





The TR-2500 is a compact 2 metre FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan and HI/LO power switch.

**TR-2500 FEATURES:**

- Extremely compact size and light weight 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches), 540g, (1-2lbs) with Nicad pack.
- LCD digital frequency readout, with memory channel and function indication.
- Ten channel memory, includes "MO" memory for non-standard split frequencies.
- Lithium battery memory back-up built-in, (estimated 5 year life) saves memory when Nicad pack discharged.
- Memory scan, stops on busy channels, skips channels in which no data is stored.
- UP/DOWN manual scan in 5kHz steps.
- 2.5W or 300mW RF output. (HI/LOW power switch.)
- Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5kHz and larger (5, 10, 15, 20, 25, 30kHz ... etc) to be programmed.
- Slide-lock battery pack.
- Repeater reverse operation.
- Keyboard frequency selection across full range.
- Frequency coverage, 144.000 to 145.995 MHz.
- Optional power source, MS-1 mobile or ST-2 AC charger/power supply allows operation while charging. (Automatic drop-in connections.)
- High impact plastic case.
- Battery status indicator.
- Two lock switches for keyboard and transmit.

**STANDARD ACCESSORIES**

- Flexible rubberised and antenna with BNC connector.
- 400mA heavy-duty Nicad battery pack.
- AC charger.

TR 2500	HANDHELD TRANSCEIVER	£207.00
ST 2	BASE STAND/CHARGER	£46.23
SC 4	SOFT CASE	£12.19
MS 1	MOBILE STAND	£28.29
SMC 25	SPEAKER/MIKE	£14.49
PB 25	NICAD PACK	£22.31
LH 2	LEATHER CASE	£21.39

So the TR2300 now costs less than its predecessor did in 1976. Not only that, the TR2200GX of 1976 only had 12 channels where the TR2300 of today covers the full amateur band.

So we rest our case — the TR2300 has to be, in today's market, outstanding value for money and, what is more, the TR2300 has an unprecedented reliability factor.

There is no need to talk of full 2 metre band coverage, the 1 watt of perfect transmitted signal, the fully comprehensive list of included accessories: carrying case, Nicad charger, 12 volt power cord, shoulder strap, hand microphone, collapsible whip antenna, reverse repeater facility, automatic tone burst, switchable illuminated frequency dial, consequent long life operation out in the field.

Don't ask us about the Trio TR2300 — ask our best form of advertisement: one of the 5,000 owners!

TR2300	PORTABLE TRANSCEIVER	£166.75
	Securicor Carriage	£5.00

**handability  
TR 2500**

**portability  
TR 2300**



**LOWE ELECTRONICS**

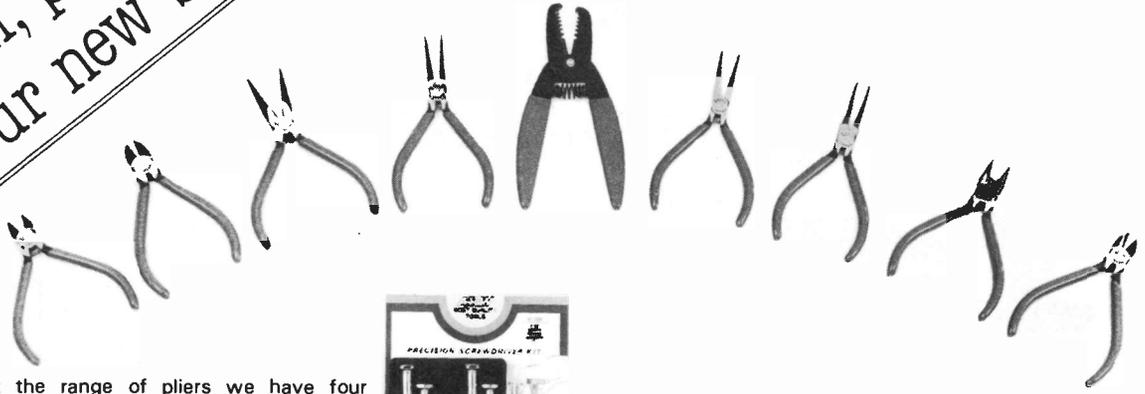
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.  
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.



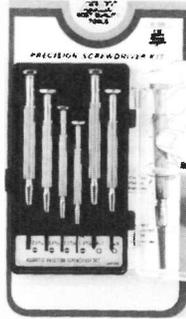
*You all know  
about our shop in  
London, please telephone  
about our new shop in Glasgow.*

## a new range of tools

For many of you who build your own pieces of equipment there has always been a shortage of good small tools. There have always been the very expensive tools which can only be owned and used by the wealthy amongst us and there are also those cheap but extremely nasty tools which we all avoid like the plague. So now after much searching we have come up with a good quality set of tools at a realistic price which



To compliment the range of pliers we have four screwdriver packs, each priced at £1.98. The sets are, six piece screwdriver, five piece hex key and Philips screwdriver, five piece nut driver and a six piece assorted screwdriver. Postage on the screwdriver kit is 75p. We also have a 21 piece tool set which contains precision wrenches, Philips screwdrivers, hex key wrenches, nut drivers and of course screwdrivers. This item costs £7.95 INC VAT. Carriage being £1.50.



all of us can afford. The pliers and cutters are available at £4.50 each which includes VAT. Carriage is 75p, if you are considering more than one item then please ring us to find out the correct amount of postage. The pliers are available in the following types, side cutting, long nose, diagonal cutting 100mm, diagonal cutting 115mm, plastic cutting, round nose, flat nose and bent nose. Also available is a wire stripper at the same price.

## AF 606K

DAIWA ALL MODE ACTIVE FILTER £56.50. CARR. £5.00.



From Daiwa yet another aid to operating. In addition to the notch, SSB and CW filters, the AF606K is equipped with a PLL tone decoder; when the tone frequency of the CW signal and the free running frequency of the PLL tone decoder are the same a locked signal is generated. This locked signal keys an audio oscillator which then reproduces the received CW signal. However, there is a tremendous difference between the produced signal and the received one — no noise and, of course, no fading. **ANOTHER PIECE OF EQUIPMENT TO ENHANCE YOUR LISTENING.**



## HK 702

MORSE KEY £24.50. CARR. £1.50.



With so many electronic keys and keyers on the market, it's hard to describe one that is better than the rest. Inevitably it is a matter of "feel", and the feel of the New Daiwa DK210 is superb. Being Daiwa, the quality of design and construction has to be of the best, but it's in use that the DK210 is so impressive. Designed to be used with an external paddle, to give greater personal choice, the DK210 is otherwise self contained, even to being battery powered (PP3). It offers a speed range of 10 to 50 w.p.m., built in sidetone, facilities for semi auto, or fully auto keying, and a tune position for adjusting your transmitter, but the outstanding feature is the adjustable "weight" control. This control gives an amazing improvement in the character of the sending, and completely removes that mechanical sounding "electronic morse" characteristic. Those experienced CW users who have tried out the DK210, have all said how good it sounds — and have usually purchased one. So will you if you try it out.

## DK 210

DAIWA ELECTRONIC KEYS  
£42.00 less paddle. CARR. £5.00.

DK210 from DAIWA — A truly nice Keyer.

# LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.  
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.



# STEPHENS-JAMES LTD.

47 WARRINGTON ROAD, LEIGH, LANCS. WN7 3EA  
Telephone (0942) 676790

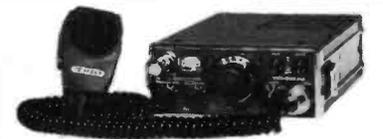


LANCASHIRE & THE NORTH WEST'S LEADING RETAILER IN AMATEUR RADIO. 20 YEARS SERVING THE AMATEUR'S BY AMATEURS SPECIALIZING ONLY IN AMATEUR RADIO EQUIPMENT.

THE ONLY APPROVED TRIO DEALER FOR NORTH WEST ENGLAND



**TR7730** the new compact 2m Transceiver £247.94



**TR2300**

TR2300 2m Synthesised Portable Transceiver. We have lost count of the number of this model we have sold over the last 12 months. Hikers, campers, climbers, you can hear them all over the country and reliability which is the essence of TRIO equipment. £166.75

<b>JAYBEAM</b>	
5Y/2M 5 element yagi.....	£12.08
8Y/2M element yagi.....	£15.53
10Y/2M 10 element.....	£33.35
PBM/14/2m. 14 element Parabeam.....	£48.30
5XY/2m. 5 element crossed yagi.....	£24.73
8XY/2m. 8 element crossed yagi.....	£31.05
10XY/2m. 10 element crossed yagi.....	£40.83
Q4/2m. 4 element Quad.....	£25.88
Q6/2m. 4 element Quad.....	£33.93
D5/2m. 5 over 5 slot fed yagi.....	£21.85
D8/2m. 8 over 8 slot fed yagi.....	£29.33
UGP/2m. ground plane.....	£10.12
MBM48/70cms. Multibeam.....	£31.05
MBM88/70cms. Multibeam.....	£42.55
TAS 1/2" 2m. Whip mobile.....	£15.30
C5/m. Colinear.....	£47.73
C8/70cm. Colinear.....	£54.05
D15/1296 23cm. Antenna.....	£36.80
Carriage on Antennas £4.50.	



**TR7800**

Continuing TRIO's policy of presenting the Radio Amateur with the finest equipment available, we were pleased to announce the NEW TR7800 2m FM Mobile Transceiver. 15 memory channels - Priority channels with simplex  $\pm 600$  KHz or non-standard operation - "Priority alert" beeps when signal on M14 priority channel. Frequency coverage 144.00, 145.955 in switchable 5 KHz or 25 KHz steps. Front keyboard for selecting frequencies, programming memories and controlling scan function. ALL THIS and MORE for £257.80.



**TRIO R1000**

R1000 Receiver £297.86  
The latest general coverage from Trio. Frequency coverage 200 KHz to 30 MHz in 30 bands. Using an advanced PLL system. Full digital readout. Three filters 12 KHz for AM - 6 KHz narrow AM and 2.7 KHz SSB. Also incorporates a noise blanker. Operation is from 100-240V AC or 12V DC.

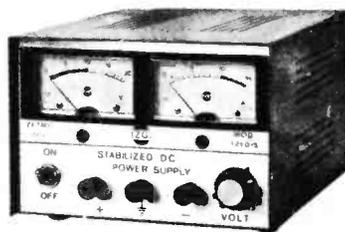


The TS930S latest transceiver from Trio Price: £1078.00 inc. VAT.

<b>TRIO</b>	
TS830S HF Transceiver.....	£694.83
AT230 All band Antenna Tuner/SWR.....	£119.83
TS530S HF Transceiver.....	£534.98
SP230 Speaker.....	£34.96
DFC230 Digital remote control.....	£179.86
TS130S Solid State HF Transceiver.....	£525.09
TS130V Solid State HF Transceiver.....	£445.05
PS20 Power supply.....	£49.46
PS30 Power supply.....	£88.55
AT130 Antenna Tuner.....	£79.12
TL922 2 KW Linear Amplifier.....	£624.91
TR2300 Portable 2m Transceiver.....	£166.75
TR2500 Hand Held 2m Transceiver.....	£207.00
TR7730 compact 2m Transceiver.....	£247.94
TR7800 25 watt 2m FM Transceiver.....	£257.60
TR7850 40 watt 2m FM Transceiver.....	£314.87
TRIO TR9130 2m Transceiver.....	£395.00
TR9500 70cm Multimode Transceiver.....	£449.88
TS930S HF Transceiver.....	£1080.00
R1000 Solid State Receiver.....	£297.85
R600 Solid State Receiver.....	£235.00

Full range of TRIO Accessories stocked.

<b>DATONG PRODUCTS</b>	
PCI General Coverage Converter.....	£120.75
Low Frequency Converter.....	£25.30
FL1 Frequency Audio Filter.....	£67.85
FL2 Multi-Mode Audio Filter.....	£89.70
Automatic RF Speech Clipper.....	£79.35
RF Speech Clipper.....	£26.45
D70 Morse Tutor.....	£49.45
AD370 Active Antenna (outdoor).....	£51.75
AD270 Active Antenna (indoor).....	£37.95
2M Converter.....	£35.65
Keyboard Morse Sender.....	£129.00



**MOD. 1210 S**

<b>SOLID STATE STABILISED POWER SUPPLIES</b>	
Maximum ratings quoted. Prices include postage.	
Model 125 10-15V 5 amp.....	£29.50
Model 156S 4-15V 5amp Twin Meter.....	£40.00
Model 1210S 4-20V 10 amp Twin Meter.....	£75.00

<b>RECEIVERS AND TRANSCEIVERS</b>	
SR9 Tunable 144-146MHz Receiver.....	£46.00
R512 Aircraft Band Scanning Receiver.....	£135.00
Regency Digital Flight Scan Synthesised Aircraft Band Receiver.....	£215.00
Yaesu FRG7 Receiver.....	£199.00
'Sky ACE' Hand Held Aircraft Band Receiver.....	£49.50
AR22 2m Hand Hold Receiver.....	£83.00
R528 Hand Held Aircraft Receiver.....	£68.50
FX1 Station Wavemeter.....	£34.00
2-way Antenna Switch 3-30MHz.....	£5.00
3-way Antenna Switch 3-30MHz.....	£10.00
FDK 700EX Transceiver.....	£199.00
FDK 750E Transceiver.....	£299.00
DL50 50 watt 5 ohm Dummy Load.....	£6.50
DL500 Dummy Load/Wattmeter 1 Kw. 3-400MHz-50 ohms.....	£38.00
WH.2 VHF Wavemeter.....	£22.30



**J.R.C. NRD515D**

General coverage receiver 100 KHz to 30 MHz fully synthesised. Digital readout PLL synthesiser with rotary type encoder pass band tuning - modular construction. £1,098.00

Matching Transmitter Solid State 100 Watts available. NEW 24 CHANNEL MEMORY UNIT.

ACCESS & BARCLAYCARD facilities. Instant HP service. Licensed Credit Broker - quotations upon request.

Try our new "Overnite" service for £6.00. Guaranteed 24 hour service if order placed before 11 a.m. (except North GM).

Part exchange always welcome. Spot cash paid for good clean equipment. If you have equipment surplus to your requirement we would be pleased to sell this on commission for you.

Shop Hours: 9.30 to 5.30 Monday to Friday. 4.30 p.m. Saturday.

No parking problems. Turn at the Greyhound Motel on the A580 (East Lancs.) Road. S.A.E. with all enquiries. 25p will bring you latest information and prices. Postage carriage extra.

ALL OUR PRICES INCLUDE VAT SEND S.A.E. FOR OUR UP-TO-DATE SECONDHAND LIST.

**FULL RANGE OF DIAWA ANTENNA ROTATORS, SWR METERS, AUTOMATIC ANTENNA TUNERS, WELLZ SWR METERS AND ATU'S IN STOCK. ALSO AVAILABLE FROM STOCK G4MH MINIBEAMS HQ1 MINIBEAM. AND A WIDE RANGE OF HY-GAIN ANTENNAS + THE NEW TET RANGE**

MN7 ATU/RF Meter 250 Watts.....	£124.20
MN2700 ATU 2 KW.....	£253.00
DL 300 Dummy Load 300 Watts.....	£20.70
DL 1000 Dummy Load 1KW.....	£37.95
TV 3300 Low Pass Filter.....	£18.40
AK75. Doublet Antenna 132' top with 470 ohm Feeder.....	£29.90

**TRIO TS530S NEW £534.98 ALL BAND HF TRANSCEIVER**



**TS830S HF SSB TRANSCEIVER £694.83**

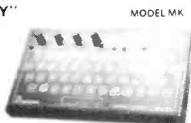
The new TS830S, the latest from TRIO. A high performance, very affordable HF SSB/CW transceiver with every conceivable operating feature built in for 160 through 10metres (including the new three bands). The TS830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift and an IF notch filter, as well as very sharp filters in the 455 KHz second IF. Together with the optional VFO230 (remote digital display VFO) which provides split frequency operation and 5 memories for frequency hold, the amateur has available today's advanced technology linked to the proven reliability and exceptional linearity of a valve PA.

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

# DATONG

## KEYBOARD MORSE SENDER - THE ULTIMATE "MORSE KEY"

● **STRAIN-FREE** sending: Converts "hunt and peck" typing to perfect morse. Just plug into any key-jack and type.



● **CONVENIENCE:** no need for a power cable, four internal pen cells last for 300 hours and give continuous memory back up.

● **EXCLUSIVE COLOUR CODED KEYBOARD DESIGN:** Separate key switches beneath a tough polycarbonate membrane combine excellent "feel" with a splash proof wipe clean surface.

● **LAVISH MEMORY:** four 64-character memories with auto-repeat and programmable "pause" function, for all the routine sending.

● **BUFFER MEMORY:** ensures perfect sending despite less than perfect typing.

● **COMPREHENSIVE CHARACTER SET:** includes punctuation, procedure signals, accented letters. Plus a "merge" key for making any non-standard character.

● **BEAUTY AND STYLE:** only one inch thin and with four-colour panel Model MK looks every bit the thoroughbred it is. Model MK is supplied with output leads and spare connectors but without batteries (four HP7 pen cells).

## BROADBAND PREAMPLIFIER - MODEL RFA

● Wide bandwidth, 5 to 200 MHz, lets Model RFA replace a whole collection of single band amplifiers.



● Low noise figure, high intercept point (+ 20 dbm), and moderate gain (9 db) make Model RFA ideal for improving the sensitivity of HF and VHF transceivers, scanner receivers, PMR, marine VHF, without difficulties with overload.

● RF switched for convenient use with transceivers

● Solid construction (same die cast case as Models VLF and DC144/28) with SO239 connectors.

## MODEL D70: THE GO-ANYWHERE MORSE CODE TRAINER

For building up your morse CODE D70 code reception speed there is no better method than the Datong "Morse Tutor".



You learn the code with the characters at normal speed but with an extra delay between each one. As you improve you reduce the "DELAY" control until, with it fully reduced, you find you are reading code at the chosen speed and with correct spacing.

An important feature is that the unit is completely portable. This allows you to practise wherever and whenever you find it most convenient. The all-CMOS design gives about 60 hours of practice from a lowcost PP3.

## GENERAL COVERAGE RECEIVE CONVERTER

If you have a 2 metre all-mode receiving set up, just add Model PC1 in series with its antenna and you have a superb general coverage receiver. What better way to listen in to all the non-VHF amateur bands, not to mention everything else from 60 kHz to 30 MHz? For sheer value for money there is no better way to get high performance general coverage reception. After all what a waste it is if your expensive 2 metre all-mode rig covers one band only? Model PC1 will also extend the coverage of SX 200 type scanners to include all the long, medium and short wave bands as well. This is an excellent way to listen to your favourite short wave broadcast stations without the extra expense of a complete new receiver.



## HIGH PERFORMANCE 2 METRE CONVERTER

Model DC144/28 is designed to overcome the overload and spurious signal problems experienced by conventional converters, it uses a Schottky diode balanced mixer with about 7 dbm of local oscillator drive. This, coupled with a 3SK88



r.f. amplifier, gives an excellent combination of low noise figure and strong signal handling capability. Its input and output gain controls also help you get the best out of your main receiver without flattening it with excessive gain.

Model DC144/28 is available either as a complete casued unit (die cast box, SO239 connectors) or as a ready built and tested PCB module.

## MINIATURE RECEIVING ANTENNAS

If you don't have enough space to put up traditional receiving antennas, our active antennas are the answer. They need no tuning yet have constant sensitivity from 200 kHz to well over 30 MHz. Results are quite comparable to full size conventional antennas but the space saving is enormous. The indoor version (AD270) is 3 metres long and the outdoor version (AD370) is 2 metres long.



A TV-type coaxial feeder cable of any reasonable length can be used yet because the antennas are balanced dipoles any interference picked up by the feeder is rejected. Because of their wide frequency coverage Datong Active Antennas are ideal accessories for modern general coverage communications receivers.

## VERY LOW FREQUENCY CONVERTER MODEL VLF

Model VLF adds the missing bands below 500 kHz to your existing receiver. It also adds MW and LW coverage to amateur bands-only receivers for news, time checks etc.



Connected in series with the antenna Model VLF allows you to tune the 0 to 500 kHz range (and above at reduced sensitivity) using the ten metre band (28-30 MHz) on your normal receiver.

## MULTI-MODE AUDIO FILTER MODEL FL2

Model FL2 offers audio filtering capability which is totally in a class of its own. Although connecting in the loudspeaker line from any rig, Model FL2 simulates the effect of fully variable IF selectivity complete with pass band edges even steeper than those of multipole crystal filters. You can remove interference in SSB and winkle out weak CW to a truly remarkable extent. No less than twelve poles of tuneable filtering in Model FL2 can be used in six different ways depending on the mode switch. For example, for SSB you have independent low and high pass filters, each a 5 pole elliptic function type for knife edge cut-off, plus when needed, a separate 2 pole notch filter. All three filters tune linearly and separately from 200 to 3500 Hz. For CW all 12 poles are combined automatically to give incredible skirt selectivity and with independent calibrated controls for centre frequency and bandwidth.



## MODEL ASP - THE "INTELLIGENT" RF CLIPPER

Model ASP modifies your speech signal direct from the microphone and makes it more effective at modulating your transmitter. The effect is as if the transmitter peak power were to increase by 6 to 10 db. "Intelligent" means that unlike other speech processors Model ASP automatically senses your voice level and reacts accordingly to always maintain the degree of true r.f. clipping selected (in decibels) by the panel push-buttons. Special circuitry does this without the undesirable side effects of simple a.g.c. devices. Adding a Datong r.f. clipper to a normal SSB transmitter has a similar effect to adding a linear amplifier but without the high cost and risk of TVI.



## "CODECALL" SELECTIVE CALLING DEVICE

The Datong Codecall adds "selective call" to any radio voice channel. A single self-contained unit at each end of the link sends or receives a coded audio signal. When the correct code is received the receiver bleeps loudly.



The only connection needed to a transceiver is to the external loudspeaker jack. Sending is via direct audio into the microphone.

"Codecall" allows totally silent stand-by operation yet with confidence that when that specific call comes, you won't miss it.

Over 4000 different codes can be selected by internal link or by three 16-way panel switches, depending on the model. This practically eliminates false alarms.

