 14th (1956) editions of this long-established handbook. Together with *The Amateur Radio Handbook* (ARRL) and *Radio Communication Handbook* (RSGB), it completes the trilogy of comprehensive amateur radio handbooks recognized and respected by amateurs the world over; yet each has carved out its own distinctive and indispensable role. *Radio Handbook* is perhaps the most professional, combining theory and practice, explanation and construction with a deceptive ease for the reader—though not, one suspects, for Bill Orr, who has edited so many of the post-war editions.

These appear occasionally rather than annually; changes are not made for the sake of change (a number of long-familiar diagrams still appear, particularly in the antenna sections). Yet the editor has a keen eye for new developments to fit among the essential theory; even the always useful "electronic mathematics and calculations" includes Boolean Algebra and an introduction to computers and computer languages; constructional projects abound in those areas where build-it-yourself remains a practical proposition, even if emphasis is increasingly placed on explaining design practices and setting-up and measurement procedures. Thermionic devices (as might be expected from Bill Orr's connection with Eimac) dominate the long section on high-power amplifiers which has nary a transistor in sight; but solid-statery is adequately treated, including 40-channel ic synthesizers and a 100W p.e.p. linear amplifier.

The book is well-organized and you find what you are looking for where logically you expect it; unfortunately the same cannot be said for the disappointing index, which breaks all the rules and is hardly helped by the expanded "contents" which include material that has been dropped from this edition.

To European eyes the book continues to reflect the American priority given to hf rather than vhf, with minimal interest in the spectrum above 432MHz. It would be easy to pick faults, and the uhf-orientated enthusiast is likely to be a disappointed purchaser: yet it is a handbook that deserves to be praised and recommended; sound, eminently practical, free of academic flourishes; a book quickly to grow into; only slowly to grow out of—and when you do you will emerge with a far more thorough grasp of hf/vhf radio communication than from a dozen lesser works.

Chapters: Introduction to amateur radio communication (16pp); direct current circuits (24pp); ac, impedance and resonant circuits (33pp); semiconductor devices (54pp); vacuum-tube principles (17pp); vacuum-tube amplifiers (10pp); rf power amplifiers (26pp); special circuitry (8pp); ssb transmission and reception (28pp); communication receiver fundamentals (49pp); generation and amplification of rf energy (63pp); frequency synthesis (14pp); fm and repeaters (26pp); specialized amateur communications systems and techniques (40pp); a.m. and audio processing (21pp); rfi (26pp); equipment design (27pp); transmitter keying and control (17pp); mobile and portable equipment (42pp); receivers and exciters (77pp); hf and vhf power amplifier design (22pp); hf and vhf pa construction (106pp); power supply (42pp); radiation and propagation (29pp); the transmission line (17pp); antenna matching systems (25pp); hf general purpose antennas (25pp); hf fixed directive antennas (18pp); hf rotary beam antennas (22pp); vhf and uhf antennas (35pp); electronic test equipment (44pp); the oscilloscope (18pp); construction practices (14pp); electronic mathematics and calculations (50pp); data etc (14pp).

For a large (9·5 by 6·6 by 2in), hardcover, well-printed handbook, the price of just over 1·1p per page must, by current standards, be considered extremely good value, even if in places there is still room for more intensive revision and up-dating.

The Theory and Servicing of AM, FM and FM Stereo Receivers, by C. R. Green and R. M. Bourque. Published by Prentice/Hall International. 583 pages (hard covers). Price £16.20.

This is a thorough guide to modern domestic radio receivers in the best American instructional tradition. Since design of broadcast receivers is now international (indeed, manufacture in the UK virtually came to an end a decade ago) this book will be found useful by service engineers and technicians here and elsewhere. However, it is tied firmly to medium-wave (long-waves are not used in the USA for broadcasting) and vhf/fm broadcast bands, so that it gives scant consideration to the questions of bandswitching and calibration that affect multiband receivers. The treatment of modern stereo decoders is good, and there is plenty of easily-assimilated material on basic principles and practice. A good book but not really for the amateur enthusiast unless he spends his working hours trouble-shooting in the trade. *G3VA*

Wire beam antennas and the evolution of the G3LDO double-D

by P. DODD, G3LDO*

Introduction

During March 1979 the author needed a beam antenna to take advantage of the sudden improvement in conditions on 28MHz: it had to be lightweight because of the tall unguyed mast in use, and a quad was not feasible because of the obstructions encountered when the mast was tilted over. Its development is described below. The author went to some lengths to defend vhf modelling of hf antennas in a previous article [2], and it would seem that vhf modelling is a well established technique [3] and is used by many designers as a method of testing hf antenna design. Its use in the design of different types of antenna for amateur purposes would seem to be beneficial and has been used extensively in this project.

First attempt

The first wire Yagi beam was constructed using graphs from the *ARRL Antenna Handbook* [1] as a guide, and the wire elements were laid on a crossed bamboo support as shown in Fig 1. The support was not quite large enough, and the driven element and the reflector were allowed to dangle over the edge of the support. The elements were pruned for a low swr and

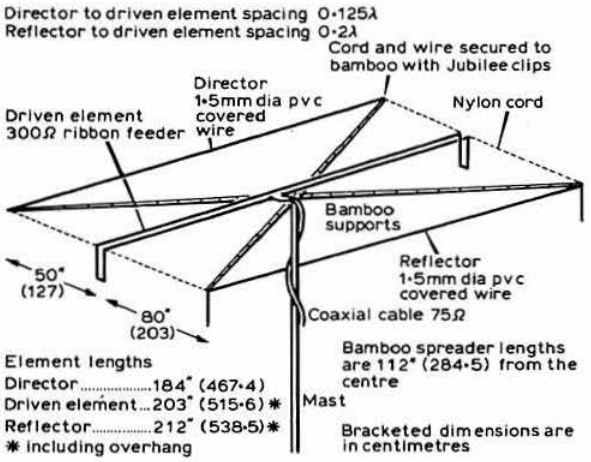


Fig. 1 Mk1 wire Yagi for 28·6MHz

25 Wood Road, Spondon, Derby.

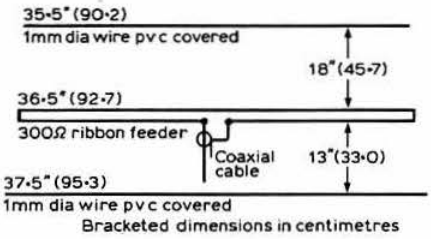


Fig 2. 145·6MHz Yagi dimensions for maximum gain

reasonable directivity, and the beam proved quite successful—giving two S-points improvement (on average) when compared with the previous dipole at the same height.

The only problems encountered were the dangling ends of the elements which in windy weather caused fluctuation in swr and, presumably, gain. Heavy rain caused an increase in swr from 1·4:1 to 1·8:1.

Wire Yagi experiments

To obtain some insight into the performance of the wire Yagi a vhf model was constructed and measurements performed with test equipment used on previous tests (2). The elements were pruned for minimum swr and maximum forward gain, which fortunately occurred at the same element dimensions (Fig 2). The driven element of the Yagi was not located halfway between the director and the reflector because it would be too close to the metalwork of the support structure.

The field strength was compared with a reference dipole whose performance had been optimized. The model exhibited a performance equally as good as an all-metal beam at the centre of the band, with the directivity pattern shown in Fig 3.

The models were constructed from 1mm diameter wire, which gave a length to diameter ratio in the range 10^2:1. When the model is scaled to the hf band the range will be in the 10^3:1 region. The appropriate factor will have to be applied if the antenna is scaled directly from the vhf model, using the graph in Fig 4. When an attempt was made to calculate the factors for scaling up it was obvious something was wrong, and on checking the dimensions of the model it was noted that all the elements were nearly 2in (5cm) short compared with normal 144MHz antennas. The model was rebuilt using insulators at the end of the elements, and the tuning and testing procedure was performed again. The elements finished up slightly longer, but the increase was less than 0·25in (0·64cm).

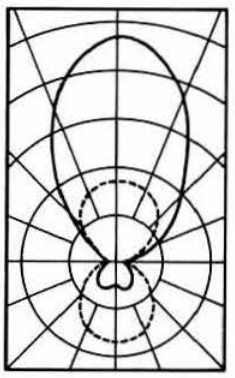


Fig 3. Wire Yagi and dipole polar diagrams compared

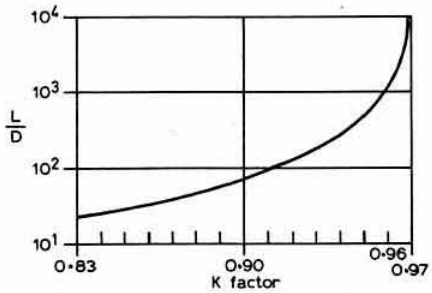


Fig 4. Length/diameter correction graph for element lengths

When the model was rebuilt yet again but using uncovered wire for the parasitic elements, the difference in length measured returned to "normal" proportions and it was evident that the insulating material had a loading effect. To measure the loading effect of pvc insulation a 15ft (457cm) length of wire was measured for resonance using a gdo. The frequency measured was 31·1MHz. This is very close to the *ARRL Handbook* figure of $\frac{468}{f} = l\,(ft)\left(\frac{14213}{f} = l(cm)\right)$

Different thicknesses of a 15ft (457cm) length of pvc-covered wire were also measured, and were found to vary between 29·9 and 30MHz. It would seem that the velocity factor of pvc-covered wire is about 0·965.

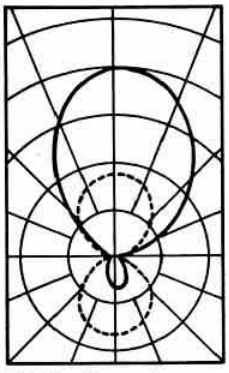


Fig 5. Two element wire antenna and dipole polar diagrams compared

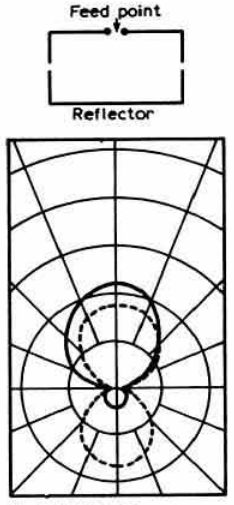


Fig 6. VK2ABQ antenna and dipole polar diagrams compared

Two-element wire beam

A two-element model was then constructed, and its dimensions and polar diagram are illustrated in Fig 5. A 28·6MHz antenna was scaled from this model and fed directly with 75Ω coaxial cable. The minimum swr of 1·5:1 probably results from a driven element centre impedance of 50Ω, and it would perform better if 50Ω cable were used.

The performance of this antenna over a period of three months is not detectably less than the three-element model previously used, but this could be accounted for by the difficulty in practice of adjusting three elements for optimum performance.

Table 1. Design data

Freq	Reflector		Drive: Elt:		A		B		C		D	
(MHz)	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm
14·2	452	1147	417	1060	245	622	263	668	180	457	33	84
21·25	302	767	279	708	154	390	166	420	113	287	22	56
28·5	225	572	208	528	114	290	122	310	85	216	15	38

The above figures are based on the following formula:

Driven element	$\frac{5920}{f} = L(in)$	$\frac{15050}{f} = L(cm)$
Reflector	$\frac{6413}{f} = L(in)$	$\frac{16288}{f} = L(cm)$

1. The above formula for pvc wire only. Multiply L by 1·04 if using uninsulated copper wire.
2. See Fig 10 for meaning of A, B, C and D dimensions.
3. Figures in C are only approximate and are an aid to construction.
4. A, B, C and D not critical and need not be altered if the elements are tuned to the band edge.

Two-element wire beam derivatives

A number of experiments were performed to investigate methods of making the two-element beam more compact without compromising the gain. The approach used was to ignore all theoretical and previously published work on the subject and to perform numerous experiments using an empirical approach.

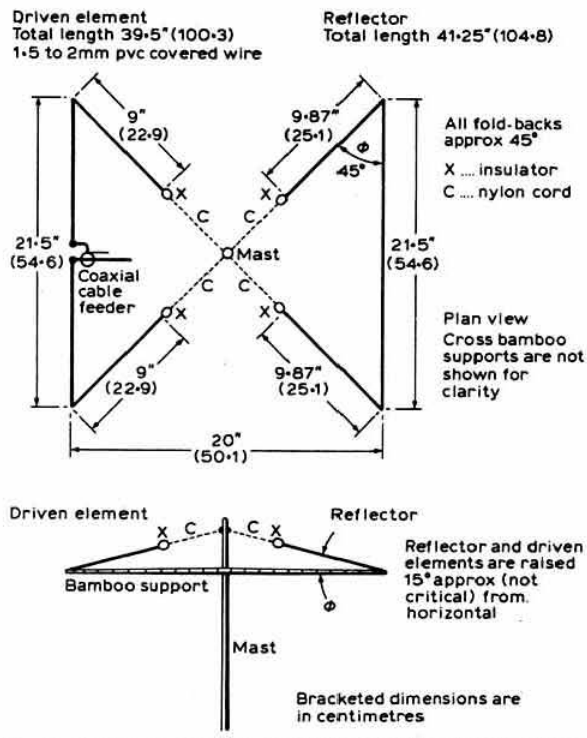


Fig 7. Double D, showing construction with dimensions for 145·6MHz

A further objective was simplicity. This is necessary because the more complex the array the more interacting parameters require adjusting. It is also more difficult to scale and build a complex array. Simplicity means ignoring traps and loading coils, which leaves element bending as the only solution to making a compact antenna. When an element is bent the resonant frequency appears to rise. A gdo is necessary to determine the exact frequency of a bent element.

What to do with the bent elements is a mechanical problem. One way out of this is to make a VK2ABQ configuration as shown in Fig 6. This has good directivity but poor gain compared with the two-element antenna. If the mechanical aspects are ignored and the elements allowed to droop (top half of a quad) the gain returns to that of the two-element antenna (Fig 5). As this seems to have the same gain as a quad there seems little point in making a full wavelength loop quad.

The double-D configuration

The double-D was the final result of a number of experiments to overcome the problem of what to do with the folded parts of the elements. The construction is shown in Fig 7 and the polar diagram in Fig 8. The elements can be folded back in the horizontal plane with some loss of front-to-back ratio and a slightly higher swr. Dimensions are given in Table 1.

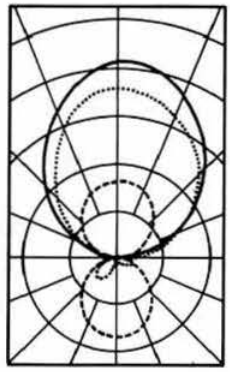


Fig 8. Double D monoband (solid line) and the effect of multiband elements (dotted line) compared with dipole

The length of the reflector of all the models was fairly critical. If any detuning of the element occurred, due to the proximity of an element for another band, the effect would be noticeable. Various lengths of wire, longer and shorter than the reflector element, were located close to the reflector. No observable effect on the polar diagram was apparent, so it was concluded that no detuning of any significance had occurred. When any wire elements were placed in close proximity to the driven element a dramatic change in swr resulted, with a consequent deterioration in gain but not directivity.

A driven element was made from 300Ω twin feeder. With careful adjustment a polar diagram as shown by the dotted line in Fig 8 resulted. Most of the adjustment was necessary because of the need to obtain an element spacing/maximum gain configuration/element coaxial matching compromise, with element coaxial matching being the most critical parameter. This could be overcome with a separate matching system (gamma match) for each driven element. From the experiments so far performed, a suggested form for a three-band array is given in Fig 9.

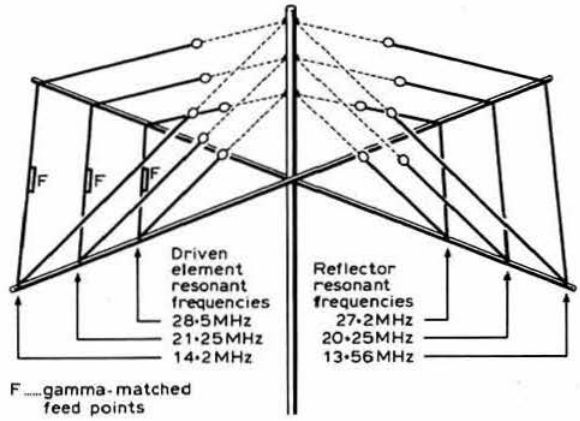


Fig 9. Suggested layout for multiband version of double D

Construction details

The support is illustrated in Fig 10. The use of aluminium angle or dexion for the centre section will enable a 14MHz antenna with the gain of a quad to be constructed that would weigh around 10lb (4·5kg). The elements are fixed to the bamboo with pvc tape, and the ends of the element are tied to insulators. These insulators can be made out of rectangles of paxolin with holes drilled at either end. About 4in (10cm) should be added to the formula for element length for connection to

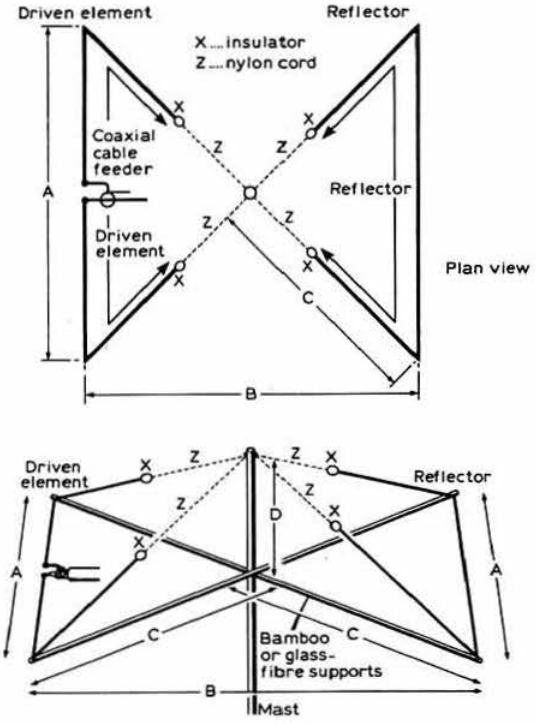


Fig 10. General construction details with dimension references (see Table 1)

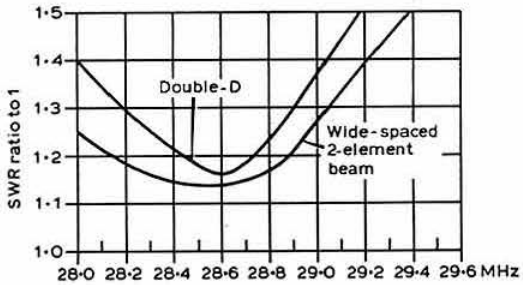


Fig 11. SWR of double D and wide spaced 2-el beam compared

the insulator. Nylon cord rather than wire should be used between the insulator and the mast if detuning effects are to be avoided.

HF band performance

In practice, the performance of the double-D antenna on 28MHz appears as good as predicted by the vhf model. The front-to-back ratio, according to local reports, is about four or five S-points; when used with a QRP 3W homemade ssb transceiver, QSOs with all continents were made in less than a week of normal operating.

References

[1] *ARRL Antenna Book* 13th edn p204.

[2] "Assessment of hf aerials using vhf aerials," P.G. Dodd. *Radio Communication* December 1972.

[3] "Aerial Gain and How it is Measured," M.F. Radford, MA. *Wireless World* October 1966. □

NEW PRODUCTS

Sommerkamp TS240 transceiver

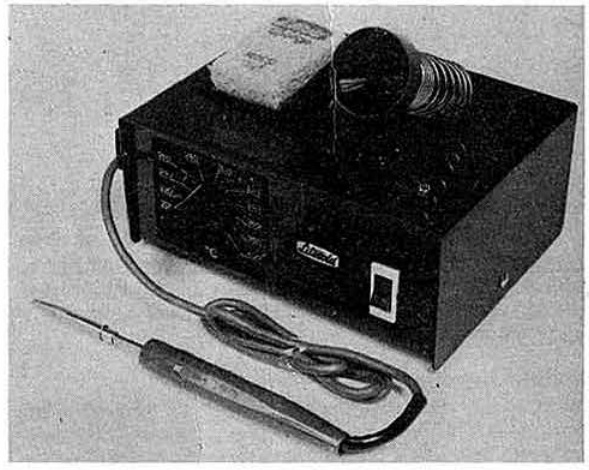
A 40-channel 16W synthesized 144MHz transceiver for £159 including VAT surely offers good value, and the new Sommerkamp TS240 from Arrow Electronics Ltd is now available from stock. The TS240 affords full coverage of the fm section of the 144MHz band, with direct digital readout of the channel in use, automatic repeater selection, tone calling facility, s/rf meter and push-to-talk microphone. As usual with the Sommerkamp range, the unit will accept all the usual Sommerkamp microphone options.

Full details of this unit and Arrow's latest comprehensive price list can be obtained by sending an sae to: Arrow Electronics Ltd, 7 Coptfold Road, Brentwood, Essex.

Litesold ETC/2A soldering station

The new electronically-controlled soldering station from Litesold is one of the most advanced soldering stations available, bringing new standards of efficiency, reliability and safety to hand soldering. Temperature and power are easily varied, and the elimination of control components from the iron itself makes the tool lighter to use and easier to maintain. The 22V power supply is controlled by an ic which responds to a sensor near the tip of the iron, eliminating transients, static and leakage voltages.

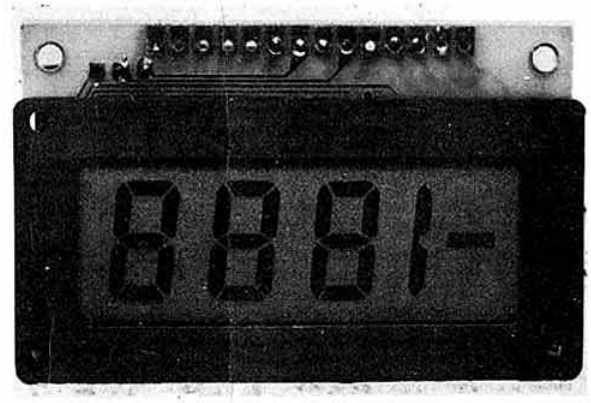
The Litesold ETC/2A soldering station costs £53.50 + VAT. Further information from Toolrange Ltd, Upton Road, Reading RG3 2JA. Tel Reading (0734) 29446 or 22245.



The Litesold ETC/2A

DVM176 lcd panel meter

Ambit are extending their range of electronic modules with a compact version of the standard 3½ digit lcd dvm—the DVM176. The overall dimensions of this new unit are only 60 by 38 by 12·8mm, enabling easy mounting in a wide variety of applications. The unit is supplied with an integral bezel, and is constructed from the highest quality gold-plated through-hole pcb and a 0·5in lcd. Being based on the functions of the ICM7106, the unit provides 200mV fullscale reading, true differential input and reference, a single 9V/1mA supply, auto zero with true polarity and 1pA input current. Applications include panel meters, multimeters and thermometers. Price £19.45, one off; £9.90, 1,000 off (+VAT). Further information from Ambit International, 200 North Service Road, Brentwood, Essex. Tel 0277 227050.



The DVM176 lcd panel meter

A narrow-band fm receiver using a Motorola MC3357

by I. J. DILWORTH, G3WRT*

THIS article is intended to spread the word about this splendid 18-pin device. Reference to Fig 1 will show that the device contains a mixer, local oscillator, limiter amplifier, quadrature detector with amplifier, active filter amplifier and squelch switching. The unit typically consumes ~3mA at a supply voltage of +6V.

Circuit description

The Motorola applications note [1] on this device gives a full description of the modules contained in the integrated circuit. For brevity this article will concentrate on the practical circuit realization, Fig 2. The mixer-oscillator combination converts the input signal, applied to pin 16, down to 455kHz, and this i.f. is then bandpass-filtered by F1 and fed to the limiting amplifier where most of the amplification takes place. Audio is recovered using a conventional quadrature coil (F2) and an internal multiplier after the limiter. The output of the limiter is also used to supply dc bias to the limiter input at pin 5.

In the absence of a signal the hf/af noise present at pin 9 is fed into the active filter network, and a rectified dc component is used to charge C2 via D1. RV1 is the squelch threshold control. To stop jitter, 100mV of hysterisis is employed at pin 12. Audio muting is achieved by connecting pin 14 to a high impedance ground referenced point in the audio path; ie to RV2,

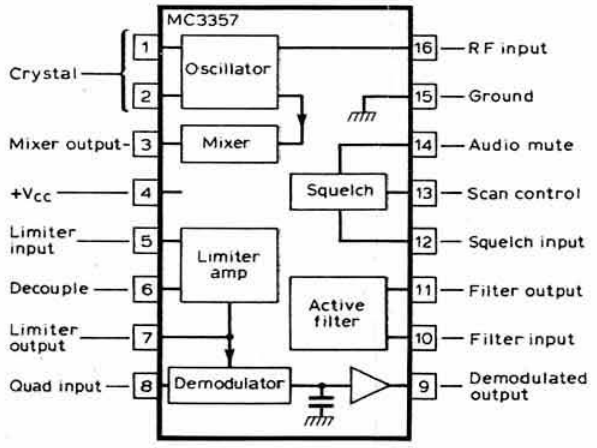


Fig 1. Functional block diagram of the MC3357

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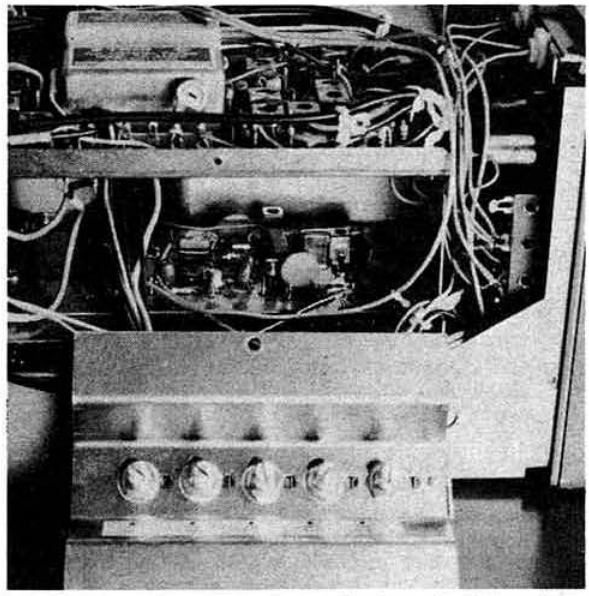


The convenient space inside the TS520 where the nbfm unit can be mounted

the audio output potentiometer. The sensitivity of the unit is approximately 5μV for −3dB limiting and, therefore, the input requires no preamplification.

Application to Trio TS520

The pcb and component layouts are shown in Figs 3 and 4. Although the prototype was constructed using a double-sided pcb, the circuit should prove stable using a single-sided board. A socket was used for the ic, and the hole positions are only suitable for the inductors suggested in the components list.

The TS520 employs a 3·395MHz i.f., thus a crystal for 3·395 ±455kHz is required, ie 3·85 or 2·94MHz local oscillator. This 3·395MHz i.f. must be sampled before the ssb crystal filter, and a very convenient point to do this is at the output of the noise blanker board. This is a low impedance point which is not affected by the 3kΩ impedance of the MC3357. Due to the lack of available front panel controls, the squelch is preset; this has not proved to be a disadvantage, since it can be set to open on very noisy signals and has shown itself to be stable over a long operating period.

The nbfm unit can conveniently be mounted in the space underneath the crystal filter board. This is accessible from the side by removing the three screws which secure the sidepanel control bracket; see photograph. Note that, at least on the author's model, a very convenient hole exists which accepts an 8BA self-tapping screw. This is tailor-made for secure mounting of the board.

Connections to the TS520 are minimal. The author used the arrangement shown in Fig 5. The fixed channel selector switch is the most convenient front panel control to use for switching between ssb and nbfm. However, this entails the loss of the fixed channel facility because the wire routed to the base of Q1 on the fixed channel avr board must be disconnected and +9V connected to the wire routed to the switch. The four wires going to the crystals may be left in place since they are dc isolated from the rest of the circuitry. The supply to the TS520 af

Components list

R1	10kΩ	**C1, 7**	0·01μF
R2, 17	33kΩ	**C2**	1μF tant*
R3	82kΩ	**C3, 12, 13**	0·1μF
R4	1kΩ	**C4, 5, 14**	1nF
R5	270kΩ	**C6, 8**	10μF tant
R6	4·7kΩ	**C9**	47pF poly
R7	6·8kΩ	**C10**	100pF poly
R8	1·5kΩ	**C11**	1μF tant
R9, 14, 15	2·2kΩ	**C15**	10pF
R10	8·2kΩ	*1–47μF to extend squelch tail for choppy signal reception	
R11	100kΩ		
R12	330Ω		
R13, 16	47kΩ	**TR1, 2**	BC108 (RS)
R18	470Ω	**IC1**	MC3357 (Ambit)
RV1	10kΩ skeleton preset	**D1**	IN916 (RS)
RV2	100kΩ skeleton preset	**D2**	200mW 6·2V zener (RS)

All resistors 1/3W (RS)

F1	Toko CFT455B (Ambit)
F2	Toko LMC4200 (455kHz) (Ambit)
X1	To convert input signal at pin 16 to 455kHz
L.E.D.	(RS)

Suppliers
Ambit International Ltd, 200 North Service Road, Brentwood, Essex CM14 4SG.
Radio Spares Ltd, PO Box 427, 13–17 Epworth Street, London EC2P 2HA.

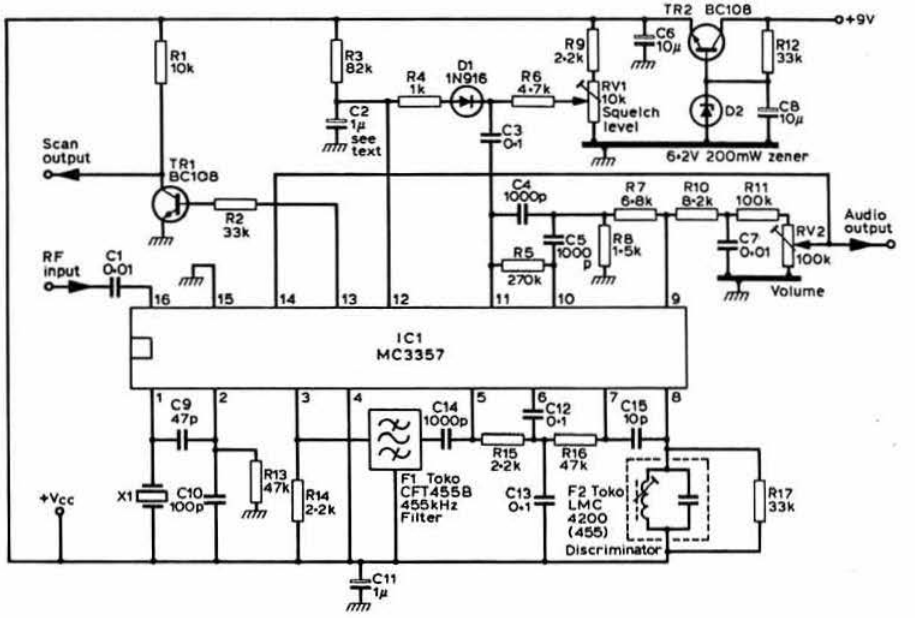


Fig 2. Narrow-band fm adapter circuit

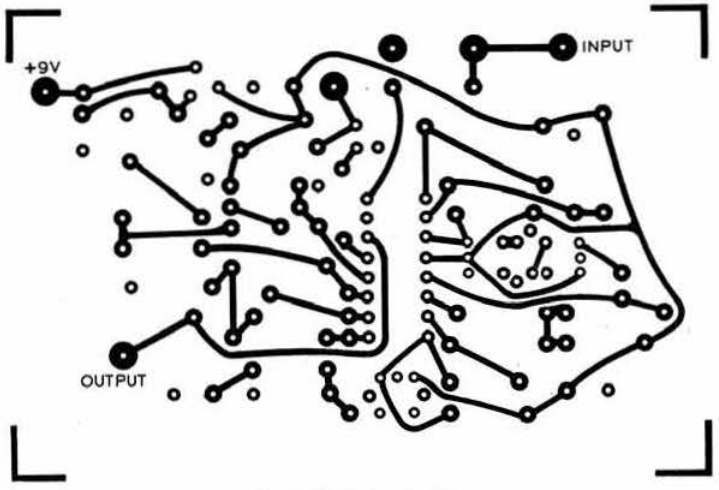
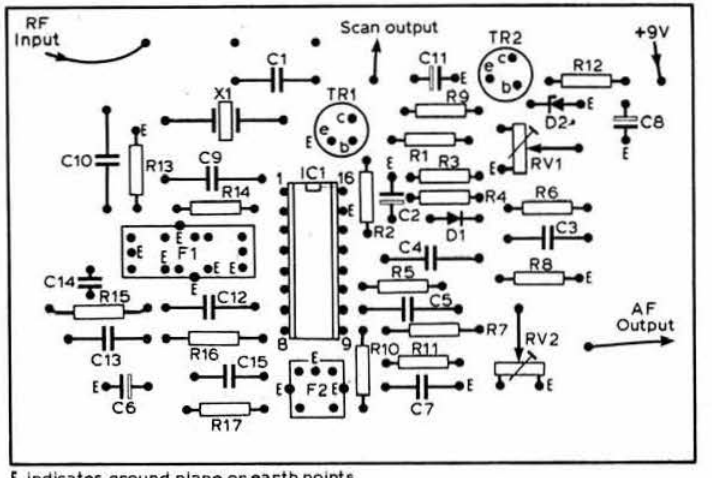


Fig 3. PCB, track side



E indicates ground plane or earth points

Fig 4. PCB component layout

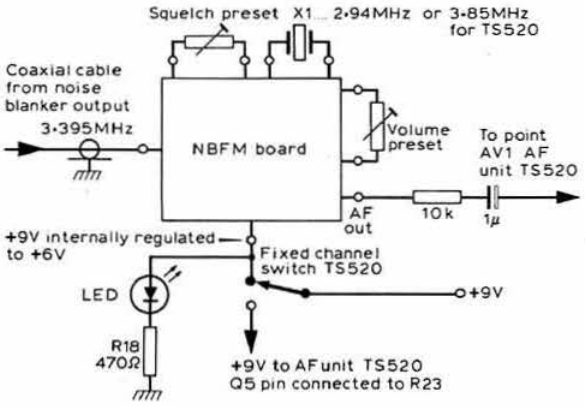


Fig 5. NBFM modification to TS520

preamplifier, (pin 9 on the end of R23 near Q5 af unit), is then routed to one position of the switch, and the +9V rail to the MC3357 routed to another position. The fixed-channel switch then acts as an ssb-nbfm mode selector. The af output of the MC3357 is routed to point AV1 on the af unit board via a 10Ω resistor and a 1μF capacitor.

On nbfm the preset volume control can be adjusted for the required audio output level in conjunction with the front panel control.

Alignment

Switch to nbfm, turn the squelch control to a minimum and adjust the discriminator (yellow top F2) for maximum noise. Switch to ssb and tune in an nbfm signal, ie for maximum S-meter reading. Switch to nbfm again and adjust F1 for maximum signal, ie minimum noise. Next adjust F2 for maximum undistorted audio, readjusting F1 if necessary. To set the squelch control disconnect the antenna and switch on the crystal calibrator. Tune in a calibration marker on the 29·5MHz range, (ie a weak one), and detune the drive control to produce a noisy signal. The squelch may then be set at the required level.

Additions

A squelch defeat switch would be useful, but this would entail either mounting a switch on the rear panel or routing a wire to the remote connector socket (or remote vfo socket), and installing an external switch. The "tail" on the squelch may be extended by increasing C2; this has proved advantageous when receiving fluttery signals. Transmission of nbfm can be achieved by either a separate vfo, tuning 4·9–5·5MHz and suitably frequency modulated (see the TS520 circuits in the manual for a suitable design), or the rit control wiper may be routed to a switch or relay and then to the microphone amplifier. This has not yet been tried by the author but it should prove perfectly feasible. Another possibility is a channel scanner using the scan-control output of the MC3357, a suitable arrangement can be found in [2, 3].

Conclusions

This excellent ic will enable many hf ssb receivers to be easily modified to provide nbfm reception while retaining all the features of the rest of the equipment. The small size of the unit means that it should be mountable inside nearly all current rigs; that has to be a better solution than the use of an external box.

References

[1] Motorola applications note for the MC3357.

[2] "A scanning arrangement for quartz crystals", by I. J. Dilworth, *Radio Communication* September 1977.

[3] "A diode matrix channel numbering system" by I. J. Dilworth, *Radio Communication* April 1979.

BOOK REVIEWS

The Beginners' Handbook of Amateur Radio, by Clay Laster, W5ZPV. Published by Howard Sams (UK Prentice/Hall International). 384 pages (soft covers). Price £6.45.

So you want to be a Ham, by Robert Hertzberg, K4JBI. 8th edition. Published by Howard Sams (UK Prentice/Hall International). 192 pages (soft covers). Price £4.25.

The new *Beginners' Handbook* is primarily an examination primer rather than an amateur handbook in the traditional sense. Much of it is devoted to fundamental electrical and electronic theory, competently presented, but of course keyed to FCC rather than the RAE. And while it would help a newcomer through his examination, he would still, one suspects, find himself at a loss if suddenly presented with an hf or vhf transceiver, some antenna wire and told to give it a whirl. And, to this reviewer, it seems presumptuous to call a chapter of under 30 pages (with 27 illustrations) "All about transmission lines and antennas"! Even the most rabid hf-only enthusiasts would hardly condone the virtually complete omission of any suggestion that the spectrum extends beyond 30MHz. As an introduction to fundamental theory, by no means bad; as an introduction to amateur practice, by no means good!

Fundamental theory is something you will *not* find in "*So you want to be a Ham*". Indeed there is not a single circuit diagram from start to finish; but, instead, plenty of photographs of amateurs and amateur stations, mostly in the USA. Nevertheless, with seven editions under his belt, Robert Hertzberg clearly knows his American readers and presents a lively, well-illustrated text on the "this is amateur radio" theme. And quite possibly a newcomer would gain more understanding of amateur "black box" equipment and operating practices from this book than from the *Beginners' Handbook*, though it certainly would not help him through his RAE.

Buy them both? That would cost considerably more than the *ARRL Handbook*, containing vastly more information on both practice and theory. Only if you are one of those people who find the full-length handbooks overwhelming, then—and only then—can these two paperbacks be recommended to British readers.

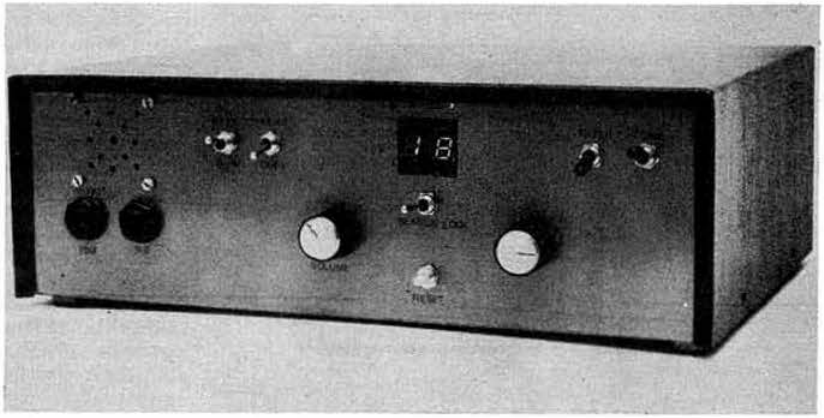
Design of Continuous and Digital Electronic Systems, by Gordon J. A. Bird. Published by McGraw-Hill (UK). 396 pages (hard covers). Price £20.

This new book by Gordon Bird, G3KOV, of EMI Electronics, is directed primarily at the professional engineer and engineering students. Nevertheless the author hopes and believes that it should prove useful and of interest to the *serious* hobbyist and radio amateur. The word "serious" does need to be emphasized, for not everyone is seeking a rigorous development of Fourier, Laplace and *z* transform theory, filter transfer functions and the like, or is in a position to set up computer simulations. But for those who want to understand such matters, this book provides notably clear explanations.

Chapters: Transform theory; system analysis; filter transfer functions; the transient response of filters; feedback and root locus; active filters; agc; pll; the *z* transform; sampled data systems; computer simulation; and digital filters. *G3VA*

The Xitex morse transceiver

—a user report



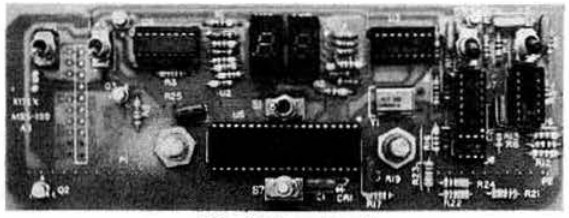
by T. F. WEATHERLEY, G3WDI*

Introduction

Some years ago a detailed, complicated and somewhat impractical design for a morse typewriter and its companion morse receiver-decoder was published. The editor, while agreeing that the design was ingenious and contained some interesting ideas, suggested that the drawback was that it required perfectly formed and spaced cw sent at a constant, predetermined speed. Since such cw was scarcely, if ever, found "in the field" it was unlikely that the device would work satisfactorily. This, then, was the problem, how to devise a machine that would cope with the different and almost instantaneous changes of character length and speed that occurred when the ordinary operator sent cw. The best solution, most operators agreed, was to learn the code and improve speed by constant use.

Now we live in the era of what the media call the "silicone chip" and radio amateur owners of microprocessor based hobby computers have written programs to file QSL cards, head the beam and even to send good cw. Work on decoding cw and displaying the result in plain text on a printer or a vdu was not far behind and in November 1977 *73 magazine* published an article entitled "Receive cw on your KIM-1," complete with program listing, to enable others to share the experience. Thus the dream of some was now available—at a cost, but it showed that the only requirement was a good interference-free cw signal from the receiver and a microprocessor.

At about the same time the Xitex Corporation of Dallas, Texas, began to advertise their "morse transceiver" in the American amateur radio press. The advertisements showed a signal from a receiver being fed into a black box from where it went to a teleprinter or vdu. They also showed a keyboard from the terminal feeding signals into the black box and thence to a transmitter. The claimed cw speeds were 1 to 150 words/min on receive or transmit. The unit was offered in two forms: the complete wired and tested box, ready to run, or a partial kit. The partial kit contained the printed boards and microprocessor components and cost US$95.



The front pc board

The kit

After some deliberation the author ordered a partial kit direct from Xitex, and it arrived in a registered parcel within three weeks. Inside the box was a comprehensive manual, two circuit boards and a small envelope containing some Molex pins and sockets, a 40-pin ic socket, a 40-pin ic and a 4MHz crystal. The parts list showed that to complete the project two voltage regulators, 14 diodes, 24 capacitors, 64 resistors, six miniature switches, two seven-segment l.e.ds, nine transistors, seven common ics, a 14-pin dil switch, a 12·6V CT transformer, two potentiometers and a box were required; none being too difficult to locate.

Circuit description

The manual is well presented and is divided into sections dealing with the theory, operational practice and assembly instructions. It is interesting to note that the manual is printed by computer, or so it would seem from the dot matrix type-face. There are a number of clear photographs and diagrams, and a very comprehensive section on fault finding giving voltages at almost every point.

The introduction explains that the transceiver is designed around a single dedicated microprocessor chip, the MK3870. This includes 4,028 bytes of program storage, 64 bytes of r.a.m., the central processing unit, plus clock generation and input/output logic. The manual also describes the copy algorithm and defines the five parameters used:

dot	Length of a short tone.
dash	Length of a long tone.
ics (inter-character space)	Pause between tones within a character
bcs (between-character space)	Pause between last tone of one character and first tone of next character within one word.
bws (between word space)	The pause between the last tone in the last character of one word and the first tone of the first character in the next word.

It was pointed out that some algorithms used to decode cw assume that a dot and an ics (and dash and bcs) are the same length, whereas in practice a dot might be as much as four times the length of an ics because of distortion introduced by the cw detector alone. The algorithm used maintains separate

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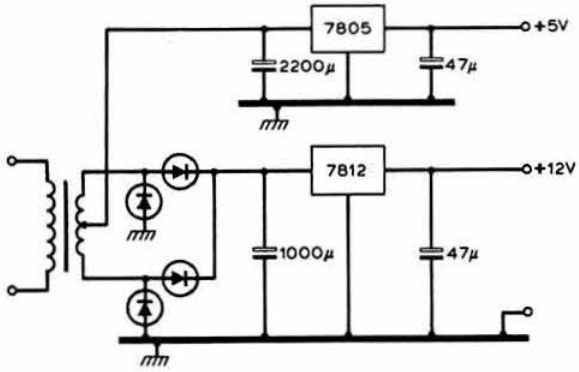


Fig 1. Power supply circuit

variables on a moving average for dots, dashes, ics and bcs, and these variables are used to determine the three decision points between dots, dashes, ics and bcs, and bcs and bws.

In the copy mode the l.e.d. display will indicate word/min of the signal being copied. This rate is recomputed and displayed after each new dot, dash, ics or bcs is received. The equation used is a function of all four variables but not the bws.

Construction

Construction was easy, since both boards were screen printed with component positions and the track was covered with that curious green paint which ensured that solder only flowed where it was meant to do so. The instructions were clear, detailed and fairly idiot proof, eg "install 470Ω (yel-vio-brn) resistor at location U1 (solder)". The only possible snags occurred when mounting the two potentiometers; American potentiometers must be slimmer than UK equivalents as the precut holes needed to be enlarged. The pins of the potentiometers were connected to the pcbs by short lengths of wire. Logic and impatience led to connecting pin 1 to hole 1 etc, but the photo referred to in the instructions clearly showed pin 1 to hole 3 etc. However, with these two minor distractions overcome the boards were soon finished.

There was provision on the board for the mounting of the transformer but as none available would fit, it was mounted nearby. The circuit for the 5V stabilized supply looked odd but it worked, and subsequently G3NTV (my technical adviser) explained the configuration to me (Fig 1). As the boards were assembled it became clear that they contained a number of discrete circuits around the main microprocessor chip concerned with the interface with the outside world; this can be seen in Fig 2.

In use

After the boards had been checked visually and switched on, the l.e.d. readout lit up, which was an encouraging sign. CW from the receiver was fed in and the unit was switched to sidetone. Re-created morse characters were heard from the sidetone oscillator and a reasonable number of word/min was displayed on the readout. The output from the unit was deemed to be Baudot, and an opto-isolated output was provided, together with wiring diagrams for simplex and duplex 60mA loops. However, a ttl output was required for the author's G3PLX vdu. The manual indicated where this might be available, and this output was connected to the input of the vdu. Provision is made within the unit to set the Baud rate and the line length and these were set to levels suitable for the vdu.

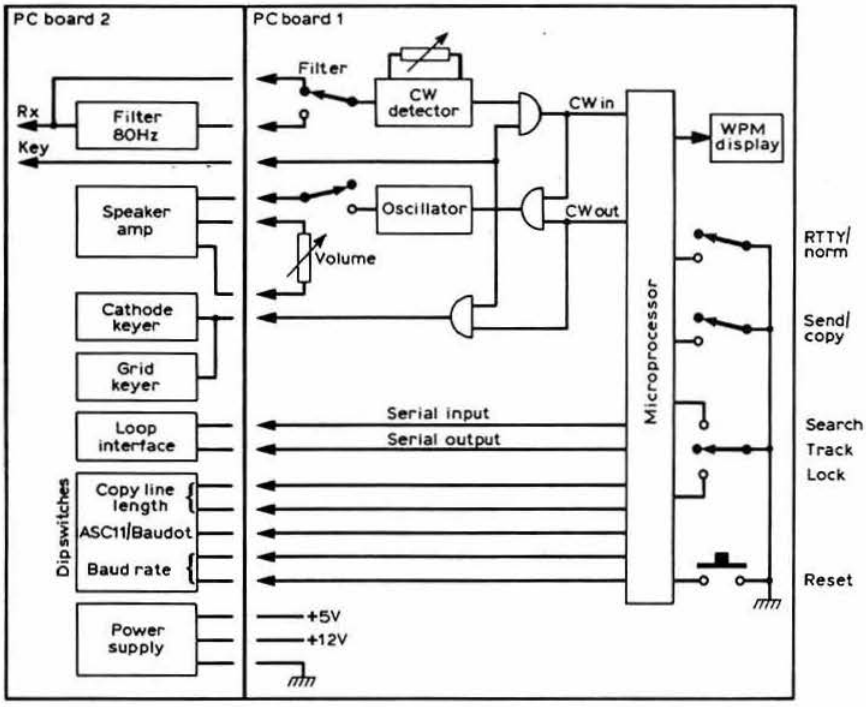


Fig 2. Block diagram of the transceiver

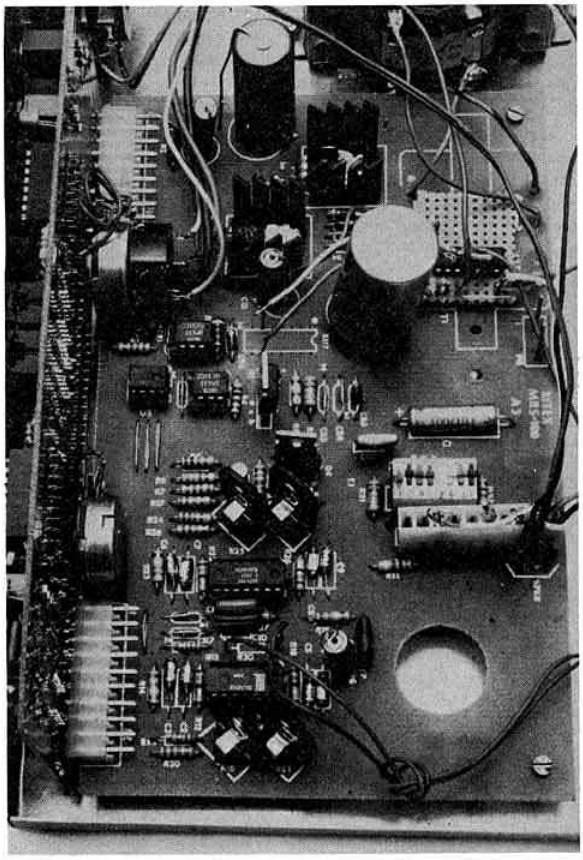
All were interconnected and cw put in but nothing was displayed on the vdu screen. Investigation with a 'scope showed that there was a signal coming out of the unit and it looked like Baudot. A phone call to G3PLX raised the suggestion that the signal might be inverted and accordingly a 7400 was connected to a piece of dil board and stuck on a suitable part of the pcb with a double-sided sticker. The output was routed through a gate and then offered to the vdu and the screen showed that the cw was in fact a DK working in German at 20–25 words/min.

The receiver at G3WDI is a Racal RA17, and this sorts out the cw signals very well. To assist in this there is an active filter in the unit based on four 741s which gives an effective bandwidth of 80Hz when switched in. This is very effective, but the unit is prone to false triggering from interfering signals which pop up as extra "E"s on the display.

There are three modes when copying signals: search, where the unit continually searches from 1–150 words/min; track, where the unit searches from +75 to −40 of the average words/min; and lock position, where the words/min is locked at the optimum value. In practice the search mode works best on hand-sent cw, while lock is best for machine-sent code.

The photograph of the vdu screen shows both sides of a live contact on 3·5MHz. Both senders are working at 27–35 words/min and using break-in and it can be seen that one tends to run his words together while the other does not. Some of the over is lost because the difference in received signal strengths meant that the receiver had to be adjusted. Nevertheless it shows the potential of the unit. If anyone recognizes their QSO the author would be interested to learn QTHs and sending conditions.

Both sides of a QSO displayed on a vdu



The base pcb with the front board mounted at left

Transmitting

Reception is only half the story. The unit is also able to transmit cw at any speed from 0 to 150 words/min with perfect spacing. Fig 2 shows that provision is made for cathode or grid keying. Learning from the receive interface, the serial rtty output from the G3PLX vdu was inverted before interfacing with the unit. At the start of transmission the words/min selected is entered from the keyboard. A CR entered next puts the unit in "auto-space" mode, but it will not transmit until the space key is pressed at the end of a word. The word characters are stored in a 32-character fifo store. The display shows how many spaces are left in the buffer at any one time with the advantage that any hesitation when typing a word is not transmitted as a space. The transmitted cw is heard via the sidetone oscillator. Reports of the on-air signal quality have been excellent, and the unit has distinct possibilities for providing the high speed morse required for meteor scatter etc.

Conclusion

The Xitex morse transceiver is reasonably priced and easy to construct. It performs well under average hf-band conditions and very well on vhf where cw is scarce. After a short time the authors' receive words/min increased simply because the display is one character behind the cw heard in the monitor speaker, and he unconsciously translated. It has certainly added a new dimension to his operating and will make telemetry from the Oscars easy to translate.

Acknowledgements

The author would like to express his thanks to G3NTV, G3PLX and G2UK for their assistance during the building and testing of this unit, and to G8JBD for processing the photographs. □

TWENTY-ONE YEARS OF TE

An account of observations and experiments in transequatorial radio propagation conducted between 1957 and 1979 using frequencies from 28 to 432MHz

(PART 1)

by R. G. CRACKNELL, ZE2JV ex-G2AHU*, and R. A. WHITING, 5B4WR ex-G3UYO

Summary

The transequatorial propagation of 144MHz radio signals between Salisbury and Limassol during the period April 1978 to May 1979 is examined in the light of earlier te observations and experiments. Important clues to determining the supporting mechanism are provided by detailed reception reports of beacon transmissions in the 28, 50, 144 and 432MHz amateur bands, and by time delay measurements, observations of the variable angles of arrival and examination of the flutter fading and frequency spreading characteristics of the received signals.

Propagation is shown to occur at frequencies at least as high as 432MHz over distances of 5,000–8,000km across the equator in years of high sunspot activity. The reliability of propagation at 144MHz is considerable, especially in the appropriate seasons which, over Africa, are displaced somewhat from the equinoxes. Evidence is produced to confirm that propagation does indeed take place via the ionosphere and that, although the mechanism is complex, no phenomena that cannot be explained by changes in the night-time tropical ionosphere were observed.

The background

In September 1957, ZC4WR joined the amateur radio net which with ZE2JV was discovering the presence of a night-time propagation path of extraordinary reliability between Salisbury, in what was then known as Southern Rhodesia, and Limassol, on the island of Cyprus, on frequencies of 28, 50 and 70MHz [1]. The renewal of an old friendship led to the systematic recording of ZE2JV's 50MHz automatic transmissions throughout the International Geophysical Year (IGY), January 1957–December 1958. The results attracted considerable interest and led to an internationally financed project [2] which demonstrated that, even as late in the sunspot cycle as 1961–2, frequencies up to 90MHz were usable.

The authors then prepared for the following sunspot minimum during the International Quiet Sun Year (IQSY) when beacons were run on 29 and 50MHz. Propagation at 50MHz still took place but with considerably reduced regularity, although at 29MHz the reduction was less apparent [3]. ZC4WR had a spell on St Helena, where he set up a ZD7WR beacon on 29MHz, while ZE2JV, working with ZE3JJ and other members of the Radio Society of Rhodesia, set up beacons on 1·8, 50 and 70MHz. After a couple of years in England, Roland returned to Cyprus as 5B4WR, and contacts with ZE2JV were renewed.

In 1978, as a result of reports of 144MHz contacts by te in South America [4] and the reception of the 145·9MHz beacon of the Oscar 7 satellite when it was well below the southern radio horizon from Athens and Cyprus, the authors were prompted to undertake a systematic investigation of the Limassol–Salisbury circuit at 144MHz. Costas Fimeralis, SV1DH, and George Vernardakis, SV1AB, both in Athens, joined in the tests. The first to hear a 144MHz signal out of Africa south of the equator was Nick Kyriakis, 5B4AZ, in Limassol, on 8 April 1978 from 1726 to 1810gmt, and he alerted 5B4WR who also heard the automatic transmission from ZE2JV. Signals were again heard on 9 April, and on 10 April the first 144MHz QSO between 5B4WR and ZE2JV took place. On 12 April ZE2JV worked SV1AB, and this was followed by QSOs with SV1DH and SV1CS a few days later.

The monitoring of ZE2JV's automatic transmissions on 144MHz had commenced in Cyprus on 21 March 1978. The frequency of transmission had been accurately determined and receivers at 5B4WR and 5B4AZ had been carefully set on the frequency, waiting for the signal to appear. In retrospect it is not surprising that nothing was heard for over two weeks, for we had forgotten or discounted the equinoctial drop-out of maximum usable frequency (muf), a phenomenon well recorded in muf curves published 20 years ago[1].

Later in 1978 the group was joined by ZS6LN and ZS6PW. Their contribution was particularly welcomed because the South Africans still had use of the 50MHz band. Dr Fred Anderson, ZS6PW, was a long-standing member of the te group, and worked with the authors as ZS1LA from Worcester in the Cape Province of South Africa during and after the IGY. Test transmissions on a regular basis were started by both stations, and the Cyprus VHF Group activated 5B4CY as a 50MHz beacon in September 1978.

Inspired by ZS6PW, a group of Pretoria amateurs, calling themselves the Tessa group, combined their efforts to establish a 144MHz beacon station at the QTH of Dave Larson, ZS6DN. It was first heard in Athens in February 1979. Within a few days ZS6DN had QSOs with SV1DH and SV1AB; at the time of writing the second was still standing as the world record for a contact via the ionosphere on 144MHz. However, on 30 and 31 March 1979 I4EAT heard ZS3B, and on 31 March ZS3B also heard I4EAT. No fully-intelligible QSO was completed but signals were positively identified both ways and recorded over a distance of more than 8,000km. (The strength of the signal recorded by I4EAT, as heard played back over the air on 28MHz, would seem to suggest that even this is not the limit and that Britain or Scandinavia to the Cape of Good Hope should be the ultimate target for amateurs on 144MHz.)

Transmissions on 432MHz commenced from ZE2JV on 18 March 1979, and two days later the signal was copied by both SV1DH and SV1AB from 1816 to 1830gmt. The signal was described as being rougher and spreading in frequency more than the 144MHz signal being received simultaneously, but was, according to SV1AB, "definitely QSA5". Nothing more

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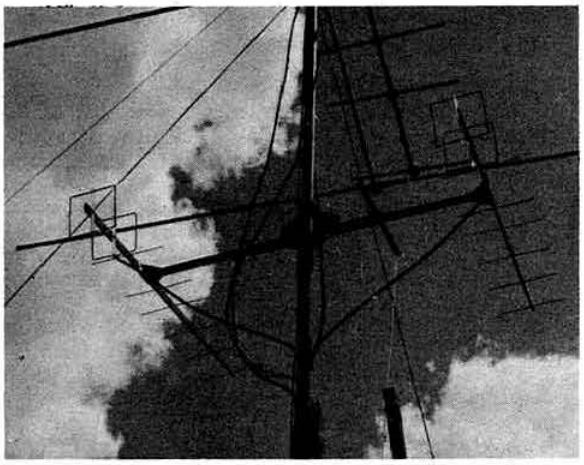


The 432MHz quagi beam used by ZE2JV for the first successful te tests. Parts of the 3-element 28MHz and the 11-element 144MHz Yagi beams can be seen higher up the mast (*Photo:* ZE3JJ)

was heard during the equinoctial drop-out period from 22 March to 8 April. The Cyprus group equipped themselves for listening on 432MHz, and on 13 May the signal was heard and positively identified by 5B4WR.

There were several other minor openings to Greece and Cyprus, and there can be no doubt that te QSOs on 432MHz are possible.

While working QSOs is the main aim of all amateur radio endeavour, over the years propagation phenomena have become the motivation for the numerous QSOs, tests and measurements which the authors have conducted. In previous articles they have resisted the temptation of advancing any novel theory to explain the phenomena which they have been privileged to witness and identify. However, against the weight of a considerable body of academic opinion, the authors established beyond all reasonable doubt, in 1959, that trans-equatorial propagation (tep) does take place via the F-regions of the ionosphere. They have consistently maintained that the propagation phenomena are directly related to changes in these regions after dark, and that only a thorough understanding of these changes can lead to an understanding of tep, although at the same time a study of tep can give important clues regarding the morphology of the ionosphere which supports it.

Methods employed

Automatic transmissions

The basic method for the investigations has been the provision of a consistent transmission schedule with monitoring at the receiving end. Strictly speaking, many of the transmissions should not be termed beacon transmissions but would be more correctly described as test or experimental transmissions, since they are operated on "as required" schedules, often use directional antennas, carry varied information, and can be interrupted in order to work QSOs.

The authors have provided some true beacons, and among these are the present 5B4CY beacons run by the Cyprus Amateur Radio Society VHF Group on 28, 50 and 144MHz; the earlier ZC4WR and ZD7WR beacons on 29MHz; the ZE1AZC beacon which ran for nearly six years on 50MHz, ZE1AZD on 1·8MHz, ZE1AZB on 70MHz and the ZE2TEP transmitters [2] which ran on five frequencies between 30 and 90MHz.

Continuous monitoring using pen, Rustrak and sampling tape recorders was usually employed with the true beacons. However, because of low signal strengths and the number of separate transmissions to be monitored, the Athens and Cyprus monitoring stations on 144 and 432MHz preferred to listen directly from their receivers: automatic recording provides interesting records of signal strength variations but is no match for the human ear when receiving weak signals.

Transmissions from ZE2JV on 28·331 (now changed to 29·226), 144·160 and 432·480MHz, and from ZS6DN on 28·315, 144·129 and 432·460MHz are test transmissions, although they are operated on widely publicised schedules and are listened for by a growing number of enthusiasts in southern Europe.

Time-delay measurements

Clearly an important clue to solving the mystery of any anomalous propagation is the time taken for the signal to travel from transmitter to receiver. In 1960 the authors published the results obtained by transmitting pulses, rebroadcasting them from the receiving station and photographing the outgoing and returning pulses together with a timing scale from a cro [5]. The results obtained are reproduced in Table 1. For practical reasons arising from the nature of the 144MHz signals, it was decided to take the 1960 measurements as valid for the time being and to do comparative time-delay measurements by pulsing ZE2JV's transmissions on 28 and 144MHz simultaneously and to use simultaneous keying of the 5B4CY transmissions on 28 and 50MHz. At first stereo recording was attempted but errors were found to result, so the authors resorted to recording on a single tape with beat notes well separated in frequency for later analysis by ZS6PW on a sonograph.

More sophisticated time-delay tests are being planned between Pretoria and Athens, where universal time standards can be obtained, but the results of these tests will not be available for some time to come.

Angles of arrival

A further important clue should be provided by determining the angles of arrival in the horizontal and vertical planes, but doing this with any real degree of accuracy is much more difficult than is often realized. The long Yagi has a relatively broad front lobe, and the sharper null in the broadside position is not usable on weak signals. Nevertheless the rotatable Yagi is a useful, if rather crude, tool, and valuable for comparative tests in the horizontal plane. In the vertical plane tiltable Yagis provide even more questionable results due to ground effects and reflections from buildings and power lines, but these impediments seldom change from day to day and variations can be attributed to variations in the angles of arrival of signals with a reasonable degree of confidence.

Beam rotation tests soon reveal that in optimum locations for tep, such as Athens, Limassol and Salisbury, beams tend to lose their directivity in a random fashion. In order to investigate this phenomenon, in 1958-9 ZE2JV transmitted a plain carrier on 50MHz from a four-element Yagi that was pointed first north, then east, south and west, and the received signal strength in each position was recorded in Limassol by ZC4WR. The results varied from a "normal" (say, 7-1-3-1) to a complete loss of directivity (say, 7-7-7-7). Tests were continued for over a year. Correlations were then sought with the degree of flutter fading, the incidence of tropical storms, solar

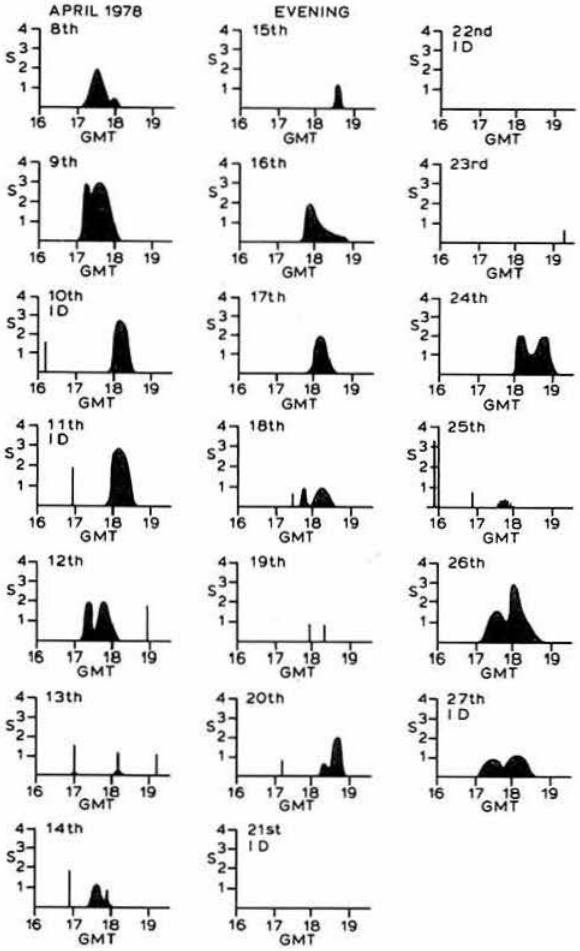


Fig 1. Reception of ZE2JV, Salisbury, on 144·118MHz in Limassol by 5B4WR

disturbances, and the results of a meteor scatter count experiment that was being run concurrently. All of these proved to be only randomly related to loss of beam directivity, which was, however, found to correlate strongly with the spread of te signals southward towards the Cape of Good Hope.

More recent experiments have been directed at determining the vertical angle of arrival of 144MHz te signals. SV1AB experimented with a tiltable eight-element Yagi, and at times found the optimum angle with his beam to be at 20°. 5B4WR compared results on his 12-element Yagi, which had excellent low-angle visibility to the south across the Mediterranean, with those on a vertical $3\lambda/2$ in-phase antenna, and often found that the expected extra gain of the Yagi was not realized. Further, 5B4AZ often received slightly stronger signals than 5B4WR, although his beam was only 2m above a reinforced concrete roof and the direct view to the south was obscured by a large water tank.

Although the results were inconsistent and the angle of arrival seemed to vary randomly in the same manner as beam directivity, ZE2JV elevated the antenna used for the first successful 432MHz tests at an angle of 15°. Whether or not this was an optimum angle is unknown, as the antenna shown in the photograph was deliberately designed to have a relatively broad vertical angle of radiation.

Examination of the fading patterns

One of the most striking characteristics of tep is the often observed presence of flutter fading which gives the received signal a quality similar to that of signals reflected from the aurora. It is, however, incorrect to assume that te signals always carry flutter fading. Such fading can sometimes be heard on signals as low in frequency as 6MHz. Similar characteristics occur as scintillations on radio stars and affect signals from satellites if the signals pass through an affected area of the ionosphere.

Earlier efforts were directed unsuccessfully at relating the degree of flutter fading to the observed signal strength, the mode of propagation and, as already mentioned, the loss of beam directivity and the other phenomena observed simultaneously.

Fading patterns were recorded for analysis at Stanford University and photographed from cro displays of received carriers under various conditions; a number of examples of these

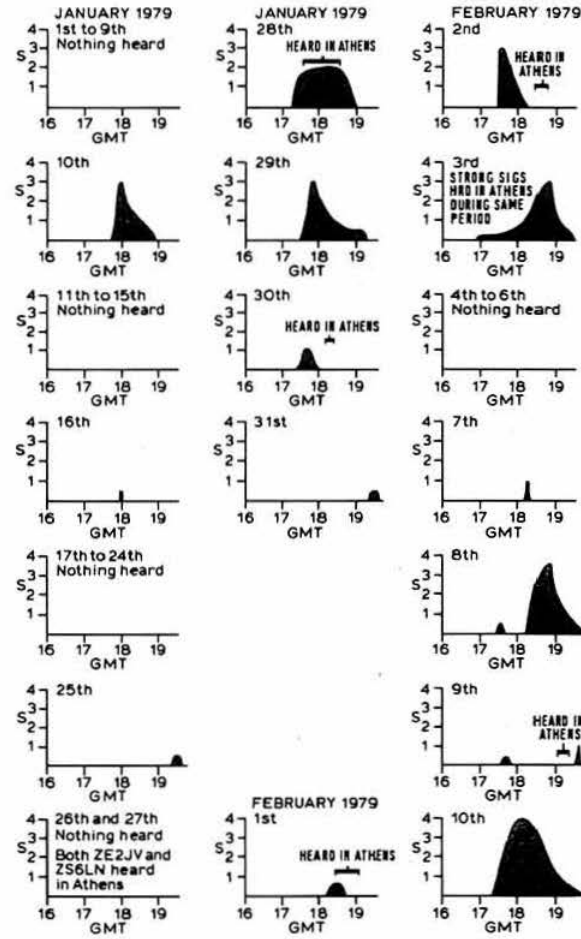


Fig 2. Reception of ZE2JV on 144·16MHz by 5B4WR

appear in [1]. In this article the authors have concentrated upon the analysis of simultaneously transmitted and received signals on 28 and 144MHz, and on 28 and 50MHz, using the same techniques as for the time-delay measurements.

With the use of higher frequencies in the 144 and 432MHz bands, the associated phenomenon of frequency spreading becomes more apparent. Doppler shift, resulting in the returned signal being lower in frequency than the outgoing signal received simultaneously, has been observed on backscatter signals both from ZE2JV and from the 5B4CY 144MHz beacon. It has been suspected on te signals but not proven. This is an obvious experiment for the future but will require frequency stabilities better than those of the crystal oscillators used in amateur equipment.

Apparatus

The transmitter power required for successful tests at 144MHz was found to be of the order of 100W rf output into a well-matched antenna system. Below this level the apparent duration of an opening was substantially reduced, although under the best of conditions very-low-power transmissions could be heard. ZE2JV's test transmissions were therefore operated at approximately 200W, except in off-peak listening periods when the power was reduced to 40W.

The antennas employed by 5B4WR, 5B4AZ, SV1DH, SV1AB and ZE2JV were all single long Yagis using from 11 to 16 elements for the 144MHz tests. The choice was fortuitous, as propagation takes place over a broad front and not necessarily in a direct line from transmitter to receiver, with a vertical angle often higher than previously anticipated, so that stations with big arrays and stacked beams may well be at a disadvantage on occasions.

The Cyprus, Athens and ZE2JV terminals all used solid-state converters, except that for the early QSOs ZE2JV used a tube converter with a 6CW4 nuvistor preamplifier. As with lower frequencies, when ionospheric openings occur there is a pronounced rise in received noise, and extreme measures to reduce the noise figure of converters to below about 2dB would not appear to be worthwhile. Similarly on cw, due to the frequency spreading often experienced on 144 and 432MHz the use of filters more selective than about 2kHz may not improve reception, and the usual ssb crystal filters in the i.f. were found to be about optimum for te work.

On 432MHz ZE2JV transmitted with a power of 40W measured at the antenna, which consisted of two colinear eight-element quagis. The antenna was only about 5m above ground, with the 28 and 144MHz beams higher up the mast. In the photograph the simple arrangement for tilting the quagi array can be seen, and further experiments with it are contemplated.

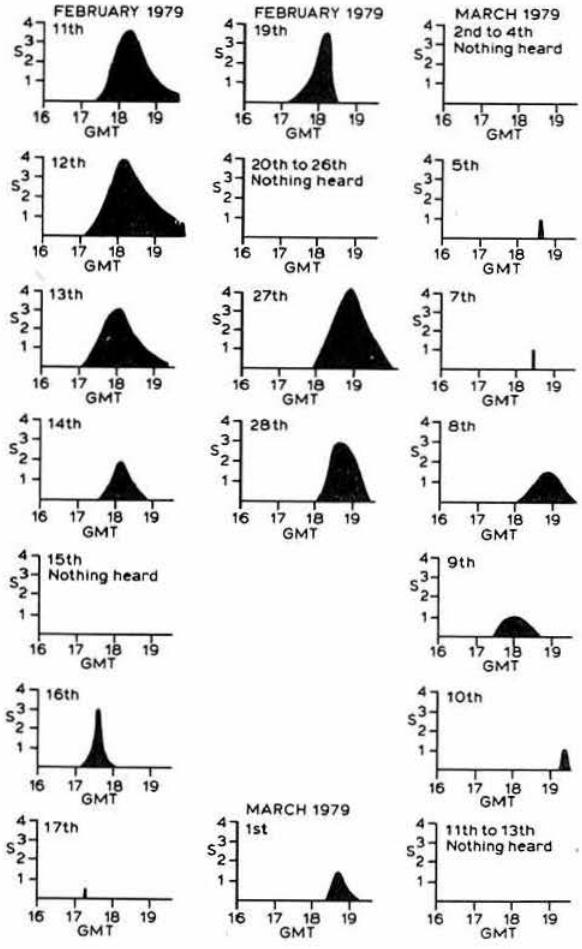


Fig 3. Reception of ZE2JV on 144·16MHz by 5B4WR

Results obtained

The results of a year's patient monitoring by 5B4WR and 5B4AZ have been drawn up on a day by day basis and a selection of these is illustrated in Figs 1–4, showing both signal strength and the duration of the openings. From these it can be seen that openings sometimes lasted for up to 2h or even more (11, 12 February 1979, for example) centred around 1800gmt (8pm local time). The high-power (200W) transmission was normally operated from 1730 to 1930gmt. However, the restricted hours of high-power transmission and of listening seem to have had little effect, except on 11, 12, 13 February 1979 where the actual time of closure could be interpolated from the graphs.

In Fig 5 these results are summarized and plotted against solar rotation periods. Some evidence can be drawn from the diagram to suggest that good periods of openings depend on solar activity and may be repeated on the next solar rotation, but the evidence is far from conclusive. Considerable effort has similarly been expended in trying to correlate openings with geo-magnetic activity and solar flux. Results were promising at first, but were later found to be applicable in only about 50 per cent of cases, and then only during the period immediately before a magnetic storm. In general it may be said that a high solar flux and low magnetic index are usually prerequisite for 144MHz openings. It is also evident that the detrimental effects of magnetic storms are more noticeable on 144 than on 50MHz, while at 28MHz propagation between Limassol and Salisbury was rarely interrupted by magnetic or ionospheric disturbances. The beneficial effect of solar activity was more noticeable in off-peak seasons and in periods of low solar flux, when an increase in ionization may make propagation at 144MHz possible, but in the peak seasons only the disruptive effect of storms was apparent.

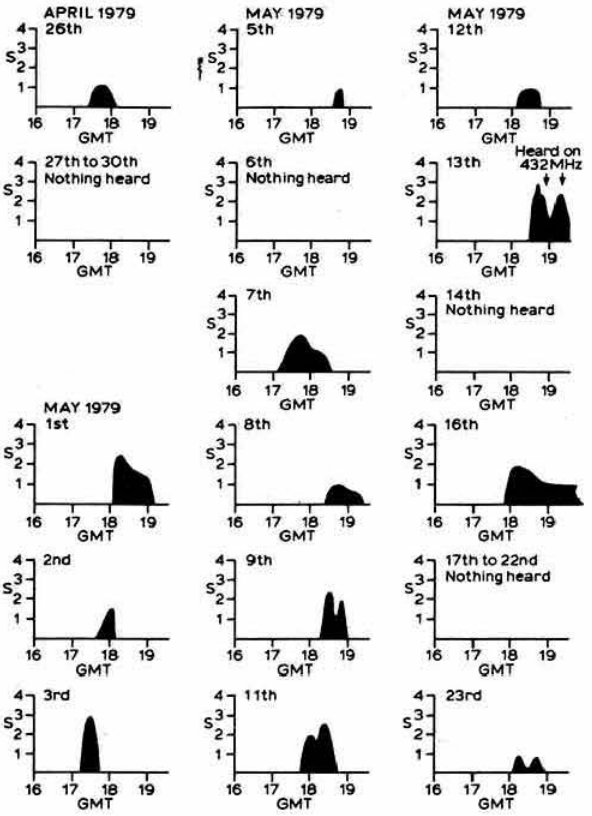


Fig 4. Reception of ZE2JV on 144·16MHz by 5B4WR

Defining the peak seasons as the equinoxes and the off-peak seasons as the solstices was found to be an over-simplification. The June–July solstice was the longer and more pronounced off-peak season, and the best conditions occurred during the period lasting from mid-February to early May, and for a shorter period in October–November.

In spite of the fact that openings at 50 and 144MHz did not always take place simultaneously, and that 144MHz propagation took place on several occasions when 50MHz was not open, the evidence gathered tends to point to the same type of propagation being involved at 28, 50 and 144MHz, and probably at 432MHz as well. Evidence leading in this direction includes the following:

Geographical zones

The zones where te signals at 28 and 50MHz come down with greatest reliability and signal strength are identical to the zones of maximum reliability at 144MHz. Reference to the map published in *QST* (December 1959, p12) and the *ARRL VHF Manual* (1st edn, p21), and reproduced here as Fig 6, will show that Cyprus and Athens are right in the middle of the main zone to the north as seen from Salisbury. Further, the most westerly report of reception of ZE2JV's 144MHz signals was from the Spanish island of Ibiza, and the most easterly from Israel, giving a 144MHz zone fitting very neatly in the middle of the 50MHz zone as drawn 20 years ago. The same snug fit applies to the zone as seen from Athens and Limassol.

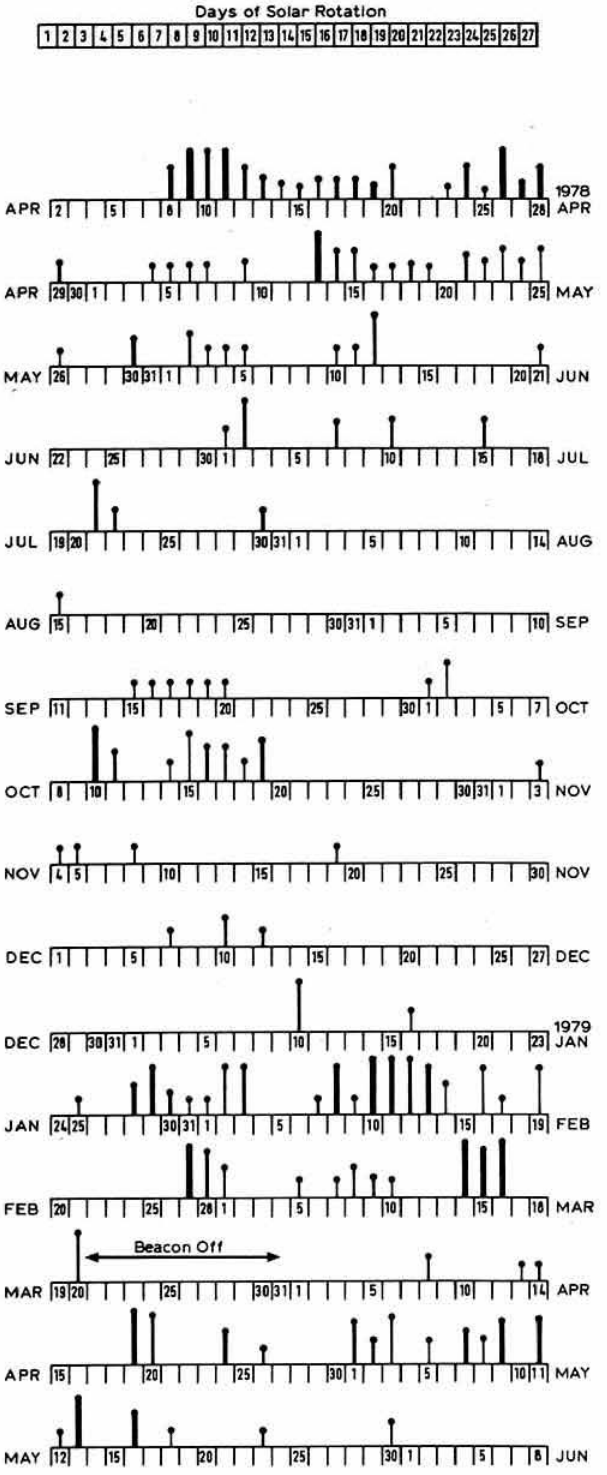


Fig 5. Reception of ZE2JV on 144·16MHz by 5B4WR during early evening (1630–1930gmt) plotted against solar rotation periods. Line thickness indicates duration; line height indicates intensity of the openings

Seasonal variations

The seasons for the best and the worst propagation conditions show a considerable measure of agreement at 28, 50 and 144MHz. There is the anomaly of the equinoctial drop-out which affects all signals above 50MHz and it is interesting to note that this may be a peculiarity of the Europe–Africa te circuit, probably caused by the southern African magnetic anomaly which gives the whole of the area from the Zambesi to the Vaal rivers high magnetic dip angles. (Salisbury and Pretoria have dip angles of something like 57°.) The ionosphere is strongly influenced by the earth's magnetic field, and symmetry about the magnetic equator appears to be a prerequisite for tep to take place.

Curves showing the monthly variations in reliability for the period September 1978–August 1979 are illustrated in Fig 7. The similarity of the curves for the British 28MHz beacon GB3SX and the Cyprus 5B4CY 50MHz beacon is striking. The effect of the equinoctial drop-out at 144MHz is illustrated, and would be even more pronounced if periods of less than a month were taken. Figures for the Japan–Australia circuit, although not strictly comparable as the January–June figures are for 1978, not 1979 as in the other curves, show no equinoctial drop-out effect. If the effect of the drop-out is removed from the 144MHz Cyprus–Salisbury curve, the correspondence between 28, 50 and 14MHz is marked.

It is interesting that every month of the year showed at least one opening on 144MHz between Salisbury and Limassol. The lowest was in August 1978, with only one opening of 10min on the 15th, but August 1979 showed a considerable improvement (10 openings).

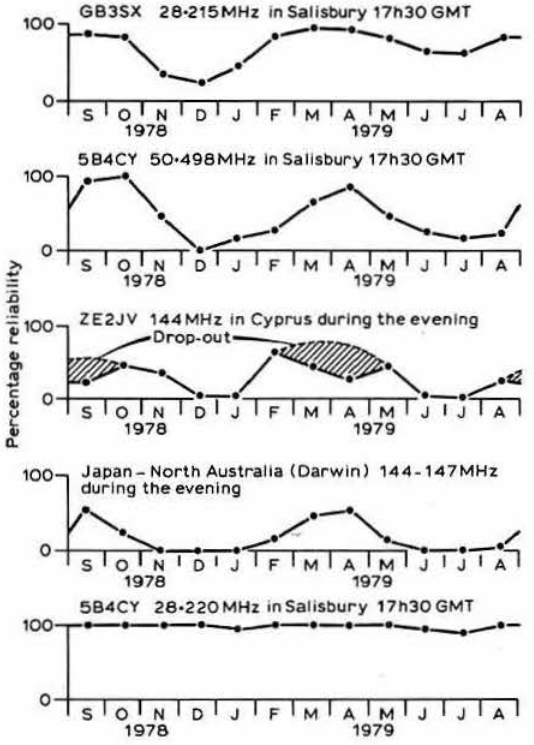


Fig 7. Seasonal variations in reliability of various te circuits. The effect of the equinoxial drop-out is evident in the Salisbury–Cyprus 144MHz results

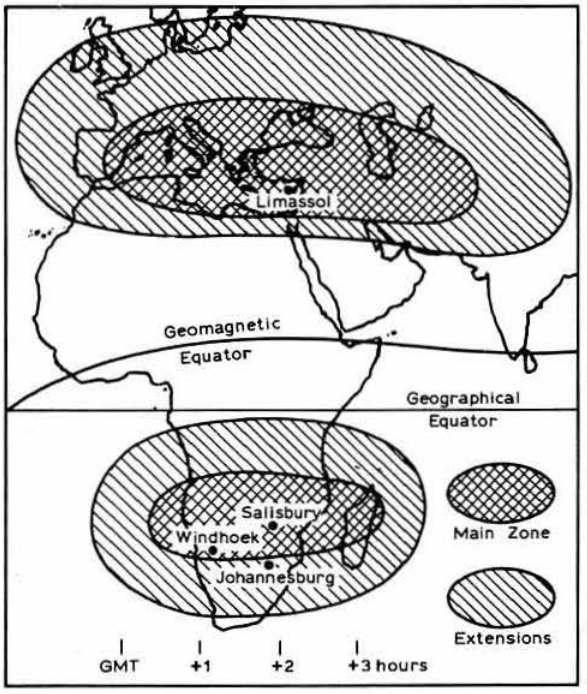


Fig 6. The te zones at 50MHz as seen from Limassol in the north and Salisbury in the south (source: *ARRL VHF Manual;* 1965). At 144MHz the respective zones fit neatly inside the main zones at 50MHz

Time-delay measurements

The 1959 time-delay experiments summarized in Table 1 showed a slightly longer time delay than could be expected from the proposed ray geometry (about 4ms longer for the round trip from Salisbury to Cyprus and back). These results obtained 20 years ago lacked the precision obtainable at the present time. However, pictures taken during the afternoons occasionally showed shorter delays which corresponded closely with the expected delay for two-hop F-layer propagation, and the stronger evening tep signals were clearly taking about 10 per cent longer. This extra time has to be taken up either by an extra ray path distance of some 600km each way, or in the propagation mechanism itself.

Fig 8 shows a sonograph analysis of the simultaneous recording of the two 5B4CY beacon transmissions on 28 and 50MHz received by ZS6PW in Pretoria. In his note accompanying this print, Dr Anderson stated:

". . . I include sonograms of simultaneous recordings on 6 and 10. You will note that there is no extra delay great enough for my system of analysis to show. If any, it is probably less than 2ms."

In Fig 9 the callsign and pulse train transmitted simultaneously on 28 and 144MHz from ZE2JV and recorded by SV1AB in Athens are displayed. ZS6PW's comment on this sonogram was:

"Note many examples of coinciding 10 and 2 metre pulses and no positive indication of non-coinciding pulses."

Table 1. Results of time-delay experiments conducted in 1958–9 published in 1960

Circuit	Time local	Great circle distance (km)	Time delay (return) (millisecs)	Elongation at fade out (millisecs)	Suggested mode of propagation
Salisbury—Limassol (50, 29·5 and 28MHz)	1800–1900	5,792	40·5	1·0	$2F^2$
	1830–2000		44·5	5·0	F-type te
	2100–2200		45–55	Diffused	Pure te
Salisbury—Worcester (SA) (28 and 29·5MHz)	1100–1700	2,144	15·3	0·5	$1F^2$
Worcester—Limassol (28 and 29·5MHz)	1830–1930	7,680	57·5	1·5	F-type te

Fig 9(a) shows an enlarged version of simultaneous 144 and 28MHz pulsing made on the same evening (2 February 1979).

Here it must be recorded that not all the 28 and 144MHz recordings provided an unequivocal picture. Some of those from Cyprus seem to suggest varying delays, but even with these the authors can find no evidence that, on average, there is any greater delay on 144 than on 28MHz. Neither does another recording made by SV1DH on 13 February, reproduced in Fig 10 with a part enlargement of pulses in Fig 10(a), show any significant difference in delay time. Difficult though these measurements have proved to be, the tentative conclusion is that within the accuracy of the method employed the delay time over the te circuit remains independent of frequency from 28 to 144MHz.

Patterns of fading

It is evident from the sonograms in Figs 8 to 10 that signals received on different frequencies simultaneously from the same location may differ in their character. From the recording illustrated in Fig 11 the more rapid fading on 50MHz is clearly apparent and its chopped nature is evident. Slow chopping on 28 or 50MHz can, at times, make it almost impossible to read morse code from a cw transmitter. On 144MHz the chopping rate is usually much faster so that the signal sounds rough and cw appears with a raw ac note, while frequency spreading has made the received signal as wide as 2kHz or even more. However, it is important to note than these effects are not consistent and the character of the received signals may vary considerably from day to day and hour to hour in a somewhat random manner. On SV1AB's recording illustrated in Fig 9 it is interesting to notice very similar signals on 28 and 144MHz, while that from SV1DH in Fig 10 shows an F-type signal on 28MHz and frequency spreading of up to 2kHz on the 144MHz signal. Very rarely has a cleaner signal appeared on the higher frequency, although a rapidly chopped signal on 144MHz may be much easier to read on cw than a slower chopped signal on 50 or 28MHz.

Under the best of conditions on 144MHz ssb is just intelligible, and narrow-band fm has been used successfully over other te circuits. Yet, under poor conditions the spread and flutter is so wide and rapid that no beat note can be obtained with the received signal, which appears merely as a change in the background noise.

In 1960 the authors claimed to have isolated three distinct modes of propagation classified by time delays and fading patterns. These were two-hop F-layer (which in 1958, with sunspot numbers in the region of 200, was quite common during the day), F-type te, and pure te (see Table 1). Whether or not they were right to separate F-type te and pure te into separate modes is debatable. The difference in time delay was small and not significant in terms of the probability of error in the system of measurement. However, if the classification is made on the basis of signal strength and fading pattern, then the division is apparently an obvious one.

Fig 8. The letters 5B of 5B4CY as received by ZS6PW at 1845gmt on 30 January 1979 simultaneously on 50·498 and 28·220MHz. Note that the 50MHz pulse is 2ms behind the 28MHz pulse, which is a function of the keyer

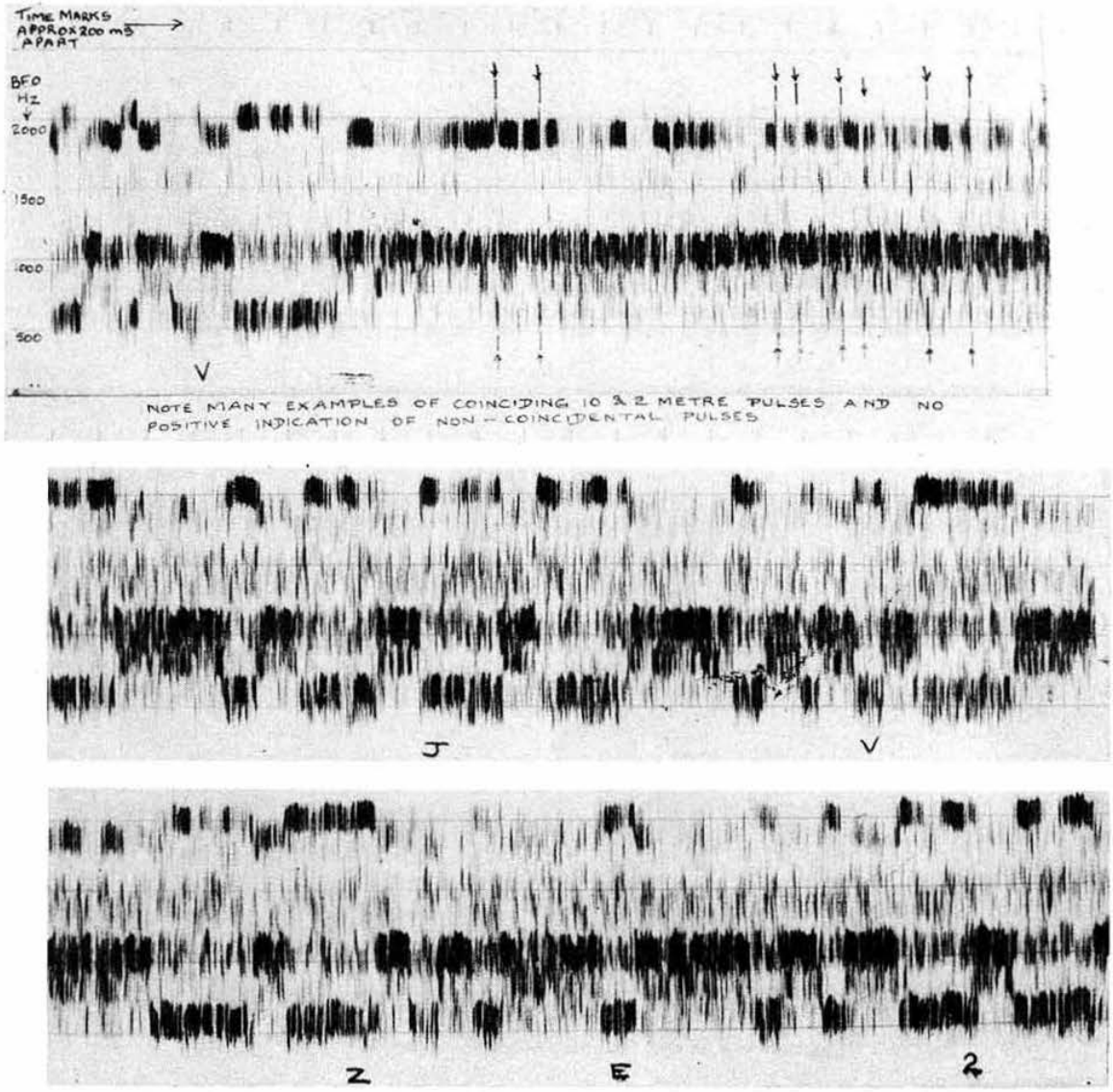
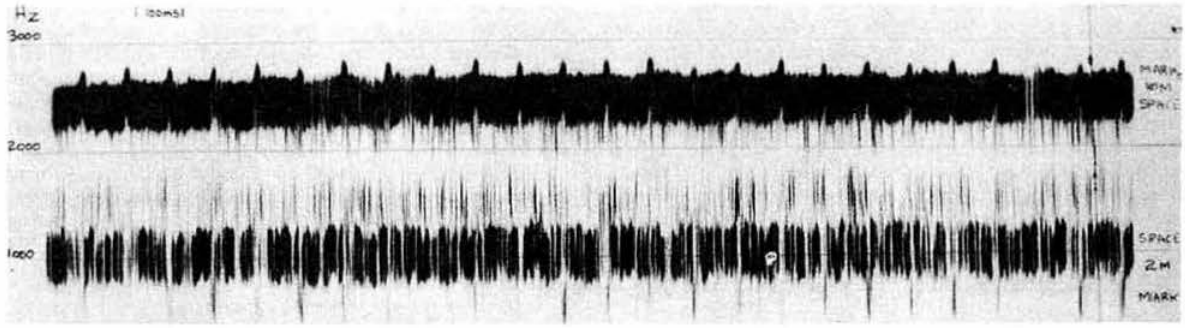


Fig 9. (a) (top) ZE2JV recorded by SV1AB at 1805gmt on 2 February 1979 from simultaneous 144 and 28MHz transmissions. (b) (below) ZE2JV pulsing recorded by SV1AB from simultaneous 144 and 28MHz transmissions on 2 February 1979



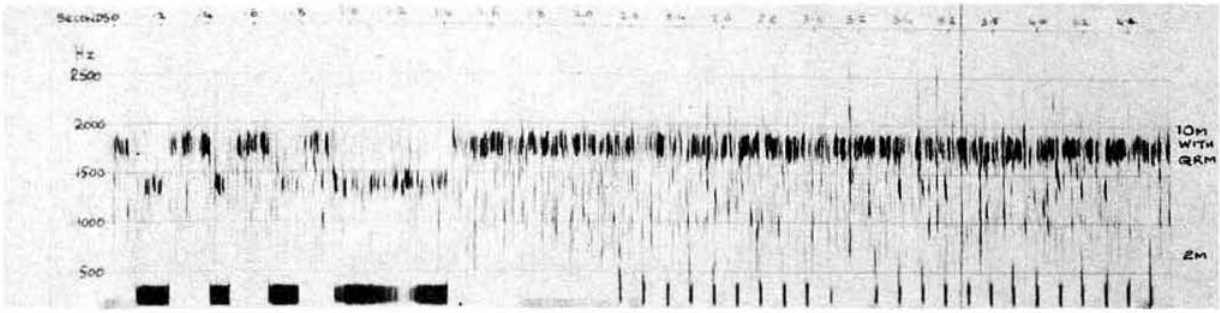
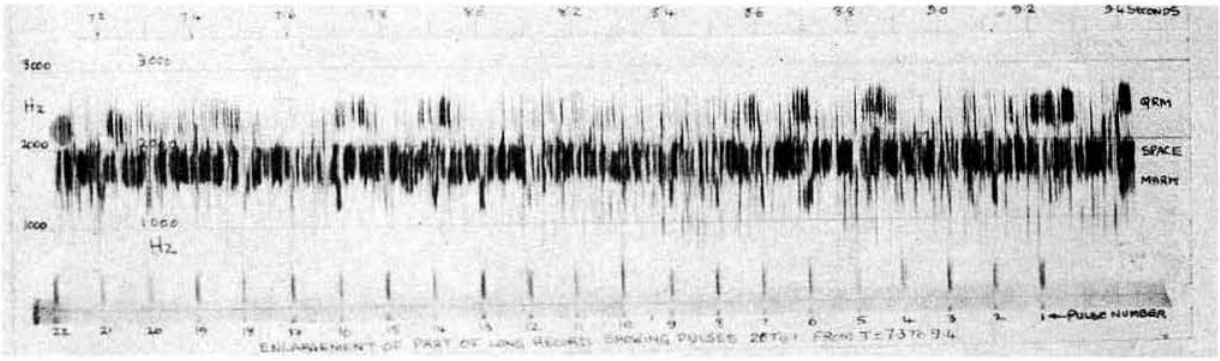


Fig 10. (a) (top) Simultaneous recordings of ZE2JV 28 and 144MHz beacons as received by SV1IDH in Athens at 1755gmt on 13 February 1979. (b) (below) Enlargement of part of the recording showing coinciding pulses on 28 and 144MHz



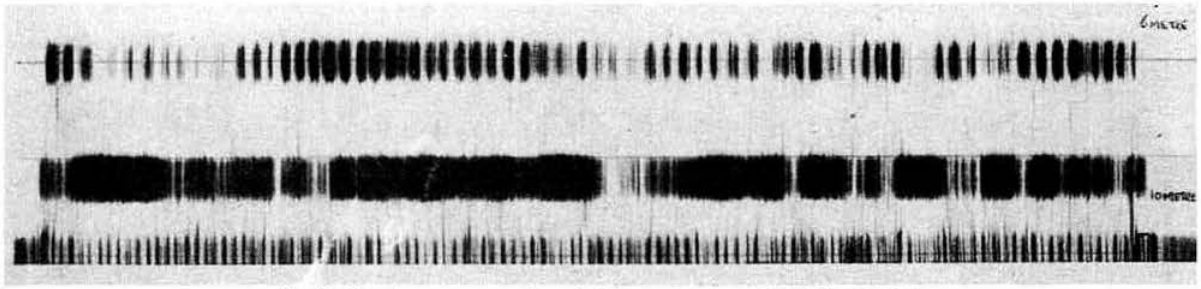


Fig 11. Simultaneous reception of plain carriers from 5B4CY by ZS6PW

F-type te signals are characterized by very strong signal strengths and the absence of flutter fading. Evidently a degree of focussing takes place, since received signals exceeding the free space value by up to 3dB were measured on several occasions on 28 and 50MHz. Such signals are common in the afternoon and early evening, cause considerable interference on Band 2, 3 and 4 CCIR television channels, as well as being responsible for the relatively common reception of African tv signals across Europe and their very strong reception in the Mediterranean area. The authors have not yet experienced this type of signal on 144MHz (possibly due to the southern African magnetic anomaly) but reports suggest that they might occur elsewhere [4].

Pure te signals are the type being received on 144 and 432MHz and are characterized by weak, diffuse and sometimes incoherent signals with flutter fading and frequency spreading in varying degrees of severity. Propagation on 28 and 50MHz may persist right through the night, and is usually, although not necessarily, confined to the hours of darkness. In the 1948 BERU Contest ZE2JV found that he could work British stations on 28MHz right around the clock, and in 1958 G2DX was worked on 50MHz on several occasions at noon with typical pure te signals. Early morning tep was frequently observed at 48MHz in the ZE2TEP experiment [2], 5B4CY has been heard on 50 and on 144MHz in Salisbury at 0600gmt, and ZS6DN on 144MHz has been heard in Athens at the same time in the morning.

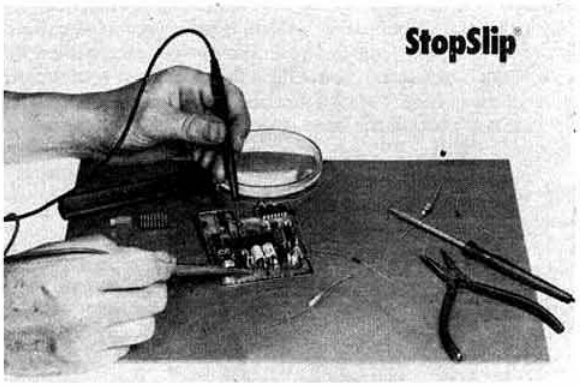
The classification is therefore a useful one, but experience has shown that there are many shades between those signals, and signals that could not be classified as one or the other are often received, particularly on 144MHz.

TO BE CONCLUDED NEXT MONTH

NEW PRODUCTS

"StopSlip" anti-slip material

When one is trying to repair a tiny mechanism on the work bench, but it keeps slipping away; or one wants to solder a connection on a circuit board which will not stay put; or, while adjusting a delicate instrument, holding it in place while doing so without leaving vice marks on it, how does one solve these problems? The answer in these and similar situations may well be an anti-slip material, produced by Spirig (Switzerland) and now available in the UK from Cobonic Ltd, London. Called "StopSlip"® elastomer, these high-friction flexible mats come in two thicknesses—1mm and 2mm—and any desired dimension up to 1m². The 1mm material, which can also be ordered in roll lengths, is produced only in a deep blue; the 2mm mats are available in three additional colours: green, red and yellow. What makes a StopSlip elastomeric pad so useful is its incredibly high coefficient of friction. A piece of StopSlip material can be brought very close to vertical, and flat objects simply placed on it—not stuck on—will stay in place.



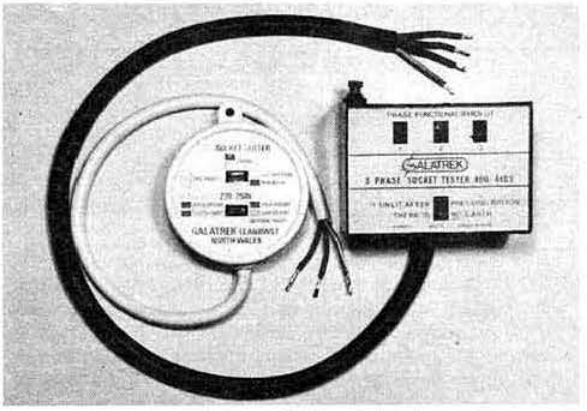
Using a StopSlip mat to hold a soldering job steady

The high friction material is advantageous because it offers a scratch-preventive surface to work on. It also snags small components so that they cannot inadvertently blow away. Constructors use it because it acts like a third hand, holding the assembly while both hands are busy soldering or unsoldering a connection. Tackiness of the StopSlip mats is inherent in the material; it does not gradually decrease, nor is it affected by repeated wet mopping. Further information from Cobonic Ltd, Knapton Mews, Seely Road, London SE17 9RL. Tel 01-767 6780.

Galatrek mains socket testers

Following the introduction of their 13A socket tester in 1978, Galatrek Engineering announce the arrival of two new models, which are international firsts.

1. A six-function socket tester for any type of socket (fit your own plug). By means of neons and indications on the front of the tester it shows immediately if: (a) socket is A1 ok; (b) danger, reverse polarity; (c) danger, no earth; (d) danger, live fault; (e) danger, neutral fault; and (f) danger, live earth reversed.



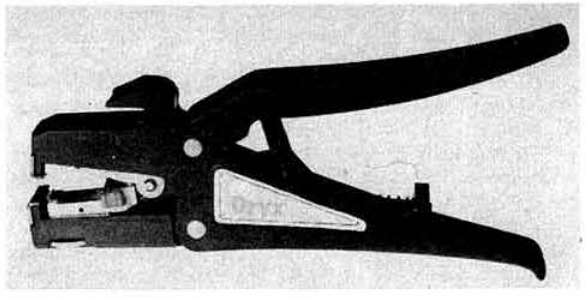
The six-function socket tester (left) and the three-phase socket tester

Price £4.50, available direct from the manufacturers and stockists as they are appointed. Price includes VAT and is post paid UK mainland.

2. A three-phase tester which instantly indicates if phases are functional and whether there is an earth. Price £8.95, including VAT and post paid UK mainland, available only direct from the manufacturers. Manufactured by Galatrek Engineering, Scotland Street, Llanrwst, Gwynedd, North Wales. Tel 0492 640311.

Oryx WS200 self-adjusting wire stripper

The Oryx WS200 flexi-jaw wire stripper, produced in conjunction with AB Engineering, utilizes a completely new self-adjusting floating cam mechanism to set the stripping jaws to the correct depth and automatically adjust the gripping pressure on the insulation. This development together with the tried and tested flexi-jaw stripping head, allows even fine wires to be stripped without damage, and different wire diameters and insulation thicknesses to be handled without adjustment. The tool is extremely light and easy to use. The use of glass-fibre reinforced plastics keeping the weight below 150g. The stripper has a built-in self-sharpening cutter which handles copper wire up to 5mm diameter. The stripper handles 0·25mm² to 4mm² solid or stranded wires, and will strip multicore cables up to 5mm od.



The Oryx WS200

The Oryx WS200 costs £19.25 + VAT. Further information from Toolrange Ltd, Upton Road, Reading RG3 2JA. Tel Reading (0734) 29446 or 22245.

technical topics

Pat Hawker, G3VA

RADIO amateurs, at times, seem to be keen only on seeking out entirely new solutions to their problems, considering any idea or equipment design more than a few years old as "old-fashioned" and, if not exactly obsolete, at least obsolescent. Even professional engineers, to emphasize the pace of "progress", have been heard to say "if it works, it's out of date". This is a view that I find extremely difficult to go along with, much preferring the concept of mixing, like the traditional bride's apparel, "something old, something new, something borrowed and something blue". This month there is nothing, we hope, "blue" in *TT*, but otherwise we follow firmly in the path of the poet!

Rejuvenation of nicads

Some considerable time ago it was noted that it is sometimes possible to overcome the problem of nicad cells that have developed short circuits; however, this is not the only problem that can arise with old cells. David Foster, G3KQR, recently carried out some rewarding experiments on a large batch of secondhand nicads. He writes:

"The most important finding was that old cells had lost weight. For the HP11 size, 45 by 25mm, in some cases the weight loss was as much as 40g. This appeared to be due to gassing and loss of fluid. It was reasoned that the weight loss was most probably due to loss of water, and not so much due to loss of hydroxide. These 'sealed' cells are provided with a pressure-gassing vent, which seems to allow blow-off at a pressure of about two atmospheres.

"The gassing vent in these cells is under the positive terminal, sometimes obscured by a brass soldering terminal which can be drilled by shallow penetration with, say, a No 55 drill. Pressurized venting is made possible by the synthetic rubber plug that is trapped during the manufacturing process between the 'Top Hat' of the positive terminal and the top disc; the two metal portions are spot-welded together.

"Access to the cell can be gained with a hypodermic needle and syringe thrust vertically through the top, through the rubber into the cell (the needle 'track' will 'self-heal' on withdrawal of the needle).

"Alternate suction and pressure will allow topping up to be done, using distilled water. Old cells were found to need about 3ml of water.

"This procedure is simple and safe and there is no contact with the hydroxide. Hundreds of cells seem successfully to have been given a new lease of life . . . in view of their condition they were acquired very cheaply!"

G3KQR recognizes that the "gassing", which is the basic cause of the weight loss, probably also results in some loss of hydroxide and there is unlikely to be any practical way of replacing this (in *TT* January 1977 it was noted that any attempt to use potassium hydroxide, even on the large screw-on-cap type cells, could more easily result in a medical emergency than a revitalized battery).

For the G3KQR water-replacement technique there is perhaps the problem, for those not within the medical profession, of acquiring hypodermic needles and syringes. Chemists may wonder whether it really is nicads that you want to "fix"! But that should hardly deter a real amateur radio "addict".

"Hula hoop" (ddrr) for 144MHz mobile

In most, but not all, circumstances, the standard 144MHz $\lambda/4$ (19in) whip can be readily accommodated for mobile installations. Faced with a need to reduce still further the vertical dimension of a $\lambda/4$ roof-mounted whip on a Bedford van, in order that it could be garaged with minimum inconvenience, D. A. Bundey, G3JQQ, recalled the original "directional discontinuity ring radiator" (ddrr) or "leaky waveguide radiator" antenna (more popularly known as the "hula hoop") devised in 1962 by J. M. Boyer, W6UYH, for Northrop, and the later Italian-developed "half-wave" version (*Electronic Letters* September 1965, and subsequently in *TT*, *ART* and, in an article by I1MK, in *CQ* September 1967). G3JQQ examined the I1MK version, slightly modified and simplified it, and successfully installed this antenna (Fig 1) as a low-profile replacement for the whip. He writes:

"Performance has been somewhat better than the original whip, with the added advantage of much reduced own-ignition pick-up. The base is 18-gauge brass sheet, edge-angled to increase rigidity. The radiating element is 6mm microbore copper tubing, supported at one end by 0·25in perspex, at the other by a vertical copper stub, close to the feedpoint and soldered to both base and ring. The ring dimension was carefully adjusted for resonance within the band, using a gdo placed close to the stub support.

"Measured vswr is not worse than 1·3 over the band; the actual value is slightly affected by the positioning of the two magnets acting as clamps. The feed is 52Ω coaxial cable."

G3JQQ notes that the ddrr can be considered as basically a

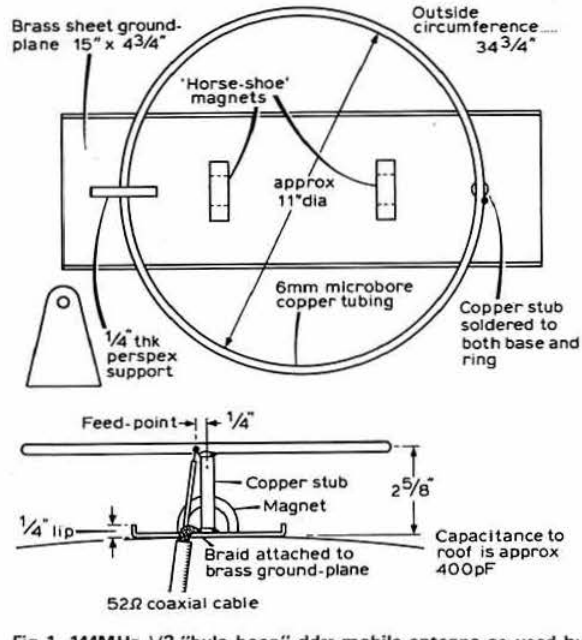


Fig 1. 144MHz $\lambda/2$ "hula hoop" ddrr mobile antenna as used by G3JQQ

"tortuous derivation of the well-known principle of the slot antenna" (this is supported, to some extent, by W6UYH's original description of the system as a "leaky waveguide radiator"). Although the "hoop" is horizontal, the signals are of course vertically polarized. It is interesting to recall that the original tests of the λ/4 ddrr included its use as a 28MHz mobile antenna making good use of the "ground plane" provided by the roof of the vehicle.

The all-band dipole

A familiar, though frequently disregarded, theme emerges in a letter from Bill Stocking, W0VM, in the April *QST*: "I often wonder", he writes, "why most antennas described in books

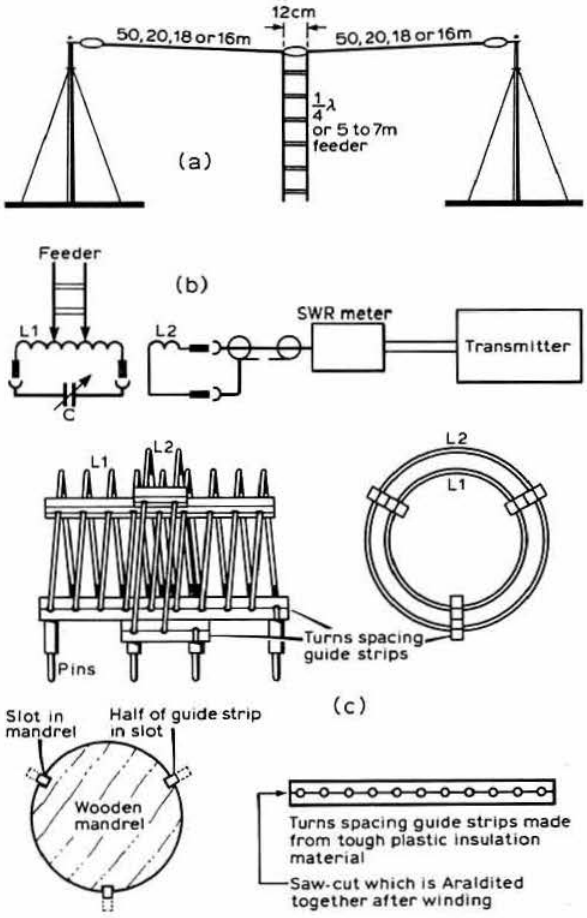


Fig 2. (a) The "Levy" centre-fed dipole antenna with resonant feeders; (b) how the antenna is connected to the unbalanced output of the transmitter; and (c) F8OP's suggested method of making self-supporting plug-in coils for the antenna tuning unit. Typically C is a 150 or 200pF(maximum) high-voltage tuning capacitor. L1 35t spaced 8mm, 8cm diameter for 3·5MHz; 14t similar for 7MHz; 7t spaced 10mm, 5cm diameter for 14MHz; 5t spaced 20mm, 4cm diameter for 21MHz; 3t spaced 30mm, 3cm diameter for 28MHz. L2 consists of 2t wound outside of L1 for 3·5/7/14MHz; 1t for 21/28MHz. Use suitable wire gauges, typically 2mm for 3·5/7MHz; 3mm for 21MHz; and 4mm for 28MHz Feeder tapping will depend on the impedance presented by the feeder and should be adjusted for unity swr (3·5MHz typically start with 4t and then increase gradually, adjusting C)

and articles use coaxial cable feeders when tuned feeders of parallel-conductor line work so much better. They permit the use of an antenna system on several bands, with the added benefit of gain (reference to a λ/2 dipole) on the higher-frequency bands. . . . Since low swr has become somewhat of a fetish among amateurs, many of them are using coaxial-to-coaxial antenna tuners to reduce the swr 'seen' by the transmitter. They do not seem to mind the extra knob required. If they used balanced open-wire twin feeders they could enjoy the advantages of a truly efficient multi-band antenna system. A coaxial-to-coaxial antenna tuner can easily be adapted for use with balanced feeders by adding a 4:1 balun. . . ."

As though "on cue" F8OP in *Radio-REF* (No 2, 1980) provides a full treatment of "L'antenne Levy", a design familiar to those with long memories as the "centre-fed dipole", "centre-fed zepp" or "centre-fed doublet". F8OP's enthusiasm for this system is based on his use of it over a period of some 20 years. He lists as useful advantages:

(1) the ability to work effectively on five bands, presenting (to the transmitter) an swr of 1:1 on each (an ability that will also extend to 10, 18 and 24MHz in due course);

(2) the ability to adapt the length to individual circumstances;

(3) the ability to radiate well even in an under-roof space (or inverted-V configuration), though of course height-gain is always useful;

(4) there should be only about 2 or 3 per cent of the power lost in the transmission line etc compared with possibly 20 to 30 per cent in typical coaxial cable systems;

(5) the ability to present unity swr to the transmitter over the full width of 3·5MHz, as well as on all bands;

(6) minimum disturbance to nearby television receivers, since the whole system (antenna, feeder, atu and transmitter) can be brought into perfect tune—a factor that is often overlooked by those who claim that open-wire feeders are not "screened" like coaxial cable, forgetting the currents that often flow back down the braid.

The length of the "top" radiating element is preferably λ/2 (or longer) on the lowest frequency band (although this is not essential) and again preferably with λ/2 resonant feeders on this band. Examples suggested by F8OP included 2 by 20m "top" with 2 by 20m parellel wire feeder; 2 by 18·5m "top" and 2 by 21·5m feed; or 2 by 16m "top" with 2 by 24m feed; although, with a suitable atu, virtually any lengths are reasonably effective, including shorter feeders of 5 to 7m. Fig 2 shows F8OP's suggestions, including an atu using plug-in coils. Most of his suggestions (except the inclusion of an swr meter) could have come straight out of almost any 'thirties handbook, but by no means the worse for that!

For those wondering how to make low-cost open-wire feeders, it may be worth recalling a tip given by Roger Wheeler, G3MGW, in *TT* November 1977: "Plastic plant labels can be drilled and make good spreaders for open-wire feeders, being low-loss and weather resistant".

Switched phased verticals

E. J. Wellman, G2HJT, notes that it has been some time since there has been any mention in *TT* of the attractions of the use of phased verticals to provide hf directional arrays. He feels that for people in sites where it may be difficult to install rotary beams, this approach "seems the next best thing—the elements take up little room and are not overprominent". He has been using the system for two years and is well satisfied with its performance, even in dx pile-ups.

Recently, on behalf of VP8PP, he has put together the notes

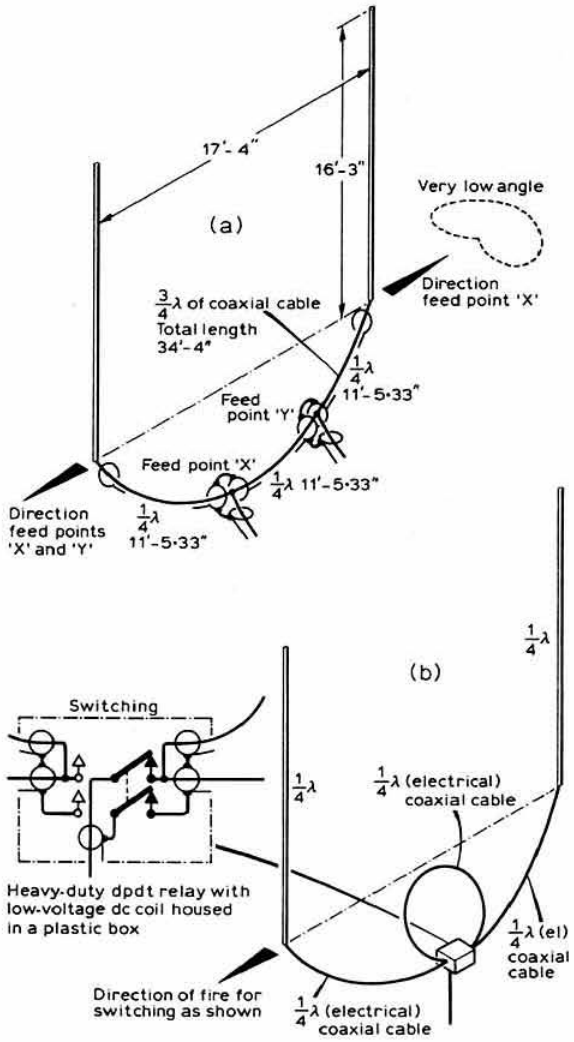


Fig 3(a). Reversible phased vertical array for 14MHz with manual change of direction; (b) System for switched reversal of beam direction

summarized below, although he points out that, apart from the phase-switching, it is all basically as per the *ARRL Antenna Handbook*. The usual warning needs to be given of the vital importance with any system based on monopoles that the best possible earthing system should be used (earthing mats, buried radials, or radials laid on the ground). The radiating elements can be made from aluminium or copper tubing, or heavy gauge wire taped to poles.

The basic configuration is shown in Fig 3(a) with dimensions for 14MHz. The array can be fed either at point "X" or "Y" depending on the required line of fire (including the possibility of manual changeover if two connectors are fitted with all inners and outers joined). The physical length of the electrical λ/4 phasing sections will depend on the velocity factor of the cable, and it will be advisable to check (eg with gdo). At the feedpoint(s) coaxial Tee-junctions or wire equivalents can be used.

Approximate dimensions are:

Band	Verticals	Radials	Spacing	λ/4 sections (elec)
14MHz	16ft 3in	16ft 6in	17ft 4in	11ft 5·3in
21MHz	11ft 0in	11ft 4in	11ft 6in	7ft 7·3in
28MHz	8ft 2in	8ft 4in	8ft 6in	5ft 8·5in

G2HJT writes: "Switching to reverse the firing direction can be easily arranged in either of two ways. One is a dpdt relay in a weatherproof box between the verticals, controlled by a cable tape to the main feeder. The second is to use two exactly equal lengths of feeder to each vertical plus a λ/4 section of feeder situated near the transmitter that can be arranged to make either feeder λ/4 longer, so providing the necessary phase difference. With no 'turning lag' of the conventional beam, one can switch immediately between 'short' and 'long' paths, often with beneficial effects".

Another way of beam-switching is shown in Fig 3(b) with the extra phasing section coiled and secured to the weatherproof box, but it is regarded as essential in this case to replace the relay with medium-duty dpdt switch, contactor or relay. At G2HJT the relay switch is wall-mounted in a small metal box with amber indicator lights showing direction of fire. In his case he finds his "long path" position to be the most used, since it takes in VK, ZL, ZS, PY, VP8, Central America, Middle East and the long path to JA, VS6 etc.

Sealing coaxial cable

TT (May 1980) provided some ideas on the salvaging of contaminated coaxial cable, as put forward by Robert Wheaton, W5XW, in *Ham Radio* (January 1980). But it is clearly far better to avoid such contamination altogether, and in the March *HR*, W5XW provides advice on how to do this by effectively sealing the cable where it connects to the antenna. He notes that too often the braid and centre conductor of the cable are simply fanned out, with no sealant applied to prevent ingress of water—this is often the case, he points out, with home-made dipole-type antennas. He writes:

"The old trick of looping the cable over the centre insulator and taping it to provide a strain relief is a good one; however, unless the cable end is carefully sealed before connection to the dipole, water will enter and be drawn 'uphill' round the loop by capillary action, and can eventually contaminate the entire line. . . .

"Frequently, amateurs attempt to seal the cable with silicone rubber sealants. Two problems exist here: (1) almost no adhesion exists between the vinyl or pvc jacket and the silicone rubber; and (2) during curing the silicone rubber compound releases highly corrosive acid vapours, which can devastate the conductive surfaces of connectors. . . .

"Where the cable end is attached directly to an antenna, an effective means of sealing the end is to use epoxy: Fig 4 shows

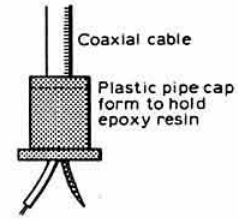


Fig 4. W5XW's recommended method of sealing the end of a coaxial cable feeder connecting directly to an antenna. The plastic form holds the epoxy until it cures

how a plastic pipe-cap or plastic chair-leg tip can be used as a form to hold the epoxy as it cures; it can then be left in place. The braid should be expanded so that it is loose enough for the epoxy to flow around all the conductors. After pouring in the epoxy, work the coaxial cable around in the pipe cap to promote saturation of the braid by the epoxy."

More thoughts on receiver specifications

The March *TT* summarized the views of Wes Hayward, W7ZOI, on the need for clear thinking on the way we specify receiver characteristics and, equally important, noted that measurement and evaluation techniques need to evolve in order to keep pace with modern developments.

Pete Barron, G3WTM, agrees with much that W7ZOI wrote, including the problem of mutually conflicting statements about dynamic range, though he is not too happy at the idea of introducing yet another term ("receiver factor"). He also indicates that he feels W7ZOI failed to mention a problem common to many of the current amateur radio receivers: that of poor gain distribution and the resulting poor ultimate signal-to-noise ratio ((s + n)/n ratio). Whereas current high-grade professional receivers achieve about 45dB, amateur receivers such as the TR7 or TS520 typically achieve about 35 to 40dB, while he recently measured a Trio R1000 at about 25dB. The causes seem to be a combination of wideband noise introduced after the ssb filter and, more especially, agc effects on the first i.f. amplifier: this latter problem is, for most amateur receivers, considerably more important than the effects of the "reciprocal mixing" that nowadays tends to be the limiting factor in high-grade professional receivers.

My own impression is that we need to think carefully about exactly what we want our receivers to do. A receiver can have an excellent paper specification and yet may still prove a poor performer when installed in an amateur station. For example, for many years we have tended to believe that the best cw receiver will have a passband of only a couple of hundred hertz or so, with a shape factor as near to unity as the designers can provide. Yet, as G6CJ noted in the development of the stereocode technique, what a cw operator often likes is to have a part of the band spread out in front of him as a series of "mountain peaks", with a really smooth tuning mechanism and a tuning rate of only around 2 to 5kHz per knob revolution that allows him to climb up and down the peaks accurately, always provided that the total noise bandwidth is not excessive. For cw there is indeed still much to be said for the classic form of crystal filter with switched degrees of selectivity (achieved by altering the impedance into which the crystal "looks") even when the shape factor may appear extremely poor by modern standards.

There is something very satisfying in being able to hit the wanted signal with a degree of crystal "ringing" just sufficient to make it stand out from the other signals, yet at the same time being able to observe other activity in the immediate neighbourhood of the wanted frequency. I find that tuning on the older classic designs can often be much improved by adding an extra "out-board" slow-motion drive to what the original manufacturer felt adequate. I also find it pays to experiment with different sizes and shapes of tuning knob (at the moment I am using one fashioned from an old bottle top!).

These, of course, are all personal idiosyncrasies, not necessarily recommended to others. But I am convinced that if an operator finds a receiver *pleasant* to use, this can be as important to him as the finer details of the paper specification: it is the old question of operability and human engineering.

Double-balanced, cross-coupled product detector

Some 10 years ago I drew attention in *TT* (and later in several editions of *ART*) to the cross-coupled form of double-balanced mixer that is used in some integrated circuits (SL640 etc) and that can also be implemented with triodes, pentodes etc. In *Electron* (No 4, April 1980), PA0SE reproduces (from a Hungarian magazine) GW3GRY's product detector, realized in this configuration: Fig 5. This circuit uses two BC108 transistors, but such types as BC182-84, BC107, BFY33 and BFY34 are given as alternatives. The bfo injection should provide a signal about 10 times that of the i.f. signal. In *ART* it is noted that accurate balance of such an arrangement can be provided by connecting the two earthy ends of the base resistors (2·2kΩ in this circuit) to the two ends of a 1kΩ pot with the rotor connected to chassis.

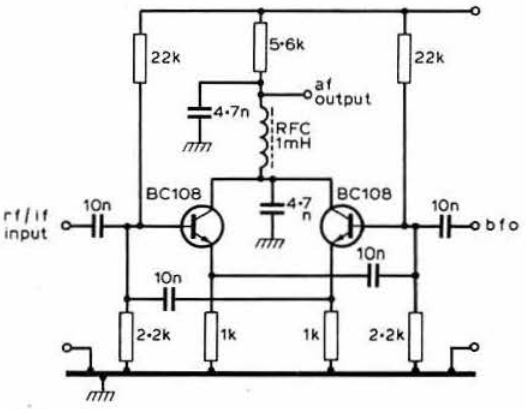


Fig 5. Double-balanced, cross-coupled product detector using two BC108 or similar transistors

It is worth recalling that *TT* (August 1978) noted that, as long ago as 1939, E. L. Gardiner, G6GR, drew attention to the importance of using a balanced detector in order to minimize the noise produced by the bfo. Nevertheless the use of balanced and double-balanced product detectors remains fairly unusual; that the conventional unbalanced approach can have a noticeable effect on the performance of modern receivers is indicated by a note in *Ham Radio* (March 1980, p64) where Bernard White, W3CVS, recommends modification of the product detector in the high-performance Drake R4C receiver. He claims that the 1N270 diodes used as the product detector create harmonic currents from the bfo that "appears as a constant hissing sound . . . not noticeable on fairly strong signals but . . . annoying if you are listening to a weak signal". His answer is to replace the two diodes with HP5802/2800 hot carrier diodes, but, alternatively, in a number of receivers it would seem to be worth considering the use of balanced or double-balanced circuits to minimize the noise from bfo sidebands.

100W broadband vmos amplifier

The September 1979 *TT* (pp828-9) provided an outline of the novel "polar-loop" form of ssb transmitters which have been under development at the University of Bath. This approach to ssb transmitters appears to offer a number of advantages both for professional communications and for amateur radio: (*a*) all rf amplifiers can be simple and efficient Class C stages; (*b*) no mixer-type frequency conversions need be used, minimizing the

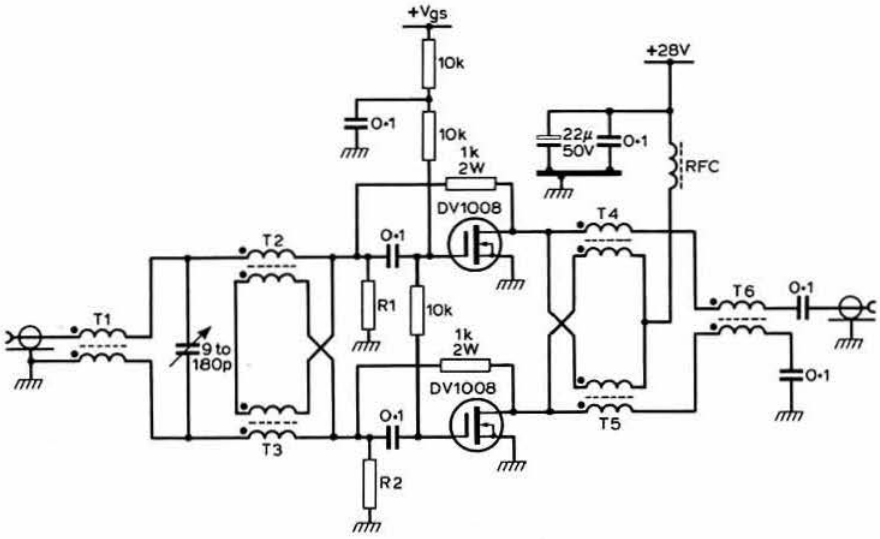


Fig 6. A 100W broadband (30-90MHz) amplifier using two DV1008 vmos devices. While it is unlikely that amateurs would wish to duplicate this design exactly, the following details are given for general guidance. R1, R2 each three 18Ω 2W carbon composition resistors in parallel. RFC Ferroxcube P/N VK200 09/3B. T1, T2 2t of RG-196 50Ω coaxial cable wound on three balun cores placed end-on-end (Stackpole P/N 57-0973). T2, T3 2t of No 22 twisted pair, 4t/in, wound on two balun cores (Stackpole P/N 57-1503). T4, T5 3t of 25Ω coaxial cable (simulated by using two lengths of RG-196 in parallel) wound on six toroid cores (cores configured similar to balun-style core, three cores per side)

generation of spurious products; and (c) no critical or voltage-sensitive circuits are needed, yet very high orders of linearity can be achieved due to the use of feedback techniques. By means of a phase-locked-loop and voltage-controlled-oscillator the low-level ssb signal is generated directly on the output frequency; it is then split into polar co-ordinate form (a constant-amplitude angle-modulated component and a baseband audio-component). The two signals are amplified separately and then recombined in a high-power modulated output stage. While the basic principle of such splitting was proposed by Leonard Kahn as long ago as 1952, the current polar-loop system is designed to take full advantage of feedback and modern pll techniques etc.

While last year most of this work was in connection with hf and vhf transmitters of a few watts output, V. Petrovic and his team recently demonstrated at the IEE a highly linear 100W hf laboratory unit with the final broadband power amplifier using the recent "DV" range of Siliconix vmos devices as mentioned below. There are several amateurs in the Bath team and they consider that the polar-loop approach may prove to have much to offer for this application.

A broadband (30 to 90MHz) vmos amplifier capable of providing up to 100W output (when used with a 28V power supply) is described in detail by Larry Leighton and Ed Oxner in *r.f. design* (Vol 3, No 1, January 1980, pp32-7). This amplifier (covering an American military band) uses two DV1008 devices in a push-pull configuration and is broadbanded by the use of torroid rf transformers: Fig 6.

With 10W drive the gain is 10dB and the efficiency about 60 per cent. With lower power inputs the gain increases: 80W out with 5W drive; 60W out with 3W drive; and 40W out with 2W drive. The article discusses in some detail the design factors for such a vmos amplifier, stressing some useful features of these devices:

(1) very little feedback is required to ensure total stability;
(2) near constant input impedance governed mainly by the input impedance of the matching circuit and not by the reflective load impedance;
(3) flat gain across the entire bandwidth, with reverse gain exceeding −35dB;
(4) ability to withstand a 20:1 vswr at any phase angle;
(5) very low noise figure typical of that when used in small-signal applications (see below).

In addition there are the basic thermally-related benefits of the vmos approach: no thermal runaway and no current hogging. The "DV" devices are not low-cost devices, but then, nor are thermionic devices these days (several readers have commented on a recent listing of the old "813" at a price of £36).

Vmos fets as "small-signal" amplifiers

The use of vmos devices as low-noise "small-signal" amplifiers of wide dynamic range also looks like becoming an established technique. The arrangement shown in Fig 7 stems from *CQ-DL* (January 1980) as reprinted in *Radio-REF*. It provides a wideband (1 to 40MHz) amplifier having minimum gain of 16dB, and will handle an output of up to 2W with an intercept point of about +36dBm and a noise factor of 5dB at 28MHz. It does, however, require a power supply providing 450mA at 30V.

Normally one needs to be very cautious about putting untuned, wideband amplifiers in front of receivers. One sees this technique being advocated quite frequently for fringe-area television reception, although wideband vhf/uhf amplifiers

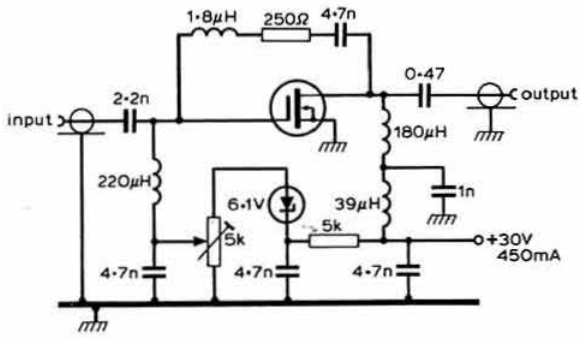


Fig 7. Broadband (1-40MHz) preamplifier of wide dynamic range using single VN66AJ or 2N6657 (Siliconix) vmos device

will not only amplify the wanted tv signals but also any signals from local amateurs using the 70, 144 or 432MHz bands and just about ensure that there will be tvi when these go into tv receivers of very restricted dynamic range. Even on hf the system cannot be recommended with receivers of limited dynamic range unless used with selective tuned filters. Such amplifiers, however, can be very useful as part of distribution systems for simultaneously feeding a number of receivers from the same antenna.

"66" Clickerty clix

In *QST* April 1980, H. Dale Strieter, W4QM, provides a word of warning about a seldom-mentioned characteristic of the latest generation of transmitters and transceivers. He writes:

"In the past several months, subjective cw listening tests on the new breed of hf transceivers have been disappointing. Most of them have slight to severe clicks, especially when they are used with a power amplifier . . . almost without exception their key clicks are noticeably more prevalent as compared with the older units . . . all it takes is a little hardening of the keying through an amplifier or a minor misadjustment and one has almost a square wave on the 'break' . . . ideally 5ns from start of carrier to full carrier on the 'make' and from full to zero carrier on the 'break' will result in clickless keying. But this time span should *not* be measured from the time the operator presses or releases the key."

W4QM congratulates ARRL on providing oscillographs of the keying wave in equipment reviews. Generally most of the 'seventies equipment provided good keying characteristics, and indeed it will be a pity if manufacturers do not continue to take the same degree of care. One reason why many ssb transmitters had better keying characteristics than some of the older a.m. equipment was the absence of Class C amplifiers which, when used with keying in the earlier stages, almost inevitably re-introduced severe clicks unless special precautions were taken to shape the rise and fall of carrier in these stages.

More power supply ideas

The journals and my incoming mail continue to reflect the keen interest in home-constructed power units for powering 12V equipment from mains supplies. This is clearly an area where home-construction is not only entirely practicable but also still results in very useful cost savings. So again this month, a further selection of ideas and circuits.

Dave Sellas, G3PBV, recently needed a high-current psu and decided to apply the "kiss" touch. "Keeping it simple", he evolved the circuit shown in Fig 8 and writes:

"I have built three of these units with similar performance

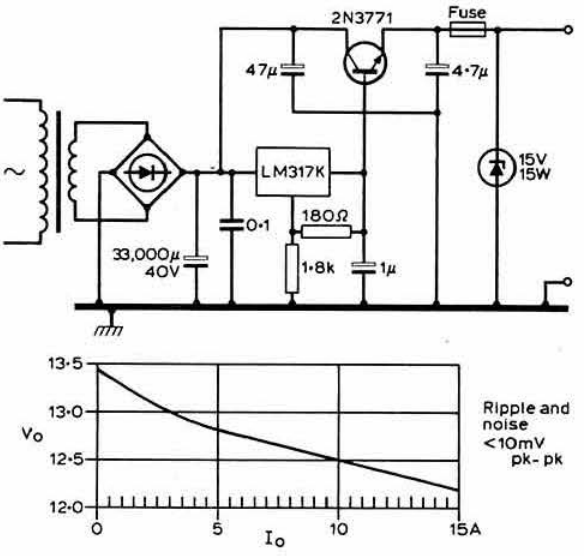


Fig 8. G3PBV's simple psu capable of providing about 10A

and found no reduction in output even with only a 4V differential (across the regulator) when providing 10A. At present I am assembling bits for a 28V version.

"The regulator needs a good heatsink, about 0·5C/W, and it was necessary to mount the pass transistor directly on the heatsink which was isolated from earth. The LM37K ic regulator was also mounted on the heatsink with a mica washer. The rectifier was mounted on a plate bolted to the transformer. Flying leads with spade connectors ran to the large reservoir capacitor. The whole regulator, fuse and output connector block were mounted on the heatsink with a flying positive lead to the capacitor. The negative lead from the capacitor was run straight to the output connector with a short earth lead back to the regulator."

D. R. Coomber, G8UYR, uses the arrangement shown in Fig 9, based on ideas and suggestions from G4GZW and G8VFG, to provide 6 to 10A. With a single 2N3055 and a good heatsink it is suitable for about 5 to 6A, and for outputs of less than about 5A the BFY52 can be omitted. Efficiency depends partly on the gain of the transistors forming the Darlington pair (BC109/BFY52). A zener-operated thyristor could be incorporated for "crowbar" protection. Total cost of components should be around £10 to £12.

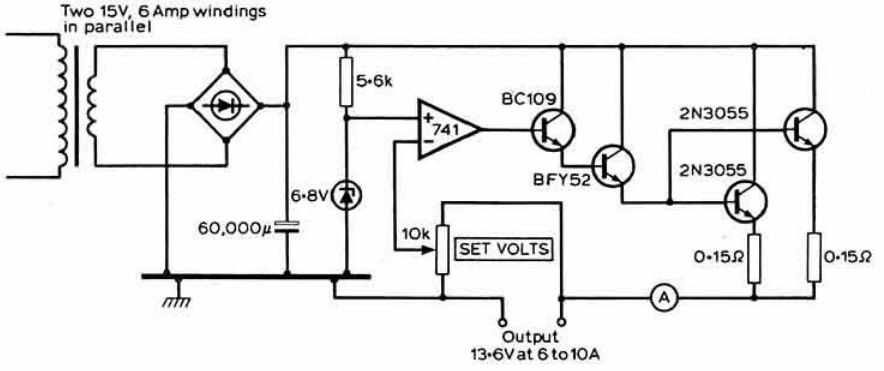


Fig 9. G8UYR finds this a flexible approach to low-voltage, high-current supplies. The transformer secondary is formed by two 15V, 6A windings in parallel. A very large heatsink is used for the 2N3055 transistors

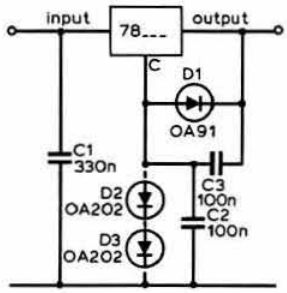


Fig 10. Using diodes to protect a "jacked-up" voltage regulator

The use of a resistor or variable resistor to "jack-up" the output from the popular three-terminal ic voltage regulators is well-known, but some novel suggestions appear in *Practical Electronics* February 1980. These are shown in Fig 10. The originator, J. A. Barrow, pointed out that the resistor technique has disadvantages. In the event of a short-circuit the common terminal becomes reverse-biased and the regulator then loses its protection, and so is likely to be destroyed.

In the arrangement of Fig 10 the germanium diode, D1, prevents the common terminal becoming more than 0·2V reverse-biased under short-circuit conditions, so protecting the regulator. Further diodes (D2, D3) etc, rather than resistors, are used to provide incremental increases in output voltage; two silicon diodes, for example, raising the voltage by about 1·3V.

Digital interference

When designers began putting digital devices into communications receivers for read-out counters, frequency synthesizers and stabilizers, auto channel-searching and the like, they soon ran into the problem that if there are a lot of high-speed pulses rushing around they will do their level best to get into the signal path and produce "hash". Even if the digital devices are outside the receiver they can still be a potent source of radio-frequency interference: try putting a pocket calculator alongside a broadcast-band receiver; you will be lucky if you cannot hear the beast working.

With more and more microprocessors and home-computers going into radio shacks, the problem is becoming more and more significant. In "Microcomputers and radio-frequency interference" (*QST* March 1980, pp17-20), Paul Cooper, N6EY, points out that low-cost microcomputers can be abominable polluters of the rf spectrum, emitting hash that covers the entire hf and vhf spectrum. He provides a detailed case-history showing that, although it is not too difficult to reduce the rfi to levels that permit acceptable operation, with the aid of some shielding and brute-force mains filtering, it can be a major problem to achieve anything like a complete solution. This could involve complete re-packaging of the microcomputer (in his case a TRS-80, but there is no reason to suppose other home machines are significantly better or worse) using a copper-plated steel enclosure, a copper-foil grid under the keys, some modifications to the computer electronics, improved interface isolation, better-shielded monitors, etc. It adds up to an approach, he suggests, beyond the scope of the average amateur.

There is, of course, also a reverse problem: a near-by transmitter can gum up the cmos works and provoke even house-trained computers into making mistakes. It clearly cannot be taken for granted that microcomputers are always likely to prove compatible to an amateur-radio environment.

An Ide mystery solved?

TT (February 1980) included an account of the views of D. B. Muldrew on the mystery of long delay echoes (Ides) which have puzzled observers for more than 50 years. A. K. Goodacre, VE2AEJ/3, in "Observations of Ides on 28MHz" (*QST* March 1980), reports that he has frequently been able to record signal echoes delayed by from 2 to 9s when transmitting pulses on 28MHz using 400W to a 5-el Yagi. He notes that echoes occur during periods when the dx east west path is open. He has been able to show that there is a significant correlation between the echo periods and multiples of the 138ms that it takes a signal to travel around the world. This has convinced him that his signals are propagating along round-the-world ducts (he suggests possibly between the E and F layers, but see below) until finally they escape from the duct by reflecting off an ionized meteor trail: a most interesting and by no means impossible explanation.

If you are sceptical that a 28MHz could travel possibly up to 50 times round the world and still emerge at sufficient strength to be recorded, there is some relevant material in the classic book *Radio Wave Propagation and the Ionosphere,* by Ya L. Al'pert (1963 edn, English text, pp322-6). This summarizes the German wartime work by H. A. Hess, who developed a technique for locating a long-distance hf transmitter from observations from a single df station, using round-the-world echoes and reverse echoes. On 19 November 1944, single, double and triple "echos" were successfully received; although of course this still represented a delay of less than a second. More recent work has shown that attenuation in such ducts can be very low; the problem being that, once a signal is firmly entrapped, there is normally very little leakage out of the duct, which is where VE2AEJ's meteor trails could be very important. One suspects, however, that the more likely propagation path would be a "whispering gallery" mode along a great circle close to the twilight zone.

Op-amp power supplies

Most op-amp circuits tend to call for balanced positive and negative voltage rails (although this is not always a necessity). A basically very simple method of obtaining positive and negative rails from a single transformer winding has been going the rounds (G5YK brought it to my attention, G3WDR to his; and apparently it has been in *Practical Electronics* of date unknown). This uses an 18-0-18V or similar centre-tapped transformer with three diodes, as shown in outline in Fig 11. Additional smoothing, regulation components should be added as required.

A slightly more complex version, again providing positive and negative 6V rails but also a positive 12V rail (as needed, for example for ttl comparators), has been described in *Wireless World* (March 1980, p91): Fig 12. A useful feature of this arrangement is the greater current rating for the +5-6V rail, as

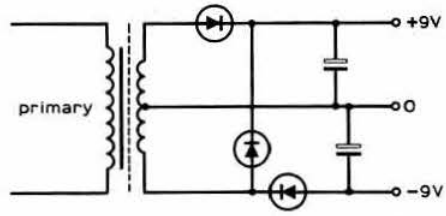


Fig 11. Simple method of obtaining balanced negative and positive rails for the supply of op-amps etc

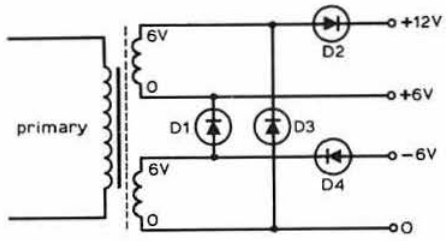


Fig 12. Multi-output supply from two secondary windings and three diodes

frequently required when using a number of ttl devices. The voltages shown on the diagram will tend to increase when capacitors are added, providing an adequate margin for voltage regulation circuits.

Pacemakers and emc

Some years ago I referred very briefly in *TT* to the fact that some of the early pacemakers—those small, life-saving electronic pulse-generators that can keep a dicky heart beating steadily—were susceptible to strong rf fields from nearby transmitters and other forms of rf power generation. It was my understanding that more recent designs have been much improved in respect of electromagnetic compatibility (emc). However, it would appear from a recent article by Gerald Samkofsky, N4ZB (*CQ* January 1980) that there may still be need for some caution if you, or a member of your household, are fitted with a pacemaker—or if you operate demonstration stations in public places. N4ZB quotes warnings that are still given in American manufacturers' literature, suggesting that persons fitted with pacemakers should stay away from such rfi sources as diathermy equipment, microwave ovens and amateur radio transmitting equipment; another firm mentions ssb linear amplifiers and transmitters of more than about 75W output. Some units are stated to work safely in fields up to about 500V/m (representing fields significantly above the normally accepted 10mW/cm^2 continous exposure to rf radiation safety limit). I do not know what advice is given in the UK to persons fitted with pacemakers, but it would be wise to avoid such dangers as might arise from high-power antennas close to living areas (or having hf long-wire antennas brought into the shack) and to use effective low-impedance earthing, etc. Even if medical staff warn patients of the hazards of very strong local rf fields, it must be difficult to get the message across to all users. However, N4ZB does indicate that provided reasonable precautions are taken, even persons fitted with pacemakers should be able to continue enjoying amateur radio safely.

SL6440 high-performance mixer

For a number of years the Plessey range of SL600 and SL1600 linear ic devices has made it possible to construct hf receivers and transceivers with (at least in theory) only the minimum of design worries. This range has of course formed the basis of many published designs, such as those in Plessey's *Radio Communications Handbook* (1977). However, a drawback has been the absence of a mixer ic capable of the sort of performance that we are coming to expect as necessary in good hf and vhf communication receivers. Some designers have overcome this problem by using packaged Schottky-diode ring mixers. but these do have significant conversion loss which can tend to complicate the design.