## NEW PRODUCT NOW AVAILABLE

**MODEL DF1**  
Direction finder attachment for FM, VHF receivers — transceivers.

**PROFESSIONAL QUALITY AT REMARKABLY LOW COST.**

## PRICES

All prices include delivery in U.K. basic prices in £ are shown with VAT inclusive prices in brackets.

FL1	59.00 (67.85)	AD370	45.00 (51.75)	RFA	25.50 (29.32)
FL2	78.00 (89.70)	AD270 + MPU	37.00 (42.55)	Codecall	
PC1	105.00 (120.75)	AD370 + MPU	49.00 (56.35)	(Linked)	24.00 (27.60)
ASP	69.00 (79.35)	MPU	6.00 (6.90)	Codecall	
VLF	22.00 (25.30)	DC144/28	31.00 (35.65)	(Switched)	25.50 (29.32)
D70	43.00 (49.45)	DC144/28		Basic DF System	125.00 (143.80)
D75	49.00 (56.35)	Module	25.00 (28.75)	DF System	131.00 (150.70)
RFC/M	23.00 (26.45)	Keyboard Morse		Complete Mobile DF	
AD270	33.00 (37.95)	Sender	112.20 (129.00)	System	173.50 (199.50)

● See previous advertisement or price list for further details.



ALL DATONG PRODUCTS ARE DESIGNED AND BUILT IN THE U.K.

Data sheets on any products available free on request — write to Dept S.W.

**DATONG ELECTRONICS LIMITED**

Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE, England. Tel: (0532) 552461

# AMATEUR ELECTRONICS UK

Your number one source  
for **YAESU MUSEN**



## FT-ONE SUPER HF TRANSCEIVER

The ultimate in HF transceivers -  
-the new FT-ONE provides continuous  
RX coverage of 150KHz - 30MHz plus all nine amateur bands (160 thru 10m).  
All mode operation LSB, USB, CW, FSK, AM, \*FM • 10 VFO system • FULL break-in  
on CW • audio peak filter • notch filter • variable bandwidth and IF shift • keyboard  
scanning and entry • RX dynamic range over 95dB! and NO band switch!!! **\*OPTIONAL**

## FT-101ZD Mk III



YAESU's FT-101ZD WITH FM is the most popular HF rig on the market thanks to its very comprehensive specification and competitive price. Incorporates notch filter, audio peak filter, variable IF bandwidth plus many other features.

## FT-902DM Competition grade HF transceiver



The YAESU world famous pace-setter with the acknowledged unbeatable reputation. 160 thru 10 metres including the new WARC bands. All-mode capability, SSB, CW, AM, FSK and FM transmit and receive. Teamed with the FTV-901R transverter coverage extends to 144 & 430MHz.

## FT-707 All solid-state HF mobile transceiver



The definitive HF mobile rig, digital, variable IF bandwidth, 100watts PEP SSB, AM, CW (pictured here with 12 channel memory VFO) Latest bands

## FRG-7700 High performance communications receiver



YAESU's top of the range receiver. All mode capability, USB, LSB, CW, AM and FM 12 memory channels with back up. Digital quartz clock feature with timer. Pictured here with matching FRT-7700 Antenna tuner and FRV-7700 VHF converter.

# TET ANTENNA SYSTEMS

## THE ANTENNA WITH THE DIFFERENCE

TET HF antennas are unique in that they employ dual driven elements with the following distinct advantages—

- Improved gain over conventional arrays.
- Broader bandwidth with lower SWR.
- Enhanced front to back ratio.
- Better matching into solid state transceivers without an A.T.U.
- High power handling capacity.



HB33SP 3 element tri-band beam with dual drive for 14/21/28 MHz

TET manufacture an exciting range of multi-element HF beams including superb monobanders plus HF verticals. Also there is a full range of VHF/UHF antennas most of which have multi-element drive or distinctive technical features.

Model	Description	incl. VAT	Carriage
HB10F2T	2 Ele. Mono Band Beams for 10 Meter Band	50.75	2.75
HB10F3T	3 Ele. Mono Band Beams for 10 Meter Band	73.79	2.75
HB15F2T	2 Ele. Mono Band Beams for 15 Meter Band	57.21	2.75
HB15F3T	3 Ele. Mono Band Beams for 15 Meter Band	88.49	2.75
HB34D	4 Ele. Tri Band Beams for 10/15/20 Meter Band	202.69	5.87
HB23SP	2 Ele. Tri Band Beams for 10/15/20 Meter Band	128.80	2.75
HB33SP	3 Ele. Tri Band Beams for 10/15/20 Meter Band	189.23	4.60
MV3BH	Vertical Antenna for 10/15/20 Meter Band	40.25	1.75
MV4BH	Vertical Antenna for 10/15/20/40 Meter Band	49.50	1.75
MV5BH	Vertical Antenna for 10/15/20/40/80 Meter Band	71.25	1.75
MLA4	Loop Antenna for 10/15/40/80 Meter Band	105.60	2.10

### YOUR LOCAL TET STOCKISTS

**Amateur Radio Exchange,**  
373 Uxbridge Road,  
Acton, London W3

**Amcomm Services,**  
194A Northolt Road,  
South Harrow, Middlesex

**Bredhurst Electronics,**  
High Street, Handcross,  
Haywards Heath,  
West Sussex RH17 6BW

**Stephens James Ltd.,**  
47 Warrington Road,  
Leigh, Lancs. WN7 3EA

**Uppington Tele Radio,**  
12-14 Pennywell Road,  
Bristol BS5 0JT

- Full range of VHF/UHF Beams now in stock — an S.A.E. for full details please

**TET SOLE AGENTS**



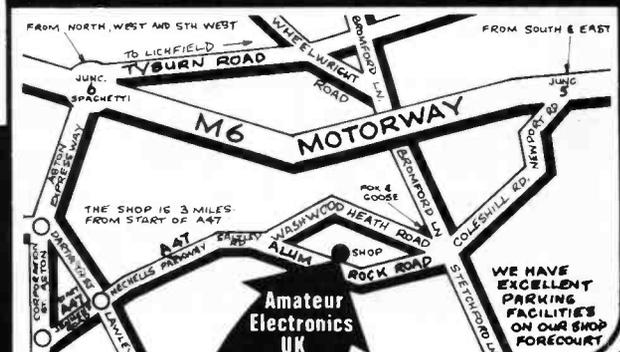
**Amateur Electronics UK**

**504-516 Alum Rock Road - Birmingham 8**  
**Telephone: 021-327 1497 or 021-327 6313**

**Telex: 334312 PERLEC G**

**Opening hours: 9.30 to 5.30 Tues. to Sat.**  
**continuous - CLOSED all day Monday.**

### WHERE TO FIND US



# KEEP AHEAD WITH THE NEW FT-102!

Once again YAESU lead the field with the exciting new FT-102 HF transceiver—no other manufacturer offers so many innovative features.



## Better Dynamic Range

The extra high-level receiver front end uses 24 VDC for both RF amplifier and mixer circuits, allowing an extremely wide dynamic range for solid copy of the weak signals even in the weekend crowds. For ultra clear quality on strong signals or noisy bands the high voltage JFET RF amplifier can be simply bypassed via a front panel switch, boosting dynamic range beyond 100dB. A PLL system using six narrow band VCOs provides exceptionally clean local signals on all bands for both transmit and receive.

## Total IF Flexibility

An extremely versatile IF Shift/Width system, using friction-linked concentric controls and a totally unique circuit design, gives the operator an infinite choice of bandwidths between 2.7kHz and 500Hz, which can then be tuned across the signal to the portion that provides the best copy sans QRM, even in a crowded band. A wide variety of crystal filters for fixed IF bandwidths are also available as options for both parallel and cascaded configurations. But that's not all; the 455kHz third IF also allows an extremely effective IF notch tunable across the selected passband to remove interfering carriers, while an independent audio peak filter can also be activated for single-signal CW reception.

## New Noise Blanker

The new noise blanker design in the FT-102 enables front panel control of the blanking pulse

width, substantially increasing the number of types of noise interference that can be blanked, and vastly improving the utility of the noise blanker for all types of operation.

## Commercial Quality Transmitter

The FT-102 represents significant strides in the advancement of amateur transmitter signal quality, introducing to amateur radio design concepts that have previously been restricted to top-of-the-line commercial transmitters; far above and beyond government standards in both freedom from distortion and purity of emissions.

## Transmitter Audio Tailoring

The microphone amplifier circuit incorporates a tunable audio network which can be adjusted by the operator to tailor the transmitter response to his individual voice characteristics before the signal is applied to the superb internal RF speech processor.

## IF Transmit Monitor

An extra product detector allows audio monitoring of the transmitter IF signal, which, along with the dual meters on the front panel, enables precise setting of the speech processor and transmit audio so that the operator knows exactly what signal is being put on the air in all modes. A new "peak hold" system is incorporated into the ALC metering circuit to further take the guesswork out of transmitter adjustment.

## New Purity Standard

Three 6146B final tubes in a specifically configured circuit provide a freedom from IMD products and an overall purity of emission unattainable in two-tube and transistor designs, while a new DC fan motor gives whisper-quiet cooling as a standard feature. For the amateur who wants a truly professional quality signal, the answer is the Yaesu FT-102.

## New VFO Design

Using a new IC module developed especially for Yaesu, the VFO in the FT-102 exhibits exceptional stability under all operating conditions.

## ANCILLARY EQUIPMENT

### SP-102 EXTERNAL SPEAKER/AUDIO FILTER

The SP-102 features a large high-fidelity speaker with selectable low- and high-cut audio filters allowing twelve possible response curves. Headphones may also be connected to the SP-102 to take advantage of the filtering feature, which allows audio tailoring for each bandwidth and mode of operation to obtain optimum readability under a variety of conditions.

### FC-102 1.2 KW ANTENNA COUPLER

### FV-102DM SYNTHESIZED, SCANNING EXTERNAL VFO

## NEW! FT-230R 25watt 2m FM mobile



- Two independent VFO's
- 10 memories ● Priority function
- Memory and band scan
  - 12.5/25 KHz steps
  - Large LCD readout.

## FT-290R All-mode 2 m portable



10 memories, 2 VFO's,  
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The ATC 720 will revolutionise air band monitoring. At the flick of a switch you can immediately dial up any one of the 720 VHF aircraft channels. In fact, it works just like the receivers built into the pilots cockpit. This means no more wondering whether you are tuned to the right frequency. The clear, white on black thumbwheel digits give instant confirmation of the channel frequency and the drift-free performance of the circuitry ensures that it will stay spot on channel indefinitely.

A new high sensitivity circuit ensures that even the weakest of signals can be copied and there is an external aerial socket so that it can be used indoors as a base station monitor. Extensive fatigue-free monitoring is possible using the squelch control setting and a built-in earphone socket provides for private listening. Included with the set is a flexible rubber antenna, rechargeable batteries and AC mains charger.

Two models are available; the ATC 720SP is designed for commercial and professional applications, housed in a metal case and built to a stringent specification to meet all kinds of environments; the model ATC 720 uses plastic mouldings and is rated for normal domestic and flying club use.

Whether you're a pilot, engineer or aircraft enthusiast, you'll enjoy the performance of these monitors. Follow the action at air shows and listen to the skills of the air crews as they guide their aircraft through the air lanes and finally down onto the runway.

### SPECIFICATIONS

Frequency range	:118-136MHz	Sensitivity	:0.5uv
Channel Steps	:25kHz	Selectivity	:8kHz/6dB & 25kHz 60dB
Mode	:AM	Antenna	:50 ohms.



## FDK MULTI-700EX

2m 25W OUTPUT  
+ PRIORITY SCANNING



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2m (& 70cm) ALL-MODE



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£ 289 inc VAT

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	Digital R.O.	725.00 (—)
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FP707	8 Band Transceiver 20W Pep	485.00 (—)
FP707	Matching Power Supply	125.00 (5.00)
FTV 707R(2)	Transverter — 2M	198.00 (—)
FV 707DM	Digital V.F.O.	203.00 (—)
FC707	Matching A.T.U./Power Meter	85.00 (1.00)
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Multi 750E	2m Multimode Mobile	289.00 (—)
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WELZ SP400	2m/70	59.00 (1.00)
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Fxi Wavemeter	250MHz MAX	33.00 (0.75)
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MMD 50/50	Microwave Mduls. Freq. Coun.	69.00 (—)
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SP230	External Speaker Unit	34.98 (1.50)
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TS130V	8 Band 20W Pep Transceiver	445.00 (—)
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SP120	Base Station External Speaker	23.00 (1.50)
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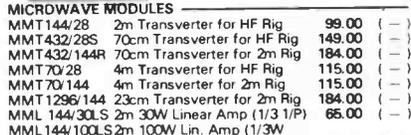
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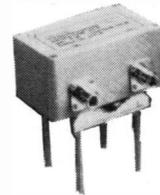
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.2dB insertion loss  
3SK97 GASFET

These are high power 240V linears using 4C x 150 or 4C x 250 or 4C x 350 Eimac  
Tubes NOT using the grounded Grid system.  
Fully protected, no thermal damage to PA finals possible.

**ICOM**

**HF TRANSCEIVERS**

IC730 200W	£586.00
IC2KL 500W linear	£839.00
IC2KLPS Power Supply	£211.00
IC AT100 100W auto A.T.U.	£249.00
IC AT500 500W auto A.T.U.	£299.00

**ICOM**

**ACCESSORIES**

BP5 IIV Pack	£30.15
BP4 Empty case for 6XAA	£5.80
BP3 STO Pack	£15.50
BP2 6V Pack	£22.00
DC1 12V adaptor	£8.40
WM9 Mic speaker	£12.00
CP1 Mobile Charging load	£3.20
LC1/2/3 cases	£3.50
BC30 base charger	£39.00
MML1 10W Booster	49.00

**TRIO/KENWOOD**

TS930S	POA
TS830S HF Transceiver	£680.00
TS130S HF Transceiver	£530.00
TR8400 UHF mobile	£320.00
TR9500 UHF Multimode	£440.00
TR7800 VHF mobile	£268.00
TR7850HP FM 2m	£295.00
TR7730 2m FM	£230.00
TR9000	£370.00

Many Trio/Kenwood accessories available

**YAESU**

FT1	£1295.00
FT902 DM	POA
FT101Z	POA
FT101ZDFM	POA
FT101ZDAM	POA
FT707 200W PEP	POA
FP707 PSU	POA
FC707 ATU	POA
FV707 DM VFO	POA

**SPECIAL OFFERS**

FT707 + FP707 + FC707  
SPECIAL PRICE POA

FT277ZD Soco all extras inc	POA
FT7670X	POA
FT902DM Sommerkamp	POA
FC902 ATU	POA
FV901 DM VFO	POA
SP901 speaker	POA
YO901P Scope	POA
FTV901 Transverter	POA
FT208 VHF	POA
FT708 UHF	POA
FT290 Multimode	POA

**ALL ACCESSORIES AVAILABLE**

**CUSHCRAFT ANTENNA**

HF, A3 20/15/10 3 ele beam 8dB	£170.00	ARX 2B Ring Ranger 6dB vertical	£32.00	144-10T x YAGI	£38.95
AV3 20, 15, 10 Trapped vertical	£39.95	CS100 Speaker	£13.50	144-20T x YAGI	£55.00
AV5 10, 15, 20, 40, 80, Trapped vertical	£84.95	A144, 44 ele Yagi	£18.25	147-20T	
		A144, 77 ele Yagi	£23.00	144 - 146 x YAGI	£55.00
		A144, 11 11 ele Yagi	£29.95		
214B 14 ele boomer 05, 2dB	£59.95	ARX2K Conversion Kit RINGO MkI to Ringo MkII	£14.18		

**MICROWAVE MODULES**

MMA 144V 2m Preamp	£34.90
MML 144/25 RF AMP	£59.00
MML 144/40	£77.00
MML 144/100S New with Preamp	£129.95
MMT 432/144 2-70 Transverter	£184.00
MMT 2B/144 10m Transverter	£99.00
MM 81 Morse Talker	£115.00

**MM 4000 RTTY**  
**SEE IT WORKING AT OUR SHOP**  
£299.00 inc. keyboard  
Full range stocked

**STANDARD**

CPB 58	£79.50
CPB 78	£67.50
C78 70cm Portable	£219.00
C58 2mtr. Port ssb/FM	£239.00
CMB8 Mounting tray	£19.95
CLB Carry case	£6.95
Battery charger	7.95
Set Nicads.	11.00

**ROTATORS ETC**

DIAWA	
DR7600X	£135.00
DR7600R	144.00
DR7500R	£105.00
KENPRO	
KR250	£44.00
KR400	£90.00
HAM IV	£189.00
CHANNEL MASTER 9502	£50.00
CN620 1.8-150MHz Pwr/swr	£52.00
CN2002 2.5 kW PEP auto ATU	£190.00

**DATONG**

PCI G/C converter HF on 2mtr	£120.75
VLF very low frequency converter	£25.30
FL1 frequency agile audio filter	£67.85
FL2 multimode audio filter	£89.70
ASP/B auto RF speech processor (Trio)	£79.35
ASP/A auto RF speech processor (Yaesu)	£79.35
D75 manually controlled RF Sp/Processor	£56.35
RFC/M RF speech clipper module	£26.45
D70 Morse rotor	£48.45
AD270 indoor active antenna	£37.95
AD370 outdoor active antenna	£51.75
MPUT1 PSU for above	£6.90

**RECEIVERS ALL ON SPECIAL OFFER -**

R600 Trio/Kenwood	} POA PHONE HOT LINE 01-556 1415
R1000 Trio/Kenwood	
FRG7 Yaesu	
FRG7700 Yaesu	
FRG7700 Memory	
FRT7700 Tuner	
FRV7700 A/B/C/D/E Convertors	
TC2001 inc. M/Adaptor	£148.00
SEARCH II	£55.00



**ICOM PORTABLES**

IC2E FM 2m	£159.00
IC202 SSB	£169.00
IC402 70cm	£242.00
IC4E FM 70cm	£199.00

All accessories available - see below

**ICOM MULTIMODES**



IC251 2m	£495.00
IC451 70cm	
IC290 2m	£366.00

**ICOM FM MOBILES**



IC24G	£165.00
IC25E	£259.00

**ICOM 720A G/C**



IC720A 200W	£883.00
PS15 Power Supply	£99.00
PS20/P/S with speaker	£130.00
IC730 See panel, below left	

**ALL ACCESSORIES AVAILABLE - PLUGS SKTS CO-AX 2MTR COLINEAR £31.50, 70CM COLINEAR £31.50**



**PRICES INCLUDE VAT AT THE PRESENT RATE OF 15%**  
**OPEN MON-FRIDAY 9:00-5.30. SATURDAY 10:00-3:00. INSTANT HP FACILITY AVAILABLE**  
**EASY ACCESS M2-M11-M1 NORTH CIRCULAR ROAD-EASY PARKING**



**SMC SERVICE**

Free Finance on most substantial items. Two year warranty on Yaesu Musen. Free Securicor on major Yaesu equipment. Access and Barclaycard over the 'phone. Biggest branch, agent and dealer network. Ably staffed and equipped service dept. Securicor 'B Service' contract at £4.49. Biggest stockist of amateur equipment. Twenty-four years of radio experience.

**FREE FINANCE**

On *regular* priced items from Yaesu, Ascot SMCHS, CDE, HyGain, Channel Master, Hansen, SMC, MFJ, KLM, Mirage and Hy Mound, on invoices over £100 SMC offers Free Finance! How is it done? Simple, pay 20%, split the balance equally over 6 months or pay 50% down and split the balance over a year. *You pay no more than the cash price!!*

**GUARANTEE**

Yaesu's *own* warranty does not extend outside Japan. Repairs are the responsibility of the UK retailer. SMC's two year guarantee is backed, as UK distributors, by daily contact with the factory and many tens of thousands of pounds of spares and test equipment. Avoid hawkers offering sets without serial numbers, spares, service or advice back up.

**NEW SHOWROOM:**

Our superb new showrooms located within our new administrative headquarters in Rumbridge Street (abuts the Osborne Road Stores/Service/Manufacturing complex) is now open six days a week 9 till 5-30.

Six "Yaesu line up length" demonstration benches provide you with full "on the air" and "side by side" evaluation facilities. Check out a FT102, FT-ONE or FT230R today.

**SUPER SELECTION**

In our catalogue you will find the widest selection anywhere:— 200 stock lines of Yaesu, 600 different antennas, masts, rotators, coaxes, plus 300 items of communications equipment.

If that is not enough to tempt you into our showrooms how about:— a FT107 (right), the six super prices (overleaf), a Bearcat 220 for £195, a MMT432/28 for £119 or a Hokoshin gutter mount ¼λ for £10!!

**— SUPER SALE!**

As part of our inventory rationalisation scheme we are delighted to announce:—

Substantial price reductions on the FT107 and accessories (see 'Sale' row).

Buy a FT107 and you can choose your accessories from the 'Line up' prices.

If sight of the full line up:— (FT + FP + DMS + FV + FTV + 144TV + SP — List £1,267.30) is too much to stand, it's yours for £999!!



	FT107M	FP107	FP107E	DMS	FV107	FTV107	SP107P	SP107
LIST	£725.00	£101.95	£113.10	£92.75	£98.50	£119.20	£57.50	£29.90
SALE		£90.00	£100.00	£90.00	£80.00	£110.00	£55.00	£29.00
LINE-UP	£625.00	£80.00	£90.00	£80.00	£60.00	£100.00	£50.00	£25.00

**WIDE COVERAGE ALL MODE Rx; FRG 7700 £329 inc. VAT @ 15% & SECURICOR**



'7700 THE ONE WITH FM!

- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory option with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz, @ — 6dB.
- ★ 3 Selectivities on AM, squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500 Ω to 2MHz, 50 Ω to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Switchable A.G.C. Variable tone.
- ★ 110 and 240Vac plus 12Vdc option.
- ★ Signal meter calibrated in "S" and SIMPO
- ★ Acc; Tuners, Converters, LPF, Memory.
- ★ FR7700; 150kHz-30MHz, Switch, etc.
- ★ FRV7700A; 118-130, 130-140, 140-150MHz.
- ★ FRV7700B; 118-130, 140-150, 50-59MHz.
- ★ FRV7700C; 140-150, 150-160, 160-170MHz.
- ★ FRV7700D; 118-130, 140-150, 70-80MHz.
- ★ FRV7700E; 118-130, 140-150, 150-160MHz.
- ★ FRV7700F; 118-130, 150-160, 170-180MHz.
- ★ FF5; 500kHz (for improved VLF reception).
- ★ MEMGR7700; 12 Channels (internal fitting).
- ★ FRA7700; Active Antenna.