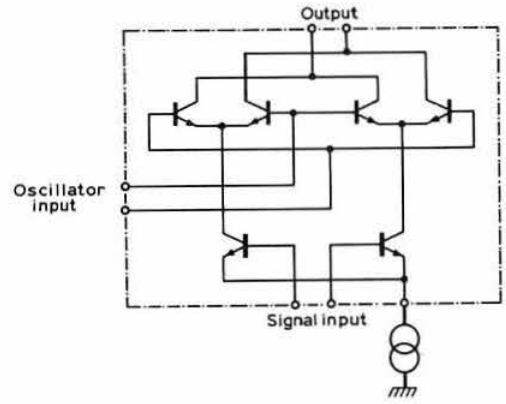


Fig 13. The basic transistor "tree" mixer/modulator arrangement which forms the basis of the SL6440 mixer ic

Peter Chadwick, G3RZP, a senior applications engineer with Plessey Semiconductors, has recently sent along a mass of information about a new mixer device, SL6440A/C, based on the cross-coupled or "transistor tree modulator" approach. This new device has been specifically developed as a high level mixer for radio communication applications requiring a high performance linear mixer (30dBm intercept point, low noise, +15dBm compression point (1dB) with conversion "gain" of −1dB). G3RZP has written a very useful application note for this device: AN1007 "Applications of the SL6440 balanced modulator integrated circuit" (also of relevance is his AN1009 "Intermodulation measurement techniques in mixers").

In this connection, it is worth noting that there is a report in *Electronics* (8 May 1980, pp93–4) of an "Electro/80" conference paper "Recent developments in communications receiver design" by Doug De Maw, W1FB (of ARRL), and Wes Hayward, W7POI (of Tektronix), which reviews amateur work in this field in recent years, with particular emphasis on the question of the need for good mixer performance in order to achieve with semiconductor designs the dynamic range that is required today on hf (and even more so on vhf).

Taking both these sources together (and hoping that I am not misrepresenting either) I have put together the following summary of the advantages and disadvantages of various types of semiconductor mixers:

Single diode mixer. *Advantages:* wide bandwidth; low oscillator power; low cost. *Disadvantages:* no rejection of

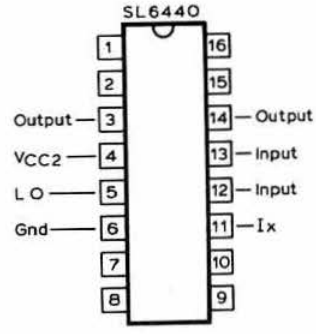


Fig 14. Pin connections for the plastic or ceramic SL6440A/C device. Pin connections viewed from above

unwanted components and no isolation between "ports"; low input impedance.

Single bipolar transistor mixer. *Advantages:* conversion gain; low noise; low cost. *Disadvantages:* very poor imd, cross-modulation and blocking performance; poor isolation; easily overloaded; no oscillator a.m. rejection.

Diode "ring" mixer: *Advantages:* can have very good imd, blocking and cross-modulation performance; low noise (and hence wide dynamic range); rejection of oscillator a.m. noise. *Disadvantages:* high oscillator power required; imd performance critically dependent on load termination; inherent conversion loss (minimum about 6dB); significant cost; limited "isolation"; low input impedance.

Single jfet mixer: *Advantages:* low noise and conversion gain; high input impedance; can provide reasonable but not exceptional imd, blocking and cross-modulation performance; not easily overloaded; low cost. *Disadvantages:* requires high oscillator power; operates as square-law detector for large-input a.m. signals; no rejection of oscillator a.m..

Dual-gate mosfet mixer: *Advantages:* reasonable but not exceptional imd, blocking and cross-modulation performance; not easily overloaded; provides conversion gain. *Disadvantages:* rather high noise figure; operates as square-law detector for large-input a.m. signals; poor oscillator a.m. rejection.

Peter Chadwick G3RZP, feels that "intermod" (imd) spurii can, and do, play an important role in determining the "goodness" and "suitability" of receivers for amateur operation. He quotes, as an example, experiences at the 1979 SSB Field Day when weak spurii were received every 10kHz throughout the 21MHz band from the adjacent 21MHz broadcast band. He believes most available receivers tend to be more affected by imd than by reciprocal mixing.

In a comparision with the other mixers noted above, he lists the advantages and disadvantages of the new SL6440 ic balanced mixer as follows:

Advantages. An imd performance set by current. Good isolation of the local oscillator. Low oscillator power requirement. May be used with single-ended or differential drive. IMD performance independent of load impedance. High input impedance. Can provide conversion gain by choice of output impedance.

Disadvantages. Bandwidth limited to 200MHz. Noise figure approximately 12dB for best imd performance. Compression point lower than for best diode ring mixers.

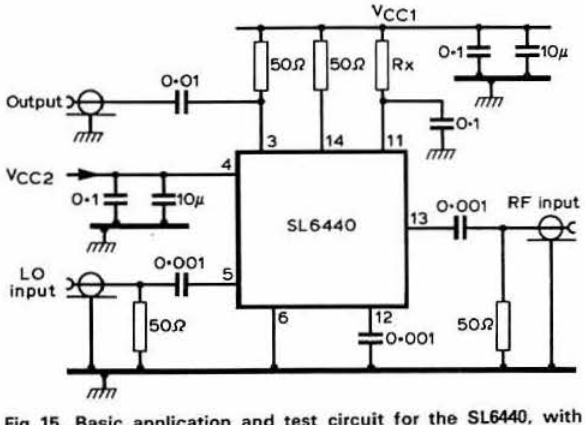


Fig 15. Basic application and test circuit for the SL6440, with single-ended input and output circuits. The variable resistor "programs" the conversion gain versus intercept point

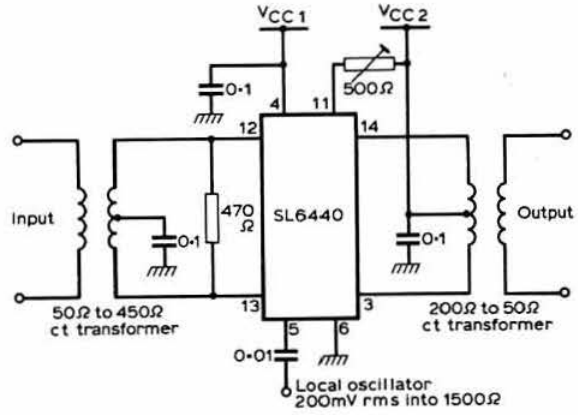


Fig 16. Typical application of the SL6440 in hf communications receiver

He notes that performance of the "tree" mixer of this type is dependent upon a number of parameters of the transistors, and the ultimate performance requires some compromises of overall performance but that the SL6440 has been optimized for noise figure and imd. It should be noted that where the device is used in such a way that conversion gain, rather than a very small conversion loss, is obtained, the compression point is reduced. However, the device is extremely flexible in that it can be used with differential or single-ended inputs and outputs. For detailed design and application information reference should be made to the manufacturer's literature.

Mixers and receiver design

Looking at the above notes from the viewpoint of the amateur operator, it seems fair to comment that so far only professional receivers (such as the Racal RA1772-series etc) appear to have adopted the expensive quad fet mixers; that the diode quads used by amateurs (often with rather marginal local oscillator power) have not always provided the performance of which this type of mixer is undoubtedly capable. This seems to put the SL6440 device into an attractive position, although of course the proof is in the pudding and not in the cookery book. But there seems a good chance that it should prove reasonably simple to obtain good performance without critical design optimization etc.

The dual-gate mosfet has been a popular choice for single-ended mixers, although the best jfet mixers can provide a superior noise figure (about 4dB). The vmos power fet could presumably form a very useful high-level mixer, but a practical snag would be the relatively high voltages required (24-36V). The rejection of oscillator noise sidebands and the better isolation provided by double-balanced configurations are important considerations.

On the general question of overall receiver design (direct conversion, single conversion, double and multiple conversion), Doug De Maw, W1FB, is quoted in *Electronics* as saying: "In 1970 I believed that use of the single-conversion method in hf receivers was the best route to follow, considering the technology then available, for optimizing the parameters under consideration: cost, simplicity, image rejection, blocking, imd, generation of birdies, etc . . . . I started this work to demonstrate that I could build a better receiver than I could buy . . . . Despite all that has happened since then, I am still not convinced that any other scheme offers the overall excellence

of the single-conversion method, especially with regard to achieving good dynamic range easily, even for some vhf receivers."

Although the direct-conversion approach is very attractive for simple (but usable) receivers, I would agree with W1FB that the single-conversion superhet has very much going for it, particularly since the development of low-cost ladder crystal filters.

Using the SL6270C "vogad" ic

Another recent addition to the range of Plessey communications ic devices forms the subject of a report from Richard Lambley, G8LAM. This is the gain-controlled preamplifier or "vogad" (voice-operated gain-adjustment device) type SL6270C. In practice he found it necessary to use component values significantly different from those suggested in the firm's application notes. He writes:

"Wanting to use my Trio TR2400 hand-held transceiver in the car, I decided to adapt a "Trimphone" handset by fitting a noise-cancelling microphone insert and an audio agc stage so as to overcome the rather unpleasant effects of driving the TR2400 with too much audio. For agc I used the new Plessey SL6270C. Together with its peripheral components, this fitted neatly inside the handle of the handset; power comes from the charger socket of the TR2400 (the negative or ground connection, incidentally, is to the *inner* of the charger socket). I potted the four connections to the TR2400 in a small block of epoxy resin for easy handling.

"The differential input impedance of the SL6270C is typically 300Ω, and the Plessey data sheet indicates that the microphone must be capacitance-coupled. If the amplifier is used single-ended, the unused input should be decoupled to earth.

"The components on pin 1 set the agc time-constants. Using the values suggested by the firm, I found that the agc tended to duck violently on speech peaks (these values are 47μF in parallel with 1MΩ, giving an attack-time of 20ms and a decay rate of 20dB/s). After some tests (with the help of John Wilson, G8KIS) I arrived at the values shown in Fig 17: the effect of these values is to lengthen the attack time without altering the decay rate. The circuit now shows no sign of instability. Any remaining transients are dealt with by the clipper built into the TR2400. The threshold of onset of the agc action is determined by the gain of the output amplifier: this is set by the resistance between pins 7 and 8 and should not be less than 600Ω. There is an internal 10kΩ resistor on the device chip. A capacitor in parallel should be used to set the high frequency roll-off point.

"The output level of the SL6270C is about 90mV rms and the load impedance should be 1kΩ or more. The supply voltage to the ic should be between 4·5 and 10V; it draws 5–10mA. In my arrangement, the light emitting diode acts as an "on the air" indicator; for this reason I used a diffused "wide-angle" type of l.e.d. and fitted it at a conspicuous point on the leading edge of the telephone mouthpiece."

The sporting QRP transmitter

Brian Castle, G4DYF, was one of several members of the West Kent club who were fired with enthusiasm for QRP operation as a result of trying out LA7MO's miniature SN7400/2N3053 "df" transmitter (*TT* February 1980, p157) reproduced from *Radio-REF*'s "sporting df" column. He feels that this type of miniature rig has wider applications than for local df hunts or as test generators. However, for general use he finds a number of modifications to be desirable; then, with a reasonable antenna, it has proved capable of bringing many contacts on 3·5MHz.

His modifications (Fig 18) comprise:

(1) Regulator to ensure full (5V) voltage for the 7400 ic as the original resistive feed brought this down to 4V.

(2) With the coupling capacitor to the pa (C1) as 10nF as specified, he found there were spurii; a change to 1nF improved matters with no loss of output.

(3) Coupling a long-wire antenna via 10nF to the tank circuit tended to reduce the Q to virtually nothing; he has therefore introduced low-impedance coupling to an atu. High Q is desirable in order to attenuate harmonics from the ic oscillator. With the revised circuit no harmonics were audible half-a-mile away.

(4) Similarly the tight coupling of the pa collector to the hot

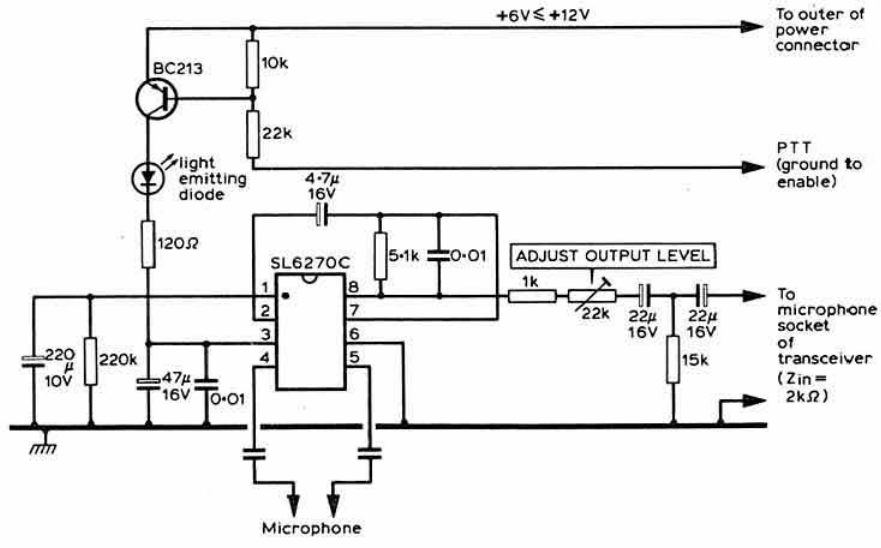


Fig 17. G8LAM's microphone amplifier/agc system suitable for use with TR2400 and many other vhf transceivers

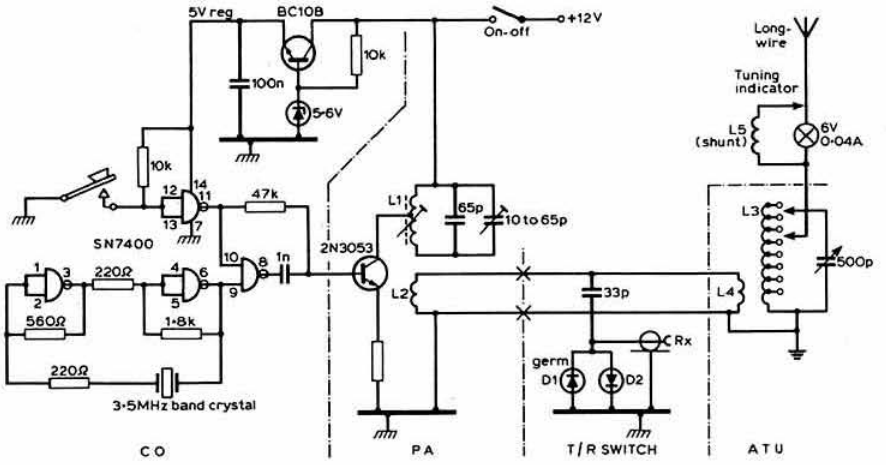


Fig 18. How G4DYF has modified LA7MO's low-power "df" transmitter into a general-purpose 3·5MHz QRP rig. L1 about 50t, 34swg on ¼in former with slug, tapped about one-fifth from cold (supply) end; L2 4t, 26swg on cold end of L1; L3 about 30t, 0·5mm pvc-insulated wire 1¼in former with tap every 5t; L4 4t, 0·5mm pvc-insulated wire on cold (earthy) end of L3; L5 about 10t 0·5mm pvc-insulated wire on ¼in former (or adjust turns to give perceptible glow in pilot lamp)

end of the tank circuit made tuning almost impossible; hence the tap about one-fifth up from the cold end.

(5) The simple atu and antenna current indicator made tuning simple and more straightforward.

(6) The transmit/receive switch makes antenna switching unnecessary, although an on/off switch in the supply line is essential so that the receiver does not hear the crystal oscillator on "receive".

The dc input to the pa is about 1·1W, providing about 0·75W rf out across a 68Ω dummy load connected in place of the atu. The preferred crystal frequency is 3·56MHz, the international QRP calling frequency. Some QRP enthusiasts, however, consider variable frequency control highly desirable, but defeats the essential simplicity of this type of rig.

Reliability and user experience

In 1976, when looking at the development of television's eng (electronic news gathering) systems in the USA, I found that the main practical worries were those concerned with the reliability of complex electronic equipment when used under the strenuous "field" conditions involved in much of today's "news"; also the difficulties involved in rapidly establishing microwave "links" from city locations in the presence of high buildings and competing eng teams (in practice most eng tends to depend more on portable "U-matic" format video tape recorders than on "live" microwave links).

From a report in *Broadcast* of the 1980 NAB broadcast convention at Las Vegas, I see that these same topics continue to worry the American broadcasters (in the UK eng has proved a headache for reasons unconnected with the technology!). Even today one sees such definitions as "the 'e' in eng stands for 'expensive'" or more plaintively "eng stands for 'electronic no-go' ", "communications are the weakest link in eng", "talkback is a long piece of wire and alligator (crocodile) clips" etc. The editorial news people are sometimes dubbed "gorillas" by the engineers for their insensitive treatment of sensitive equipment (yes, I know that is a calumny on David Attenborough's gentle gorillas!). There are still complaints about the "prodigous" technical support which can amount to "one full-time engineer to maintain every two eng units". And "lightweight" still tends to mean any piece of equipment that can just be lifted by a strong man!

ENG uses high-grade, professional electronic equipment costing many thousands of pounds. By comparison most factory-built amateur radio equipment has to be designed and constructed much closer to "consumer" standards (which is why, perhaps, one sometimes sees members' ads offering equipment "not used mobile"). Looking through the black-box advertisements one wonders what, in practice, is the "mean time between faults" and "mean time to repair" experienced in fixed and mobile operation.

In many years of operating electronics equipment, I can think of very few items of either domestic, amateur radio or professonal units that have proved to be completely free from faults over any extended period, whether based on thermionic or semiconductor devices. Nevertheless there *has* been a steady improvement in the gaps between faults, although these now tend to take longer to trace and repair. The valve had limited life, but it was usually extremely easy to trace the fault and then just plug-in the replacement.

Ten years ago the average fault-rate on domestic colour tv receivers represented about four service calls a year; that figure has steadily come down and is often now less than one per annum. There are always some "rogue" equipments that give considerable trouble (often caused by batches of defective components getting into the assembly bins, or by poor soldering of hand-assembled equipment). With semiconductors, reliability tends to follow the "bath-tub curve"—with faults most likely to occur in the first few weeks of operation, then a long period of very few faults, and then finally a steady rise in the fault-rate as components wear out.

There is a strong feeling among some service engineers that as simple component failures in domestic equipment become less frequent, those faults that do occur are becoming much more difficult (and hence expensive) to trace and repair. One, quoted in *Electronics Australia*, puts it: "Now they've done away with valves, paper capacitors and moulded mud resistors, there are no simple faults left to happen. When something does go wrong its almost bound to be a hard one!" In practice, there are still some fairly common faults: hair-line cracks in printed-circuit boards; dirty potentiometers, dirty switches etc, but these can result in that most exasperating of all faults—the intermittent fault that never occurs when the equipment is dismantled for servicing.

In recent issues *Ham Radio Report* has been endeavouring to conduct a survey among users of amateur radio equipment to discover their reaction to particular models, which factors prove the most popular, and which are disliked. A survey of a very

popular series of Japanese hf transceivers showed that some 77 per cent of the 186 owners who responded said they would buy the same model again if they had the choice; a very good recommendation. Yet 60 per cent admitted to having had problems with the equipment, and 44 per cent had had their rigs "serviced": 13·7 per cent by makers, 51·8 per cent by dealers, and 34·5 per cent by others (including self-servicing). Among the "problems" were clearly cases where owners did not like certain design features, or never got the sub-systems (such as alc, vox etc) working to their satisfaction. Out of some 90 *faults* listed, 15 represented pa valves, and four driver valves, but in general there were few faults that seem to be encountered frequently. No information was given that could enable one to relate the number of hours of operation of the equipment to the total number of faults reported. Nevertheless it does indicate that in what must be regarded as a satisfactory, reasonably reliable piece of equipment, some faults must be anticipated, and the need for servicing taken into account. There is of course also the problem that spares may not be readily available in view of the changing technology. One day we may enter an era of "throw-away electronics" to the extent that, when a fault develops, either the whole equipment or (more likely) a faulty module will be thrown away rather than repaired. But clearly we have not reached a "fit and forget" situation yet.

In my own station I note with interest that I have in *operational* use, at least some parts and components dating from each decade since 1910 with the exception, so far, of the 'eighties! Examples include a morse key dated 1914, switches from an early broadcast receiver of the 'twenties, a number of plug-in coils, capacitors etc from the 'thirties . . . . etc. Marketing men would say that such parts were over-designed as they have lasted too long!

Safe climbing on masts?

I must confess that I have never climbed a really high tree or worked high up a mast. Perhaps this is the outcome of having fallen right through a roof while attempting to fix an antenna, or a relic of the days when I used to watch with envy a famous Australian character, "Digger" Buick, G3XJ, and his gang of riggers handling with aplomb the erection of 75–100ft poles (although the story is still told of how, at that same wartime country farmyard, an all-day attempt to cut down an enormous elm tree came near to total disaster!). To some of my present IBA colleagues, of course, maintenance work on high masts is an everyday happening, and the following notes are taken from an article "Safety" by Jim Clarke, *IBA Technical Review No 6:*

"With mast heights up to 1,265ft, the problems of maintaining both the masts and the antennas can present special problems . . . The rigging and operation of mobile winches and associated lifting ropes, guide ropes and skips are skilled tasks requiring specialist training . . . This has been highlighted by the one serious accident in which a number of conditions existed, none in itself dangerous, but which together resulted in a severe leg injury . . . A problem exists with regard to safety belts and harnesses used when climbing masts. A wide range of types exists, but those more effective in preventing injury are often the more complex and restrictive of movement. A belt, though likely to cause injury to a person falling, will arrest the fall and prevent a fatality. The principle employed is that of giving climbing staff a choice of equipment and to encourage them to use a harness, rather than a simple belt."

I was reminded of the above advice to professional climbers by receiving a letter from Dave Hogg, G4CAF. He writes:

"Having a homebrew self-supporting antenna tower of welded scaffold pole and gas pipe construction (it does not 'tilt over'!) means working aloft on antenna maintenance. This is a precarious business without a pole belt of the Post Office variety, but these appear to be unobtainable on the surplus market.

"I think readers may be interested to know that one can be made for under £10 using rock-climbing equipment. I have made one using a belay belt with a D-ring, looping an extra D-ring on the other side. Then tying 1in nylon webbing (3m) from one ring, around the *back* of the belt, tying to the other ring, leaving about 1·5m free—the end of which is tied to a locking carabiner. This is then used in Post Office fashion: around the tower and clipping the carabiner onto the first D ring, thus leaving both hands free to work. Figure-eight knots must be used with the webbing to stop possible knot slippage.

"The above arrangement makes working aloft on antennas an easier, quicker and far safer operation than hanging on with one hand and praying!"

To which I can add only "rather you than me"—but certainly for those who do climb, a suitable belt or harness is strongly to be recommended.

Low drop-out voltage regulator

A number of techniques have been described in *TT* that reduce the minimum voltage drop across voltage regulators, a factor that can decrease power waste with battery operation and that can also raise, for example, the regulated voltage supply line available in mobile equipment to a figure much closer to the minimum battery voltage.

In *Electronics* (24 April 1980), Thomas Valone and Kelvin Smith describe a further arrangement which includes short-circuit protection and which provides a regulated output with an exceptional small voltage differential between input and output voltages, particularly at low current. The differential can amount to less than 12mV for a supply providing 5V at 10mA (ie the input voltage need be only 5·012V); at higher currents the differential is still small compared with most other arrangements: 350mV at 0·5A, 650mV at 0·75A and 1V at 1A.

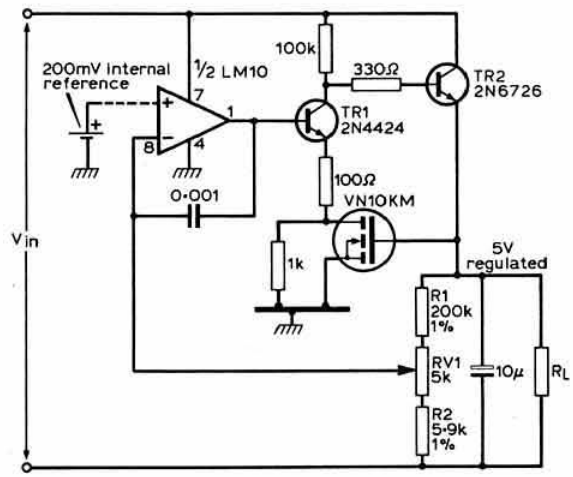


Fig 19. A protected regulator that can deliver 10mA at 5V with an input of only 5·012V and up to 1A with 6V input. A vmos fet provides short-circuit protection *Electronics*

The system is shown in Fig 19 and it should be noted that the 2N6726 transistor has an unusually large junction area that permits a lower emitter-to-collector voltage drop than most other devices, including Darlington arrangements. Physically this is a small transistor but it can safely dissipate 1W without a heat sink.

The short-circuit protection is also interesting as it uses a VN10KM vmos power fet which normally offers a resistance of less than 10Ω to the emitter circuit of the 2N4424 drive transistor. However, if the output current is excessive the drain-to-source resistance rises, so shutting down the 2N6726 series regulator. This characteristic can also be used to advantage in adjustable current limiters where the trip point is set by the input voltage, a method claimed by the writers as more effective than any transistor foldback technique.

Operation is described as follows: "The LM10CH reference amplifier compares the voltage set by potentiometer RV1 to its internal 200mV reference and through TR1 acts to minimize voltage differences at the input to the amplifier. With suitable selection of the component values in the divider network R1, (RV1), R2, the circuit will regulate over any voltage from 1 to 40V. The op-amp half of the LM10CH is available for other uses".

It is stated that load regulation is to within 0·3 per cent for the range 0–100mA, and to within 1 per cent for the range 100mA to 1A. Idle current of the regulator is only about 320μA.

Droitwich 200kHz standards

In *TT* July 1977, Harry Bradshaw, G3VTJ, reported some of his experiments in using simple Droitwich receivers with or without a phase-locked loop oscillator. Subsequently others claimed that an ic limiter cannot remove all of the phase modulation on the carrier, and that for the most demanding requirements a crystal filter is necessary. The most recent such design, that by N. D. N. Belham, G2BKO (*Radio Communication* April 1980, pp368–71) uses a two-crystal 200kHz filter; a fairly costly approach unless one has suitable crystals available.

Despite all that has been written to the contrary, G3VTJ remains convinced that, with the pll system, crystal filtering is a waste of effort. If a crystal is to be used, he considers it would be better employed as the basic frequency element for the voltage-controlled oscillator. In support of this view he enclosed a copy of a letter he received from J. L. Eaton, of BBC Research at Kingswood Warren, describing the system developed by the BBC as follows (my italics):

"In our system we use off-air (200kHz) signals for phase comparison, and this necessitated the development of a special receiver for this purpose.

"We use a straight receiver with an input 200kHz bandpass filter. This filter has a 7kHz bandpass characteristics. The incoming 200kHz waveform is amplified and heavily limited before being used to phase-lock a 2MHz voltage-controlled crystal oscillator. The crystal oscillator output is divided by 10 to provide a 200kHz input to the comparator section of an RCA4046 phase-locked ic. The time constant of the pll circuit has been *made long so that it has a relatively small response to incidental phase modulation,* which can occur in the transmitter output at high modulation levels.

"The 200kHz phase-locked signal is finally filtered to provide a sine wave output from the receiver. This arrangement gives a stable waveform in which the phase jitter, due to variations in the phase at high modulation levels, is less than 1°.

"We did endeavour to improve the receiver by using a narrow band crystal filter to remove modulation, but we found this did not provide a noticeable improvement in phase stability."

G3VTJ notes that the BBC design is basically similar (except for the use of more recent components) to the design published a few years ago in the RSGB publication *Test Equipment for the Radio Amateur.*

Sunspot puzzles

Two items noticed in *Nature* raise interesting questions. In the first place, Christopher Cullen has put on record his doubts about the so-called "Maunder Minimum"—the theory that there was a virtual suspension of sunspot activity during the 70 years 1645 and 1715AD. Belief in the Maunder Minimum has played an important role in much recent speculation about future sunspot cycles. It arose partly from a study of East Asian (mostly Chinese) naked-eye sunspot records that were kept over many centuries. These records have been held to indicate a considerable "gap" in the sunspot cycles in a period just before regular observations began in Europe. However, Christopher Cullen claims that examination of other Asian sources "suggest solar activity can be seen to have continued unabated during the entire 17th century". He believes that the Maunder Minimum may not have existed in fact but that the records on which it is based may simply reflect a period of political chaos and simple incompetence. He considers that we should suspend judgment for the time being on the Maunder Minimum.

On the other hand, there now appears to be new evidence concerning the long-sought-after connection between solar activity and terrestrial weather patterns. Two scientists, Nastrom and Belmont (*J. geophys Res* 85 C1, 443, 1980) have discovered a correlation between the 11-year solar cycle (or "half-cycle" if you now accept the 22-year cycle) and the upper troposphere and lower stratosphere. Winter records for the period 1949 to 1973, it is claimed, show that the average position and, to a lesser extent, the strength of the jet stream and the intensity of features such as the Siberian upper level trough, have a strong relation with solar activity.

Vehicles, interference and mobile tips

Two items contribute to the continuing saga of interference "to and from" vehicle electrics and electronics. Richard Lambley, G8LAM, comments on the inductively-wound ignition cable sets (see *TT* January 1979, p31) that are gradually becoming more widely available. He notes that the manufacturers of "Sparkrite" electronic ignition units are now distributing cable sets using helically-wound resistance wire. These are available, in his experience, from quite a number of motor accessory shops (including some branches of Halfords) at around £5 per set for a wide variety of British and European cars. G8LAM tried a set in his wife's Chevette and reports: "the improvement over the resistive cable fitted by the manufacturer was fairly dramatic." The earlier notes made it clear that inductive cables (Fig 20) are not necessarily the answer to all interference problems, but they do seem to be effective at vhf.

P. N. Harlow, G8JQK, encountered the reverse type of problem on his Triumph Bonneville motorcycle fitted with a Lucas "Rita" ignition system. His 144MHz rig delivers 15W fm, and he sometimes (intermittently) experienced very erratic ignition timing during transmission. He believes this is due to intermittent rectification of the rf by the "bullet" connectors which are exposed to the elements and tend to corrode after a

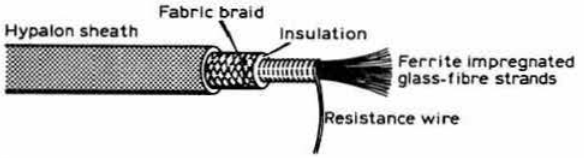


Fig 20. Construction of one form of inductive ignition cable. The core is finer and contains more strands than can be shown in this drawing *Electronics Australia*

time. He has effected a complete cure by replacing these connectors with soldered joints on the lines to the magnetic ignition sensor, and decoupling these lines to chassis ("ground") with 100pF capacitors. He also mentions that Lucas produce a special ignition amplifier for use on machines fitted with radio equipment.

Panel lights on some of the 12V mobile rigs have a rather short life-expectancy. K7QWR in *QST* suggests adding a series resistor of adequate rating to reduce potential across the lamps to about 8V. This provides sufficient illumination and extends the life of the lamps very considerably. Replacing panel lights on some equipment can require major dismantling of the rig.

Technical miscellany

A problem that faces modern-day constructors is the susceptibility of some semiconductor devices, particularly of the mosfet and cmos variety, to damage and destruction by stray electrostatic potentials, including body static, antenna static, soldering iron leakage and the like. This susceptibility is most pronounced when handling the devices out of circuit where protection is provided by controlled leakage to earth. The US Electronic Industries Association has introduced a new symbol and "warning message". The symbol consists of a hand in a triangle with a bar through it, and this will be shown, wherever possible, on the device itself. The warning message "Attention—Observe precautions for handling electrostatic sensitive devices" will be printed on the final level of packaging.

W7YKN (*QST*, "Hinks and Kinks") recommends bottle corks fitted with thin fixing screws as a means of mounting toroid cores on to circuit boards etc. A razor-cut notch in the sides of the cork will be needed if there are dividers fitted on the toroid.

Professor Gery Felser, OE1RFB/VK2ZGF, mentions that the useful 144MHz bandpass tvi filter (*TT* February 1980) was originally constructed and described by K. Maiwald, DJ4KH, *UKW Berichte* (the German Language edition of *VHF Communications*) in the Sonderheft II, September 1969. He notes that the Tronser capacitors, as recommended in the original versions, are very expensive but that he has had very good results with ordinary compression trimmers costing a fraction of the Tronser components.

Jacob Schanker, W2TSM, recommends in *QST* wrapping self-adhesive Teflon tape around antenna beam elements and quad spreaders in climates were there is any danger of ice build-up on the beams: weight of such ice can bring down even well-designed beams. On a non-stick Teflon surface the water "beads up" and the droplets fall off before they turn to ice. This type of tape is very light and stretches, and can be wound "mummy fashion" on the elements. He notes: "Teflon tape is expensive but a lot cheaper than a new antenna." It is not known if similar tape is available in the UK, but W2TSM gives the American suppliers as Connecticut Hard Rubber Co, 407 East Street, New Haven, Connecticut 06509, USA, and the product (1in tape in reels 18yd long) as Temp R Tape, type T.

In the nostalgic world of "vintage" radio, the wartime hf receivers made by Lorentz and Telefunken for the German services are outstanding. For example, the Lorentz Lo6K39 "straight" receiver with six ganged-tuned signal-frequency circuits and weighing some 65kg may well have been the best receiver of this type ever produced in quantity. Jan Martin Noeding, LA8AK, noticed a recent write-up on this receiver in the Dutch *Electron* (it had also caught my eye!) and sent along the circuit diagram and basic details. It so happened that in 1945 I was able to use "on air" some of the German military equipments, and well remember a tunable hf transceiver with "straight" receiver. I still recall the excellent calibration (that enabled one to use the rig on hf circuits normally using crystals), the good clear dials and ingenious resetting mechanisms, the beautifully-made coil turrets, etc, that were such outstanding features of many of these equipments. But, my goodness, the man-hours that must have gone into their production! By comparison most British and American Services equipment seemed just thrown together.

J. H. Cant, G6FU, was interested in the mention of the "Goyder Lock" as popularized by the late Cecil Goyder (*TT* April). As some of the G6FU QSL cards in the Wireless Museum on the Isle of Wight show, in 1934 he was himself using a crystal-stablized tptg oscillator using a slightly different technique (*T&R Bulletin* February 1934 "Unorthodox Crystal Control"). In checking this, I also found a note that year under the title "Technical Topics" (sic) an invitation to members to contribute "the most logical and least bigoted" contributions on "The advantages and disadvantages of a locked oscillator for the final stage, as compared with the properly neutralized power amplifier". He also recalls his own 0-V-1 that had no ht battery but could give "loudspeaker" reception! □

BOOK REVIEWS

Out of Thin Air, published by IPC Magazines Ltd. 80 pages, 290 by 215mm, paperback. Cover price £1.25.

This book contains 22 articles of varying length covering the field of antennas from dc ["A simple field telephone system"] to 144MHz. The authors include F. Judd, J. R. Green, F. G. Rayer, R. A. Ham and C. Molloy. A number of the articles have appeared in *Practical Wireless*.

There appears to be a gap in the coverage of this book lying between 1·8 and 144MHz. There is material on medium wave/longwave loop antennas and antennas for 1·8MHz, but coverage of the amateur bands between 3·5 and 28MHz is almost non-existent. There is very good coverage of 144MHz antennas, together with material covering such items as swr bridges and other accessories.

Presentation of the text and diagrams is clear. For those who have not previously seen the contents elsewhere the book is considered to represent good value at its cover price.

Two-metre Antenna Handbook by F. C. Judd, G2BCX. Published by Newnes Technical Books; paper covers, 185 × 120mm, 157 pages. Price £3.95.

As the title indicates, this new book concentrates on antennas for the 144MHz band. However, by suitable scaling the design can be adapted for higher or lower frequency allocations. Chapter headings are: *Wave Propagation and Fundamentals; Omni-directional Antennas; Directional Antennas; Matching and Feed Cables* and *Antennas Performance*. With the exception of Chapter 1, of 24 pages, the book is essentially a practical approach. Within the limited number of pages mechanical details of a number of 144MHz antennas are given. Photographs and diagrams are of good quality and the text is easy to read. *G2BVN*

EQUIPMENT REVIEW

Wood & Douglas 384MHz MD05T microwave driver source and MD10PA power amplifier kits

by HUGH D. GRIFFITHS, G4CNV*

Introduction

One of the features of microwave band planning is that all the bands are related to a common frequency of 1,152MHz, so an exciter for this frequency represents a very versatile piece of equipment. It is therefore pleasing to be able to review a kit for a driver source and power amplifier which deliver 0·5W and 10W respectively at 384MHz to be multiplied to the microwave bands. The kits are produced by Wood & Douglas (G4EEE, G8DCA and G8MGC), who also make a number of other useful vhf, uhf and microwave products.

Description of kits, construction

Fig 1 shows a block diagram of the units, and details of the modulation facilities of the driver board.

The kits proved very straightforward to construct, with the assistance of well laid-out instructions and diagrams. (In fact the pa kit was assembled very competently by the reviewer's brother, who has limited experience of electronics.) Good-quality components are used throughout, and with a little care the boards can be assembled to a high standard.

*Beggars' Roost, Plaisters Lane, Sutton Poyntz, Weymouth, Dorset DT3 6LQ.

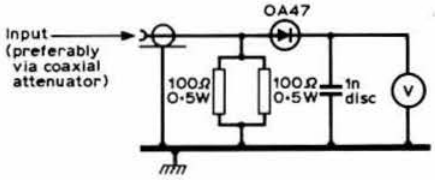


Fig 2. Simple diode detector and power meter

$$p = \frac{(v+0{\cdot}2)^2}{100} W$$

The boards measure 108 by 46mm (driver) and 70 by 28mm (pa), and as can be seen from the photograph there is a minimum of wasted board space. The prices (including VAT) of the units at the time of writing (November 1979) are: £19.25 (kit), £28.35 (assembled and aligned) for the driver; and £20.90 (kit) and £28.35 (assembled and aligned) for the pa.

Alignment

The alignment instructions assume familiarity with vhf/uhf circuits, and it is desirable to have access to the appropriate test equipment to get the best performance from the units. However, acceptable results can be obtained with a minimum of test equipment as long as sensible procedures are followed.

Alignment was initially carried out using simple techniques, literally on the kitchen table. A dummy load/power meter consisting of a 50Ω resistor and detector diode (Fig 2) was employed. The alignment of the driver board was generally straightforward, although trouble was experienced with the crystal oscillator which could be made to oscillate on frequencies other than that of the crystal. The manufacturers have since incorporated a modification to the design as a result of this, which improves matters considerably.

The output was examined on a spectrum analyzer (HP 8565A), and minor adjustments made to improve the spectral purity of the output from the driver board, which reduced the level of harmonics and sub-harmonics relative to the 384MHz output from about −25 to −30dB.

Tests and performance

Perhaps the most important test of a microwave driver source is the stability of its signal—random fluctuations in phase and amplitude of the signal give rise to noise modulation of the carrier (just as with coherent phase and amplitude modulation), which produce noise sidebands on either side of the carrier. Amplitude modulation noise sidebands are usually only significant when close to the carrier. Phase noise generally extends much wider and, as well as giving a less-than-perfect cw note, will degrade receiver mixer performance if severe, and if the i.f.

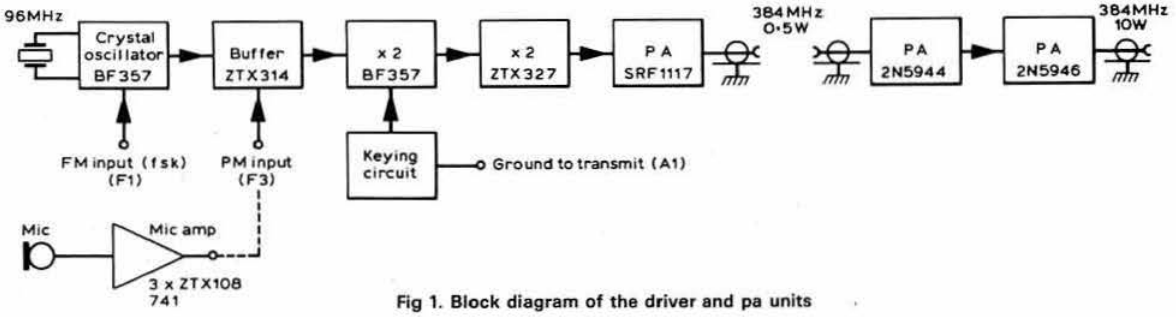
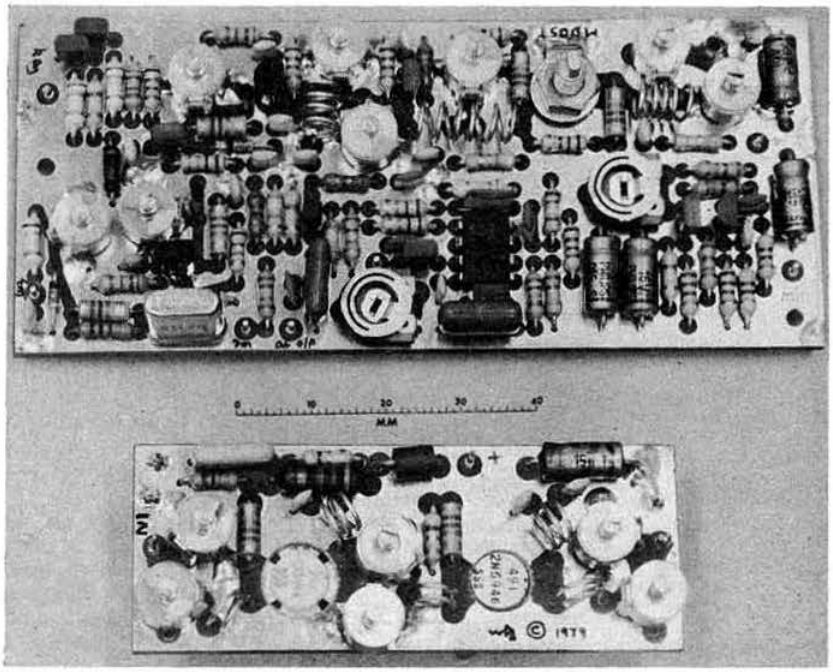


Fig 1. Block diagram of the driver and pa units



The 0·5W 384MHz microwave driver source (top) and the 10W 384MHz pa below

is not high enough. Quantitatively, sideband noise is described by a ratio between sideband noise power in a given bandwidth to carrier power, at a particular frequency from the carrier.

Fig 3 shows the level of the noise sidebands on the signal multiplied to 10,368MHz by a step-recovery diode multiplier. While the level of sideband noise is slightly worse than a number of other 10GHz sources examined, this is not likely to give problems in the majority of applications.

The cw note at 10GHz is not quite as stable as the best crystal-controlled signals that the reviewer has heard; this reflects the problems experienced with the crystal oscillator. The keying is quite clean, without noticeable chirp.

The phase modulation was checked in a similar fashion, and clean, clear modulation was obtained on the 10GHz signal, both at low deviation in the 10kHz bandwidth of a crystal-controlled receiver, and at high deviation in the 200kHz bandwidth of a receiver with Gunn diode local oscillator.

Figs 4 and 5 show the spectra of the driver and pa respectively. While harmonics and sub-harmonics are at a relatively high level with respect to the wanted signal (about −30dB) in the output from the driver board, the selectivity of the pa provides a substantial improvement, leaving only harmonics of 384MHz visible; all better than −35dB with respect to the fundamental.

The results of some further tests on the unit are detailed in Table 1.

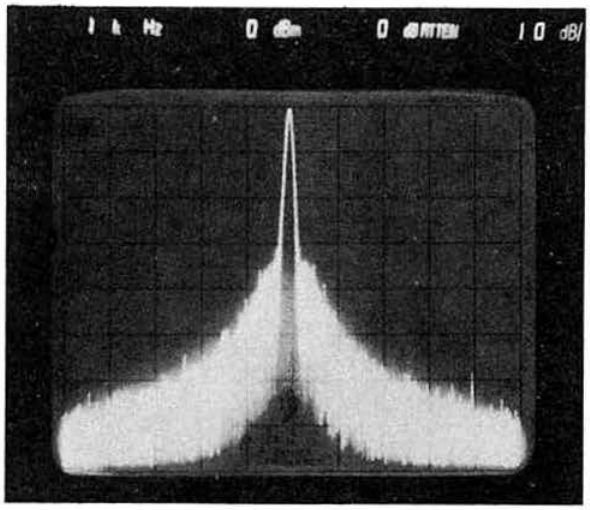


Fig 3. Sideband noise on output of driver board multiplied to 10GHz
Horizontal: centre frequency = 10,368·0MHz, 10kHz/div
Vertical: top of screen = 0dBm, 10dB/div
Analyzer bandwidth = 1kHz

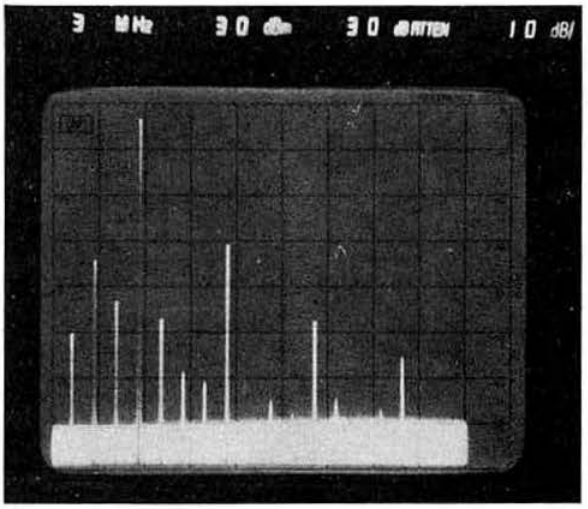


Fig 4. Spectrum of driver source
Horizontal: 0–1·8GHz, 200MHz/div
Vertical: top of screen = +30dBm, 10dB/div
Analyzer bandwidth = 3MHz

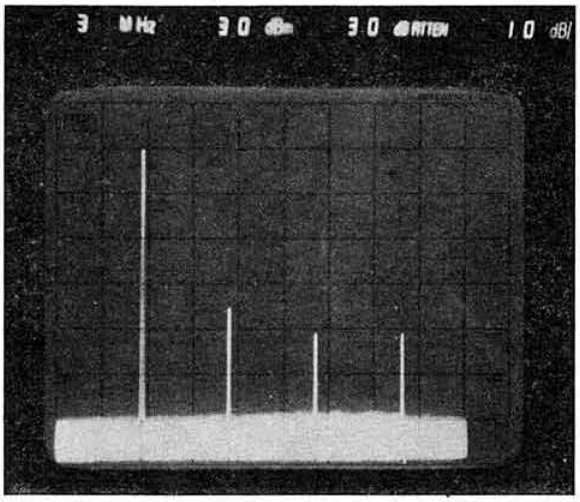


Fig 5. Spectrum of driver source + pa
Horizontal: 0-1·8GHz, 200MHz/div
Vertical: top of screen = +50dBm, 10dB/div
Analyzer bandwidth = 3MHz

Applications and conclusions

The boards were used in two typical applications to demonstrate the usefulness of this type of source. In the first the 10W were tripled using a BXY35A tripler [1], which gave just over 5W output at 1,152MHz, with all other products <-35dB (Fig 6). This is eminently suitable for use in the G3LTF/G3WDG high-level 1·3GHz transmit mixer [2], or for multiplication to the higher bands, though the point must be made that the cascading of varactor multipliers without isolation between them is likely to lead to stability problems.

In the second application the bare driver board was used to drive a BXY41E step-recovery diode multiplier [3, 4] to

Table 1. Test results

DRIVER

Input power	125mA @ 12V
Sensitivity of frequency to supply volts	<400Hz @ 384MHz, 10-15V

POWER AMPLIFIER

Input power	1·43A @ 12V = 17·2W i/p
Efficiency	65% ±5% (did not vary substantially with supply voltage)
Gain	13·5dB ±0·5dB

Supply volts	Driver output (mW into 50Ω)	Driver + pa output (W into 50Ω)
10	265	7·2
11	420	9·5
12	520	11·6
13	615	13·4
14	705	15·8
15	800	17·3

(Power output measured on HP435A power meter: all results ±5%)

10,368MHz, and the output filtered with a G3JVL filter [5]. Over 1mW of output was obtained, with all other products reduced to <-70dBm by the filter (Fig 7).

If a 94·666MHz crystal is used instead of a 96MHz one, the same system can be used as a local oscillator in the G3JVL 10GHz transverter [4]. Due to demand for crystals for this frequency, the manufacturers will be able to supply either frequency on request.

In conclusion, the only criticisms that the reviewer has of the boards is that the levels of harmonics and sub-harmonics in the output of the driver board are somewhat high, as is the sideband noise on the signal. Also, the crystal oscillator is not particularly stable, and may prove difficult for the inexperienced constructor to adjust correctly.

The importance of the harmonic/sub-harmonic content in the spectrum of the output depends a lot on the application,

(continued on page 655)

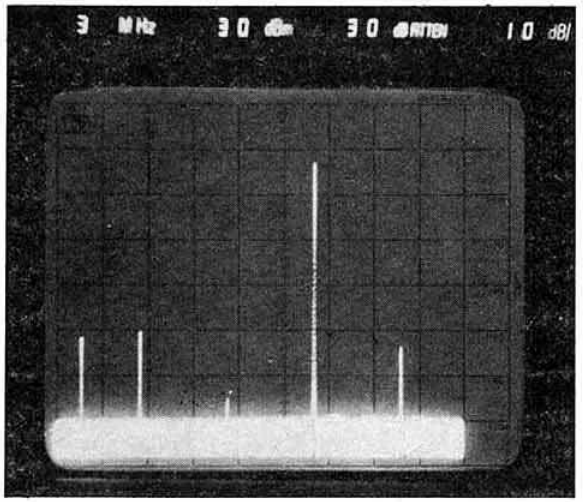


Fig 6. Spectrum of driver source + pa + 1,152MHz tripler
Horizontal: 0-1·8GHz, 200MHz/div
Vertical: top of screen = +50dBm, 10dB/div
Analyzer bandwidth = 3MHz

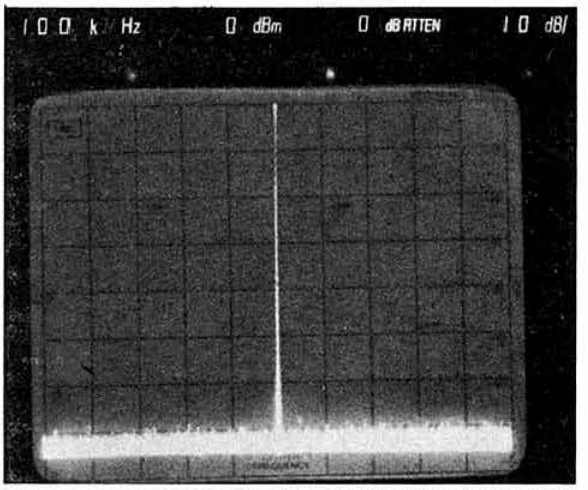


Fig 7. Spectrum of driver source + BXY41 10GHz step-recovery diode multiplier + G3JVL bandpass filter.
Horizontal: 9·4-11·4GHz, 200MHz/div
Vertical: top of screen = 0dBm, 10dB/div
Analyzer bandwidth = 100kHz

microwaves

Charles Suckling, G3WDG *

Using rf preamps on 1·3GHz

The days are long gone since preamps were considered exotic on 1·3GHz, and there is no reason why all stations active or listening on this band should not improve their receivers by using preamps. This is particularly true now, as a number of rf preamps are being offered by *Radio Communication* advertisers, as well as there being various designs available for homebrew (see *VHF/UHF Manual)*. However, simply connecting a preamp to a converter will not result in ultimate performance, as will be shown below.

Before building or buying a preamp, one can determine what gain is likely to be obtained by its use. Unfortunately the receiver's sensitivity is not determined by the noise figure of the preamp alone, since there is always a noise contribution from the rest of the receiver. The level of this depends on the gain of the preamp and the overall noise figure of the subsequent stages, and will be greater if the preamp has a low gain or the rest of the receiver has a high noise figure. This is shown graphically in Fig 1, where the overall noise figure of the preamp + receiver is plotted as a function of the gain of the preamp and the noise figure of the second stage (eg the mixer), for three typical preamps, with 2, 4 and 6dB noise figures. For example, it might be proposed to use a 2dB noise figure preamp with, say, 12dB gain, in conjunction with a mediocre converter with a 12dB noise figure. From Fig 1(a) it can be seen that an overall nf of about 4dB would be obtained, which would be a disappointing result with a relatively expensive preamp. In this case the answer would be to insert a second preamp of average performance (eg 8dB gain, 4dB noise figure) between the low-noise preamp and the converter. This preamp would then reduce the second-stage noise figure from 12dB to 7dB (Fig 1(b)); the overall nf would then be 2·6dB (Fig 1(a)), a much better result.

The majority of converters and preamps in use have considerable image responses. This means that the preamp generates noise at the image frequency, which is mixed down to the i.f. by the converter, thus worsening the signal-to-noise ratio. In the worst case, when image and signal response are equal, the receiver can lose 3dB of sensitivity. This problem can be cured by placing a suitable filter *between* the preamp(s) and the converter. This filter needs to be fairly low-loss, otherwise the resulting reduction in premixer gain may increase the mixer's contribution to the overall noise figure by an unacceptable degree. A very simple filter has been used by the writer for some years for this purpose, and consists of a shortened $\lambda/4$ line, tuned by a 2BA screw, with capacitive input/output coupling using two bnc sockets (Fig 2). The square outer conductor was fabricated by bending a piece of copper sheet. In use the filter is connected between the converter and the last preamp stage, using the same cables as will be used in practice. With a 144MHz i.f. converter the filter provides over 35dB of image rejection. The bnc sockets are moved in and out, while keeping the filter on resonance by adjusting the 2BA screw for best signal-to-noise ratio on a received signal, final adjustment

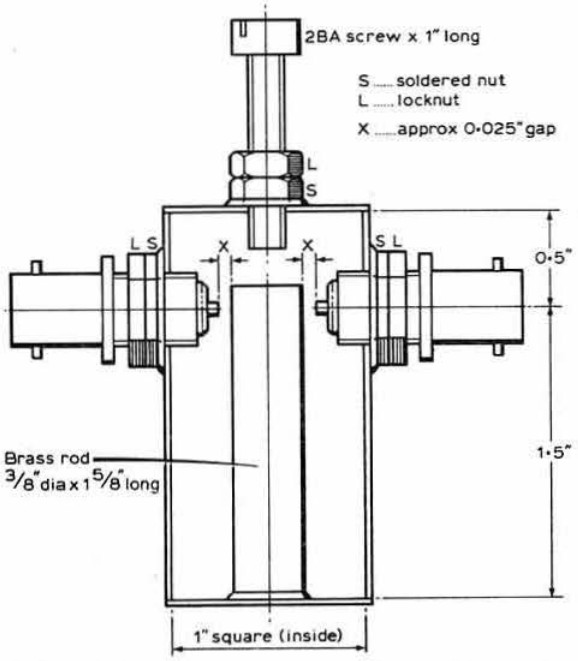


Fig 2: A 1·3GHz filter suitable for the rejection of image noise

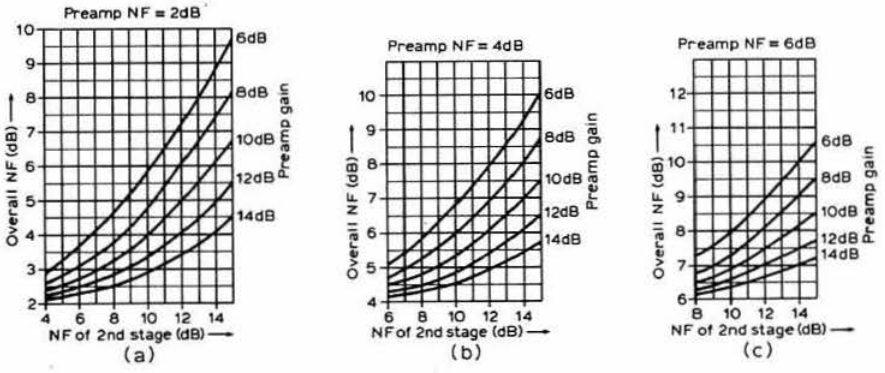


Fig 1. Graphs showing overall receiver noise figure as a function of second stage noise figure and preamp for (a) a 2dB nf preamp, (b) a 4dB nf preamp, and (c) a 6dB nf preamp

*31 Oakwood Road; Chandler's Ford, Hants SO5 1LW.

is best done with an automatic noise figure optimization aid, such as the G4COM device referred to recently in *Microwaves*.

It should be recalled that feeder losses ahead of the preamp will worsen the noise figure. For example, a 3dB loss ahead of a 2·5dB noise figure preamp will give an overall noise figure of 5·5dB. Thus in most cases there will be a great benefit in mounting the preamp(s) at the masthead, where feeder losses are at a minimum.

1·3GHz eme progress

The first half of the ARRL International EME Contest in April provided a focus for a good deal of eme activity on 1·3GHz, with a number of new stations participating. VK5MC, who has provided the most difficult continent (Oceania) for many stations' WAC on 432MHz, made his second contact via 1·3GHz eme, during the contest period, with VE7BBG. Reports exchanged were 529/429, with VE7BBG reporting that VK5MC's signals were peaking a good 10dB out of the noise (500Hz bandwidth); a substantial eme signal by any standard! VE7BBG also contacted PA0SSB and heard LX1DB.

Stations known to be listening on 1·3GHz during the contest were G3LTF and G3WDG/G3YGF. The latter group took the opportunity to test a new gasfet preamplifier, using a Plessey GAT6 device, which is achieving a 0·9dB overall noise figure (2dB second-stage nf). The improvement in noise figure in going from the old 2dB nf preamp to the gasfet was very noticeable in practice—sun noise increased by 4 to 5dB to about 18dB. Unfortunately the writer dropped the preamp 4ft onto solid concrete after the sun noise checks, resulting in a damaged input circuit and a 3dB noise figure! Nevertheless, even with the preamplifier in this state good signals were received later from PA0SSB, VE7BBG and LX1DB. G3LTF reports signals being considerably weaker than expected, and has found since that his dish is at least 4dB low in gain on 1·3GHz due to distortion of its profile following recent storm damage.

Most stations active or listening on 1·3GHz eme are using 20ft diameter dishes. This size represents a reasonable practical maximum for 1·3GHz, mainly since a larger dish (with a narrower beam) would be very difficult to point sufficiently accurately, or to keep on heading during windy weather. This problem is particularly acute while checking for one's own echoes, since any loss due to pointing error counts on both transmit *and* receive! Also, a larger dish would be more difficult to build sufficiently accurately, since surface tolerances are beginning to become quite significant at 1·3GHz. For optimum gain the reflecting surface should be within 1in on 1·3GHz, and any large departures from this will result in low gain. A poorly-made 30ft dish could easily have less gain than a well-made 20ft dish.

The reflecting material used to cover the dish also needs to be chosen carefully. Most 1·3GHz antennas are covered with 0·5in chickenwire, which has a very low feedthrough loss at 1·3GHz, and is certainly usable at 2·3GHz. Some stations have tried larger mesh material (eg 2in), but have found significant leakage, resulting in low gain and increased pickup of ground noise.

The increasing interest in 1·3GHz eme probably stems from the fact that for a given size of antenna, power output and receiver noise figure, signals should be nearly 10dB stronger on 1·3GHz than on 432MHz, due to the higher antenna gains. With the increasing availability of gasfets it is now possible to achieve very low noise figures on 1·3GHz, leaving the generation of transmit power as the main limitation. However, it is possible with several designs of 2C39-based pas to get within 3 to 4dB of the levels employed on 432MHz, giving 1·3GHz a significant advantage. At the time of writing, your scribe was busy completing a 1·3GHz pa in readiness for the May tests!

1·3GHz activity from Hereford

G4ASR writes that he has been active for about two years from Hereford on 1·3GHz, and that despite his relatively simple equipment, and severe site limitations, results have been very encouraging. Most contacts to date have been on cw, using a varactor tripler, a Microwave Modules converter with a stripline "Birkett" transistor amplifier, and a G3JVL loop-Yagi at 40ft agl. SSB operation has only been possible recently, following the construction of a "processed" ssb generator, in which the 28MHz ssb drive signal is divided by three, transverted to 432MHz and then tripled to 1·3GHz.

To date, contacts have been made with G, GW, PA0 and DL, the best dx being DK0VL near the Swiss border (EH11h) at 900km, on 1 March. G4ASR also regularly monitors the GB3CLE, GB3BPO and GB3IOW beacons, average levels being S9+ for GB3CLE and S2 for GB3BPO and GB3IOW.

Comparing 10GHz wideband and narrowband equipment performance

The popularity of 10GHz narrowband operation is growing rapidly in the UK due mainly to the better performance of such equipment. The assumption that twts and gasfets are necessary for narrowband is only true for tropospheric scatter or other such exotic modes of propagation. For the amateur without such facilities, results on narrowband will still be better than on wideband, as the discussion below will show. The price for better performance is of course the increased complexity of narrowband equipment, and the stage has not been reached where narrowband can be considered suitable for the beginner on 10GHz. Prior experience with wideband equipment is essential; in addition components of the wideband system will be needed as test equipment during the setting-up of the narrowband equipment.

The basic reason for the superior performance of narrowband equipment is that it uses much narrower receiver bandwidths. The advantage to be gained in going from 250kHz bandwidth to 2·5kHz (ssb) is +20dB, and to 500Hz (cw) is +27dB. Much practical work has shown that, contrary to popular belief, one really can operate with such narrow receiver bandwidths, even using non-ovened crystal oscillators (provided that they are well designed). Thus the reduction in bandwidth does really pay off. Furthermore, in the case of weak signals, going from fm to such non-threshold modes as cw and ssb yields a further 10dB gain, giving ssb an overall 30dB superiority to wideband fm, and cw a 37dB superiority. All this of course assumes that equal rf power outputs will be used on wide and narrowband, which will not generally be the case. For ssb, when transverting using a G3JVL mixer, 1mW p.e.p. is achievable, compared to, say, 20mW for a typical wideband Gunn transmitter. With cw, direct multiplication will give out 5mW. Thus, taking into account the lower power levels on narrowband, ssb will still have a 17dB advantage and cw a 31dB advantage over wideband fm.

These improvements in equipment performance do in fact make quite a difference to the types of path which can be worked. While on wideband it is very difficult to work even a

one-obstruction path, such paths become almost routine on narrowband. Obviously, there are a great many more one-obstruction paths available than line-of-sight paths! Also, if a high power station is available at the other end, then signals should be receivable via tropospheric scatter up to 250km or so, even without the use of preamplifiers. Such paths only require a low-angle horizon (ideally better than 1°) at both ends of the path, but do not depend otherwise on the intervening terrain. The availability of such paths is virtually limitless.

As an example of how well narrowband equipment can perform in the field, G3WDG/P (5km N Towcester) recently had several contacts with G3YGF/A at Oxford over a 50km obstructed path. The equipment in use for these tests consisted of G3JVL mixers on receive, 5mW transmitters, a 20dB horn at G3YGF/A and a 25dB horn at G3WDG/P. Signals on cw were Q5 copy at 3dB s/n in a 2·5kHz bandwidth. G3YGF/A's ssb at 10mW p.e.p. was also copied. When G3YGF tried his 15W twt, very strong ssb signals were received, even with no antenna at G3WDG/P!

Microwave expedition

An expedition carrying microwave equipment is being organized by the Telford & D ARS. The callsigns in use will be G8VZT/P, G3ZME/P and G3UKV/P, and the operating schedule will be as follows: 24/25 July Cornwall (XK square), 26/27 July Devon (XL), 28/29 July Somerset or Avon (YL). Equipment is being taken for 1,296·2MHz (cw/ssb) and 10,050MHz (wideband fm), and talkback will be via 144·2MHz ssb. Skeds may be made during the expedition via 144MHz, or beforehand by writing, including an sae, to G3UKV, QTHR.

Winchester round table meeting

Due to the unfortunate late publication of the May issue of *Radio Communication,* many people were not aware of the May round table meeting at Winchester. In future, every effort will be made to give meetings better publicity.

The main discussion topic was 10GHz narrow-band techniques; quite a few sets of equipment were brought, and much time was spent testing and aligning the equipment, using the wide range of test equipment which has become a regular feature of round table meetings. A two-way ssb link was demonstrated, and after the meeting a number of people joined G3YGF and G4CNV for an "in the field" demonstration of 10GHz narrowband, when signals were received from G3JVL (Hayling Island) from just outside the IBA headquarters site.

Most agreed that, although the meeting had been rather smaller than usual, it had been very worthwhile.

Microwave awards

A number of stations now hold certificates for the new Microwave QTH Squares Award. An updated listing of current awards is given below. G5UM, the vhf awards manager, will be pleased to send details and application forms to any stations wishing to claim these awards.

1·3/5: 1, G8MWR; 2, G4FRE.
1·3/10: 1, G8LEF; 2, G3XDY.
1·3/15: 1, G3XDY/P.
1·3/25: 1, G4BEL.
2·3/5: 1, G4BYV.
10/5: 1, G8GKV/P; 2, G8BDJ/P; 3, G3KSU/P; 4, G3JHM/P; 5, G8PMT/P; 6, G4CNV/P; 7, GW3YGF/P; 8, G3ZME/P; 9, F6DLA/P; 10, BRS40670/P.

First QTH Squares Award for 2·3GHz

To G4BYV of Norfolk goes the distinction of earning the first QTH Squares Microwave Award for 2·3GHz. The award was a retrospective one—he had already worked five squares when the award was introduced.

All the G4BYV equipment for 2·3GHz is homebuilt. The transmitter consists of a 2C39A mixer (144 +2,160MHz) feeding a 2C39A pa at 42W input. The 2,160MHz local oscillator drive is obtained by varactor multiplication from 360MHz (two stages ×3 and ×2). Details of his receiver and antenna system were given recently in *Microwaves.* We hope that his claim for a 10 Squares Award will not be too long in coming.

Late news

1·3GHz eme activity was high in the second half of the ARRL EME Contest in May. The Oxford University group made their first contact on 1·3GHz eme during the contest, with LX1DB, as well as hearing their own echoes. More details next month.

The first activity period in the 1980 10GHz Cumulative Contest was also very successful, with near-perfect weather conditions bringing out a record number of stations. A number of stations were operating with output powers of 1W or more, resulting in a number of non-optical paths being covered. The half-points for one-way contacts rule seems to have encouraged this, as it allows everyone to benefit from some stations running high power. Narrowband activity was also at record levels, and many two-way contacts were made on narrowband. Fortunately almost all narrowband operators also take out wideband equipment, so there were few, if any, equipment incompatibility problems. □

Equipment review

(Continued from page 652)

and increases roughly as the square of the multiplication factor. Multipliers with high-Q input matching will provide considerable further rejection of unwanted products. For applications where high purity is desired, Wood & Douglas are now able to supply a filter which reduces the level of unwanted output to >50dB relative to 0·5W. They have also advised that the sideband noise can be reduced significantly by additional decoupling of the zener diode which stabilizes the crystal oscillator supply.

For many applications these problems are not important, or can be overcome quite easily, and the units (especially the pa) are certainly recommended to the microwave constructor.

References

[1] G8ADP BXY35A 1,152MHz tripler. *VHF/UHF Manual* (3rd edn), p5.70.
[2] "1·3GHz band ssb", P. K. Blair, G3LTF, and C. W. Suckling, G3WDG. *Radio Communication,* January 1976.
[3] G8DEK BXY41E 10GHz step recovery diode multiplier. *Radio Communication* March 1976, p202.
[4] G3JVL 10GHz transverter. *Radio Communication* January and April 1979, pp41, 342.
[5] G3JVL 10GHz bandpass filter. *Radio Communication* October 1977, p791. □

4-2-70

Graham Knight, GM8FFX*
and
John Morris, G4ANB

Awards

How long does it take to achieve a Senior certificate for the 144MHz band? Obviously the answer does not depend on how quickly one can work the required number of stations, but how quickly the other stations QSL. When Paul Lawrence, G8BWR, of Warwick, sent a claim for a 144MHz Senior to G5UM, the vhf awards manager, the dates on the cards revealed that they had been gathered in just over two years. G8BWR now has Senior Award No 147 to complement the Squares Award No 7 which he attained a few weeks earlier. Another member to submit a claim for two different awards was G4IGO of Bristol. He received Senior 144MHz No 148 and certificate No 9 in the 144MHz QTH Squares 10 plus 40 category.

Still on the subject of "how long?"—Bryn Llewellyn, G4DEZ, having moved from Didcot to Hockley in Essex, made a concentrated effort on the 10 countries plus 40 squares in order to attain the award from his new QTH. With his contacts spread over a six-month period from July 1979 to January 1980, he was fortunate to receive all the QSL cards within a further two months. G5UM notes that some of the QSL cards are for such 144MHz dx as Italy, and even the Aaland Islands. Needless to say, G4DEZ made maximum use of meteor scatter and auroral propagation to contact many of the far-away stations on 144MHz, thus enabling him to claim the award in a very short time.

G5UM reports that the tally of QTH Squares awards so far issued is 10 in the 10 countries plus 40 squares category, three for the 15 plus 60, and three for 18 plus 40 squares (the same three: G3IMV, GJ4ICD and G3VYF). He is surprised that no claims have yet been made for squares awards in the 70MHz and 432MHz categories. It is, however, evident that many members are still collecting for, and are still interested in obtaining, the Standard, Senior, and Supreme vhf awards. In the 144MHz Senior Standard category, Nos 543 and 544 have been awarded to G4HLX and G8RYK, and in the 144MHz Senior section Nos 146, 147 and 148 have been sent to G3AZI, G8BWR and G4IGO. On 432MHz no fewer than four Seniors were sent in one month to G4FMD, G3AZI, G8BHH and G8IFT—Nos 58, 59, 60 and 61.

G5UM, 27 Ingarsby Lane, Houghton on the Hill, Leicester, will be pleased to send claim forms to members who send him a stamped addressed envelope.

QTH squares—the last words

The comments made by G2WS *4-2-70* February that collecting QTH squares was just a "parlour game" resulted in 90 letters being sent to your scribe. Six operators agreed with G2WS, and all the others vehemently disagreed. The vast majority like the squares format which originated in Sweden in 1973 when the "top list" was first published, showing the number of squares worked by operators on each of the vhf and uhf bands. The competitive spirit of the QTH squares idea soon spread and other countries began publishing tables of results. Soon the collecting of squares spread to other European countries, and it really became popular following the publication by DL7QY of the Dubus Top List.

Folke Rasvall, SM5AGM, the Swedish vhf manager and IARU Region 1 vhf records co-ordinator, started the whole business of collecting squares in Sweden, and he has followed the comments in *Radio Communication* with great interest. As he was responsible for the spread of the popularity of QTH squares it is appropriate that SM5AGM is given the last word on the topic. He writes:

"I do not agree when G2WS says that the collection of squares is utterly unscientific and does not advance our knowledge of radio. Being the IARU records co-ordinator I know that several of our present records are undoubtedly the result of expeditions to rare QTH squares, or at least to enhanced activity thanks to the pursuit of QTH squares.

"For many years vhf operators had wondered whether it was possible that a very strong aurora could give such a strong increase in ionization of the E-layer that a forward E-scatter contact could be established on 144MHz. This question was answered by a QTH squares expedition to northern Norway by SM4AXY/LA, who managed to work stations in southern Sweden during an aurora. This contact took place at a time when his beam was directed to the south, and the signals received in northern Norway were completely free from the usual auroral buzz and were, in fact, T9. Sweden was covered in snow at the time of this contact and tropospheric propagation was ruled out, thus proving that forward Es during aurora was possible.

"It is therefore true to say that the introduction of QTH square hunting was successful as far as vhf propagation studies were concerned, and if the clock could be turned back to 1973 I would still start collecting QTH squares. After all, I encouraged the collecting of QTH squares because it gave a more uniform distribution of the units collected than the list of DXCC countries."

Moonbounce contest

The most recent moonbounce contest took place on the weekend of 19/20 April, and many European amateurs took the opportunity to check their eme systems. Richard Newstead, G3CWI, near Norwich, used the 30ft dish (described in last month's *4-2-70*), to listen for stations participating in the contest. G3CWI's set-up is working very well, as he was able to hear stations in all the continents on 432MHz on each day. His calculations showed that there should be a 50min window to New Zealand at a time when the moon was just above the horizon, and these theories proved to be correct. A 432MHz eme signal from ZL3AAD in New Zealand was received for a 20min period, with Q5 copy on the distant station's cw transmissions. It is believed that this is the first time that signals have been received in the UK from a station in New Zealand. G3CWI was also pleased to receive good signals on sideband from JA6CZD in Japan.

Moonbounce nets on 14MHz

The 432MHz moonbounce net meets on 14·345MHz on Saturdays and Sundays between 1600 and 1700gmt. The net for the 144MHz eme enthusiasts meets on the same days but for the

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following hour between 1700 and 1800gmt—both nets would appreciate frequencies free from QRM. In fact, earlier on the same days these frequencies on the 14MHz band are popular with other vhf operators who are busy setting up schedules for meteor scatter contacts and exchanging the latest vhf news. Class B operators, who cannot of course transmit on 14MHz, will still find that a wealth of vhf information can be obtained by listening to these vhf dx nets. Your scribe often listens and admits having enviously heard an American operator describing K1WHS's new eme antenna system—24 14-el CushCraft boomer Yagis—with this 336-el system being fed by 3in diameter coaxial cable.

High-power expedition

Richard Diamond, G4CVI, and John Regnault, G8FQO, left their eyries in the Surrey hills in late April for a high-power expedition to Scotland. Operation commenced from a 500m asl site near Selkirk in QTH locator YP15f. Although weather conditions were far from ideal they eventually succeeded in erecting the 14-el Parabeam which was only slightly bent after three unsuccessful attempts to erect the 40ft mast. The equipment used consisted of a Yaesu FT901DM, with an FTV901R transverter driving a Tempo 6N2 linear amplifier running close to 400W output on ssb. More than 70 stations were worked during a three-hour period of operation, including G8OPR in Andover. G4CVI and G8FQO had operated from the same site near Selkirk three years previously, but they both commented on the apparent demise of regular high-power operation on 144MHz ssb, resulting in many weak stations being logged.

The unfortunate weather conditions continued for the rest of their Scottish expedition, but they continued undaunted and had a very successful visit to ZR square near Peterhead. From that exotic location for QTH square hunters they succeeded in working seven countries, with the strongest signals being received from G4DZU in Leeds, G4CXL in Weybridge, and G8CKZ in Southampton. G4CVI and G8FQO plan further expeditions to Scotland later this year, and would appreciate suggestions regarding which areas they should visit.

Long delayed echoes on eme

Charles Suckling, G3WDG, and his yl Petra, were recently going through all the tape recordings they have made of G3WDG moonbounce echoes. They noticed that on some of the recorded echoes of their own transmitted dashes there were two extra "dahs" after the expected echoes. The tape recordings were made around 2000gmt on 6 January 1979, and, since G3WDG was operating well away from the normal tropospheric and eme sections of the 432MHz band, it is unlikely that the signals were recorded from any other source. They also checked for adjacent channel or print-through on the tape, but there were no other similar signals recorded which could have explained these long delayed echoes. Other operators have previously reported uhf long-delayed echoes, OZ9CR noticed them on his own 1,296MHz echoes, and ZE5JJ reported hearing them on signals from K2UYH's 432MHz eme transmissions.

G3WDG does not offer any explanation why these long-delayed echoes have taken place but thinks they could be connected with disturbances as a result of high solar activity. Doubtless the Propagation Studies Committee will check the levels of solar activity on the days preceding 6 January 1979, and it would be of interest if other operators can offer any theories for these extra moonbounce echoes.

Moonbounce operators should note that the *EME Newsletter* being distributed by Julian Gannaway, G3YGF, can be obtained by contacting him at the department of engineering science at Oxford University.

St Kilda expedition

Barry Titmarsh, GM8SAU, of Benbecula, sends notice to all vhf operators that he will be back on St Kilda, QTH square VR18g, during the month of September. GM8SAU/P will be running 200W of ssb to a 16-el on 144MHz, and 400W of ssb to a 36-el antenna on 432MHz. GM8SAU would like to arrange schedules with European operators for tropo and meteor scatter contacts, and as he will be located at an excellent high site on the island, it is expected that many operators will be able to work VR square for the first time.

GM8SAU is also investigating the possibility of putting a 144MHz beacon on the island of North Uist. He has already contacted the IARU Region 1 beacon co-ordinator, Brian Bower, G3COJ, and is thinking of having the beacon beaming south-east towards London. Further details of this project and information on the St Kilda expedition can be obtained by contacting GM8SAU at the Sergeants Mess, RAF Rifle Range, Benbecula.

Expedition to Scandinavia

Richard Bown, G8JVM, is going on a combined climbing and dx expedition to Scandinavia from 10 until 28 July. G8JVM will visit Denmark, Sweden and Finland, with operation being planned from the BM, CO and DO QTH squares. He will be taking equipment for 144MHz ssb and fm, and will be looking for contacts from locations above 3,000m asl. He is willing to keep schedules with stations wishing to arrange tropospheric or meteor scatter contacts, and he can be telephoned during the day on 0793 46348. Written requests can be sent to him at 27 Lennox Drive, Swindon, Wiltshire.

50MHz around the world

Without doubt the 50MHz band has provided vhf enthusiasts with plenty of excitement in the last 12 months. The sensational contacts between ZB2BL and Japan are reported in this issue, and several reports of other 50MHz openings around the world have been sent to *4-2-70*.

SV1DH, in Athens, heard signals from KH6EQI, the 50·100MHz beacon in Hawaii, at noon on 25 March 1980. This very-long-distance signal was logged while SV1DH was beaming directly over the south pole, suggesting that signals were propagated via the long-path route. It is interesting to note that this opening took place at midday, while the opening from Gibraltar to Japan was 12 hours later at midnight.

Peter Taylor, H44PT, in the Solomon Islands, reports working 27 countries on 50MHz ssb in 11 months of operation. H44PT, who comes from Manchester and also holds the call G8BCG, has also noticed very-long-distance paths open at midday, with the FY7THF beacon in French Guiana being logged on several days. In view of the extremely long distances now being worked on 50MHz, H44PT wonders whether a crossband contact to the UK would be possible. He thought a combined F2 and transequatorial path would cover the 15,000km distance, but the events of the last few weeks suggest that the path to investigate may well be much longer. H44PT also reports that PZ1AP is looking for schedules for 50 and 144MHz.

The 50MHz path between the UK and South Africa was open on several days during April. G4BPY, G4JJC, G4JLH,

G5KW and G3WBQ have all been taking advantage of these conditions and report reception of ZS3E, ZS6LN, ZS6PW and ZS6XJ. Due to the high levels of activity on 28·885MHz, ZS3E now listens for crossband contacts on 28·330MHz.

Trevor Brook, G3WBQ, of Shamley Green, Surrey, also reports receiving Australian television signals on 11 and 20 March between 0755 and 0845gmt. Trevor is interested in comparing the times of the openings to South Africa, and finds that they usually occur between 1030 and 1525gmt and then later between 1700 and 1815gmt. Signals fade out during the afternoon, even on days when strong signals are received from ZS. G3WBQ would be interested to know whether other 50MHz listeners have observed similar fade out times.

50MHz pirate operation

Tom Moore, W7KMA, says he was under the impression that UK stations were licensed for transmission on 50MHz, and thought he worked one on 18 November 1979 on 50·175MHz at 1653gmt, when he exchanged 5-and-5 reports with a station supposedly in England. Unfortunately for W7KMA no British stations are licensed for transmission on 50MHz—W7KMA will have to wait till the next 50MHz openings and hope he can work a licensed station in Eire. KV4FZ and VE1AVX have also worked stations claiming to be in the UK, and this has apparently caused some controversy in the USA—overseas operators should note that no special permits for 50MHz operation have been issued in recent years, and that any stations giving G callsigns on 50MHz are illegal.

On a happier note, W7KMA reports that his cw beacon on 51·973MHz is running on a continuous basis, and he hopes to receive reception reports from Europe in the autumn. W7KMA uses an Icom IC551 transceiver and has worked all states on 50MHz with just 6W. In April he managed 50MHz contacts with LU8DIN in Argentina and with ZL1AUM in New Zealand. He is also working hard at putting together an eme station, and he hopes to make the state of Arizona popular with European moonbounce enthusiasts.

ZB2BL works Japan on 50MHz

Jimmy Brunzon, ZB2BL, made vhf history on 10 April, 1980 by contacting JA1BK in Tokyo on 50MHz. The QSO took place at 0012gmt, with ZB2BL beaming at 210 from Gibraltar—a long-path distance of 27,000km. This interesting opening lasted for half an hour, and ZB2BL went on to work several other Japanese stations. Stations in the UK have been trying to hear signals from Japan on 50MHz, but so far none have been successful, although it must be noted that most of these tests have taken place in the period between 0800 and 1200gmt. ZB2BL is to be congratulated on this magnificent achievement and given full credit for contacting Japan at a time that had not previously been thought possible.

70MHz activity

Harold Turner, G8VN, at Mickleover in Derbyshire, has commented on the high level of activity he finds on the 70MHz band. April's *4-2-70* detailed the new Microwave Modules 144 to 70MHz transverter, and this seems to be responsible for many operators renewing their interest in this band. G8VN heard the following stations in a 90min period on a recent Sunday evening: G5UM, G3BA, G3PKO, G3XRD, G4DMD, G4GQY, G3APY, G3IKR, G3UKV, G3FDW, G4IDG, G4FJI, G3XEV and G3YZU. Harold Turner remarks that some of these stations were on fm, and he suggests that this should be encouraged on 70MHz. He mentions that some 70MHz stations are still crystal controlled and that it is worthwhile tuning for replies to CQ calls.

There has certainly been a large up-swing of activity on 70MHz, and operators from the south coast to northern Scotland have remarked on the number of new stations coming on the band. Reports of reception of the Buxton beacon have been received from stations from Dumfries to Devon, and GB3SU on 70·695MHz is a reliable indicator of propagation conditions.

Proposed repeater for Dumfries

Bill Jarvis, GM8APX, says he is a regular user of the A75 road and is disappointed with the present coverage by vhf repeaters—even including that afforded by the new repeater GB3AS. He wonders whether there would be support for a vhf repeater in the Wigtown–Creetown–Gatehouse area, and asks those operators who are interested in planning a new vhf repeater to contact him at Salewheel House, Salesbury Hall Road, Ribchester, Preston, Lancashire.

Beacons

The 70cm beacon GB3SUT is now back in service on 432·890MHz beaming signals to the north and south of Sutton Coldfield. GB3SUT has been very useful in the past for promoting activity on 432MHz, and because of its beam direction it serves as an excellent propagation indicator for operators on the Continent. Reports of reception would be appreciated by the beacon keeper, Tom Douglas, G3BA, 141 Russell Bank Road, Four Oaks, Sutton Coldfield.

Frank Hall, GM8BZX, reports that the Angus beacon is on the air again on 144·965MHz. The beacon has been very much missed by 144MHz operators in the south and its reappearance has greatly helped GM operators by encouraging G stations to beam north. While GB3LER remains off the air, the Angus beacon is the most northerly in the UK. GM8BZX and the members of the Kingsway Technical College Radio Club are to be thanked for reactivating GB3ANG.

New propagation theories

Geoff Grayer, G3NAQ, at Newbury in Berkshire, a member of the RSGB Propagation Studies Committee, was interested in the "new" *Es* theories put forward by GJ4ICD and publicised in GB2RS news bulletins and in the March and April issues of *Radio Communication*. G3NAQ notes that the hypothesis that *Es* openings are caused by ionospheric winds concentrating metallic ions derived from meteors has been around for at least 20 years—reported by J. D. Whitehead, *Atmos Terr Phys 20* (1961) p49, and much later by E. B. Dorling in *Wireless World* (April 1978).

Until G3NAQ and the other members of the Propagation Studies Committee have an opportunity to study the evidence gathered, he confesses to being slightly sceptical of finding any correlation between *Es* data and meteors. He is preparing a statistical study of any such correlation, using a continuous record of an *Es* dominated path over a two-year period. So far Geoff's results do not indicate any correlation between *Es* and ms propagation. G3NAQ reports that scientific literature contains many references to similar searches, all of which have been unsuccessful.

G3NAQ also takes a jocular swipe at his fellow Propagation Studies Committee members, by reporting to *4-2-70* that he listened with interest to a 144MHz contact between colleagues

discussing the fact that no aurora would happen that night. G3NAQ then tuned further down the band into the cw section and was amused to hear G stations working Ar to GM3JIJ in Stornoway. A little later on the same night of 11 April, he monitored a 432MHz contact via the aurora between G4DGU and G3AUS in Devon—not too bad a night for auroral contacts, but also a night showing that the pundits can be wrong on some occasions. We will all await with interest the detailed results of the new Es theorists—perhaps the pundits will be proved right this time.

Experiments at G4BPY

Gordon Pheasant, G4BPY, is well known to readers of *4-2-70* for his activities on 70MHz and on 50MHz crossband. Readers will remember that it was G4BPY who first heard Australian beacon VK6RTV on 50MHz. Since Arthur Latham, EI6AS, obtained his special permit from the Eire authorities for transmission on 50MHz, G4BPY has been keen to establish a crossband contact from 70MHz. Gordon first worked EI6AS on 70MHz ssb, and after giving EI2DJ his first G contact on 70MHz, he listened for EI6AS on 50·1MHz. Signals on 50MHz were good and a 5-and-5 report was sent on 70·3MHz. G4BPY wonders if this is the first ever EI-to-G crossband 70/50MHz QSO.

G4BPY has also been conducting experiments with VE1AVX, trying to get a 70MHz signal across the Atlantic via aurora. During the tests he has been listening on 50·110 and 28·885MHz. These tests are continuing with G4BPY transmitting on 70·03MHz after 2100gmt, but so far results have been negative.

De-luxe vhf mobile

Your scribe recently had the pleasure of driving a caravan-trailer belonging to an American visitor who was driving along the shores of Loch Ness calling "CQ" on 144MHz ssb. KA2BA was the callsign on the registration plate of this magnificent vehicle, which belonged to Harry Stein of San Francisco. Among the luxury fittings were an FT107 solid-state hf band transceiver feeding two FTV107 transverters—one for 50 and 144MHz and the other for 432MHz. These transverters fed high-power solid-state linear amplifiers for each band, including a special KLM 300W model for the 144MHz band. By the time this appears in print KA2BA will also have travelled as far as Jeddah in his luxury home, and he hopes to be back in the USA for July. He looks forward to setting up an eme station so that he can keep in touch with the many friends he made during his stay on this side of the Atlantic.

New Es theory

John Branegan, GM4IHJ, read the details of the new Es theory put forward by GJ4ICD, in the March and April *4-2-70*, with great interest. He too has been doing research into sporadic-E openings, and has been comparing results with VE1AVX to ascertain whether there was a correlation between events on both sides of the Atlantic. GM4IHJ recorded 18 Es events during January, with none reaching 144MHz at Fife but with two events reaching 90MHz. A further five events were recorded in February, with lockable television signals being identified as coming from stations located in Austria, Hungary and Spain. The dates of these events were compared with the dates recorded by VE1AVX during the same period, but nothing definite could be concluded with such a short period for comparison. Es signals were strongest for both operators on the same days, and they got the same pattern of days with and without Es openings; however, they did not occur at the same gmt time but were more related to individual sun times. GM4IHJ is looking forward to the Phase 3 satellites so that he can talk to the USA each day and compare notes with other propagation watchers such as VE1AVX and W1HDQ.

Fast-scan television dx

4-2-70 has previously detailed the success of G3PTU's fast-scan television station in having two-way television contacts with stations on the Continent. The picture shows just how well the G3PTU CQ card was being received in Amsterdam by keen amateur tv dxer R. J. Muntiewereff. G3PTU used 10W peak output to feed a Jaybeam 46-el antenna, and the transmit frequency was 436MHz.

The G3PTU CQ card received in Amsterdam

New operators—give your location

The latest edition of the *RSGB Amateur Radio Callbook* has sold tremendously well and is now being reprinted. It is extremely useful to vhf operators who use the *Callbook* as an operating aid to pinpoint the location of various stations heard calling CQ on the vhf bands. A simple flick through the book on hearing a call ensures that the beams are turned towards the correct location, and this is undoubtedly the reason why most vhf operators eagerly buy the latest edition. There are, however, new operators coming on to the vhf bands daily, and some forget that they are not yet in the *Callbook* and that they should give their locations when calling CQ. This greatly assists in getting contacts by ensuring that the other operators beam to them correctly. Newcomers to vhf operating not in the current edition of the book will greatly increase their chances of distant contacts by remembering to announce their locations.

Final from GM8FFX

This is the last copy for 4-2-70 *to be prepared at Aberdeen. I must confess that it has surprised and pleased me to watch how the number of pages devoted to vhf communication has grown from those first two pages to the present four- and five-page sections. This growth has been due entirely to the reports sent in by vhf enthusiasts around the world. Many changes have taken place over the last three-and-a-half years, and the pages of* 4-2-70 *have detailed the growth of man-made repeaters, and helped to increase the number of operators using the*

natural repeaters—auroral curtains, meteor trails and the moon.

I have become accustomed to receiving telephone calls from operators like YV5ZZ, VS6BF, ZS5JY, W1BL, PA3AHD, and DK2ZF, and many other international vhf enthusiasts have either written or telexed to ensure that hot news items reached me quickly. I would also like to thank the hundreds of UK operators who have sent reports for publication; it would be quite invidious to single out any single callsign, but special thanks are due to listeners Mike Allmark, Kevin Jackson and Harold Meerza.

It has been great fun compiling the 4-2-70 pages from those reports, and I am sure that the pages will continue to grow under the guidance of the new vhf contributor—John Morris, G4ANB. In view of the recent controversy about QTH squares I will reveal in these last few lines that G4ANB is firmly in favour of this "parlour game". All future reports should be sent to John.

73,

Graham Knight, GM8FFX

PS. Now that I will have some free time, I might get around to sending out some QSL cards at long last!

The Society's grateful thanks are extended to Graham Knight for the considerable amount of voluntary time and effort he has given to writing *4-2-70* over the past few years. His lively reporting style has done much to enhance the pages of this journal.

G4ANB takes up the pen

One of the most worrying things for a person taking over the writing of a regular feature is whether he can match up to the standards set by his predecessor. When that predecessor is GM8FFX, the task is not an easy one. I am sure that readers will wish to join me in thanking Graham for his years of skilful preparation of vhf news, and in wishing him well in his future enterprises.

The compilation of a feature such as this depends above all upon information from readers. Please send any news and comments to your new scribe at the address below†. Please note that this is *not* QTHR. Due to the propagation delay between receipt of letters and the eventual publication of their contents, news of planned expeditions, required skeds and so on should, if possible, arrive at least two months before the actual event.

IARU Region 1 vhf managers meet

A meeting of IARU Region 1 vhf managers which took place in Maidenhead on 26-27 April was well attended, with delegations from Austria, Belgium, Denmark, Finland, West Germany, Italy, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland and the UK. The Spanish presence was particularly welcomed, as this was the first appearance by that country at such a gathering. Despite its title, amateur activity in all of the vhf, uhf and microwave bands came within the scope of the meeting. Predictably, in the multifarious world above 30MHz, many subjects came up for discussion, and some of these may be of interest to readers.

The decisions and implications of WARC were examined, and it became clear that Region 1 amateurs have been very lucky in being able to retain a full 10MHz wide allocation between 430 and 440MHz. This highly desirable part of the spectrum had been under great pressure from several other services. Luck by itself is never enough, of course, and a vote of thanks was made for the hard preparatory work by the IARU. A special mention was made of the dedication shown by G2BVN. These sentiments must be applauded by all UK amateurs, and echoed around Region 1.

During the meeting it became apparent that the demands for spectrum space between 430 and 440MHz were not confined to sources outside amateur radio. Proposals for modifications and additions to the band plan came from several societies. Rather than trying to sort out all of these often-conflicting ideas in the short time available, it was suggested that the whole band plan needed to be redrawn. When the advances made by amateurs in the past few years are considered, it is hardly surprising that the old band plan is beginning to show its age. The RSGB, in the guise of the vhf manager G3BA, offered to co-ordinate this work, and to present a proposal to the full Region 1 conference at Brighton in April next year. With repeaters, fm, ssb, cw, television, moonbounce, satellites, transponders and many other activities all needing space in the lowest uhf band, one cannot help feeling that G3BA is in for some very hard work over the next few months!

Another subject of general interest which arose at the meeting was that of locator systems. During recent years the question of the introduction of a worldwide locator system has been under discussion. The present QTH locator used on vhf and uhf only adequately covers Europe and northern Africa, and cannot be easily extended to cover the whole of the earth's surface. The Swedish vhf manager, SM5AGM, had collected over 20 proposals, and it was felt that the time had come to compare all of these and try to select the best one. A working group was formed to do this and report back to the main meeting. The result was a recommendation for the publication of a slightly modified version of the G4ANB proposal, with a view to getting comments from all regions, and hopefully enabling a decision to be made at the 1981 Brighton conference. This proposal, with outline details of the other proposed systems, is being made the subject matter of a separate article which is in preparation.

Other items from the meeting in brief: certificates will be issued to the leading station of each country in future IARU vhf/uhf contests; the Norwegian society proposes the use of 144·725 and 144·775MHz for ASCII data transmission; and LA2PT, the Norwegian vhf manager, is co-ordinating suggestions for random meteor scatter calling conventions.

Expedition news

Summer is upon us, and all over the country portable gear is being retrieved from the attic and having its waterproofing checked. Colin Desborough, G3NNG, recently took the opportunity presented by two business trips to the north of Scotland to operate portable on 144MHz from YS locator square. The first trip, between 22 and 24 April, proved very disappointing in terms of dx, but did give Colin chance to find a good site in

† 120 Whitehorns Way, Drayton, Abingdon, Oxon.

locator YS26G. The repeat visit between 6 and 8 May was rather more eventful, the expedition vehicle having problems negotiating the extremely boggy route to the portable site. Colin reports that he began to get a sinking feeling when the number plates disappeared from view. Fortunately help was at hand, and full legal power ssb and cw were soon feeding the 16-element F9FT. This time operations were much more successful, with over 40 G stations and many GMs managing a contact with GM3NNG/P. The best dx worked was G3KEQ in Surrey (ZL6OJ), who put a consistently good signal into the site at John O'Groats. Also heard, but not worked, was G3CHN in Devon.

The Oxford University Radio Society 1980 expedition will also be to northern Scotland, in this case to a site near Peterhead, in ZR locator square. G3YGF, G8LYB, G8RHI and G8RPV will be operating GM3OUR/P on 144MHz and GM3YGF/P on 432MHz every afternoon and evening from 11 to 26 August inclusive. The G3OUR summer expeditions are well known for being very well organized and run, with state-of-the-art equipment, and this year seems to be no exception. On 144MHz they will be running 400W p.e.p. to a pair of 16-element F9FT Tonnas, with a 1·5dB noise figure preamp on receive. A similar output power on 432MHz will be driving four 21-element F9FTs, with a 0·5dB NF gasfet preamp in the front-end of the receive system.

The team will be equipped for both tropospheric and meteor scatter operation, and for the first two days (11 and 12 August) will be concentrating their activity on the RSGB European Meteor Scatter Contest. They are hoping that their operation from the rare ZR square will generate much demand for contacts from Continental stations. Tropo operation will be around 144·245 and 432·245MHz. GM3OUR/P will be on the 14MHz vhf net on Saturdays and Sundays, and skeds for tropo or meteor scatter QSOs may be arranged by contacting that station, or through G8RHI, QTHR.

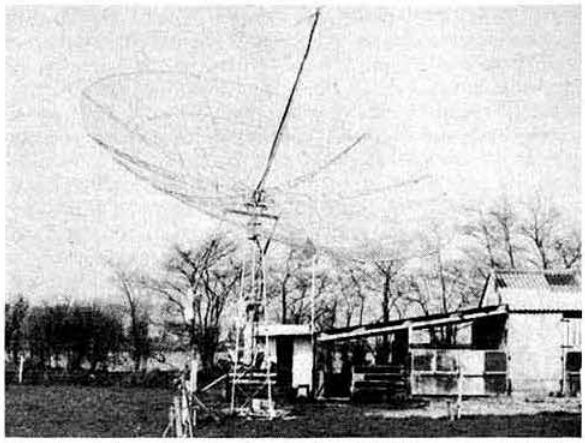
A QRP expedition to Eire is being mounted by Adrian Ball, G8PSF. He will be touring the counties of Waterford, Wexford and Wicklow between 25 July and 10 August. Operating portable and mobile with the callsign EI3VAN, Adrian will be using an IC202S to put 3W of 144MHz ssb into a five-element portable Yagi. Most likely activity periods will be after 1700gmt, and G8PSF hopes that the sea paths will enable many QSOs to be made.

432MHz world record claim

At 0850gmt on 18 April members of the Banningham EME Group (James Keeler, G4EZN; Richard Newstead, G3CWI, and Nick Whyborn, G4JNX) using the callsign G4EZN established two-way communication with Graham Alderson, ZL3AAD, using 432MHz moonbounce. This is believed to be a new world record for this band.

The marginal QSO was made possible by the use of an unusually large and precisely optimized antenna system, together with careful selection of operating times. At the time of the contact the moon was at perigee (the point of closest approach to the earth) and, as would be expected, was just above the horizon for both stations, thus giving some ground gain at each end of the path. These two factors are believed to have given a path loss rather lower than normal for moonbounce. As is usual for this sort of work, the contact was made by a sked set up on 14MHz.

The 10m diameter dish used by the Banningham group is located on G4EZN's father's farm, near Norwich. As may be seen in the photograph, the centre point is about 5m above ground, and an az-el mount is used to simplify tracking. The scale of this antenna may be appreciated by realizing that its diameter is comparable with the mast height of many stations. Linear polarization is used, but with the orientation variable by servo control. This allows accurate compensation for the effect known as Faraday rotation, whereby the plane of polarization of a signal is altered as it travels to the moon and back. Ultra-low-loss 3cm diameter heliax cable carries rf power to the dish, and illumination of the dish is by a twin dipole and splashplate arrangement. A gasfet device with a 0·5dB noise figure is used in the receiver front end.



The 10m dish used by the Banningham EME Group. The building to the right of the operating shack is a pig-sty. The operating shack is behind the tower supporting the dish

ZL3AAD, in Christchurch, uses a similar front-end device on receive, with a pair of 4CX250Bs providing the rf on transmit. His antenna consists of an array of 16 W0EYE 17-element Yagis.

In a detailed and interesting letter, G4EZN commented wryly on the problems encountered with the dish in the high winds of Norfolk, and closed by offering thanks for advice and support to G4FIL, G3YGF, G3WDG, G4DGU, G3IOR, G4DMB, W3OZ and especially of course to ZL3AAD.

Scandinavian activity contests

Readers wishing to work Norway, Sweden, Denmark and Finland will be interested in the Scandinavian activity contests organized by the Norwegian national society. Running from 1800 to 2300gmt on the first Tuesday and Thursday of each month, these regular events are designed to promote activity on the vhf and uhf bands. The Tuesday contests are for 144MHz only, while those on Thursdays run on all bands from 432MHz upwards. It is reported that they are proving very popular in and around Scandinavia, generating much activity and station improvement, both technically and in operating procedure. The short format and midweek evening timings encourage single-operator entries from home, and give contests without all the formality and intense preparation of the full-blown weekend event. Amateurs in other countries are welcome to participate, and the hope has been expressed from Norway that these or similar contests will gradually spread to other parts of Europe. Comments on this idea would be welcome.

HF net frequencies

Two new net frequencies of interest to vhf/uhf operators have recently been announced. Readers with copies of the highly informative *Amateur Radio Operating Manual* will already know of the vhf net which runs every weekend on 14·345MHz plus or minus QRM, and which is the main hunting ground for those wishing to set up dx skeds. To relieve some of the congestion around this frequency, a second vhf net has been established on or about 28·345MHz. When conditions permit, use of this frequency—where there is rather more elbow room, and much less noise than on 14MHz—is recommended for arranging skeds.

Moving down in frequency, the 50MHz information net takes place every Monday evening on 3·650MHz, again plus or minus QRM. Starting at 1800gmt and running for about an hour, this net is designed as a forum for exchange of 50MHz news and information. Ken Ellis, G5KW, who first organized the net, is the normal controller, with G4JCC acting as standby. All those interested in 50MHz are invited to listen in and contribute any information they have to this lively net, which has become a regular date for many people since its recent inception.

GB3SIX installed

The RSGB 50MHz beacon, GB3SIX, was moved on 9 May from its test site in Cambridge to its more permanent home on Anglesey, in locator XN49f. John Wilson, G3UUT, who has done most of the hard work on the project, reported that the installation went well and that all looked good for the planned switch-on scheduled for 18 May. The Pye transmitter, which has been specially modified by G3UUT for the beacon, runs 25W output on 50·020MHz. The stability is specified as 250Hz, but is likely to be within 50Hz. The antenna, a three-element horizontal Yagi built and donated by Harry Bateman of Telecommunications Ltd, Dublin, is 45ft above ground and on a heading of 290°. Alan Mills, GW3NNF, provided the 200ft asl site, and will be the beaconkeeper. The keying unit, also built by G3UUT, sends the beacon's callsign every 20s using 850Hz fsk.

Operating times will be restricted to periods when Band 1 television is off the air. Initially this means that the beacon will be transmitting from 1am to 8.30am each day. Due to screening and the beam heading in use, it is thought that the beacon will normally be inaudible in the UK. It may, however, be possible to hear signals via aurora or meteor scatter. G3UUT is interested in the range over which the beacon is audible, and readers with receiving equipment for 50MHz are asked to listen for GB3SIX. Reports should be sent to your scribe, who will pass them on to G3UUT.

GB3WH on the move

After 18 months' operation from its present site at the Culham Laboratory, near Abingdon, the "White Horse" repeater GB3WH is looking for a new home. The move has been forced by the building at Culham of the JET (Joint European Torus) fusion project, which will mean that the current site will soon be enclosed on three sides by tall buildings and high-voltage power grids.

The GB3WH Repeater Group sees this as an excellent opportunity to upgrade and extend the coverage of GB3WH. To this end a series of rather unusual tests has been made. On several weekends the repeater was switched off for two hours on Sunday afternoon, and a portable station established on the site under test. This portable station would then operate in "reverse repeater" mode on R4, the normal GB3WH channel. Prior publicity encouraged a large number of mobile stations to tour around the surrounding area, each of which regularly called in and exchanged signal reports and location with the portable station. In this manner a coverage map was built up for each of the proposed sites, allowing a choice to be made of the best one. Life is never so simple of course, and the tests made it clear that it would be very difficult to find a site which would both adequately cover the required service area and also be available for use.

The present favourite is Shotover Hill, located just to the east of Oxford city centre. It is planned to move the present hardware to the new site as soon as possible, and then hand over control to the "Vale of White Horse Repeater Group". This group does not yet exist, but an inaugural meeting is planned for June or early July. Interested readers should contact the GB3WH repeater group chairman, G4DPA, QTHR.

A new propagation mode?

With the advent of moonbounce for long-distance communication on vhf and uhf, many people have speculated on the possibility of using some of the vast quantity of debris orbiting the earth for reflecting signals. G4DGU and G4ANB recently began a series of tests with SM6CKU to investigate this idea. Calculations indicate that a large, low-orbit satellite should reflect signals with a total path loss up to 10dB less than for moonbounce. More detailed investigations reveal two problems. Low satellites are in the process of slowly decaying, and so their orbits cannot be predicted with accuracy. If the orbit is known, then tracking the object as it moves across the sky is almost impossible, as it may cross at up to 5°/s. Coupled with this high speed comes a large amount of doppler shift. The net effect is that a short "window" should exist between two stations with antennas pointing at the same section of the satellite orbit. On 432MHz, signals will first appear shifted up in frequency by about 12kHz, but moving lower at up to 4kHz/s. Six to eight seconds later, signals will disappear, with the frequency now shifted 12kHz down.

Despite these severe operational difficulties, a series of tests between G4DGU and SM6CKU gave an encouraging result. During a pass of a Cosmos third-stage launcher, a 4s burst of ssb from G4DGU was received by SM6CKU at 10dB above the noise. The large and fast changing doppler shift precluded any other mode of propagation. G4DGU was using 400W p.e.p. to feed an array of eight 17-element Yagis. The 8m diameter dish at SM6CKU was feeding a receiver front-ended with a low-noise NE64535 bipolar transistor. No complete QSO has yet been made via "sat scat", but tests are continuing. The short time available on each pass of a satellite and the huge doppler shift will require special operational techniques to be developed before the use of satellites as passive reflectors can become a regular occurrence.

432MHz aurora

From Chris Bartram, G4DGU, came news of an auroral contact with G3AUS in Devon (locator YK32J). From his QTH near Abingdon (ZL24e) G4DGU gave a signal report of 42A, and received one of 55A in return. Chris could hear both the direct and auroral signals from G3AUS, the latter being doppler shifted about 1kHz up in frequency. The QSO took place in the early evening of 11 April, a time when only a weak aurora was evident on 144MHz. Chris commented that this was not the first time that 432MHz auroral contacts have been made when only a weak event was apparent on the lower band.

Sporadic-E on Band 1

Trevor Brook, G3WBQ, reported a remarkable day of listening on 4 April. It started well, with east European television on R1 (49·75MHz) and a strong rtty signal on 50·120MHz coming in via sporadic-E. The latter turned out to be the second harmonic of a station somewhere in Europe on 25·06MHz. Then the harmonics of the Nouakchott broadcast station in Mauritania began to come in. The intended transmission frequency of this station is 7·246MHz, but it has a high harmonic output, effectively giving "marker pips" all the way up the spectrum. The highest harmonic detected by G3WBQ was the tenth, on 72·461 (cf the 70MHz band). All of the lower harmonics down to the fundamental were audible, apart from the fifth on 36·23MHz, for which Trevor has no receiver. The signals could be heard at the Surrey QTH between 1010 and 1225gmt, and from 1305 to 1320gmt, with the tenth harmonic reaching S4. Propagation over the 4,000km path was evidently by double-hop Es, as ZB2VHF, which is nearly in the middle of the Mauritania path, came in between 1127 and 1327gmt.

Trevor wrote that this was the first time he had ever received the Mauritania signals during the day, and that it seems that this station is still the only identifiable signal from equatorial Africa, apart from a broadcast harmonic on 49·735MHz from the Canary Islands. A tinge of sadness may be detected in his report that the impending construction of a television service in Mauritania is likely to lead to a clean up of "this amazing station" in a couple of years to avoid local tvi.

Also heard on 4 April were ZS6PW on 50·032MHz between 1125 and 1250gmt, and ZS6LN on 50·050MHz between 1140 and 1250gmt. Both of these were at strength five, with the main impairment to reception being solar noise events.

These observations of 70MHz signals crossing a 4,000km path make an encouraging start for possibilities of transatlantic QSOs by Es on 50 or even 70MHz. The east–west path is more difficult than that between Surrey and equatorial Africa, but perhaps this may yet be the year of that long-awaited event, the crossband 50MHz/70MHz transatlantic QSO. Certainly, with the growing use of 70MHz in the UK and an ever-increasing interest in crossband 28/50MHz working, when and if suitable conditions do arise there is now a better chance than ever of somebody being in the right place at the right time to complete this historic QSO.

More believed firsts

Writing from Dunstable, Johnny Haydon, G3BLP, one of the real pioneers of vhf work in the UK, said that he has been "spurred on" by the item in the April *4–2–70* recalling early believed "firsts" by G3DIV/A. He holds QSLs from G8OL (6 October 1949 at 2155gmt), ON4HC (4 April 1951 at 2400gmt) and PA0PX (13 May 1950 at 0030gmt), all on 144MHz. While not claiming these as "firsts", Johnny said he would be interested to know which operator may have predated them: he believes that one of the south-coast pioneers such as G5MR or G2XC may well have done so.

Chris Tran, GM3WOJ, also offered some believed "firsts" with certain qualifications, observing that some of the following may have been predated by expeditions in the 'sixties:

70MHz: GM3WOJ/P to GU3HFN on 22 January 1978, A1, QRB 595km.
70MHz: GM3WOJ/P to GJ3WMR/P on 12 August 1978, A3J, QRB 630km.
1,296MHz: GM3WOJ/P to GD2HDZ on 25 June 1978, A1, QRB 40km.

Any expeditionaries who can claim to predate the above "firsts" are invited to send the details to G5UM, QTHR, who collates information on vhf/uhf "firsts and farthests" for eventual forwarding to SM5AGM, the European co-ordinator of information in this field.

The feel of "Four"

Any certificate claim for the 70MHz band is still an event, and a recent claim for the FMD Standard award by G4FKI represented almost a potted history of the band. Some of the comments on the QSL cards checked by vhf awards manager G5UM, were very revealing. For example, from an operator in Surrey: "My very first QSO on 'Four'. After a couple of weeks of abortive CQing was thrilled to bits to raise you."

At G4FKI success was achieved in an almost copybook manner. First there was just a dipole and phone on 70·26MHz. Then came a transverter and a three-element beam. At once coverage expanded from local to national, but it still took two years to collect the necessary cards. This is all the more surprising when it is remembered that every 70MHz operator must be aware of the difficulty in getting cards in, and should therefore be meticulous in QSLing. Even four saes failed to produce "the necessary", but a registered post return envelope did the trick! The G4FKI breakdown reads: 11 on cw, another 11 on ssb, 1 on fm and 10 on a.m. By now 70MHz parchment No 137 should be residing proudly on Dave Thorpe's wall.

First 70MHz Squares Award

G3IKR of Redditch recently passed near the QTH of G5UM, and took the opportunity to call in and claim two 70MHz operating awards. One of these is of particular historical interest, the first-ever 70MHz 4–2–70 Squares Award. At the same time G3IKR collected his 70MHz FMD Senior, for six countries and 60 counties. G5UM reports that G3IKR watched very closely as the cards confirming the 20 squares and four countries worked since 31 December 1978 were checked. Shortly afterwards, certificate No 1 for the 4–2–70 Squares Award and 70MHz FMD Senior No 45 were borne off by J. P. Moore, to whom congratulations.

Still apropos 70MHz affairs, it is worth reiterating that considerable activity now occurs during peak television hours, which could not be said of the band as little as two or three years ago. The swing away from a.m. is a major cause, and those members who have written the band off are in for a surprise on most evenings from about 8pm onwards.

The rest of the awards

To Vernon Boldy, G8SVG, goes the distinction of being the first of the G8S—— series to achieve the FMD Award. It took him a bare four months to do so from the time of obtaining his licence, and demonstrates the possibilities of 144MHz when good equipment is used in a flexible manner. At G8SVG a TR7010 was backed by an 80W linear and a 12-element "ZL special"—but it was also backed by other operators' co-operation in QSLing promptly. Now Vernon has FMD parchment No 547 on the shack wall.

The following comment was made by G4FRE when submitting a claim for the 432MHz award: "A plea for the indefinite retention of the countries-and-counties award alongside the squares award. The squares award system seems so faceless: without the QRA map in front of you, you don't know in real terms where you are working into. Moreover, the squares award seems inclined towards the 'professional' award chaser who hears a lift and has the day off to work squares." □

swl news

Bob Treacher, BRS32525 *

THE summer should now be upon us and, as a result, the higher frequency bands will be poor by day but should produce good dx signals by night. On the lower frequency bands, 3·5MHz will only produce dx signals after around 2300, and those mainly from South America, but 7MHz will be a little more favourable for dx working.

April certainly provided some really fine dx. In particular, the dxpeditions to FR0/G, 9M6, SV1/A, FK0, CR9 and ZL2/C. Many reporters commented upon these expeditions and how they had provided new countries. FR0ACB and FR0ACC/G were active from Glorieuses Is, and were reported on 28–14MHz.

The 9M6 appeared courtesy of KP2A's Asian dxpedition. So far he has activated 4S7 and 8Q7, and he was also scheduled to activate VS5 in early May. QSLs for the 9M6 trip should go to N2CW with at least two ircs to cover airmail reply.

SV1IW/A, operating from Mount Athos in Greece, provided many with a new country. The previous trip in 1972 —SY1MA—put this "country" on the map, but there has been no activity since then. The dxpedition was reported on all five bands on ssb, and SV1DC/A was also active at the same time.

New Caledonia was active in the shape of FK0BW (LX1BW and DJ5CQ). This duo was also scheduled to activate VK9N and VK2/LH in May. P29JS did visit both countries earlier in the year but conditions to G were not too favourable at that time.

VS6AG is the QSL route for CR9AK, active for three days at the end of April. He was reported on 28 and 14MHz. ZL2UW/C was "on" from Chatham Is, but was very elusive on 28 and 21MHz.

Conditions in mid-April seemed very helpful to those of us chasing that elusive "morsel". The 28MHz band was very patchy, but it did produce a large number of rarer countries and provided some unusual openings. It was reported that on 6 April W6s were audible at 0920; on 3 April ZLs were good copy at midnight gmt, while on the following day VKs were audible at 2230gmt. On an otherwise "dead" band, W6 and W7 were heard at 1900gmt on 22 April. Some of the more choice dx reported on the band included A22SM, A51PN, H44BP, HL9KE, FB8ZO, PP0MAG, SU1BA, TZ4AQS, 3B6CD, 7P8AC and 9Q5GB.

The other bands also proved to be of interest to other reporters. On 21MHz the best possible dx was W6ENK/KH4 at 2020, while 14MHz continued to churn out the expected and, on several occasions, the unexpected—on some evenings there were extended openings to the Far East with YB0, DU, JA, 9M2 and HM well over S9. The 7MHz band also provided some interesting dx: Robert Small, ARS8841, reports VP2EEV, 5N0DOG, 9A1ONU; other reports mention PY, YV, CE, CX, HP and YS from South America, and UK8MAA.

K6LPL (of KH5 fame) duly activated Johnston Is late in April and was reported on 28, 21, and 14MHz. Mid-May saw Tokelaus Is activated by 5W1AT. He signed ZM7AT and was heard on 14MHz around 0830 and 1300. The customary drop in activity during the summer months, coupled with changing band conditions, has seen the 28MHz band in relatively poor shape. However, the 21MHz band was producing strong signals from KH6 on most mornings around 0700. West coast USA signals were also audible around this time, and as late as 0900.

Dave Stewart, BRS40293, had been monitoring 28MHz to see what was audible in early May, and he logged H44PT and ZK1AC around 0845. Other good dx logged by Dave on 14MHz included TL8CR, VS5KV and ZD7AL. QSL returns had provided him with OK on 1·8MHz, and W6 and 6Y5 on 7MHz.

Mark Hattam, BRS43475, reported his pass in the morse test and now requires the RAE to get on the air. Meanwhile he reports a good QSL return, especially from WA3HUP who provided him with verifications from A9XBD, CN8AK, CN8CW, CT1OF, OY5J and 8Z4A.

Martin Briddon, BRS33745, has been an swl for over 12 years, using an ex-Forces R107. He took part in the Helvetia H26 Contest and logged 16 cantons. Martin also mentions a station whose callsign he copied as CR8ITC. Your scribe thinks this is highly dubious, as CR8 was deleted from the countries list in 1976 and there is no known amateur in the country. As in all these cases, let us see if the QSL arrives.

Prefix changes

David Grainger, ARS43261, asks if it is possible to give a list of countries which have recently changed their prefix. The ARRL has an up-to-date DXCC countries list which shows, in prefix order, all the countries and their prefixes, and deletions and special prefixes. It can be obtained from ARRL, Newington, Connecticut, 06111, USA.

Newcomers

Several newcomers to welcome this time. Paul Hutchinson, BRS43905, who has a DX300 receiver, intended to sit the RAE in May with a view to obtaining a G8 licence. A newcomer to this column, but not to dxing, is Larry Hoult, BRS42559, who was a radio operator in the Forces while in the Far East. He uses a DX160 with a 132ft long-wire used as a Beverage. His choicest May dx included CN3RM, HZ1AB and PZ1BU.

Gordon McKinlay, ARS43474, has been plagued by the new East German prefixes; eg Y29, Y55. (See *MOTA* Sept 1979, p838, for a full explanation of this prefix system—once this is read there will be no confusion.) Gordon was introduced to amateur radio by GM3GNE, who is his physics master, and together they re-formed their school club, which has a Heath HW101 and an RA1 receiver. At home Gordon only has a receiver capable of receiving a.m. transmissions, so most of his listening takes place at his school station.

Victor West, ARS43496, uses a Skywood CX203 receiver and a dipole at 20ft. He may sit the RAE next year and is already brushing up his morse, being able to read stations calling CQ more easily than listening to actual QSOs.

Ex-BRS41578 is now G4JKO. Kevin always promised himself that, as and when he was lucky enough to obtain a

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

licence, he would QSL all swl reports. He feels that swl reports are sometimes more accurate than reports obtained over the air. It is certainly true that many exaggerated 5/9 reports are given, and this may be a very valid point, and an even more pleasant comment coming from a licensed colleague! This goes to show that the vast majority of amateurs do respect and acknowledge the majority of useful listener reports.

Record books

Some swls have mentioned recently that the *DX Listings Callbook* is a must for QSLing direct. For those interested in obtaining the 1980 edition, RSGB has a limited supply costing £11.28. This price includes postage and packing, so a personal visit to HQ would certainly save some cash. However, it is advisable to telephone before setting out, to ensure that copies are still available.

For those who take their dxing seriously, your scribe has received details from W3HNK about three new record books which will help swls to trace what countries etc are still to be heard/worked. First, the *5-band WAS Record Book,* which shows, by band, states worked/heard, confirmed, mode of contact and QSLs missing.

For DXCC at a glance, two record books are available: *5-band DXCC Insta-Gress* and *5-band DXCC Record Book.* The first lists DXCC countries in alphabetical order by prefix, is fully cross-indexed to prevent duplicate entries, and shows countries worked/heard, countries confirmed, countries needed, QSLs missing, ssb or cw. The second has 364 country charts, titled and arranged in alphabetical order by prefix, with ample room for entries of several callsigns and dates per country, per band. They certainly avoid haphazard record keeping.

Anyone interested should order from Richard M. Norley WA1CFT, PO Box 543-J, Derry, New Hampshire, 03038, USA. The *5-band WAS Record Book,* and *5-band DXCC InstaGress* each cost $9 air mail, $7 surface mail. The *5-band DXCC Record Book* costs $15 air mail, $13 surface mail. As a special offer, the two DXCC books are available together at a special price of $17 air mail, $15 surface mail.

The table

Although the countries table which appears in these pages is meant to reflect the number of DXCC countries heard/worked, and there are no prizes at the end of each year for the leading entrant, we do expect everyone to follow the rules. It has been noticed that some dubious "countries" have been appearing this year, such as Staten Is and Benbecula. It can only be repeated that the RSGB Countries List forms the basis of the table. If the country does not appear on that list, it does not count for the table. Hopefully, everyone with entries in the table will check to see they have not included any dubious "countries", and keep the game as a fair one!

While on the subject of the tables, your scribe was disappointed at the poor response from our amateur colleagues who failed to send any scores to complement that of G3KMA. Hopefully, we may get some response before the table is published again in September 1980.

Loop antennas

Harold Moss, BRS18529, has built a 40in loop antenna originally mentioned in this journal a couple of years ago, in an attempt to obtain lower noise levels on 3·5MHz. It certainly reduces the QRN level, and dx is audible on the loop when it is not audible on a trap dipole. Harold was informed that the loop would show some directional properties, but it does not seem to do so. He would be pleased to hear from anyone else who may use such an antenna and who can explain the lack of directivity; his QTH is: Garden Cottage, School Lane, West Kingsdown, Sevenoaks, Kent.

All-time countries table

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS17567	265	304	349	163	224	33	1,338	ssb/cw
BRS25429	247	291	322	214	217	45	1,336	ssb
BRS32525	246	288	310	208	237	38	1,327	ssb
G3KMA	278	306	314	224	159	36	1,317	ssb/cw
BRS35943	232	274	297	198	218	30	1,249	ssb
BRS25901	220	280	312	182	189	22	1,205	ssb
A8808	214	247	287	133	153	42	1,076	ssb/cw
ARS8841	207	239	301	128	152	12	1,039	ssb/cw
RS42604	206	213	180	138	112	21	870	ssb
A9191	144	187	232	72	95	11	731	ssb
ARS41426	161	163	145	87	104	28	688	ssb/cw
BRS20185	150	145	195	45	48	6	589	ssb
ARS41386/GJ	129	146	140	53	38	5	511	ssb

1980 hf countries table

Station	28	21	14	7	3·5	1·8	Total	Mode
RS42604	179	174	130	114	108	17	722	ssb
BRS43475	118	153	192	86	74	10	633	ssb
A8808	144	141	144	73	82	14	598	ssb/cw
ARS8841	101	97	161	80	80	0	519	ssb/cw
BRS35943	97	97	93	76	85	5	453	ssb
BRS18529	29	66	114	48	47	13	317	ssb
BRS43273	96	75	74	26	13	0	284	ssb
BRS40293	44	79	82	30	25	0	255	ssb
BRS20185	59	54	75	20	27	2	237	ssb
ARS43261	54	50	75	20	18	0	217	ssb
ARS42503	67	38	62	45	20	0	212	ssb
BRS40705	50	56	46	38	19	0	209	ssb
BRS43135	22	34	58	23	28	8	173	ssb
BRS42559	36	47	60	11	9	2	165	ssb
BRS41992	33	32	50	11	31	7	164	ssb
ARS43496	1	38	66	22	21	2	150	ssb

144MHz activity

Many swls seem to turn to the vhf and uhf bands during the summer when the hf bands are not so lively. With a decent antenna system, it is easy to copy good dx on 144 and 432MHz during lift conditions and contest weekends. So far in May there has been one good opening to OZ and SM on 432MHz, with one station being 5/9 from FS square. During the contest in early May, stations were worked in YU and Y (East Germany) from G. With the RSGB vhf/uhf awards available to swls, the majority of those active on 144 and 432MHz will QSL swl reports (providing they are accurate). Your scribe would be pleased to receive reports of dx heard by listeners for future inclusion in this feature. Remember to quote the callsign and the QTH locator, as the latter provides most of the interest and certainly tells how rare the station is.

Finale

Details next time of Cray Valley's 10th SWL Contest which will take place in September. If any dx swl requires details, please write to the address at the foot of the first column. Certificates are provided for first swl in each DXCC country.

Mail is also acknowledged from ARS42922, BRS43135 (KX6AT is on Marshall Is), ARS42503, BRS40293, BRS20185, BRS43273 and RS42604.

Copy for the September issue should reach your scribe before 14 July. □

the month on the air

John Allaway, G3FKM *

THE response to the request for opinions on the ultimate band plan (if any) for the new 10MHz allocation made in April *MOTA* has so far been very disappointing. Now is the time to make strong views known—the Society will be putting forward its case at the IARU Region 1 Conference next spring, and it really would be useful to know what *you* think.

A request has been received from F6EZH, via G4DGQ. He has a 13-year-old son who is learning English and who wishes to arrange an exchange holiday with an amateur family. Please write to Marc De Filippis, 25 Avenue de Tassigny, 73100 Aix les Bains, France (tel: 16 79 61 06 53).

G4HLX reports that the callsign of the University of Birmingham Radio Society is being pirated by someone claiming to be located near Shrewsbury. The club callsigns G3IUB and G8IUB are only used from the university premises, and 7MHz cw has not been used for more than six years.

G3GFC has also asked for publicity for the fact that his callsign is being used by an unauthorized person on 14MHz cw.

Apologies are extended for the delay in appearance of some items in this month's *MOTA*, which, of course, became two months' columns combined. Hopefully things will be back to normal next month!

Radio Amateur's Conversation Guide

Older members may remember a most useful multi-lingual phrase book called *Ham's Interpreter* which was available some years ago. A modern and much more comprehensive book has now been produced by OH1BR and OH2BAD. This contains numerals, phonetics, 147 phrases covering many fields of amateur radio: antennas, contests, dxing, personal information, QSLing, and much more, plus a 450-word dictionary. The languages covered are English, German, French, Italian, Spanish, Portuguese, Russian (expressed in both phonetic and Cyrillic alphabets) and Japanese. Supplements for minor languages (Finnish, Serbo-Croat, Swedish etc) will be available soon, as will cassettes for the major languages. The book is available from Transelectro OY, Box 8, SF-00610 Helsinki 61, Finland, price US$12 (or equivalent). There is a special request not to pay by cheque please, unless an additional US$1 is included to cover costs.

News from overseas

Jukka, OH1BR/OH2BR, and Miika, OH2BAD, as well as sending along their picture and information on their new book, have also provided background details of their amateur radio careers. Jukka started amateur radio in 1960 at the age of 15, and his younger brother became OH2BAD at the age of 12 and was possibly the youngest amateur in Europe. Jukka attended

OH1BR (l) and OH2BAD, joint authors of the "Conversation Guide" (see text)

Helsinki University, where he graduated in languages—he is now married and his wife is studying for her novice licence. Miika is studying theology and is married to the sister of OH1QP and OH1XX! Both brothers have Drake 4-lines, '1BR has a Henry 3KA amplifier, and '2BAD a 1kW linear. Miika was a member of the record-breaking EA8CR contest team in 1977–8 and is QSL manager for the OH expeditions (eg OH0, CT3, EA8, ZD3, C5, SV1/A, 5T5, TZ and others). Both have served SRAL as dx managers and written the society's dx column, and both have nearly 330 countries confirmed for DXCC.

The *Ex-G Radio Club Bulletin* gives the latest news on the position of amateur radio in Malawi through letters received by VK5ZB. Ron MacFarlane, who was first licensed as GM3EAK after the war, became ZD6RM in 1955 and 7Q7RM in 1964, says that amateur activities were suspended in March 1976 and that all his equipment has been in official hands since then. He feels that letters to the Postmaster-General asking when Malawi amateurs will be on the air again may prove a help in getting the ban lifted. Jock Perrett, 7Q7S, points out that the last amateur who operated was jailed and then deported. Jock has been in Africa for 31 years and says that Malawians are most friendly and some of the nicest people it is possible to meet.

Mark Deutsch, G3VJG, is in Singapore and very active on the hf bands as 9V1UH. He has been there since last November, and uses his TS520 and dipoles mostly on 21 and 28MHz ssb. He says that his favourite operating times are between 1400 and 1530 when he looks specially for contacts with the UK, although he suffers greatly from European and Japanese QRM. He will be in Singapore until mid-1981 and suggests that those who would like a quick QSL send theirs to the address in "QTH Corner".

Congratulations to Hugh Cassidy, WA6AUD, whose callsign was a household name in dx circles for many years during the time he published the *West Coast DX Bulletin*. He was awarded the CQ Magazine Hall of Fame honour at the recent Fresno DX Convention.

WA4JQS, who is a member of the RSGB, reports that he acts as QSL manager for the following stations: KG4DS, VP8PU, VP8QG, VP8NJ, VP8WA, ZS1DM and TA2TA.

John Bautista, ZB2EO, also holds the callsign G4JTC, and QSLs for both his calls should be sent to the address in "QTH Corner".

*10 Knightlow Road, Birmingham B17 8QB

DX news

3B9AE on Rodriguez Is seems to have two crystal-controlled frequencies—14,130 and 14,240kHz. However, he has also been reported on 14,243kHz at around 1700.

On 4 June a scientific expedition will leave Sweden on the icebreaker *Ymer*. It will follow the route through the North-East Passage mapped by Adolf Nordemskjold in the *ss Vega*—through the Barents Sea, north of Svalbard and Greenland, and will return in September. It is understood that the ship has permission to enter Soviet waters. SM0GKA, SM6EQH and SM1JIR will be aboard and they will operate on all bands (including vhf and uhf) using their special callsign SL8AEN/MM. All contacts will be QSLd with a special card.

G3KER in Bahrain has now received the callsign A4XIH, and is requesting QSLs via G4BWP. After a long period with no amateur activity it seems that new stations are appearing on the air from Qatar fairly frequently. A7XE has been worked on 21MHz and 28MHz cw.

According to the *DX Bulletin* the Northern California DX Foundation has shipped a beam and rotator to the Children's Youth Palace in Omdurman for use by 6T1YP. OH2BH will be in Khartoum this month and hopes to be on from the station for a few days before moving on to ST0, Southern Sudan.

VK0DB keeps a schedule with Australian stations on 14,210kHz at 0930 each Tuesday. Following this he often moves to the 21,150–21,180kHz area. VK0KH was due to leave Macquarie Is at the end of April, and OZ8AE paid his second annual visit to the island between 20 February and 4 March when he was on the air as VK0JC.

YI1BGD is still quite active from Baghdad, and YI4SC has also been worked—this is operator Mohammad and he requests QSLs to the YI1BGD address.

UA1PAL in Franz Josef Land keeps a schedule with W7PHO almost daily on 14,250kHz at 0400. He is also sometimes on the DK2OC net on 28,750kHz at 1200, and also on 14MHz cw after 0200. UA1OAZ/U1P is not located in Franz Josef Land but at Naryanman in Oblast 114.

A51PN reports that his mail is often opened, and asks those wishing for QSLs not to include money. He also has problems with ircs which the local post office will not accept unless they bear a 1980 date-of-issue stamp. He has been worked recently on 28,430kHz from 1030 to 1100.

BV2A/BV2B has a schedule which is as follows: Wednesdays 1000 to 1400, and Saturday 2300 to Sunday 0200, mostly on 14,218kHz, but he has also been worked on 28,030 and 28,530kHz.

Alan Wright, G4EPN, specializes in 14MHz dx work, but operates all bands, including vhf and uhf

Tom Christian, VR6TC, has been active on 28MHz ssb and seems to follow the pattern: Monday at 0700 on 14,185kHz, Tuesday at 2200 on 21,350kHz, and Thursday at 1700 on 28,950kHz. His wife Betty is now licensed as VR6BC, and it is believed that VR6KY will be on the air soon.

JA1KSO is being troubled by QSL cards for supposed contacts with FU8AB, 5W1CC, VK9TV, CR9ABX, BY1A, BV2A, JA6CSH/JD1, JA1KSO/BY and 3C0AA. He is not able to comply with any of them.

SM0AGD/XW8 QSLs are now being accepted for DXCC credit, and those who have had their card rejected should now resubmit. A6XJA cards are not being accepted, as no licences have been issued in the United Arab Emirates since 11 February 1979.

The second letter of the suffix in the callsigns of stations in the Sultanate of Oman indicates the status of the owner: if it is V the call belongs to a visitor, and if Y a lady. GW4BLE is anxious to trace the former owner of the call A4XVI.

A number of stations were on the air in mid-May with special callsigns celebrating ITU day on 17 May. They included HW3ITU (in France), FM7ITU, FY7ITU, and 8J3ITU (in Japan).

YB0ACL is trying to make as many contacts as possible before he leaves Indonesia at the end of August. He says that YB0ADI has a 7MHz beam.

An unconfirmed report says that Gopal, VU2GO, was killed in a road accident during March. Another loss to the hf bands was Horace Gray, 9M8HG.

The station using the callsign CE0ZJ is not authorized by the Chilean authorities, and local government officials say that there is no island resident in possession of either a licence or radio equipment.

4U1UN is happy to arrange schedules—please write to Hermann Bohning, W2MZV, 1 Caryl Ave, Yonkers, NY, 10705, USA, enclosing an sae and irc.

There is a report that the 3C1 stations which have been fairly active in the past few months have been closed down by the Equatorial Guinea authorities.

Anyone wishing to make contact with Tom Christian on Pitcairn Is might do so by listening on Tuesdays at 2300 when he keeps a schedule with WA2DXJ on 21,350kHz. When this is finished he works European callers.

According to the *Long Island DX Bulletin* A51PN responds to requests for cw contacts during his Tuesday schedules with AP5HQ at 1200 on 14,236kHz. He also uses 28,560kHz at 0001 and 1100 and has put up antennas for 3·5 and 7MHz. QSLs go to Box 166, Thimpu, Bhutan, and applicants are asked to enclose five 1980 ires and an sae, and particularly **not** to mention amateur radio on the envelope.

The Northern California DX Foundation

In a most interesting newsletter dated May 1980 the NCDXF details its activities and achievements during the period since 1972 when it was first formed. The list of dxpeditions which have benefited from its help is very impressive indeed; and they received all kinds of assistance, from the provision and handling of QSL cards to major expenditure for equipment. The stated purpose of the foundation is to "assist radio and scientific events with funds or equipment . . . supported by those who benefit. To provide a central point for collecting and dispensing funds or equipment to applicants . . . after careful

Colin Richards, 9M2CR, has an extensive range of equipment

screening by the board of trustees." Applications for help must be made directly by the person or group involved, and each case is carefully investigated and voted on by the board (which consists of W6ISQ, president; W6RJ, vice-president; WB6UOM, treasurer; W6CF, secretary; and K6DC, W6WB, K6UD and W6MZ). Anyone is welcome to join, and a donation of at least US$5 brings a handsome certificate to the donor—yearly contributions are encouraged but not mandatory. The address to write to is: PO Box 717, Oakland, Cal, 94604, USA. As the news-sheet says: "If you have worked everything, then all we can offer you is the satisfaction of helping others share in the pleasure. If you have enjoyed the hobby put something back in payment to help someone else."

The NCDXF is running an experimental beacon on 14,100kHz. Its callsign is WB6ZNL and it transmits for 75s every 15min sending "QST QST de WB6ZNL beacon". This is sent at a power input level of exactly 100W. There then follows a series of five 9s dashes at power levels decreasing from 100 to 0·01W in accurate 10dB steps. Each dash is preceded by one to five dots to identify the power level, and after the long dash at the 0·01W level the beacon switches back to 100W for the sign-off. The 10dB step function is expected to be useful for propagation studies, calibrating S meters, comparisons between antennas, receivers, locations, etc. It is intended to install similar units in Hawaii and Puerto Rico, and also on the east coast of the USA.

Dxpeditions

The *DX Bulletin* has published a letter from the "Heard Island DX Association" in which P29JS says that this association has been formed to try to activate Heard Is within the next nine months. A considerable amount of information was gleaned from the visit of the scientific expedition in March of this year, and the Australian authorities are said to have made it clear that they would have no objection to a well-planned, well-founded and good-intentioned amateur expedition. It is intended that the expedition should have a place for a professional scientist, and that the amateur team should consist of experienced contest-type operators. The cost will be considerable, but offers of help have already been received and a trust account has been opened—all donations will be acknowledged with receipts, and if the trip does not take place money will be refunded or allocated to another dxpedition or worthy charity. Weather conditions limit the expedition to the mid-December to mid-February period. Donations should be sent to Jim Smith, P29JS, c/o PO Box 2053, Konedobu, Papua New Guinea.

Long Skip has a report that HK0AA and HK0AB may be active during July from Malpelo/Bajo Nuevo. It is not known whether the two operations will be simultaneous or at different times.

Several expeditions to Tokelau were in the "possible" category at the time of writing, and one not previously mentioned may be carried out by W2TDQ during August.

Last month's *MOTA* reported that the 8Z4A group may go to Kamaran Is, but it is felt that their destination may turn out to be South Yemen, 7O, and that it may be over by the time that this information reaches readers.

K2QBV will be visiting various countries in Africa, commencing about 30 June. He plans brief operations from ZS, S8, 3D6 and possibly other areas.

A final bulletin from Iris and Lloyd Colvin says that, after making over 10,000 contacts from HI6XQL, they returned to the USA during April. Out of the six months' duration of their trip they were actually operating for four months and during that time their equipment (901DM, SB230, and TH3 beam) gave no major problems. In all they made 55,000 contacts. They say that they are prepared to visit Kamaran Is or Desecheo Is if entry permits and operating permission can be obtained. At the meeting of the YASME Foundation directors on 20 April it was decided to issue a "YASME Award" to those who have proof (QSL cards) from at least 30 YASME dxpedition calls—including those held by present or former directors. The custodian is W0MLY, and QSL cards, plus a list, should be sent to him by those who qualify.

Ten-Ten International

To prevent a large frequency allocation being left devoid of amateur activity for some years, in 1962 a group of amateurs in southern California established the Ten-X Net. It is a non-profit organization with the avowed aim of making the maximum use of the 28MHz band. Following the recent WARC the immediate threat to amateur interests in the 28–29·7MHz band has diminished. Nevertheless it is a large segment of the rf spectrum, and other services would gladly move in if amateurs were not seen to be making full use of the band throughout all phases of the sunspot cycle.

The founders of Ten-X used the band for local working in California. From there the movement spread slowly at first and then with increasing rapidity across the USA and into Canada. Today there are more than 28,000 members throughout the world, and the name has been changed to Ten-X International Net Inc. There are local chapters in almost every state and province in North America. Several chapters have been established in western Europe—there are currently two active in the UK: one in London (organized by G4CLK) and one in the Manchester area (run by G3BKS). There are 10 branches in Australia and New Zealand, and two in Japan. Most chapters have names which are associated with some historical or geographical feature of the city or state concerned. The London chapter is called the Tower of London and that in Manchester the Laurel Mancunium (indicating Manchester's Roman origins). Chapters issue certificates for contacting specified numbers of members. Most have a meeting at least once weekly, and there is a general "backscatter" net daily at

1300 on 28,825kHz. Most USA nets meet rather late for propagation into Europe but some have morning sessions, eg the Los Angeles group which meets at 1700 on Saturdays on 28,655kHz and the South Dakota net which is held at 1800 on Sundays on 28,700kHz.

Joining Ten-X is achieved by working five members and then sending log details (including the membership numbers of the stations worked) to H. Syring, WB1FTQ, 37 Bradford Drive, Windsor, Ct, 06095, USA, together with US$4. The new members will be issued with a five-digit number, will receive a quarterly bulletin, and be allowed to take part in all the organization's many activities (Tnx "D.Deich").

JOTA

G3BHK's report on the 22nd Jamboree-on-the-Air, which took place on 20-21 October 1979, notes a marked fall in the number of UK stations taking part—only 315 compared with 397 the previous year. In contrast the number of overseas stations participating increased to an all-time record of 723 in 59 different countries—from only 658 in 1978. A notable feature was the very large number of stations in the Netherlands, and it is almost certain that this came about as a result of the relaxation of the rules by the authorities which now enables unlicensed Scouts to speak over the air. Unusual callsigns listed in the report included ZD8JAM, ZD7JAM, ZB2FFG, 4S7RS, VP8SB and VP8VN, and stations were also active in Fiji, Western Samoa, Korea, Guatemala, Hong Kong, Indonesia and Namibia. Many national Scout HQs were on the air, including GB2GP, K2BSA, CE3BSC, HB9S, HM0S, PY2BPH, PA6RSN, VE2JAM and VK4QH. The 1980 event will take place over the weekend of 18-19 October.

A reminder that there is a UK Scout Net every Saturday at 0900 local time on 3,740kHz. World Scout frequencies are 3,590, 3,740, 3,940, 7,030, 7,090, 14,070, 14,290, 21,140, 21,360, 28,190 and 28,990kHz.

Welcome

The Society is very pleased to welcome the following overseas amateurs who became members during March (April and May new members will be listed next time): EA1QP, EA7AJN, EI9DB, I0JAJ, LA6VC, LU6DWA, PE1CBL, SM6CTQ, SV3MG, VE7DER, W3XO, WD8DSX, YB0IP, 5B4DV, 5B4HY, and listeners K. M. Jones (7Q), S. Bordelais (F), and D. Debelli (I).

RSGB hf awards

The cost of the Society's hf awards to *non-members* has now been increased to £1 or eight ircs. Due to an unfortunate error a number of information leaflets bearing the old fees and giving G5GH as hf awards manager were issued at the Alexandra Palace exhibition. Please note that the certificates are *free to members* as a membership benefit. In order to claim this benefit all applicants must enclose proof of Society membership with every application.

Computers

Many amateurs are now experimenting with home computer units controlling their equipment, and a request has been received from G3ZPF (30 High Arcal Road, Dudley DY3 1BN, W Midlands) for other interested parties to contact him. He has an Apple 2 and has already written a program to give the times of "grey-line" openings on the lower frequency bands.

Richard Dismore, ZE1FX (see text)

Instant international relations

Richard Dismore, ZE1FX, points out that a large proportion of the world's amateur population is less than 40 years old. He feels that there is no better way for them to practice the third aim of Round Table (to promote and further international understanding, friendship, and co-operation) than by means of amateur radio. Regular contact has already been established between Botswana, South African and New Zealand Round Tables, and it is intended to extend this to as many countries as possible where Round Table, Active 20 30 International Apex, Kinsmen, JECC, and Sable clubs exist. ZE1FX may be contacted most days from 0500 on the ANZA net on 21,203kHz.

Ex-G Radio Club

Please note that the information given on p169 of February 1980 *MOTA* concerning the time of meeting of the Canadian Chapter is not correct. The time is now 1730 and not 1630 as published. At one time the net time was varied according to the time of year but this no longer happens (Thanks, VE4DE).

Contests

The All Asian DX Contest

0000 21 June to 2400 22 June (Phone)
0000 23 August to 2400 24 August (CW)

1·8 to 3·5MHz. Single-operator, single- and multi-band, and multi-operator multi-band categories. Exchange RS/T plus age (lady operators send 00). Contacts with Asian stations count three points on 1·8MHz, two on 3·5MHz, and one on all other bands, and the multiplier is the number of different Asian prefixes worked on each band added together. Note that contacts with USA "auxiliary military radio stations" in the Far East do not count, and that JD stations located on Minamitori Shima (Marcus Is) are not in Asia. The AA countries list is as follows: A4, A5, A6, A7, A9, AP, BV, BY, CR9, EP, HL/HM, JA, JD (Ogasawara Is), JD (Okinotorishima Is), JT,

QTH CORNER

A35BK	via ZL1AA, Auckland Branch, NZART, 104-A St Andrews Rd, Auckland, New Zealand.
CR9AK	via VS6AG, c/o Box 541, Hong Kong.
FH0FLP **FR0ACB/G** **FR0ACC/G**	via DK9KD, D. Loeffler, PO Box 620 620, 5000 Koeln 60, Fed Rep of Germany.
FR0FLO	via F6CVI, 62 Rue Chaptal, 92300 Levallos-Perret, France.
FR0RX/G	via DK9KD (see above).
G4JTC	J. J. Bautista, 47 Valiant House, Varyl Begg Estate, Gibraltar.
S79GM	via WA4JIL, 2708 Oakland Av, Cleveland, Tenn, 37311, USA.
K5LBU/ST0	via WA4ZQQ, 105 Hickpry Knob Court, Ft Mill, SC, 29715, USA.
SV1DC/A **SV1IW/A** **SV1JG/A**	PO Box 3751, Athens, Greece.
VS5JM	PO Box 1200, Bandar Seri Begawan, Brunei.
VS5LH	L. Higginbotham, Box 1580, Bandar Seri Begawan, Brunei.
VS5OO	via N2OO, R. Schenk, 2-12 Oak Leaf Drive, Tuckerton, NJ. 08067, USA.
VS5RP	PO Box 43, Tutong, Brunei.
ZL2BCF/A	J. M. Henderson, 45A Bamber St, Wanganui, New Zealand.
ZM7AA	(CW QSOs) Box 22800, Tel Aviv, Israel.
ZM7AA	(Phone QSOs) Box 22572, Tel Aviv, Israel.
5W1CN	via ZL1AA (see A35BK).
9H3AM	via G3VLX, QTHR.
9H3BC	via G3XMD, QTHR.
9M6MU	via N2CW, G. Medford, 207 W 5th St, Ship Bottom, NJ, 08008, USA.
9V1UH	M. Deutsch, 17 Kings Walk, Singapore 1026.

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

JY, OD, S2, TA, UA9/UA0, UD, UF, UG, UH, UI, UJ, UL, UM, VS6, 8Q, VU, VU (Andaman), VU (Nicobar), XU, XV, YA, YI, YK, 5B4, 1S, 4S, 4X, 7O, 7O (Kamaran), 8Z4, 9K, 9M2, 9N, 9V and Abu Ail. Logs should indicate date, time, station worked, numbers sent and received, if multiplier, and points claimed. They should show 40 QSOs per page, and separate sheets must be used for each band. A summary sheet, containing the usual signed declaration, should also be submitted, and entries should reach JARL, PO Box 377, Tokyo Central, Japan, before 30 September (for phone section) or 30 November (for cw section).

Results of the **1979 CQ WW WPX CW Contest** appeared in April *CQ* and UK scores listed were as follows (certificate winners in bold type):

SINGLE-OPERATOR

Station		Points	Station	Points
GU5CIA (All band)		1,695,907	G6NK (All band)	10,557
G5CMX	,,	431,475	**G4CNY** (21MHz)	407,745
G3TXF	,,	239,578	**GU4CHY** ,,	161,784
GW3NYY	,,	134,240	**GU3MBS** (14MHz)	11,408
G3HRY	,,	61,915	**G4FDC** ,,	5,280
G2AJB	,,	59,094	**GU4EDN** (7MHz)	191,888
G3ESF	,,	16,146		

Congratulations to **G4BUE** who was listed world second in the QRP section (all-band) with 159,120 points—the winner being SM0GMG with 170,352; G3DOP scored 252. G3DOP was also world second on 14MHz with 252 points. In the multi-operator category (single-transmitter) **GB2DAA** was also world second with 2,630,888 points.

SEANET Contest
0001 19 July to 2359 20 July (CW)
0001 16 August to 2359 17 August (Phone)
This publicizes the 10th SEANET Convention in Manila on 28-30 November, and the usual RS/T plus QSO number exchanges should be made. For stations outside the SEANET area QSO points are as follows: with DU, HS, YB, 9V, 9M2, 9M6 and 9M8 20 points on 1·8MHz, 10 on 3·5 or 7MHz, and 4 on 14, 21 and 28MHz. With other stations in the area 10, 5 and 2 respectively. The multiplier is three for each NET country worked. NET countries are: A4, A5, A6, A7, A9, AC3, AP, BV, CR9, C21, DU, EP, HL/HM, HS, H44, JA,JD, JY, KA, KC6, KG6/KH2, KX6, KH6, P29, S2, S7, VK, VQ9, VS5, VS6, 8Q6, VU, XU, XV, XW, YB, YJ, ZL, 3B6, 3B8, 3D2, 4S, 4W, 5Z4, 9K2, 9M2, 9M6, 9M8, 9N1 and 9V. Final score is total QSO points from all bands times the sum of the multipliers from each band. Logs must reach 9M2FK, PO Box 13, Penang, Malaysia, by 31 October, and an enclosed irc will produce a copy of the results.

The Venezuelan Contest
0000 5 July to 2400 6 July (Phone)
0000 26 July to 2400 27 July (CW)
This is a world-wide type contest and there are single-operator, single- and multi-band, and multi-operator single- and multi-transmitter and listener sections. Exchange RS/T and QSO number (from 001). Contacts between stations in different countries count two points, in the same country no points but only for multiplier credit. The multiplier is one for each DXCC country, YV call area, and USA call district worked on each band. The final score is total QSO points times the sum of the multipliers from each band. Certificates will be awarded to those who have worked 15 YVs plus 10 other countries (for stations on the American continent), or 10 YVs and 10 countries for European and African entrants, or five YVsf and 10 countries for Asia and Oceania. Listeners reporting at least 50 complete QSOs (including 10 YVs) are also eligible. Include a summary sheet and the usual signed declaration with logs, and if a certificate is desired please include US$2 or equivalent in ircs. Post before 15 September (phone) or 15 October (cw) to: Radio Club Venezolano, PO Box 2285, Caracas 101, Venezuela.