**SOUTH MIDLANDS COMMUNICATIONS LTD**

S.M. HOUSE, OSBORNE ROAD, TOTTON, SOUTHAMPTON, SO4 4DN, ENGLAND  
Tel: Totton (0703) 867333, Telex: 477351 SMCMM G, Telegram: "Aerial" Southampton



**GRIMSBY**

S.M.C. (Humberside)  
247A Freeman St.,  
Grimsby, Lincolnshire.  
Grimsby (0472) 59388  
9.30-5.30 Tuesday-Sat.-day

**STOKE-ON-TRENT**

S.M.C. (Stoke)  
76 High Street,  
Talke Pits, Stoke,  
Kidsgrove (07816) (72644)  
9.5.30 Tuesday-Saturday

**LEEDS**

S.M.C. (Leeds),  
257 Otley Road,  
Leeds 16, Yorkshire.  
Leeds (0532) 782326  
9.5.30 Monday-Saturday

**CHESTERFIELD**

S.M.C. (Jack Tweedy) Ltd.  
102 High Street,  
New Whittington, Chesterfield.  
Chesterfield (0246) 453340  
9.5 Tuesday-Saturday

**BUCKLEY**

S.M.C. (T.M.P.)  
Unit 27, Pinfold Workshops,  
Pinfold Lane, Buckley.  
Buckley (0244) 549683  
9.30-5.30 Tues-Sat (Lunch 1-2)

**SMC AGENTS**

- |             |       |        |  |           |        |        |               |        |       |        |  |
|-------------|-------|--------|--|-----------|--------|--------|---------------|--------|-------|--------|--|
| Edinburgh   | Jack  | GMBGEC | { (031657) 2430 day<br>(031665) 240 eve. | Bangor    | John   | GI3KDR | (0247) 53162  | Neath  | John  | GW4FOI | { (0639) 55114 day<br>(0639) 2942 eve. |
| Stourbridge | Brian | G3ZUL  | (03843) 5917                             | Tandragee | Mervyn | GI3WVY | (0762) 840656 | Jersey | Geoff | GJ4ICD | (0634) 26788                           |

**FT ONE £1,295 inc.** VAT @ 15% & SECURICOR



\*Option

**TWO YEAR WARRANTY**

- ★ Rx: 150KHz-30MHz. Continuous general coverage.
- ★ Tx: 160-10m (9 bands) or 1.5-30MHz commercial.
- ★ All Modes: AM, CW, FM\*, FSK, LSB, USB.
- ★ 10 VFO's!!! Any Tx-Rx split within coverage.
- ★ Two frequency selection ways, *no* bandswitch.
- ★ Main dial, velvet smooth, 10Hz resolution.
- ★ Inbuilt keyboard with up/down scanning.
- ★ Dedicated digital display for RIT offset.
- ★ Receiver dynamic range up to 100dB!!!
- ★ SSB: Variable bandwidth *and* IF shift.
- ★ 300\* or 600Hz\*, 2,400 → 300Hz, 6kHz\*, 12kHz\*.
- ★ Audio peak and notch filter. FM squelch.
- ★ Advanced variable threshold noise blanker.
- ★ 100W RF, key down capability, solid state.
- ★ Mains and 12VDC. Switch mode PSU built in.
- ★ RF processor. Auto mic gain control. VOX.
- ★ Last but not least *full* break-in on CW.

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ Audio Peak and independent notch controls.
- ★ AM, FSK, USB, LSB, CW, FM, (TX and RX).
- ★ Semi-break in, inbuilt Curtis IC Keyer.
- ★ Digital plus analogue frequency displays.
- ★ VOX built-in and adjustable.
- ★ Instant write in memory channel.
- ★ Tune up button (10 sec, of full power).
- ★ Switchable AGC and RF attenuator.
- ★ Optional 350 or 600 Hz CW, 6kHz, AM filters.
- ★ Clarifier (RIT) switchable on TX, RX or both.
- ★ Plug in modular, computer style constructor.
- ★ Fully adjustable RF Speech processor.
- ★ Ergonomically designed with necessary LEDs.
- ★ Incredible range of matching accessories.
- ★ Universal power supply 110-234V AC and 12V DC.

**FREE FINANCE**

**FT902DM £885 inc.** VAT @ 15% & SECURICOR



\*Option

- ★ 1.8-3.5-7-10-14-18-21-24.5-28MHz
- ★ All modes: — LSB, USB, CW, AM±, FM±, (±Option board)
- ★ Front end: extra high level, 24V DC operation
- ★ RF stage bypassable, boosts dynamic range over 100 dB!
- ★ Variable bandwidth 2.7KHz→500Hz *and* IF Shift
- ★ Fixed bandwidth filters, parallel or cascade configurations
- ★ IF notch (455KHz) *and* independent audio peak
- ★ Noise blanker adjustable for pulse *width*
- ★ External Rx and separate Rx antenna provisions
- ★ *Three* 6146B in special configuration — 40 dB IMD!
- ★ Extra product detector for checking Tx IF signal
- ★ Dual meter, peak hold ALC system
- ★ Mic amp with tunable audio network
- ★ **SP102** — Speaker, Hi and Lo AF filters, 12 responses!
- ★ **FV102** — VFO, 10Hz steps and readout, scanning, QSY.
- ★ **FC102** — ATU, 20/200/1200 W FSD PEP, wire.
- ★ **FAS-1-4R** — 4 way remote waterproof antenna selector.

**FT 102 £725 inc.** VAT @ 15% & SECURICOR



**FREE SECURICOR**

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4kHz down to 300Hz.
- ★ Selectable CW fixed bandwidth CW-W and CW-N\*
- ★ Semi-break in with sidetone for excellent CW.
- ★ Digital plus analogue frequency displays.
- ★ 180W PIP and — 31dB 3rd order intermod.
- ★ RF speech processor fitted — adjustable level.
- ★ VOX built-in and is adjustable from the front panel.
- ★ Wide dynamic range for big signal handling.
- ★ High usable sensitivity, for those weak ones.
- ★ Superb noise blanker — adjustable threshold.
- ★ Attenuator; 0-10-20dB, AGC; slow-fast-off.
- ★ Clarifier (RIT) switchable on TX, RX or both.
- ★ Low level transverter drive output facility.
- ★ Universal power supply 110-234V AC and 12V DC\*.
- ★ Incredible range of matching accessories
- ★ 6 models: Digital/Analogue — AM/FM options.

**'INSTANT' H.P.**

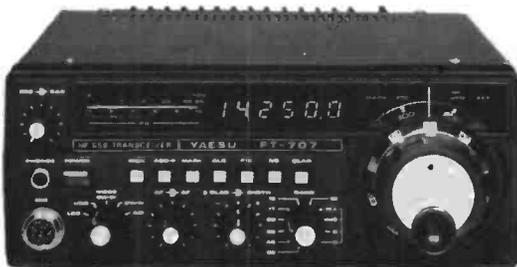
**FT 101ZD £635 inc.** VAT @ 15% & SECURICOR



\*Option

- ★ 80-10 metres (including 10, 18 and 24MHz bands).
- ★ USB-LSB-CWW-CWN-AM (Tx and Rx operation).
- ★ 100W PEP. 50% power output at 3:1 VSWR.
- ★ Full "broad band" no tune output stage.
- ★ Excellent Rx dynamic range, power transistor buffers.
- ★ Rx Schottky diode ring mixer module.
- ★ Local oscillator with ultra-low noise floor.
- ★ Variable IF bandwidth — 16 crystal poles.
- ★ Bandwidths 6kHz\*, 2.4kHz-300Hz. (600 350) Hz\*
- ★ AGC; slow-fast switchable VOX built-in.
- ★ Semi-break in with side tone for excellent CW.
- ★ Digital (100Hz) plus analogue frequency display.
- ★ LED Level meter reads: S, PO and ALC.
- ★ Indicators for: calibrator, fix, int/ext VFO.
- ★ Receiver offset tuning (RIT-clarifier) control.
- ★ Advanced noise blanker with local loop AGC.

**FT707 £569 inc.** VAT @ 15% & SECURICOR



**VISA ACCESS**

\*Option



OVER  
33%  
OFF!!

Reductions shown are taken from previously advertised prices and are not necessarily those that the equipment has been offered continuously for the last 28 days. Certain items are shop soiled/ex demo - please enquire

**2m SYNTHESISED £175 inc.**  
**FT227RB.** 10W remote tuning transceiver.  
**FT227RXS.** 227 fitted special scanner £195.



OVER  
40%  
OFF!!

Reductions shown are taken from previously advertised prices and are not necessarily those that the equipment has been offered continuously for the last 28 days. Certain items are shop soiled/ex demo - please enquire

**2m SYNTHESISED £205 inc.**  
**CPU2500RKS.** 10W keyboard mic up/down tuning etc., 25W RK model £210, 25kHz stepper version £220.



SUPER  
PRICE

**COMMUNICATIONS RX £995 inc.**  
**NRD515,** 100kHz - 30MHz, Digital, Electronic tune, 100Hz VFO. SSB/AM/CW/RTTY.



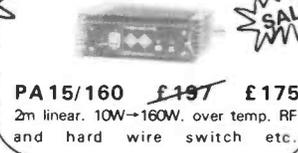
SAVE  
£20

**2m, 25W, FM, £179 inc.**  
**2025 MARK II** full coverage 2M Transceiver, 12½ kHz (set 12½-200kHz), rapid tune, 10 "easy write" memory channels, memory or band-scan between programmable limits, auto scan stop dependent on squelch and centre zero.



**KP202**  
**c/w KCP 2**  
~~£146.34~~  
**£100 inc.**

6 chnl, 2W,  
144MHz Handheld  
c/w charger  
Telescopic ant  
S20, S21 etc.,  
Extra crystals -  
stock items only -  
£1.00 each!!!!



**PA 15/160** ~~£197~~ **£175**  
2m linear. 10W→160W. over temp. RF  
and hard wire switch etc.



**YC 221** ~~£83.38~~ **£35.00**  
Digital readout for FT221R (suffix D)  
FT221 buffer kit £3.00



£50  
OFF

**2m, 250W (+) PEP. £459**  
**NAG 144XL LINEAR.** 4CX350F tube, 10W nom. drive, switchable pre-amp. RF and hard switching. Thermal delay.

**FT207R: SALE!**

**£159 inc** VAT @ 15% & POSTAGE

LOW  
PRICE



- ★ 144-146MHz (144-148 possible)
- ★ 4 bit CPU chip for freq. control
- ★ Keyboard entry of frequencies
- ★ Keyboard lockout safety feature
- ★ Digital display to hundreds of Hz
- ★ Display auto shutdown timer
- ★ Four Channels of memory
- ★ Memory back up disable switch
- ★ Up/down manual tuning

- ★ Bandscan for busy or clear channels
- ★ Memory scanning features
- ★ ±600kHz split built in
- ★ Any split + or - programmable
- ★ BNC antenna connector
- ★ "On Air" and "Channel Busy" LEDs
- ★ Built in condenser microphone
- ★ 200mW AF to internal/external speaker
- ★ 2.5/0.2W of RF output
- ★ Rx: 35mA squelch, 150mA full vol.
- ★ Tx: 250mA low, 800mA high
- ★ 0.3µV for 20dB quieting
- ★ External speaker/mic available
- ★ 1.7 (2.2)" D x 2.5 (2.7)" W x 6.7 (7.2)" H
- ★ C/w Easychange NiCad pack, case, helical

- ★ 144-146MHz (144-148 possible).
- ★ 25 watts RF output (Low 2.5W).
- ★ 150 (W) x 50 (H) x 176 (D) mm. 1.3Kg.
- ★ Selectable 12½ or 25kHz steps.
- ★ Up/down, memory/band scanning.
- ★ Ten Memories with priority function.
- ★ Easy "write-in" memory channels
- ★ Large illuminated "any angle" LCD display.
- ★ Display to 100's of Hz + special functions.
- ★ Two independent VFO's.
- ★ Operation between memory and "other" VFO.
- ★ Memory backup "5 year" lithium cell.
- ★ ± 600kHz and/or simplex.
- ★ Manual and automatic tone burst.
- ★ Large "full sound" speaker.
- ★ Concentric volume/squelch controls.

**FT230R £239 inc.** VAT @ 15% & SECURICOR



- ★ Multimode USB, LSB, FM, CW
  - ★ 100Hz backlit LCD Frequency display
  - ★ 10 memory channels '5 year' backup
  - ★ Any Tx/Rx split with dual VFOs
  - ★ Up/down tuning from microphone
  - ★ AF output 1W @ 10% THD
  - ★ Bandwidth 2.4kHz and 14kHz @ -6dB
  - ★ LED's; 'On Air', 'Busy'. m/c meter; S, PO.
  - ★ 58 (H) x 150 (W) x 195 (D) (1.3kg)
- |                                |       |
|--------------------------------|-------|
| SMC2.2C NiCad 2.2 A/hr, 'C'    | 2.70  |
| SMC8C Slow Charger (220mA)     | 8.80  |
| MMB11 Mobile Mount             | 22.25 |
| CSC1 Soft carrying case        | 3.45  |
| FL2010 Linear Amplifier 2m 10W | 64.40 |
| FL7010 Linear Amplifier 70cms  | 99.65 |



**FT290R**  
**£249 inc**

VAT @ 15%  
& POSTAGE

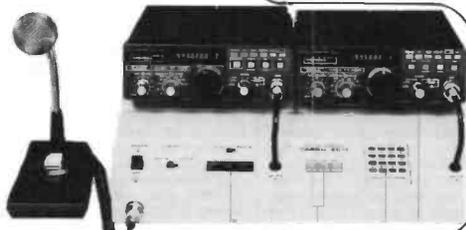
- ★ 144-146MHz (144-148) possible
- ★ 2.5W PEP, 2.5W RMS/300mW out
- ★ FM: 25kHz and 12.5kHz steps
- ★ SSB: 1kHz and 100Hz steps
- ★ ±600 kHz repeater split 1750kHz burst
- ★ Integral telescopic antenna
- ★ Rx, 70mA, Tx; 800mA (FM maximum)

**FT790R**  
**£299 inc.**

VAT @ 15%  
& POSTAGE

- ★ 430-440MHz (440-450 alternative)
- ★ 1W PEP, 1W/250mW FM/CW out
- ★ FM: 100kHz and 25kHz steps
- ★ SSB: 1kHz and 100Hz steps
- ★ 1.6MHz shift with input monitor,
- ★ 1750Hz burst
- ★ Rx; 100mA/200mA. Tx; 750mA max
- ★ BNC Mounting ½ flexi antenna

- ★ USB-LSB-CW-FM (A3, A1, F3).
- ★ 30W PIP A3, 10/1W out A1 F3.
- ★ Any Tx Rx split with dual VFO's.
- ★ Four easy write-in memory channels.
- ★ Memory scanning with slot display.
- ★ Up/down tuning/scanning from mic.
- ★ Priority channel on any memory slot.
- ★ Digital RIT. Advanced noise blanker.
- ★ Satellite mode allows tuning on Tx.
- ★ Semi break in with side tone.
- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx & Rx freq (inc RIT).
- ★ String LED display for 'S' and PO.
- ★ LED's; 'On Air' Clar, Hi/Low, FM mod.
- ★ Size (Case): 8.3" D, 2.3" H, 6.9" W.



Ills. c/w SCI station console and YD148 mic.

**FT480R (2m) £379 inc.** VAT @ 15%  
& SECURICOR

- ★ 144-146MHz (143.5-148.5 possible).
- ★ ±600kHz standard repeater split.
- ★ Excellent dynamic range and sensitivity.
- ★ FM; 25, 12½, 1kHz steps.
- ★ SSB; 1,000, 100, 10Hz steps.

- ★ FT780R 1.6 fitted 1.6MHz Shift £459 inc.
- ★ 430-434MHz (440-445 possible).
- ★ GaAs Fet RF for incredible sensitivity.
- ★ FM; 100kHz, 25kHz, 1kHz, steps.
- ★ SSB; 1,000, 100, 10Hz steps.

**FT780R (70cm) £499 inc.** VAT @ 15%  
& SECURICOR

- ★ Keyboard entry of frequencies/splits
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- ★ Priority channel with search back
- ★ Scan between any two frequencies
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- ★ External speaker/mic. available
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**£209 inc.**

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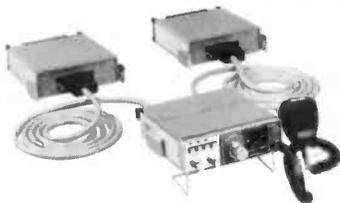
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- ★ 12.5/25kHz synthesizer steps.
- ★ ±600kHz repeater split.
- ★ 2.5 or 0.3W RF output.
- ★ Rx: 20mA squelch 150mA max. AF.
- ★ Tx: 800mA at 2.5W RF.
- ★ 0.25µV for 12dB SINAD.

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- ★ Rx 0.5A, Tx 4.5A.
- ★ 5.8 (6.5)" D x 6" W x 2 (2.2)" D.

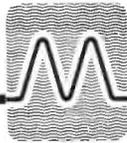
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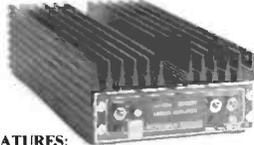
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# SHORT WAVE MAGAZINE

(GB3SWM)

ISSN: 0037-4261

Vol. XL

AUGUST, 1982

No. 466

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Editor: PAUL ESSERY, G3KFE/G3SWM

Advertising: Charles Forsyth

Published at 34 High Street, Welwyn, Herts. AL6 9EQ, on the last Friday of the month, dated the month following.  
Telephone: 04-3871 5206 & 5207

Annual Subscription:

Home: £8.40, 12 issues, post paid  
Overseas: £8.40 (\$17.00 U.S.), post paid surface mail

Editorial Address: Short Wave Magazine,  
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# AMATEUR RADIO EXCHANGE



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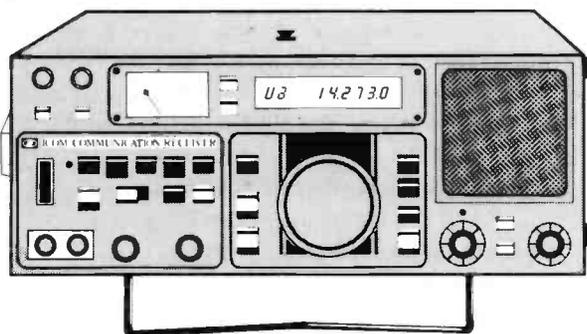
Customers often ask, after they have decided on a new rig, whether it's the most up-to-date equipment on the market, or whether there is something even more exciting lurking round the corner... and our honest answer to that question has to be that, however sophisticated the rig you buy, there is **always** something newer on some manufacturer's launching pad. The trouble is, if you insist on waiting for the ultimate rig, you'll miss out on a lot of superb equipment in the meantime.

The recent progress in communications receivers is a case in point. About seven years ago YAESU introduced an absolute gem of a receiver, the FRG-7, which sold by the thousand

world-wide, and is still in demand today as sheer good value for money when funds are limited.

Then, however, TRIO/KENWOOD burst upon the market with their even more remarkable R-1000. YAESU's answer was not long delayed, and came in the form of the FRG-7700 which outclassed even the R-1000 and has been, until today, the market-leading receiver...

...until today, and the entry of a new name into the receiver field, namely ICOM, who are about to announce a really outstanding new model which we had the opportunity to see and try on our recent trip to Japan. Having done so, we are convinced that everyone who wants the best in today's receiver technology will now be asking for ICOM. Here are just a few of its key features.



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The further fruits of our trip to the Land of the Rising Sun are a whole new generation of scanning receivers, all synthesised (of course!), for UHF, VHF and Low Band, with digital readout, scanning in 5/10/12.5/25kc steps, and in hand-held and mobile format. Also airband receivers, including a professional-type model tunable from 118 to 136MHz on AM.

All of these should start to arrive in August, so come and hear the full story.



Ever wanted to decipher all those funny morse code (CW) and radio teletype (RTTY) noises you hear on your communications receiver? Well, now you can—with the new TASCOWARE telereader CWR-680.

Simply connect the input side of the Telereader to your receiver or transceiver, and the output either to a domestic TV (UHF) or to a proper VDU which we can also supply. RTTY and CW will be automatically demodulated and displayed on the screen, CW at speeds of up to 250 characters per minute, RTTY at between 45.5 and 110 Bauds.

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

# The SHORT WAVE Magazine

## EDITORIAL

### Various Things

We still haven't had any great amount of input on the question of MCC; we need some opinions and constructive suggestions *urgently*, or we shall have to conclude that MCC is no longer of use to the Amateur Radio scene.

The Home Office has issued a press release, dated June 15, discussing the setting-up of an independent review of the radio spectrum 30-960 MHz. This review is being set up as the result of pressure from the Land Mobile Services user, we guess. Quite clearly the pressure has been in the direction of releasing the old 405-line channels TV to the land mobiles more or less *in toto*, but we would hope that there will be an RSGB input to this review, both to defend our existing bands and, hopefully, to regain our long-lost five-metre allocation. For the rest, we must make quite sure that all our VHF Bands, and particularly 70 MHz, are well patronised, or the review, in accordance with its terms of reference (to look at ill-used allocations), will doubtless think of putting the axe in. Again the cry must go up "use or lose!"

Continuing with our belief that it is at the club level that our hobby is fostered, we propose to augment the existing services for clubs by creating a Tape Lecture series, for loan to clubs looking for a means of filling gaps in their programme. Clearly to do this, we will need to have some volunteers to generate tape talks, and the associated slides, on their pet topics. Thus, if any reader has recollection of a well-delivered talk given to his club, perhaps he would let us know the topic and the speaker, and we will make an approach; and of course we will also appreciate any ideas as to suitable subjects. This scheme should not be seen as in any way crossing the RSGB's well-established tape library, but we do realise that there is *always* a requirement for more such facilities, in particular by those who are 'in the sticks' and so not able to gain access to popular speakers.