Ten-Ten Net QSO Party
0000 19 July to 2400 20 July
Activity on 28MHz only. All may enter but only members are eligible for awards (see elsewhere in *MOTA*). Only 24h may be worked, in minimum periods of at least 1h, and a station may be worked once only. There are single-operator and QRP sections—the latter must not use more than 20W p.e.p. maximum output. Exchanges consist of callsign, name, city, state and 10-10 number (if any). Each QSO counts one point, two if with member. There is no multiplier. Send summary sheet with log showing hours of operation etc. Logs must reach Robert Watson, 2 Suffolk Court, Oceanside, NY, 11572, USA, no later than 20 August.

AGCW-DL QRP Contest.
1500 19 July to 1500 20 July
CW only, 1·8 to 28MHz. Same station may be worked on each band for credit. Five classes: (A) single-operator 3·5W or less input, (B) single-operator 10W or less input, (C) multi-operator 10W or less input, (D) stations running QRO (over 10W input), and (E) listeners. Single-operator stations must take a 9h break. Exchanges consist of RST, QSO number, and power input. Add "X" if crystal controlled. Contacts with own country count one point, with own continent two points, and with other continents three points. Points are doubled if station is crystal controlled. (NB: not more than three crystals may be used.) The multiplier is the number of countries worked and dx contacts made (outside own continent) on each band, and the final score is the total of points times the multiplier on each band added together. Call areas in JA, PY, VE, VK, W and ZS count as separate multipliers. Send log within six weeks of

Not something for working VK on top band, but G3SED (l) and G3YRO in the control room of their recording studio

contest to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed Rep of Germany.

In the **QRP Winter Contest 1980,** in Class A **G4BUE** was top scorer with 7,320 points, GM3OXX/A second with 6,761, and G3DNF third with 6,278. G8PG was sixth with 3,333 and G4ETJ 23rd with 324. There were 41 entries, and a total of 97 participants in all categories.

In the **AGCW-DL Happy New Year Contest, G4DRS** scored 2,960 points in Class 1, and **G4FDC** 620 points in Class 3. **BRS15822** was leader of the listener (Class 4) section.

Congratulations to **GD4HIT** who won the gold cup in the **1980 YL-OM (CW) Contest** with 21,553 points as world top score. GD4GWQ also did well in the phone section with 12,870 points, and G3VUH, G3NFV and GM4ELV are also listed as OM participants with 1,821, 672, and 406 points respectively.

1980 IARU Radiosport Championship.
0000 12 July to 2359 13 July
Maximum 36 hours for single-operator entrants. Single- and multi-operator, and single but no multi-transmitter categories. Separate categories for single operators—cw only, phone only, and mixed. Multi-operator stations must observe a 10min rule—if a contact is made on a band the transmitter must remain on that band for at least 10min. Contest covers 1·8 to 144MHz, and a station may be worked on each band once only. QSOs within one's own ITU zone (UK is in zone 27) count one point, with other zones on same continent three points, and with all others five. The multiplier is the sum of different ITU zones worked on each band. Exchange RS/T and zone number. Entries should be posted no later than 25 August to IARU HQ, Box AAA, Newington, Ct, 06111, USA. Note that "dupe" sheets must be included if more than 200 contacts were made. Photocopies of the entry sheet may be obtained from G3FKM (sase please).

Awards

The Amsterdam Certificate
New rules for this award were published in *MOTA* (January 1980) and it seems that these have now been modified. Confirmed contact with at least 10 members of the Amsterdam DX Club is required from applicants—wherever they are situated. QSOs must have been since 1 January 1957, and QSLs must have been received. Send a log extract (certified by two other amateurs) plus six ircs to ADXC Club, PO Box 9, 1000 AA Amsterdam, Netherlands.

The AGCW-DL Awards
Issued by the Arbeitsgemeinschaft Telegraphie, Deutschland (AGCW-DL) to promote the use of cw on all bands. Any licensed amateur or listener may apply and the fee for each is DM5, US$2, or equivalent in ircs. The **CW-1000 Award** is for 1,000 cw QSOs in one calendar year. Non AGCW-DL members should submit a list (certified by two other amateurs) of the total number of QSOs each month in the relevant year; members submit a simple list of all QSOs. The **CW-500 Award** is similar but for a minimum of 500 contacts, and the **QRP-CW-250** is awarded for a minimum of 250 QSOs with a transmitter input of less than 10W. In this case a signed declaration saying: "I hereby certify that all QSOs contained in this claim have been made using a tx input of less than 10W" must be included. Listeners record both callsigns in each QSO, and CQ calls do not count as the exact power input of each station listed must be recorded. Applications go to: The Secretary, AGCW-DL, Otto A. Wiesner, DJ5QK, Freudenheimer Str 14, D-6900 Heidelberg 1, Federal Republic of Germany.

The Cornish Award
Offered by the Cornish Radio Amateur Club for working Cornish stations. European applicants require 30 points for Class 1, 20 for Class 2, and 10 for Class 3. Others 15, 10 and 5 points respectively. Each contact counts one point, and a station may be worked once on each band for credit. A vhf/uhf award is also available and requires 9, 6 or 3 points. QSLs need not be sent, but a list (certified by two licensed amateurs or officer of a national radio society) plus 25p, US$1.25, or 10 ircs should be sent to: Awards Manager, G2AYQ, "Albany House", Goonown, St Agnes, Cornwall. There are no date restrictions and the award is free to disabled applicants.

The BYLARA Award
This beautiful and colourful award is available for working lady members of BYLARA—the British YL Amateur Radio Association—and to listeners on a "heard" basis. Stations in Europe need to work 15 members, including at least 10 in Britain (G, GM, GE, GI, GD, GU and GJ). Others need 10 members—six in Britain. Endorsements are issued on request, and only contacts on or after 29 April are valid.

Definitive sunspot numbers for 1979

by A. ZELENKA

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	158	116	116	131	108	121	158	115	165	213	224	122
2	158	113	138	134	106	145	168	96	141	187	157	156
3	191	136	141	135	103	154	205	121	148	167	155	187
4	157	123	142	138	112	178	219	110	157	156	172	218
5	146	134	135	109	113	207	232	93	139	168	166	232
6	173	146	144	91	122	226	249	104	139	168	203	206
7	163	144	146	77	148	222	223	110	170	179	240	212
8	172	142	143	69	157	220	219	132	192	190	280	262
9	165	139	146	61	162	224	191	115	190	210	279	280
10	163	137	140	75	145	205	163	92	177	178	302	260
11	157	137	156	94	148	186	155	84	167	183	295	242
12	159	138	170	107	158	199	145	87	156	189	248	261
13	151	152	169	113	163	172	142	91	175	201	183	235
14	157	163	159	116	203	149	127	112	186	213	218	230
15	178	161	155	117	207	117	121	135	177	198	186	225
16	164	159	130	119	187	103	107	115	163	185	166	215
17	164	160	142	107	184	122	109	124	155	214	238	180
18	146	162	142	98	148	126	109	143	177	224	172	151
19	138	166	138	79	109	110	135	176	195	221	174	138
20	177	181	131	68	107	111	158	187	191	214	153	126
21	192	171	134	68	114	124	151	218	184	209	124	124
22	188	155	140	79	121	108	152	216	178	191	116	111
23	200	127	139	76	117	96	154	206	219	179	142	116
24	209	99	118	72	119	90	143	203	236	161	162	130
25	209	88	114	85	124	120	144	201	252	153	155	143
26	173	108	114	118	123	132	142	182	261	145	141	116
27	167	97	117	125	118	112	146	189	256	136	115	93
28	157	95	114	132	110	128	132	174	239	142	119	98
29	153		123	132	113	124	148	158	235	184	98	121
30	149		135	120	96	154	150	150	233	190	116	139
31	130		147		120		144	168		223		135
Mean	166·6	137·5	138·0	101·5	134·4	149·5	159·4	142·2	188·4	186·2	183·3	176·3

Yearly mean = 155·4

Applicants should send signed log data and £1.50, 12 ircs or US$4 to: Diana Hughes, G4EZ1, 3 Primley Park Crescent, Leeds LS17 7HY. Contacts for the award may be made after 7.45pm local time on the BYLARA Net on Mondays near 3,605kHz, and particularly on activity days (the 6th of every month). Look around 14,288, 21,388 and 28,688kHz, on the hour every hour. Note that no QSLs are required.

All copies of the *Isle of Man Millennium Award* were despatched early in May. The sponsors are very grateful to the island's Lieutenant Governor who personally signed each certificate.

50MHz propagation information net

A net designed to co-ordinate information on propagation conditions on 50MHz is being held each Monday by G5KW and G4JCC who meet at 1800 on 3,650kHz. All contributions are welcome.

Band reports

A most interesting period since the last *MOTA* was written, with at least one long-path opening in the early morning on 28MHz into the western USA during early April.

Both monthly reports from G8KG are worthy of note and are as follows:

(April) "Mean solar activity rose quite steeply during April, the highest activity being in the second week of the month, which also saw some disturbed days. Daily solar flux was above 200sfu for more than half the month, with a peak of 249 on 11 April. With a few more days to go at the time of writing, it looks as if the average for the month will be only a little lower than that for October 1979, and there are signs that the rise will continue for a while."

(May) "The rise in mean solar activity which began in April continued during May. Based on preliminary information, and with a few days' data still to come, at the time of writing it looks as if the monthly averages of both solar flux and sunspot numbers may equal or even exceed those recorded in the autumn of 1979. Daily solar flux values were above 200sfu for most of the month and reached a peak of 285 on 25 May, giving the second highest peak in daily values during Cycle 21. The indications are that the smoothed monthly sunspot number for November 1979 will be well above 160, with the corresponding solar flux value being about 195sfu and the peak in the smoothed curve not being reached until December or later."

Your scribe is very grateful to the following who contributed to the column during the two-month period: G2s CDT and HKU, G5s JL and LR, G3s AAE, GHY, GVV, IMW and KSH, GM3LYY, G4AXD, GW4BLE, G4s EHQ and GXL, and RSs 15767, 31301, 36928 and 42876.

Stations listed in italics were using cw.

Phil Weaver, VS6CT

1·8MHz. 0000 *PY1RO.* **2100** *F6DYY, OZ1W, SP5IXI, RP2BET, UC2AAK, YU2OB.* **2300** *OH2OT/OH0.*

3·5MHz. 0400 OA4AKP. **0500** TG9GI, ZP5CP. **0600** W0AFY, ZL4AP. **2000** TR8DX. **2100** UA0AAB, 9K2DR. **2200** LU2FFD, *VU2UH,* ZS5LB, 5H3FW (QSL to DF2TA).

7MHz. 0000 *PP0MAG, ZB2EO, ZD8TC.* **0500** *J6LKY* (QSL to N6NK), *TI9CF,* VE8RR, *W6-W7,* 4U1UN, *5N0DOG.* **0700** FM0FJE, TI2CC, *W6BJH, ZB2EO, ZL.* **0800** *VK.* **2200** XT2AW. **2300** ZP5PT.

14MHz. 0000 4U1UN. **0200** TI9XXX, VP2s AZE,SQ. **0300** VP1TL. **0500** *FO8AK, W7KEU/OA8.* **0600** HV2VO, KH6, KL7, *UA0KAR* (Wrangel Is), W4-W0, *ZK1BD* (QSL to ZL1SZ). **0700** K6LH/AH8, FK8DH, ZM7AA. **0800** A35BK, CR9AK, FK8CR, FW8s AC, SC, K2BS/HH2, KH6, VK2AGT/LH, TA2CK, VK0KH, W6-W7, ZL2UW/C. **0900** 3D2WR. **1300** *UA1OAZ/U1P.* **1500** BV2B. **1600** FH8OM. **1700** *UA0YT.* **1800** D68AK, *JT1BM,* S8AAP, VQ9WE, 3B9AE, 8Q7AR. **1900** SV1JG/A, TR8PO, *9N1BB.* **2000** A7XM, D4CBC, EA9GS, *FH0FLP, UP0L22.* **2100** *HZ1SH, JT1KAA,* VP8PP. **2200** *FP8FJ,* J7DAO, YI4SC, YK1AA. **2300** CE0ZG, DU1JB.

21MHz. 0000 G5RV/ZP5. **0500** *FO8DR, KL7.* **0600** A7XE, K6LPL/KH3, KH6IJ, W6-W7, ZK1BD. **0700** *FO8EW, JT1KAA,* SU1IM, ZK1BD, 3D2DB. **0800** FK8CR, *TR8CR,* VK, ZK1DR, ZL2UW/C, ZL. **0900** C6ACY, J28CB, KL7JAA. **1000** WA4CEH/KH8, TA1UA, TZ4AQS, ZL, 3D2WR. **1100** HS1AMT, NL7F, T3AP, UK0YAA, VK9XW, 4K1A. **1200** SV1IW/A, VP9AD, 9M6MU. **1300** VK9XT, VP2KAM, VU2BK. **1400** VS6GY. **1500** *HS1AMC.* **1600** AP2JL, FR7AI/T, VS5PP, VS6EG. **1700** *BV2A,* C5AAT, K5FSS/DU2, HK0BKW, *VP2MFI,* (QSL to K1RIF), WA1YIG/3B8, 8Q7s AR, *AW, 9A1ONU,* 9L1FC, *9N1MM,* 9M6MU. **1800** *A7XE,* EP2TY, HB9VP/KH6. **1900** A7XD, *FR0ACB/G, J28CB,* VQ9JJ, *ZD8KM* (QSL to G3IFB), 9X5MH. **2000** *FH0FLP,* HZ1HZ, TI9CF, *VP8AI,* VQ9CI, VU2DK, ZL4BO, *ZM7AA,* 5H3FW, 8Q7AW. **2100** A4XCA, *FH0OM,* KL7H, VS5RP, W6, 9V1UH.

28MHz. 0000 VK, ZL (via LP). **0700** N6AV, *WB7FDQ,* (via LP). **0800** *FR0ACB/G, HM50C,* JI1KUL/JD1, TR8GM, VK, ZL, *4S7DX,* 8Q7AT. **0900** CN3RM (QSL to EA3OG), ET3LOC (?), JH6VKO/JD1, VE6CP. **1000** C5AAS, H44PT, HS1ALP, TU2IK, YJ8NMB, ZL, 5H3FW. **1100** FK8s CR, DH, H44s AJ, DX, JT1KAI, VK, 9Q5GB. **1200** FK8DH, FG0DYM/FS7, VK9NM, ZD8KM. **1300** AH2s, FB8XY, FH8OM, *HK0BK,* P29s, SV9LR, YB0ADT. **1400** K2BS/HH2, *HZ1AB,* HZ1HZ, P29NLS, S8AAT, W5JMM/SU, UA1PAL, VP8QG, W6-W7, ZD7SE (Box 30, St Helena), ZS2MI. **1500** *A7XE,* DU1HS/P, *PP0MAG,* VK9XT, 9M6MU, 9V1UH. **1600** A22BX, VK8CC/M (using 4·5ft vertical), VS5SR, YB4HR, 3B6CD. **1700** *A22DW,* (QSL to VK7CH), DU1CK, FG7XA, JE6CNW, VE6-VE7, VR6TC, VS5SA, ZF1AK, ZS2MI. **1800** DUs, FR0ACC/G, HS1WR, KG6SL, VP8JB, 4S7DJ. **1900** CE2BMU, EA9AQ, *ZL1ATW,* (2W input), ZL2AQF. **2000** FY7IB, VE7, VK (LP), VP8s NO, QG, VU, ZL (LP). **2100** CE0ZG, VE7, VP5WJR, W6. **2200** J3AJ, SU1AL, VK (LP), ZD8, ZL. **2300** VK, ZL2UW, ZL4LZ.

Finally, many thanks to all who supplied information and to the writers of the following for items extracted: the *Ex-G Radio Club Magazine* **(W3HQO),** *DX Bulletin* **(K1TN),** the *Long Island DX Bulletin* **(W4UL/W2IYX),** *DX News Sheet* **(Geoff Watts),** *Long Skip* **(VE3FRA),** *DX'press* **(PA0TO),** and *CQ Magazine* **(W1WY).**

All items for **September** issue to reach G3FKM by **25 July,** and for **October** no later than **5 September;** however, anything arriving *earlier* is always doubly welcome! □

Propagation predictions

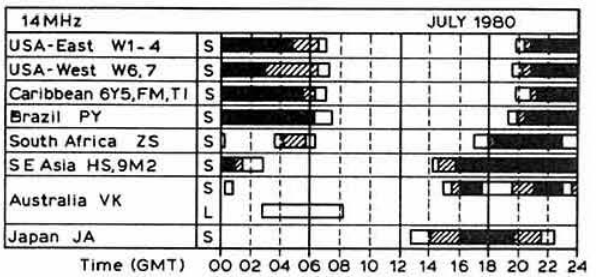
In the seasonal flow of F2 mufs, the months June, July and August present a minimum. This means that during these months conditions on many paths—especially North America and East Asia—are most unfavourable on the hf bands, mainly **28MHz.** This is so even during the present state of relatively high solar activity—the last maximum occurred at the end of 1979.

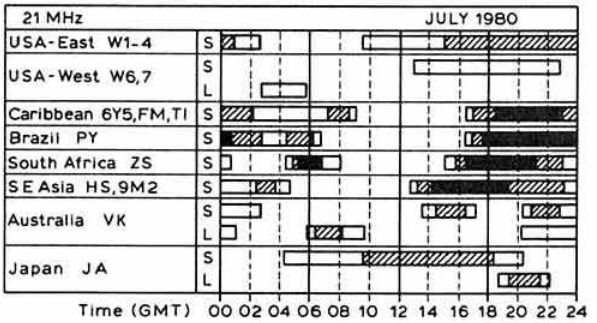
Some compensation for the bad dx conditions on **28MHz** will be provided by sporadic short-skip conditions which are difficult to forecast and which will make traffic possible on **28** and **21MHz.** Traffic with the USA on **28MHz** will be very rare. More certain will be traffic with Africa and the rest of America. The seasonal worsening of dx conditions will not be so noticeable on **21MHz;** during day-time, traffic on this band will sometimes cease because of relatively high absorption.

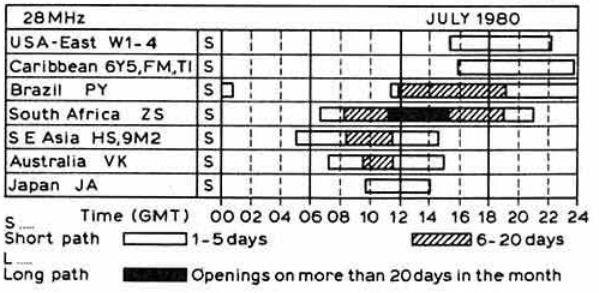
Favourable dx conditions are expected on **14MHz** from about late afternoon (East Asia, Australia) to about 1 to 2h after sunrise. The **7MHz** band will not be suitable for dx during the night because of summer static, but **3·5MHz** will be suitable. There will be no interruption by the dead zone even during the period before sunrise.

The provisional sunspot number for March 1980 was 126·5. The daily numbers reported by the Swiss Federal Observatory range from 36 on 16 March to 205 on 27 March. The provisional sunspot number for May was 179·7.

The predicted smoothed monthly numbers for July, August, September, October and November are 139, 137, 139, 136 and 134 respectively.







HF propagation study

Predicted hpf + luf in megahertz for July 1980

	00	02	04	06	08	10	12	14	16	18	20	22
Suva (s)	1800	1900	1900	2200	2300	2400	2500	2300	2400	2400	2200	2100
Wellington (s)	2100	2100	2200	2500	2500	2600	2400	2000	1900	1600	2500	2200
Osaka	2212	2112	2313	2514	2615	2715	2615	2614	2713	2612	2512	2312
Hong Kong	2313	2314	2514	2716	2818	2918	2816	2814	2912	2908	2707	2509
Sydney (s)	2315	2318	2519	2721	2821	2918	2515	2213	2011	1707	1805	2509
Moscow	2104	1904	2006	2207	2309	2509	2409	2409	2408	2506	2403	2103
Bangkok	2311	2412	2614	2917	3119	3119	3017	3015	3012	3008	2806	2608
Singapore	2410	2412	2614	3017	3219	3119	3116	3114	3111	3107	2805	2606
New Delhi	2406	2408	2610	3012	3214	3215	3114	3112	3109	3106	2805	2604
Perth	2611	2514	2718	3121	3223	3321	3217	2615	2112	1908	1705	1607
Teheran	2604	2605	2708	3110	3312	3313	3213	3311	3309	3106	2903	2802
Colombo	2605	2608	2712	3115	3318	3318	3216	3314	3311	3007	2905	2804
Bahrain	2704	2706	2708	3211	3213	3314	3314	3312	3409	3206	3003	2902
Cyprus	2604	2405	2407	2909	3011	3012	3112	3111	3110	3006	2903	2703
Aden	2505	2407	2810	3312	3315	3516	3615	3614	3712	3408	2805	2804
Seychelles	2900	2300	2800	3200	3300	3400	3600	3600	3300	3200	3200	3000
Mauritius	2100	1700	2800	3300	3300	3400	3600	3700	3700	3400	3200	3000
Nairobi	2404	2105	2708	3211	3314	3415	3615	3614	3711	3107	2303	2402
Malta	2204	2004	2004	2206	2409	2410	2510	2510	2509	2506	2404	2204
Salisbury	3104	2404	1807	3211	3315	3516	3716	3715	3913	3508	3203	3102
Cape Town	1800	1300	1300	3100	3300	3400	3700	3800	3900	3600	2900	2400
Lagos	2905	2803	2404	2908	3313	3415	3715	3716	3915	3710	3306	3004
Suva (l)	3100	3200	2800	2900	2600	2200	2000	1800	1700	1500	3300	3100
Gibraltar	1902	1702	1602	1704	2006	2007	2107	2107	2106	2205	2103	1902
Ascension	2105	2103	2103	2008	3214	3316	3517	3617	3716	3811	3306	2505
Wellington (l)	2900	2900	2800	2500	2100	1800	1600	1400	1400	1400	2900	3000
Dakar	3006	3105	2805	2609	3213	3316	3516	3616	3716	3711	3307	3006
Las Palmas	2604	2503	2402	2305	2709	2811	3011	3112	3011	3009	3006	2705
Falklands	2407	2105	1805	1509	1414	2119	3321	3522	3421	3517	3313	3009
Rio de Janeiro	2906	2904	2604	2208	2014	3117	3319	3520	3419	3516	3312	3009
Buenos Aires	2806	2904	2704	2507	2113	2617	3320	3420	3420	3417	3314	3009
Sydney (l)	2800	2700	2600	2400	2600	2100	1800	1600	1600	1400	1800	3000
Lima	2800	2700	2500	2400	2800	2600	3100	3100	3100	3200	3200	3000
Barbados	2804	2602	2502	2305	2609	2913	3115	3016	3116	3114	3211	3007
Bogota	2700	2600	2400	2200	2600	2900	3000	3000	2900	3100	3100	3000
Jamaica	2700	2500	2200	2100	2400	2700	2900	2800	2800	2900	3000	3000
Bermuda	2600	2500	2200	2100	2300	2700	2900	2700	2800	2900	3000	3000
New York	2608	2306	2006	1808	1810	2312	2514	2415	2615	2614	2612	2810
Mexico	2600	2300	2000	2000	2200	2100	2600	2600	2700	2700	2700	2700
Montreal	2510	2309	1909	1810	1912	2214	2415	2415	2615	2614	2613	2711
Denver	2200	2100	1800	1800	1600	1700	2100	2300	2300	2300	2500	2500
Los Angeles	2100	1800	1800	2000	1800	1600	1800	2300	2500	2400	2500	2300
Vancouver	1900	1700	1700	1900	2000	2100	2100	2100	2200	2300	2300	2100
Iceland	1603	1403	1404	1605	1706	1807	1908	1908	1908	2007	1905	1704
Honolulu	1800	1700	1800	2000	2200	2300	2400	2200	2300	2300	2200	2100
Fairbanks	1800	1700	1800	2000	2100	2100	2100	2100	2000	2000	2100	2100

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

BOOK REVIEW

English–French QSO language instruction, Leo and Mary Craven. Obtainable from Mary Craven, "Grass Moor", Radford Road, Alvechurch, Birmingham B48 7DT. Price £1.75, incl p&p.

Confidence is the name of the game when it comes to using a foreign language. Confidence can come either from a very sound knowledge of the language or careful planning of what you want to say. If you have a sound knowledge you do not need any help; if you have not, then the best starting point is to gather together vocabulary and phrases for the topics you are going to talk about, be they postillions or standing wave ratios.

Leo Craven, G4EQI, and his xyl Mary have done a first-class job with this English-French slim volume of very accurate, specialist amateur radio vocabulary. The introduction gives clear guide-lines on how to set about gaining confidence in using the language, and the booklet contains a sample QSO, common phrases and background information, and includes a very useful – perhaps even more useful if it had been on two sides of a card – memory sheet which takes a complete beginner through his first QSO.

The purist could grumble, perhaps, about the sketchy coverage of syntax, and about the complete lack of the usual phonetic props, but Leo and Mary were right to leave this out and thereby make it all less frightening – amateur radio communication does not depend on perfect grammar nor on immaculate pronunciation; if it did, we would talk to very few people even in our own language.

Have a go at a QSO with the help of this booklet. It is much easier than you think – the biggest difficulty is to persuade the Fs to stop speaking English. *G4HMF*

Science Museum lecture series, 11, 12 April

"Amateur radio . . . Making a start"

Following the severe weather experienced during January 1979, when the last series of lectures was presented, the Education Committee decided that Easter would be a better time for this programme. An approach to the education service at the Science Museum brought forth an immediate agreement and plans proceeded accordingly.

As an outline agreement had been reached with the officials at the Science Museum, and RSGB Council had given approval that this lecture series should become an annual event rather than bi-annual, decisions were made with this in mind. It was decided that half the members of the Education Committee should be responsible for this year's lecture, and the other half of the committee should present next year's, as far as personal commitments allowed.

A difficulty which exists when planning an event of this kind is the inability to bring together the contributors to the lecture in a rehearsal situation, due to widely-spaced domiciles. The programme is therefore discussed at normal committee meetings and by correspondence, and a format for the lecture decided and tabulated.

The aim of these lectures is to convey to complete beginners to the hobby, especially the 12 to 16-year age group, where to obtain information, how to start listening and how to progress beyond this stage. The diversities of the hobby are listed and explained, and any misconception that it needs to be an expensive hobby is dispelled.

This year the main talks were delivered by W. A. Scarr, G2WS, and G. C. Oxley, G8MW, under the following sub-headings:

Talk 1

(a) The hobby. Fascination and privilege. The amateur fellowship. Worldwide communication.
(b) Listening to amateurs. Receiving sets and antennas. The amateur bands. QSLs. Simple Q code.
(c) Linking up with licensed amateurs. Clubs. Reading. Inexpensive equipment.
(d) Preparing to obtain a licence. The examination. Morse test.
(e) Joining RSGB. *Radio Communication*. BRS. Contest activity.

Talk 2

(a) Construction. Kits or straight purchase of receiver.
(b) Simple transmitters.
(c) Simple antennas.
(d) Morse transmission and reception.
(e) Mobile, dx, ATV satellite, rtty, Raynet.

A short extract from the Philips Electronics kit film entitled *Calling All Boys* was shown between the two main talks. Contributions from D. M. Pratt, G3KEP; L. E. Newnham, G6NZ; and J. Anthony, G3KQF, were also given, including a short cw transmission of text provided by a member of the audience. This gimmick always goes down well with the audience and is included each year.

Following a lively formal question-and-answer session the audience were then invited to inspect the equipment on the platform and question individual members of the lecturing team. Copies of *How to become a Radio Amateur* were made available to those interested in pursuing the hobby.

Attendance at the lectures was 124 on the Friday and 54 and 65 at the two Saturday sessions; a satisfying response.

The speakers were introduced by Dr A. Wilson, the education officer at the Science Museum, and we are grateful to Dr Wilson, his staff and other Science Museum senior officers for the opportunity of presenting these lectures.

We look forward to next year's presentation.

G3KQF,
Education Committee

your opinion

TRACING SERVICE!
The Editor
Radio Communication
Sir—Following the publication in the January issue of my request for assistance in tracing the whereabouts of my relative G. W. Cliff, I am pleased to be able to say that as a result we are now in touch again.

I offer sincere thanks to those several members who assisted, particularly John Malyon, BRS39782, N. A. Tyndal, G3VLQ, and I. B. Bullock, G8DDT.

Harry Cliff, VK3HC

REPEATER USAGE
The Editor
Radio Communication
Sir—Following a recent "lift" in conditions on the vhf band I feel I must protest against the way the repeaters are used during these periods.

I am sure I am not the only amateur who, while not against the repeater system which serves a useful purpose, is tired of the continuous "dx hunters" who plague the machines during above-average propagation conditions.

For hour after hour these "amateurs" block the machines with long CQ calls, "QRZ the repeater" calls, exchanges of addresses for direct QSLs, "my QTH locator" and other such meaningless rubbish.

Surely the repeaters were licensed for the use of mobiles and should be used as such. Even if base stations are to use the machines it would seem obvious that the purpose of time-outs, Ks, and resetting systems is to prevent individuals monopolizing the machine, so I am surprised to hear so many stations "jumping the K" or stating that they do not know why there is one.

It would also seem clear that it is pointless to QSL for a contact made through a repeater or to state that "your signal strength is 5, OM" when it is the repeater which is being heard.

I am not anti-repeater, and I do feel that our licence conditions are too strict in some respects, but I now feel that it is time for some addition to our licences stating that repeaters be used only by amateurs in the country in which the repeater is located, or within the designated service area of the latter.

In view of the RAE being made so much easier to pass, and the consequent increase in the number of radio amateurs, this problem can only get worse unless action is taken soon.

S. J. Barrett, G4IVH (ex G8OCC)

VHF PROFICIENCY AWARDS
The Editor
Radio Communication
Sir—May I be allowed to comment on the new QTH Squares vhf proficiency award? It will, I think, give a further incentive to dx operating, but it should not be allowed to supersede the existing Four Metres and Down Awards but rather be an extension of them. Briefly, my reasoning is that: (a) The QTH Squares minimum requirement is too high to encourage the poorer-sited operators to attempt it because they will feel it is permanently out of their reach; and (b) the existing Four Metres and Down Awards do promote inter-UK working.

If the FMD Awards were abolished (and I for one hope they will not be) then beams will be pointed to the Continent for most of the time, since only one contact per QTH Square will be required, thus reducing the amount of inter-UK communication among ourselves (which is the overwhelming bulk of vhf traffic for most of the time).

No, let us continue with the well tried Four Metres and Down system based on recognizable geographical features, and use the new QTH Locator system solely as an extension to it.

A. J. Collett, G8GXE

EQUIPMENT COSTS
The Editor
Radio Communication
Sir— In reply to Mr Wilson's letter concerning the reduction which he would expect due to the increased strength of the pound sterling against the Japanese yen, we feel that he has overlooked one important fact. Unfortunately the price which we are charged by our suppliers has not remained constant. To be specific, the Trio TS-820S has increased in price by 23 per cent over the last year. For this reason it has not been possible to make a price reduction, notwithstanding the increase in the value of the pound, by a similar figure. Whether a price remains constant or has to be raised or lowered therefore depends upon the seller's price as well as the international rate of exchange.

Furthermore, perhaps we can claim to be "the first honest broker" when you examine our November 1978 price list which shows that our Emoto 103LBX antenna rotor was priced at £85, whereas our September 1979 price list carries a price of £80 for the same item. All other Emoto antenna rotor prices were similarly reduced. This was possible since the manufacturer's prices increased less than the increased value of the pound sterling against the Japanese yen. We would like to assure Mr Wilson that where reductions are possible they are made.

H. E. Perkins, Western Electronics (UK) Ltd

YOUNG AMATEURS
The Editor
Radio Communication
Sir—What a pity Duncan Piper, G8SZM, ("Your opinion", February) finds it so hard to integrate with older members. Speaking as an old timer of 33 I hope I never find myself in a situation where I am unable to find common ground with other amateurs of any age.

If you want to sort out problems and discuss amateur radio, Duncan, do not cut yourself off from the people who know some of the answers and do not let them cut themselves off from you. Instead of writing for support from under-19s, get on the air, call CQ, tell people what your problems and interests are, and take full advantage of amateur radio—you can talk to literally anyone.

John Butcher, G4GWJ

Sir—How does Duncan think us "Old Uns" had assistance and got our problems solved when we were young—we fraternised with the "Old Uns" of the day.

By all means organize your own local Young Amateur Group on whatever suitable frequency you care to choose, but *please* not yet another "sacred cow" channel devoted to a very small minority of 144MHz band users. We have far too many of these already!

William James, G6XM

IS THIS A RECORD?
The Editor
Radio Communication
Sir—As a member of some years' standing I have been fighting a constant battle with my local Post Office to ensure the early delivery of my mail; the most tardy service being the monthly delivery of *Radio Communication*. In March, a verbal promise on the telephone of a more prompt delivery was followed a week later by the arrival of my November 1979 copy of the Society's journal.

Andrew G. Atkinson, G4CWX

REPEATER OPERATION
The Editor
Radio Communication
Sir—When, oh when, are amateurs using repeaters going to realize the amount of time being wasted by the constant repetition of callsigns?

I refer to the instances when one of a group of people in QSO says something like: "G2XYZ, G8ZZZ, G5XYZ (or was it YZX)-G4ZZZ replying". He then says his piece and concludes his over by repeating the whole lot again, to be followed by the next operator who goes through the whole sequence again, and so on.

Surely they must realize that a simple "From G4ZZZ" is enough to establish who is making the transmission, and concluding "G2XYZ from G4ZZZ" clearly indicates who is to take the next transmission and who is passing it. This fulfils licence obligations and prevents a lot of people getting bored with a surfeit of callsigns.

Dave Probert, G4JBU

PHONETICS AND THE RST SYSTEM
The Editor
Radio Communication
Sir—May I add my voice in approval of earlier correspondence on these subjects.

The number of unreadable callsigns one hears is legion and I would welcome mandatory phonetics. I agree that an amended and improved phonetic alphabet would further assist identification.

Regarding the RST system, I have always had reservations. It seems to me that, the object of amateur radio being to communicate (ie to receive and be understood), the "R" figure is the only one necessary. The "S" figure is of value to the transmitting station only if the two stations are within ground wave distance. Anything beyond that becomes a matter of propagation and gives little indication of the efficiency of the transmitter and antenna system. I never bother to read my S-meter. To me the "R" figure is the only one that really matters.

F. R. Roberts, G3DSI

council proceedings

A brief report on the Council meeting held on 13 March 1980

Present: Mr P. Balestrini (President, in the chair), Dr E. J. Allaway, Messrs J. Anthony, R. Barrett, J. Bazley, R. Bellerby, T. P. Douglas, Dr D. S. Evans, Messrs K. A. M. Fisher, L. N. G. Hawkyard, G. R. Jessop, G. I. Knight, M. McGonigle, B. O'Brien and G. M. C. Stone (members of Council), D. A. Evans (general manager), and Mrs H. M. Allin (minutes secretary).

The President welcomed Mr Fisher to the meeting and presented him with a Council member's badge.

Apologies were received from Messrs D. J. Andrews, G3MXJ, P. F. D. Cornish, G3COR, D. Pratt, G3KEP, and A. W. Hutchinson (editor).

Historical amateur radio equipment
Mr Hawkyard raised the question of the Maurice Child collection, and Mr Jessop commented on the collection's history. A discussion ensued, during which it was noted that the hon treasurer was investigating the general subject of historical amateur radio equipment.

Financial report
The general manager introduced this item, in the absence of the hon treasurer, by referring to the hon treasurer's proposals to increase subscription rates from 1 October 1980 following detailed discussion in the Finance & Staff Committee. After considerable discussion on the rate of increase and the month of implementation, the following F & S Committee recommendation was approved unanimously: "That the annual subscription rate for corporate members be increased to £12.50 from 1 October 1980, with appropriate variations of other rates".

The income and expenditure account for the six months ended 31 December 1979 was distributed.

General manager's report
Mr Evans spoke on the possibility of introducing additional methods of payment for subscriptions and book orders, eg credit cards, with the aid of the new data processing equipment. Much development work would be needed before any changes could be implemented. The new equipment could also be used to generate standard letters.

Phasing in of the new IBM34 equipment was proceeding as planned. After several weeks of testing and monitoring had been completed, programming work would be resumed.

Telecommunications liaison officer
The President read an extract from Council minutes dated 21 February 1975 concerning the appointment of a telecommunications liaison officer. There was a short discussion on whether the appointment should be for one or three years, and it was agreed unanimously that it should be an annual appointment in line with other honorary officer appointments.

Review of committee minutes
Education (January)
Accepted without comment.
Finance & Staff (January, February)
Accepted without comment.
HF (January, February)
Accepted without comment.
HF Contests (December, January)
A recommendation that stations located in the Falkland Islands dependencies but not licensed by the British administration will not be eligible for awards or count for points in RSGB hf contests was adopted.
IARU (January)
Accepted without comment.
Interference (January)
It was confirmed that the rfi document was now with the Technical & Publications Committee and that the Home Office had requested 250 copies. It was hoped to produce a reprint of the special interference section of the May 1975 issue of *Radio Communication* in the near future.
Membership & Representation (January)
The position of affiliated society representatives was discussed, and was to be further considered by the committee.
Microwave (January)
A proposal for a link between this committee and the Repeater Working Group in the person of G8BBE was approved.
Propagation Studies (December)
Mr Jessop requested data on the muf beacon.
Rally & Exhibition (January)
It was reported that arrangements for the Alexandra Palace exhibition were going well. A request for chairs to be made available for the public during the exhibition was noted.
Raynet (December, January)
Mr Balestrini reported that a company was being established under the name of Raynet Ltd. This would protect the name "Raynet" for the Society's use.

Some discussion followed on the role of Raynet in the future of amateur radio.

The use of the term "National Raynet Committee" in the minutes was also discussed. Mr Balestrini said it was used to distinguish the committee from local Raynet groups, but he would pass Council's comments to the committee.
Technical & Publications (December)
Dr Evans spoke on the committee's decision to change the dimensions and format of *Radio Communication* from January 1981. A possible change of title had been discussed at the same time but the committee had decided to retain the existing one.

Dr Evans also explained the Society's current book production programme and priorities.
Telecommunications Liaison (January)
Council accepted a recommendation to invite Mr E. Godsmark, G5CO, to join the committee.

The general manager reported on the increased number of mobile operators being stopped by police under suspicion of using illegal cb sets. The matter was under discussion with the Home Office.
VHF (January) and RWG (November)
Mr Stone spoke of the success of the VHF Convention, which had been attended by 953 people compared with 779 in 1979. A provisional booking of 14 March had been made for 1981.

The appointments of G3XDV, G5KW and G4AVV as corresponding members of the committee were approved.
VHF Contests
Accepted without comment.

IARU matters
Affirmative votes were given to the following applications for membership of IARU: Montserrat ARS, RS of Gambia, Solomon Islands RS, and Cuba.

It was reported that the 1981 IARU Region 1 Conference would be held in Brighton from 27 April to 1 May. It was a great honour for the RSGB to be host for the conference.

Membership and representation
One reduced subscription and four waived subscriptions were noted, and one application for life membership was accepted.

Council approved applications for affiliation in respect of Basildon Marconi ARS; Bury St Edmunds ARS; British Young Ladies Amateur Radio Association, Cheltenham; Crompton House CE Comprehensive School Radio Club, Oldham; Ealing & District ARS; Kidderminster & District ARC; Louth & District ARC; Rowys ARC; Rolls Royce ARC, Colne; St Helens & D ARC, and South Bucks Contest Club, Slough.

It was noted that Messrs N. H. Grassby, G4CPY, and G. Mather, G3GKA, had resigned as representatives for Regions 4 and 20 respectively. Two nominations to fill the vacancy in Region 10 had been received. Only one nomination had been received for the vacancy in Region 14, and Council approved the appointment of that nominee, Mr C. W. Tran, GM3WOJ, as regional representative.

The following area representatives had been appointed: E. C. Jones, GW8DRY (Tywyn Area, Gwynedd); J. Sleight, G3OJI (Cheshunt and district), and M. J. Stevens, G3CPN (Bournemouth).

Mr Hawkyard outlined the position regarding the area representative in Jersey, and it was agreed to write to the area representative concerned and request certain assurances.

raynet

G. Cluer, G4AVV *

In March last year I was appointed by the RSGB to serve on the Raynet Committee. Until then I had been closely involved in London Raynet and a controller of the South-East London group. My first impression of the committee was one of surprise at the amount of work it did. It was not the four-weekly committee meetings that surprised me, or the fact that they lasted from 1130am until after 6pm—after all, anyone can talk—it was the sheer volume of paperwork cleared in that time. I suppose that it should not have come as such a shock since I had just finished a long correspondence with the committee myself, and most of the 130 groups have some contact over the year. Also, of course, Raynet now has some 3,600 members. The work done in administering Raynet is totally unpaid, home based and by necessity tends to be done mainly by one or two people.

A questioner at the recent Raynet symposium in Sussex mentioned in passing that he hoped that the Raynet Committee meetings were not dominated by records and paperwork. I regret that my experience suggests that necessarily a lot of time is taken up by this but I feel that the committee still makes time to discuss other interesting and important matters. Frequencies, the perennial problem of flashing lights, insurance, talkthrough, user services, county shows, oil pollution, citizens band, identification and the licence have all been discussed (mostly at length), as well as the problems of individual groups, the manual, membership cards and supplies.

After about eight months on the committee I felt that I had gained some idea of what it was all about, so, feeling guilty about all this work going on around me, I volunteered for the job of publicity officer, which involves a number of activities. First there are the stands for the main rallies and exhibitions. ("Thank you" to all those groups who supplied photos etc for this year's RSGB exhibition at Alexandra Palace.) This part of the job is probably the most time consuming because it is so difficult to get groups to blow their own trumpet. Please, let the committee know when an incident or even a major exercise takes place: send press cuttings, "thank you" letters, and a report as this is all essential information required by the committee.

Second there is the publicizing of Raynet to prospective members. Anyone who writes to me will be sent a handout (re-written), an application form, and details of their local controller to whom they are referred for further details.

Third, but not least, I try to hold a file of countrywide Raynet activity so that this information is available to anyone who needs it. Again, I have to rely on people telling me about their Raynet activities.

Finally a reminder that controllers are welcome to sit in on Raynet Committee meetings. The committee tries to keep this to one visitor per meeting, so anyone interested should please contact the chairman (G3GJW) for an invitation. Committee members like to see visitors as they do try not to be too remote! □

*24 Patterson Road, Upper Norwood, London SE19 2LD.

West Sussex Raynet Group social

At a social evening held by West Sussex Raynet Group, the guests of honour were RSGB President and emergency communications manager Peter Balestrini, and his wife Jane who is Raynet supplies officer. Eighty members and guests attended the function, which included a five-course meal, bar, films, music and entertainment. Full details of Raynet activities in West Sussex are available from group controller G4BLJ.

Peter Balestrini presenting trophies at the West Sussex Raynet social. L to r: Bill Pitfield Memorial Trophy, 1980, to Ken Wilson, G8DPZ; Second Operator's Trophy to Mick Rump, G8VIC; and a replica of the Bill Pitfield Memorial Trophy, 1979, to Ray Farmer, G4AOC. *Photos:* G3ZYE

L to r: G4BLJ, West Sussex Raynet Group controller; Peter Balestrini, G3BPT; Ray Farmer, G4AOC, and xyl; Susan, xyl of G4BLJ; and Jane Balestrini

sstv scene

P. Burnett, G4BLL*

The past few months have heralded a number of interesting developments in the sstv arena, probably the most exciting of which is the news of two-way transmission and reception of colour sstv in real time between Jeremy Royle, G3NOX, and W1VRK who simply retransmitted the recorded RGB frames sent by G3NOX. A later contact produced original two-colour (red and green) only picture content from Don Miller, W9NTP. Jeremy kindly forwarded colour photographs taken directly off his monitor screen comparing the closed-circuit readout with the received retransmission, and the two-colour picture from W9NTP. These contacts must stand as an important landmark in the progress of sstv.

Although G3NOX used three (!) Robot 400s to achieve his full colour content, a number of other sstv enthusiasts in this country and the USA are working on the W9NTP-designed additional memory board for the Robot 400. This will give two colour (red and green) capability. Blue is inserted as a fixed bias. A number of other interesting possibilities emerge, including composite or split-screen effects, write-over etc. Hopefully there will be news of the successful completion and installation of one of these additional memory boards in the very near future.

Robot 800 super terminal

Activity in the Robot camp has also produced a new development on a somewhat different, although related, front: to integrate rtty/cw/sstv in their new Model 800 super terminal which represents one of the most complete speciality mode terminals ever built for amateur radio use.

Some of the sstv features are:
(1) Slow and fast scan outputs.
(2) "Winking" cursor to indicate the position of the next character on screen; also indicates on the fast scan display exactly which part of the sstv message is being transmitted at that moment.
(3) Two screen formats provided *(a)* 36 normal-size characters (six lines of six characters) and *(b)* 18 tall characters (three lines of six characters)—1, 2, 3, 4, 5 or 6 lines may be transmitted by selection, or 1, 2 or 3 lines in the 18 character mode.
(4) Six-bar grey scale and 8 by 8 checkerboard test patterns provided for alignment purposes.

Further information may be obtained from Aero & General Supplies, 32 Rufford Avenue, Bramcote, Nottingham.

Computer control

The request for details of computer control for sstv brought an interesting letter from GM8ARV and GM8JAV (om and xyl). David is in the process of developing a system around the S-100—the American standard backplane system which enables a variety of different manufacturer's cards for cpu, memory input/output and display functions to be used. This is a general-purpose system with sstv capability using the Z-80A processor and a memory size of 60k bytes using 16k dynamic rams.

To quote the final paragraph of David's letter concerning software: "To obtain the speed required the coding has to be in assembly language (mnemonic machine code) and I use a Z-80 assembler from the CP/M users' library. The program detects sync pulses by software and will automatically set the contrast and brightness. It provides a special tuning mode for the initial tuning in and will also provide image processing later".

The G3NOX test card: (l) local reception, full red, green and blue; and (centre) after being transmitted to the USA and back on 28.680MHz with W1VRK. On right is the W9NTP test card, red and green only

SC-422 scan converter

On the commercial front Volker Wraase, DL2RZ, has introduced an updated, two-memory version of his SC-422 scan converter with the following features:

(1) Memories can be used in transmit or receive mode independently to store two different pictures, or together for improved definition—256 pixels per line.
(2) Uses 16k ram memory chips—128k bits total memory capacity—16 shades of grey.
(3) Automatic hold circuit retains the picture in memory at the end of the sstv transmission.
(4) Eight-step grey scale automatically inserted at the top of the picture.
(5) L.E.D. tuning indicator.
(6) Cabinet size 12 by 4 by 7in.

Obviously an interesting piece of equipment. Write to Volker Wraase Elektronik, Wischofstr 1-3, 2300 Kiel 14, West Germany, for full details.

Digital sstv-fstv converter

KB9FO has forwarded a copy of the March/April 1980 issue of *A5 magazine* which contains an article by JA0BZC entitled "Build a digital colour sstv-fstv scan converter". The article also contains a reprint of the original b and w converter circuit diagrams published in *A5 magazine,* March 1979. Henry, who is the editor of *A5,* states that JA0BZC will supply his converter (b and w only) for US$250.

Anyone interested should forward a letter of intent and 25 per cent deposit to Amateur Television Magazine, PO Box 1347, Bloomington, IN47402, USA. If not enough orders are received (10 or more) deposits will be returned. Photostat copies of the complete article can be supplied by your sstv contributor, but please forward cheque/PO for £1 with your enquiry to cover cost of photostating (16 pages) and postage.

Has anyone decoded the 10m mstv transmissions from W9NTP? □

*21 South Cross Road, Cowcliffe, Huddersfield, W. Yorks.

obituaries

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

Mr R. T. R. Cocks, G3BHC
Richard Cocks died on 4 April. Although he was disabled in the war, and unable to carry out active amateur radio work, he remained in close contact with his local club, the Cornish Radio Amateurs' Society, and with RAOTA.

Mr A. E. Dempsey, GW2FBG
Ted Dempsey, who died on 10 May, was a keen phone operator, mainly on lf and 144MHz. He was active until a short time before his death. At one time he had been a member of the Edgware and District Radio Society, and was always interested in the progress of young people in the hobby.

Dr D. V. Duckworth, G4DVD
Dennis Duckworth died on 16 April. He was a keen and capable operator on cw and ssb on the hf bands, and a member both of RSARS and Verulam Amateur Radio Club.

Mr C. G. Eley, G3HHC
Cyril Eley died on 2 May, aged 77. He was active on the bands until a week before his death.

Mr J. Fisk, W1HR
Jim Fisk, who died in April, was editor-in-chief of *Ham Radio Magazine* and *Ham Radio Horizons*. He played a great part in creating a specialized technical and state-of-the-art amateur radio magazine which has a worlwide circulation.

Mr E. W. J. Holloway, RS38554
Ernie Holloway, who died early this year, was an active member of the Mid-Lanark RSGB Group, and a very keen swl until his death.

Herr H. Hoschek, OE3HOW
Helmut Hoschek, president of the Austrian national amateur radio society OVSV since 1977, died recently. He contributed a great deal to the society's reputation during his term of office.

Mr G. Painter, G3CFO
Gordon Painter, known as "Pete" to some of his amateur radio colleagues, died on 19 April. At 75, he had been a lifelong radio enthusiast, and a licensed amateur since 1947. Although mainly active on 3·5MHz, he had recently acquired a 144MHz transceiver, and was looking forward to learning vhf techniques.

Mr C. N. W. Reece, G4IFL
Norman Reece died on 29 March. He had regular skeds with many Midland amateurs.

Mr S. Riesen, G5SR
Stan Riesen, who died on 26 December 1979, had been a member of the Society for well over 50 years. He was first licensed in the late 'twenties, and was for a long time an instructor at the London Telegraph Training College at Earls Court. In the early 'forties he joined the Civil Service, where he remained until his retirement.

Stan confined his amateur activities mostly to 7 and 14MHz, and very occasionally to 21 and 28MHz, and with never much more than 50W and a piece of wire. As he never used the lower frequencies he was not very well known in this country.

Dr J. A. Saxton, CBE, DSc, PhD, CEng, FIEE, FInstP
John Saxton died on 17 April 1980, aged 66. A graduate of Imperial College, Dr Saxton was engaged on propagation studies and research in radio meteorology before, during and after the second world war. In 1960 he was appointed deputy director of the Radio Research Station. Between 1964 and 1966 he held the post of director of the UK Scientific Mission and scientific counsellor at the British Embassy, Washington, DC, USA. On his return to the UK Dr Saxton was appointed director of the Radio and Space Research Station, later known as the Appleton Laboratory, a position he held until his retirement in 1977.

After this date he joined the Home Office in an advisory capacity, assisting in the preparation for WARC 1979. In 1978 he chaired the special preparatory meeting for WARC in Geneva, and during the conference was a member of the UK delegation. Always very active in international radio science, Dr Saxton participated in meetings of URSI and the CCIR. He was international chairman of CCIR Study Group 5.

Despite his extensive commitments Dr Saxton accepted office as President of the RSGB in 1970 and 1973. He took part in many society activities and gave the RSGB his full support. He was elected an Honorary Member of the Society in 1975.

This eminent man, who did so much for the RSGB and amateur radio, will be greatly missed.

Mr G. C. Simmonds, RS38380
Cliff Simmonds, who died on 16 April, aged 84, was president and df secretary of the Slade Radio Society of Birmingham. With his brother, Bert, he joined the Slade Society in 1928, and retained an active interest in direction finding until a few months before his death.

Dr R. L. Smith-Rose, CBE, DSc, PhD
Dr Smith-Rose, who was the RSGB president in 1959, died recently at the age of 85. He had a long and distinguished career in scientific research, and was a renowned worker in the field of radio propagation research and a world authority on radio direction finding. He was the first director of the Radio Research Station at Slough, from which he retired in 1960.

Dr Smith-Rose's wide-ranging involvement in radio included membership of many scientific bodies. He was president of the International Scientific Radio Union from 1960 to 1963, and remained an honorary president until his death; secretary general of the Inter-Union Commission for the Allocation of Frequencies; a contributor to the work of the International Telecommunication Union; chairman of CCIR Study Group 5 from 1951 until 1970, and a supporter of amateur radio.

Mr C. E. Solly, G4DJT
Mr Solly, who died on 21 April, was mainly active on 144MHz fm. He was a member of the Thanet Radio Society and successfully coached several amateurs for the cw examination.

Mr A. Wheeler, G8VP
Mr Wheeler died on Monday, 8 April. He had been a keen radio amateur all his life, and operated on all bands from top band (his favourite) to 144MHz, until his death. He constructed one of the first radio receivers in his home town, Faringdon, and some years before the war, one of the first television sets. He was a founder member of the Swindon and District Short Wave Club in 1936.

We have also been advised of the deaths of:
Mr R. Hill, G3CBE, who was chairman of Grays Radio Club;
Mr H. R. Symon, RS27863.

Special event stations

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

GB2GB, 4–31 July
The station will be part of the celebrations to commemorate the 10th anniversary of the return of the *SS Great Britain* to Bristol. The callsign is a repeat of that used by the RSGB Bristol Group in 1973. The main open day, to show the public the progress made in the rebuilding of the ship, will be on 19 July, and the station will be operating c/o *SS Great Britain* Project, Great Western Dock, Gasferry Road, Bristol 1. Contact Brian Goddard, G4FRG, QTHR.

GB4LFF, 5 July
There will be a special event station operating at the Litcham Flower Festival. The station will be operating from 5 Manor Drive, Litcham, Kings Lynn, Norfolk PE32 2NX. Contact D. Jarrett, G4DCJ, QTHR.

GB2BRC, 5 July
This station will be operated by the Bromsgrove & DARC at the "Leisure and Sports for all the family" day in Sanders Park, Bromsgrove. It is intended to operate ssb/cw 3·5, 28MHz, 144MHz ssb/fm, three stations in all. Details from V. K. Harvey, Ex G8KLO, QTHR. Tel 021-477 7447.

GB2PPS, 5-31 July
To celebrate the 25th anniversary of Portishead power station, there will be an open day on 12 July at the power station, with the special event station operating in the hobbies section. Further information from Brian Goddard, G4FRG, QTHR.

GB2SR, 10-12 July
Solihull School Open Day will include a station, working on various bands. Details from T. Steele, G4IAC. Write to Broomfield House, Church Lane, Lapwort, Solihull, N. Midlands BJ4 5NU.

GB4KCT, 11-13 July
This station will commemorate the centenary of the Kings College, Taunton, and will be operational on all hf bands and 144MHz. Contact G. F. W. Trenchard, G4EHU, QTHR.

GB4BNF, 12 July
A charity fete at Bircham Newton will have a station in operation at the Bircham Newton Training Centre, Bircham Newton, Kings Lynn, Norfolk PE31 6RH. For details contact D. C. Jarrett, G4DCJ, QTHR.

GB2FD, 12 July
The station will be situated at the fete of the Queen Elizabeth Foundation for the Disabled at Stoke D'Abernon, near Leatherhead. Details from John M. Tweed, G3WWT, QTHR.

GB2DTS, 12-13 July
The Barking R&ES will be operating this station at the Dagenham Town Show on 14-28MHz and 144MHz. Details from A. Sammons, G8IZN, QTHR.

GB2BCS, 12-13 July
Bucks County Scouts at RAF Halton have a station in operation. Details from G3FRL, QTHR.

GB4BB, 12-13 July
The station at the Boy's Brigade (9th Liverpool) Open Days will be at St Philemon's Church Centre, Admiral Street, Toxteth, Liverpool 8. Details from F. E. Kneale, G4DBG, QTHR.

GB8PCS, 15-16 July
Two open days celebrate the 18th anniversary of Perry Common School, and will include a special event station. The school is in Faulkners Farm Drive, Erdington, Birmingham B23 7XP. Details from Kenneth Harris, G8NAJ. Write to Perry Common School ARS, at the school.

GB4LCS, 16-20 July
The Lambeth County Show will include a station operated by the Cray Valley RS from Brockwell Park, Herne Hill, London SE24. Contact Roy Hathaway, G3JHI, QTHR.

GB4SHQ, 19 July-3 August
The Scottish International Patrol Jamborette, held every two years since 1946 will feature an amateur radio station, foxhunt and electronics display. The address of the station is c/o Staff Headquarters, Scout International Camp, Atholl Estate, Blair Atholl, Perthshire. Contact V. W. Stewart, GM3OWU, QTHR.

GB4CF, 25 July-2 August
A station will be operating at "Charnwood 80", an international Scout camp, on Bardon Hill, near Coalville, Leicestershire. Further details from Timothy Raven, G4ARI, QTHR.

GB2PK, 26 July-2 August
This station will be operating at the Derbyshire Scout and Guide international camp, in Chatsworth Park, Derbyshire. Radio operation will be on 3·5, 7, 14, 21 and 28MHz ssb each day. VHF contacts and talk will be available on 144MHz fm via the calling channel (S20). Details from D. F. Reynolds, G4BPW, QTHR.

GB2FAA, 1-2 August
The station will be operating at RNAS Yeovilton International Air Day. More details from D. L. McLean, G3NOF, QTHR.

GB2MSS, 15-17 August
The Mid-Somerset Show, at the Show Ground, Shepton Mallet, will include this station. Information from D. L. McLean, G3NOF, QTHR.

GB3RN, 16-27 August
The station will be operational from RNARS HQ, HMS *Mercury*, Leydene, Petersfield, Hants GU32 1HE, during Portsmouth "Navy Days". Details from M. Puttick, G3LIK, QTHR.

GB4TCF, 22-25 August
The Town and Country Festival, and the special event station, will be at the National Agricultural Centre at Stoneleigh. Further information from G4GEE, QTHR.

GB2EAS, 25 August
This station will operate from the showfield, West End Road, Epworth, Doncaster, during the Epworth Agricultural Show. More details from K. W. Turner, G4GZB, QTHR.

A22GTF, 27-31 August
The Botswana Police Radio Club will be operating this station from the Gaborone Trade Fair. Operating frequencies will be 28·660, 21·310, 14·280, 7·095, 3·800MHz on phone, 14·080MHz (crystal controlled) on transmit, 14·080-14·090MHz on receive on rtty, and 14·075MHz, cw. The station will be operated from 0600 to 1500 daily, and possibly from 1500 to 2000. Special activities include: 27 August, 0800-1000, Project Goodwill equipment only, 28 August 0800-1000 Commonwealth capitals only, 29 August, start of message handling demonstration, 30 August, 1200-1300, Project Goodwill operation only. QSLs to Botswana Police Amateur Radio Club, c/o PO Box 10017, Gaborone, Botswana, Southern Africa. Further details from A. Johns, A22AJ, at the above address.

Mobile rallies calendar

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

13 July—Upton Mobile Rally, Upton-on-Severn, Worcs. Further details from G8NSL, QTHR, tel Worcester 620507.
13 July—The Knowlsley Safari Park Rally, which was to have been held on this date, has been cancelled due to clash of date with the Upton Mobile Rally.
20 July—Cornish RAC Mobile Rally. The Technical College, Cambourne, Cornwall. Further details from G4BHD, QTHR, or G3VGO, QTHR, tel Truro 864255.
20 July—RAIBC Picnic, Broadlands, Romsey, Hants. Further details from G4COM, QTHR, tel Fair Oak 3017.
27 July—Anglian Mobile Rally, Stanway School, Colchester, Essex. Open 1000 to 1700. Talk-in on 144MHz. Further details from G3YAJ, tel 0206 39 3938.
27 July—Scarborough ARS Mobile Rally, Technical College, Scalby Road, Scarborough. Further details from G4JAQ, 43 Broadlands Drive, East Ayton, Scarborough, N Yorks YO13 9ET, tel Scarborough 862638.
3 August—RSGB National Mobile Rally, Woburn Abbey. Details from N. Miller, G3MVV.
10 August—Derby Radio Rally, Lower Bemrose School, St Albans Road, Derby. Open at 11am. Admission and parking free. All the usual attractions. Details from Jenny Shardlow, G4EYM, QTHR, tel 0332 56875.
17 August—Preston Amateur Radio Society Mobile Rally. Walton-le-Dale County High School, Bamber Bridge, Preston (one mile from M6 Junction 29). Talk in on S22. Usual attractions including bring-and-buy stand. Doors open 11am. Details from G8SIV, QTHR.
24 August—Torbay ARS Rally. STC/ITT Social Club, Brixham Road, Paignton. Talk in on S22 and GB3TR (R2). Trade stands, bookstall, equipment stall, bar and refreshments. Raffles. Huge car park. Details from Mrs Ged Coker, c/o G4FCN, QTHR, tel Ipplepen 812117.
7 September—Vange ARS Mobile Rally, Nicholas School, St Nicholas Lane, Basildon, Essex. Details from G4FMK, QTHR.
7 September—Telford Amateur Mobile Rally, Telford town centre, Salop. Excellent indoor venue, with full facilities as previous years. Further details from G3UKV, tel Telford 55416; G8DIR, tel Shrewsbury 64273; or G8UGL, tel Telford 584173; (all QTHR).
28 September—Harlow & D ARS Mobile Rally, Nettleswell Comprehensive School, Harlow, 10am. Details from P. Turner, G4IJE, Gladwin Cottage, The Street, Sheering, Bishops Stortford, tel Sheering 482.

Looking ahead

13 September—Scottish Amateur Radio Convention. Organized by West of Scotland Amateur Radio Society. Details from Ian McGarvie, GM4JDU, 3 Kelso Avenue, Paisley PA2 9JE.
14 September—Isle of Wight get-together, Alverstone Manor, Shanklin. Details from G3KPO, QTHR, tel 098-386 2586.
28 September—Welsh Amateur Radio Convention, Oakdale Community College, Blackwood, Gwent. Details from GW3KYA, QTHR.
18-19 October—Jamboree on the Air.
24-25 October—Amateur Radio Retailers Association National Amateur Radio Exhibition, Granby Halls, Leicester.

contest news

First 1·8MHz Contest 1980 results

A contest to delight every top band cw enthusiast, this event produced a high level of activity all the way through, with the leading station making 20 contacts in the final hour. A good spread of European stations provided extra bonus points resulting in a hard fought battle for the first four places in the British Isles section.

Ken Riddoch, GM3ZSP, emerged triumphant, repeating his success in the 1978 event by winning both the Somerset and Maitland Trophies. Many of the leaders lost points for unmarked duplicates and incorrect callsigns, so the final result was not certain until the last logs came in from overseas. In the Overseas section Jan Zika, OK1MAC, operating under his club callsign OK1KWP/P came third.

For those interested in facts and figures, there were 177 British Isles stations active during the contest from 49 counties, with overseas countries bringing the possible bonus total to 64. The winner made 167 contacts and had 55 bonuses to his credit, while the overseas leader had 71 contacts and 35 out of the 49 bonuses available to him. Two stations managed transatlantic contacts with K1PBW and one entrant worked 9H1BB. Very little homebrew equipment was in use by British stations although overseas entrants tended to use it. A breakdown of the various equipments showed six FT101s, five T4XCs, three KW2000s and one each FT201, FT301s, FT401, FTDX560, HW101/T-V, KW204, TR7, TS520 and TS820. Two stations in the British Isles section used homebrew transmitters and one had a modified command transmitter. Six did not give any details.

Few comments were received this time, which seems to indicate that most competitors are satisfied with the present rules. One entrant suggested that the times of all three top band contests be standardized, while another queried present-day operating techniques which use only one callsign to establish contact.

The HF Contests Committee thanks all participants who sent in entries and also those who did not get around to sending in logs. Perhaps they will next time! *G3KKQ*

BRITISH ISLES SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	GM3ZSP*	748	16	G2MJ	497
2	G3YDX*	741	17	G3KDB	447
3	G3PDL*	735	18	G3RSD	446
4	G3RPB	730	19	G3NKS	418
5	G3YUV	707	20	G3HTI	384
6	G3XTJ	680	21	G3KKQ	368
7	G3ZEM	659	22	G3ZNH/A	367
8	G4BUO	628	23	G8RZ	343
9	GM4ALK/A	594	24	G3ZDJ	341
10	GW3KOR	583	25	G8IB	338
11	GM3WTA	571	26	G3VPS	309
12	G3SJE	553	27	G4HSD	308
13	G3LCH	526	28	G3FVW	239
14	G3GC	504	29	G3MCX	158
15	G3YMC	499	30	G4IYE	136
			31	G3ILO	8

*Certificate winners

OVERSEAS SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	DJ0OE*	370			
2	DJ3XK*	346	14	OK1ASG	186
3	OK1KWP/P*	291		OK2SOD	186
4	F6EBA*	290		HB9BNB	186
5	UC2AAK*	288	17	OK2BQU	183
6	HB9BOI/P*	280	18	RZ5UWG*	174
7	OL6AWY	273	19	OL9CJB	154
8	OL8CJO/P	259	20	OK1KFQ	141
9	UK2PCR*	258	21	OK1MSB	128
10	SP5KMB*	227	22	UQ2PM*	121
11	OL6AUL	212	23	UC2LBJ	90
12	OL8CLL	203	24	OH3XZ/2*	89
13	OK2BUV	202	25	OK1KTW	78
				UB5YE	78
			27	OK2BAS	70
			28	HB9QA	40
			29	SP9ADU	32

* Certificate winners

Check logs gratefully acknowledged from G3XFS, GM4HBG, YU4RS-6643.

DF Qualifying Event Coventry results

Nineteen teams assembled at the start of the first of this year's qualifying events for the National Final. Competitors started at Hay Wood, approximately seven miles north-east of Warwick. Both signals were heard at the start, although the transmission from Station A was a few minutes late starting due to a fault at the transmitter.

Transmitter A, G3TFA/P, was located in a small coppice adjacent to the Birmingham Canal, approximately 12 miles west of the start. The station was hidden in the steep side of a small brook, with the antenna running the entire length of the coppice and disappearing up a culvert. A number of competitors were known to have crawled up the culvert in search of the transmitter.

Station B, G2ASF/P, was hidden in a small wood approximately six miles north of the start. This bearing passed the east side of Birmingham and it was hoped that competitors would not be able to obtain bearings on both stations at the 2pm transmission.

			Time of arrival	
Posn	Name	Club	Station A	Station B
1	B. Bristow	Mid-Thames	3·11	2·28
2	P. Lisle	Mid-Thames	3·18	2·29
3	M. Hawkins	Chelmsford	3·26	2·28½
4	D. Holland	S. Manchester	3·28	2·35
5	R. Vickers	Slade	2·31	3·28½
6	A. Simmons	Mid-Thames	3·31	2·16½
7	I. Butson	Colchester	3·36	2·26½
8	B. Pechey	Mid-Thames	3·38	2·34½
9	E. Mollart	Mid-Thames	2·30	3·42
10	J. Drakeley	Slade	2·43	3·44
11	C. Plummer	Mid-Thames	2·46	3·46
12	A. Horton	Mid-Thames	3·56	3·09
13	P. Yeates	Salisbury	3·12	4·03
14	T. Gage	Mid-Thames	2·51	4·13
15	B. Mahoney	Rugby	4·25	2·35
16	D. Newman	Rugby	2·33	4·25½
17	C. Merry	Dartford Heath	4·28	2·35
18	P. Williams	Slade	—	2·30

One competitor failed to find either transmitter.
B. Bristow and P. Lisle qualify for the national final.

Affiliated Societies Team Contest 1980 results

The 10 per cent reduction in the number of logs received belied the activity during ASTC. A total of 300 logs was received, representing 70 club entries. Yet again the records for club and individual scores were broken.

For the third year running, Stockport RS 'A' team won the Edgware Trophy, with G3WPF, G3PEK, G3NOM, G4BUX and G4HIU amassing a record-breaking winning score. In a repeat of last year, East Barnet Amateur Radio Contest Club were runners-up. New to the top ten this

Barking R & ES chairman Nick Dowsett, G8PUY, demonstrates the operating style that has yet to win the society a major contest, while yl Julie sleeps in the sun. Photo: G8NVJ

year are Hereford ARS 'A', Shefford & D ARS, Leicester Polytechnic ARS and Norfolk ARC. Out go Cray Valley, Guildford, Verulam 'A' and Bracknell. The leading individual, G3YDX of East Barnet had a record score from a record number of 210 contacts. The top five individual stations all scored more than last year's winning individual.

Most logs were legible and well presented. Entrants are asked to note, however, that logs in pencil and photocopied logs are very difficult to mark—particularly in the early hours of the morning. Because of the slightly lower number of logs, most stations lost points through non-confirmation of AFS. Incorrect callsigns also led to many points being lost. Do G8+3s really operate 3·5MHz cw? Are the G4 three letters really down to S or even W? Unmarked duplicates were another cause of lost points. Contest participants are reminded that unmarked duplicates attract a heavy penalty!

From comments received from entrants, the vast majority want no change in the rules, although some ask for a revision in scoring to assist the more distant stations, who had difficulty in breaking through the wall of QRM. One club suggests (rather tentatively) a return to the old AFS formula!

Statistics

	1976	1977	1978	1979	1980
Winning club score	4,191	5,488	6,442	6,575	7,565
Leading individual score	1,155	1,403	1,592	1,640	1,795
Number of stations scoring over 1,000 points	16	29	45	70	76
Number of club entries	51	51	61	77	70
Number of individual entries	230	218	291	330	300

Finally, spare a thought for G3MZV who really was portable. He had to be towed by tractor to the road and then, courtesy of an RAF Red Arrows Land Rover, found the road again after hitting snow-covered ice.