*John  
3KFE.*

WORLD-WIDE COMMUNICATION

# VHF BANDS

NORMAN FITCH, G3FPK

## Awards News

THE 32nd member of the 432 MHz VHF Century Club is Gordon Emmerson, G8PNN, from Widdrington in Northumberland, his certificate being issued on July 9. He holds VHFCC Certificate no. 330 for 144 MHz already. His station comprises an Icom IC-402 with a 100 watts, solid state amplifier, the aerial being a 19-ele. *Tonna Yagi* at 33 ft. Gordon's QTH is 43m. a.s.l. and 2¼ miles from the coast which can be seen from the shack window. Take-off to the north, east and south is good, but with slight, rising ground to the west, thus far limiting contacts in that direction to G3BW in Cumbria and GD2HDZ in the Isle of Man. Over 40 counties and 14 countries have been worked up to early June, but it took about 18 months to get the 100 QSLs in.

## Satellite News

Object No. 82-33b, otherwise known as *Iskra 2*, re-entered the Earth's atmosphere in the early hours of July 9. On the 80m. AMSAT net, G3EFR said the last orbit he heard the telemetry signal was no. 835 on the preceding day. Just what scientific value this satellite has been remains to be revealed.

As AMSAT members may recall, *OSCAR 8* is now managed by the ARRL and AMSAT-UK believes 0-8 to be switched off completely on Wednesdays to enable the batteries to be recharged. Adrian Chamberlain, G6ADC, (Coventry) is a keen Mode "J" user and his best DX to date is N4AR in Kentucky at 6,320 kms. not far short of the maximum range of approximately 6,450 kms. Apart from *E-M-E*, which requires lots of *e.r.p.*, satellite communication is the only means open to Class B licensees to work really long distances. By carefully working out times and beam headings and choosing horizon-skimming orbits, it is quite possible to work limiting distance stations with a little prior setting up of frequencies and times. This is what G6ADC and N4AR did to conclude their QSO on July 9 at 1119 UT during orbit no. 22,139. Dave Rowan, G4CUO, who lives in Newark-on-Trent, has also worked N4AR at 6,337 kms.

Attempts by Dave Olean, K1WHS, to get the appropriate command signals into

*U-0-9* were unsuccessful, so it would seem that there is little chance that this research satellite will be of any further use. It is very disappointing that this first British built satellite seems to have ended up rather ignominiously before the more interesting experiments could be embarked upon.

Your scribe has written to Jan King, W3GEY, AMSAT (USA) Engineering Vice-President, requesting technical information on the 1,269/436 MHz transponder for the *Phase 3B* satellite, now scheduled for launch on February 13, 1983. During environmental testing, the 436 MHz PA stage of the "L" transponder failed and has been replaced. From this publication date, a mere 28 weeks remain to launch. It seems quite astonishing that essential information has not been published. How can manufacturers be expected to design, develop and manufacture suitable equipment in such a short time span? This is no way to treat the thousands of radio amateurs whose donations have made *Phase 3* possible, not forgetting the considerable funds provided by many national amateur radio societies, and financial and hardware contributions from the space industry. It is time for some digit extraction!

The six, Soviet *RS* satellites are functioning normally. Their orbits, along with those 0-8, *U-0-9* up to September 18, are published in the latest issue of *AMSAT-UK's* excellent *Orbital Calendar*. For details of all AMSAT's services and supplies, contact G3AAJ at AMSAT-UK, London, E12 5EQ.

Finally, please remember that none of the communications satellites should be used on Wednesdays, which days are set aside for special experiments and battery recharging. AMSAT-UK would like details of the call signs of any British Isles stations heard during Wednesdays.

## Beacons

Brian Bower, G3COJ, has advised that the 2m. Wrotham beacon, GB3VHF on 144.925 MHz, will be off the air for one or two months longer. This is to enable the Tx to be modified for rack mounting before transfer to a different building. Some circuit modifications will be made and it is hoped to install a new aerial on the new mast to replace the old one which has been in use for over twenty years.

During the phenomenal tropo. lift of July 8/9, a very strong signal was heard on 144.550 MHz sending, "Traducteur region 5." This could be a French repeater in southern France in beacon mode, but it is an odd frequency and all the more mysterious as no call sign was sent.

## Contest News

**Results:**— The 144 MHz Low Power event on May 2 was well supported in spite of poor conditions. The Fixed section was

won by G8YLH with 1,579 pts. from 225 QSOs. G3NNG — 1,376/220 — was second and G8ZHP — 1,253/162 — third. The All-Other section was won by G4LIP/P — 2,477/229 — with G6EKR — 2,391/252 — in second place. GW4ERP/P was third with the highest number of QSOs, 313, worth 2,137 pts.

First place in the Multi-operator section of the 432/1,296/2,304 MHz contest on May 1/2 went to the Norfolk VHF/UHF Contest Group with 2,615 pts. The Hadrabs C.G. were second with 1,695 pts., and the Leicestershire SHF Group came third with 1,293 pts. This section attracted twelve entries. There were only five entrants in the Single-op. part with G4KIY, G4LRT and G4MUT tying for first place. Individual band results for each category would take too much space to list and full details will doubtless appear elsewhere in due course. **Coming events:** — The 432 MHz Low Power contest runs from 0900 to 1700 on Aug. 1, with Tx output limited to 15 watts. The two sections are Fixed and All-other. The fifth leg of the 10 GHz *Cumulatives* is on Aug. 8 from 0900 to 2000. The 70 MHz Trophy contest is on Aug. 15 from 0900 to 1700 and is another two section affair for Fixed and All-other categories. The weekend Sept. 4/5 sees the 144 MHz *IARU* and *RSGB* events, both from 1400 to 1400. The *IARU* affair is a two section one; Single-op. but the owner of the licence (no club stations) and All-others. *RSGB's* contest is in four parts; Single-op. fixed and Single-op. —/P or —/A, and Multi-op. fixed and Multi-op. —/P or —/A. Usual radial ring scoring for the *RSGB* affair, but one point per kilometre in the *IARU* one.

VHF NFD coincided with mediocre conditions. Even so, Angus McKenzie, G3OSS, (London) worked 59 stations on 23cm., best DX being G3SPJ/P in Co. Durham. He thought activity greater than ever before, some stations giving serial numbers in the 90s and 100s. GW4CBW/P and GW4KGC/P were both very strong signals into London. Angus heard GM4BYF/P for the first ever Scottish station on 23cm. Activity on 4m. was also up and on 2m., fewer poor quality signals were heard.

Dave Sellars, G3PBV, (Devon) found things, "... quite hectic in the last hour before midnight at the end of the SSB section in Field Day." He worked 17 stations but missed the CW session on the Sunday morning, on 4m. Dave's best 70cm. DX was G4IRC/P in Suffolk, while five QSOs were completed on 23cm.

Walt Davidson, GW3NYY, (Swansea), was QRV on 2m. in NFD and worked many Fs, ONs in BK, BL and CL squares, PAs in CL, EIs in VL, VN and WM, GI8HXY (WP) for a new square and GM8MJV/P in YP. An excursion to 70cm. gave EI5DD/P (VN) for a new square. Tony Prior, G8XHL, (Essex) worked his first Frenchman on 70cm. in

NFD and several new 1982 counties. He heard GWs, ONs and PDs but not strong enough to work. His 24-ele. log periodic aerial was only 15ft. up at the time. His Tx/Rx is the *Icom* IC-251E and *MM* transverter.

### Scilly Isles Operations

Although publicity is often requested, and given, for DX-peditions, not all groups write up their results. However, the Royal Air Force A.R.S. has reported on its RAFARS DX-Pedition to St. Marys through the Expedition leader, Flt.-Lt. Dave Rycroft, G8IGZ. Between June 14 and 23, some 700 contacts were made on VHF/UHF. Both G3RAF/P and G8RAF/P were granted temporary high power licences for long distance propagation experiments. Although both the American and Canadian Radio Relay Leagues had been contacted by letter concerning transatlantic tests on 144 MHz, up to the time of departure, no replies had been received. Eventually, K1WHS and K1MNS heard about the idea on 20m. and skeds. were arranged. However, on just about all these, heavy rain and S9 static occurred making weak signal copying impossible. Whether any traces of signals were heard in the U.S.A. has yet to be determined.

None of the team members had had any experience of MS operation, nor did they have high speed CW capability. Nevertheless, they tried to arrange skeds. with the many operators anxious to work WJ square, although they did not encourage this mode themselves. Dave mentions the helpful advice on this mode given by Chris Bartram, G4DGU, whom they contacted. Throughout the period, tropo. conditions were poor and no *E's* or *Auroras* were encountered.

The equipment comprised an *Icom* IC-251E with *muTek* preamp. at the Rx input, not at the masthead. 75ft. of UR67 feeder was used to the four, 16-ele. *Tonna Yagis*, with *Tonna* phasing harnesses and power divider loaned by *Random Electronics*. The VSWR was 1.4:1. No electrical rotator was used and the array was turned manually, a difficult operation around the concrete structure of the Woolpack Gun Battery. Limited tests on the array were made before departure. Due to the continual high winds, it was not easy to keep this sharp array correctly aimed by compass. On 70cm. the "prime mover" was an *Icom* IC-451E, but Dave did not mention the power amplifier or aerial used.

The rest of the team consisted of G3XMU, G3YTT, G3ZDW, G4NSZ, G4NVD, G5DYG, G6ESD, G6FOY and G8RVK. They would like to thank *Thanet Electronics* for the loan of the transceivers, *muTek Ltd.* for the preamps., *Random Electronics* for the aeriels, G4DGU for the big amplifier and lots of advice, and John Moxham, G3KQB, for two coaxial relays.

Summing up, Dave writes, "The execution of the expedition was good and team members were highly motivated." However, your scribe and several others, have remarked upon the lower-than-expected signal strengths received in the London area and of the poor reports given to stations of proven performance at 450 kms. range. On paper, even in flat conditions such a well equipped station should have performed better, but perhaps rain and static are better attenuators than we thought at 144 MHz.

### DX Corner

CT square in Norway was destined to be activated until August 8 by HB9BKQ who was taking 100w. of RF and two 9-ele. *Yagis*. No QRGs known on 2m. GM3WOJ, GM4IGS, and GM8BJF plan operation from rare Scottish squares. Aug. 6 should see them in XS and, during the *Perseids* shower peak, Aug. 11/12, they will be in YT. The gear will be 200w. to a 16-ele. *Yagi* with MS at 400 *l.p.m.* in mind. Contact man is Chris Tran, GM3WOJ, on Fort William (0397) 2527 and "last minute" calls can be made to Troon (0292) 312329 or 315213.

Walt Davidson, GW3NYY, with GWs 6EWA, 8TVX and 8VHI, will be QRV from rare XM square from Aug. 7 to 15, using the callsign GB2XM. Operation at weekends on tropo. on 2m., 70cm., and 23cm. with weekdays devoted to MS, mainly CW mode, Skeds can be made *via* landline with Walt on Swansea (0792) 201111 in the evenings prior to the trip, or by the 20m. VHF net during it. On 2m. the gear consists of full legal power to two 14-ele. *Cushcraft Yagis*; on 70cm., 50w. output to two 21-ele. *Yagis*, and on 23cm., 10w. output to four 23-ele. beams.

GN is a rather rare German square, so listen for Y22SA who has been worked during *Auroras*, and Y21TC. AN is a bit of a rarity too and Derek Brown, G8ECI, is now resident there. G4IJE has made a number of MS skeds. for him and he has become somewhat addicted to the mode. He works in Saudi Arabia and hopes to be back home October/November time. His 2m. station is the *Yaesu* FT-221R with *muTek* "front end," 4CX250B amplifier and 13-ele. *H.A.G.* aerial at 45ft. fed with *Helix* LDF4-50 coax. Derek can be reached at the following address:—

D. C. Brown 67578  
c/o ARAMCO  
P.O. Box 62  
A.C.C. Uthmaniyah  
Via Dhahran  
Saudi Arabia.

As mail is subject to delay and censorship, he asks that no mention of *any* callsigns be made on the envelopes.

The Channel Islands of Alderney now has an active, resident VHF operator in GU3EJL, who has retired there from Surrey. On 2m. he runs 100w. and uses the

*Trio* TS-770 with preamp. his QTH is P.O. Box 9, Alderney, C.I.

### Four Metres

Syd Harden, G2AXI, (Hants.) is way ahead of the table on 4m. adding many more counties during the June 13 contest and NFD. Likewise, Frank Howe, G3FIJ, (Essex) netted nine more counties and a couple of countries on June 13. G3PBV's (Devon) best DX in the 4m. event was G4ANT "as usual," and 17 stations were worked by Dave. Tim Raven, G4ARI, (Leics.) is back on the band with 6w. to crossed dipoles in the loft.

Paul Turner, G4IJE, (Essex) successfully conducted a crossband 4m./2m. MS QSO with DK1PZ (EL) on June 30, receiving a 37 report. Ken Wood, GM3WCS, (Fife) has also had a similar crossband MS QSO with the DK. Derrick Dance, GM4CXP, (Borders) heard ZB2VHF between 1750 and 2000 *via E's* on June 8, up to S7, but has not worked anything this time. Dave Lewis, GW4HBK, (Gwent) also copied ZB2VHF for several hours on June 8. Eight 1982 counties and GD4IOM were added in the June 13 contest. GW3LDH (Clwyd), G4FOH/P (Cambs.), G4ODA/A (Lincs.) and G4IJL (Notts.) were also worked in this event and G3IOI in Essex heard.

### Two Metres

As usual, no lack of reports of Ms, *E's*, *Ar* and tropo. events on this band! G2AXI caught the *E's* on June 5 and got ISOCSX/P and IT9IKG for a couple of all-time new countries. June 20 brought G8RAF/P on the Scillies. LA1EKO (BQ) on the *Ekofisk* platform has been quite active lately and Rod Clews, G3CDK, (Surrey) worked them on July 8. In the excellent south through east tropo. lift of July 6-9, he worked HB9APB/P (DG), F1CCC/P (CG) and F6GIA/P (CH).

A very newsy letter from Roger Thorn, G3CHN, (Devon) covered events up to June 14. On the *Ar* scene, the event on June 10 revealed stations in WP, YO, YQ, YR and XR squares. On the 11th, between 1736 and 1850 yielded SM5MIX (HS) and SM7DLZ (IQ) a new square, plus the U.K. "regulars." The *E's* opening on June 5 gave "... massive coverage of Italy only ..." for Roger, with 20 stations worked and another 13 heard. five were worked using an ancient *Liner 2* and 3-ele. beam in the station roof and in the early part of the event, the Italians were stronger on that set-up than the main station and high *Yagi*. On the 8th, 9H1BT (HV) was copied on and off for about an hour from 1615 and again stronger on the "small" rig. The afternoon of June 8 brought a small tropo. opening to Spain when EB1MS (XC) was worked for another new square. However, this, and subsequent QSOs with G4HFO and GU8FBO, were painfully slow due to language problems.

DG1JT/MM in WJ was worked at 1530 on June 6.

John Tindle, G3JXN, (London) found EA9GH in Melilla, North Africa, (YV) in the *E*'s event of July 9 but is not sure if the EA9 got all John's information. However, CT1AGH was worked. Earlier that day, he worked LA1EKO, 4U1ITU and a couple of Italians in EF square. G3PBV worked 27 I's plus Sicily on June 5 in ten squares, five of them new ones. At 1/18, YU6NGS (JC) and at 1901 YU7EW (KF) were contacted but faded out before completion. On the 8th, Dave heard 9H1BT several times, peaking S7 and working F and GJ, then IS0RHF working N. Devon and GW and at 2020, G4JZF (Staffs.) working EA8XS. He heard G8JHL (Manchester) calling Salvador but could not hear the EA8 in Newton Abbot. In the June 12 *Ar* GI4GVS was worked on SSB but G18YDZ got away.

Mark Turner, G8OBS, operating G3UNU (Nottingham) worked 21 assorted I, IT, IS, FC, YU and 9H stations on June 5 between 1621 and 1950 but the *E*'s on the 8th, were very poor with but fleeting signals from Spain. As compensation, tropo. conditions, east-west, were good to north Germany, OE and SM. DC7MH and DK0TU in West Berlin were contacted as well as Y38ZA (HN01c), Y21TC (GN37j), Y22SA (GN08b), Y23BD (GM05f), OZ1GXW (FO18f) and SK70C/7 (GP27c) from 1958 onwards. Two Y22s were worked the next day and Germans in E and F row squares. From 0540 on the 10th, three OKs in HK and two portables in HJ06c were worked, plus many more DLs and a couple of Y2s. Later, between 1400 and 1625, there was the *Aurora* which yielded the "... normal GM squares ..." plus LAs and SMs in BQ, EU, FU, FR, HS and IS squares, at QTFs 10-20°. Another *Ar* was worked on the 12th from 1520 to 1925 with EI, G, GM, LA, OZ, SM and UQ2NX (MR) for best DX. On the MS front, C31XV/P (AC) on SSB on June 7; IW3QEF (GF) on the 8th, and IIDMP (DF) on the 10th on CW, with DFISO (EI) on random CW the same day.

Reporting after a long interval due to poor family health, John Cleaton, G4GHA, caught the *E*'s on June 5 and worked some new Italian squares and FC9RY (EC). Martin Blythe, G4HFO, (Cornwall) also enjoyed the June 5 *E*'s which lasted 3½ hours and gave him eight new squares. A QSO with 9H1BT on the 8th was uncompleted but EB1BT (XC) was worked as a bonus. Martin has upped his power to 80w. now.

Ken Osborne, G4IGO, (Bristol) lists lots of Italians on June 5, plus 9H1BT and a couple of FCs. On the 8th, he heard the GWs working stuff but it was not till 2012 that he got CT4KQ (WA21e). Then stations in YN and YM were heard working EA8XS. MS brought C31XV/P on June 9 and Ken worked GI, GM and

SM via the *Ar*'s on the 10th and 12th. G4IJE has now had 72 MS QSOs this year Paul's squares total now being 258 in 49 countries. New countries this report included DL0SP/HB0 on June 30 and F6KAW/EA6 (CZ) on July 5.

Graham Taylor, G4JZF, (Staffs.) was on for the June 5 *E*'s during a heavy thunderstorm. IT9 and IW0 were new countries for him. On June 8, from 1720-1900, Graham was calling "CQ *E*'s" with no luck. Later, beaming NE, he heard a Spanish station so turned the beam south-west, called "QRZ" and was answered by EA8XS (SO73d)! 52/54 reports were exchanged and after four minutes Salvador was gone. He makes the QRB 2,945 kms., the best DX to date. On June 12, GM5DTB (ZR) was worked via *Ar*, and Jon Stow, G4MCU, (Essex) also logged this station for a new square. Jon mentions rumours that a UA1 in RC square has been consistently workable from central Sweden and southern Norway at the end of June and queries the propagation mode.

Welcome to Cliff Jeffery, G6ADE, (S. Yorks.) who enters the tables for the first time. His station comprises the *Trio* TS-770E, 200w. amplifier and 14-ele. *Parabeam* at 35ft., his QTH being 450ft. *a.s.l.* Another new correspondent is David Dodd, G6DOX, (Cumbria) who uses the popular *Yaesu* FT-290R and 25w. amplifier. The aerial is an 8-ele. *Yagi* atop a "... shaky 30ft. portable mast ..." which he puts up each time he operates. On June 5, David first heard the *E*'s event at 1745, including an IS0 beacon on 144.862 MHz. He worked IS0 WWL and SCB (EZ) at 1930 and it all faded out by 2000.

"A very good month with 15 new squares worked ..." writes Mick Cuckoo, G6ECM from Kent, who experienced his first *E*'s on June 5 working IT9TDN (HY67e) and IS0RHF (EZ67h). 9H1B was one of the other DX stations heard. A French contest the next day gave CH and DI for new squares and several others worked before. On the 8th, tropo. to the north-east was good with LA1EKO, OZ and DK worked between 2200 and 2400. Fourteen Germans were worked in the E and F squares on the 9th, while the next day it was the turn of the GMs to get into Mick's log. The sole *Ar* QSO was GM3EHH (YQ09b) on the 12th. The Scilly Isles lads were worked on the 15th for a new square. On the 17th, HB9HB was up to S9 but no amateur activity, though DA2CD (DH19a) and DK2GZ (DG80h) were contacted.

Garry Clark, G6FSH, (Coventry) heard the June 5 *Es* but did not work anything. However, he is pleased with Co. Durham worked with 2½w. Stuart Jackson, G6FTB, (Lancs.) writes for the first time, too, now that he has a reasonable set-up. The stations consists of a *Belcom* Liner 2, 40w. home made amplifier and brand new beam and rotator. An entry in the tables is

contemplated soon. He is disappointed at the low QSL return rate. Of 26 cards sent direct with *s.a.e.*'s to G2 and G3, two-letter call holders, only five had replied.

George Grzedieniak, G6GGE, (London) remarks upon the very selective nature of the superb tropo. opening around the July 8 period. For example, he worked F6GIA/P (DH04b) with 6w. and heard some strong HB9s, which G8CDA, a few miles away, could not copy. This was noticed too at G3FPK and seemed more reminiscent of *E*'s events. Phil Ingham, G6HDD, (Gtr. Manchester) is another new contributor and joins the table. His set-up is a *Standard* C58, one watt transceiver with MM 30w. amplifier, the aerial being an 8-ele. *Jaybeam* at 40ft. The QTH is 475ft. *a.s.l.* A 4CX250B amplifier was nearing completion on June 20.

Mick Harsey, G8ATK, reports after a long interval to up-date his scores. He did very well on the July 7/9 tropo. from his excellent site at Farnham, Surrey. The evening of the 7th gave HB9REE/P (EH57e) and LX2TN (DJ12a). A short session from 0652 to 0708 on the 8th brought HB9PRV (DH), DF6UO (DI), F1FMB (DH) and F6GCT (BI). Some fine DX was worked from 1730 to 1905 on the 8th, starting with I2FAK (EF77g) and another four Italians were contacted:— I1KTC (EF44g), IW1AHH (DF15c), I2ZZZ (EF74j) and I2WSG (EF57e). At 1810, after finishing a chat to G3WZT, Mike was called by 4U1ITU (DG61b) with Geoff Grayer, G3NAQ, at the controls. Nine HB9s were worked in EH, DG and DH squares, plus five Fs.

Martyn Jones, G8CXQ, (Warks.) is now up to 27 countries, all-time, having added IS0CSX/P (EA) and FC1KPK (EB) in the June 5 *E*'s. A couple of IT9s in GY were worked before the event ended at 1950. During the several "phases" of this event, the IS0 was first in and last out, often S9 when no other signals were heard. George Gullis, G8MFJ, (Wilts.) was QRV in the June 5 *E*'s affair from 1624 to 1946 and worked a number of Is and IT9s, plus FC9RY (EC28g). The only successful MS sked. was with SM7GEP (HR) on June 5.

G4IJE has been at work on G8ECI, as mentioned earlier, and Derek has sent in a list of his MS operations which began on June 16 with SM7DLZ (IQ) and DK1PZ (EL) which finished on tropo. June 17 brought I1ANP. On the 19th, the sked. with EA3LL was not completed due to amplifier problems at Derek's end which were fixed in time to work YU3ZV at 0700. OK2KZR and IV3HWT were worked on the 20th, the Italian peaking S5 with four seconds bursts. The next day brought I6DQE and OK2IDK. On June 26, LA9BM (EU), YU2CCB and F1JG were successfully worked with some tremendous bursts from F1JG. The last two QSOs were on the 27th, with OE6WIG and HG1YA, two new countries. The only failures were

DL3MBG, F6FHP and DF7RG. Since June 15, Derek has worked 18 countries and 46 squares on MS and tropo.

Jackie, G8RZO, and John, G8RZP, Brakespear have worked much the same stations. Jackie worked C31XV/P on June 9, which John missed, but he got 9H1BT on the 15th which Jackie did not. However, G8RZP did work Andorra on July 8, thanks to C31YQ. Chris Easton, G8TFI, was a member of the *HADRABS* group that went to Andorra in early June. About 50 MS QSOs were completed, the fastest taking but six minutes. East/west propagation was very good and a 15 secs. burst at S9-plus-20dB. was received from OK1MBS. In the six days of operation, 75 squares were worked. A C3/GM "first" is claimed but, although they got all information from EI2CA, that QSO was not completed.

George Frazer, GI5MPS, (Co. Armagh) has been reading this column for some years. His letter dated June 5 missed last month's deadline and refers back to the *E's* event on May 25. G stations worked SMs, but from Ulster they were able to contact Finnish stations as well. George first discovered the opening at 1500 and worked OH5IY (NU03d) at 1507, then OH3AXN (LV38j) at 1514; OH1AWW (LV39e) at 1519; OH2BBX (MU56a) at 1521; OH1DM (KV69b) at 1523; OH7PI (NW60d) at 1525 and OH5BX (OV54b) at 1530, when it all faded. It returned at 1558 when SM2CKR (KX12j) was worked. The big June 5 *E's* event ended in GI about 1945 with mostly IT9 and FC stations heard. Harry Irwin, G18ROJ, also in Co. Armagh, worked IW9ANO (GY67f) at 1815, using a *Liner 2* and *EDL* amplifier to a 13-ele. *Tonna Yagi*. He also heard YU2CBM. George's gear comprises an *Icom IC-202* and home made QQV06-40A amplifier. A 3SK88 preamp. has been fitted, the aerial being a 6-ele. *Quad*.

GM4CXP was on for the June 5 *E's* working I0CUT/P at 1822; IS0RHF at 1829; IS0SCB at 1928 and IS0PDQ at 1930, fade-out being about 1947. On June 8, Derrick worked CT4KQ at 1952; EA1MO at 2008 and CT4IB at 2020 with fade-out ten minutes later. Tropo. was good to Germany in the late evening of the 8th, and PAs and DLs were heard between 1900 and 2015 on the 10th with a small *Ar* preceding this from 1620 to 1645 and which yielded two Gs and OZ1GRS (EP49a) at QTF 55°.

Andy Steven, GM4IPK, (Edinburgh) has joined his first ship, the *Gas Enterprise* in Dubai, and will be away till the end of the year. He refers to a good *Ar* but did not mention the date. He worked 73 stations, all but one on CW. On June 5, I0EIO (GB) was audible for 25 secs. and worked. Many IT9s, IS0s and "off-course" Italians were heard. Andy noticed that when *E's* signals were propagating on 2m., Band 2 FM stations dropped in strength.

ANNUAL VHF/UHF TABLE									
January to December 1982									
Station	FOUR METRES		TWO METRES		70 CENTIMETRES		23 CENTIMETRES		TOTAL Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G2AXI	51	7	64	14	41	9	<i>10</i>	2	186
G4JZF	—	—	74	17	51	9	—	—	151
G8TFI	—	—	70	14	54	12	—	—	150
G8RZO	—	—	70	21	39	11	—	—	141
G8RZP	—	—	70	21	39	11	—	—	141
G3PBV	29	5	54	14	27	5	5	2	134
G6ADE	—	—	58	11	46	12	—	—	127
GD2HDZ	33	5	44	9	30	5	3	2	126
GW3NYY	—	—	81	19	15	4	—	—	119
G3FIJ	27	3	51	11	18	3	—	—	113
G4DEZ	—	—	74	36	—	—	—	—	110
G6ADC	—	—	60	13	33	3	—	—	109
G4ARI	15	2	63	14	—	—	—	—	94
G8VR	10	1	51	29	—	—	—	—	91
G3FPK	—	—	72	18	—	—	—	—	90
G6ECM	—	—	70	18	—	—	—	—	88
G8VRJ	—	—	37	10	21	5	8	3	84
GM4CXP	8	3	46	17	6	3	—	—	83
G8LFB	—	—	63	17	—	—	—	—	80
G4MUT	—	—	45	11	22	1	—	—	79
GW3CCF	—	—	42	8	16	2	9	1	78
G3BW	—	—	40	14	14	3	2	2	75
G4KLX	—	—	53	18	3	1	—	—	75
G8WUU	—	—	41	10	17	4	—	—	72
GM8OEG	—	—	51	14	—	—	—	—	65
G6FSH	—	—	51	11	—	—	—	—	62
G4FKI	18	1	22	8	9	1	—	—	59
G8VJV	—	—	47	12	—	—	—	—	59
GW8TVX	—	—	38	9	—	—	4	3	54
G6CGY	—	—	42	12	—	—	—	—	54
G6AJA	—	—	44	10	—	—	—	—	54
GW4HBK	31	5	11	5	—	—	—	—	52
G8KAX	—	—	23	4	13	2	8	1	51
G4NRG	—	—	22	13	10	2	—	—	47
G8XTJ	—	—	41	6	—	—	—	—	47
G8XHL	—	—	25	8	9	3	—	—	45
GM4COK	—	—	21	15	1	1	—	—	38
G8ZYL	—	—	31	5	—	—	—	—	36
G8LXY	—	—	18	1	12	2	—	—	33

Three bands only count for point. Non-scoring figures in italics.

At one time, there were no Band 2 signals at all, yet an IS0 was copiable on 2m. This IS0 sounded rather tropo-like, fading up and down "in sympathy" with the signals of the Gs working him. Andy says it was as if the IS0's signal was being tropo. propagated from the same places his signal was being received by the Gs! If any other reader notices such odd effects, please write in as the more data received, the better we may understand propagation. Andy mentions that ZR square is now quite active with GM5DTB, GM6IRO, GM6IUB and GM8GCV all with good signals. When he returns from sea, he plans to put up four 16-ele. beams and have a go at some *E-M-E* work.

GW3NYY was away from home on June 5 but did work as G3NYY/P from Folkestone and contacted I7TBF (IA) and 9HICD (HV). 9HIGB was heard, plus assorted I, IT9 and IS0 folk. HB9RHM/P (DG) and three Fs were worked on tropo. from AL76j on June 5/6. From XL40b, Walt worked G8RAF/P (WJ) on June 15, some PAs in CL square and DC4QF in DL. On the 17th, some ducting from 2025 to 2055 brought QSOs with three Fs in DI square. EI4AEB and EI8AQB/P, both in WN, were contacted on the 17th and 21st respectively. On MS, CW QSOs were completed with OK2KZR (IJ); OK2PEW

(IJ); YU3ZV (HG); OE6WIG (HG); SM5MIX (HS) and SM7DLZ (IQ) a new square.

Richard Hope, GW8TVX, (Swansea) was just on his way out on June 5 when he took a telephone call from GW8XLY alerting him about the Italian *E's* opening. IW0WWJ (GB) and IT9TDN (HY) were quickly worked before leaving. "The closest I've come to giving up Wine, Women and Song in a long time," he wrote. Other DX in the month included ON5LH/P (BK); F1DPX (ZH); F6APE (ZH) and F1BOH/P (AI). G8RAF/P and GU3EJL were also worked.

### Seventy Centimetres

According to G8TFI, the *HADRABS* group's 70cm. activity was a bit of a disaster from Andorra so they gave up trying half way through. G4HFO gave his county of Cornwall to G8RZO on June 20 and Martin added a couple more squares; G8RAF/P (WJ) and GW3NYY (XL) to bring his tally to 57. G4JZF has worked EI9Q (WM), G8RAF/P and G3BW in June and concentrated on the band in NFD and got two new squares, AK and BJ, while GM4DIJ/P (XO) was a new county and country. G18TBQ and EI9DD/P (VN) were heard.

G6ADC leaps into second place in the 70cm. section of the Annual Table with 12 countries worked up to July 5. Cliff runs the TS-770E at 10w. to a 21-ele. *Tonna* aerial at 40ft. G8ATK took part in the July 7/8 tropo. lift and worked DK8SG, (EI); 7 Fs; GW3NYY; an ON and two HB9s. Mike has just refitted his aerial system with new feeder cable which has made, "... a phenomenal improvement." Water penetration into two joints had produced a noisy system. Even so, he cannot hear the Emley Moor and Sutton Coldfield beacons.

G8ECI operates from AN square using a *Yaesu* FT-780R with 3SK97 RF amplifier. Derek has built a 150w. amplifier, the aerial being a 23-ele. *H.A.G. Yagi* at 55ft. fed with *Heliac* cable. A *Gasfet* masthead preamp. is being considered. G8RZO/RZP are now both up to 39 counties and 11 countries this year, new ones being G8RAF/P (Scillies), G4HFO (Cornwall) and F1DMG/HB9/P in DG. G8TFI leads the field on the band this year and Chris has added HB, OE, and OK to the country tally in the early July lift. He found the 70cm. signals much stronger than the 2m. ones, HB9AMH/P being particularly outstanding.

Geoff Brown, GJ4ICD, is still seeking to complete 100 squares on the band and would like skeds, with anyone in, or going to, WN, WO, XN, YP and YQ. Skeds. can be arranged at short notice when the conditions seem right and his telephone number is 0534 26788. GM4CXP says that the 70cm. Angus beacon, GB3ANG, is an S7 signal at his QTH with slight QSB.

Alex Scott, GM8BDX, (Berwicks.) is contemplating *E-M-E* on this band and 23cm. around November/December and would like to contact others already doing this. His QTH is Manderston Stables, Duns, Berwickshire. Russ Clark's, GW3CCF, (Clwyd) aerial blew down recently, so nothing to report this time. GW3NYY has added three more squares:— F6DJB (BI) on May 20; G8RAF/P (WJ) on June 16 and EI5DD/P (VN) on July 3.

### Twenty-three Centimetres

During NFD, G3JXN worked his first GM on the band, his 13th country. In the good tropo. on July 8, G8ATK worked DK8VR (DJ55c) at 2006. He tried for one and a half hours to work HB9AMH/P who varied from noise level to S9-plus. But the Swiss kept his keyer going for five

minutes at a time and would likely have worked many more stations if he had listened more frequently. Mike now has a 15-over-15 *Jaybeam* aerial up at 48ft. and consistently copies GB3BPO and GB3IOW at S3. GB3NWK and GB3FRS are very strong but he is still unable to hear GB3AND and GB3DUN.

By next spring, G8ECI hopes to put AN square on the air. He has an *MM* transverter but has not decided upon the aerial yet. G8PNN is QRV on the band from Northumberland with about one watt fed by 14m. of *Heliac* cable to a home made, 28-ele. *Quad Loop* aerial at 35ft. Since February this year, Gordon has worked 7 counties, 6 countries and 18 squares. He thinks he is the only amateur on the band in the county. G8PWX is also QRV from ZP square, though.

Andy Renouf, GJ8SBT, made the first GJ to France QSO on May 28 with F1FHI (ZH63d) who worked GJ8KNV shortly after. Andy is about to upgrade his station with a 1.1m. dish aerial at 50ft. and more power.

GW3CCF, in between gardening and painting, is making good progress with a 2C39A PA. Russ is also collecting material for a two-stack G3JVL, 36-ele. job. G8GP and G3SPJ in London have been heard. Activity time is 2030 on Mondays and Tuesdays — local time — and Sundays at 1130. GW8TVX's efforts were well rewarded on July 7 when Richard made the first GW/HB QSO with HB9AMH/P at 2105, the latter running 100w. to a 1.3m. dish. Richard was running just one watt and got an S3-4 report.

### Late Reports

It's still all happening! More *E's* from GJ to 9H on July 9 at 1930; huge HF bands black-out the morning of the 12th followed by afternoon *Aurora*, then super tropo. in the evening to Scandinavia. Another *Ar* on the 13th coinciding with very strong tropo. signal from GM4LBE (ZU65f) in Lerwick. Huge sunspot groups visible with 2m. radio noise some 20-30dB!

### Final Miscellany

*HADRABS* team, back from Andorra, experienced this so-called trans-alpine propagation by working YUs, by beaming at Switzerland: it really works. Also they

report several QRO stations in EA6 nowadays, keen to work DX. G8ATK rightly sounds off about some of the dreadful signals heard during the July 7/8 tropo. and put out by English and French stations, "... who do not seem to understand the difference between single-tone input conditions and two-tone, coupled with speech compressors." He points out that 10w. *r.m.s.* — *i.e.* single-tone on SSB — equates to 4.06w. *r.m.s.* with two tones.

Terry Hackwill, G4MUT, wrote a program for his *BBC Micro Computer* to keep tabs on his squares, counties and countries, but it turned out to be such a performance that he has gone back to ticking them off on a piece of paper! G8MFJ advises that G8YUE will be operating from OV60h in Finland through August with about 25w. and a 9-ele. *Yagi*. Pray for *E's*!

G8OBS suggests that if people must use the 144.30 MHz calling frequency, they inquire whether anyone is trying to establish a QSO before piling in with a CQ call. (Hear, hear! Ed.) Finally, GJ4ICD asks if we can remind people that it is no use sending him *s.a.e.*'s with U.K. stamps on for QSL cards. They are invalid in Jersey, which has its own stamps and postal rates. He will QSL direct if an International Reply Coupon is sent. Geoff's QSO of the month must surely be the tropo. contact with F6KAW/EA6 (CZ) on July 8. He contacted G3CHN, who also worked them on tropo. Nearly forgot. In a QSO with DK3UZ recently, Eddi mentioned to your scribe a QSO on 2m. on January 9 last between a German station in DL square and 5T5RR in the West African country of Mauretania. Signals were rock-steady for ten minutes over a 5,000 km. path. Any ideas?

### Deadlines

This has been a marathon month with the result that, unfortunately, the squares table has had to be omitted just this once. All your letters, claims, moans, etc., for the September issue by August 4 please, and by September 1 — *very early* — for the following month. Send it to:— "VHF Bands," SHORT WAVE MAGAZINE, 34, High Street, WELWYN, Herts., AL6 9EQ. 73 de G3FPK.

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## A WEEKEND MARITIME MOBILE

KEITH HAYNES, G3WRO

**T**HE writer of this article works for a shipping forwarding agent in the city of London and earlier this year it was suggested to the directors (who as well as being bosses are also very good friends) that a weekend aboard the company-owned yacht *Beagle Hound* operating amateur radio maritime mobile would be great fun. The suggestion was readily accepted, the weekend was booked for 29/30th May, and plans were under way.

*Beagle Hound*, which is generally available for private charter, is a "Samphire 29" 35-foot 5-berth yacht, moored usually at Bradwell Marina, Essex. The whole operation was in fact organised with two boats in mind; the station G3WRO/MM would be on *Beagle Hound* and another crew aboard a second yacht crewed by the non-amateur members of the party. The total party consisted of ten people, of which six were licensed radio amateurs; five of the six are all members of the Harlow & District Amateur Radio Society. The amateurs involved were Keith Haynes G3WRO, Dave Gould G3UEG, Terry Robinson G3WUX, Ron Fenn G8CXR, Mark Cracknell G6ABB, and Neville Allen G4MIS. All necessary negotiations with the Home Office were made and the Maritime Licence was issued with no difficulty.

A pre-event meeting was held some four weeks before the weekend to discuss arrangements. Operation was planned for 40, 20, 15, and 10 metres, and also 2 metres. It was decided that two rigs each for HF and VHF would be sensible in case of rig failure. The HF gear consisted of a KW Ten-Tech and Yaesu FT-200, and for VHF an FT-225RD and Trio TR-9000. Plenty of wire for dipoles and a couple of baluns were taken and VHF antennas comprised a couple of colinears and a 16-element Tonna (very kindly loaned by G4IJE). Power did present a bit of a problem, but after ruling out the idea of some form of generator it was decided to be armed with sufficient 12 volt batteries for the trip.

The weekend started on the morning of 28th May when G3WRO arrived at the QTH of G8CXR to load some of the gear. The journey was then made to the home of Peter Buckmaster, one of the company directors, and then on to Maylandsea which is where *Beagle Hound* was anchored; the vessel had to be taken from there to Bradwell Marina. The plan was to get this done and then to meet the rest of the gang at a suitable location (a pub) in the evening. It was at Maylandsea that the writer began to have a doubt as to whether this would be achieved: when the small dinghy was boarded, complete with outboard motor (which was to take us to *Beagle Hound* situated in the middle of the basin), for some strange reason there was *no mounting* for the motor! After muttering a few words of the English language which up until that time we were unaware of, Peter said "it's no good, we'll have to row". Fine. One problem though: two oars in boat — but no rowlocks! The same few words expelled from Peter's mouth although this time not muttered. "Only one way now, paddle Indian fashion". This was done and finally *Beagle Hound* was reached. (We must find out who's responsible for that wretched dinghy!)

It was now full steam ahead to Bradwell and with the help of Ron's handheld the first QSO from G3WRO/MM was made en route. Bradwell Marina was reached around 6 p.m., and the rendezvous was at Latchingdon a few miles up the road at 7 p.m. All was well. We all made it, and enjoyed the supper very kindly provided by the publican in arrangement with Peter. After our first class sustenance it was back to Bradwell Marina for a night's sleep.

It was an early rise for everyone the following morning as breakfast had to be downed and the aerials erected by 8 a.m., by which time we had to sail in order to catch the tide. It must be



Ron, G8CXR, fixing the Tonna to the cross-tree on the mast of *Beagle Hound*.

mentioned that Ron, G8CXR, was extraordinarily keen, almost to the point of fanaticism, to be hauled up the yacht's mast in the bo'sun's chair in order to fix the antennas at a lofty height. He obviously performed this task very well as they stayed very secure for the entire weekend!

One thing that was appreciated by all was that the weather would play a very important part in the success or failure of the expedition. We were not let down in this respect. On the Saturday morning the sun shone from a beautiful clear blue sky. So *Beagle Hound* and the back-up vessel set sail from the marina into the River Blackwater and G3WRO/MM went on the air. Both boats were tied alongside towards the mouth of the Blackwater and a marvellous day was had by all. The weather was so good that everyone could do a bit of radio, sunbathe, swim, fish and sail, though the sailing had to be done in the back-up vessel as with all the aerials on *Beagle Hound* it was impossible to hoist any sails.

By about 5 p.m. everyone had had a good time, with sun tans (and a few burns) all round. Radio-wise it had been very interesting, with DX worked on HF and a lot of local interest shown on 2 metres. To catch the tide we were back in the marina by around 6 p.m. and it was up to the clubhouse for drinks and dinner. Fortunately access to the mains was possible in the marina but for some strange reason not a lot of stations were worked. It was assumed that this could have been mainly because the marina is situated at a very low point.

Everyone was up bright and early again on Sunday, and again the sun shone. The two boats made their way out of the marina around 9.30 and when we got into the river it was noticed that the wind was much stronger than on the Saturday. For this reason the two vessels could not be tied together, so both dropped anchor about 50 yards apart. Again a lot of radio was done: one mobile was travelling down to his father's boatyard on Mersea Island and said that he may try and find us in the afternoon. Sure enough, while everyone was enjoying lunch a fishing vessel drew alongside and a voice bellowed "are you Keith G3WRO/MM?" We pointed out that if he looked up the mast he would realise we were! His QSL card was sifted from the pile and after two attempts was successfully transferred to our visitor. He certainly got his card quicker than anyone else!

Back to the marina by 6 p.m. and the log book showed a total of 119 contacts for the entire weekend. After packing up, the gang proceeded to the Friday night venue at Latchingdon for another splendid nosh. By that time everyone was rather tired and looking forward to a good night's sleep. The whole weekend was most successful not only from a radio point of view but also as a relaxing break, made so much more pleasant by the fine weather.

In conclusion, thanks are most certainly due to the directors of B & D Beagle Southern Freight Services Ltd. for all their help and assistance in providing such a fine weekend for us all.

# A MORSE TUTOR AND MEMORY KEYSER USING THE SINCLAIR ZX81 COMPUTER

J. V. MOSS, B.SC., A.M.B.C.S., G4ILO

ONE of the biggest problems facing the aspiring Class-A licensee is simply getting enough code practice, at the right speed and at a convenient time. The author, having given up with records and tapes, eventually reached the vital 12 w.p.m. after programming a Nascom 1 microcomputer to provide him with an endless supply of random Morse.

There are now commercial Morse tutors on the market, and they cost much less than did the Nascom 1. The Sinclair ZX81, on the other hand, costs about the same as a Morse tutor, and as well as being programmed to become one, it can do many other things. This article describes how to get the ZX81 to send Morse, and how to use this to make a Morse tutor, a Morse keyboard and even a memory keyer for meteor-scatter work. All the programs will run on the basic machine without additional memory.

## Morse Code Routines

The ZX81 has one output port, the one used for saving programs to cassette. A tone is generated by setting the port to 1, then 0, very rapidly, giving a square wave; the duration of the tone gives the Morse dots and dashes. Unfortunately, it is not possible to set and unset the port using BASIC, and so the programming to generate the Morse characters must be done in machine code[1].