G3WPF

SOCIETY TOTALS

Posn	Society	Total points	Stations contributing to score					Number of entries
1	Stockport RS (A)	7,565	G3WPF	G3PEK	G3NOM	G4BUX	G4HIU	5
2	East Barnet ARCC	7,535	G3YDX	G3RTE	G3XTJ	G3RPB	G3UGK	7
3	Government Communications ARC (A)	6,415	G3SSO	G8DV	G3MZV/P	G3FXA/P	G2HDU	5
4	Hereford ARS (A)	6,345	G4CNY	G3HVX	G3TQD/A	G4HKF	GW3MPB	5
5	Gravesend ARS (A)	6,140	G3DCV	G4BUO	G3OHP	G6BQ	G3GRS/A	5
6	Shefford & D RS	5,935	G3FJE	G4GIR	G4DRS	G4GJM	G3DOT	7
7	Leicester Polytechnic ARS	5,910	G3SDC	G3CWI	G3ORY	G3RIR	G4CAB/A	6
8	Addiscombe ARC	5,675	G3ROZ	G3UFY	G3SJX	G3WRR	G4ALE	5
9	Crawley ARC (A)	5,495	G3JKF	G3YVR	G6RC	G3TNO	G3MGL	5
10	Norfolk ARC	5,460	G3LDI	G3VZT	G3TMA	G3PDH	G4GVR	6
11	Stockport RS (B)	5,265	G3KAF	G3FYE	G3SNX	G3RUG	G4CBW	5
12	Surrey RCC	5,215	G3IAS	G6LX	G3BFP	G3EUE	G3KXT	6
13	Edgware & D RS (A)	4,830	G3SJE	G3GC	G3SHY	G3VW	G3PSP	5
14	White Rose RS (A)	4,670	G3PSM	G3MJT	G3YEE	G3FCW	G3WSZ	5
15	Grimsby ARS (A)	4,585	G3VIP/P	G3RSD	G4EBK	G3HTI/A	G2AJB/A	5
16	RNARS HMS *Mercury*	4,485	G3LIK	G3JFF	G3BZU	G3JZV	G3BTO	8
17	Thames Valley ARTS (A)	4,480	G3JEQ	G3OGP	G3AIV	G4DZS	G3GHS	5
18	Leicester RS	4,430	G4ERT	G4GVC	G4CWY	G3PBC	G3HYH	5
19	RNARS HMS *Belfast*	4,375	G4HMS	G4BLR	G3LCS	G3PZP	G4FRN	9
20	Verulam ARC (A)	4,330	G3JKS	G4DUS	G4BOU	G3LXP	G3EPT	5
21	Cray Valley RS	4,300	G4FAM	G3XRX	G2MI	G3RCV		4
22	Maidenhead & D ARC	4,155	G5CMX	G3WYK	G3TWG	G3LVW	G4GGV	8
23	Glenrothes & D ARC (A)	4,125	GM4GRC	GM3YOR	GM3PFQ	GM4IPS	GM3YBQ	5
24	Sutton & Cheam RS	4,015	G3DNJ	G3LCH	G4CWH/A	G2DMR	G3CWL	5
25	RSARS Catterick	3,625	G3ASM	G3IBB	G4RS	G3EJF	G3FMW	5
26	Cardiff RSGB Group	3,500	GW3NYY	GW3NJW	GW5BI	GW3LAD	GW2DHM	5
27	Southdown ARS	3,460	G3WQK	G3SJV	G4BMK	G3KLX	G3YYF	5
28	Wirral ARS	3,275	G4EWJ	G2FOS	G4EFP	G3UJX		4
29	Stockport RS (C)	3,270	G4GRU	G4ECI	G4FAS	G4IAL	G3AUB	5
30	Conway Valley RS	2,980	GW3JI	GW3GRY	GW3HGL	GW3MDK		4
31	Echelford ARS	2,890	G3KKQ	G3MCK	G2FNK	G3VFB		4
32	Oxford & D ARS	2,860	G4AZN	G3ZZR	G3JLE	G3BLS	G4FTA	5
33	Leyland Hundred ARG	2,840	G3AZI	G3HKU	G3VYV	G3WYY	G3XII	5
34	Dunstable Downs RC	2,695	G4ENA	G4ENB/A	G3HAL	G3BLP		4
35	Farnborough & D RS (A)	2,535	G3SVL	G3VAA	G4ISK	G4FON	G4BJQ	5
36	Lincoln SWC	2,510	G3ZDW	G3EBH	G3PVU	G4BU	G4ICN	5
37	Aberdeen ARS	2,460	GM3DZB	GM3VEY	GM4BYT	GM3ZBE	GM3UU	6
38	Crawley Court ARG	2,405	G3RDQ	G3OGY	G3LMH	G3HQX	G3HRH	5
39	Government Communications ARC (B)	2,335	G3LEJ	G3AGF	G3YRU	G3IFB	G4AQR	5
40	Thames Valley ARTS (B)	2,220	G2KI	G3CFR	G3BPM	G3JNB		4
41	Bracknell ARC	2,125	G4DDL	G3YMC				2
42	RNARS Yeovilton	2,085	G2KV	G3BEC	G4DVK	G6LQ		4
43	Crawley ARC (B)	1,980	G3GRO/A	G3TIR	G3WTM/A			3
44	Kingsway Technical College ARC	1,945	GM3ZXE	GM4CUZ	GM4BAG	GM4AGS	GM4JCK	6
45	Dover RC	1,930	G4AWW	G3MLO	G3YMD	G4EGQ	G4HRE	5
46	Hereford ARS (B)	1,900	G4FFD	G3WRQ				2
47	Grimsby ARS (B)	1,820	G4BNT	G3IYT	G4HZF			3
48	Bury RS	1,805	G3BRS/A	G4GOM	G4FQE	G4JAG		4
49	RNARS Rosyth	1,795	GM3HUN	GM3UM	GM3KPD			3
50	Ariel RG	1,640	G3COJ	G3YKI	G3RFJ	G2BCI		4
51	Caterham RG	1,560	G4APL	G3TWJ				2
52	RNARS Plymouth	1,510	G3KDK	G3ABU	G3VNG	G3UVS		4
53	Swansea ARS	1,485	GW3OAY/A					1
54	White Rose RS (B)	1,340	G4DXA	G4GOP	G4FKS	G4HSZ		4
	Bromsgrove & D ARC	1,340	G4DSE	G2CLN	G4IVJ	G4HFP		4
56	Bishops Stortford ARC	1,255	G3TVW					1
57	Edgware & D RS (B)	1,195	G3ZDJ	G3BZG	G4HMD			3
58	Gravesend RS (B)	1,175	G3JLB	G4FJW				2
59	South Birmingham RS	1,060	G4EYD	G3OXL				2
60	Malvern Hills RAC	1,055	G4BVY/A	G4GFX	G3MYO	G4GOA		4
61	Glenrothes & D ARC (B)	1,040	GM4EJI	GM3OLK	GM4AQO			3
62	Sutton & Cheam RS (B)	880	G4HSD	G4CMU	C4EOI			3
63	Stockport RS (D)	845	G3RZJ	G3DNX	G4GQC	G4FFW	G3GMM	5
64	RNARS Chatham	815	G4CZD	G3WP				2
65	Eden Valley RS	775	G4AFU					1
66	Verulam ARC (B)	690	G3UFB	G3WFM	G4GYO	G2AIA		4
67	RNARS Culdrose	545	G4FIV					1
68	Douglas Valley RS	475	G4HSC					1
69	Farnborough & D RS (B)	380	G3AQC	G4HGJ				2
70	Stockport RS (E)	115	G3NUQ	G4HXB	G3PY			3

INDIVIDUAL SCORES

Posn	Callsign	Score	Society
1	G3YDX	1,795	East Barnet ARCC
2	G3SSO	1,695	Govt Comms ARC (A)
3	G3WPF	1,685	Stockport RS (A)
4	G3RTE	1,665	East Barnet ARCC
5	G3PEK	1,645	Stockport RS (A)
6	G3NOM	1,635	Stockport RS (A)
7	G4FAM	1,590	Cray Valley RS
8	G3FJE	1,575	Shefford & D RS
9	G3SDC	1,525	Leicester Polytechnic ARS
10	G3XTJ	1,495	East Barnet ARCC
11	GW3OAY/A	1,485	Swansea ARS
12	G3LDI	1,470	Norfolk ARC
	G4CNY	1,470	Hereford ARS (A)
14	G3DCV	1,465	Gravesend RS (A)
15	G4BUO	1,440	Gravesend RS (A)
16	G3IAS	1,435	Surrey RCC
17	G6LX	1,410	Surrey RCC
18	G3OHP	1,400	Gravesend RS (A)
	G8DV	1,400	Govt Comms ARC (A)
20	G3RQZ	1,390	Addiscombe ARC
21	G3CWI	1,375	Leicester Polytechnic ARS
22	G3HVX	1,360	Hereford ARS (A)
	G3MZV/P	1,360	Govt Comms ARC (A)
24	G3SJE	1,355	Edgware & D RS (A)
25	G3JKS	1,345	Verulam ARC (A)
	G3UFY	1,345	Addiscombe ARC
27	G4BUX	1,340	Stockport RS (A)
28	G3RPB	1,335	East Barnet ARCC
29	G4GIR	1,320	Shefford & D RS
30	G3BFP	1,315	Surrey RCC
31	G3VZT	1,305	Norfolk ARC
32	G3XRX	1,295	Cray Valley RS
33	G3SJX	1,290	Addiscombe ARC
	G4DUS	1,290	Verulam ARC (A)
35	G3TQD/A	1,270	Hereford ARS (A)
	G4DSE	1,270	Bromsgrove & D ARC
37	G4HKF	1,265	Hereford ARS (A)
38	G4DRS	1,260	Shefford & D RS
	G4HIU	1,260	Stockport RS (A)
40	G3KAF	1,255	Stockport RS (B)
	G3TVW	1,255	Bishops Stortford ARC
42	G3PSM	1,245	White Rose RS (A)
	G3UGK	1,245	East Barnet ARCC
	G3TLX	1,240	East Barnet ARCC
44	G4HMS	1,240	RNARS HMS *Belfast*
	GW3NYY	1,240	Cardiff RSGB Group
47	G3JKF	1,230	Crawley ARC (A)
	G3TMA	1,230	Norfolk ARC
	G3RFS	1,210	East Barnet ARCC
49	GM4GRC	1,210	Glenrothes & D ARC (A)
	G3ORY	1,180	Leicester Polytechnic ARS
51	G4DDL	1,180	Bracknell ARC
53	G3LIK	1,175	RNARS HMS *Mercury*
54	G3YVR	1,155	Crawley ARC (A)
	G5CMX	1,155	Maidenhead & D ARC
56	G3FYE	1,150	Stockport RS (B)
57	G3JFF	1,130	RNARS HMS *Mercury*
	G4EWJ	1,130	Wirral ARS
59	G3SNX	1,115	Stockport RS (B)
60	G3DNJ	1,100	Sutton & Cheam RS (A)
	G3FXA/P	1,100	Govt Comms ARC (A)
	GW3NJW	1,100	Cardiff RSGB Group
63	G4ERT	1,085	Leicester RS
64	G3JEQ	1,080	Thames Valley ARTS (A)
	G3VIP/P	1,080	Grimsby ARS (A)
66	G3WYK	1,075	Maidenhead & D ARC
67	G6RC	1,065	Crawley ARC (A)
68	G3TNO	1,060	Crawley ARC (A)
69	G3AZI	1,050	Leyland Hundred ARG
	G4GVC	1,050	Leicester RS
71	G3RIR	1,035	Leicester Polytechnic ARS
72	G4AZN	1,030	Oxford & D ARS
73	G3ASM	1,025	RSARS Catterick
74	G3KKQ	1,020	Echelford ARS
75	G4ENA	1,015	Dunstable Downs RC
76	G4GJM	1,000	Shefford & D RC
77	G3RDS	995	Grimsby ARS (A)
	G6BQ	995	Gravesend RS (A)
	G3LCH	985	Sutton & Cheam RS (A)
79	G3MGL	985	Crawley ARC (A)
	G3OGP	985	Thames Valley ARTS (A)
82	GW3MPB	980	Hereford ARS (A)
83	G2MI	975	Cray Valley RS
84	G4FFD	965	Hereford ARS (B)
85	G3RDQ	960	Crawley Court ARG
86	G4EBK	955	Grimsby ARS (A)
87	G3MJT	950	White Rose RS (A)
88	G3YMC	945	Bracknell ARC
89	G3WRQ	935	Hereford ARS (B)
90	G3ZDW	930	Lincoln SWC
	G4CWY	930	Leicester RS
92	G3GC	925	Edgware & D RS
93	G3IBB	920	RSARS Catterick
94	GM3YOR	915	Glenrothes & D ARC (A)
95	G3ZZR	910	Oxford & D ARS
96	G3RUG	905	Stockport RS (B)
97	G3MCK	900	Echelford ARS
98	G3SHY	895	Edgware & D RS (A)
	G3WQK	895	Southdown ARS
100	G4RS	890	RSARS Catterick
101	G4BLR	885	RNARS HMS *Belfast*
	GW3JI	885	Conway Valley ARC
103	G3AIV	875	Thames Valley ARTS (A)
104	G2HDU	860	Govt Comms ARC (A)
	G3GRO/A	860	Crawley ARC (B)
	G3LCS	860	RNARS HMS *Belfast*
107	G3YEE	855	White Rose RS (A)
108	G2FOS	845	Wirral ARS
	G3WRR	845	Addiscombe ARC
	G4EYD	845	South Birmingham RS
	GW5BI	845	Cardiff RSGB Group
112	G3GRS/A	840	Gravesend RS (A)
	G4CBW	840	Stockport RS (B)
114	G3VW	835	Edgware & D RS (A)
115	G3PDH	825	Norfolk ARC
	G4APL	825	Caterham RG
117	G3PSP	820	Edgware & D RS (A)
118	G3FCW	815	White Rose RS (A)
	G2KV	815	RNARS Yeovilton
	G4DZS	815	Thames Valley ARTS (A)
121	G3BZU	810	RNARS HMS *Mercury*
	G4BOU	810	Verulam ARC (A)
123	G3HTI/A	805	Grimsby ARS (A)
	G3WSZ	805	White Rose RS (A)
	G4ALE	805	Addiscombe ARC
126	G3HKU	800	Leyland Hundred ARG
	G3PBC	800	Leicester RS
128	G4CAB/A	795	Leicester Polytechnic ARS
	G4CWH/A	795	Sutton & Cheam RS (A)
130	G3DOT	780	Shefford & D RS
	G3LEJ	780	Govt Comms ARC (B)
	GW3GRY	780	Conway Valley ARC
133	G4AFU	775	Eden Valley RS
134	G3AGF	760	Govt Comms ARC (B)
	G4GRU	760	Stockport RS (C)
136	G2AJB/A	750	Grimsby ARS (A)
137	G3EUE	745	Surrey RCC
138	G3SJV	740	Southdown ARS
	G4ECI	740	Stockport RS (C)
140	G3TWG	735	Maidenhead & D ARC
	G3TWJ	735	Caterham RG
	GM3DZB	735	Aberdeen ARS
	G3JZV	730	RNARS HMS *Mercury*
143	G3TIR	730	Crawley ARC (B)
	G4BNT	730	Grimsby ARS (B)
	GM3PFQ	730	Glenrothes & D ARC (A)
147	G3GHS	725	Thames Valley ARTS (A)
148	G3COJ	720	Ariel RG
	G4BMK	720	Southdown ARS
	G4AWW	715	Dover RC
150	GM4IPS	715	Glenrothes & D ARC (A)
152	GW3HGL	710	Conway Valley ARC
153	G4ENB/A	705	Dunstable Downs RC
	G3IYT	700	Grimsby ARS (B)
154	G3SVL	700	Farnborough & D RS (A)
156	G3BRS/A	695	Bury RS
	G3OGY	695	Crawley Court ARG
	G3PZP	695	RNARS HMS *Belfast*
	G4FRN	695	RNARS HMS *Belfast*
160	G2FNK	690	Echelford ARS
161	G3KLX	680	Southdown ARS
162	GM3VEY	675	Aberdeen ARS
163	G3JLB	670	Gravesend RS (B)
	G4EFP	670	Wirral ARS
165	G2DMR	665	Sutton & Cheam RS (A)
	G3KDK	665	RNARS Plymouth
	G4FAS	665	Stockport RS (C)
168	G3LVW	660	Maidenhead & D ARC
169	G2KI	650	Thames Valley ARTS (B)
	G3CFR	650	Thames Valley ARTS (B)
	GM3HUN	650	RNARS Rosyth
172	G3BTO	640	RNARS HMS *Mercury*
	GM3UM	640	RNARS Rosyth
	GM3ZXE	640	Kingway Tech RAC
175	G3UJX	630	Wirral ARS
	G4GVR	630	Norfolk ARC
177	G3LXP	620	Verulam ARC (A)
178	G3YRU	615	Govt Comms ARC (B)
179	GW3MDK	605	Conway Valley ARC
180	G4IAL	595	Stockport RS (C)
181	G3BPM	585	Thames Valley ARTS (B)
	G4BVY/A	585	Malvern Hills RAC
	G4EMM	585	RNARS HMS *Mercury*
184	G3JLE	570	Oxford & D ARS
185	G3HYH	565	Leicester RS
186	G3MLO	555	Dover RC
	GW3YBQ	555	Glenrothes & D ARC (A)
188	G3EBH	550	Lincoln SWC
	GM4EJI	550	Glenrothes & D ARC (B)
190	G3VAA	545	Farnborough & D RS (A)
	G4FIV	545	RNARS Culdrose
192	G4DXA	535	White Rose RS (B)
	GM4BYT	535	Aberdeen ARS
194	G4GGV	530	Maidenhead & D ARC
195	G4GOM	520	Bury RS
196	G3AUB	510	Stockport RS (C)
	G4HVC	510	Norfolk ARC
198	G4FJW	505	Gravesend RS (B)
	GM3KPD	505	RNARS Rosyth
200	G4CZD	495	RNARS Chatham
201	G3HAL	490	Dunstable Downs RC
202	G3BEC	485	RNARS Yeovilton
	G3BLP	485	Dunstable Downs RC
204	G4HSC	475	Douglas Valley RS
	G5CAX	475	Shefford & D RS
206	G2GM	470	RNARS HMS *Mercury*
	G3CWL	470	Sutton & Cheam RS
	G4FQE	470	Bury RS
209	G3FVC	465	Maidenhead & D ARC
210	G4ISK	460	Farnborough & D RS (A)
211	G3ZDJ	450	Edgware & D RS (B)
212	G4HSD	445	Sutton & Cheam RS (B)
213	G3LMH	440	Crawley Court RAG
	G3RCV	440	Cray Valley RS
	G3YKI	440	Ariel RG
216	G3BZG	435	Edgware & D RS (B)
	G3EJF	435	RSARS Catterick
	G3PVU	435	Lincoln SWC
219	G4FON	430	Farnborough & D RS (A)
220	G3YYF	425	Southdown ARS
221	G3VYV	420	Leyland Hundred ARG
	G4DVK	420	RNARS Yeovilton
223	G4BJQ	400	Farnborough & D RS (A)
224	G3WTM/A	390	Crawley ARC (B)
	G4HZF	390	Grimsby ARS (B)
226	G3VCT	380	Maidenhead & D ARC
227	GM3OLK	375	Glenrothes & D ARC (B)
228	G3ZAM	370	RNARS HMS *Mercury*
	G4BU	370	Lincoln SWC
230	G6LQ	365	RNARS Yeovilton
	GM4CUZ	365	Kingsway Technical College RAC
232	GM3ZBE	360	Aberdeen ARS
233	G3FMW	355	RSARS Catterick
234	GM4BAG	345	Kingsway Technical College RAC

Posn	Callsign	Score	Society
235	G3AQC	340	Farnborough & D RS (B)
	G3RFJ	340	Ariel RG
	GM4AGS	340	Kingsway Technical College RAC
238	G3AHB	335	Maidenhead & D ARC
	G3JNB	335	Thames Valley ARTS (B)
	G4CMU	335	Sutton & Cheam RS (B)
241	G3WP	320	RNARS Chatham
	G3YIG	320	RNARS HMS *Belfast*
	G4GOP	320	White Rose RS (B)
224	G3ABU	310	RNARS Plymouth
	G3KXT	310	Surrey RCC
	G3YMD	310	Dover RC
	G4HMD	310	Edgware & D RS (B)
248	G3WYY	295	Leyland Hundred ARG
	G4EGQ	295	Dover RC
250	G3RZJ	285	Stockport RS (D)
	G3VNG	285	RNARS Plymouth
252	G3VFB	280	Echelford ARS
	G4BVA	280	RNARS HMS *Belfast*
	G4FKS	280	White Rose RS (B)
255	G3XII	275	Leyland Hundred ARG
256	G3EPT	265	Verulam ARC (A)
257	G4GFX	260	Malvern Hills RAC
258	G3UFB	255	Verulam ARC (B)
	GM4JCK	255	Kingsway Technical College RAC
260	G3BLS	250	Oxford & D ARS
	G3UVS	250	RNARS Plymouth
262	G3WFM	245	Verulam ARC (B)
263	GW3LAD	235	Cardiff RSGB Group
264	G3HQX	230	Crawley Court ARG
	G8TB	230	Surrey RCC
266	G4ICN	225	Lincoln SWC
267	G3OXL	215	South Birmingham RS
268	G4HSZ	205	White Rose RS (B)
	G5BQR	205	Shefford & D RS
270	G3MYO	195	Malvern Hills RAC
271	G3DNX	190	Stockport RS (D)
272	G4ARI	185	Leicester Polytechnic ARS
273	G4GQC	160	Stockport RS (D)
274	GM3UU	155	Aberdeen ARS
275	G2BCI	140	Ariel RG
276	G3TKO	130	RNARS HMS *Belfast*
277	G4FFW	125	Stockport RS (D)
278	G3IFB	120	Govt Comms ARC (B)
	G4JAG	120	Bury RS
280	GM4AQO	115	Glenrothes & D ARC (B)
281	G4EOI	100	Sutton & Cheam RS (B)
	G4FTA	100	Oxford & D ARS
	G4GYO	100	Verulam ARC (B)
284	G2AIA	90	Verulam ARC (B)
	G3OZY	90	RNARS HMS *Belfast*
286	G3GMM	85	Stockport RS (D)
287	G3HRH	80	Crawley Court ARG
	GW2DHM	80	Cardiff RSGB Group
289	G4AQR	60	Govt Comms ARC (B)
290	G4HRE	55	Dover RC
291	GM4BKV	50	Aberdeen ARS
292	G2CLN	45	Bromsgrove & D ARC
293	G3NUQ	40	Stockport RS (E)
	G4HGJ	40	Farnborough & D RS (B)
	G4HXB	40	Stockport RS (E)
296	G3PY	35	Stockport RS (E)
297	GM4FLP	30	Kingsway Technical College RAC
298	G4GOA	15	Malvern Hills RAC
	G4IVJ	15	Bromsgrove & D ARC
300	G4HFP	10	Bromsgrove & D ARC

Check Log: GM4AZZ.

21/28MHz Telephony Contest 1979 results (errata)

Below are listed contestants who operated on 28MHz only. They should have been indicated as such in the results table published in the April issue of *Radio Communication*. Accordingly, the Powditch Trophy will be awarded to G4BWP. The adjudicator of this contest apologises to all concerned, also to G3PDL whose score should have read 140,148 and been placed 22nd in the results table. Thus all stations listed below 21st drop one position.

Posn	Callsign	Points	Posn	Callsign	Points
1	G4BWP	270,504	6	G3SEM	153,459
2	G3XBY	248,184	7	G2QT	107,730
3	G5CMX	231,450	8	G4GVB	73,788
4	G4APL	199,710	9	GM3SKX	32,472
5	G4GUO	178,596			

This photograph was taken around midnight at G8FG/P, the portable station of the Bournemouth RS, during the March 144/432MHz Contest. It shows David Walker, G8UCY, and xyl Mandy who were married earlier in the day. They arrived at the site to continue the reception and to assist in the operations. What a way to spend a wedding night!

March 144/432MHz Contest results

This contest once again brought in a large number of entries which, combined with good propagation, made adjudication somewhat time consuming. Conditions on both bands were well above average in most parts of the country. Good signals were received from DK0VL in the Black Forest area of the EH square, and from many HB9/P stations in DH.

Congratulations go to the winners and runners-up in each section, but especially to the GI entries, who had their first opening during a contest for a very long time. *G4BEL*

144MHz SINGLE-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	G3NAQ	3,684	393	ZL34	400	DJ6XH	997
2	G8GGP	2,896	388	AL52	300	HB9MIN/P	760
3	G8NEY	2,605	295	YL63	400	DK0VL	914
4	GJ8TDT	2,538	225	YJ70	200	GM8MBP/A	874
5	G8SFM	1,869	238	YL39	100	HB9AHD/P	961
6	G8SZF	1,599	260	YM30	80	HB9AMD/P	1,001
7	G8EYC	1,344	202	ZL50	20	HB9AHD/P	829
8	G8NQD	1,337	155	ZL71	200	DK0VL	802
9	G3ZQU	1,266	152	AM66	40	HB9AHD/P	806
10	G8PJZ	1,162	207	ZL56	300	HB9AHD/P	861
11	G8RXK	1,041	143	ZL28	15	HB9AHD/P	860
12	G3ZLQ	990	175	ZL37	40	DB1TP	733
13	G4IGZ	900	129	YN19	15	HB9MIN/P	990
14	G4HLX	883	171	ZM41	75	DK0VL	868
15	G4AGQ	832	134	ZL66	70	DL0MT/P	798
16	G8NWM	813	87	ZM19	75	DK0VL	811
17	G8OPS	763	111	ZN68	18	F6GAK/P	755
18	G8OQV	684	124	ZK04	25	DB1TP	728
19	G3ORX	641	73	YL49	10	HB9AHD/P	925
20	G4HSS	604	61	YN75	100	HB9MIN/P	976
21	G3ZMF	599	105	ZL59	45	DK0VL	688
22	G8KMG	596	122	ZL10	40	HB9MIN/P	744
23	G8KAX	530	68	AL32	70	HB9MIN/P	698
24	G8SKG	521	71	ZN68	10	F1KFN/P	797
25	G8KWX	513	95	YN49	130	F1KFN/P	851
26	G8OMI	502	92	ZM41	50	DK0VL	850
27	G4ISN	501	72	ZM14	50	HB9MIN/P	890
28	G8RBY	500	95	ZM16	400	DK0VL	810
29	G8GGG	415	91	ZL24	25	F1KLQ	440
30	G3XEU	330	45	YK23	12	DK0VL	895
31	G4GSU	278	215	YN49	10*	GW8RZU	161
32	G8USX	262	66	YN79	20	GM8MBP/P	440
33	G4FMD	180	22	AL02	3	DK0VL	708

*FM only used.

144MHz MULTI-OPERATOR SECTION

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
1	GW3OXD/P	8,897	710	YM54	250	HB9PMF/P	1,083
2	G4BWG/P	8,750	730	AL45	350	DF3RU	794
3	GW8CSA/P	6,596	533	YL15	400	DJ6XH	1,118
4	G6HH/P	6,550	656	AK03	400	F6GKP/P	748
5	GJ4ICD	6,056	474	YJ70	400	DK9RA/P	1,099
6	G3NNG/P	5,977	627	ZL33	200	DJ0DO	926
7	G3ZIG/P	5,858	545	AM06	400	F6GKP/P	930

Posn	Callsign	Points	QSOs	QTH	Pwr	Best dx	Km
8	GD4IOM	5,255	372	XO67	160	F6GDO/P	1,206
9	G8FG/P	4,970	567	YK19	400	DK0VL	818
10	G4IJE	4,924	522	AL12	400	DK9TV/P	734
11	G4ERP/P	4,515	600	ZL01	400	F6GDO/P	903
12	G3YMD/A	4,496	425	AL66	100	F6EKG/P	643
13	G4BEM/P	4,147	533	ZN71	200	F6GKP/P	1,041
14	G3CRC/P	3,816	273	XK64	400	DJ9NV	1,047
15	GW4GMO/P	3,673	415	YL05	160	F6GKP/P	999
16	G5MW/P	3,569	415	AL54	150	DJ6XH	832
17	G8PFC/P	3,276	261	YO20	400	F6GKF/P	1,209
18	G3XZW/P	3,126	339	YK05	200	DB7UZ	1,007
19	G4DSP/P	3,021	333	ZN60	300	F6GKP/P	994
20	G3XBF/P	2,421	400	AL21	200	F6GDO/P	796
21	G3SFG/P	2,384	438	ZL29	200	F1KFN/P	954
22	G8NAT/A	2,336	408	ZN64	400	F1ECU/P	646
23	G4AYM/P	2,231	327	YL29	25	DK0VL	856
24	G8RAE/P	2,220	286	AN61	400	F1DV	810
25	G4CDA/A	2,042	246	YN58	350	HB9MIN/P	965
26	G4ILX/A	2,015	307	ZN54	200	HB9MIN/P	906
27	GI4FUM/P	1,748	91	XO11	13	HB9MIN/P	1,225
28	G4HKO	1,703	283	AL42	260	HB9RO	717
29	G3KMI	1,585	222	ZK04	300	DK0VL	760
30	G3AMW	1,490	202	ZN19	400	F1AQC	867
31	G8IFF/P	1,319	161	AM37	60	F6BQX/P	954
32	G4HJE/P	1,265	240	AL53	80	DK0VL	730
33	G3VZI	1,238	193	YM20	60	HB9AHD/P	909
34	G8NWR	1,049	162	YM60	80	HB9MIN/P	860
35	G3CMH	968	108	YK07	25	HB9AHD/P	958
36	G4GFX	785	122	YM79	3	HB9AHD/P	933
37	G8OIV	498	101	AL34	15	DB2VZ	490
38	G8TJX	438	62	YN27	10	F1KFN/P	891

144/432MHz SINGLE-OPERATOR SECTION

Posn	Call-sign	Total points	Points 144	Points 432	QSOs 144	QSOs 432	QTH	Best dx	Km
1	GI4GVS	2,041	1,849	192	97	12	XO12	HB9MIN/P	1,203
2	G8OPR	1,569	1,437	132	205	30	ZL63	HB9AHD/P	870
3	G3JXN	1,401	779	662	96	105	ZL39	DK0VL	723
4	GW3NYY	1,370	802	568	56	28	XL39	DJ9HJ/P	1,200
5	G3YTE	1,109	687	422	77	42	AL13	DK0VL	694
6	G3XBY	910	864	42	142	14	ZM52	HB9MIN/P	885
7	G3PBV	887	498	389	40	27	YK32	DL7QY	996
8	G4FZL	668	461	207	82	41	ZM25	DK0VL	842
9	G3TDG	614	118	496	34	75	AL51	HB9BMC/P	777
10	G4HFO	602	442	160	50	18	YK03	DK0VL	895
11	G4INL	346	308	38	60	14	YL10	DK0VL	840
12	G8FAT	268	189	79	11	5	ZL39	HB9AHD/P	838
13	G8LXY	224	139	85	47	22	ZL09	DK0VL	751
14	G5UM	151	—	151	—	45	ZM35	GD2HDZ	266

144/432MHz MULTI-OPERATOR SECTION

Posn	Group	Total points	Points 144	Points 432	QSOs 144	QSOs 432	QTH	Best dx	Km
1	Addiscombe ARC	6,440	5,390	1,050	521	129	AL16	F6GKP/P	83
2	Lagan Valley RS	5,693	4,307	386	272	20	WO40	F6GDO/P	1,302
3	South Bucks CC	4,890	4,146	744	540	136	ZL26	HB9MJF	860
4	Barry RS	3,978	3,470	508	335	46	YL24	DJ9HJ/P	1,125
5	Harrow RS	3,876	3,060	816	425	150	ZL26	F2DL/P	982
6	Northampton RC	3,657	3,016	641	477	109	ZM45	HB9AQ/P	865
7	Reading ARC	3,477	2,457	1,020	373	141	ZL54	DJ9HJ/P	965
8	Sutton & Cheam	3,323	2,587	736	330	97	AL66	HB9AQ/P	726
9	Moonrakers CG	2,399	2,102	297	314	47	ZL42	HB9BMC/P	882
10	Mansfield RS	1,693	1,190	503	185	81	ZN62	HB9AHD/P	975
11	Oxford URS	1,459	1,026	433	158	67	ZL14	HB9AHD/P	907
12	Bolton CG	1,376	100	371	139	52	YN38	HB9MIN/P	991
13	Mickey Mouse CG	1,165	756	409	104	58	ZK04	HB9AHD/P	848
14	G8PTA/G8IFT	792	450	342	78	57	YM50	DK0VL	875
15	N Bowland RCG	457	377	80	72	80	YO67	F1EDJ	881
16	G8TMI/P	341	305	36	59	12	ZM72	F1KLQ	508
17	G8EDG/P	153	—	153	—	41	YM49	G4GLN/P	241

144/432MHz LISTENERS SECTION

Posn	Station	Total points	Points 144	Points 432	QSOs 144	QSOs 432	QTH	Best dx	Km
1	BRS15822	783	783	—	123	—	ZL40	HB9AHD/P	795
2	BRS32525	512	472	40	107	12	AL41	DB6YB	440
3	BRS26003	478	478	—	52	—	YO23	F1ANH	637
4	BRS43706	374	374	—	70	—	ZK10	DK0MD/A	500
5	BRS41733	252	218	34	53	19	ZL38	ON5FF/P	340

Checklogs acknowledged from G2BQ, G3OIT, G3PUU, G8DPQ.

Low Power Contest 1980 results

The increasing popularity of QRP operation was reflected in a UK entry which was double that of last year, although only four entries were received from the Continent, due in part to a clash of dates with the DL/DIG contest.

The UK winner, Chris Henderson, G4FAM, used an FT101 with outboard pa, a delta loop for 3·5MHz and two-element delta loop for 7MHz. Second-placed Steve Spencer, G3ILO, used a TS120 driving an outboard pa into a 132ft centre-fed antenna, while third, J. Cockrill, G4CZB, used a BFY50 final, inverted-V on 3·5MHz and a delta loop on 7MHz.

Most entrants seemed happy with the rules, and welcomed the high level of activity. There remain a few who feel the contest period is too long, particularly the 3·5MHz operators, and the present timing does not favour overseas competitors.

Logs were generally well presented and correctly scored, although many entrants failed to mark the operating periods in the log as required in rule 3, and one or two exceeded the eight-hour time limit. Almost half of the entries were submitted on "homebrew" log sheets, and entrants are reminded that a supply of log and cover sheets can be obtained from either RSGB HQ or from any HF Contests Committee member on receipt of an sae.

Subject to the approval of Council, G4FAM will receive the 1930 Committee Cup.

G4BUO

UK SECTION

Posn	Callsign	Score	3·5MHz QSOs	3·5MHz Points	7MHz QSOs	7MHz Points	Power used
1	G4FAM*	14,908	26	3,917	76	10,991	1W
2	G3ILO*	14,508	38	5,600	61	8,908	1W
3	G4CZB*	11,625	24	3,825	52	7,850	1W
4	GM3OXX/A	10,999	19	2,866	54	8,133	1W
5	G3AZ	9,339	24	3,733	36	5,616	1W
6	G3NEO	9,325	38	5,775	22	3,550	1W
7	G3NKS	8,866	31	3,225	62	5,641	3W
8	G3LCG	6,641	2	275	43	6,366	1W
9	G4EYE	6,625	42	6,125	4	500	1W
10	G3LHJ	6,607	—	—	47	6,607	1W
11	G4ERT	6,483	44	4,008	23	2,475	3W
12	G3DNF	6,458	8	1,275	33	5,183	1W
13	G3VIP/P	5,600	15	1,525	39	4,075	2W
14	G3NIJ	5,516	10	1,200	41	4,316	3W
15	G8PG	5,383	—	—	34	5,383	1W
16	G4DVK	5,298	13	1,123	42	4,175	3W
17	G4AEM	5,050	29	3,250	19	1,800	3W
18	G3AHS	4,600	19	2,084	24	2,516	3W
19	G3KSU	4,591	16	1,391	30	3,200	3W
20	G3SYC	4,475	42	4,475	—	—	3W
21	G4CCB	4,266	6	1,000	23	3,266	1W
22	G3KSK	4,141	17	1,325	27	2,816	5W
23	G3FRN	3,891	17	1,700	19	2,191	3W
24	G4DVW	3,675	14	2,125	15	1,550	1 and 3W
25	GI4GYE	3,458	6	833	18	2,625	1 and 3W
26	G3AWR	3,175	—	—	29	3,175	3W
27	G4FJF	3,116	26	2,075	15	1,041	5W
28	G3DRP	3,032	31	3,032	—	—	3W
29	G3YNA	2,775	35	2,775	—	—	3W
30	G4BUO	2,666	9	750	22	1,916	5W
31	G4AYS	2,300	17	2,300	—	—	1W
32	G3JKY/P	1,150	17	1,150	—	—	3W

OVERSEAS SECTION

Posn	Callsign	Score	3·5MHz QSOs	3·5MHz Points	7MHz QSOs	7MHz Points	Power used
1	DJ6FO*	1,300	—	—	14	1,300	3W
2	OK1DKW*	999	—	—	14	999	3 and 5W
3	DL6AO*	450	—	—	5	450	3W
4	DK5RY	50	—	—	1	50	5W

* Certificate winners

Checklogs acknowledged with thanks from G3BY, G3AIO, G3KKQ, G3MCK, G4BCY, G4BUE.

IARU Region 1 VHF/ UHF/ SHF Contest rules

1. Eligible entrants. All licensed radio amateurs in Region 1 can participate in the contests. Multiple-operator entries will be accepted, provided only one callsign is used during the contest. The contestants must operate within the letter and spirit of the contest and at no greater power than permitted in the ordinary licences of their country. Stations operating under special high-power licences do so *hors concours* and cannot be placed in the contest proper.

2. Contest sections. The contest will comprise two sections:

VHF contest

1. Single-operator station, operated by owner of the licence (no club stations).
2. All other stations.

UHF/ SHF contest

The contest will comprise two sections for 432MHz and for every higher band.

All participating stations must operate from the same location throughout the event.

3. Dates of contests.
VHF contest.
This contest will take place during the weekend of 6 and 7 September 1980.
UHF/SHF contest
This contest will take place during the weekend of 4 and 5 October 1980.
4. Duration of contests. The contests will commence at 1600ut/gmt on the Saturday and will end at 1600ut/gmt on the Sunday.
5. Contacts. Each station can be worked only once on each band, whether it is fixed, portable or mobile. If a station is worked again during the same contest, only one contact will count for points, but any duplicate contact should be logged without claim for points and clearly marked as duplicate. Contacts made via active repeaters or translators do not count for points. Any telephony contact made with stations generating in the cw(A1) sub-band shall not count for points.
6. Type of emission. Contacts may be made on A1, A3a, A3j or F3. F2 may be used above 1GHz. Only one transmitter or transceiver may be used on each band at any time.
7. Contest exchanges. Code numbers exchanged during each contact shall consist of the RS or RST report, followed by a serial number commencing at 001 for the first contact on each band, and increasing by one for each successive contact on this band; this must immediately be followed by the QTH locator of the sending station (eg 59003 GX24j or 579023 HG46e).
8. Scoring. Points will be scored on the basis of one point per kilometre. The final claimed score must be shown on the first sheet.
9. Entries. Entries should be sent to the VHF Contests Committee, c/o the adjudicator for the RSGB contest on the same date.
10. Awards. The winner of each section will receive a certificate. The entrants compete for the following challenge trophies:
VHF contest:
(a) The IARU Region 1 VHF Trophy, for the winner of section 1.
(b) The PZK Trophy, for the winner of section 2.
UHF/ SHF contest:
(a) The Vittoria Alata Cup 1, for the winner of the 432MHz fixed section.
(b) The Vittoria Alata Cup 2, for the winner in the 432MHz portable/mobile section.
Overall winner: An overall winner of the IARU Region 1 UHF/SHF Contest will be declared. For this competition, the scores of the entrants will be combined, using the following multipliers: 432MHz × 1, 1,296MHz × 5, 2,400 × MHz × 10, higher bands × 20.
The entrant scoring highest will be awarded an IARU Region 1 medal. The 1980 organizing society is the Danish national society EDR.

144MHz Trophy & SWL Contest rules

1600–1600gmt, 6–7 September 1980
All entries and check logs to: VHF Contests Committee, c/o Mr L. Hawkyard, G5HD, The Eyry, Newton St Petrock, Nr Torrington, Devon EX38 8LU.
The following general rules, published in the January 1980 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11b, 12–22.
As this contest is timed to coincide with the IARU Region 1 VHF Contest, QTH locators only need be sent, as per rule 11b. Stations wishing to enter both contests should score their logs in accordance with rules 7a *and* 7b.
The Mitchell Milling Trophy will be awarded to the leading multi-operator station; the Thorogood Trophy to the leading single-operator station, and the GM4HAM Trophy to the leading Scottish station.

21MHz CW Contest 1980 rules

TRANSMITTING SECTION*
1. The general rules for RSGB hf contests, published in the January 1980 issue of *Radio Communication* will apply.
2. When. 0700gmt to 1900gmt on Sunday, 19 October 1980.
3. Eligible entrants. Single-operator stations only in the following sections:
(a) British Isles section, RSGB members resident in the British Isles.
(b) QRP British Isles section, RSGB members resident in the British Isles using less than 10W input.
(c) Overseas section, licensed amateurs in all parts of the world except British Isles.
(d) QRP Overseas section, licensed amateurs in all parts of the world except British Isles using less than 10W input.

Contests calendar

1 July	Canada Day *(Rules in May issue)*
5–6 July	VHF NFD *(Rules in April issue)*
13 July	DF Qualifying Event Salisbury *(Rules in June/July issue)*
20 July	3·5MHz Field Day *(Rules in June/July issue)*
20 July	WAB CW *(Rules in March issue)*
20 July	10GHz Cumulative *(Rules in May issue)*
3 August	144MHz QRP and SWL *(Rules in June/July issue)*
5 August	DF Qualifying Event South Manchester *(Rules in June/July issue)*
11–12 August	Meteor Scatter *(Rules in May issue)*
16 August	10th SARTG WW RTTY
17 August	70MHz Trophy and SWL
17 August	DF Qualifying Event Slade *(Rules in June/July issue)*
24 August	10GHz Cumulative *(Rules in May issue)*
31 August	WAB VHF *(Rules in March issue)*
31 August	ROPOCO *(Rules in June/July issue)*
6–7 September	IARU Region 1 VHF/UHF/SHF (VHF Section) *(Rules in June/July issue)*
6–7 September	SSB Field Day *(Rules in May issue)*
6–7 September	144MHz Trophy and SWL *(Rules in June/July issue)*
14 September	DF Final Dartford Heath
21 September	10GHz Cumulative *(Rules in May issue)*
27 September	AGCW-DL *(Rules in April issue)*
4–5 October	432/1,296/2,304MHz and SWL
4–5 October	IARU Region 1 VHF/UHF/SHF (UHF/SHF section) *(Rules in June/July issue)*
12 October	21/28MHz *(Rules in May issue)*
19 October	21MHz CW *(Rules in June/July issue)*
19 October	70MHz Fixed
26 October	Shefford & DARS Transmitting and Receiving (Section 1) *(Rules in June/July issue)*
November–December	432/1,296MHz Cumulative
1 November	Shefford & DARS Transmitting and Receiving (Section 2) *(Rules in June/July issue)*
2 November	144MHz CW
8–9 November	Second 1·8MHz
7 December	144MHz Fixed

4. Contacts between stations in the British Isles are not allowed. A cw contact shall consist of the RST report plus a progressive QSO number starting with 001.
5. Scoring: British Isles stations. Each completed contact shall score three points. The final score is the number of countries worked multiplied by the total number of points. For the purpose of scoring, the RSGB countries list will apply with the exception that VE, VK, A/W/K/N, ZL and ZS call areas will count as separate countries. *Note:* different USA prefixes for the same district may not be counted more than once, eg W1, WA1, K1, N1 etc, is a single call area for the purpose of scoring.
6. Scoring: Overseas section. Each completed contact with a British Isles station will score three points. The final score is the number of British Isles prefixes multiplied by the total number of points. British Isles prefixes are G2, G3, G4, G5, G6, G8, GD2, GD3, GD4, GD5, GD6, GD8, G12, G13, G14, G15, G16, G18, GJ2, GJ3, GJ4, GJ5, GJ6, GJ8, GM2, GM3, GM4, GM5, GM6, GM8, GU2, GU3, GU4, GU5, GU6, GU8, GW2, GW3, GW4, GW5, GW6, GW8. Contacts with GB stations do not score points or count as multipliers.
7. Entries should be sent to J. Bazley, G3HCT, Brooklands, Ullenhall, Solihull, West Midlands B95 5NW, England. Entries must arrive no later than 31 December 1980 from overseas entrants, who are advised to submit their entries by air mail. British Isles entrants 'logs must be received not later than 30 days following the date of the contest.
8. Logs should be submitted on standard RSGB log sheets or A4 paper with a completed declaration cover sheet indicating antenna, equipment and power used and *must include a separate list of countries worked as specified in Rule 5 above.*
9. Awards. Certificates will be awarded for each section.

**Note:* The HF Contests Committee has decided not to have a receiving section this year.

3·5MHz Field Day 1980 rules

There are several changes to the rules for this year's contest which reflect the comments and suggestions made by entrants last year. There will be a mandatory "lunch break" of one hour between 1200gmt and 1300gmt (entrants whose sending markedly deteriorates after this interval for refreshments may be penalized!), and there will now be two sections to cater for the differing types of commercially available low power equipment. The restriction on the number of operators has been removed.

1. The general rules for RSGB hf contests, published in the January 1980 issue of *Radio Communication*, will apply.
2. **Eligible entrants.** RSGB members resident in the British Isles.
3. **Periods.** 0900gmt–1200gmt, and 1300gmt–1600gmt on Sunday 20 July 1980.
4. **Sections.**
   (a) 15W dc input maximum, multi-operator.
   (b) 5W dc input maximum, multi-operator.
5. **Frequencies.** 3·520–3·570MHz.
6. **Contest call and exchange.** Call CQ FD. Exchange RST plus serial number starting at 001, location (defined by place name) and county code (see *Radio Communication* January 1980. p66).
7. **Scoring.**
   Portable or mobile stations ..... 15 points per QSO.
   Fixed stations ..... 5 points per QSO.
8. **Special conditions.**
   (a) Power. The power for all parts of the station must be derived from dry batteries, accumulators, or "natural" sources (eg solar cells or wind driven generators). The practice of float charging batteries from petrol, gas, or diesel driven generators is not permitted.
   (b) Equipment. Entrants using equipment capable of running more power than the specified input power for the section entered must specify how the power limit was adhered to.
   (c) Antennas. The maximum height must not exceed 35ft (11·5m) above ground level.
9. **Logs.** Standard RSGB hf contest log sheets must be used with column (5) headed "Location and county code received".
10. **Declaration.** The log sheets must be accompanied by the standard RSGB hf contest cover/summary sheet with the declaration signed by the operator responsible for the contest entry.
11. **Address for logs.** RSGB HF Contests Committee, c/o D. Thom, G3NKS, 37 Whittington Road, Cheltenham, Glos GL51 6DB.
12. **Closing date for logs.** Postmarked not later than the Monday 15 days after the end of the contest.
13. **Awards.** The Houston-Fergus Trophy will be awarded to the leading station in the 15W section. Certificates of merit will be sent to the first three stations in each section.

144MHz QRP Contest rules

0900–1700gmt, 3 August 1980

All entries and check logs to: VHF Contests Committee, c/o Mr F. Mathews, G8ACJ, Easedale, Woodway, Merrow, Guildford, Surrey.

The transmitter output power shall not exceed 1W cw or p.e.p.. If transmitter power reduction is required, then brief details of how this has been achieved must be given. Station inspections will be made by members of the committee and other officials.

The following general rules, published in the January 1980 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11a, 12–22.

70MHz Trophy & SWL Contest rules

0900–1700gmt, 17 August 1980

All entries and check logs to: VHF Contests Committee, c/o Mr J. H. Quarmby, G3XDY, 16 Peacroft Road, Ipswich, Suffolk IP1 6PJ.

The VHF Managers Trophy will be awarded to the leading station.

The following general rules, published in the January 1980 issue of *Radio Communication,* will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 8, 9a, 10a, 11a, 12–22.

The ROPOCO Contest 1980 rules

ROPOCO stands for "Rotating Post Codes" and is a new, short, snappy, Sunday morning event designed to give practice in information handling to a greater degree than the usual serial number exchange. You begin with your own post code, but after that, resend the code received in the previous contact.

1. The general rules for RSGB hf contests, published in the January 1980 issue of *Radio Communication,* will apply.
2. **Eligible entrants.** All paid-up members of the RSGB resident in the British Isles holding a Class A licence. Single-operator entries only.
3. **When.** 0800 to 1000gmt, Sunday 31 August 1980.
4. **Contacts.** CW in the 3·5MHz band only. Entrants are requested to confine their operations to 3,510 to 3,590kHz. Send RST plus—for the first contact, entrant's own postal code; for the second and subsequent contacts, the postal code received in the previous contact.
5. **Scoring.** 10 points/contact. To score points, a log entry must contain a valid post code received.
6. **Entries.** Logs must be sent to D. J. Andrews, G3MXJ, 18 Downsview Crescent, Uckfield, East Sussex TN22 1UB, postmarked not later than Monday 15 September 1980.
7. **Awards.** Certificates will be awarded to the first, second and third places.

DF Qualifying Event Salisbury

Date: 13 July 1980.
Map: OS Sheet 184, 1:50,000 series, Salisbury and the Plain.
Assembly: 1300bst for start at 1320bst.
Location: Near AA box, 3 miles north of Wilton, ngr 101 365.

Competitors requiring tea are asked to notify Mr A. Newman, 74 Victoria Road, Wilton, Nr Salisbury, Wilts SP2 0DY, as soon as possible.

DF Qualifying Event South Manchester

Date: 3 August 1980.
Map: OS Sheet 109 1:50,000 series, Manchester.
Assembly: 1300bst for start at 1320bst.
Location: Lay-by on A49 (T) approximately 100yd south of junction with M56 at Stretton, ngr 618 819.

Competitors requiring tea are asked to notify Mr D. Holland, 32 Woodville Drive, Sale, Cheshire M33 1NF; tel 061-973 1837, by 27 July.

The South Manchester DF Trophy will be awarded to the winner.

DF Qualifying Event Slade

Date: 17 August 1980.
Map: OS Sheet 139 1:50,000 series, Birmingham.
Assembly: 1300bst for start at 1320bst.
Location: Barr Beacon, ngr 062 977.

Competitors requiring tea are asked to notify Mr J. R. Vickers, 6 Iverley Walk, Chawn Park, Stourbridge, W Midlands DY9 0YJ; tel 03843 77008, by 10 August.

DF contests

Anyone requiring further information about top band df contests should contact Mr E. L. Mollart, 17 Spinfield Mount, Marlow, Bucks SL7 2JU; tel Marlow 3276.

International ATV Contest 1980 rules

13–14 September 1980. 1800gmt Saturday to 1200gmt Sunday.

SECTION A: TRANSMIT/RECEIVE STATIONS

Scoring: Logs have to be entered per band operated:
(a) Two-way QSO on 432MHz: 2 points/km
(b) Two-way QSO on 1·3GHz: 8 points/km
(c) Two-way QSO on 10GHz: 16 points/km

Multi operator stations may only use one call. Crossband-QSOs must be entered in the log for the transmit band. QSOs via repeaters do not count.

Exchanges: The following data is to be exchanged:

1. Code-group, which consists of four digits, individually chosen by each entrant, i.e. 1865 or 9732. *The code group must be exchanged in video only.*

2. Call, QTH locator, report, serial number starting at 001. This data is to be exchanged via video and, if necessary, via phone.

Should one of the stations fail to receive the picture of the other, the scores of both stations are to be halved.

144·75, 144·80 and 144·17MHz are well-known ATV calling-channels in Europe. Please QSY from these frequencies as soon as a QSO is established.

SECTION B: RECEIVE ONLY STATIONS

For swls, the same rules as above are applied. Entrants of section B may not give points to stations working in section A.

Logs must include postal address, locator and station details, and be mailed not later than 30 September to G. Shirville, G3VZV, 18 Church End, Milton Bryan, Milton Keynes, Bucks.

club news

RSGB affiliated societies and clubs, and RSGB groups, are invited to submit items for inclusion in "Club News" to their regional representatives (not direct to the editor).

Items of news and dates of forthcoming events should reach RRs by 16 July for the September issue.

Club secretaries are QTHR unless otherwise stated.

REGION 1—RR W. M. Furness, G3SMM, 16 Coniston Avenue, Sale, Cheshire M33 3GT.

Ainsdale (AARC)—Thursdays, fortnightly: 10 and 24 July, 7 and 21 August. Ainsdale Scout HQ. Full details from G2CUZ.

Blackburn (East Lancs ARC)—First Thursday in each month, 7.30pm. YMCA, Blackburn. Sec F. Hill, G3YWH.

Blackpool (B&DARS)—First Monday in each month. Phone G5ND (Blackpool 64508) for details of venue.

Bolton (B&DARS)—First, third and fourth Wednesdays in each month. Horwich Leisure Centre, Horwich, Bolton. Sec Alan Hartley, G8PRH, tel Bolton 46023.

Bolton (BTCARC)—newly affiliated club—no other details available.

Bolton (Edbro RC)—Details from sec, c/o Edbro Ltd, Lever Street, Bolton.

Bury (BRS)—Tuesdays, 7.30pm. Second Tuesday in each month (main meeting). Mosses Community Centre, Cecil Street, Bury: 8 July (Fox-hunt on 144MHz); 29 July (main meeting and surplus equipment sale); 12 August (Club visit to Ferranti). Club activities include cw tuition, constructional projects (the hf linear is now complete), using a microprocessor. Publicity officer, Chris Marcroft, G4JAG, 24 Lancaster Avenue, Ramsbottom, Bury. Visitors always welcome.

Carlisle (C&DARS)—Mondays, 7.30pm. Currock House, Lediard Avenue, Currock, Carlisle. A very full programme of lectures and demonstrations has been arranged for the coming months. Full details from G8DVD.

Chester (C&DARS)—Tuesdays, 8pm, except first Tuesday in each month. YMCA, Chester. New sec, from whom further details can be obtained, D. Cutts, tel Gresford 3344.

Colne (Rolls Royce ARC—Barnoldswick)—A newly affiliated club but no other details available.

Douglas (IoMARS)—Mondays, fortnightly. Keppel Hotel. Cregny-Baa, Nr Onchan. Sec GD4FWQ, tel Douglas 22295.

Eccles (E&DARC)—Tuesdays, 8.30pm. White Swan, Worseley Road, Swinton. CW class each week. Sec Chris Harrison, G8KRG, 15 Cockey Moor Road, Starling, Bury BL8 2HD. tel 061-797 0031.

Leyland (LHARG)—Second Monday in each month, 7.30pm. Rose & Crown, Ulnes Walton, Leyland. Details from G3XII.

Liverpool (L&DARS)—Tuesdays: 1 July (Junk sale); 8 July (Local clubs get together); 15 July ("TV electronics", by G8NRD); 22 July (Club quiz, Questionmaster G8NRD); 29 July (Open night); 5 August (Natter night); 12 August (RSGB tape/slide lecture—"Radio aurora", by G2FKZ), 8pm. Conservative Association Rooms, Church Road, Wavertree, Liverpool. Thursdays 8.30pm. "G3AHD" cw practice session on 144·250MHz. Hon sec, Al Neilson, G4CVZ, tel 051-220 5470. Visitors/new members always welcome.

Liverpool (North Liverpool RC)—For details of meetings please contact R. Porter, G3VXK, 11 Cranmore Avenue, Crosby, Liverpool L23 0QD; tel 051-928 1610.

Liverpool (UoLARS)—Lunchtimes. Shack in Reilly Building, open any time. Callsigns G3OUL and G8JUL active 1·8 to 432MHz. Would prospective members please contact Paul Broadhurst, G8LGL, UoL, 2 Bedford Street North, Liverpool L7 7BD.

Macclesfield (M&DRS)—Second Tuesday in each month, 7.45pm. For details of venue and programme contact Mary Roberts, 15 Park Brook Road, Macclesfield, tel Macclesfield 24383.

Manchester (M&DARS)—Wednesdays, 7.30pm. Morse practice most evenings, lecture on third Wednesday in each month. Newton Heath Community Centre, 203 Droylsden Road, Newton Heath, Manchester. New sec John Dent, G8OWY, 76 Lynwood Grove, Audenshaw, Manchester. Club station G3HOX active on hf and vhf.

Manchester (South Manchester RC)—Fridays: 4 July (Preparation for VHF NFD Contest); 11 July (Midsummer df contest); 18 July (Mini lecture contest); 25 July ("Introduction to cryogenics", by G3VIW); 1 August (Summer review of club activities); 8 August ("Simple 23cm", by G3LQO); 18 August ("Radio controlled models", by John Slinn); 22 August ("Top band dx", by G4IRN); 29 August (Modern communication receivers", by G8LUL); 5 September (Contest for club df shield), 8pm. Informal meetings, Mondays 8pm. Sale Moor Community Centre, Norris Road, Sale. Hon sec, D. C. Holland, G3WFT, QTHR. Visitors and new members always welcome.

Manchester (UoMISTRS)—Wednesday afternoons, cw classes if required; Thursday evenings. The radio shack. UMIST Union bar. Prospective members please contact M. P. Doig, G4COZ, UMIST RS, UMIST Union, PO Box 88, Sackville Street, Manchester M60 1QD. G3CXX/G8FOT active on 1·8/144MHz and, in the near future, on 432MHz/1·3GHz.

North Western Repeater Group—Third Thursday in each month (informal), 8pm. Globe Club, Willows Lane, Accrington, Lancs. Details from sec. G3RXH.

Ormskirk (OARC)—Tuesdays, 8.30pm. "Over 60's" Hut, Liverpool Road (opposite Christ Church). For details contact either G4HDU, tel Aughton Green 423062; or sec G4IGX, tel Ormskirk 75546. Club interests include vhf, uhf, hf, rtty, contests, film and slide shows.

Penrith (Eden Valley RS)—Third Thursday in each month. Two Lions Hotel, Great Dockray, Penrith, Cumbria. Sec G4HYJ, *Herald* office, 14 King Street, Penrith, Cumbria. Full programme. Visitors welcome.

Preston (PARS)—Alternate Thursdays. New venue: St Mary Magdalene Church Hall, Farringdon Lane (Ribbleton Lane), Preston. Hon sec, George Earnshaw, G3ZXC, QTHR.

St Helens (StH&DARC)—Thursday, 7.45pm. YMCA, North Road, St Helens. Hon sec Paul Gaskell, G8PQD, 131 Greenfield Road, St Helens, tel St Helens 25472. Club net Sundays 11.30am, 145·575MHz (S23).

Salford (Dial House RS)—Wednesdays, 5.30—9.30pm. Dial House, 21 Chapel Street, Salford, Lancs. Net channel 145·25MHz fm—the club station G3WDH monitors this frequency every club night for any other station. Details from sec G8JCL, c/o M43 at above address.

Stockport (SRS)—Second, third and fourth Wednesdays in each month, 8pm. Blossoms Hotel, Buxton Road (corner of Bramhall Lane),

Members of the Stockport RS at its diamond jubilee supper in April. L to r: Mrs Christini Barrow, vice-chairman; Bill Banks, G2ARX, president; Mel Betts, G4FFW, chairman; Fred Lowe, G8GMK; Des Alimundo, G4HK; John Heywood, G4IAL; Ian McArthur, G3NUQ; Stan Aspinall, G3VSA; Don Birch, G3AOO; Neville Paul, G3AUB; Joel Weaving, G3OWW; Barry Simpson, G3PEK; Ray Phillips, G2FYE, and Albert Evans

Stockport. Hon sec, G3FYE, QTHR. Club net 3,692kHz, 11am, Sundays, 28,430MHz, 10am, Sundays (SRS International).
Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm; morse practice from 7.30pm. St John Ambulance Hall, Fleetwood Road North (next to Gardner's Arms), Thornton. Details from sec G8MKQ.
UK FM Group (Western)—First Thursday in each month, 8pm. Grappenhall Community Centre, Grappenhall, Nr Warrington. Sec G3LEQ, tel Knutsford 4040.
Warrington (W&DARS)—Tuesdays, 7.45pm. Grappenhall Community Centre, Bellhouse Lane, Grappenhall, Warrington. Sec G3MMD, tel Lymm 3533.
Wigan (Douglas Valley ARS)— First and third Thursdays in each month; Shevington Conservative Club, Shevington, Wigan. Details from G4EHK, tel Appley Bridge 3320.
Winsford (Mid-Cheshire ARC)—Wednesdays. RAE class 7pm to 8pm. Morse class every third Wednesday. Technical Activities Centre, rear of Verdin Building, Verdin Comprehensive School, Grange Lane, Winsford. Net nights 1·8MHz Monday, 8pm; 144MHz (fm) Tuesdays. Hon sec G3JWK.
Wirral (WARS)—First and third Wednesdays in each month, 7.45pm. Sports and Recreation Centre, Grange Road West, Claughton, Birkenhead. Hon sec G3DLF.
Wirral (W&DARC)—Second and fourth Wednesdays in each month: 9 July ("Burglar and fire alarm systems", by G8CVF); 8pm. 23 July, 13 and 27 August, no meetings. Sports Concourse, West Kirby, Wirral. Hon sec Ian D. Brooks, G8PMW, 59 Mosslands Drive, Wallasey L45 8PF.

Congratulations to Stockport Radio Society on again winning the AFS Contest. As this is the "third win in a row" are they entitled to keep the trophy? Hi!

REGION 2—RR D. S. Smith, G4DAX, Red Roof, Goathland, Whitby, North Yorks YO22 5AN. Tel Goathland 333.

Bradford (UoBARS)—Thursdays, 7.30pm. N10, Main Building. Sec G8GOV, 30 Moorfield Drive, Baildon, Shipley, West Yorks. Net frequency 145·275.
Denby Dale (DD&DARS)—Second and fourth Wednesdays in each month, 7.30pm. 10 July (Talk on equipment, by G4MH). Pie Hall, Denby Dale. Sec G3FQH. Visitors always welcome.
Doncaster (DMIofHEARC)—Details from sec Robert Lane, G4AWU, Kelston, Doncaster Road, Bawtry, Doncaster, S. Yorks. Club call G3UER.
Goole (G&DARS)—Fridays, 7.30pm (during school term only). Goole Grammar School. Details from chairman G3VBI.
Halifax (Northern Heights ARS)—Wednesdays, 7.45pm. 2 July (VHF NFD planning meeting). Bradshaw Tavern, Bradshaw, Nr Halifax. Sec G8NUC.
Hornsea (HARS)—Wednesdays, 8pm. The Mill, Mill House, Attic Road, Hornsea. Sec Mrs J. Heathershaw, G4CHH. This seems to be a well organized club. It produces a news sheet which recently included a full list of members and a comparative list of 144MHz rigs. The HQ is also well kept.
Hull (H&DARS)—Fridays, 8pm. RAE classes are held at 9pm each Friday. Kingston Community Centre, Fountain Road, Hull. Sec G8GLM, 27 Trafford Road, Willerby, Hull HU10 6AJ.
Hull (HUR&ES)—Tuesdays, 1.15pm. Room 313B, University Union Building, Cottingham Road. Enquiries to G8RPZ. All amateurs welcome.
Leeds (White Rose RS)—Wednesdays, 8pm. Moortown Rugby Football Club, Moss Valley, Alwoodley, Leeds 17. Sec G4DZI. Thanks to the club for some stand space at their rally, we signed on about 20 new members. They are on the air at about 8pm on 3·750MHz, each Thursday.
Leeds (LUUARS)—Tuesdays, 8pm. Union Annexe (second floor), Woodhouse Lane. All new students welcome. Sec G4CNG, or at "E" block, Lupton Flats, Alma Road, Leeds 6, during term.
Otley (OR&ES)—Tuesdays, 8pm. 14 Back of Court House Street, Otley. Sec G8DFZ.
Pontefract (P&DARC)—The new club premises are in use. Details from sec, G4DTO, 43 Red Hill Drive, Airdale, Castleford, Yorks.
Scarborough (SARS)—Mondays: 7 July (Surplus sale); 14 and 21 July (Rally preparation); 28 July (Post rally social); 4 August (Surplus sale); 11 August ("Frequency counter", by G4EEV), 7.30pm. Scarborough Cricket Club, North Marine Road, Scarborough. Preparations are well advanced for the mobile rally to be held on Sunday 27 July. The club station, G4BP, is often operating on club nights, and there are moves afoot to get a permanently installed club station. Sec G4JAQ, tel Scarborough 862638.
Sheffield (SARS)—Third Monday in each month, 8pm. Sheaf House Hotel, Bramell Lane, Sheffield. Sec G4APV, 321 Fulwood Road, Sheffield S10. Visitors and swls particularly welcome.
Sheffield (British Steel Corporation ARS)—Wednesdays, 7.30pm. Tinsley Sports and Social Club, Bawtry Road, Sheffield. Details from G3XSI, tel Sheffield 51417.
UK FM Group (Northern)—3 August, 7 September. Sec G8PLJ. Do you use GB3NA? Your subs or donations would help support the service provided by this repeater.
Wakefield (W&DARS)—Second and fourth Tuesdays in each month. 7.30pm. Holmfield House, Thornes Park, Wakefield. Sec Andrew Walker, G4ARH, tel Horbury 274607.
York (YARS)—Fridays (except third in each month), 7.30pm. United Services Club, 61 Micklegate, York. Sec G3WVQ. After flying the flag at GB3YCS, a cub scout camp, this busy club will be running GB3GYS from Stand 568 at the Great Yorkshire Show, on 8, 9, 10 July. GB2TS will be operated from the Tollerton Village Show on 16 August. The annual dinner will be on 3 October.

Both RR2 and the zonal manager will be at the Scarborough rally.
Many thanks to the clubs who replied to the questionaire on "Club News". It seems that the majority are in favour of maintaining the current system, ie all the information every two months. A number have said however that they would like to see more news as well as coming events. I shall try to do this in future, as I am sure it will be printed if there is room, but I *do need the information*. Ask your club sec if he has written to me recently.

REGION 3—RR H. S. Pinchin, G3VPE, 61 Cole Bank Road, Hall Green, Birmingham B28 8EZ. Tel 021-777 1320.

Birmingham (Midland ARS)—22 July (Surplus sale), 19 August ("Amateur television", by Arthur Bevington, G5KS), 8pm. Room 110, University of Aston, Gosta Green, Birmingham. Sec G8BHE, tel 021-422 9787.
Birmingham (Slade RS)—First Friday in each month, 7.45pm. The Kingsbury Road Community Centre, 75 Kingsbury Road, Erdington, Birmingham B24 8QH. Sec G4FGF, tel 021-770 3474.
Birmingham (South Birmingham RS)—Thursdays (HF night on the air), Fridays (Construction and morse classes), 7.30pm. 6 August (Natternight), 3 September ("Amateur radio on a shoe string" by Rev G. C. Dobbs, G3RJV), 8pm. Hampstead House, Fairfax Road, West Heath, Birmingham B31 3QY. Sec G4GZI, tel 021-427 7104
Birmingham (UoB ARS)—Thursdays during term, 8pm. Tuesdays (RAE classes), 7pm. Morse classes as required, lunchtime. Students' Union (above stage). Sec G8VNC. Club stations G3IUB and G8IUB. University and non-university visitors welcome.
Bromsgrove (B&DARC)—8pm. Avoncroft Art Centre, Bromsgrove. Sec G4HFP, tel Stourport (02993) 3818. Visitors welcome.
Burton-on-Trent (BoT&DARS)—Wednesdays, 8pm. Stapenhill Institute, Main Street, Stapenhill, Burton-on-Trent. Sec G3ACR.
Cannock Chase (CCARS)—First Thursday in each month (Formal); other Thursdays (Informal); 8pm. Bridgetown War Memorial Club, Union Street, Bridgetown, Cannock. Sec G4IDK, tel Penkridge (078571) 2067. Visitors and new members welcome.
Coventry (CARS)—11 July (Treasure hunt), 18 July (Night on the air), 25 July (Open night), 1 August (Open night), 8 August (Night on the air), 15 August (Treasure hunt), 22, 29 August, 5 12 September, 8pm. Baden Powell House, 121 St Nicholas Street, Radford, Coventry. Sec G8SEQ, tel Coventry (0203) 598186. Visitors welcome.
Coventry (CTCARS)—Mondays, 7pm. Winfray Annexe of the college. Sec G8ISJ.
Coventry (UoW ARS)—Wednesdays during term, 7pm. Cryfield Farm, University of Warwick. Talk-in on S20, or contact G4BXI or G4DCW, Hurst Flat 40, Cryfield Village, University of Warwick.
Dudley (DARC)—Second and fourth Tuesdays in each month, 7.45pm. Central Library, Dudley. Sec Norman Rock, 28 Conway Close, High Acres, Kingswinford, Brierley Hill DY6 8PT.
Hereford (HARS)—First and third Fridays in each month, 8pm. Civil Defence HQ, Gaol Street, Hereford. Sec G4CNY.
Kidderminster (K&DARC)—Mondays (Informal), 9.30pm. Bellman's Cross, Shatterford. 22 July, 5, 19 August, 2 September, 8pm. Aggborough Community Centre, Hoo Road, Kidderminster. Sec G4ILQ, tel Kidderminster (0562) 4930.
Lichfield (Chad RC)—Alternate Wednesdays, commencing 16 July, 8pm. The Naval Club, Burton Old Road, Lichfield. Sec G4ESK.
Lichfield (LARS)—First Monday and third Tuesday in each month, 8pm. Swan (bar), Lichfield. Sec G4JKQ, tel Ibstock (0530) 60396.
Malvern Hills (MHRAC)—Second Tuesday in each month, 7.30pm. The Foresters' Arms, Wilton Road, Barnards Green, Malvern. Sec G8JAO, tel Malvern (06845) 63270.

Mid-Warwickshire (MWARS)—First and third Mondays in each month, 8pm. 61 Emscote Road, Warwick. Sec G8RZR, tel Warwick (0926) 496453.
Redditch (RRC)—Second and fourth Thursdays in each month, 8pm. WRVS Centre, Ludlow Road, Redditch. Sec G3EVT.
Rugby (RATS)—Wednesdays, 7.30pm. Cricket pavilion entrance to B Building, Rugby Radio Station, A5 trunk road, Hillmorton, Rugby. Sec G4ECO.
Shrewsbury (Salop ARS)—Thursdays, 8pm. Albert Hotel, Smithfield Road, Shrewsbury. Sec G3UDA. New members welcome.
Solihull (SARS)—15 July ("Amateur colour television", by Arthur Bevington, G5KS), 19 August ("VHF direction finding", by Bill Williams, G8AVX), 7.30pm. The Manor House, High Street, Solihull. Club net (G3GEI), Fridays, 9.30pm on 1,960kHz. Sec G4BBT, tel 021-743 7277. Morse classes available. New members and visitors welcome.
Stoke-on-Trent (North Staffs ARS)—First and third Mondays in each month (Lectures, etc), other Mondays (Natternights, Raynet and club station, G4BEM), 7.30pm. Harold Clowes Community Centre, off Dawlish Road, Bentilee, Stoke-on-Trent. Sec G8ORU. New members welcome.
Stoke-on-Trent (SoTARS)—Thursdays, 7.30pm. 2a Racecourse Road, Oakhill, Stoke-on-Trent. Sec G4CWN.
Stourbridge (SARS)—21 July, 4 August (Constructional evening), 18 August, 1 September (Constructional evening). 7.45pm. Library, Longlands School, Brook Street, Stourbridge. Sec G4IEB, 7 Hanbury Hill, Stourbridge, West Midlands DY8 1BE, tel Stourbridge (03843) 2006.
Stratford-upon-Avon (SuA&DARC)—No regular meetings but occasional events. Help always given to new amateurs and swls. Chairman/sec G3OOQ, tel Stratford (0789) 5973.
Sutton Coldfield (SCRS)—14, 28 July (Natternight), 11 August, 8 September, 7.30pm. Central Library, Sutton Coldfield. Sec G8TUR, tel 021-353 2061.
Tamworth (TARS)—Second and fourth Mondays in each month, 7.30pm. White Lion, Lichfield Street, Tamworth. Other Mondays (Informal). Club shack. Sec G4FZN, tel Tamworth (0827) 69708. Club net Wednesdays 145·375MHz, 9pm. Visitors welcome.
Telford (T&DARS)—Wednesdays, 7.30pm. Phoenix Centre, Webb Crescent, Dawley. Sec G3UKV, tel Telford (0952) 55416. Visitors welcome.
Walsall (WARC)—Alternate Wednesdays, commencing 23 July 8pm. Forest Community Centre, Forest School, Hawbush Road, Leamore, Walsall. Sec G4GKC, tel Walsall (0922) 31675.
Willenhall (W&DARS)—Alternate Wednesdays, commencing 23 July, 8pm. Three Crowns, Stafford Street, Willenhall. Sec G4FAP. New members welcome.
Wolverhampton (WARS)—7 July (Club project—28MHz direct conversion receiver), 14 July (TX measurements—equipment available—bring your rig), 21 July (Natternight), 4, 11, August ("The TS700G", by Peter Burden, G3UBX, and John Cook, G8EDG), 18, 25 August (no meeting), 1, 8 September ("Microprocessors", by Peter Burden, G3UBX), 8pm. Neachells Cottage, Danescourt Road, Stockwell End, Tettenhall, Wolverhampton WV6 9PH. Sec G8EDG, tel Wolverhampton (0902) 763617.
Worcester (W&DARC)—4 August ("Meteor scatter work", by David Butler, G4ASR), 1 September, 8pm. Old Pheasant, New Street, Worcester. Sec G4EKG, tel Evesham (0386) 41105. New members and visitors welcome.

REGION 4—RR *(post vacant).*
Derby (D&DARS)—Wednesdays—2 July (Junk sale), 9 July (144MHz df), 16 July ("Home computers", by Lowe Electronics), 23 July (Night on the air), 30 July (Bring and buy), 6 August (Rally preparation), 13 August (Video show), 20 August (Visit by SMC Jack Tweedy of Chesterfield), 27 August (Natternight), 7.30pm. Tuesday and Thursday (Morse classes) 7pm. 119 Green Lane, Derby. Sec Jenny Shardlow, G4EYM, tel Derby 56875.
Derby (Nunsfield House ARG)—Fridays, 7.30pm. Nunsfield House, Boulton Lane, Alvaston, Derby. Sec Ian Cage, G4CTZ.
Glenfield (Leicestershire Raynet Group)— Monthly. County Hall, Glenfield. Further details from M. G. Barker, G8CAC.
Grimsby (GARC)—First and third Thursdays in each month, 8pm. Alexandra Club, Cleethorpes.
Leicester (LRS)—Mondays, 7.30pm. Club House, Gilross Estate Cottage, off Groby Road, Leicester.
Leicester (LPARS)—Mondays, Wednesdays, Thursdays and Fridays, lunchtime during term. Leicester Polytechnic. Sec R. Newstead, G3CWI, 24 Richmond Road, Leicester.
Leicester VHF/UHF Group—Contact G4FZL.
Lincoln (LSWC)—Second and fourth Wednesdays in each month. Lincoln Corporation Social Club, Waterside South, Lincoln. Sec G4JES, 4 Horner Close, Brant Road, Lincoln.
Loughborough (LFARC)—Fridays, 8pm. Brush Sports and Social Club, Fennel Street, Loughborough. Sec G8BUB.
Mansfield (MARS)—First Friday in each month, 7.30pm. New Inn, Westgate, Mansfield. Sec G4AAH, 233 Southwell Road, Mansfield.
Matlock (Derwent Valley ARS)—First Monday in each month, 7.30pm. Chatsworth House, Matlock Training College, Chesterfield Road, Matlock. Sec S. Boller, G8VEF, c/o Lowe Electronics Ltd.
Melton Mowbray (MMARS)—Third Friday in each month, 7.30pm. 19 September (AGM). St John Ambulance Hall, Asfordby Hill, Melton Mowbray. Sec Richard Winters, G3NVK.
Nottingham (ARCoN)—Thursdays: 3 July (Preparation for VHF NFD), 10 July (Post mortem on VHF NFD), 17 July (HF activity night), 24 July (144MHz foxhunt), 31 July (VHF activity night), 7 August (Forum), 14 August (HF activity night), 21 August (Bring your gear), 28 August (144MHz foxhunt), 7.30pm. Sherwood Community Centre, Mansfield Road, Nottingham. Sec M. Shaw, G4EKW.
Nottingham (Trent Polytechnic RS)—Mondays, 7pm. Ninth Floor, Newton Building. Sec P. M. Bond, G8TIS, via Students' Union.
Nottingham (NURC)—Tuesdays and Thursdays, 1pm. Shack behind Union Shop. Sec C. Coleman, G4HCW. Theatrical Mechanics, extension 2146.
Scunthorpe (SARC)—Tuesdays, 7.30pm. The Hobbies Centre, Franklyn Crescent, Scunthorpe. Sec J. Stace, G4FUH.
Spalding (S&DARS)—Penchbeck Teachers Centre, Spalding. Sec G. C. L. Parker, G4CMK, 33 Beech Avenue, Bourne, Lincs.