A listing of the machine code routines is given at Table 5. However, it is not necessary to understand the routines in order to use them, and they may be loaded into the ZX81 by the following procedure:

(a) Clear the machine by typing NEW, then input a line 1 REM followed by 250 A's.

PRINT PEEK 16511 will give a value 2 more than the number of A's in the line. There must be 250 (i.e. PEEK 16511 = 252).

(b) Now enter the BASIC program of Table 1A.

(c) RUN the program. It will display 16514. Enter the first number of the data in Table 1B: 118. The program will then display 16515. Enter the next number working along the row, 118 again. What you are doing is storing the machine code program in memory locations 16514 to 16763.

Table 1A: Machine Code Input Program

```

1 REM AAA . . . (250 letter A's)
10 LET L = 16514
20 LET S = 0
25 CLS
30 FOR I = L TO L + 9
40 PRINT I,
50 INPUT X
60 POKE I, X
70 PRINT X
80 LET S = S + X
90 NEXT I
100 PRINT "CHECK", S
110 PRINT "OK?"
120 INPUT AS
130 IF AS = "Y" THEN LET L = L + 10
140 GOTO 20

```

Table 1B: Machine Code Data

Location	Values										Check
16514	118	118	80	0	0	0	42	132	64	62	616
16524	4	211	255	6	128	16	254	205	67	15	1161
16534	6	128	16	254	45	32	238	201	42	132	1094
16544	64	6	0	16	254	45	32	249	201	58	925
16554	133	64	198	4	24	5	58	133	64	198	881
16564	2	205	158	64	61	32	250	201	33	134	1140
16574	64	86	30	4	203	2	203	2	62	3	659
16584	162	40	16	33	222	64	133	111	14	1	796
16594	233	29	32	236	33	135	64	24	228	205	1219
16604	176	64	201	12	12	205	136	64	13	32	915
16614	250	205	158	64	24	231	237	75	16	65	1325
16624	121	254	11	56	19	33	252	64	9	9	828
16634	126	50	134	64	35	126	50	135	64	205	989
16644	188	64	24	3	205	169	64	237	75	16	1045
16654	65	201	0	0	223	112	0	0	0	0	601
16664	87	240	245	240	117	192	117	208	223	192	1861
16674	119	112	127	64	221	192	127	208	125	0	1295
16684	125	192	119	112	95	80	221	208	85	64	1301
16694	213	64	245	64	253	64	255	64	255	192	1669
16704	127	192	95	192	87	192	85	192	208	0	1370
16714	127	0	119	0	124	0	192	0	247	0	809
16724	92	0	255	0	240	0	213	0	116	0	916
16734	223	0	80	0	112	0	84	0	215	0	714
16744	93	0	220	0	252	0	64	0	244	0	873
16754	253	0	212	0	125	0	117	0	95	0	802

(d) When you have entered the ten values of the first row, the computer will display a check number. This should agree with the check number at the end of the row in Table 1B. If it does not, you have made a mistake typing in the numbers. Since the computer is displaying OK? answer it N (for No). You may then input the ten values of that row again.

(e) if the check number does agree, answer Y (for yes). You may then enter the next row of data. Continue this process until all the data of Table 1B has been entered.

(f) Delete the program of Table 1A (lines 10 to 140) leaving only line 1 REM. This line cannot now be listed, as the 250 A's have been replaced by the machine code routines. To list any BASIC lines following the REM, you will have to type LIST 2.

(g) SAVE the machine code REM line on tape.

The most difficult part of the job is now over, and the machine code routine may now be tested. The entry point of the main routine is 16620, and it expects 0 (for space) or a character code to be 'poked' into location 16656. Location 16516 is set to 800 ÷ speed in w.p.m., and is currently set to give a speed of 10 w.p.m. Location 16517 is used to give an extra delay between characters.

Since the ZX81 cannot produce the TV display and output to the cassette port at the same time, the computer must be set to FAST mode.

Typing in POKE 16656, CODE "K" followed by RAND USR 16620 will result in a pattern on the screen as the computer sends "K". If the cassette recorder is set to record from the output port, then the K may be recorded and played back. Unfortunately, the output level from the port is too low to drive even an earpiece directly, and so some amplification will be necessary in order to drive headphones or a loudspeaker.

The machine code routines can be used to generate Morse for many applications. All the ZX81 characters with codes from 11 to 63 with the exception of £ and \$ may be sent, that is the numbers, letters and punctuation. All the BASIC program has to do is to POKE into 16656 the code of the character to be sent, and then RAND USR 16620 or LET A = USR 16620. If it is required to print the character to the screen as well, then PRINT USR 16620 could be used instead.

## Morse Tutor

Table 2 gives a BASIC program to generate random five-character groups of letters only, numbers only, or mixed letters and numbers. The program asks the speed required in WPM, then

**Table 2: Morse Tutor Program**

```

1 REM machine-code routines.
10 PRINT "WPM?"
20 INPUT X
30 POKE 16516,800/X
40 PRINT "DELAY?"
50 INPUT X
60 POKE 16517,X
70 LET Y=28
80 LET LETTERS=26
90 LET NUMBERS=10
100 PRINT "TEST?"
110 INPUT X
120 IF X=26 THEN LET Y=38
180 CLS
200 FOR I=1 TO 5
220 LET C=INT(RND*X)+Y
230 POKE 16656,C
240 PRINT CHR$USR 16620;
250 NEXT I
255 POKE 16656,0
260 PRINT CHR$USR 16620;
290 GOTO 200

```

it asks if a delay is wanted. The delay is measured in dot-lengths at the specified speed; 0 would be no delay, 5 would amount to a space between every character. The program then asks TEST? There are three possible replies: LETTERS, NUMBERS or LETTERS + NUMBERS. The computer will then begin sending. When it has filled up the screen (less than a full screen on a 1K machine) it will stop and display the characters sent for checking. The program may then be resumed by typing CONT.

If it is desired to produce a continuous stream of Morse without displaying the characters to the screen, for example, to produce practice tapes, then lines 240 and 260 of the program may be changed to LET A = USR 16620.

### Morse Keyboard

Table 3 gives a program to turn the ZX81 into a Morse keyboard with programmable memory. The program again asks the speed required in WPM, it then asks MEM? A message of up to about 100 characters may be entered on a 1K machine. The TV screen then goes blank as the computer is ready to send Morse. As each key is pressed, the corresponding character is sent. The keys are not buffered, and so it is necessary to hold down a key until the previous character has been sent. If the key \$ is pressed, then the message in memory will be transmitted.

**Table 3: Morse Keyboard Program**

```

1 REM machine code routines
10 PRINT "WPM?"
20 INPUT W
30 POKE 16516,800/W
40 PRINT "MEM?"
50 INPUT A$
90 CLS
100 LET W = CODE INKEY$
110 IF W > 63 THEN GOTO 100
115 IF W < CODE"'" THEN GOTO 200
120 POKE 16656, W
130 LET W = USR 16620
140 GOTO 100
200 IF W < CODE"$" THEN GOTO 100
310 FOR I = 1 TO LEN A$
320 POKE 16656, CODE A$(I)
330 LET W = USR 16620
340 NEXT I
350 GOTO 100

```

### Interface

Of course, the ZX81 cannot key a transmitter directly, and so a circuit would be required to make the tone output drive a relay. Such a circuit as is used by meteor-scatter operators to key a transmitter with speeded-up Morse from a tape recorder would be suitable. Alternatively the tone output could be fed, *via* a suitable low-pass filter, into the microphone input of an SSB transmitter.

Another possibility is the plug-in data port for the ZX81 made by *Technomatic Ltd.* as described in [2]. This add-on board allows a relay to be controlled by the computer, which could be used to key a transmitter in the normal way. Minor alterations to the machine-code routines would be required if this board were to be used, and this has not been tried by the author.

### MS Keyer

The final program is for a memory keyer for meteor-scatter work (Table 4). The keyer has two memories, one to hold the transmitting station's callsign, and one to hold the message to be sent using high-speed CW. The program will send the callsign at 12 w.p.m., followed by the message at 50 w.p.m. for about 55

**Table 4: MS Memory Keyer**

```

1 REM Machine-code routines
10 PRINT "CALL?"
20 INPUT A$
30 LET C$ = "DE " + A$
40 IF INKEY$ = "R" THEN GOTO 100
50 IF INKEY$ <> "P" THEN GOTO 40
60 PRINT "MEM?"
70 INPUT A$
80 CLS
100 POKE 16516,64
110 LET X$ = C$
120 GOSUB 500
200 POKE 16516,16
210 LET X$ = A$
220 FOR I = 1 TO 240 / LEN X$
230 GOSUB 500
240 NEXT I
300 POKE 16516,64
310 LET X$ = C$
320 GOSUB 500
330 GOTO 40
500 FOR K = 1 TO LEN X$
510 POKE 16656, CODE X$(K)
520 RAND USR 16620
530 NEXT K
540 RETURN

```

seconds, and then the callsign again at 12 w.p.m., giving a total 'over' of about one minute.

When the program is run, it will ask CALL? and the station callsign should be typed in. The screen will then go blank, and the program is waiting for one of two commands, R or P. P will cause the screen to display MEM? and the message to be sent repeatedly at high speed should be programmed in. The "newline" at the end of the message should be typed at the start of the transmission period, as the computer will immediately begin to send the message, with the station identification at 12 w.p.m. at the beginning and end of the transmission. R will cause the message already in the memory to be transmitted.

Line 220 in the program determines the length of transmission, and is set to give about a minute, although the exact time will depend on the text of the message. It is a simple matter to alter the program to give a longer or shorter transmission periods, or to vary the speed of the sending.

## Conclusion

The example programs given here have shown that it is possible to program the ZX81 to create sophisticated memory keyers. ZX81 owners with the 16K RAM pack will have far greater possibilities, including message storage capacity far in excess of any memory keyer commercially available. It should not be difficult for the average amateur, using these programs as examples, to create a microcomputer Morse keyer tailored to his individual requirements.

```

16625      FE 0B      CP 0B
16627      38 13      JR C SP
16629      21 FC 40    LD HL, TABLE
16632      09          ADD HL, BC
16633      09          ADD HL, BC
16634      7E          LD A, (HL)
16635      32 86 40    LD (CWCH), A
16638      23          INC HL
16639      7E          LD A, (HL)
16640      32 87 40    LD (CWCH + 1), A
16643      CD BC 40    CALL SEND
16646      18 03      JR EXIT
16648      CD A9 40    SP:      CALL SPACE
16651      ED 4B 10 41 EXIT:    LD BC, (CHAR)
16655      C9          RET
16656      00 00      CHAR:    00 00
  
```

DEFINE TABLE = 16636

16658 — 16763 is the table of Morse characters. Each character takes two 8-bit bytes, i.e. 16558 and 16559 are the character " (quote). Two bits are used for each symbol — 11 for dot, 01 for dash and 00 for the end of the character.

Table 5: Listing of Machine Code Routines

16514	76		HLT
16515	76		HLT
16516	50	SPEED:	50
16517	00	DELAY:	00
16518	00 00	CWCH:	00 00
16520	2A 84 40	TONE:	LD HL,(SPEED)
16523	3E 04	TO:	LD A,04
16525	D3 FF		OUT (FF),A
16527	06 80		LD B,80
16529	10 FE	T1:	DJNZ T1
16531	CD 43 0F		CALL 0F43
16534	06 80		LD B,80
16536	10 FE	T2:	DJNZ T2
16538	2D		DEC L
16539	20 EE		JRNZ T0
16541	C9		RET
16542	2A 84 40	SPCE:	LD HL,(SPEED)
16545	06 00	S0:	LD B,00
16547	10 FE	S1:	DJNZ S1
16549	2D		DEC L
16550	20 F9		JRNZ S0
16552	C9		RET
16553	3A 85 40	SPACE:	LD A,(DELAY)
16556	C6 04		ADD A,04
16558	18 05		JR S2
16560	3A 85 40	ICG:	LD A,(DELAY)
16563	C6 02		ADD A,02
16565	CD 9E 40	S2:	CALL SPCE
16568	3D		DEC A
16569	20 FA		JRNZ S2
16571	C9		RET
16572	21 86 40	SEND:	LD HL, CWCH
16575	56	S3:	LD D,(HL)
16576	1E 04		LD E,04
16578	CB 02	S4:	RLC D
16580	CB 02		RLC D
16582	3E 03		LD A,03
16584	A2		AND D
16585	28 10		JR Z END
16587	21 DE 40		LD HL,SWIT
16590	85		ADD A,L
16591	6F		LD L,A
16592	0E 01		LD C,01
16594	E9		JP (HL)
16595	1D	BACK:	DEC E
16596	20 EC		JRNZ S4
16598	21 87 40		LD HL,CWCH + 1
16601	18 E4		JR S3
16603	CD AD 40	END:	CALL ICG
16606	C9	SWIT:	RET
16607	0C		INC C
16608	0C		INC C
16609	CD 88 40	S5:	CALL TONE
16612	0D		DEC C
16613	20 FA		JRNZ S5
16615	CD 9E 40		CALL SPCE
16618	18 E7		JR BACK
16620	ED 4B 10 41	GETCH:	LD, BC,(CHAR)
16624	79		LD A,C

## References

- [1] 'Machine code' is the instruction code of the Z80 chip, the microprocessor used in the ZX81. A useful book on the subject is "Programming the Z80" by Zaks, published by Sybex.
- [2] The data port is described in an article "Control your own Substation" by D. E. Graham, in *Personal Computer World*, October 1981, p. 74.

*Footnote:* There are two versions of 8K ROM used in the ZX81. The old version contains an error which results in, for example, the result of PRINT SQR 0.25 being incorrect. The program as described will work on this ROM. The new ROM corrects this error, and with this version it will be necessary to POKE 16532, 70 before saving or running the program, otherwise it will go into an endless loop.



"... he says the memory unit's got amnesia ..."

# PLUG IN YOUR SOLDERING IRON AND BEGIN HERE, PART III

A GUIDE FOR THE INEXPERIENCED  
IN THE METHODS, TECHNIQUES,  
PITFALLS AND FOLKLORE OF  
BUILDING EQUIPMENT, WITH  
PRACTICAL PROJECTS TO BUILD  
ALONG THE WAY

REV. G. C. DOBBS, G3RJV

“THE happy people are those who are producing something” wrote Dean Inge. Had the worthy Dean been around this century instead of the last, he could have been referring to the constructors in the amateur radio world. Ah — the therapy of the soldering iron cannot be denied!

In the last part of this series of articles we considered three simple techniques for building equipment, the last being the use of *Veroboard*. In that article *Veroboard* was used for two integrated circuit projects so it may be a good idea to show that it can be used just as effectively for other types of circuit. It also provides an excuse to build a very useful piece of test equipment.

The AC Bridge is a useful piece of test equipment to have around the amateur radio shack. Not essential nor in everyday use, but so simple to build that it ought to have its rightful place in our array of equipment. It can be used to measure the values of unknown capacitors and resistors and, as I have more frequently used it, to match pairs of such components. So those capacitors in the junk box with weird Far Eastern codings or rubbed-off markings can be graded into their correct values with such an instrument. The idea is based upon the Wheatstone Bridge, so beloved of physics masters in school. Such a bridge can be used to compare the values of unknown resistance and capacitance against known components. The Wheatstone Bridge of the physics lab. is usually a DC instrument but this bridge makes its measurements at AC.

## The AC Bridge

The circuit of the Bridge is shown in Fig. 1. Look at the actual bridge arrangement — RV1 and the ‘Known’ and ‘Unknown’ terminals. Usually commercial bridges use fixed standards of high accuracy, but this bridge allows any known component to be used as a standard. This is not only cheaper, as very accurate components are expensive, but also more versatile. If RV1 is placed with the slider in the centre of the track, it forms two resistances either side of the potentiometer wiper. The resistance between the slider and the top of the track we can call Ra and that between the slider and the bottom Rb. Two resistors can be joined across the terminals, Rs across ‘Standard’ and Rx across ‘Unknown’. An audio signal from the secondary of the transformer T1 is applied across the bridge, and a pair of headphones is connected to SK1 — that is between the other two sides of the bridge. If the standard and the unknown are equal in value (Rs = Rx) and Rv1 is at the centre of its track (Ra = Rb) then the bridge is balanced and no audio tone is heard in the headphones. This is equated as:

$$\frac{R_s}{R_x} = \frac{R_a}{R_b}$$

Since Rs = Rx and Ra = Rb, there is no output, this is called the null point and in this circuit it will be indicated by no tone in the headphones. DC Bridges use a sensitive meter to indicate a null point, but this method of finding the null point using sound is very

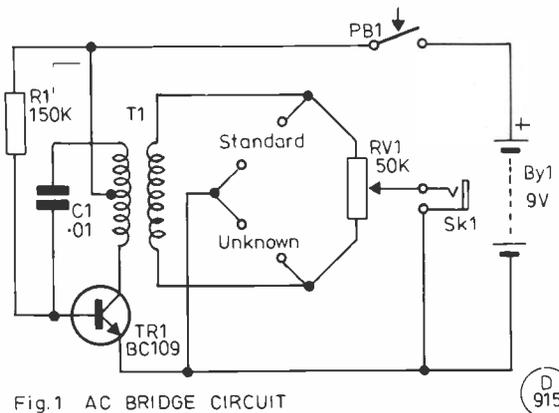


Fig.1 AC BRIDGE CIRCUIT

D 915

accurate as our ears have a logarithmic response to sound — that is, the lower the sound the more sensitive our ears become to changes in volume. If only the makers of juke boxes knew about our logarithmic lugs!

The equation shows that the ratio of the unknown to the standard is equal to the ratio of the resistance of each side of the potentiometer arm. If the unknown differs from the standard, RV1 can be adjusted to find a null point. The position of the slider of RV1 will, therefore, represent the ratio of the standard to the unknown. RV1 is fitted with a pointer knob to show this ratio on a scale. This scale will be logarithmic either side of nought in the centre. This action of the AC Bridge also applies to capacitance and the ratio of an unknown capacitor to a known capacitor can be found. This circuit uses any known component as the standard, so good tolerance components are advised for the comparison.

The audio oscillator used is a very simple Hartley oscillator based upon the tapped transformer T1. R1 provides the base biasing and the output is taken from the secondary of T1. SK1 is the output socket for a pair of high impedance headphones or a crystal earpiece; this output could be taken to an audio amplifier. The transformer T1 is a typical transistor radio output transformer. A type, LT700, is named but this is a real junk box item. Most cheap and nasty transistor radios seem to use push-pull output transformers so this transformer is best gleaned from a scrap transistor radio. Some radios use tapped driver transformers into the output stages and these would serve very well in this circuit. Avoid buying T1, and for that matter TR1 could be one of many types. Try any NPN audio transistor that comes to hand. The potentiometer RV1 ought to be a large wirewound component and must have a linear track. The value is not critical, 50K ohms works well, but 100K or other values would be just as suitable. Failing a nice large wirewound potentiometer, get the best suitable linear pot available, but remember the longer the track the more accurate the bridge will prove to be.

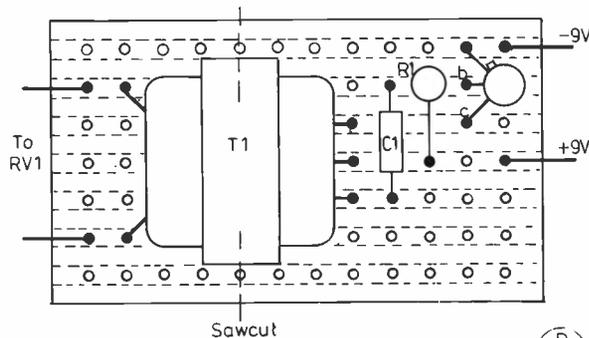


Fig.2 OSCILLATOR VEROBOARD (Plain side)

D 916

## Table of Values

**Fig. 1**

R1 = 150K	T1 = LT700 transistor output transformer, <i>see text</i>
C1 = 0.01 $\mu$ F	PB1 = miniature press (on) button
RV1 = 50K linear pot., large wire-wound	SK1 = jack socket
TR1 = BC109	B1 = PP3 battery

*Also:* 0.1" matrix Veroboard (1 1/2" x 1"); aluminium box with lid (4" x 4" x 1 1/2"); three 4mm. insulated sockets; large pointer knob.

**Fig. 4**

R1 = 150K	VC1 = 200 pF Polycon, <i>see text</i>
R2 = 100R	D1 = 1N34A or similar
R3 = 47K	TR1 = 2N3819
C1 = 330 pF	TR2 = BC108
C2, C3 = 0.01 $\mu$ F	M1 = <i>see text</i>
RV1 = 5K linear	L1 = <i>see text and chart</i>

## Construction

The AC Bridge is built using a combination of *Veroboard* and point-to-point wiring. The audio oscillator is built on a piece of *Veroboard* with 12 holes by 7 holes (1" x 1 1/2"). The only alteration to the layout of the track on the board is a saw cut made right across the board tracks underneath the transformer. This should be made in the place shown in Fig. 2 by carefully cutting across the copper tracks with a sharp hacksaw held flush to the board. After this cut check that none of the tracks are joined by loose copper; if they are, clear the gaps with a knife point.

The layout of the *Veroboard* is shown in Fig. 2, and Fig. 3 shows how it all fits together inside a suitable box. A size and type of box is suggested but any housing would serve the purpose, use what you have or can obtain cheaply. The control RV1 is mounted on a front panel, which was aluminium in the prototype, the lid of a box. The *Veroboard* was held in place with a blob of "Blutack". Three 4mm sockets provided the termination, but screw terminals are probably better. The centre lead is a common connection for both 'Standard' and 'Unknown'. A large knob with a pointer is used for RV1 (actually I used quite a small knob with a homemade cursor fashioned from scrap perspex). The most important part of the front panel is the scale for RV1. This scale could be copied from the drawing in Fig. 3. The whole front panel can be covered with a sheet of white paper stuck to the panel. The scale is then drawn on the paper, or traced onto it prior to sticking it on the front. The scale in Fig. 3 should apply to most potentiometers but they do vary a little in track length. However, this variation will be at either ends of the scale where the instrument is at its least accurate points. It is possible, but tedious, to calibrate the scale using good known value components to give values either side of zero. This is best done with close tolerance resistors and adding the capacitor scale from these readings. The scale figures can be made in *Letraset*. Finally the whole front panel is covered with a layer of sticky backed clear plastic film, the sort sold for book covering, for protection. It looks good, too.

## Operation

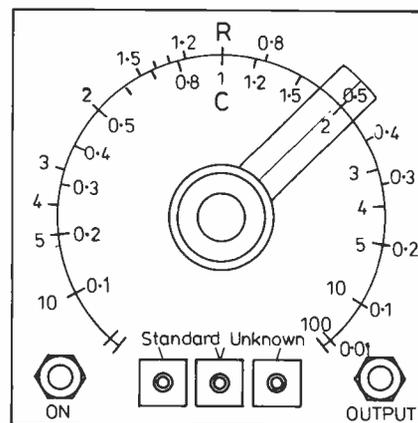
Before the AC Bridge can be used, it must be set to an accurate zero point. This can be done using two high tolerance resistors of the same value. They are plugged into the 'Known' and 'Unknown' terminals. If sockets have been used it is wise to make up a set of short leads with small crocodile clips on the ends to grip the components. Plug in the headphones and press PB1 for an audio tone. It should be possible to rotate RV1 to find a good null point. This point ought to be exactly zero on the scale; if it is not on zero adjust the knob on the spindle of RV1 until the pointer indicates zero.

The Bridge is simple in use. Close tolerance components make the best standards, so it is a good idea to collect a few for use with

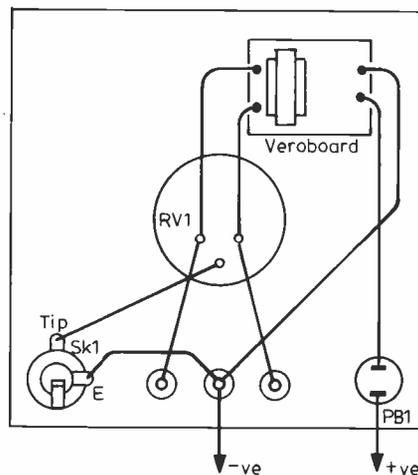
the Bridge. Just simply attach a standard and an unknown to the Bridge, depress PB1 and adjust RV1 for the null point. The ratio is expressed as multiples or decimal fractions of the standard. Note that the scale is clearly marked R and C as resistance and capacitance ratios are high and low on opposite sides of the scale. Try to use the scale as near to the zero as possible, the further the scale goes to its extreme ends the less accurate it becomes. If the ratio is large then use a standard to give a more accurate reading nearer the centre. The AC Bridge can give reasonable results over a wide range of values, but a word of warning: it gives funny readings with airspaced variable capacitors.

## The Perf Dipper

The circuit construction methods discussed in this series so far have all been methods using existing termination points which are governed by the constraints of the materials, tags or strips of copper in *Veroboard*. Printed circuit construction allows a greater freedom of layout in that the builder can arrange and set up his own layouts. One method of achieving this freedom of layout without complications of etching and drilling one's own board is to use perforated matrix board. These boards, usually called 'perf boards' by Trans-Atlantic friends, are simply *Veroboard* without the copper strips. The plain board has a similar matrix of holes, usually with 0.1" spacing although other spacings are available. Such boards are not as easily obtainable as *Veroboard*, though the *Tandy* chain of stores will provide these boards in most areas of the UK. Perf board allows the constructor to devise the layout, using the holes to take the leads of components and the interconnections are made with wires on the underside of the board. Perf board is more expensive than printed circuit board



(a) FRONT PANEL



(b) LAYOUT UNDER LID

Fig.3

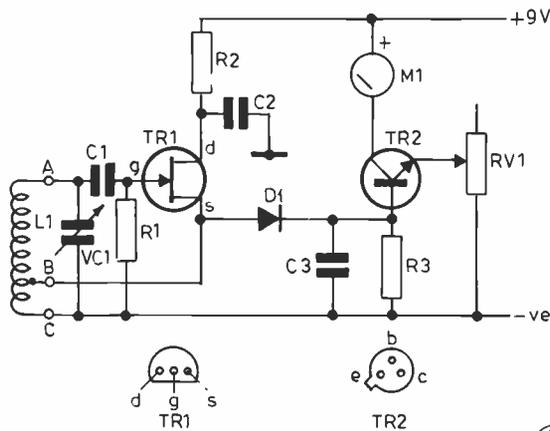


Fig. 4 PERF. DIPPER CIRCUIT

D 918

but it does allow printed circuit board type layouts without the fuss of etching a copper surface.

One of the most useful items of test equipment for the amateur constructor, after the multimeter and certainly before the frequency counter and oscilloscope and other sophisticated items, is the Dip Meter. Such meters are frequently called GDOs after Grid Dip Oscillators, the valve versions of such instruments. Few, if any, use valves these days, so I suppose they might more correctly be called 'Dip Meters'. Dip meters are used to check the resonant frequency of tuned circuits, a valuable asset to the coilwinding amateur and can serve in a variety of other roles. In short, a handy little item to have around the place.

They are essentially variable frequency RF oscillators capable of indirectly monitoring the amount of RF energy absorbed from the instrument by a tuned circuit. When the resonant frequency of a tuned circuit matches the frequency of the Dipper oscillator, the tuned circuit absorbs some of the energy radiated by the Dipper. As this happens the grid current, in the case of a valve instrument, decreases. Therefore by varying the frequency of the oscillator and observing a meter that displays grid current, the point can be found where the frequency of the instrument oscillator matches the frequency of the tuned circuit under test. In the particular example used here an FET transistor oscillator is used.

Fig. 4 shows the circuit of the perforated board Dipper. TR1 is a Hartley type oscillator, with feedback from the tapped coil, L1, used to maintain oscillation. In practice L1 is a plug-in coil to give a range of frequencies using the variable capacitor VC1. An output is taken from the source and is rectified by the diode D1, with C3 acting as an RF decoupling capacitor. TR2 is a simple DC amplifier feeding a meter, M1, in the collector. RV1 varies the gain of this amplifier and allows the instrument to be set prior to readings being made. A very simple circuit, but most commercial Dippers have unbelievably simple circuits hidden beneath their fancy case-work.

The circuit uses cheaply and easily available components. TR1 and TR2 are common inexpensive types, L1 is homemade and VC1 is the typical 'Polycon' variable capacitor with solid dielectric between the vanes so beloved by manufacturers of miniature transistor radios. These should have a nominal value of some 180 to 200 pF. They are usually two-gang variable capacitors; some capacitors have a very short shaft designed to take a combined scale-come-knob, so look for an example with a shaft long enough to be used for a slow motion drive. These capacitors may be fiddly to use and mount, but they are easy to obtain for nothing or little cost. M1 is a cheap ex-tape recorder meter. The movement in the prototype was about 100µA full scale deflection, but meters up to 1mA are suitable. It is quite possible not to use a built-in meter and to rely upon an existing multimeter if this has a low enough DC microampere scale. The meter can have any sort of calibration markings as these are totally unimportant since the instrument is only required to show a meter needle deflection.

Several coils may be needed for L1 to give the range of frequencies required for measurement. This means that L1 should be a coil with plug-in mounting suitable for ease of changing. The coil also needs to be of reasonable size because it acts as the probe in making measurements and a physically large coil is more prone of RF absorption. The prototype coils were all wound on lengths of PVC piping bought from a do-it-yourself shop. A pipe is commonly sold with an outer diameter of some 3/4" for internal house plumbing. The method of making these coils plug-in types is completely open to the constructors ingenuity. In my case, simple lad that I am, I "Araldited" the base of the coils to a small piece of flat plastic into which I mounted three 4mm plugs. The plugs mated into similar sockets in the top of the Dipper case. It is better to take a longer piece of PVC tubing than required, wind the coil and then cut the tube to a convenient size with a 'junior' hacksaw before mounting onto the base. The plug and socket arrangement could be anything that the individual constructor can devise. I have seen very neat plug-in coils mounted onto old valve bases, then plugged into valve holders. If scrap valves are available, the glass tops from old octal or 4-pin valves can be broken and the plastic base used to take the coils.

Fig. 7 shows the arrangement I used for the coil and suggests numbers of turns based upon the use of the small PVC piping. The coils must have the tapping point B. Winding the coils is easy. Secure one end of the wire (enamelled wire must be used) to the pipe. I use a piece of PVC tape. Then wind on the turns, tightly and closely side by side, to the correct number of turns for tap B. Pull out a loop of wire about 6" long and twist this wire until the twists go back to the body of the coil former. This will hold the tapping point while the additional turns of wire are added. If the constructor wants to be neat, as I was with my later coils, the tapping point can go on the inside of the coil former, in which case begin with a twisted wire pushed through a small hole in the tube and wind away from the tapping point to give the required number of turns to points A and C. Remember to wind these in opposite directions. The windings do need secure fixing. This may be done by binding with PVC tape or using a covering of model aeroplane cement. The coils are sawn to size. The open end, A, ought to be near the end of the pipe and the opposite end, C, ought to be long enough for the coil to protrude to act as a probe. I suggest about 2" for the total coil former length. The values in the chart in Fig. 7 just happen to be what I used for my Dipper.

Individual constructors may like to try other numbers of turns to give the ranges they require; these ranges are a little large in practice. The important thing to remember it that the tapping B must be included and this seems to be best made at about a fifth of the total turns. This ratio is open to experimentation because if the tapping is too large the dip is small, and if it is too small TR1 will not oscillate.

### Construction

The layout for the Perf Dipper is shown in Fig. 5. This drawing shows the top of the circuit board and the placement of the components. Like many printed circuit board layouts, the layout matches well with the circuit diagram. The various component leads are poked though the holes in the perf board and connected

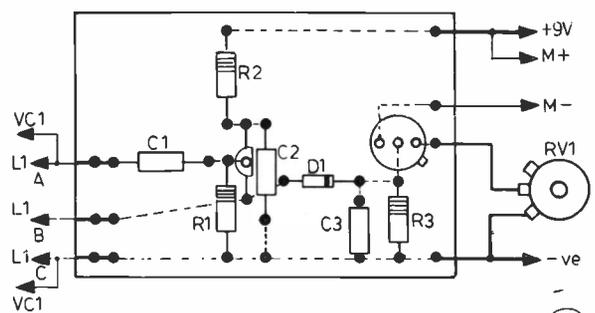


Fig.5 PERF. DIPPER LAYOUT (Actual size).

D 919

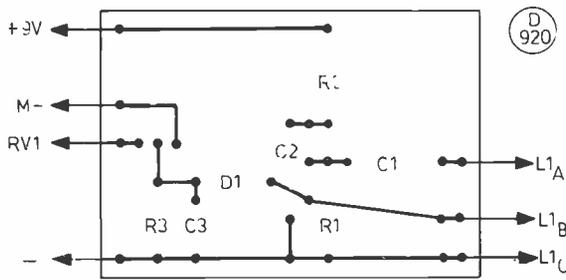


Fig. 6 PERF. DIPPER (Underside).

on the underside of the board. In practice this does not entail the use of extra wire as the leads on many of the components are long enough to be taken to the next lead which requires a solder joint. For example the right hand lead from R2 will lay across the underside of the board to reach the collector of TR1 and the top of C2. The leads must have a secure mechanical connection before soldering so the leads from TR1 and C2 are hooked around the lead from R2. When the solder joints have been made surplus wire can be clipped away. It is possible to use extra lead lengths to make all the connections, but had this not been the case, interconnections could use thin bare copper wire. The terminations at either side of the board are simply the ends of the wires bent through the last two holes a couple of times and arranged to extend beyond the board. Fig. 6 is included to show the layout of the interconnections on the underside of the board. Armed with these two drawings it should be possible to build up the board without any real problems.

But we come now to the real problem. . . . It has always been my experience that making up circuit boards is the easy bit, the real test is putting it into a box and adding the controls. It may be that you are more of an engineer or metal worker, if so you will have no problems . . . and I would be very pleased to meet you next time I'm putting a project into a case! A later section of this series will deal with simple case making for the likes of us with our *Black and Decker* drills and 'Workmates', so just a few pointers on housing the Dipper and you are on your own. The Dipper does require a metal casing. I used a commercial chassis type box with a screwed down lid, the lid formed the back plate and the meter and controls were mounted on the other side of the box, which then became the front panel. The circuit board needs to be firmly fixed to the casing, three or four 6 BA nuts and bolts do this very well. The ground wire, that is the wire from C on L1 to the negative of the supply, is joined to the case *via* one or more of the fixing bolts. Spacers slipped onto the bolts hold the board away from the metal case.

The other problem — save the worst until last — is that the tuning control VC1 is far too sharp and requires a reduction of tuning rate. Therefore some form of slow motion drive must be fitted to VC1. I always use the little inline epicyclic drives which give a shaft turn reduction of some eight to one. These are quite inexpensive and simple to fit, the wide shaft which drives the tuning control may be fitted with a pointer or a disc scale for calibration. The subject of slow motion drives will be dealt with later in this series in the section on case construction, so at this

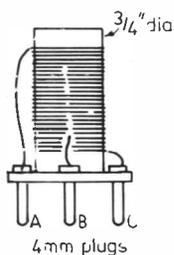


Fig. 7 COIL DETAILS

Range MHz	Turns	Tap B	SWs
1.6 - 5.5	50	40	26
3.0 - 11.6	20	16	26
9.0 - 45.0	5	4	20

D 921

stage I leave it with the reader's own ingenuity. The brave can battle with those drum and cord arrangements if they wish — they drive me mad. Attempt to get a drive reduction of at least eight times and some means to fabricate a scale to read out frequency.

The calibration of the scale is not difficult. The sophisticated can use a frequency meter, taking an output from the source(s) of TR1 *via* a capacitor of a few hundreds of pF. Most of us will have to check the frequency on a general coverage receiver. Pick up the oscillations of the Dipper with a lead from the receiver aerial input placed close to the coil. The receiver must have a BFO on the CW or SSB mode of operation. A scale can be marked out by hand as the coils are tuned through each of their ranges. I have seen very clever arrangements which have had scales on pieces of card which are slipped under a pointer dial for each range; we lesser mortals rely on several concentric scales on the same card or paper. A large scale helps and there is no reason for not filling the whole width of the front panel with the scale and a large tuning knob makes small adjustments much easier.

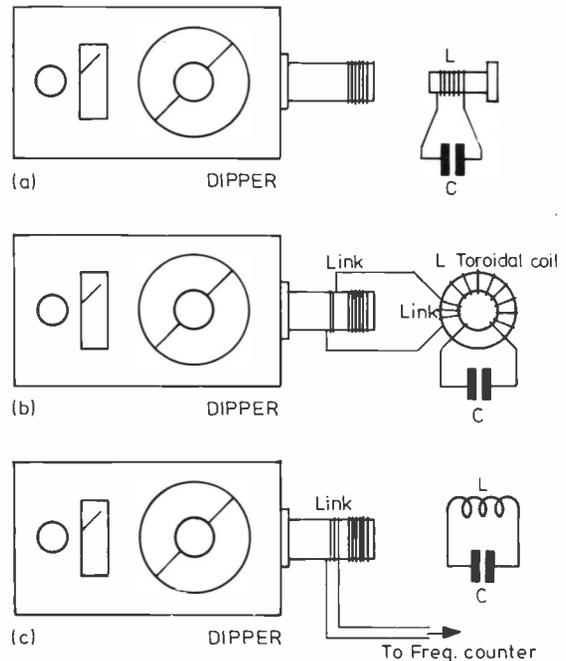


Fig. 8

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### Operation

Some ideas for using the Dipper are outlined in Fig. 8. Fig. 8a shows the usual operation for checking the frequency of a tuned circuit. The Dipper coil, L1, is brought into close proximity with the coil under test, L; the capacitor, C, which completes the tuned circuit may be a fixed or variable type. The tuning control on the Dipper is rotated until a dip is seen in the meter reading. The amplifier gain control RV1 is required to give a high reading on the meter before a dip is sought. The reading on the meter will vary from range to range and will change as each range is tuned; RV1 enables a reading to be maintained which is high enough to show the dip. Try to keep the reading on the meter at about three-quarters of full scale prior to the dipping. It will be noticed that the closer L1 is to the coil being measured, the stronger will be the dip. This is not necessarily a good practice as you will probably notice that the dip is not even. The meter will dip slowly down and return more quickly as VC1 is rotated. This occurs with over coupling and may cause the oscillator to pull giving a less accurate reading. It is better to see a smaller dip which is sharper as the tuning control is moved. I often couple close to find the dip, then draw the Dipper coil away from the coil under test and repeat the operation to get the final reading. The point at which the dip can

just be detected is probably the best point to use for a good reading.

Fig. 8b shows the method for checking the frequency of a tuned circuit which uses a toroid coil former for the inductance. Toroid coils have very small fields surrounding the inductors and it is practically impossible to see dips using the method above. The toroid has to be link coupled to the Dipper coil. This involves winding a couple of turns of wire round the dipper coil and a couple of turns through the toroid former and joining these coupling coils. It should be possible to obtain good clear dips using this method. If the dip seems to indicate overcoupling as mentioned above, reduce to one turn on the Dipper coil or slide the Dipper coupling coil down the former away from the winding of L1 until a smaller dip is seen. It is possible to measure coils when they are in a circuit board although coils in screened cans rarely give reliable readings unless they protrude from the can. Also avoid making readings too close to large areas of metal, for example close to metal workbench tops. A Dipper can measure the inductance of unknown coils and the capacitance of unknown capacitors if they are compared with known components in a similar arrangement. Other ideas for using the Dipper will emerge

as it begins to become a part of the test bench set up.

Fig. 8c shows a method, for those lucky enough to have a frequency counter, of obtaining more accurate results. Measurements are taken in the usual way, but a link coupling is added to the Dipper coil with provides a signal to drive the frequency counter. This coupling coil may require some three or four turns, the actual number can only be determined by experiment, and should be placed a short distance away from L1 on the Dipper coil former. As the measurements are made the counter reads directly the frequency of the dip. Should a frequency counter be permanently available there may be no need to provide any calibration scale for the Dipper and the counter can always be coupled into the circuit for measurements. The lead between the coupling coil and the counter ought to be a screened lead.

The Dipper is a useful item of test equipment and it is easy to build and once the problems of calibration and use have been mastered, it provides the constructor with a useful tool. In the next part of this series I will consider methods of construction which involve the use of printed circuit board. None of these projects is complex, all can be built on the kitchen table with a few tools and little expense; so plug in your soldering iron. . . .

## PRODUCT REVIEW

### AMBIT INTERNATIONAL FET DIP OSCILLATOR KIT

**A**NYONE who has built even the simplest receiver, will have experienced the frustration of being unsure that the various tuned circuits are even approximately tuned to the correct frequencies. Construction of beams or multiband dipoles is similarly a matter of cut and try.

Possession of a grid dip oscillator can do much to eliminate the trial and error. There is no shortage of published designs, both valve and transistor. Unfortunately it is often difficult to replicate the original exactly, especially with respect to the correct capacitor and coils, leading to a deal of wasted effort. One solution is to build a kit and this review deals with a dip oscillator kit produced by **Ambit International Ltd.**, to a design by G3WPO.

Originally described in the RSGB journal *Radio Communication* of November 1981, the design covers 1.6 to 215 MHz in five ranges, thus spanning all the HF bands and two VHF bands. The RF oscillator is based on a Kalitron oscillator using two 2SK55 FETs. One of three bipolar transistors drives the meter and two form a simple multivibrator driving a piezoceramic resonator to give a tone dip feature, useful when working in tight corners. Power comes from a PP3 battery within the case and a zener diode stabilizes the supply at 5.6V. It is claimed that the circuit will operate down to 6V so battery life, at 7mA consumption, should be quite good. A switch is provided to allow the circuit to be used as a wavemeter also.

The kit supplied is described as complete, as indeed it is — almost. The only omissions were the absence of any connecting wire and the lack of any instructions. Very detailed instructions were given by the designer in the article referred to above, but the kit differs in one or two respects from the original and in any case not everyone will have seen the article. One difference is in the use of a push/pull type on/off switch as part of the potentiometer which forms the sensitivity control. Mounting the pot using the single nut supplied leads to the knob standing high above the case, which detracts from the appearance. A second nut would allow the height of the mounting bush to be adjusted; this has to be supplied by the spares box as **Ambit** apparently has not thought of it.

With the exception of the pot., function switch, meter, piezo resonator and 6:1 reduction drive, all the components fit on the pre-drilled, silk screened, fibreglass printed circuit board. This operation takes about two hours but presents no particular difficulty if a fine bit iron and solder are used. The drilling is sufficiently accurate for all the components to fit without undue strain on the leads.

Winding the five coils also takes about two hours. Four pieces of white electrical conduit 70mm. long are supplied. One has to be cut to give 25 and 16mm. lengths which serve as handles rather than formers for the coils for the two highest ranges. When fully wound the coil formers are glued to 3-pin DIN plugs. This is most easily accomplished using rapid-set *Araldite* in a warm atmosphere.

The author made the mistake of assembling the components into the case before soldering the internal wiring to the pins on the PCB. One has to decide between having the wires getting in the way whilst the other components are fitted, or doing the job after this has been done; on balance the former would appear to be the better solution.

The 6 x 8 x 12cm. case is a two-piece affair of steel and aluminium, finished in a business-like black. A precalibrated scale to be glued to the aluminium dial, is supplied and a drilled perspex cursor protects the dial. Assembly time is about two to three hours. It is not particularly difficult but the accuracy and appearance of the finished instrument will owe much to the care taken, so the time spent is well worthwhile. Incidentally *Superglue*, useful in fitting the meter to the case, appears to stain the case so care is needed to keep even a trace from the outside. The scale supplied was found to be reasonably accurate provided care was taken to initially adjust it on one of the higher HF ranges.

A couple of spindles needed cutting to length, requiring a lightweight vice and Junior hacksaw, and the mounting holes on the PCB needed to be opened up slightly with a hand held, but sharp, drill bit; as well as a screwdriver the only other tool needed was of course the soldering iron. *Superglue* is very convenient for fixing the end turns of the coils in place and *Araldite*, preferably rapid-set, is needed for fixing the coils to their respective plugs.