REGION 5—RR R. F. G. Kendall, G8BNE, 19 Willow Green, Needingworth, Huntingdon, PE17 3SW. Tel St Ives (0480) 67538.
Bedford (B&DARC)—First Wednesday in each month. Other Wednesdays (Informal). Club shack, Ravensden. Sec G8PZZ.
Cambridge (C&DARC)—Meeting place in course of change. Contact sec G8JKV for information.
Cambridge (CUWS)—Mondays. Queen's Bar. Details from Adrian Langford, G8PQP, St John's College.
Corby (CARG)—Fridays, 7.30pm. Hightrees Scout Centre, The Nook, Corby. Sec G8MLA.
Dunstable (DDRC)—Fridays, 8pm. Chews House, 77 High Street South, Dunstable. Sec G8ASP.
March (M&DRAS)—Tuesdays, 7.30pm. 2 Grays Lane. Sec G8GNE.
Northampton (NRC)—Thursdays, 8pm. Kingsthorpe Community Centre, Thornton Park, Kingsthorpe, Northampton. Details from sec I. P. A. Scott-Iversen, 35 Milverton Crescent, Abmington Park, Northampton.
Peterborough (GPARC)—Fourth Thursday in each month, 7.30pm. Southfields Junior School, Stanground, Peterborough. Sec G4FDF.
Peterborough (PR&ES)—For details contact G3EEL.
Shefford (S&DARS)—Thursdays, 8pm. Church Hall. Hon sec G4DAQ.
St Neots (Foster Cambridge RC)—Tuesdays, 8pm. Foster Cambridge Ltd, Howard Road, Eaton Socon, St Neots. Details from P. Dineen, 5 Reynolds Drive, Little Paxton, St Neots.

Members of the RAFARS who attended this year's Drayton Manor rally. L to r: (front) G3DCG, G3ZZR, G2FIX, G4DEW; (standing) G4EJH, G4DVP, G4AYD and G4AJD (the photographer)

REGION 6—RR F. S. G. Rose, G2DRT, 84 Cock Lane, High Wycombe, Bucks HP13 7EA. Tel Penn (049481) 4240.

Banbury (BARS)—Last Friday in each month, 7.30pm. St Paul's Church Hall, Warwick Road, Banbury. Sec G. Reason, G4EBF, tel Croughton (0869) 810794.

Bracknell (BARC)—For details of current activities contact D. Sargeant, G3YMC. tel Bracknell 21006.

Burnham Beeches (BBRC)—First Thursday in each month, 8pm for 8.15pm start. New venue: St John Ambulance, Serena HQ, Slough. Contact Janie Britton, tel Windsor 61723.

High Wycombe (Chiltern ARC)—John Hawkins Ltd, Victoria Street, off Oxford Road (A40), High Wycombe. Further details from sec W. Catterall, G4IWC, 78 Fairacres, Prestwood, Great Missenden, Bucks, tel Great Missenden 4504.

Maidenhead (M&DARS)—First Thursday and third Tuesday in each month: 3 July (Demonstration of gear by members), 15 July (Talk: "Phase lock loops", by G4IOW), 7 August (Evening foxhunt (144MHz) starting from the club), 19 August (Visits to the shacks of two members), 4 September (Talk on the North Thames Gas radiotelephone system, by Les Dibben), 16 September (Talk: "Three centimetres", by G8AZU), 2 October (Grand junk sale—all welcome), 7.45pm. Red Cross Hall, The Crescent, Maidenhead. Sec J. Patrick, G3TWG, tel Bourne End (06285) 25275.

Mid-Thames RDF Club—Club competition, the Gage-Tyler Cup, will be held on 30 July and 3 September at 7.30pm. Further details from sec C. Gage, Lowfield House, Bolter End Lane, Lane End, High Wycombe, Bucks HP14 3NB, tel High Wycombe (0494) 881842.

Newbury (N&DARS)—Second Tuesday in each month. Newbury Technical College. Details from sec G8LTD, tel Newbury 46078.

Newport Pagnell (Milton Keynes ARS)—8pm. Lovatt Hall, Newport Pagnell, Bucks. For further details contact sec D. White, G3ZPA, Rose Cottage, Whaddon Road, Shenley Brook Road, Milton Keynes MK5 7AF, tel Shenley Church End 310.

Oxford (O&DARS)—Second and fourth Wednesday in each calendar month, 7.30pm. Civil Service Social Club, Marston Road, Oxford. New sec C. Marshall, G4IOK, 9 Mountfield Drive, Whitney, Oxon, tel Whitney 4867.

Oxford (OURS)—Wednesday evenings during term. Further details from Simon Pike, G8KRD, Brazenose College.

Reading (RARC)—Details from sec Chris Young, G4CCC.

REGION 7—RR D. A. G. Pedder, G3LFX, 97 Elgar Avenue, Tolworth, Surbiton, Surrey KT5 9JS.

Following information is latest received.

Addiscombe (AARC)—Tuesdays, 9.15pm. Prince of Denmark, 152 Portland Road, South Norwood. Sec G3SJX, tel 01-656 9054. New members and visitors most welcome.

Ashford (Echelford ARS)—Second Monday and last Thursday in each month, 7.30 for 8pm. The Hall, St Martin's Court, Kingston Crescent, Ashford, Middx. Sec G8LEL, tel Byfleet 46847.

Bexley Heath (North Kent RS)—8pm. St Mary's Institute, 2 North Cray Road, Bexley. Sec G3VFD.

Coulsdon (CATS)—Sec A. R. Bartle, G6HC, tel 01-684 0610.

Cray Valley (CVRS)—First and third Thursdays in each month, 7.30 for 8pm. Christchurch Centre, High Street, Eltham, London SE9. For details of morse classes run by the club contact sec G4FUG.

Croydon (Surrey Radio Contact Club)—First and third Wednesdays in each month; 7 May ("VK6-Land", by Ted Jones, G3EUE), 7.30pm. TS Terra Nova, 34 The Waldrons, Croydon. Sec G4FFY, tel 01-642 9871.

Crystal Palace (CP&DRS)—Third Saturday in each month, 8pm. Emmanuel Church Hall, Barry Road, London SE22. First Tuesday in each month (Open house). Members' QTHs. Sec G3FZL.

Guildford (G&DRS)—Second and fourth Fridays in each month, 8pm. Model Engineers HQ, Stoke Park, Guildford. Sec G4BHQ, tel Guildford 76375.

Guildford (U of Surrey E&ARS)—Informal meetings, lunch-times during term. Lower Bar, Union House, G8AHK is active on vhf, and G3IGQ on hf. Skeds and QSOs always welcome. Sec G8MIO, tel Guildford 71281.

Kingston (K&DARS)—Second Wednesday in each month, 8.15pm. For details contact Sec R. Pellatt, RS41392, tel 01-399 8113.

New Cross (Clifton ARS)—Fridays, 8pm. 225 New Cross Road, London SE14. Details from R. A. Hinton, 42 Sutcliffe Road, Welling.

Redhill (Reigate ATS)—Third Tuesday in each month, 8pm. Constitutional Centre, Warwick Road, Redhill. First Tuesday in each month. Marquis of Granby, Hooley Lane, Redhill. Sec G3XSZ.

Sutton & Cheam (S&CRS)—For meeting details contact hon sec G. W. Brind, G4CMU, tel Burgh Heath 54497.

Thames Ditton (Thames Valley ARTS)—July (Technical film show). Giggs Hill Green Library, Giggs Hill Road, Thames Ditton. Sec G3ZNW.

Tolworth (Decca ARG)—First Thursday in each month, 8pm. Decca Sports and Social Club, Kingston Road, Tolworth. Sec G3NFV, tel Leatherhead 72587.

Wimbledon (W&DRS)—Second and last Fridays in each month, 8pm. St John Ambulance HQ, 124 Kingston Road, Wimbledon. Sec J. W. Todd, tel 01-540 9031.

RR7 would be *very pleased* to receive clubs' entries before the copy date published at the beginning of "Club News".

REGION 8—RR D. N. T. Williams, G3MDO, Seletar, New House Lane, Thanington, Canterbury, Kent. Tel 0227 66586.

Following information is latest received.

Brighton (B&DRS)—8pm prompt. 47 Cromwell Road, Hove. Details of future events from the new sec, J. A. Trimmer, 7 Dale Crescent, Patcham, Brighton BN1 8NT.

Burgess Hill (Mid-Sussex ARS)—Alternate Thursdays. 10 July (Construction contest and sale of equipment). 7.30pm. Marle Place Further Education Centre, Leylands Road, Burgess Hill. Details from the sec, Jack Brooker, G3JMB, tel Hassocks 4965.

Canterbury (East Kent RS)—Further details from G3MDO.

Chichester (C&DARC)—Details of future events from J. Chinn, 5 Shrubbs Drive, Middleton-on-Sea, Bognor Regis PO22 7SL, tel 2335.

Crawley (CARC)—For future information please contact the new secretary D. L. Hill, G4IQM, tel 0293 882641.

Dartford (DHDFC)—Second Friday in each month. Scout House, Broomfield Road, Dartford. Details from Jeanette Maggs, 25 Leybridge Court, Eltham Road, Lee, London SE12.

Dover (South East Kent YMCA ARC)—Details from G8KEN.

Eastbourne (Southdown ARS)—First Monday in each month. Details

The annual dinner of the Sutton & Cheam RS, at which the guest of honour was Basil O'Brien, G2AMV, RSGB executive vice-president. L to r: John Allaway, G3FKM; Basil O'Brien, G2AMV; Mrs O'Brien, G3WOJ; Bob Tillin, G3MES, president of S & CRS; Mike Pharaoh, G3LCH; Moira Seaton, xyl G3HSK; and Les Seaton, G3HSK. *Photo:* G4BFJ

At the AGM of the St Dunstan's RS in February, Christopher Cathles (l) received the G3MOW Memorial Trophy for which his father, the late Ralph Cathles, G3NDF, had been nominated as the person who had most helped the aims and objectives of the society during the past year. The presentation was made by the guest speaker, Henry Hatch, G2CBB (r). ***(A St Dunstan's photo)***

from R. Jeffries, G8KQN, 84 Mill Road, Hailsham, Sussex BN27 2HU; or pro G3LFZ.

Gravesend (GRS)—Mondays, 7.30pm. Windmill Tavern, Shrubbery Road, Gravesend. Details from F. Donovan, G4ALD, 4 Rembrandt Drive, Northfleet, Kent DA11 8NG.

Hastings (HE&RC)—Fridays. 479 Bexhill Road, St Leonards-on-Sea, Sussex. Third Wednesday in each month, 7.30pm. West Hill Community Centre, Croft Road, Hastings. Details of events from G4FET.

Horsham (HARC)—First Thursday in each month. Parish Rooms, The Causeway, Horsham. Details of future events from A. C. Wadswirth, G3NPF.

Kent Repeater Group—The group is responsible for GB3KR (Dover) and the proposed GB3KN (Mid-Kent), and for 432MHz repeaters GB3CK (Charing), GB3EK (Margate), GB3NK (Wrotham), and GB3SK (Folkestone). Information leaflet and membership details from G3XDV.

Maidstone (MYMCAARS)—Fridays; first and third in each month devoted to the beginner; 7.30pm. Y Sports Centre, Melrose Close, Loose, Maidstone. Details of events from sec J. A. Hastie, tel Medway 251387.

Medway (MARTS)—Details of events and venue from G4EVY.

Sussex Repeater Group—Information from G4EFO. Treasurer G4GNX, 38 Elphick Road, Newhaven.

Tunbridge Wells (West Kent ARS)—Alternate Fridays. Adult Education Centre, Monson Road, Tunbridge Wells. Tuesdays following the Fridays (Informal) at Drill Hall, Victoria Road. Details from Brian Castle, G4DYF, tel 0732 56708.

Worthing (W&DARC)—Tuesdays, 8pm. Adult Education Centre, Union Place, Worthing. Details from G8MSQ.

REGION 9—RR H. W. Leonard, G4UZ, 4 Start Bay Park, Strete, Dartmouth TQ6 0RY. Tel Stoke Flemming 505.

Following information is latest received.

Camborne (Cornish RAC)—First Thursday in each month. 20 July (Mobile rally at Cornwall Tech College). 7.30pm. SWEB Clubroom, Pool, Camborne. Cornish net weekdays 10am on 3·715MHz and on Sundays 11am on 3·682MHz. Visitors most welcome at club meetings. Full details from Spencer, G3VGO, tel Devoran 864255.

Exeter (EARS)—Second Monday in each month. 7.30pm. Community Centre, St Davids Hill, Exeter. Full details from Jack Bawden, 232 Exwick Road, Exeter EX4 2BA.

Exeter (EUARS)—Sundays, 2.30pm. Full details from Julian Corben, G4EXT, c/o "Devonshire House", Stocker Road, Exeter EX4 4PZ.

Exmoor (ERC)—Second and fourth Thursdays in each month, 7.30pm. "Loughrigg", East Street, South Molton. Full details from Dave Stone, tel North Molton 377.

Exmouth (EARC)—Alternate Wednesdays, 7.30pm. Rolle College, Exmouth. Hon sec Mrs J. Nicholson, 35 Hollymount Close, Symonds Farm, Exmouth, tel 77263.

Newquay (N&DARS)—Alternate Wednesdays, 7.30pm. Treviglas School, Newquay. Full details from Ted, G3YJX, tel Wadebridge 2772.

North Devon (NDRC)—Second Wednesday in each month, 7.45pm. Pilton Community College, Barnstaple. Fourth Wednesday, 7.30pm. Bideford School, Abbotsham Road, Bideford. Full details from George G4CG. Tel Barnstaple 3683.

Plymouth (PRC)—Alternate Mondays, 7.30pm. Physics Lab, Tamar Secondary School, Paradise Road, Stoke, Plymouth. Full details from John, G4GWJ, tel Plymouth 338417.

Plymouth (PPARS)—During term time listening facilities available on 3·5-28MHz and on 144 and 432MHz for 24 hours every day. For further details contact the Amateur Radio Society, Plymouth Polytechnic Students Union, Drakes Circus, Plymouth.

Saltash (S&DARC)—First and third Fridays in each month, 7.30pm. Burraton Toc-H Hall, Saltash. Visitors most welcome to club meetings. Full details from R. S. Pridham, G4BVB, tel Gunnislake 832891.

Torbay (TARS)—Every Friday with special meeting on last Saturday of each month. GB3TR is now operational. 7.30pm. Bath Lane, rear of 94 Belgrave Road, Torquay. Full details from hon sec, Mr Hugh Davies, G4DZH, 18 Bowland Close, Paignton, Devon TQ4 7RT.

RR9 will be running a bookstall at the Plymouth, Cornish and Torbay Rallies this year.

REGION 10—RR P. A. Jones, GW4HAT, 68 Pastoral Way, Tycoch, Swansea SA2 9LY.

Barry (BCoERS)—Thursdays, 8pm. Teachers Centre, Weycock Cross, Five Mile Lane, Barry, South Glamorgan. Details from GW8OPK.

Blackwood (BARS)—Fridays, 7pm. Oakdale Community Centre, Oakdale, Blackwood, Gwent. Details from GW8UCQ, 2 The Alders, Oakdale, Blackwood.

Bridgend (B&DARC)—Second Wednesday in each month, 7.30pm. NCB Social Club, Tondu, Bridgend. Details from sec GW4BDV.

Cardiff (CRSGBG)—Second Monday in each month, 7.30pm. 14 July (Surplus sale). Pantmawr Inn, Pantmawr Estate, Cardiff. Details from GW3GHC.

Loughor (LAR&EC)—Every second Monday, 8pm. Loughor Boating Club. Further details from sec T. Griffin-Thomas, GW8TYS, 77 Castle Street, Loughor, Nr Swansea, W Glam, tel Swansea 893392. All amateurs, enthusiasts and swls welcome.

Merthyr (Hoover ARS)—Mondays, 7.30. Hoover Social Club, Pentrebach, Merthyr. Details from GW3RNC.

Newport (NARC)—Mondays, 7.30pm. Adult Education Settlement, Brynglas Road, Newport. Details from GW4HYZ.

Newtown (PARC) Thursdays, 7.30pm. College of Further Education, Newtown, Powys. Details from GW4DWX.

Pembroke (PRSGBG)—Last Friday in each month, 7.30pm. Defensible Barracks, Pembroke Dock, Dyfed. Details from sec GW3XJQ.

Port Talbot (British Steel Corporation ARS)—Thursdays, 7.30pm. BSC Sports and Social Club, Margam, Port Talbot. Details from GW4ESV.

Rhondda (RARS)—Every other Thursday, 7.20pm. Transport Employees' Club, Porth. Details from GW3PHH.

Sully (S&DSWC)—Mondays fortnightly, 7pm. Sully Bowls and Social Club, 58 South Road, Sully, Cardiff. Details from David Hughes, 13 Nailsea Court, Sully.

Swansea (SARS)—Thursdays, fortnightly. 8pm. Technicians' Common Room, 2nd Floor, College House, Swansea University. Details from GW4HSH.

Swansea (UCoSRS)—Thursdays, during term, 7.30pm. Room 801, Applied Science Building, University College of Swansea. Details from Tim Davies, c/o Dept. of Electrical Engineering.

REGION 11—RR P. H. Hudson, GW3IEQ, Silhill, Dinas Dinlle, Caernarvon.

Following information is latest received.

Bangor (UCoNWARS)—Thursdays, 7.30pm. Small Lecture Theatre, School of Engineering Science, Dean Street, Bangor.

Conway Valley (CVARC)—Second Thursday in each month. 10 July (144MHz df hunt). 7.45pm. The Quaries, Llandulas, Colwyn Bay.

Rhyl (R&DARC)—Fourth Thursday in each month. Ambulance Station. Coast Road, Rhyl. Other Thursdays (On the air on 144MHz), 8pm. Newcomers and visitors welcome.

Towyn (T&DARC)—Newly formed club. More details from hon sec GW8SYX, Merion ARS, tel 0654 710402.

REGION 12—RR F. Hall, GM8BZX, 45 Priory Cottages, Lunanhead, Forfar, Angus DD8 3NR.

Aberdeen (ARS)—Fridays, 7.30pm. 80 Guild Street, Aberdeen (next to Station Hotel immediately adjacent to railway station). Sec GM4BKV. The club now has a print board service from your own artwork.
Dundee (Kingsway TC ARC)—Closed during July and August. Will reopen mid-September. Details from sec GM8RDU.
Elgin (Moray Firth RS)—First Wednesday in each month; external venue, other Wednesdays, within Elgin Technical College. Due to small membership the arrangements may be varied. For full details contact GM4IAO or GM3KHH.
Invergordon (Easter Ross RC)—Every Wednesday evening. 100 High Street, Invergordon. Details from sec GM4DKL.
Inverness (ITCARC)—Every second Wednesday, 6.45pm. Room C30. Sec W. Lee, 36 Old Mill Road, Inverness.
Kirkwall—Members now meet on a few occasions during the year to discuss various aspects of amateur radio. Information from GM3IBU, tel Kirkwall 3232.
Perth (P&DARG)—First and third Tuesdays in each month. Room M1/15, Perth College of Further Education. Chairman GM8JCR. Details of programmes from sec Ian McLaren, GM8RYZ, 75 Viewlands Road West, Perth.
Shetland (Lerwick RC)—Wednesdays, 7.30pm, at Annsbrae House. The new club rooms are still awaiting completion. Visitors to Shetland during the summer months are very welcome to visit the club, which is active under the callsign GM3ZET on 144MHz fm and on around 3·775MHz on club nights. The possibility of siting a repeater on the island of Bressay is being investigated. Sec GM4BBL.

RR12 would be pleased to hear from club secretaries regarding club programmes. Please note the closing dates for information at the beginning of this feature. Lack of information from clubs may in the future result in those clubs not being mentioned in "Club News".

As many clubs are known to close during the holiday period, intending visitors are advised to check with the club secretaries. RR12 requires up to date club information as soon as possible.

REGION 13—RR A. B. Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife KY1 2LH. Tel Kirkcaldy (0592) 200335.

Berwick-upon-Tweed (B&DARS)—First and third Fridays in each month, 7.30pm. Avenue Hotel, 122 Marygate, Berwick-upon-Tweed. Details from sec GM8IIO.
Borders Repeater Group—This group was set up to administer the two 144MHz repeater projects GB3BT (Berwick-upon-Tweed) and GB3SB (Scottish Borders). For details contact GM8MJV, tel 031-663 203.
Dalgety Bay (Marconi Space & Defence Systems ARC)—Open to employees and ex-employees of the company. Tuesdays, 7.30pm. MSDS Social Club, Hillend Industrial Estate, Dalgety Bay, Fife. Details from GM3YND, tel Dalgety Bay 822678.
Dunfermline (DARS)—Second Wednesday in each month, 7.30pm. CCTV Studio, Pittencrieff School, Maitland Street, Dunfermline. Details from GM3CIG.
Edinburgh (E&DARC)—Tuesdays, 7.30pm. City Observatory, Calton Hill, Edinburgh. Details from GM3RFQ.
Edinburgh (Ferranti Recreation Club AR Section)—Membership is restricted to company personnel. Details from GM8JKG, tel 031-441 5684. Visits by other clubs by prior arrangement.
Edinburgh (GB3ED Repeater Group)—GB3ED is a 432MHz repeater situated at Napier College, Edinburgh, and operating on channel RB14 (output 433·350MHz, input 434·950MHz). Details of group meetings from GM3GBX, tel 031-447 2611.
Edinburgh (Heriot Watt UARC)—Open to persons attending any of the city's universities or colleges. Wednesdays, 2pm. Aerial Laboratory, Top Floor, Mountbatten Buildings, 31-35 Grassmarket, Edinburgh. Informal get-togethers, 7.30pm. University Bar, Riccarton Campus, Currie, Midlothian. Details from GM4EAU, tel 031-443 5061.
Edinburgh (Leith Nautical College ARC)—First and third Thursdays in each month, 7.30pm. Leith Nautical College, 24 Milton Road East, Edinburgh 15.
Edinburgh (Lothians RS)—Details of summer programme from GM8BJF, tel 031-447 5527.
Glenrothes (G&DARC)—Wednesdays and third Sunday in each month. 20 July; 17 August (Contests); 21 September (AGM). 7.30pm. Provosts Land, Leslie, Fife. Details GM4HBG, tel Glenrothes 771057.
St Andrews (UoStA R&ES)—Details from Physics Department, North Haugh, St Andrews.

REGION 14—RR C. W. Tran, GM3WOJ, 21 Richmond Avenue, Dumfries DG2 7JS.

Ayr (AARG)—Two Sundays in each month. No meetings during July or August. Restart in September. 7.30pm. Community Centre, Wellington Square, Ayr. Details from sec GM3THI.
Dumfries (D&GREC) (GM4HAA)—First and third Monday in each month. No meetings during July. 24 August (Summer outing), 15 September (Lecture: "70cm and microwaves", by GM4DIJ), 7.30pm. Cargenholm Hotel, Dumfries. Details from sec C. Rodgers, GM8TKA, 5 Elder Avenue, Lincluden, Dumfries.
Falkirk (Stirlingshire ARG)—Details from sec Bill Stirling, GM4DGT.
Glasgow (West of Scotland ARS) (GM4AGG)—Fridays. 7.30pm. 22 Robertson Street, Glasgow. Details from sec Ian McGarvie, GM4JDU, 3 Kelso Avenue, Paisley.
Greenock (G&DARC) (GM3ZRC)—Tuesdays and Fridays (RAE course). 7.30pm. 22 Inverkip Street, Greenock.
Helensburgh (HARC) (GM4HEL)—First and third Wednesday in each month. 7.30pm. Clyde Street School, Helensburgh. Details from GM4FEO.
Motherwell (Mid-Lanark ARS) (GM3PXK)—Third Friday in each month. 7.30pm. Wrangholm Hall Community Centre, Jerviston Street, Motherwell. Details from Sec GM4FKD.
Stevenson (Ardeer RCARS) (GM3USL)—Thursdays: 17 July (Talk/slides "Mount Palomar Observatory", by GM8JTX), 24 July (RSGB tape/slide lecture), 17 August (Portable outing), 7.30pm. Ardeer Recreation Club. Details from Sec GM8BOM.

All RSGB members resident in Region 14 are invited to our Region 14 official regional meeting to be held on Saturday 13 September, 1980, at Bellahouston Palace of Arts, Glasgow. This is the venue of the Scottish Amateur Radio Convention. Please send any items for the agenda to your new RR Chris Tran, GM3WOJ. There will be ample opportunity for matters raised at the meeting to be discussed.

REGION 15—RR I. J. Kyle, GI8AYZ, 2 Galgorm Gardens, Ballymena, Co Antrim BT42 1BA. Tel 0266 2024.

Following information is latest received.
Ballyclare (East Antrim ARC)—Newly formed club. Details from GI4BWM or GI8DMX, both QTHR.
Ballymena (BRC)—Fridays, 8pm. 86 Old Cullybackey Road. Annual Radio Rally on 21 September, Castle grounds, Antrim. Sec GI4HCN.
Bangor (B&DARS)—First Friday in each month, 8pm. Redcliffe Hotel, Bangor. Sec GI4AAM.
Belfast (BRSGBG)—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. Details from GI3USS.
Belfast (CoBYMRC)—Tuesdays, 7pm; Saturdays, 2.30pm. 12 Wellington Place, Belfast. Sec Paul McTaggart, 14 Thirlmere Gardens, Belfast BT15 5EF.
Belfast (Queen's UoBRC)—Tuesdays during term, 7pm. Morse and RAE tuition available. Queen's University, 37 Fitzwilliam Street, Belfast. Sec GI4FVM.
Dromore (Lagan Valley ARS)—Second Monday in each month, 8pm. Scout Hall, Mossvale Road, Dromore, Co Down. Details from AR GI4GDV.
Londonderry (North West Ireland ARS)—First Monday in each month, 7.30pm. Technical College, Strand Road, Londonderry. Sec GI8MOA.
Mid-Ulster (MURSGBG)—First Sunday in each month. GI4BAC's QTH. Details from GI8RJW or GI8TAX.
North Ulster (NURSGBG)—Details of meetings from GI4HVI, GI8JTS QTHR.

As new clubs and groups are being formed in the region, would any members who have information about them please contact RR15.

An ORM will be held on Saturday, 20 September, in the Antrim area. Full details in the next "Club News". Members who have topics for discussion please write to RR15 *well* in advance so that an agenda may be prepared.

REGION 16—RR M. S. Appleby, G3ZNU, 45 Cedar Avenue, Kesgrave, Ipswich IP5 7HA. Tel Ipswich (0473) 622559.

Braintree (B&DARS)—First and third Mondays in each month, 7.30pm. Braintree Community Centre, Victoria Street, Braintree. Details from Dave Boniface, G3ZXX, 131 Humber Road, Witham.
Bury St Edmunds (BStERS)—Third Tuesday in each month, 7.30pm. Red Cross Headquarters, Mustow House, Eastgate Street, Bury St Edmunds. Details from John Munro, 29 Angel Hill, Bury St Edmunds.
Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi

College, Arbour Lane, Chelmsford. Details from A. Mead, G8KQE, 9 Abraham Drive, Silver End, Witham.
Colchester (CRA)—Thursdays, fortnightly, 7.30pm. Colchester Institute, Sheepen Road, Colchester. Details from Frank Howe, G3FIJ.
Felixstowe (FARC)—Tuesdays, 8 July (G3XIX slide show). 8pm. Felixstowe Ferry Golf Club. FARC is arranging a bank holiday "Ham-in" at Goslings Farm, Trimley, from 22 August to 27 August. Volunteers to meet at golf club on 22 July. Details from John Hobin, G3XIX.
Great Yarmouth (GYRS)—Last Thursday in each month, 7.30pm. 67 Southdown Road, Great Yarmouth. Details from Tony Besford, G3NHU.
Harlow (H&DRS)—Tuesdays, 8pm. Mark Hall Barn, First Avenue, Harlow. Further details from hon sec A. C. Keeble, G4HPU.
Harwich (H&DRA)—Thursdays, 7.30pm. Harwich Adult Education Centre. Details from sec Tony Free, G4EYE.
Haverhill (H&DRS)—Fridays, 7.30pm. Steeple Bumpstead Road, Haverhill. Further details from Chris Kitchener, G8IMI, tel Haverhill 2852, evenings.
Ipswich (IRC)—Second and last Wednesdays in each month during school term, 8pm. Handford House, Ranelagh Road, Ipswich. Members are reminded about the Ipswich Carnival in Christchurch Park on 9 August. Morse classes also available at club. Details from Jack Tootill, G4IFF, 76 Fircroft Road, Ipswich.
Loughton (L&DARS)—Fridays, fortnightly, 8pm. Loughton Hall, Rectory Lane, Loughton. Details from John Ray, G8DZH, tel 01-508 3434, evenings.
Lowestoft (L&DARC)—Fridays, 4 July (Junior members activity evening); 18 July (Discussion on Schools Open Day); 15 August (144MHz fm df hunt). 7.30pm. North Suffolk Teachers' Centre, Lovewell Road, Lowestoft. Details from Paul Godfrey, G8JBD.
Martlesham (MRS)—First Wednesday in each month, 7.30pm. Visitors are welcome but must first contact Simon Garrett, PO Research Centre, Martlesham Heath, Ipswich.
Norwich (Norfolk ARC)—Wednesdays, 7.45pm. Crome Community Centre, Telegraph Lane East, Norwich. Details from Andrew Kiddle, G4HVC.
Southend (S&DRS)—Fridays, fortnightly, 8pm. Church Hall, Sir Walter Raleigh Drive, Rayleigh, Essex. Contact sec G3YOA.
Stowmarket (S&DARS)—First Monday in each month, 7.30pm. Red Cross Hall, Stowmarket railway station. Details from Jim Lowe, G8SCB, 22 Bluebell Grove, Needham Market.
Thurrock (TARC)—First and third Tuesdays in each month, 8pm. Grays Park Hall, Orsett Road, Grays. Morse tuition available. Details from sec G3KMD. Club net on 144MHz S21/22, on second and fourth Tuesdays in each month, 8pm. New members and visitors welcome.
Vange (VARS)—Thursdays, 8pm. Main Hall, Barstable Tenants' Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

REGION 17—RR H. G. Cunningham, G8FG, 235 Station Road, West Moors, Wimborne, Dorset BH22 0HZ. Tel Ferndown (0202) 876018.
Basingstoke (BARC)—Third Wednesday in each month, 7.30pm. Chineham House, Popley, Basingstoke. Sec, G4HTM, tel Basingstoke 23421.
Basingstoke (UK FM Group Southern)—First Wednesday in each month; 7.30pm. Chineham House, Popley, Basingstoke. PRO Jan Payne, tel Aldershot 26108 .
Bournemouth (BRS)—First and third Fridays in each month, 8pm. Dolphin Hotel, Holdenhurst Road, Bournemouth. Sec Bob Freeth, G4HFQ, tel New Milton 618092.
Chippenham (C&DARC)—Tuesdays, 7.30pm. Sheldon School, Hardenhuish Lane, Chippenham, Sec P. J. Tuck.
Fareham (F&DARC)—First and third Wednesdays in each month, 7.30pm. Porchester Community Centre, Room 9. Sec David James, G8GRV, tel Titchfield (03294) 45977.
Farnborough (F&DRC)—Second and fourth Wednesdays in each month, 7.30pm. Railway Enthusiasts' Club, Access Road, off Hawley Lane (near M3 bridge), Farnborough. Sec Ivor Ireland, G4BJQ, tel Farnborough 43036.
Guernsey (GARS)—Tuesdays and Fridays. Details from sec GU8KUT, PO Box 100, St Peter Port, Guernsey.
Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Sec S. Jenkins, G4CHO, tel 0705 591788.
Jersey (JAEC)—Second Wednesday in each month. 7.30pm. The Quennevais, Communicare Centre, St Brelade's, Jersey. Hon sec Mrs M. Smith, tel 0534 23249.
Jersey (JARS)—Sundays, 10.30am. Fridays, 8pm. Le Hocq Tower, St Clement, Jersey. Sec R. H. Ford, Sanaldi House, Plat Douet Road, Bagot, St Saviour, tel 0534 31131.
Poole (PARS)—Last Friday in each month, 7.30pm. Poole Technical College. Sec Phil Ciotti, G3XBZ, 214 Rossmore Road, Parkstone, Poole.

The South Dorset RS operated its club station G3SDS/A at Lulworth on 3 May at a Scout rally attended by the chief Scouter, Sir William Gladstone: L to r: G3ZGP, Sir William Gladstone, G8EOJ, G3PFM and G3OBD

Portsdown Hill Repeater Group—Repeater going QRT for re-engineering prior to fitting at a new site. Sec G8GNB.
Portsmouth (P&DRS)—Wednesdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland, Portsmouth. Sec G3JZV.
Salisbury (SR&ES)—Tuesdays, 7.30pm. Salisbury Activity Centre, Wilton Road. Sec G2FIX, 74 Victoria Road, Wilton, Salisbury.
Southampton (SUARC)—Tuesday evenings. Also informal meetings every lunchtime in the clubroom, Old Union Building. Sec A. C. Talbot, The Radio Club, JCR Post, The University, Southampton.
Southampton (SRSGBG)—Wednesdays. The Clubroom, Kent Road. 7.30pm. AR J. R. Compton, G4COM, tel Fair Oak 3017.
South Dorset (SDRS)—First Tuesday in each month, 7.30pm. The Lecture Hall, South Dorset Technical College, Newstead Road, Weymouth. The AGM was held on 15 April and the following officers were elected: Chairman, G8EOJ; secretary, G3ZGP; treasurer, G3SDO; swl rep, BRS35295.
Swindon (S&DARC)—Alternate Wednesdays, 7.45pm. Clubroom, Oasis Leisure Centre. Sec K. Clinch, G8OQY, 13 Pound Piece, Ashbury, Swindon.
Winchester (WARC)—Third Saturday in each month. The Scout Log Cabin, Stockbridge Road, Winchester. First Friday in each month (Informal). Crown Hotel, North Walls, Winchester. Both at 8pm. Sec Peter Simpkins, G3MCL, Lawn End, Park Road, Winchester.

REGION 18—RR W. A. Ricalton, G4ADD, 4 South Road, Longhorsley, Morpeth, Northumberland.
Following information is latest received.
Durham (DURES)—During term. Physics Dept, Science Site, Durham University. Forthcoming events include a Film/Talk "Man in Space", by Lt/Commander Nicoll, RN (Plymouth). Details of this and other events from G3ZJY, G4FOP, or sec Miss E. Dean, Collingwood College, Durham. External members welcome.
Easington (EAR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Workmen's Club. RAE and morse tuition if required (the club has a good pass record). Details from sec G4GXI. All welcome.
Great Lumley (GLAR&EC)—Wednesdays, 7.30pm. Great Lumley Community Centre. Sec G4DWM.
Hartlepool (HRC)—Mondays, 7.30pm. Methodist Church Hall, Grange Road. Sec G3NWU.
Middlesbrough (Post Office ARC)—All amateurs welcome, but first contact sec G8CDP.
Middlesbrough (Teesside Repeater Group)—Last Tuesday in each month, 7.30pm. 196 Marton Road, Middlesbrough, Cleveland. All amateurs and swls invited but first contact sec G8MBK.
Morpeth (Northumbria RC)—For details contact G4GWB.
Newcastle upon Tyne (Tyne & Wear Repeater Group)—Arts Common Room, Claremont Tower Block, Newcastle University. Sec G4DOB, tel Newcastle 744444.
South Shields (SS&DRS)—Fridays, 7.30pm. Trinity House. Old and new members welcome. Sec G8BQF, 67 Lauderdale Avenue.
Tyneside (TRS)—Mondays, 7.30pm. The Community Centre, Vine Street, Wallsend. Morse tuition can be arranged. Sec G8OFA, 69 Rectory Lane, Blaydon-on-Tyne. New members welcome; club equipped for multiband operation.

REGION 19—RR R. J. C. Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ.

Barking (BR&ES)—Weeknights Monday–Friday. Westbury School, Westbury Road, Ripple Road, Barking. 12–13 July (Dagenham Town Show). Further details from sec Alan Sammons, G8IZN. All are welcome.

Central London (Post Office HQ ARG)—For Post Office members only. For details contact J. A. Clarke, Room 134, Cardinal House, Farringdon Road, London EC1M 3ND.

Cheshunt (CDRC)—Wednesdays: 2 July (Chairman's lecture), 9 July (Natter), 16 July ("Commercial tv distribution", by D. Woolard, Rediffusion), 23 July (Natter), 30 July (Rig clinic), 6 August (Natter/cw), 13 August ("Home computing", by G8PWC), 20 August (Natter/cw), 27 August (Broxbourne Common-vhf portable). The Church Room, Church Lane, Wormley, Herts. New hon sec, G8VBL, tel Waltham Cross 32198.

Chingford (Silverthorn RC)—7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Hon sec Chris Hoare, G4AJA, tel 01-529 2282. All are welcome to attend any meeting.

Chiswick (Acton, Brentford & Chiswick RC)—Latest news—venue was burnt down. RF? Meetings now held in Chiswick Town Hall, London W4. 7.30pm. Committee Room, Town Hall, W4. Hon sec W. Dyer, G3GEH, QTHR.

Ealing (E&DARS)—Tuesdays, 8pm. Northfields Community Centre, Northfields Road, London W13. Hon sec E. Batts, G8LWY, 27 Cranmer Court, Richmond Road, Kingston Upon Thames. All welcome.

East London (ELRSGBG)—Next meeting 21 September 1980. Further details from hon sec, Rod Holmes, G3PKQ, tel 01-558 2928.

Edgware (E&DRS)—Second and fourth Thursday in each month. 8pm. The Watling Centre, 145 Grange Hill Road, Burnt Oak, Edgware. Further information from G3MNO, D. Lisney, tel 01-907 1237, or any committee member. Slow morse classes held on first and third Thursdays of month at 7.30pm. All welcome. Edgware Net, Monday, 10pm local time, on 1·875MHz.

Harrow Weald (RSH)—Fridays: 4 July (Informal), 11 July ("The stories behind the controls", by G3IEE), 18 July (Informal), 25 July ("Microcomputers", by G4JNZ, G8TCE). All August—informal meetings held at Harrow Arts Centre, High Road, Harrow Weald. Further details from sec G4AUF, tel 01-868 5002.

Havering (HDRS)—Wednesdays, 8pm. Fairkytes Arts Centre, Billet Lane, Hornchurch. Further details from sec, A. Negus, tel Upminister 24059. All welcome.

St Albans (Verulam ARC)—Fourth Thursday of each month. 8pm. Jubilee Centre, Catherine Street, St Albans, Herts. Hon sec A. Clarke, G8MAE, QTHR, tel 0442 64751.

Shelburne (SRC)—Thursdays, 7pm. Shelburne Youth Centre, Hornsey Road, London N7. RAE courses available. Hon sec T. C. Clark, G4BZW, tel 01-249 1843. Sec would be pleased to hear from any prospective members. The club has a 2000E transceiver, and G5RV for licensed members to use.

Southgate (SRC)—Second Thursday in each month. 10 July ("Microprocessor control of slide projectors", by G8EWG), 14 August (Open forum). The Scout Hut, Wilson Street, Winchmore Hill Green, London N21. Sec John Fitch, G8EWG, tel 0440 7353.

South West Herts UHF Group—The building of GB3BH (1·3GHz/beacon/repeater) is progressing, and the group's 10GHz beacon, GB3SWH, is now operational. Reports are requested from as many amateurs as possible to evaluate GB3SWH's catchment area. Talks can be arranged for interested groups. Contact hon sec G8BBE.

Stevenage (S&DARS)—First and third Thursdays in each month; 8pm. Senior Staff Canteen, Site B, British Aerospace, Gunnels Wood Road, Stevenage. Information from Peter Byrne, G8MCV, tel 0438 64624; or net Mondays, 7.30pm. 145·550 fm, or ASR Trevor Tugwell, G8KMV, QTHR.

West Drayton (LT District Line ARC)—Thursdays, 6pm. DLAA Sports Ground, Park Place, Gunnersbury Avenue W3. (Bar). This club requires the attendance of former members, who lost interest, to enable the club to survive. It would also like the assistance of local amateurs who could give talks on any radio topic. Hon sec R. Ball, G8JEB, tel 01-422 0414. Club net 144·250 ssb, 2000–2100 local.

The RR has received a letter from an old ELRSGB Group member now overseas. Roland, G3FT, now VE3AML, is in Canada and sends good wishes to all old friends from the Ilford/Romford area. Roland would appreciate a call on 14MHz, as he is now not too mobile at home.

REGION 20—RR B. L. Goddard, G4FRG, 2 Greenfield Park, Portishead, Bristol BS20 8NQ.

Following information is latest received

Bridgwater (HPSSARS)—Second Monday in each month, 7.30pm. YMCA, Nr St John Ambulance Hall. Further details from G4ETN.

Bristol (BARC)—Tuesdays, 7.30pm. The University Settlement, Barton Hill, Bristol 5. Sec G8KGE.

Bristol (BRSGBG)—Last Monday in each month. 7–9.30pm. Small Lecture Theatre, Queens Building, University Walk, Clifton, Bristol. Hon sec G4FRG.

Bristol (North Bristol ARC)—Fridays, 7.30pm. Self help enterprise, Braemar Crescent, off Braemar Avenue, Northville, Bristol, RAE and morse classes. Hon sec G2HDG.

Bristol (Shirehampton ARC)—Fridays, 7pm. Twyford House, Shirehampton. Hon sec G4GTD. HF and vhf station all modes, lectures and films, df hunts etc, planned for 1980. RAE and morse classes in progress. New members welcome.

Cheltenham (CARA)—First Thursday (Formal) and third Friday (Natter night) of each month at 7.30–8pm. The Old Bakery, Chester Walk, Clarence Street (rear of public library). Hon sec G4ILI, tel Cheltenham 43891. All visitors welcome.

Gloucester (GARS)—Thursdays; first Thursday in each month (Society business followed by a talk), remaining Thursdays (Activity nights with G4AYM in operation), 7pm. Chequers Bridge Centre, Painswick Road, Gloucester. Hon sec G3MA.

North Avon Repeater Group—Provisionally GB3AA at Alveston, Avon. Group meets on an *ad hoc* basis. Further information from G8NNU.

Weston-super-Mare (WsMARS)—Second Monday in each month, 7.30pm. Lewis Block, Worle Comprehensive School, Redwing Drive, off Mead Vale, Weston-super-Mare. Hon sec Irvin Barr-Sim, The Old Dairy, Eastertown, Lympsham, Somerset.

Yate (Y&DARC)—First Friday in each month, 8pm. G3RQN QTH. Further details from G8LGC. All welcome including swls.

Yeovil (Y&DARC)—Thursdays (Lectures most weeks), 7.30pm. Building 101, Houndstone Camp, Yeovil (off A3088). Hon sec G3NOF. Club net 10.30am Sundays, 3·660MHz.

The Brunel Technical College RS wants new members. Contact Students' Union, Cabot House, Brunel Technical College, Bristol, or Martyn, Bristol 678467.

Members and xyls at the first dinner dance of the Yeovil ARC. L to r: xyl of G3MYM, xyl of G8UXY, xyl of G8VUZ, xyl of G3KSK, G4EVI, G3MYM, G8UXY, G3KSK, G4JBG, xyl of G4JBG and xyl of G4EVI. *Photo:* **G8VUZ**

members' ads

These subsidized flat-rate advertisements are accepted as a service to members of the RSGB. They must be submitted on the Members' Ads order form printed in alternate issues of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* mailing label addressed to the advertiser, as proof of membership, and a remittance by postal order or cheque for £1 for every 40 words or part thereof. They will not be acknowledged. Those not clearly worded or punctuated will be returned. No correspondence concerning this service can be entered into.

Closing dates in 1980 for issues in brackets: **18 July (September), 29 August (October), 26 September (November), 24 October (December), 21 November (January), 19 December (February).**

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale. Advertisements may be edited or abbreviated as necessary.

Advertisements for 27MHz equipment will not be accepted.

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

Do not post to RSGB HQ or Advertising Representative

FOR SALE

PSU, continuously variable 0–10V output at 300A, fully metered on mobile rack, Variac 2kVA 0–270V out, autotransformer, six steps 270/69V at 12A, galvanized steel mast, 25ft, crated, first reasonable offers secure. Buyer collects. G3ESO, QTHR. Tel 0980 23001.

FC901, as new, boxed, £80. BC221, orig charts, £15. Both plus carriage. *Wanted:* NCX5 or KW2000, Osker power meter. GW4EVJ, QTHR. Tel 0792 843948.

Pye Bantam on R7, S20–21, case, nicads, helical, £50. Xtals for Ultra Lion 9MHz and 33MHz for R7, £2.50 each. *Wanted:* Trio 2200 or similar fm portable. G4EVZ, QTHR. Tel Romford 45733.

Computer bits: BRP 11ocps paper tape punches, 8-channel with sound reducing enclosures, some 250V, others 110V, £25 each. Elliott optical, high speed, 8-channel paper tape readers, some 250V, others 110V, £20 each. Creed 75 printers, Elliott code, keyboard, tape punch, £25 each. One very compact receive-only printer, £27.50. GE computer manuals for Elliott, ICL and RCA equipment. Ex-GPO telephone switch board, 5+20, vgc, antique, offers? All must go, leaving for VE land July. G4HRN NOT QTHR. Tel 0454 316733.

Hallicrafters rx, model S27C, covers 120–230MHz, in good physical, electrical cond, £25 ono. Buyer to collect. R. Bunney. (Nr Salisbury). Tel 0747 4370.

Drake T4XC, AC4 psu, MS4 spkr, R4C, noise blanker, a.m., ssb, 500, 250Hz cw filters, both incl 160m, all of 10m, fully compatible new WARC bands, £750, or might split. Tel 01-432 5959, daytime.

4m Europa, fb cond, incl handbook, £55. 2/4m Europa psu, £35. Creed 75R 45·5 baud, mains, £18. 4m converter, MMC70/28, lo, virtually new, £15. 2m pa unit, two 4CX250Bs, £30. HRO, coils, £10. G4ERX, QTHR. Tel 0277 225736, evenings.

FT227RA, fitted Amateur Radio Exchange 25kHz scanner, four memories, full remote control, as new, £225. G4JLU. Tel Dave, 01-349 1122, daytime.

Radio bits: 2m ground plane, £2.50. 2m contest beam, all Jaybeam supplied 8-over-8, extensions to 11 and 14-over-14, single beam dipole included, coaxial feeders, £25. SMC 600W hf traps, £4. Tonna 25ft portable mast, guys, stakes, as new, £25. Pye 4m a.m. rig, 1/4 wave gutter mount, £10. Other Pye rigs, 2m, 4m, lot £2.50. Hy-Gain hf vertical, worked VK QRP, £15. Lasky 'Skywave' rx thermal drift scanner, £1.50. 5kW spotlight, stand, 24in lens, long cable, ideal /P illumination, £10. 2m halo with 24in mast, £2. All must go, leaving for VE land July. G4HRN NOT QTHR. Tel 0454 316733.

Radio and tv valves ancient and modern, all numbered, good, many boxed, 200 plus, £20. 54 Grand Avenue, Lancing, Sussex. Tel Lancing 5204.

YC305D Yaesu 250MHz counter, vgc, £75. Full set five Newtronics Hustler mobile whip sections, 80–10m, usable base section and spring free as selling set only, new cond, offers please. G3BHT, QTHR. Tel 021-308 4764.

Wireless World Nov '77, 2m synthesized fm tx/rx, cased up in smart satinized aluminium case, switches etc, never found time or test gear to set it up, all circuits, instructions, offers? G4GGC, QTHR, Suffolk. Tel 0787 71842.

Yaesu FT301S, used little, immac cond, in orig packing, comp with full options, cw filter, rf processor, vox, marker unit, full 10m coverage, £400 ono. Ling. G4CCH. Tel 0652 648497.

Solartron CT316 oscilloscope, 6MHz, sound cond, manual, circuits, £50 ono. Tel 01-997 1416, Ealing, London.

Heathkit HR1680 comms rx, 80–10m in five bands, ssb, cw, fb rx, handbook, 240V mains required, £110 ono. Collect and examine if possible. G4JIZ. Tel 062 981 2398, after 6pm please.

QTH GM5RM, Borders, Kelso 2374, 1·5 acres, stone, detached, in parkland, fine view, exc for dx, two 18ft bedrooms, 18ft lounge, four other rooms, garage, three store. AR88LF, RL84, TW12LTX. Write for information/view. G5RM, QTHR Bromley, Kent BR1 3HB.

Heathkit SB100, SB101 conversion, psu, vgc, BC221. G4GQL, QTHR. Tel 01-518 1562.

Shack clearance: tx/rx TS288A, FT101, 160–10m, mic, rxs 15W77, 160–10m, Eddystone 840C gen/cov, FR400DX, Trio 2kW linear amp, 911 80–10m, 50ft, two-section tower, BC221 wavemeter, *ARRL Handbooks, CQ, QST, 73*s from 1973, some before 1940, valves: PX4; PX25; T25D; 803; 813; 823; 825; HY25; 35T and many more, transformers, etc, send sae for list. GM3NVU, QTHR.

Trio 22009X, as new, R2–3, R7, S20–22, S0, nicads, charger, in orig packing, helical whip, homebrew external charger, homebrew 30W valve pa, 19in rack, prefer buyer collects, £135. G8RIW, QTHR. Tel Grimsby (0472) 883161.

FT101B, vgc, cw filter SP101, £360. FV101B, £75. YO100 'scope, £95. Elliott FT628 uhf base station, manual, £50. SEM Europa 2m transverter, £70. 6-el 2m quad, £15. All items carriage extra. GW4HAT, NOT QTHR. Tel 0792 28737, after 6.30pm.

Crown 5TV525R b and w tv, plus fm and a.m., portable, 4in, mains, 12V dc, internal batteries, as new, orig packing, used few hours, £80. Brock. Tel Oxted 2141, evenings.

Impaired vision scrubs project, 1in cathode ray tube with mumetal screen, base and escutcheon, makers' complete data brochure, £30. G8AWT, new QTH, 104 Arctic Road, Cowes, Isle of Wight.

Trio TS700, £280. Datong model FL1 filter, £45. G4EYS, QTHR. Tel 01-594 8992.

Magnum Two, two to ten transverter, Yaesu FT101 cables, good cond, £70. G4GGC, QTHR Suffolk. Tel 0787 71842.

KW Vanguard a.m./cw tx, 50W 80–10m, full data, exc cond, £30. KW E-Zeematch, £25; or £50 the pair. G3TPO, QTHR. Tel 01-699 9660.

TS520, fitted cw filter, dc psu, Shure 201 mic, spare driver, pa valves, superb cond, never used mobile, £400. Hy-Gain 18AVT/WB vertical, £45. Transformer, very heavy, 0–2000, 3000, 4000V at 1/2A, offers. G4BYA, QTHR Berks. Tel 0635 22680.

Icoms IC215, IC202 hand portables, quality cases, vgc, offers around £130 and £135, respectively. FTDX500 hf tx/rx, very good, reliable cond, £228 ono. Quality coaxial changeover relay, £7. Coaxial, assorted types, lengths, offers please. Tel Robin, 021-453 5138.

FTDX560 tx/rx, new pa, valves, etc, comp with separate spkr, external FV400S vfo, good cond, £315. Trio 7200G, fitted 18 channels, mobile 2m tx/rx, exc working order, £150. Trio QR666 communication rx, 1·5kHz–30MHz, £100. Tel Shoreham (Sussex) 3706.

FT227R, 5/8 whip, £175 ono. TW 10W a.m. tx, Nuvistor converter, power supply, £30 ono. Mohican rx, £20 ono. *Wanted:* 2m 8XY, morse key. G8BIJ. 21 Squires Bridge Road, Shepperton, Middlesex. Tel Chertsey (09328) 63544.

Icom 255E, as new, £225. Two ILP HY400 240W audio amps, £20 each. Heath HD1250 dip meter, £30. Tel Thanet (0843) 67932.

Yaesu FT202R 2m hand portable tx/rx, nicads, charger, ext spkr/mic, 12 months old, fully xtalled, £100. Codar PR30X mains powered preselector, £7.50. G3ZQF, QTHR. Tel Medway 723694, after 7pm or w/ends.

Mosley TA32 beam, 2in galv steel poles, various lengths, must be collected. G3JBU, QTHR. Tel 0604 401800.

Jaybeam 2m, 6-el quad, £18. Heathkit HR10B rx, £30. Datong UC1 up converter, £85. Shure 201 mic, £8. Akai 1720L stereo tape recorder, £50. G8NEY, QTHR.

Pye 460 base, ideal repeater, 1H, CE, SU8, SU20, mic, full service folder, £100. Labgear LG50 antenna, C10 relay, ptt, £12. Gomer. G8UNZ. 55 Hythe Hill, Colchester. Tel 74427 ext 10, daytime.

Heathkit 10m walkie-talkies, single channel, xtal controlled, mint cond, £25 ea, £45 pair. High band 12·5 kHz a.m. mobiles, fair cond, Cambridge, £35. Vanguard a.m. 25B, control gear, £20. Have alternative 25kHz filters if required, G3HTC, QTHR. Tel Sunbury (093-27) 84422.

Trio TS510/PS510, exc cond, orig packing, manuals, £225 ono. Comdel CSP11 processor, £25. G3SJH. 50 Christopher Road, Birmingham 29. Tel 021-472 8577.

KW2000B, 6146Bs, lpf, good cond, £190. FT227R, 5 and 25kHz scan, auto t/b, reverse repeater facility, £215. Both ono. Carriage extra. Could deliver southern England. Scott, G4FOY, QTHR. Tel Alton (0420) 82855.

Yaesu FT301D, FP301, FC301, comp 100W broad band hf station, matching atu, mint cond, £650. Yaesu FT224 mobile rig, fitted 19 channels, pre-amp, perfect, £100. G4EMG, QTHR. Tel 01-534 3460.

Atlas 180 and AR230 Console power supply, £300. Atlas 206 digital vfo, £190. Yaesu FT2F, toneburst, 12 channels, £89. Any reasonable offers accepted. G4CIN, QTHR. Tel Bilston 403416, after 6pm.

Liner 2, 2m ssb tx/rx, pre-amp, mobile mount, Halo antenna, £110. TS700G multimode 12V or mains, £380. *Wanted:* fm portable rig. Pelham G8PGX, NOT QTHR. Tel Weybridge 47262, daytime, Guildford 37726, evenings.

Hy-Gain 12AVQ vertical antenna for 10-20m, £25. Tel Michael, 01-272 7575. after 7pm, weekdays.

FT101E cw filter, Datong a.s.p. Dentron Super 1kW tuner, Datong FL1, all mint, realistic offers. G4HKL, QTHR. Tel 044 284 3474.

JV6PV4500, used little, portable video recorder, monochrome, camera, 9in Sony batt/mains, monitor/rx, rechargeable battery, power unit/charger, 10 once only used tapes, rf converter, all leads, £550. P.S. Bush, 41 Waverley Road, Bristol BS6 6CT. Tel 0272-44688 or 43932, daytime.

TR2200G, seven channels, nicads, charger, case, good cond, £90 ono. *Wanted:* FT221R. G8MKX, QTHR. Tel 0342 26366.

Yaesu FL2100B lin amp, as new, used twice, £270. Yaesu YD844A desk mic, imp 600Ω/50kΩ, new, boxed, £16. Taylor sig gen 100kHz, 240MHz £10. G3EPE, QTHR. Tel 0253 890467.

Arac 102, 144/146MHz and 28/30MHz, fm, ssb, a.m. cw, rx, few weeks old, as new, in orig packing, £90 ono. G4BOO. 68 Percy Road, Hastings. Tel Hastings 713644.

FRG7000, new in March, £320 ono. Reason for selling, need 2m as newly licenced G8. Last. G8WGL. 213 Rushmere Road, Ipswich. Tel 0473 714563.

Liner 2, as new, no mods, with circuit, £95. Homebrew 28MHz/144MHz transverter, requires Microwave Modules converter, with local osc output QQV06-40pa, any reasonable offer accepted. G8BJO. 17 Causeway Court, Woking, Surrey. Tel Brookwood 2981, or Uxbridge 32240.

Trio 9R59D 0·55-30MHz rx, good cond, £45. 2m 10W pa VB2200GX, 1W in, 10W out, £20. Class D wavemeter, psu, £10. Early radio literature 1910-40, good cond, over 50 pieces, offers. Vintage radio gear, valves, etc, horn speaker. G8LGO, QTHR. Tel Gosport 81296.

Racal digital frequency counter type 801M, 125MHz, £100. Rxs: Eddystone S640, £30. 880/2, £175. BRT400, £55. Mullard valve tester, cards, adaptors, offer? SP600 rx, £120. Taylor test meter, 88B, £30. G3DVF, QTHR. Tel Alnwick 602487.

Kenwood TS700S, 2m multimode, nearly new, same as Trio but has 2MHz extra, £500 ono. Microwave Module 432/285 transverter, satellite band, £90. Datong morse tutor, £35. Need QRK for another piece of equipment. G4JNW. Tel Dewsbury (0924) 452303.

TS280FM 80 channel tx/rx, as new, 10/45W, clip-on antenna, mic etc, £170. 500VA transformer, primary 415/240, sec 2X 60, 55, 0, ditto radiospares, £8. G3KPW, QTHR. Tel Gravesend 62051.

IC202, usb, lsb, five ranges, £125. 4-el quad, £10. ZVC Mk2 board, built, tested, £50. G4JNZ, G8OBL, QTHR. Tel 01-868 2159.

Stolle 2050 rotator, cable, 18in stand-off brackets, 12ft mast, as new, only used for two months, £35. Buyer collects. Tel Horsham 67908.

Pye Cambridge 2m fm, S20-22, S8, R3, R6, auto toneburst, control box, leads, mic, £45. Cambridge six channel xtal Ledex assembly, £5. Cambridge xtals S23. R7, S0, S1, £3 per pair. G3TKQ, QTHR. Tel Colchester 861917, evenings.

G3ZVC ssb tx/rx, board QC1246AX, filter SL600, ics, £40. Microwave Modules MMD050/500 dfm, £50. G2RY, QTHR. Tel 0308 88343.

KW Viceroy tx, 80-10m, Trio JR500 rx, both good cond, £110, or will split, G3RTB, QTHR. Tel 01-348 9813.

National Panasonic comms rx, RF4900LBS/LBE, fm/a.m., 11-band, as new, manual, orig packing, £220 ono. Tel Aberdeen (0224) 821656.

Never used, greatly reduced to clear: Atlas 210X tx/rx, £400; AR200 power supply, £55; Honda portable generator, 115V, 60Hz, 1·5kVA, £200; transformer 115/230V, £30. D. A. Evans. G8UMQ, QTHR. Tel 0703 556746, after 7pm.

Datong up converter, immac cond, replaced by Racal, £85. Liner 2 PA3, vgc, £90. Crofton video camera, mint, modulator, £100. *Wanted:* half min slave clocks. G4FFH, QTHR. Tel Burton-on-Trent 702962.

Trio 520 hf tx/rx, 80m-10m, superb, as new, incl mic, £350. G4HTE, QTHR. Tel Potters Bar 54905.

Racal RA17, ssb adaptor, Racal cabinet, good cond, £260 ono. G3XSF, QTHR. Tel 0422 60438.

Trio 9R59DS, mint, orig packaging, handbook, SP5DS spkr, spare set of valves, £60. AR88, fair cond, £50. Buyer collects. G8OMC, QTHR. Tel Wigan (0942) 39576, evening.

FT101ZD, brand new, impeccable, latest model with a.m., extras include fan, mic, two years guarantee, sensible offers considered, emigration reason for sale. G2CDN, 13 Wood Lane, Isleworth, Middx.

Deceased amateur's equipment, items 25p-£500. SAE for lists. G8AJ, QTHR.

Xitex ASCII/Baudot vdu, partial kit: pcb, MK3870 micro, character generator, xtal, manual, transmit/receive ASCII (110, 330), Baudot (45·45, 74·2) auto cr/lf, 50/60Hz selectable, £40 ono. K. Arasu, 21 Chelverton Road, Putney, London SW15 1RN. Tel 01-785 6712, evenings.

70cm Microwave Modules converter 432-144MHz i.f., cond as new, £18. 2m, 10-el, Parabeam, Jaybeam, good cond, £15. G8KGF, QTHR. Tel Bicester 2574, weekends only.

Avo transistor test set, £20. 1177 valve tester, £20. Litton 1602 processor, 10K bytes drum memory, £100. *Wanted:* Computer hardware, etc, any size, any cond. J. M. Harmer, 39 Harrogate Road, Rawdon, Leeds. Tel 0532 502954, after 7pm.

FT207R synthesized handheld, case, helical, nicads, NC9C charger, NC2 base unit, packing, four months old, used very little, £195. B2 spyset, two containers, psu, coils, h/set, key, xtals, circuit, very good cond, £50. Creed 7E, transit crate, £15. G8LQL. Tel Goosnargh 372.

FT7 tx/rx, 11 months old, £265. 20m mono band linear hb, £30. TA33Jr beam, £30. KW Voyageur, faulty but good for filters/spares, offers. Various ac, dc, psus to suit ssb rigs, offers. *Wanted:* FV101B. G3UXH, QTHR. Tel Medway 250562.

Hy-Gain TA33 Jnr, as new cond, one month's use, dismantled, stored, £70. J. Berry, G3JZN, QTHR. Tel 061 723 2529.

AR88D, wkg, needs clean-up, £25. Pye 3017 general coverage rx, lw, mw, seven short wave positions, in veneer cabinet, £12. G4HRP, QTHR. Tel Wallingford (Oxon) (0491) 37217, evenings only please.

Stornophone 600L solid-state 10W fm dash mounting tx/rx, six channel, easily xtalled for 2m operation, vgc, c/w maintenance manual, £70 ono. Eddystone 898 dial, unused, mint, £15. QM70 70MHz 2W transverter, very reliable, £30. 70cm cavity, linear, c/w, 2C39A, good for 50W with suitable psu, £25. Transformer 500-0-500, ok for above linear, £3·50. 2m 40W linear, QQZO640 pa, c/w, integral 12V inverter, small size, vgc, £35. 30ft army portable vertical antenna, c/w rigging kit, in canvas bag, £5. G3ZTZ, QTHR. Tel 0276 20607.

Yaesu CPC2500R, 25W 2m tx/rx, superb cond. £280 ono. G4HTE. Tel Potters Bar 54905.

KW Atlanta vfo, new pas, some spare valves, £200 ono. Marconi v/vm TF428B/1, h/bk, £7.50. Both inspect, collect or carr extra. MF455 10AZ filter, £10. Mizuho peak filter PF1, £7.50. G3PJN, QTHR. Tel Chesterfield 6040, after 6pm.

Exchange Leica camera outfit: M4 body, MR4 meter, F2·8/50 Elmar, F2·8/28 Elmarit and finder, F2/90 Sumicron, Leitz case, hoods, filters, bayonet to screw adaptors etc, all in truly mint cond, insurance valuation £1,000, for; best Drake TR7 rig offered, cash adjustment either way, or direct cash offer. G3ZF, QTHR. Tel Crawley 883097.

Sommerkamp FT250/FP250, new pa valves, spares, manual, orig packing, £235. Osker SWR200 power/swr bridge, £22. Drake TR4C, MS4 spkr/psu, incl noise blanker, recent professional overhaul, going 12V operation, £355. Lemay. G8KAX, QTHR. Tel Chelmsford 67131, ext 239 (works).

FDK Multi 11, fm 2m mobile tx/rx, 10W/1W. fitted nine simplex, six repeater channels, perfect cond, £140 ono. G8SAJ, QTHR. Tel 06845 63552.

Huge number of parts to build linear amplifiers, numerous transformers, big valves, big capacitors, etc, many smaller items, complete clearance. SAE/list requirements. *Wanted:* AR88 or RA17, also telephone answering machine. Durst colour enlarger, will consider part exchanges. GM3WTA, QTHR.

FR101D hf, 2m, 6m broadcast, front cover, manual, immac, £360. R517 airband rx, case, handbook, immac, £40. G8USB. Tel Bookham 52390.

Morse keys, Marconi marine, ball race action, filters, cover, superb, mint, £25. USAF lightweight model, exc, £11. US Army, the same, £8. Both mounted on mahogany base, Jackson 500pF variable, 500W, very high quality, robust construction, £10. All plus postage. G3GUU, QTHR.

Heathkit DX60B tx, fb 90W cw rig, 80-10m, integral power supply, grid block keying, matching driftfree vfo, HG10B, 80-10m, 2m powered from DX60B, both mint, manuals, spares, £65 comp. Tel Frome (Somerset) (0373) 4694.

IC211E vhf multimode tx/rx, boxed c/w mic, £390 (carriage paid). FRG7 rx, as new, boxed, £160. Realistic DX160 rx, £40. G3ZYY, QTHR. Tel 07555 5913.

Handheld 2m fm KEN KP202, 2W, R0, R4, R7, S20-21, S23, charger, nicads, £80. Sentinel 2m conv, 28MHz i.f., £8. DJ70S four channel disco amp, 70W rms, 40Ω, £35. Two 6146, £3 ea. G4FQF. QTHR. Tel Romford 47998.

Oscilloscope, telequipment, D43 double beam, 15MHz, exc cond, £90. Buyer collects. G8SZK, 328 Nine Mile Ride, Wokingham. Tel 0734 732218.

FT221R, mint cond, handbook, etc. £330. Buyer collects. G8DMR, QTHR. Tel Basingstoke (0256) 59773.

Datong FL1 frequency agile audio filter, as new, perfect, £50, no offers. D. F. Mathews. Tel 01-876 7868.

FT101ZD fan, mic, four months use only, exc cond, no offers, £550. Buyer collects. G8SZK, QTHR Wokingham. Tel 0734 732218.

I have over 60 valves of all types, which must be sold. No sensible offers refused, everything from A2293 to Z329, 6AL5 to 12AR7, send sae for list. G. Plucknett, 432 York Road, Stevenage, Herts. Tel Stevenage (0438) 59019.

Yaesu FT201 tx/rx, 80-10m, cw filter, 260W p.e.p., used little, £300. Trio 2200GX, fitted 11 channels, nicads, helical ant, auto toneburst, charger, dial light, incl homebrew psu, both rigs unmarked, orig packing, £125. Taylor, G4EBT, QTHR. Tel Rotherham (0709) 70021, after 6pm.

Wireless set No 19, less psu, switched coil, ideal renovation or parts, £10. Homebrew transmitters: 80/160 non-working, no drive, a.m./cw, £5; multiband, untested, no mains psu, cw, £5; both valved, buy now. G4HOC, QTHR. Tel 779 3118.

FR101D, built-in spkr, 2m pre-amp, new last October, owner needs cash through ill-health and retirement, under guarantee, £465. RS44128, M. J. Bastow, 14 Milnthorpe Lane, Wakefield, West Yorks WF2 7DE. Tel 0924 252887.

FTDX401 QRO tx/rx, 600Hz filter, £270. G3MHF, QTHR. Tel Eastbourne (0323) 762252.

Collins 651S-1 rx, 12kHz-30MHz, synthesizer tuning in 100Hz steps via flywheel, l.e.d. readout, stability one part in 10^8 per week, exc cond, £950. D. Dall, Bendochy, Ellesmere Road, Weybridge, Surrey. Tel Weybridge 42514.

HW8 QRP cw tx/rx, 80-15m, matching Heath HWA71 mains psu, £95. G3WWJ, QTHR. Tel Cambridge 880101.

FT200, FP200, 10-80m, immac, used as base station only, buyer collects or Securicor extra, £250. G4DAU, QTHR. Tel 0272 852304, evenings and weekends.

Heathkit SB300 amateur bands rx, 3·5-30MHz, ssb, cw, vgc, 'S' meter, atu, spkr, 'phones, manual, £70 ono. Scott, 43 Wordsworth Street, Keswick, Cumbria. Tel 72595, daytime.

RTTY/cw vdu, £175. RTTY/cw keyboard, £175. UT4, £50. ST6, £75. Xtal afsk osc, £10. Fluke 8000A dmm, £50. Tel Hastings 427994.

KDK2015 2m synthesized tx/rx, 15W, full band, 4ch prog scan, repeater up/down shift, toneburst, £170. KP202 case, nicads, charger, helical, 1/4 wave, xtal toneburst r/chs, S0, S20-21, R5-7, £65. G4AEU, QTHR. Tel 0703 772812, evenings; 0703 23458, daytime.

Yaesu FL110 hf linear amp, brand new, guaranteed, designed to be driven by FT7 tx/rx, 130W output from 13V supply, £115. G3KLF. Tel Fareham 236906, weekends or evenings only please.

Yaesu FRDX400, 2m, 4m converters, all filters, fm discriminator, £135. AR88, wkg satisfactorily, but no cabinet, £35. G3FZG, QTHR. Tel Penketh 2403.

FTDX560 tx/rx, 80-10m, good wkg cond, handbook, spare valves, £250 ono. Buyer collects. G4EEP, QTHR. Tel Ash Bank 2904.

TS700, absolutely mint cond, orig packing, manual, mic, £260. VOX unit, £12. Heathkit 1kW oil filled dummy load, £15. GW8IQC, QTHR. Tel Rhiwderin 4708, after 6pm or weekends.

Sommerkamp FLDX500, hf tx, £150 ono. Trio JR310, rx, SP5 spkr, £90 ono. GEC RC600 25W 4ch 2m, boot mount, £35 ono. FSR 1·1 rtty tu, psu, 'scope, £20 ono. *Wanted:* Trio PS500 psu, cond immac, transformer, must be good. G4COU. 66 Firecrest Road, Chelmsford, Essex. Tel 0245 83090.

KW202 rx, £175. Partridge vfa, £17.50. Sig gen af to vaf, £25. SWR/pwr meter, £7.50. All vgc, buyer collects. G4FKH, QTHR. Tel 0245 61082.

Bird Thruline wattmeter, type 43 with 0-1000W element covering 2-30MHz, £75. MMT 144/28 2m transverter, £65. C146A 5ch, 2m fm handheld, charger, whip, helical, case, etc, £70. G3AZI, QTHR. Tel 0772 37815.

Eddystone EC10, manual, battery/mains, £70. 1924 Fullerton xtal set, valves, books, mics, other items, sae for lists. 51 Ernest Drive, Maidstone, Kent. Tel Maidstone 61327.

House for sale on ridge, good vhf take-off, GM no problem on 70MHz, four beds detached, long garage, workshop, good for schools, shops, New Forest etc, £43,000 is preferred value. G3TAL, QTHR. Tel Hythe (Southampton) 848640.

Trio TS180S 100W tx/rx, dfc, extra ssb filter, PS30 psu, £650. Trio TS120S 100W tx/rx, £350. Both tx/rxs only used for few hours, as new cond. Tel Joe, 01-405 5361, office hours.

Speech compressor, l.e.d. Ipswich, full gen, £6. Blower, muffin type, 110V, £5. Two Ferranti 3·25in 0-500 microamp precision jobs, £2 ea. Labgear hi-pass filter, £3. Components: ant/Pye coupler, variable capacitors 1, 2 and 3 gang, tx/rx coils, etc. Stamp list. G5FH, QTHR. Tel 0425 25974.

SSB tx/rx, Atlas 180, 160-20m, 180W, £200. HW8, QRP, 80-15m, calibrator *IRT* manual. *Wanted:* H/B transistor pa, 50W valve pa psu. G4GXU. 6 Spinny Bank, King's Sutton, Banbury, Oxon OX17 3RL.

FT200/psu, £210. Racal RA17, £230. 14AVQ, 80m loading coil, £25. All good order, consider 2m tx/rx, preferably multimode, part exch either way. G3PNM. Tel 0252 48836, evenings.

IC245E 2m multimode, h/b keypad, £285. Pye Compact 70cm fm handheld on SU8, less batts, £40. Pye charger for 12+12 pocketphone nicads, £12. GM8BOV, QTHR. Tel 031-331 2755.

Icom IC700R rx, 10-80m fet front end, usb/lsb cw filter, mains or 12V, spare channels, nice cond, £75 ono. G4BVB. Tel Tavistock (Cornwall) 83289.

SB220, superb linear, £330 ovno. Will deliver within 40 miles. Craw, G3CCX. 117 Sea Lane, Rustington, West Sussex BN16 2RU. Tel 09062 3953, preferably 10am-2pm, weekdays.

Liner 2 with PA3, 4CX250B, £100. Tulip mic, £5. New 6KD6s, £4. 10·7 xtal filters, £4. Pye and Storno manuals, £2 and £5. CC5/s, 4CX250Bs, 6146s, etc, postage extra. GW3EJR, QTHR.

TS820, £575. 211E, £425. 7200G, four simplex, six repeater channels, £140. Lunar 2m linear 2M/10/80P, £90. PS30, £65. T150 dummy load, £15. RM3 remote controller, £65. FS700H swr/pwr meter, £45. YC355D digital freq meter, £75. KP12A speech processor, £30. Heathkit monitorscope, £50. RW100L wattmeter, £30. ZQM2 transistor tester, £15. Rotator 103LBX with indicator, £60. SAE for complete list. All as new—property deceased amateur. G2YS, QTHR. Tel Rickmansworth 76864.

IC240, SS240 Superscan, used little, comp with mobile mounting bracket, £195. Trio 2300, nicads, charger, case, helical, £160. G8PLQ. Tel Alasdair, Truro (0872) 70908.

FT200 80-10m tx/rx, FP200/250 power supply, manual, exc cond and appearance, £215. Mosley trap dipole, TD3Jr 10, 15, 20m, can be extended for 80m, two months old, £26. G4IBG. Tel Hove (0273) 731391.

TS515, £270. KW monitorscope, £60. EZee-Match, £30. Sig-gen SG402, £35. Shure 444, £20. KW lpf, £12. MM transverter 432-144R, £150. Ant PBM18/70, £15. Ant 10XY/2M, £25. Buyer collects. Thompson, G3WQM, QTHR. Tel 0904 793672, after 6pm.

Power transformer 20V/250V, 500V-0-500V, 120MA, two 2V-0-2V, one 4A. 2V-0-2V, 3·5A, one 10V, 1A, secondaries weight 4·5kg, £10. Marconi absorption wavemeter type TF643B, 20-30MHz, £10. Solartron two-beam oscilloscope CT436, up to 6MHz, £50. Raymart band checker, 3·5-28MHz, £3. Valve signal generator 120kHz-28MHz, direct, £10. Self-assembled DL6SW fet converter, 144/28MHz, mains power, £5. Carr extra. G3TYX, QTHR. Tel Southwater 730240.

Hammarlund HQ170 amateur bands rx, 1·8-50MHz, very good wkg cond, manual, some spare valves, £120 ono. *Wanted:* Manuals/circuits for Marconi TF1041C vtvm, CT212 oscillator test No 1, buy or borrow, expenses refunded. G2AZM, QTHR. Tel 021-476 7974.

FRG7 comm rx, as new, unmodified but with Yaesu ssb filter, simple fitting instructions, £150. Collect or arrange carriage. *Wanted:* FT7 or TS120V in good cond. G3AHO. 65 Warlingham Road, Thornton Heath, Croydon, Surrey CR4 7DF.

Yaesu WC2 charger, eliminator, mint, £30. Heath mobile mic, £5. Muirhead type D Vernier drive, £2. G3FBA, QTHR. Tel 095 386486.

HF low-pass filter, £10. Homebrew linear amp, hf PL509, £45. BC221 frequency meter, *Radio Communication* fet conversion, £20. El-key, £25. All ono. G4ANW. 16 Chestnut Drive, Broadstairs, Kent CT10 2LN.

KW2000A, ac psu, mic, handbook, fitted pair new 6146B, good cond, £170. G3CDJ, QTHR. Tel 0604 35508.

KW2000B, exc cond mains psu, circuit, manual, £200. G4CHW. Tel Bath (0225) 316278.

PM2000 power swr meter, mint cond, £38. SP820 matching spkr for TS820, new cond, must be bargain, £28. Ward, G3MZB, QTHR. Tel 0232 56221, ext 36, business hours.

FT7, commercial 160m transverter, exc, £250. FT101E, cw filter, mint, £375. GM3VMB. Tel 047556 712.

Yaesu FT2F tx/rx, 144·30, 144·48, 144·60, 144·80, 145·00, 145·50, 145·525, 145·55, R4, R6-7, orig packing, £75. Standard C146A tx/rx, 145·00, 145·15, 145·50, 145·55, R4, leather case, charger, helical, orig packing, £85. Collect or carriage extra. G8CJM, QTHR. Tel Medway 47280.

FL110 160-10m solid-state linear amplifier, six months old, £100. G4GPX, QTHR. Tel Lancing (Sussex) 3893.

Swan 350 240V ac psu, £225 ono. Collect or pay carriage. Projector stand, mint, £18, cost £40. G3WNM, QTHR. Tel 01-959 4781.

Swan 500 tx/rx, 480W p.e.p., 240V psu, h/b mobile psu, £275. Prefer buyer to test and collect. G5WG, QTHR. Tel 01-504 5499.

CPU2500RK, 5kHz steps, 25W, four memory channels, scanning, keypad mic, £240. New AR20 rotator, £20. G8TAF, QTHR. Tel Romford 40265.

Deceased amateur's equipment, (G3GXO). Heathkit HW100 tx/rx, £110, FRG7 rx, £100. Yaesu FL110 all-band linear amp, £125. Many other items. All ono. Tel 01-890 0276.

Shack clearance incl HW101, no pa valves or pu, £75. 25W modulator valves etc. SAE please for list. G8ATA, QTHR. Tel 04488 513.

RTTY FSY1·1 frequency adaptor, indicator CRT type 3, power unit type 761, £20. Creed 7B for spares, £5. Westrex 80, 0–80V psu, £6. The lot for £29, including free paper and tatty teletype 14TD. G4GCB. Tel Belper (Derbyshire) 6851.

FT227R mobile tx/rx, perfect cond, usual features, scanner, £200 ono. GM8RMM, QTHR. Tel Clynder (0436-83) 693.

IC22A, xtals 11 channels, £115. HAL DKB2010 dual-mode (rtty/morse) k/board, 128k memory, RVD100G video unit, £450. Mustang Mk2, £95. Lafayette field strength meter, £15. Lambda reg psu, 5V, 10·5A, £20. All as new, carriage extra. G3UFU. Tel 0803 312879.

Property of the late G3EGT: Heath DX40U with vfo, £25. FT200, FP200, £235. Heath rx RA1 and spkr, £20. Mosley Elan beam, 15, 10m, £40. Avo model 7, £20. Ashahi power/swr meter, ME11B, £10. Crown mic, MC70, £10. 2m 5-el Yagi, £10. 2m converter (valved), £10. Eagle all band f/s meter, £10. RX BC342N, £15. All items ovno. QTH near Bournemouth. Tel 0202 822977.

TS700G 2m multimode, fitted SD306 pre-amp, £328 ono. Basic roms for Nascom I, tiny basic, £22. Super tiny basic, £32 or £48 for both. All items carriage free. *Wanted:* keying paddle. GW4AEC, QTHR. Tel 0766 2295.

Linear amplifier, 80–10, grounded grid, 3-400Z table top, comp with psu, worked over 100 countries in last year, £160. G3UDR, QTHR. Tel Evesham (0386) 870 052.

Heath SB303 rx, SB401 tx, recent service, £300 the pair inc mic, cables. HO101 monitor scope, £45. Airmec 314 vtvm, £20. RAE course, £20. 1kW dummy load, £15. Miller. Tel Braintree 40263, evenings only after 8pm.

FT221, absolutely new cond, orig packing, handbook, etc, £290. FRG7, mint cond, fine tune etc, £140. *Wanted:* very cheap rx for very junior harmonic. Tel 0793 771153, evenings and weekends.

TS520 hf tx/rx, cw filter, £340 ono. KW204 ssb tx, mic, £135 ono. Prefer buyers collect. G4AGO, QTHR. Tel 0788 811915.

FT200B, FP200, 10–80m, all xtals, 10m, new spare pas, most valves, no mobile use, good cond, manual, £220. G4EOV, QTHR.

KW2000A, comp with ac/dc psus, some spare valves, mic, £180. G3XMQ, NOT QTHR. Tel Glos (0452) 730198.

FR101, FL101, broadcast bands, 25kHz, 6kHz, 2·4kHz, 600Hz filters, fm, provision for all new amateur bands on rx, two aux bands on tx, transverter use only, both front panels stove enamelled and silk screen printed, unique and unmarked, £645 ovno, might split. G8ART, QTHR. Tel Northampton 740633.

FT101B, fan accessories, orig packing, exc cond, used very little, £365. Pair heavy duty Selsyn direction indicators, transformer, 50Hz, £11. *Wanted:* Gen coverage rx, CR100, BC348 Eddystone etc, faulty ok if cond good. G2HCV, QTHR. Tel 01-954 2960 (home), 01-952 7722 ext 200 (work).

FL1 audio filter, £48. MMCs 144/28LO, marine 156/24, £16 ea. 432/28S, £20. All boxed, U450L tx/rx on RB10, £31. SEM pre-amps, £5 ea. MacGregor Jr 4ch fm rx, Bell 47G helicopter, (unflown), £250. G8UUL. Tel Maldon (0621) 773183, after 6pm.

PET 16K, external cassette deck, work books, dust cover, M65 rtty/cw interface, software, QRA, games programs, etc, offers. FTDX401, SP401, mic, £290 ono. TS700S, VFO700S, SP70, £510. EC10, mains/battery, £50. G4CUS, QTHR. Tel Battle 3205.

KW2000B, KW swr meter, mint cond, £220. G3YNC, QTHR. Tel Romford 49175.

BC454, £4. Lafayette labtester 100,000Ω/V, 29 ranges, orig packing, as new, £20. KW2000 xtal for 21·2–21·4MHz, £3. Carr extra. Lists, sae, valves, meters, transformers, components, bargain prices. G2HKU, QTHR. Tel 0795 873100.

Trio 2200G, fitted 145–50, 145·55, R6–7, nicads, case, charger, handbook, etc, £80. Bantex 5/8 whip, boot mount, £10. 2FM70 tripler, £10. G-whip, 160–10, £10. Coward. Tel Portishead (Avon) 849192, evenings, Bristol (0272) 292811, day.

FT75, ac/dc, psu, homebrew vfo, £150. G4FJO, QTHR. Tel 04895 3664.

Sommerkamp FLDX500, FRDX500, tx/rx, 2/4m converters, matching spkr, comp, £325. FDK multi 2000, 2m multimode, £200. IC22A 2m fm tx/rx, four simplex, six rptrs, xtal toneburst, £120. FT202R handheld, charger, nicads, case, helical, £100. G4ISN, QTHR. Tel 0509 67309, evenings.

Valves: 2E26, 6B8G, 6F4, Acorn, CV261, STC, 45150/45, CV6, two caps, 6BS7, DF91, 6111 Sylvania, wires, 5639 Sylvania, wires, Z700U, wires, CV58, 2D21, 6J6, Z803U, 12BL6, 6AM4, 13D3, 13D5, 6D4, 19G6, 5687, CV14, CV2194, STC. G3MBL, QTHR. Tel 01-445 4321.

Linear amplifier, 80–10m, h/b, 450W p.e.p. input, 2XPL509, spare tubes, compact well-built unit, integral psu, aerial c/over relay, fan, works well, £60 ono. KW2000 dc/psu, £20 ono. G4GXM, QTHR (1980 book only). Tel Biggleswade 313137, ext 211, office hours.

Mint Hammerlund HQ215 rx, £200. Mint FDK 800D, £195. TH3 Mk3 beam, £100. SP60 Versatower, two auto brake winches, £275. Heathkit SB200 linear, £200. G3LEZ, QTHR. Tel 0702 230489.

Icom IC701 hf tx/rx, power supply, Icom ICRM3, remote controller, MM 432MHz converter, i.f. 144–146, MM 1,296MHz converter, i.f. 144–146, *Radio Communication*, 1977-79, offers. Barrow. Tel Sale (061 969) 9339, after 4.30pm.

Manufacturer's surplus test equipment: five Airmec modulation meters, model 409, 3–600MHz, £45 each. Two Taylor If bfos, model 191A, £15 each. Five BSR If bfos, model LO50, £10 each. Five Racal If digital frequency meters, SA520, £12 each. Some of these items will need attention. G5WG, QTHR. Tel 01-504 5499.

Trio 9R59DS communications rx, 0·5–30MHz, MM 2m converter, Telford TC9 a.m. fm tx, 10W vfo, controlled 144–146MHz, vhf wavemeter, swl antenna, calibrator, 2m dipole etc, the lot £120. Tel Hugh, Malvern 63270, after 9pm.

QTH to rent. Idyllic weekend retreat, furnished bungalow, 2/3 bedrooms, on Berkshire Downs, by car Newbury, M4, 20mins, Oxford, 40mins, exc site, Versatower, hf/vhf/uhf antennas, owner going abroad August for two years, reasonable terms negotiated. Tel Chaddleworth (04882) 446, evenings.

TS120S hf tx/rx, PS30 pwr supply, AT120 ant tuner, YK88C xtal cw filter, MC355, immac cond, £460. Genuine reason for sale. New 12AVQ vert ant, £26, plus 25m coaxial free. Tel Arthur, 0342 (Sussex) 823016, after 8pm.

Marconi signal generator, 500kHz–30MHz, a.m./fm dev level meter built in, very heavy, £30. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

Trio TS700S digital readout, all mode, as new, comp with mains/batt, leads, mic, handbook, workshop manual, in orig packing, £380 cash. G6XM, QTHR. Tel Swindon 762540.

GEC Lancon walkie-talkie, xtals for 70·26MHz, nicad, reprint handbook, £25 each, pair for £45. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

Trio TS510, PS510, in good cond, recently revalved, comp with VFO5D ext vfo, still in orig box, unused, £240 ono. Jaybeam UGP/2M 2m ground plane, unused, £5. G4IDL, QTHR. Tel Rotherham (0709) 874100.

Trio 2200G xtals, charger, nicads, orig packing, handbook. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

TS700, MM pre-amp, auto toneburst, orig packing, handbook, £260. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

Microwave Modules MMT144/28 transverter, £60. Trio 50/28 converter, dual range, suit JR599, £8. G8AYY, QTHR.

FDK multi U11, xtals, four simplex, RB2-4, RB6, RB10, RB14, orig packing, handbook, £179. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

33 *Wireless World*s, between April 1939 and Sept 1942, 52 *Electronic Engineering*, between July 1941 and Dec 1946, 48 *Short Wave Magazines*, 1964-67 comp, offers. G8MY, QTHR. Tel Farnborough (Hants) (0252) 511086.

Antennas: 18-el Parabeam, 70cm, £15. Jaybeam, portable 20ft mast, £10. 5-el, £8. SMC 40ft push-up telescopic mast, £25. Ringo Ranger, £15. 6-el quad, new, £20. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

Uniden 20-30, rpt R3–7, S19–24, comp with mic, handbook, mobile mountings, £100. Buyer to collect. Pye Bantam, R4–6, S23, needs tone access, comp with ac power supply, £30 ono. Buyer collects. G3NWP, QTHR. Tel Glossop 61046.

Trio VB2200 pa, 1W in, 10W out, rx pre-amp fitted, mobile mount incl, designed for Trio TR2200G, £30. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

FT101B cw filter, SP101, £350. FV101B, £75. YO100, £95. Europa B 2m transverter, £70. 6-el 2m quad, £15. UHF 10W base stn, £45. Two AM10D Cambridge low band, £20 pair. All carriage extra. GW4HAT, 68 Pastoral Way, Tycoch, Swansea SA2 9LY.

Antenna, rotator type AR40, Bell type, £25. Carriage at cost. G8BIR, QTHR Bristol. Tel 774048, day; 510699, evening.

75Ω Electrosil dummy load resistor, £3. KW antenna sw, £5.50. G4CJY, QTHR. Tel 0494 30018.

KW2000B driving Europa B 2m transverter, 2m 6-el quad, rotator, handbooks, etc, buyer checks and collects, £300. G3TSO, NOT QTHR. Tel Malmesbury (Wilts) 3353.

Hy-Gain TH3 Mk3 tri-band antenna, BN86 balun. Buyer collect, dismantled to 12ft lengths, £65. G5WP, QTHR. Tel 04866 2826.

FRG7000 rx, exc cond, no mods, £250 ono. Carriage paid. P. Bishop, 73 Holcombe Green, Upper Weston, Bath, Avon.

IC155E, Icom new 25W fm mobile scanning rig, digital readout, two months old, unmarked cond, boxed, all accessories, manual, etc, going multimode, £215. G8CCI, QTHR. Tel Oxford (0865) 880229, evenings or weekends.

AR88LF rx, 73–550kHz, 1·48–30·5MHz, handbook, £20. Heathkit DX40U tx with VF1U vfo, 75W cw, 60W phone, worked full DXCC, handbooks, £50. Prefer buyer collect but delivery possible. G3OLU, QTHR Braintree, Essex. Tel 0376 23429.

1978 *DX/USA callbooks,* each plus three supplements, effectively '79 book, £5·50 ea. ***PCB ARRL Handbook,*** 1976/80, split band speech processor, reprint if required, £3.50. MC1595 for same, £3. ***Radio Communication*** design braid break highpass tvi filter, £1 ea. G3IZJ, QTHR. Tel 0252 48561.

Plessey type 70 solid-state tdms rx in exc cond, recently recalibrated by Plessey, £75. Collins 250kHz usb, 455kHz usb miniature mechanical filters, £12.50. *Wanted:* Electrac 315A diversity locked phase demodulator chassis. Fletcher, 62 Moorbridge Lane, Stapleford, Nottingham. Tel 0602 397446.

FT207R, days old, never used, all accessories, still in box, offers? FT221RD, used but good cond, manual, all accessories, no mods, £300. Could deliver depending on distance. GM4HJQ. Tel 031-552 6785, Sunday–Thursday evenings.

Radio control aircraft, Irvine engine, new, ready to fly. Fuitaba four channel fm radio, six channel rx, nicads, four servos, charger, sell, or swop for 2m ssb or fm equipment. 2 Winston Close, Boyatt Wood, Eastleigh, Hants. Tel Eastleigh 618787.

FT101E with spkr SP101, latest model, hardly used, absolutely mint, £450. G4GCL, QTHR. Tel 0924 402257.

EC10 Mk1, good cond, £55, or P/EX IC215. *Wanted:* 2m fm handy one requiring attention pref. G8ADT, QTHR. Tel High Wycombe 20639.

SEM 2m Europa C transverter, £80. MM 2m converter, 10m i.f., l.o., output, £15. MM 2m converter, 4–6MHz i.f., £14. Bellsonic psu, 13·8V, 3A cont, 5A peak, £15. Codar PR40 preselector, 1·5–35MHz, £8. All items very good cond, carriage/postage extra. G4IDO, QTHR. Tel Hitchin 730550.

FT221 2m tx/rx, £275. FT200 hf tx/rx, FP200 psu, £250. IC215 2m fm portable rig, £125. Eagle rf sig gen, 120kHz–500MHz, £35. G8IRJ. Tel Steyning (0903) 814089.

Pair GEC Couriers, three channel, handheld, highband a.m. cases, nicads, telescopics, helicals, charger, a few spares, £60 ono. G8NPZ, NOT QTHR. Tel Pete, Reading 81087.

Storno CQF13/330, 10W 2m base station, xtalled S23, £35. Microwave Modules, MMC 28/144 2–10m rx converter, as new, boxed, £15. Heathkit HW30, 2m a.m. tx, £5. G8NVY, QTHR. Tel Walsall 21530.

TR7500 2m synthesized fm tx/rx, mint cond, in orig packing, mic, desk stand, power lead, £180. G3UKM, NOT QTHR. 23 Jubilee Way, St Anne's, Lytham St Anne's, Lancs FY8 3TS. Tel Blackpool 711536.

Icom IC701 hf tx/rx, IC701PS power supply, 1·8–30MHz, superb performance, recently checked by agents, only one year old, absolutely mint cond, the Rolls-Royce of amateur radio, sale breaks my heart but house move forces hf QRT, used only 5½ hours, offers. G4FRX, NOT QTHR. Tel 01-794 9411.

Lowe SRX30, one month old, £140. Owner wants to purchase a tx/rx, new G4. Tel Tunbridge Wells 25983, weekends.

Xtals: R3, R5–7, S8, S20–23, all 8MHz tx, 44MHz rx, suit Pye Cambridge etc, £3 per pair. Liner 2, £45. G4ETH, QTHR. Tel Worcester 840409.

FRDX500, FLDX400, fan fitted, topband tx converter, £300. Buyer collects, Midlands. *Wanted:* Manual for JR599 rx. G4BPY, QTHR. Tel Cheslyn Hay 413193.

7500 Trio mobile tx/rx, as new, orig packing, £185. Datong rf clipper, £20. G3MSW. Tel Harrogate (0423) 879202.

FRG7, comm rx, fine tune, narrow filter, 2m converter fitted; sorry to see it go but G4 beckons, £120. G8TEC. Tel Southampton 766547.

Codar RQ10 multiplier, £8. Type D wavemeter, mains, £5. Headphones, £1. Homebrew converter, 2m, 6·3V stabilized supply, two, £4. FDK Palmsizer, handheld, charger, mic, battery pack, £135, aovno. Collect. Carriage extra. G8SBU, QTHR. Tel Fareham 232799, after 6pm, weekend.

Latest model IC255E, unused, new winch 1200lb, ditto 800lb, new turn buckles, nylon rope etc; also heavy gauge alloy 2in tubes, 5/8 whip, box containing meters, dials, valves, mics, irons, relays, plugs, etc. Details, offers. Tel Barry 741520.

Yaesu FT207R, £166. PSU/fast charger, £29. Spkr/mic, £11. Spare nicad, £13. Search 10 2m fm rx, £39. Brainbank language translator, English, French, German modules, £130. Modules, £12. All new, boxed, unwanted presents. G4BKM, QTHR. Tel Denham (0895) 834358.

Surplus new valves: boxed, 6LQ6 rect 83, 6AT6, 6AU6, VR150, 6CH6, 6AQ5, 6AL5, 6AJ8, EF183, 6AM6, ECC83, total number 15, old types: 6SL7GT, 6C5, 6J5, VR54, ARTH 2, etc, total number 36, offers, the lot. G3FK, QTHR. Tel 07257 436.

Morse keys: choice of three: ex-German aircraft, £12. Marconi marine type 365A, £20. Classic GPO key, hand-made brass on heavy ebonite and mahogany base, send/receive switch, an antique to treasure and use, £25. G5CS, QTHR. Tel 01-398 1582.

Kyokuto 10SXR11 tx, synthesized, full 2m coverage, £170 ono. Tel 0290 22343.

Regency K100 touch scanning rx, covers 30MHz, 51MHz, 143MHz, 174MHz, 372MHz, 512MHz, two months old, unwanted gift, £150 ono. Tel 0290 22343.

Pye Vanguard AM25B, unmodified, £45. B41RX, £15. Marconi TF144G signal generator, £20. Racal frequency counter, faulty, offers? Presettable mains stabilizer, 115–230V, 8A, £10. 40W transistor amplifier, integral psu, £8. Cowlgill motor, £15. 18in 625 line video monitor, £25. Miniature coaxial relay, 12V50R, £4. Tested 2K25 klystrons, £3. WG mount £6. Hivoltage transmitter, variable capacitor, £3. Avo 8 Mk2, mostly ok, £22. Xtals 6,430, 7,042, 7,045, 7,139, 8,050, 8,089kHz, all 10XJ, 50p each. G3OAD, Beggars Roost, Painswick, Glos. Tel 0452 812109.

FT200, FP200, tx/rx, 80–10m, all 10m, good cond, manual, buyer collects, £230. G4HHI, QTHR. Tel 0325 52739.

Pye fm Bantam, nicads, case, antenna, mic, vgc, working on hb/dem channel, £60. Six new marine band xtals for above, £20. GU3HKV, QTHR. Tel 0481 47278, 6/7pm.

HF5 80–10m vertical, used twice, £25. 10XY/2M, polarization switching unit, £30. PEP/RMS swr meter, 1kW Z-Match, £40. BC348 rx, £12.50. HRO, needs attention, £10. 2m tx, a.m./fm/cw, offers. G3ZUM. Tel Long Sutton (Hants) 298, or 021-747 5077, after 12.7.80.

Microwave Modules 2m converter, 144/28 lo, £10. Shinwa 2m bandpass filter, 20W max, £5. Homebrew 2m linear amp, 1W in, 10W out, £10. Lunar 2m low noise pre-amp, both rf switched. G8RWG, QTHR. Tel Camberley (Surrey) (0276) 32195.

FPM Mk2 Hallicrafters tx/rx, ac/dc, 10–80m, ssb, cw, 125W p.e.p. o/p, nice rig for getting going, solid-state to pa, built-in ls, mobile mount, side tone semi-break-in, £275 ono. G4HZF, QTHR. Tel 0472 71215.

FT200, FP200, no mods, very good rig, buyer collects, £225 ono. G3POJ, QTHR. Tel Nottingham 273601.

TH3Jnr, vgc, £75. Datong FL1 filter, vgc, £50. FDK 700E, vgc, £170. Several mains transformers, chokes, suitable linears, Goodmans Module 90 tuner amp, 45W, £75. Pair Wharfdale Melton spkrs, vgc, £70. G3UCE, QTHR. Tel Heysham (Lancs) 51760, evenings.

RTTY Creed 7E teleprinter, BARTG terminal unit, £50 ono. Europa B 2m transverter, hf antenna changeover relay fitted, £50. GW4HDR, QTHR. Tel Rhyl (0745) 31980.

Eddystone 990R rx, 27–240MHz a.m., fm, manual, vgc, £425 ono. Yaesu FT7B tx/rx, 100W 80–100m, as new, £390. AR88D rx, £55. Mirage B108 2m linear, 80W out, fm, ssb, new, £90. Standard C828 2m fm tx/rx, 12ch, £135. MM144/28 converter, £15. Pair PFI pocketphones, £20. G4AFY, QTHR. Tel Kidderminster 63358.

STE Milan AR10 rx, 28–30MHz, AA1 audio amplifier, AD4 fm, discriminator modules, £25. AT23 2m fm 3W tx module, some xtals, needs attention, £25. G8RWG, QTHR. Tel Camberley (Surrey) (0276) 32195.

Trio TR2200G, S0, S20–24, 145·8, R5, R6, nicads, charger, toneburst, manual, immac cond, £110. G4EHZ, 16 Sussex Road, Worthing, Sussex. Tel 0903 39612, after 6pm.

FT7 hf tx/rx, FP12, 12A, psu, exc cond, £250. G3ZZR, QTHR. Tel Witney (0993) 3792.

Yaesu FT101, good cond, 160m, all 10m, 350Hz, 8pl, cw filter fan, mic, manual, connections, spare, unused, 6JS6Cs, £295. Buyer collects or carr extra. J. J. Pascoe, G4ELZ, 56 Bushmead Avenue, Newton Abbot, Kingskerswell, Devon TQ12 5EP. Tel Kingskerswell 2583, after 6pm.

Printer by Transtel, 45·45 and 50 baud, xtal for 75 (will run to 300 baud) solid-state, needle matrix print head, 20 character programmable id, full keyboard, workshop manual, paper, ribbons, £450, delivered. G4EJA, QTHR. Tel 051-424 7280.

Icom IC240, 22 channels, 19 programmed, auto toneburst, exc cond, orig packing, £150 ono, or will swop for Icom IC202 in good cond. G8PPM. Tel Chris, Worthing (0903) 38309, evenings and weekends, Croydon (01-760) 7182, weekdays.

Spacious three bedroom s/d house, gas c/htg, close all amenities, some double glazing, garage, carport, shed, greenhouse, 80m dipole, TH3Jr, at 12m, HW101, power supply, cw filter, £32,500. HW101 only, £180. G4DXI, QTHR. Tel Sittingbourne 25364.

TS120S, fitted YK88 filter, rarely used, seven months old, Shure controlled magnetic mic, orig packing, positively as new, £360. VFO120, unused, £65. Trio mic, £6. Shure 201 mic, £5. Vibroplex key, £22. GW3JUV, QTHR. Tel 0656 3875.

AR88D, unmodified, vgc, recently realigned, offers invited around £50. Tel Watford 20593.

FT101E, as new, £450. Yaesu hf comp stn, FLDX400 80–10m tx, FRSDX400, 160–2m rx, matching spkr unit, FL2000B linear, Shure 444 mic, leads, manuals incl, £490. Prefer buyers inspect/collect. GM4DPC, QTHR. Tel Boarhills 210.

18 AVT/WB vertical 10–80m, manual, £35, delivered. DFM (G8CZW type), Hi-Z buffer, components, pcb for prescaler, £40, delivered. ICL 7181 vdu, 2,000 character screen, keyboard, printer interface, manual, offers or swop commercial linear. G4EJA, QTHR. Tel 051-424 7280.

IC201, mint cond, base station, no mods, removable built-in power supply for mobile use, hardly used, £250 ono. Can arrange delivery. G4ILR, QTHR. Tel Pymore 341.

Pye Bantam S20, R5, R7, 2W rf o/p, 12V p/s, h/b, £55. Pye Cambridge, xtals S20, S21, S23, R4, R5, R7, £17. Set of pcbs for WW 2m synthesized tx/rx, 1MHz xtal thumbwheel switches, 4059, £15. UHF linear amp for conversion to 70cm, uses two QQV03-20A silver plated tuning lines, £10. New Eimac 8560A for ARRL 70cm linear, £20. Pair of ex-equip SK610 bases, £6. STC conduction cooled 4CX250 type valves, as *VHF/UHF Handbook*, £5. New QQV03-20A, base, £2. Gun diodes, CV7147, IN78AR, four CS3B, two IN78R, £8. 20in colour tv, new, unused, 90° regunned tube, in case, all coils, Magic Line type chassis, ideal colour monitor, £35. WW Matrix H-quad decoder, pcbs incl Sansui QS ics, £20. Leak point 1 valve hi-fi amp, for collector? Offers, or w.h.y.? G8NTH, QTHR. Tel Woking (04867) 80955, evenings.

HBR Electronics TD224, rtty solid-state vdu, set of two pcbs, built, wkg, £65. GM3WIL. Tel Prestwick 79217.

Heathkit HW101 tx/rx, fitted SBA301-2 cw filter, matching SB600 spkr, housing HP23A psu, Heath HDP21A desk mic, all unmarked cond, few spare valves, all manuals, complete station, £200 cash. G3TYJ, QTHR (1980 callbook). Tel Frome (0373) 4694.

Liner 2 2m ssb tx/rx, fitted pre-amp, matching psu, mobile bracket etc, good cond, £100. Carriage extra. Prefer buyer to inspect and collect. J. W. Henderson, GM4HKW, 53 Dumyat Drive, Falkirk. Tel 0324 25559.

TH3Jr tri-band beam, £75. VGC MD35CB mic headset for mobile wkg, £12. MBM 48/70, £16. Q4/2M quad, £10. G3JGC, QTHR. Tel Poole 81215.

Collector's item, HMV DSR1 tape recorder, 1960, three motors, two amps, orig mint cond, unused 19 years, all servicing data, buyer to collect, 33lb, £49. 6 Trinity Close, Swindon, Wilts SN3 2ED. Tel 0793 46266.

Radio Communication Handbook, fifth edition, Vol 2, duplicate copy, unwanted birthday gift, unopened, £6, post free. GM4IHW, QTHR. Tel 047 92941.

IC202, professionally modified for multimode transmission, a.m., fm, ssb, cw, break-in, xtals for 144·0-144·4 and 145·4-145·8, fast charge nicads available, £120. G8IHP, QTHR. Tel 0742 57229, daytime.

MK14 program for cw contests (messages and serial numbers), listing and explanation, £1.50. G3RWL, QTHR.

Scope, Tech T0-3, 1·5MHz, 75mm tube, nice, compact, £40, or offers. G4BZL, QTHR. Tel 0532 582958.

Collins R388/UUR gen cov rx, 30 1MHz bands, ex cond, handbook, £200. EDL144 2m linear, £100. KW107 atu, £95. Peto Scott monitor, £35. Heath SB610 monitor scope, £40. Robot 400 sstv converter, hardly used, £475. Venus SS2 monitor, £90. Ness camera, £45. Yaesu YO100 monitor scope, £85. Elf 2 computer, £200. EL40X 80-40 dipole, unused, £30. TH3Jr beam, £85. Versatower P40, motor, £230. Kenpro rotator, £80. 8XY 2m beam, £15. 10-el 2m Parabeam, £18. 10-el 70cm Parabeam, £15. 70cm colinear, £30. Star ASC11 keyboard, options, £35. MM 70cm converter, £10. SEM 2m auto pre-amp, £10. All ono. Tel Downland (near Croydon) 55908.

FT221R/D, new YC221, LA106 100W linear, all vgc, £500. MMT432/144S, £130. Trio R300, £100. 250MHz DFM, £35. Shure 444, £15. Redifon GR336 Mk2, £13. 2N6084, new, £8. Creed 7B, £10. A510 rx, £5. 88 set, £11. B44, £10. G8NQP, QTHR.

Uniden 2020 hf tx/rx, 80-10m, 100W, p.e.p. cw filter, comp, mic, dc power lead, instruction book, workshop manual, £300. MCS rtty terminal unit, solid-state, £25. D108 Asta mic, £10. Tel 0480 53775.

FT901D, mint cond, used only one month on tx, £675 ono, must be seen. G4JQI, ex-G8MPZ, QTHR.

Tektronik oscillator, 585A, 82 plug-in 82MHz, will trigger over 110MHz, calibrated by Plessey, new cond, cost £750, accept £375. FT200 tx/rx, FP200, exc cond, £220. Mosley trap dipole, TD3JR, 10, 15, 20m, £25. G4IBG. Tel 0273 731391.

Icom IC215 2m fm portable, R0-R9, S20-S23, cond as new, orig packing, £130. Jaybeam 6-el quad, weatherproofed, good cond, orig packing, £18. Jaybeam 5-el Yagi, used indoors only, orig packing, £6. G8PNX, QTHR. Tel Sheffield (0742) 745850.

Icom IC245E fm/ssb, £300. ICRM3 up controller for IC245E, IC211E, IC701, £80. Bearcat 220FB scanner, £225. All as new, hardly used, boxed. G8MXE. Tel Holsworthy (0409) 253550, office hours.

Liner 2, good cond, £95. Prefer buyer collects. G8LCD, 8 Stafford Road, Ruislip Gardens, Middx. Tel Ruislip 37590.

2m 4-el quad, weather-proofed, £14. MM 2m converter, as new, £15. 8-track stereo tape cartridge player, £10. WW xtal controlled fm tuner, £7. Shack clearance, sae list. *Wanted:* Pre-1900 clocks, pocket watches. G3ZIJ, QTHR. Tel 0632 403706.

Trio TR7500 80ch, 2m, mobile tx/rx, Hustler 5/8 whip, boot mount, £190. G3VMM, QTHR. Tel 045 385 2888.

IC215, portable 3W tx/rx, channels R0-R9, S20-S23, REV RO nicads, case, helical, whip, carrying strap, handbook, orig packing, good cond, exc performance, £150 ono. G8NXE, QTHR. Tel Lichfield 22742, after 6pm.

FT101B, little used, TA33Jnr, rotator, swr meter, £430 ono. G3ZCE, QTHR. Tel 0253 885767.

QTH for quick sale, (moving north), planning permission granted for 35ft mast, 28ft erected, exc hf site, antenna for 1·8, 7-28MHz, backs onto park, very nice semi, sympathetic neighbours. G4GMZ, QTHR Greenford, Middx. Tel 01-575 1839.

FT101ZD, fan, mint, £495. IC260E, hardly used, £295. FT207R, NC 1A, charger, spare nicad, £190. Araki 285D 2m 2-el colinear, £25. M65 pet interface, cassette, £20. Shack clearance components, cables, etc, by appointment. All carr extra. G4BGE, QTHR. Tel Bracknell 21502, after 6pm.

TR2300, charger, nicads, helical ant, exc cond, manual, orig packing, £155 ovno. Buyer to inspect or arrange collection. G4BVY, QTHR. Tel Malvern (06845) 62900, evenings.

Drake "C" line, T4XC tx, R4C rx, MS4 spkr, AC4 power supply, TV3300 low pass filter, as new cond, £650. Delivery arranged. G3VMM, QTHR. Tel 045-385 2888.

FT101E, as new, orig packing, manual, £395. FM144 10SXR2 Kyokuto scanner, tone, digital, Rolls Royce, £160. Telescopic mast, 40ft, P40, £180. Hy-Gain dipole TH3Jr, boxed, £86. G4IJS, QTHR. Tel Flitwick 05257 4343.

FT101E, very little used, £425. Datong FL1 filter, £45. Tech Ass speech compressor, £15. Regency HR2A tx/rx, 15W, six channels, £75. Europa B, plugs into FT101, £75. Large Morganite 80Ω dummy load, £5. All ono. Carriage extra. G3IDW. Tel Swindon 822055.

FT250, FT200, ac psu, YD844 deluxe desk mic, all xtals, good pa tubes, could deliver 100 miles, £200. MMT144/28 transverter, £60 plus carr. GM8DMZ, QTHR. Tel Patna 225.

IC245, six months old, immac, £340. FT207R, five months old, base charger, carrying case, £220. ZVC board, 10·7MHz, £70. Pye Europa rx, £25. Two SP25 Mk4 decks, G800 cartridges, £25 each. Tuac 100W amp, £25. G8OQN. Tel John, 0705 750600.

Icom IC240, in orig packing, 18 months old, comp with 80-channel switch box, £135 ono. G8PSY, QTHR. Tel Hatfield 65182.

CR100, hdbk, meter, £25. Avo 9MK3, leather case, £65. Marconi TF801A 10-470MHz, £20. 813, used, £3. VCR517B, £5. Professional tape recorder, three-head, ppms, balanced mic in xcrs, etc, £165. All ono. Moss, 37 Knollmead, Surbiton, Surrey. Tel 01-337 7309.

IC201 2m multimode, inc mains psu, rx, preamp, used but good, £250. SRX30 g/c hf rx, mint, £150. KP202 2m handheld, nicads, hod charger, BNC flex ant, £85. MM144/28 transverter, mint, £80. *Wanted:* MMT432/28. G8PJL, QTHR. Tel 049 17426.

Drake R4B rx, amateur bands, 10 extra xtals, ssb, cw, rtty, variable pass-band, notch control, S-meter, instruction manual, vgc, £170 ono. GM4HKW, QTHR. Tel Falkirk (0324) 25559.

FT101B. low mileage, one owner, latest 250 cycle filter, best offer over £325. Wavemeter type 101, internal 230V power supply, 370-600MHz, large HRO type dial, chart, plugs, offers. G3RUG, QTHR. Tel 061-483 2188, work, 061-439 7183, home.

MMV1296 tripler, £22. MMC 1,296/144 converter, oscillator o/p skt, £20. Green CTR70 432MHz varactor tripler, 18W o/p, £14. G8AYY, QTHR.

Eddystone 880 high stability communications rx, 0·4-30·6MHz, in 30 1MHz bands, two xtal filters, good cond, manual, £190. ICL vdu, 7181/4, detachable 85 key keyboard, manual, £50. Redifon RFN90 transistorized teleprinter, terminal, circuit, £25. Ex BBC Ferrograph mono tape recorder, 7·5, 3·75 in/s, circuit, £30. BBC vhf rx, single channel, high band, 240V ac, manual, £15. G8JDE, QTHR. Tel Sambrook (Shropshire) 375.

Property of the late G3PSX: FTDX401, 560W p.e.p., £250. KW101 meter, £15. Apply in first instance to G4GDM, QTHR. Tel 051-645 1201, day, 051-334 1819, after 6pm.

Versatower P60, fitted autobrake winches, Gem quad fed RG8U, TR44 rotator, ac power supply, indicator, demonstrated, bargain, £300. Various units, meters, new components, spares, emergency disposal, emigrating. View/collect. G2CDN, 13 Wood Lane, Isleworth, Middlesex.

TR2200GX 12-channel, charger, nicads, etc, 20W pa/pre-amp, £125. JR310 hb rx, 160m, narrow filter, fm detector, £100. G8DYK, NOT QTHR. Tel Keighley (0535) 45182.

Trio 2200GX, 11 xtalled channels, all usual accessories incl mobile mount, charger, nicads, power leads, etc, only used for short period, owner went ssb only, £115 or sensible offer. Will exch for ssb 2m rig. G8NWM, QTHR. Tel Bourne (Lincolnshire) (07787) 306.

TS520S, mint cond, orig packing, VFO520 dc-dc converter, ext spkr, £540. Yaesu FRG7, mint cond, £160. Plus carr. Available mid-July. Hughes, GW6WIC, 5 Maesffynnon, Llanddulas, Clwyd, N Wales. Tel Llanddulas 636.

Double gun scope tube, new, £7. Part-built hb scope £8. 145MHz fm valve tx, spare 3-20A, £12, 10GHz WG16:- load, £2. 2K25, in mount, £4. Micrometer, tuned Klystron, £4. 70MHz xtal, 3-20B, DET29, £1 each. G8CUB, QTHR. Tel Brentwood 214406.

FT101E, SP101, G3LLLs fm adaptor, Shure 444 mic, all in good cond, £450. G4DBX, QTHR. Tel 0270 581657.

Pye Cambridge AM10D, modified fm, fitted S0, S20, S22, S24, R6–7, R6 inpt, t/b, £45. Eddystone 670A marine gc rx, £40. Pair 35Ω Fane tweeters, 3Ω 8in spkrs, £6. R1132, less pp, £8. Buyer collects. G4ESO, QTHR. Tel Formby 75220.

Icom IC21XT, 20W, £90. B40, spare valves, £20 ono. Eddystone EB35, offers? G3UKE, QTHR. Tel 0279 814889.

FTDX560, comp with FV400S external vfo, new pas, a really powerful hf tx/rx, 560W input, no pa required, £250 ono. Trio QR666 communication rx, 200kHz to 30MHz, £75 ono. *Wanted:* VFO30G to suit Tric 7200G. Tel Shoreham (Sussex) 3706.

Westrex ASR33 teletype, UCC6, traction feed, comp, but untested, £90 ono. G4DBX, QTHR. Tel 0270 581657.

WANTED

Any *QST* and *CQ* mags. Collins 75A and 32V series rx and tx, 455kHz, 2·1kHz mechanical filter. Dow aerial relay. D104 astatic mic. *For Sale:* HXL1 1500W p.e.p. Call/del, many areas possible. GW3MHW, Bontnewydd, Aberystwyth. Tel 097 421 608.

Oscilloscope, 10MHz bandwidth or better, details and price please. G2DAF, QTHR. Tel 0772 719150.

Help to fix tx fault on FTDX401, prevents operation 80m and 10m, otherwise will sell, £200. G4HRN NOT QTHR. Tel 0454 316733, Bristol area.

B/S coil packs for 10m, 15m, 20m, for HRO. H. Stables, 1 The Meads, Letchworth, Herts.

Droitwich rx pll, Advance model or similar. Class "B" frequency reference rx, any make. Four xtal oven single or double xtal holder, small size preferred. G4IZW. Tel Ken, 0632 678828, anytime.

Junk Q5'R for coils. Design engineers ttl data books. 898 dial or similar. Thorn 3000/3500 power panel. 6CL6, 6146, 807. Grundig Stenerette 'R' and Pye Reporter (valve type), circuits. Switch with 30 positions. 45 Chanel Road, Artane, Dublin 5.

RF 24 unit, preferably working but not essential, would consider any other converter for 15–10m. R. B Williams. 54 Woodlands Avenue, Talgarth, Brecon, Powys LD3 0AT.

Cowl-gill motors, will collect within reasonable distance, 2m crossed dipoles. Early radio gear, bright emitter rxs, horn speakers, xtal rxs. *For sale:* Icom IC260E 2m multimode, new, £335. Apologies to those readers who telephoned regarding price; it was my mistake. G3AYA, QTHR. Tel Ware 870010.

For the Wireless Museum: old radios, amplifiers, spkrs, testgear, valve testers, books, catalogues, magazines, QSL cards. Collection arranged. Details please to hon curator, G3KPO, QTHR. Tel Shanklin 2586.

FV201 remote vfo for FT201. G3DYY, QTHR. Tel 0487 841558, after 6pm.

Students to take part in correspondence course for RAE. SAE to G8SEQ, 14 Hollow Crescent, Coventry CV6 1NT.

Cheap 2m black box tx/rx for school station, anything considered. G8SEO, QTHR.

RAE secondhand correspondence course, reasonable price paid. G. Tyler. 41 Park Crescent, St George, Bristol. Tel 555476.

Suitcase type tx/rx, especially: Mk119, Mk122, Mk128A/B, Mk217, BP5/T5, AR11, A3, B2 (3 Mk2), B2 minor (A Mk3), A510. 117L7 valves. Any manuals or literature, incomplete or damaged items welcome. Letters only please. Taylor. G3UCT. c/o 31 Willow Walk, Culverstone, Gravesend, Kent.

Standard vfo CV110, mic, plug for C828M, KW107 Supermatch. Reid, 62 Elizabeth Avenue, St Brelade, Jersey.

Complete hf amateur station, must be in first class cond, satisfy full GPO requirements, cash payment in full to successful vendor in Middx, Bucks, Berks, Surrey, Hants, Sussex, Oxon, where collection will be made. G3JJH, QTHR.

Old-time QSL cards used before 1930 are needed for research by Britain's only serious QSL historian and collector. Please send cards or initial letter to G3BDQ, Whitefriars, Friars Hill, Guestling, Hastings, East Sussex. Tel Pett 2262.

Mobile mount for Trio 2200GX. G8RHB, QTHR. Tel Uxbridge 30674, evenings 6–7pm.

Eddystone 730/4, good price paid for good cond. G4HSB, QTHR. Tel Peter, 0642 86608, evenings.

Urgently needed: manual for Eddystone S750 rx to buy or hire for short period to photo-copy. Failing this circuit diagram only would help. G3MI. 32 Germain Street, Chesham, Bucks.

Ex-RAF Signals, please do not throw away any pre-1948 instruction books, manuals, personal notebooks, logbooks, photographs, anything with RAF radio schools, E&WS, signals units, airborne or ground, I'll beg, borrow or buy for historical study. G4DEW, QTHR. Tel 0604 491703.

Information on transformer No R824917, used in 24V inverter, using two OC28, one each end of flat case approx 12in × 5in × 2in or would purchase comp unit. G3YNN, QTHR (1979). Sussex.

Suitcase radios. American researcher purchases military radios built inside civilian style suitcases or other clandestine radios, any style or condition, wkg or otherwise, complete or incomplete. Send phone number in letter. Melton, Box 2037, Ogden, Utah, 84404, USA.

Trio SP10 spkr for JR310 Trio VFO5S for TS515. Stobbs, 78 Hershall Drive, Middlesbrough, Cleveland. Tel 0642 246689, daytime, 0642 211685, evenings.

Photostat copy of *QST,* December '71, article by Lowe titled "A 15-watt output solid-state linear amplifier for 3·5–30MHz". Will remit copying and postage costs. G4ETJ, QTHR.

AR22 rotator or control box. Electroniques coil pack GC166. Tel 061-792 1959.

G3JIX is looking for KW2000, FT200 or other tx/rx with psus, reasonable price for youth group stn in Thanet. Also, any old wireless/electrical equipment for museum and lecture demonstration collection. G3JIX, QTHR. Tel Ash 812 723.

Manuals for: AR88D rx; Eddystone EA12 rx; BC221 freq meter; Mallory or similar paper cond 65μF, 40V ac 0·75 by 2·5in. G3GYW, NOT QTHR. 0702 528112.

Sommerkamp FP250 ac psu, AR88, sstv monitor or parts, *Radio Communication* back issues. G8TFE. Tel Oxted 4888.

Heathkit HW32A 20m tx/rx, HP23A or h/b psu, please state price and cond. G4ANW, 16 Chestnut Drive, Broadstairs, Kent CT10 2LN.

TR4C dc psu. *For Sale:* Cmos el-bug with paddle, £8. Smith, 12 Curtis Road, Alton, Hants. Tel 0420 84499.

Circuit/information on Recordacall telephone answering m/c, Baird Bantam. G3SMK, QTHR. Tel Earlswood (Warks) 3423, after 7·30pm (reverse charges).

QST back issues to 1975. DX60 or hb hf cw tx. Tel Arthur, 0342 (Sussex) 823016, after 8pm.

Service manual, circuit R1155A rx, RAF air ministry, buy, borrow or copy, all expenses refunded. N. A. G. Mortimore, 62 Ashbourne Road, Mitcham, Surrey CR4 2BA.

General coverage or amateur band rx, Heathkit, Eddystone, Trio, HRO, etc. Will exchange (sell separately) for Soligor 350mm lens, T-mount, used on Olympus, £50 ono. RX any cond considered. Richardson, G8KJI, QTHR. Tel Godalming 22193.

Gash 19 set or 4 by 500 variable from same. G3RB, QTHR. Tel Whitley Bay 530504.

Range selector wafer switch for Simpsom 260, series three multimeter, expenses paid. Eugene E. Pons, 5 Tankerville House, Tarik Road, Gibraltar.

Good cond KW E-Zee Match or KW107. Circuit, handbook, w.h.y. Solartron 'scope type CD711S2, faulty timebase. GI8MOA, QTHR.

Electroniques GC166, valved, or GC166T transistor, general coverage Qoilpax. A. C. Bryant, 21 Briarfield Road, Newcastle upon Tyne NE3 3UE.

RA117 in good mechanical cond, but electrical faults accepted. Will inspect/collect SW area. G4DND, QTHR. Tel St Columb (0637) 880479.

Valves 7R7, 7Q7 for B2 rx. PSU for B2 equipment handbook or circuit for Weston model 685 tube checker. G3LYW, QTHR. Tel Leics (0533) 876459.

Wireless set 18, good unmodified condition, prefer with mic, phones, satchel antenna rods, can arrange UK pick-up. Write G3NKR/9M2ME, 204A Jalan Ampang, Kuala Lumpur, Malaysia.

KW160 top band atu, in good condition. G3EJA, 9 Holybrook Road, Reading.

'Suitcase' type sets etc, eg type 3 Mk2 (the B2), type A Mk3, Mk119, Mk122, Mk217, BP5/T5, AR11, A3, Australian A510 manpack, also Mk128 set in wooden case (recently available from AH Supplies, Sheffield), any valves type 117L7, incomplete or damaged sets, manuals, any associated bits welcome. Letters only please. Taylor. G3UCT. c/o 31 Willow Walk, Culverstone, Gravesend, Kent.

A.M. mid band rig, such as Cambridge, Bantam, etc, or a.m. xtal controlled amateur rig. G4EVZ, QTHR. Tel Romford (Essex) 45733.

2m converter, i.f., 28–30MHz circuit diagram. D. J. Emmett. G8AED, Liston Sheils Hostel, Bierley Lane, Bierley, Bradford 4. Tel Bradford 681352/682331.

Drake TR7 tx/rx. HF linear. GJ3AME. Tel 0534 54186, after 7pm.

Urgent: manual for Shibaden SV700E vtr, (editing version). Manual for Ferrograph series four tape recorder, also details on stereo adaptor for above. Movement for Shinohara 2·25in SRS2P panel meter, any value will do. S. Robinson, G8POO, QTHR. Tel Stocksfield 3449.

LG50 cw hf tx or similar, my EA12 rx is poor performer on 10m despite professional attention, is my brute being difficult or is it the breed? Advice and suggestion please. G3AIO, QTHR. Tel Pembury 2836.

160 Twin Labgear rx, must be good cond. Tel Shipley 596584.

HF cw tx/rx, eg HW7, HW8, or w.h.y.? H. Woodward, G4JUC. 18 Stambourne Way, West Wickham, Kent. Tel 01-777 3379.

1155, electrical cond immaterial, must have good front panel, not altered or drilled. 19 set 15–600V meter. G3YNN, QTHR.

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- **See Members' Ads page for conditions of acceptance.**
- **Not more than 40 words, including name, address, etc, for £1.**
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- **Please write in block capitals, or type.**

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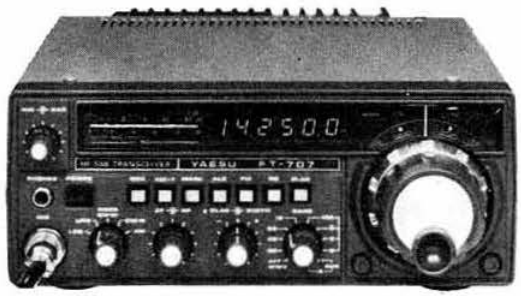
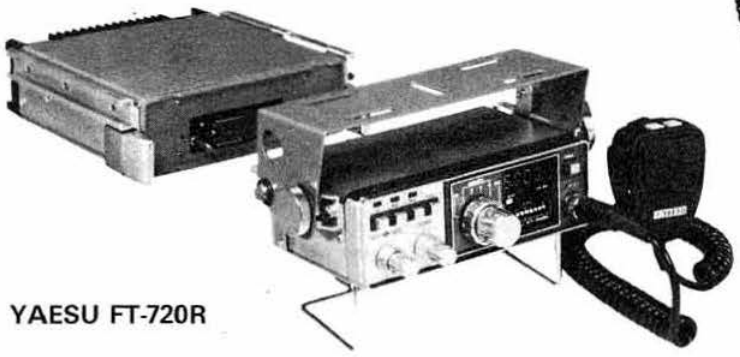


YAESU FT-707



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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.
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YAESU FT-101ZD

YAESU FT-2100Z

Keep ahead with Yaesu—not just a typical advertising slogan or empty phrase but a fact of life that when you buy Yaesu Musen equipment you get the benefit of the superb Research and Development Department which is located at the Yaesu headquarters in Tokyo. This is quite separate from the extensive Yaesu manufacturing facilities elsewhere in Japan and has to be seen to be believed, but then again what else would you expect from the world's largest manufacturer of amateur communications equipment.

This month we feature some new developments by Yaesu in the HF, VHF and UHF field with the fabulous new mobile HF transceiver FT-707 which we picture on the facing page, together with its matching ancillary units for base station operation also. The new FT-720R is a completely new innovation for VHF/UHF mobile operation giving the user the benefit of both bands with a single control head and with such features as a five memory channel bank and an automatic search ability. Finally, in answer to numerous enquiries we show the new Yaesu FL2100Z 1200 Watt Linear Amplifier which matches in style the superb FT-901 and FT-101ZD HF transceivers and we hardly need remind you that the FT-101ZD is the finest transceiver in its price range available from any manufacturer today.

THE ABOVE IS ONLY PART OF THE YAESU STORY—FOR FULL DETAILS OF ALL THE MODELS 36p IN STAMPS WILL BRING YOU THE LATEST GLOSSY CATALOGUE OF THE FULL PRODUCT RANGE TOGETHER WITH OUR CREDIT VOUCHER FOR £3.60—A 10-1 WINNING OFFER!

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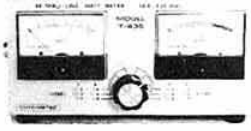

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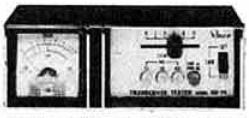

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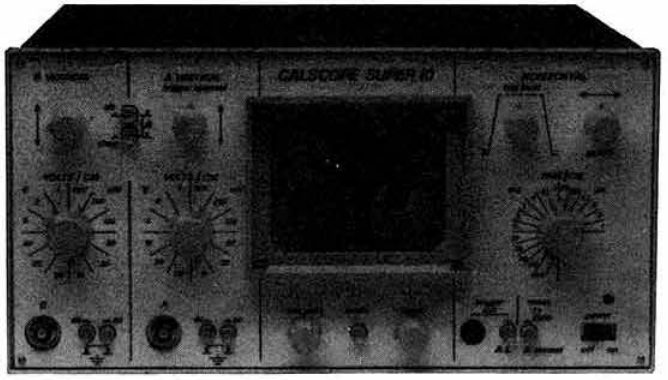

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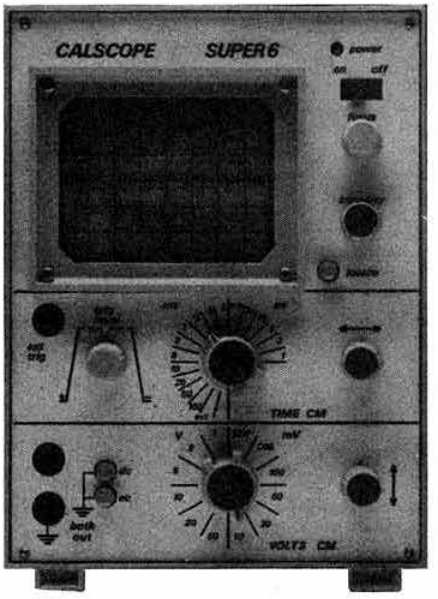

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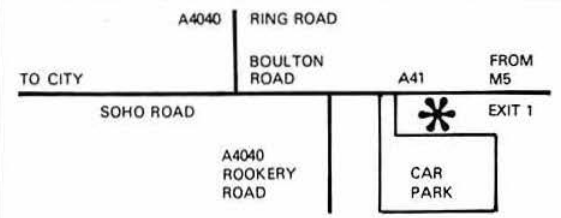

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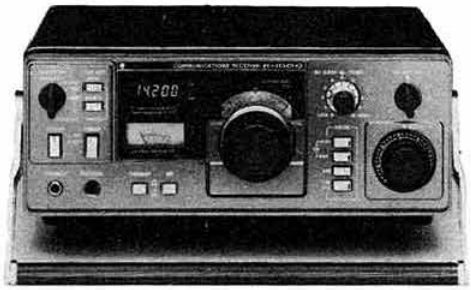

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THIS MONTH'S LAR SPECIAL—Trio SG402 RF signal generator 100kHz–30MHz. £52.00 inc. VAT. While stocks last.

TRIO EQUIPMENT

		Price inc. VAT £
NEW!	Trio 9000 multi-mode	345.00
R1000	200kHz to 30MHz PLL Receiver with digital readout	297.85
R820	The ultimate matching receiver to the TS820	690.00
TS820S	160-10m transceiver 200W P.E.P. (with DG1)	832.00
TS820	160-10m transceiver 200W P.E.P.	669.30
DG1	Digital readout to 100Hz	121.90
VFO820	External VFO	118.45
YG88C	CW filter 8 pole	36.80
SP820	Speaker	37.95
SM220	Monitor scope	197.80
BS8	TS820 scan board for SM220	48.30
AT200	1.8 to 30MHz antenna tuner	82.80
TL922	HF linear amplifier 160-10m/2kW P.E.P.	672.75
TS520SE	1.8-30MHz SSB transceiver 200W P.E.P.	437.00
SP520	Matching speaker	17.25
DG5	Digital display/40MHz frequency counter	105.50
DK520	Conversion kit allows use of DG5 with TS520	10.35
YG3395C	CW filter	37.95
TS120V	80-10m mobile transceiver 20W P.E.P.	347.30
TL120	80-10m 200W P.E.P. linear	128.80
PS20	AC power supply for TS120V	44.85
MB100	Mobile mounting bracket	17.25
YK88C	CW filter	28.75
SP120	Matching speaker	25.30
VFO120	Remote VFO	89.70
AT120	Antenna tuner (100W)	55.20
TS120S	80-10m mobile transceiver 200W P.E.P.	495.00
PS30	AC PSU for TS120S, TA130 & TS180S	85.10
TS770	2m/70cm all mode dual bander	763.60
SP70	Matching speaker	18.40
TR7600	2m synthesised mobile FM 10 Watt	247.25
TR7625	2m synthesised mobile FM 24 Watt	246.10
PS8	PSU for TR7625 only	80.00
TR2300	2m FM portable transceiver	166.75
VB2300	10W booster	49.45
MB2	Mobile mount	17.25
RA1	Helical rubber antenna	6.90
TS180S	160-10m solid state transceiver digital readout	589.95
TS180S	As above with memory frequency control	679.65
VFO180	External VFO	96.60
SP180	Speaker	38.80
DF180	Digital frequency counter	104.65
AT180	1.8-30MHz antenna tuner	95.45
PB10	Pack of 10 ni-cad batteries	10.35
TR7600	Spare power lead	1.30
LAR PS1200	Power supply unit and ni-cad charger for TR2200GX/TR2300/TR3200 and ICOM portables. You can charge and operate at the same time	29.50
TR8300	70cm FM mobile 10W transceiver fitted 4 channels	225.00
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SRX30	0.5 to 30 MHz SWL Receiver	178.00
HS5	Communications headphones, tailored response	21.85
HS4	Communications headphones, tailored response	10.35
MC50	De luxe desk microphone dual impedance	24.15
MC35S	50K fist microphone (noise cancelling)	13.80
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LF30A	HF low pass filter 1kW 90dB. Stop band rejection	18.40

VHF AMATEUR RECEIVERS

SR9	Tuneable/crystal 2m FM receiver 144-146MHz	46.00
AMR217B	Scanner. The best mains/battery operated	120.75

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'G' whip tribander helical 20/15/10	24.72
'G' whip multimobile 20/15/10	28.75
L.F. coils for the above whips (specify whether tribander or multimobile)	6.56
Telescopic whips for the above	3.34
Base mounts for all 'G' whips	4.48

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Famous Ringo Ranger 2m co-linear	24.70
Slim Jim 2m vertical	21.00
GDX2 VHF/UHF Discone Antenna 50-480MHz	36.80

ROTATORS

AR40	(5 core cable required)	59.80
DR7500	Will take 3 element tribander	108.10
DR7600	Will take a 2 element 40 metre beam	154.10
DR8600P	As above but with preset or manual controller	204.70
	Channel Master 9502A	56.00
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NEW HF VERTICAL ANTENNA

HF5	80-10m vertical	41.40
HF5R	Operational radial kit for roof mounting	23.00

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IC240	FM mobile synthesised transceiver 2m	169.00
IC215E	FM portable (LAR PS1200 available!) 2m	162.00
IC202S	SSB portable (LAR PS1200 available!) 2m	199.00
IC211E	All mode 2m transceiver	450.00
IC701	1.8 to 30MHz HF transceiver	899.00
IC255E	25 watt FM 2m mobile with memory and scanner	255.00
IC215E	HF transceiver	app.479.00
IC260E	Multi-mode	339.00
NEW!	IC2E hand held	159.00

Securicor delivery arranged if required

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OFF THE PAGE – Simply choose the product and then complete the coupon and enclose cheque.

* Open Mon–Fri 9.15–6.30pm
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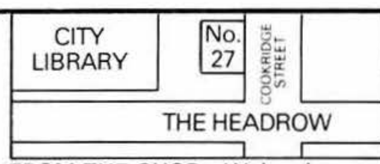
* H.P. Terms on request



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When we decided to get muTek involved in the amateur radio business, we decided to cater for the uhf/vhf operator who was prepared to use his brains, rather than bow to the barons of black-box land. We've been pleasantly surprised by the interest in our products, and by using our increased purchasing power have been able to get better deals from some of our suppliers. Our prices of course reflect this!

FT221/225GT front-end board.
Our list of customers for this board is beginning to look like a 'Who's who' of the 144MHz contest world! We use a modern ion-implanted mosfet (3SK88) driving a diode ring mixer via a properly designed filter. A great deal of care has been taken to ensure that the ring is properly terminated: this is essential for good performance. A mosfet post amplifier follows the mixer and interfaces an additional 6-pole crystal filter. After the filter two separate mosfet if amplifiers drive the existing if amplifier strips.

Two small, easily reversible, modifications are needed to the transceiver: we supply fitting instructions which at least one customer has described as 'just like a Heathkit!' **£53.87**

1.3GHz transverter system
Our system consists of a series of properly designed pc modules which are supplied in a fully aligned and tested state for assembly into your own system. Obviously, if you just want a black-box system, then you'll go elsewhere, but we consider that 23 is still a band where 'box-ops' are in the minority, and that this state of affairs is likely to continue. By using our system you can build your own very high performance transverter, which won't become obsolete as the technology advances:

Low noise amplifier:	**£22.72**
Gain block:	**£11.15**
Bandpass filter:	**£6.75**
Mixer—local oscillator. (1.3GHz in–144MHz out)	**£22.60**
384MHz source (the clean one!)	**£18.25**

At the time of writing this advertisement we have several other modules under development, including a linear transmit mixer, a dual directional coupler, a 5W linear amplifier strip and a very low noise crystal oscillator for 10GHz transverters. Give us a ring or write!

144MHz preamplifier
We are making this preamp in response to a considerable demand from those people who are unable to fit a complete replacement front-end to their rigs. Fitting a preamp *will* degrade dynamic range, however, we have designed ours to minimise the effect. By using a very low noise mosfet it is possible to reduce the insertion gain of the preamp to a minimum whilst still maintaining the system noise figure at a level which ensures that externally generated noise is the factor limiting receiver sensitivity.

Unlike many of the preamplifiers currently available we have also incorporated a bandpass filter, thus minimising problems due to out-of-band responses. The preamp is available in both boxed and unboxed versions with facilities for masthead relay control and an internal attenuator for gain setting. Ask us for a data sheet!
Unboxed: **£10.79** Boxed: **£17.72**

Kungsimport antenna combiners
Very nicely manufactured in aluminium, with N connectors as standard fittings these combiners make the electrical side of antenna stacking almost a doddle! We get bored with telling people to ask for data, but please do!

2-144N	**£26.75**	4-144N	**£29.75**
2-432N	**£23.50**	4-432N	**£26.50**
2-1296N	**£23.50**	4-1296N	**£26.50**

Carriage: £1.50 for 144MHz models, £1.00 for others

TVI filter Still very available: **£1.80**

NEC rf and microwave semiconductors
We've been expanding our range of NEC devices over the last few months. Additions include the **NE21936** (an 8GHz f_t, 1.1dB nf transistor for 432: 1.8dB on 1.3) at **£3.74**, the **ND4692** (X-band 7dB cartridge mixer diode) at **£3.51**, and the **NE12683** gasfet at **£26.08**! Don't forget that we also have the **NE02137 (£1.91)**, **NE57835 (£6.73)**, **NE64535 (£10.00)**, **NE73432E (£0.97)**, **3SK88 (£1.73)**, **3SK74 (£0.60)**, **ND4991 (£0.40)** and we'll help you learn to use them!

Data on request: SAE appreciated. CWO. Please add 50p p&p unless stated, and then VAT. Tnx!

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Battery operated CMOS calibrator giving 1MHz, 500, 100, 50, 25, 12·5, 10, 5kHz and harmonics to above 600MHz. Heterodyne wavemeter and modulation ident facilities..... Price **£55.00**

WAVEMETER TC-101
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For use with FRG-7/7000, SRX-30, SSR-1 or any receiver with a 455kHz I.F. Includes signal buffer, limiter, detector, squelch and audio filter.
Price: Kit **£18.63**. M & T **£23.20**

HF/VHF PREAMPLIFIER MA-1
Single-stage tuned preamp for 28, 50, 70 or 144MHz (state which) with 18dB gain and 2·5dB noise figure..... Price: Kit **£6.17**. M & T **£7.26**

UHF PREAMPLIFIER MA-80
Single-stage stripline preamp, tuneable over 400-480MHz with 12dB min gain and 2dB noise figure..... Price: Kit **£7.90**. M & T **£9.80**

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BF900 ..... **£1.15**	BFR96 ..... **£3.16**	MC10216P **£1.58**
BFR34A **£1.13**	MC1648P **£3.24**	MC10231P **£3.06**
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BFR91 ..... **£2.79**	MC10116P **£0.58**	BZY88 ..... **£0.08**
BFR94 ..... **£7.32**	MC10131P **£1.93**	DL507 ..... **£0.92**

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FT101Z

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FERRITE RINGS Mullard FX 1588 for TVI/AFI	**£0.67**

All prices include VAT and carriage
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ANNUAL HOLIDAYS—JULY 26-AUGUST 11

SUGIYAMA F850

An all band (160 to 2m including 4m), all mode transceiver available at a realistic price, with a specification that includes as standard most of the options the discerning amateur considers essential for serious operation. For 2 metre FM operation, repeater shift and automatic tone burst are provided.

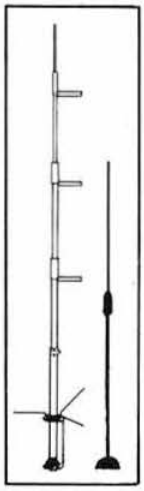
Brief Specification

* Covers all current amateur bands 1.8-144 MHz, including 4m
* All popular modes USB, LSB, car FM and AM
* Easy to read digital display
* Switched selectivity 0.4, 1.2, 1.8 and 2.4 KHz
* AC or 12V DC powered for base station or mobile/portable operation
* Built in VOX, speech processor and 25 KHz calibrator
* Power output 10 watts min SSB/CW/FM (Typical 15 watts) — 5 watts AM

LIST PRICE: Fitted 2.4 KHz filter £799.00 inc VAT
Fitted ALL filters £899.00 inc VAT

432 MHz Transverter (ordered with F850) £100.00 inc VAT

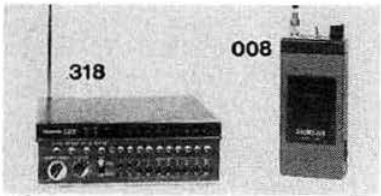
220 Watt Solid State Linear (up to 30 MHz) £95.00 inc VAT



HIGH GAIN 2m ANTENNAS

KT284 — 4 Section Colinear — 11dBi 100 Watts 5.47 metres long 2.7 kg £40.25
KT282 — 2 Section Colinear 6dBi £21.85
KT852 — 5/8 Mobile Whip c/w Mag Mount, Cable and Plug £17.25
KT872 — 7/8 Mobile Whip £10.10
GCL — Gutter Mount £3.15
C43 — Cable Assembly and Plug £3.45
All above prices include VAT.

FM SCANNING MONITORS

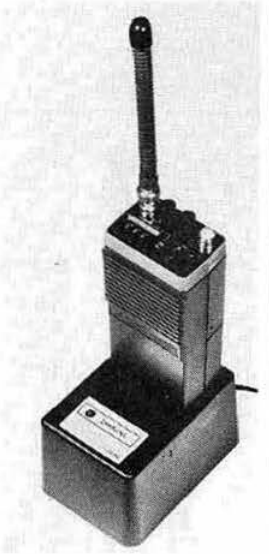


Pocket Model — 008 covers 8 Channels in 2m or marine bands. Lockout on all channels. Wide range of accessories supplied PRICE: £59.00 inc. VAT.

318 — Three Band Monitor — allows 20 Channels in 430-470 MHz, 140-175 MHz and 68-88 MHz ranges to be scanned in user programmable order. Mains or battery operation. Vehicle mount supplied. PRICE: £95.00 inc. VAT. Carriage extra on above prices.

Stock Crystals: S20, 21, 22, 23 — RO to 7 — SU 8 and 20 — RBO, 2, 4, 6, 10, 14 — MO, 6, 10, 16. PRICE: £3.00 each inc. VAT.

ZYCOMM Z5800 Hand Portable



A no nonsense synthesised rig free of gimmicks. Covers 144-148 MHz in 5 KHz steps. Simplex or Repeater Operation — High/low power (over 5 watts from internal NiCd pack).
PRICE £199.00 inc VAT c/w Desk Charger and Remote Microphone.

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9 El crossed	£28.75	21 El ATV	£26.43
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Telescopic portable mast 18ft			£16.76

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FDK 750E Multimode **£299.00**
R517 Aircraft Monitor Receiver VFO + 3 fixed channels **£49.75**
BELLSONIC 13·8V 3 Amp Stabilised Power Supply . . . . . **£18.40** + £1.20 p&p
DL20 DUMMY LOAD 15 Watt cont., 30 Watt peak . . . . . **£6.04** + 30p p&p
DM350 50kΩ P.T.T. mics. . . . . **£4.83** + 30p p&p

MICROWAVE MODULES CONVERTERS for 2mtrs., 70cm., 4mtrs and 23cm.

MICROWAVE MODULES. TRANSVERTERS. MMT 144/28 **£90.85**; MMT 432/28S **£136.85**; MMT 432/144R **£173.65**; MML 144/25 Linear Amp **£48.30**; MMD 050/500 Frequency Counter **£69.00**; MMD 500P Prescalers, Special Price **£21.00**.

STOLLE 2010 Rotators **£50.00**; 2050 **£45.00**.

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Secondhand **MMT 144/28 TRANSVERTER £66.00**.

DAIWA SR9 2mtr VFO Monitor Receiver **£46.00**.

VEROBLOCK and **C.S.C.** Breadboard now in stock.

TRANSFORMERS as last month, plus new types. 6·0·6V, 2 Amp **£3.11** + £1.20 p&p. 110/240V 20 Watt auto **£2.59** + £1.20 p&p.

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Type	Output	Gain(dB)	Volts	Freq	Price Exc Vat
2N3866	1	10	28	175	£0.85
2N4427	1	10	12	175	£0.92
2N3553	2·5	9	28	175	£1.02
2N5913	2	7	12	470	£1.40
SD1127	4	12	12	175	£2.1 (1)
2N6080	4	12	12	175	£4.1
SD1143	12	10	12	220	£6.00
2N6081	15	6·3	12	175	£6.50
2N6082	25	5·7	12	175	£7.50
2N6084	40	4·5	12	175	£11.00
RF2127	70	6·6	12	175	£21.00 (2)
SD1019-5	100	6+	28	175	£16.00
2N5590	10	5·2	13	175	£5.50
2N5591	25	4·4	13	175	£6.90
SD1428	45	6·5	12	175	£11.55 (2)
2N5944	2	9	12	470	£5.90
2N5945	4	8	12	470	£7.50
SD1135	5	7·5	12	470	£4.50
SD1136	10	5·5	12	470	£6.75
2N5946	10	6	12	470	£9.50
SD1088	25	6·8	12	470	£16.00 (2)
SD1089	40	4·3	12	470	£22.00 (2)
SD1434	45	5·0	12	470	£23.00 (2)

NOTE (1) G.Emit. IC202/215 P.A. (2) Controlled "Q" Type

Low noise semiconductors

TRW TP491 1·5dB N/F at 500MHz T Pack	£3.20
MUL BFR91 2·5dB N/F at 1·2GHz Pack	£3.55
Sig SD306 1·5dB N/F at 150MHz "D" MOS	£2.20
Sig SD201 4dB N/F at 1·2GHz "D" MOS sin/gate	£2.00
BFR34A 4dB N/F at 2GHz T Pack	£1.99
BFT66 Low intermod. for Preamp. Low noise	£2.25
3N204 2nd Generation MOSFET to replace 40673	£1.25
40673 RCA Low noise MOSFET	£0.80

BF900 Stripline VHF/UHF MOSFET. 2dB N/F 200MHz **£1.35**

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UNDERWOOD-UNELCO Cased mica Caps. Resonance >2GHz. 500V working 30 and 50pf **£1.40**. 100 and 150pf **£1.50**. PTFE Sheet 0·25mm (11 thou) 10kV Dia Stable. Sheets of 300mm square **£2.00**.

ANTENNA RELAYS. Mag. Dev. 951–170–12V 50Ω RG43 cable. Good VSWR to 1296 **£7.45**.

Hewlett Packard Diodes. 5082 Series. 2800 H.Car. **97p** 2835 H.Car **85p**. 3080 Pin **85p**.

ITT 10·7 Xtl Filters for 12·5kHz spacing 910Ω 25pf. **£6.00**

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Jackson Tetfer PTFE (UHF) 1·5–10pf Low Loss **28p**. Dau. PTFE film. 1·5–9pf 2–18pf all **24p**.

Surplus 10mm 2·5–25pf 3 pin type **12p**.

FERRITES. Mullard. FX1115 Bead **5p**.

FX1898 6 hole **11p**. FX2049 2 hole trans **10p**.

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