This kit cannot be described as a project for the complete novice, but provided one has confidence in one's ability to solder neatly, and the patience to assemble it with care, it represents good value for money and can be highly recommended. It costs £17.90 plus VAT.

G4HHS

# SIXTEEN-ELEMENT ARRAY FOR SEVENTYCEMS

## SIMPLE CONSTRUCTION WITH CHEAP MATERIALS

**T**HIS very effective — yet cheap and simple to construct — 432 MHz beam originated from a supply of galvanized (zinc-coated) iron wire coat-hangers, as used by most local dry-cleaner firms who return each laundered garment on one, at no extra charge. Being non-returnable, the writer's wardrobe was quickly over-burdened with spare galvanized (zinc) coat-hangers, which were duly pressed into radio service.

The total material complement for this beam is: 12 ft., of coat-hangers, 12 g. galvanized; 10 ft., 26 g. tinned copper wire; two 5 ft. x  $\frac{3}{8}$  ins. diam. bamboo canes; 10 ft. of thin, strong cord (fishing line); 8 in. of PVC sleeving, and one reel of cored solder.

Each hanger is made from a 42 in. length of galvanized wire, which is very strong. Figs. 1 to 9 show clearly the construction, step-by-step. The first thing is to straighten out the hangers, using a strong pair of pliers, after which cut and bend two pieces to shape as in Fig. 1, and four pieces as in Fig. 2.

Now bind these six pieces together with thin tinned copper wire, and solder with the cored solder, taking care to arrange the overlaps so that the centre phasing-line spacing is not stepped. This is achieved by laying the sections on the ground and arranging the overlap joints so that one lies on top of the other, and *not* as shown in Fig. 3, which is drawn for clarity showing the overlaps side by side.

These six pieces combined form the radiating elements and phasing lines. It should be noted that the phasing line sections between the upper and lower radiator sets have cross-overs in them. The spacing between the lines is 1 inch, and the cross-over is achieved by a judicious bend around a broom shank, thereby forming a semi-spiral in each line. The two semi-spirals thus produced result in a cross-over with a constant 1 inch spacing. (This operation sounds much more complicated than it really is.)

At this stage, strip 8 ins. of the outer sheath of  $\frac{1}{4}$ -inch coaxial cable, cut into one-inch lengths, and slip one over each radiator element, positioning them at the centres.

Fig. 4 shows the construction of the element supporting members, of which two are required. Each one consists of a 41 in. length of 12 g. wire and four pieces  $6\frac{3}{4}$  ins. long. The 41 in. piece is the vertical member and the  $6\frac{3}{4}$  in. pieces are fixed to it by twisting one end two complete turns in a downward direction. By giving two turns, the cross member is held rigidly at right angles to the vertical member. Now bend a downward hook on the remote end of each cross member, as shown in the drawing, forming an arm  $5\frac{3}{8}$  ins. long. As before, a strong pair of pliers is necessary for this operation.

Lay the two supporting pieces thus formed on the ground to ensure that all the cross members are in the same plane, and solder each spiral joint.

To form the reflector elements, cut 8 straight pieces of 12 g. wire  $13\frac{3}{8}$  ins. long and fasten one to the underside of each cross member, hard up against the spiral joint, mutually at right angles to the vertical and cross members, and bind in position with thin tinned copper wire. Solder at each joint after binding — see Fig. 5.

Now cut four pieces of bamboo cane 3 ins. long from the 5 ft. canes, by taking 6 ins. from each one. These pieces will of course have holes through their centres.

Take the two sections of aerial which from the supporting members complete with reflector elements, and lay them side by

side on the ground. Make a pencil mark  $1\frac{1}{4}$  ins. inwards from the inner end of each reflector, and push one 3 in. piece of cane over these ends of each pair as far as the pencil marks, as shown in Fig. 6. This should leave a centre spacing of  $\frac{1}{2}$  inch. between the reflectors inside the cane spacers. Make sure that the spacers are a good tight fit by packing with scrap pieces of PVC sleeve if necessary.

Lay the two  $4\frac{1}{2}$  ft. canes down the back of this section, with a spacing of about one inch, and bind them with cord at each intersection between the long canes and the cane spacers. Leave about 12 ins. of cane overhanging at the bottom for fastening to the mast head — see Fig. 7.

The final stage is to take the radiator and phasing line assembly (which is in two sections) and insert each radiator into the hook formed in each cross member. The position of the hook should correspond to the centre of each radiator, and the hook is then nipped tight with the pliers. The one-inch PVC sleeving pieces form insulating bushes between the cross arms and radiators, so ensure that they are not nipped through. Theoretically, these insulating bushes are not necessary as the centre of the radiator is a low impedance point, but in practise it is preferable to have them.

The phasing lines should be equally spaced about one inch along their length; the radiating elements  $12\frac{3}{4}$  ins. long, spaced vertically  $13\frac{1}{2}$  ins; the reflectors  $13\frac{3}{8}$  ins. long, spaced vertically  $13\frac{1}{2}$  ins; and the reflector-to-radiator spacing is  $5\frac{3}{8}$  ins, which is  $1/5$ th of a wavelength. It can be seen that both the reflector and radiator are mounted *below* the cross arm in each case.

For extra rigidity, and to help keep the phasing line spacing symmetrical, a  $3 \times 1\frac{1}{4}$  in. piece of perspex can be laid across the phasing lines between the top and bottom pairs of radiators, and fixed in position with PVC tape.

### Feeding

The array is fed at the centre of the phasing lines, and has an impedance of about 300 ohms.

It can be connected either by 300-ohm tubular twin feeder, or by 75-ohm low loss TV type coaxial cable, with a balun transformer. A suitable balun of simple construction is shown in Fig. 8.

In the author's case, the balun is made with 75-ohm semi-air spaced coax, the total length of the loop before bending being half-wavelength, which, after taking into account the velocity factor of the cable, is 11 ins. for 433 MHz. The three braided ends thus formed are strapped together (preferably soldered, but care should be taken to avoid melting the inner insulant) and earthed. In practise, the earthing has no noticeable effect and need not be bothered with. The centre conductors are connected as shown, and should be soldered to the centres of the phasing lines, after which the ends are sealed against moisture by liberally coating the bare ends with polystyrene or *Bostik*. As a further precaution, arrange the feed cable so that it runs *down* to the feed point, by taping the coaxial cable to the canes about one foot above the centre. Finally, clean off all residual flux from the joints, and rinse with water, as this flux is mildly corrosive.

The complete 16-element 432 MHz stack, which took only a few hours to build (in spite of the apparent complications) is extremely strong, light in weight, has low windage and is durable. It can be clamped to a mast by the canes. The beam as described has survived many gales and much severe weather, 15 feet above the chimney, without damage or rusting, and has proved most effective, the performance being noticeably better than the previous array, which consisted of a dipole in a close-mesh  $2 \times 1$  wavelength-sided corner reflector.

With only 10 watts RF into the array at a height of 30 feet, good distances have been worked on the 70-centimetre band. More recently, power has been increased to 100 watts.

Finally, it hardly needs mentioning that the same general design can be adapted to other materials — it is not likely that everyone, everywhere, has a full supply of galvanized coat-hangers! Probably, 12 or 14 g. wire would do as well, but would be more expensive.

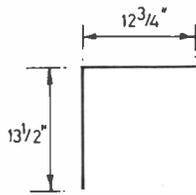


Fig. 1 2 off

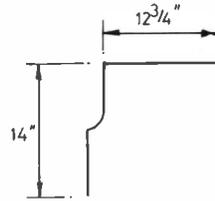


Fig. 2 2 off

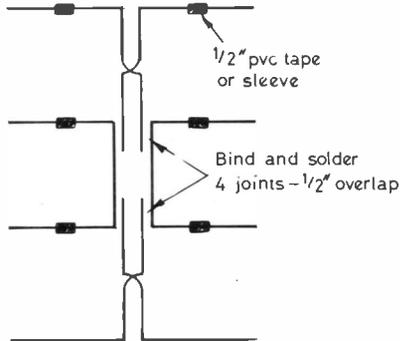


Fig. 3 RADIATORS & PHASING LINES

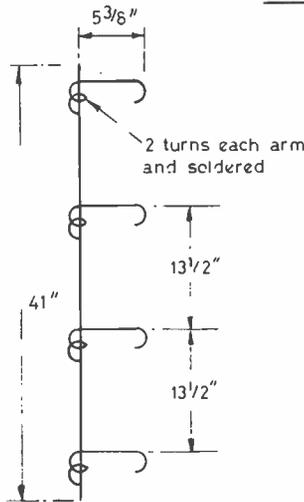


Fig. 4 ELEMENT SUPPORT (2 off)

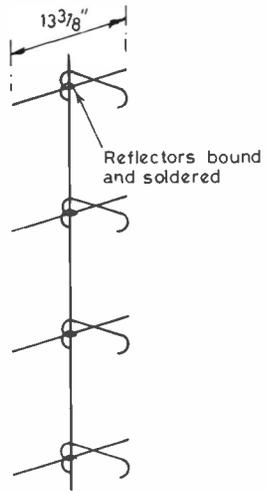


Fig. 5 REFLECTOR MOUNTINGS

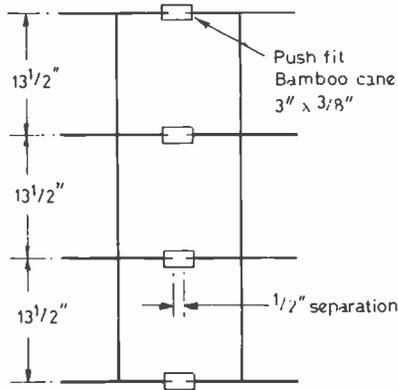


Fig. 6 BAMBOO REFLECTOR SPACERS

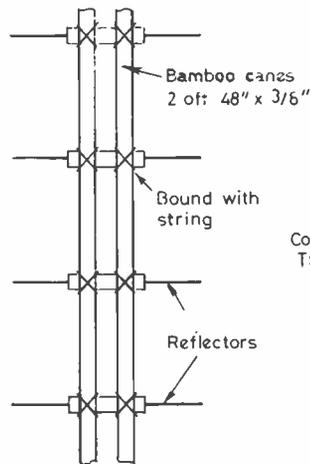


Fig. 7 MOUNTING CANES

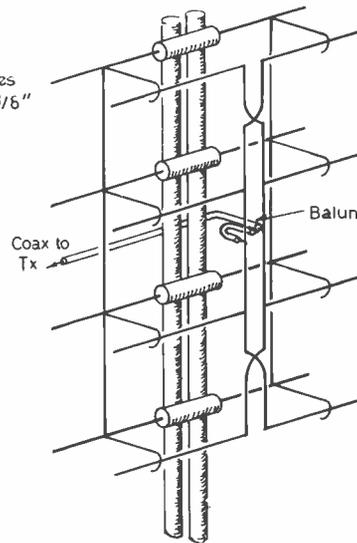


Fig. 8 COMPLETE ASSEMBLY



Fig. 9 BALUN TRANSFORMER

# CLUBS ROUNDUP

By "Club Secretary"

**B**Y the time this comes to your notice, it will be nearing the time for us to make our final decision on the future of MCC. Should we run it again at all, should we change to, say 3.5 or 144 MHz, or change from CW to Phone as the desired mode, or whatever? Readers may recall that after last year's results were evaluated we asked for some feedback: we didn't get anything like enough for us to make a considered decision. *We need it now*, and much as we dislike dropping a club event, in the absence of some indications of interest, we will have to do just that. It's up to you!

## The Letters

As usual, a large crop, including some new ones and some updates, and some changes to note in the Secretaries Panel; we hope we have them all correctly noted.

Our first letter comes from **Abergavenny & Nevill Hall**; the club was formed initially in connection with Nevill Hall Hospital with the main aim of helping the blind and handicapped, and seems to have grown into an ordinary club with a proportion of handicapped members, based on Pen-y-Fal Hospital, Abergavenny, in the room above Male Ward 2, every Thursday evening; there is also a club net on Sunday evenings, 2000 clock on S17.

At **Acton, Brentford & Chiswick** the venue is Chiswick Town Hall, on Tuesday, August 17, for a discussion on members' problems.

The second and third Thursdays of each month see the **Atherstone** group members all heading for the Tudor Centre, Coleshill Road, Atherstone. August 12 is down for a talk by Ian Briknell on Fast Scan TV, and on 19th they have a VHF D/F Hunt.

Now to **Aylesbury Vale** who will be holding a junk sale, on August 10, at Stone Village Hall, Stone. This is an open event so all are welcome to bring one lot of junk and take another lot home again!

Not only have the **Biggin Hill** group been consolidating their membership, but the Hon. Sec. has also sneaked out for a quick Morse text and hence become G4NSD — congratulations! All that having been said, we notice that, like many other clubs, they have scrubbed-out their August meeting, so that the next chance to find them at Biggin Hill Memorial Library will be on September 21, when G2MI will talk about the work of running a QSL Bureau.

Once more we must remind you that **Borders** are now gathering in a new Hq — this is the Waterloo Arms, Chirnside, Berwickshire, on the first and third Fridays of the month.

**Braintree** have their meetings on the first and third Monday at Braintree Community Centre, Victoria Street, Braintree, which lies next door to the bus station.

August 2 and 16 are the dates for the **Burnham Beeches** gang, at the St. John Ambulance Hq in Slough; the first of these will be a talk on *Oscar* by G3RWL, and the latter a Fox Hunt, meeting at Upton Court Playing Fields car park.

If you are in the **Burton-on-Trent** area, and are looking for the

local club, we suggest you get in touch with the Hon. Sec. — see Panel for his address.

Next stop for us is at **Bury**, which means the Mosses Community Centre, Cecil Street, Bury, on Tuesdays. Most are informals but on August 10 they have a Fox Hunt organised for the 85 members.

On now to **Cheltenham**, which means the Old Bakery in Chester Walk, Clarence Street. Here they have "An Alternative approach to Aerials" on August 12, the speaker being G3GWW. August 20 is, as usual, the natter night at the same spot.

The **Chesham** crowd are rightfully proud of their club and its extensive premises; details of the club and the programme from the Hon. Sec. — see Panel.

**Cheshunt** are to be noted every Wednesday evening at the Church Room, Church Lane, Wormley. August 4 and 18 are down for a natter; August 8 is down for a discussion on "Amateur Radio — a Very Special Hobby", and 25th they will be out /P from Baas Hill Common, Broxbourne.

Now it is the turn of **Chichester** to take their bow; they are based on the Spitfire Social Club, Tangmere, on the first and third Monday of each month. However, both the August dates (2nd and 16th) will be informals at the "Bader Arms", Tangmere.

## Deadlines for "Clubs" for the next three months—

September issue — July 30th

October issue — August 27th

November issue — September 24th

December issue — October 29th

*Please be sure to note these dates!*

For **Chiltern** it is the last Wednesday of each month at the Sir William Ramsey School, Hazelmere. August 25 is down for a film show and natter night.

Over the water now, to **Connemara**, and for the latest details we must refer you to the Hon. Sec. — see Panel for his details.

At the last **Conwy Valley** AGM the chairman was able to report a very healthy state of affairs all round; try it for yourself by going to Green Lawns Hotel, Bay View Road, Colwyn Bay, on August 22, when they have a demonstration of equipment by David Monkhouse of *Lowe Electronics Ltd.* Visitors and new members always welcome.

Northwards now, to **Copeland**, based on the Market Hall, Egremont, West Cumbria on the first and third Wednesday of each month.

The **Cornish** crowd live at the SWEB Club room, Pool, Camborne, on the first Thursday of each month, at 7.30. This has to be one of the most successful clubs in the country, where the pressure on space makes everyone get there early so as to get a seat in the very large club room.

Turning now to **Crawley** we note they are still based at Trinity United Reformed Church, Ifield; for the latest details on the programme and the dates we have to refer you to the Hon. Sec. — see Panel for his address.

The **Cray Valley** newsletter doesn't have much to say about the August programme, probably as a result of their having had an AGM recently. However, we suggest you try the first and third

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Thursdays at Christchurch Centre, High Street, Eltham, or contact the Hon. Sec. — see Panel.

Our latest data on **Crystal Palace** affairs indicates that they have moved their Hq to All Saints Church Parish Rooms, Upper Norwood; this is at the junction of Beulah Hill, and Church Road. The third Saturday evening each month is the one to mark-up on the calendar. More details from the Hon. Sec. — see Panel.

**Dacorum** is the name of the club who meet at the St. Stephen's Church Hall, Long Chaulden, Hemel Hempstead on the first Tuesday of the month.

The August programme for **Derby** shows the Derby rally on August 8, and the Wednesday evening before this (4th) will be devoted to the preparations. August 11 is down for films, and there is a night-on-the-air on August 18. On August 25 there will be a Measurement Evening; all these Wednesday dates are at the club Hq at 119 Green Lane, *except* for August 4 when they will be at the rally site at Lower Bemrose School.

Every Monday evening sees the **Derwentside** club foregathering, at the R.A.F. Association Hq, Sherburn Terrace, Consett.

A new Hon. Sec. takes over at **Echelford**, and we are pleased that he indicates they are still thriving and still at the Hq address we remember from 'way back, namely The Hall, St. Martins Court, Kingston Crescent, Ashford, Middlesex, the arrangement being to get together on the second Monday and the last Thursday of every month.

**Edgware** are next in the pile, at 145 Orange Hill Road, Burnt Oak, Edgware, on the second and fourth Thursday of the month. Their recent Straight Key Evening on the air seems to have proved a winner, with many people from all over the country taking part and — which is as important — writing to the Hon. Sec. and asking when the next one will be held.

The **Edinburgh** crowd are to be found at premises within the grounds of the City Observatory, Calton Hill, every Tuesday evening. They don't run a planned programme in the summer months, which allows for some reaction to the weather, but we do notice one special-event activity, in the form of a station set up at the Edinburgh International Festival around the end of August/early September. Details from the Hon. Sec. at the address in the Panel.

If you want to make contact with the **Fareham** club members, we suggest you get in touch with the Hon. Sec. at the address in the Panel, as during this month the Porchester Community Centre is closed down.

On the second and fourth Wednesday of each month, the Railway Enthusiasts Club, Access Road (near the M3 bridge), **Farnborough**, will be full of amateur-radio chat; on August 11, G3TUX will talk about electrical connectors, and on 25th they will welcome some words of wisdom from G3LTP.

Over in EI, the Hon. Sec. of **Fingal** club indicates their wish to welcome visitors to their Monday evening sessions at the Scouts Hall, Ballygall Road East, Dublin 11.

From EI we now turn to GM, and **Glenrothes** in particular. The group are based on Provosts Land, Leslie, and can be found on every Wednesday evening plus the third Sunday in the month. Details from the Hon. Sec. — see Panel.

Another Hon. Sec. to upgrade his call is at **Greater Peterborough**; he was G8ZVW and has become G4NRJ — congratulations. During August, he says, the club will be holding informal sessions at venues to be announced, so if you are thinking of looking them up, a hail to G4NRJ — see Panel — will bring the up-to-date word.

**Guildford** club are at the Guildford Model Engineers' Hq in Stoke Park on the second and fourth Fridays, with a full spectrum



At a ceremony prior to the AGM of the Worked All Britain Award Group on 24th April, a cheque for £200 was presented to RAIBC by WAB President G4FQO, and accepted on behalf of RAIBC by G4JMA. In the photograph are, left to right, G4IAR, SWL Alan, GW4ISF, G4JMA, G4FQO, G4HXI, G8BVE and G3VIJ.

of interests catered for. Details from the Hon. Sec. — see Panel.

All the normal meetings of the **Harrow** crowd are held at the Roxeth Room, Harrow Arts Centre, High Road, Harrow Weald, opposite "The Alma" public house. August 6 is both informal and practical, and there is a D/F hunt on 13th. They are off visiting on August 20, and on 27th there is another informal and practical session.

Looking at the **Hastings** newsletter, we see that they have a main meeting on August 18, the subject being radio control, and the venue West Hill Community Centre; in addition to this there are chat nights every Friday evening at 479 Bexhill Road.

Turning now to **Havering**, we find their Hq to be at Fairkytes Arts Centre, Billet Lane, Hornchurch, with a booking every Wednesday evening. For August the only details we have are of the August 4 "Plugs and Sockets" competition, with G3TPJ as the MC.

With the current newsletter, the list of events organised comes to an end for **Hereford**, whose members are asked to indicate their desires, and advised that in the interim there will be something going on at all meetings. The Hq address is the County Control, Civil Defence Hq, Gaol Street, Hereford, on the first and third Fridays of the month.

We come next to **I.R.T.S.** which is the national society in E-Iland. From the Hon. Sec. — see Panel — you can get all the data on clubs in EI beyond those who have reported in on their own account.

In the **Isle of Wight** the locals foregather every Tuesday for operating and every Friday for chatting, at Unity Hall, Wootton Bridge; and we doubt not they would like to see new members, or visitors, too.

In **Jersey**, we understand their Hq is at Quennevais Communicare Centre on the second Wednesday of the month; more details from the Hon. Sec. — see Panel.

Our next stop is at **Leith Nautical College** where the majority of the members are studying electronics at the College; however, they are keen to rope in anyone within the area who can turn up at the meetings every Thursday evening at the College from 6.30 p.m.

**Lincoln** are a little coy about their activities at the City Engineers' Club, Central Depot, Waterside South, Lincoln, but

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- GLENROTHES: I. Robertson, GM4HBB, 123 Altyre Avenue, Glenrothes, Fife.
- GREATER PETERBOROUGH: F. Brisley, G4NRJ, 27 Lady Lodge Drive, Orton Longueville, Peterborough, Cambs.
- GUILDFORD: Mrs. H. M. Mullenger, G8SXB, 23 Foreman Park, Ash, Aldershot, Hants. GU12 6JN.
- HARROW: C. D. Friel, G4AUF, 17 Clitheroe Avenue, Harrow, Middx. HA2 9UU. (01-868 5002)
- HASTINGS: G. North, G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea. (Cooden 4645)
- HAVERING: A. Negus, G8DQJ, 17 Courtenay Gardens, Upminster, Essex RM14 1DH. (Upminster 24059)
- HEREFORD: S. Jesson, G4CNY, 181 Kings Acre Road, Hereford. (Hereford 3237)
- I.R.T.S.: S. Nolan, EI7GD, 68 Ratoath Estate, Ratoath Road, Dublin 7.
- ISLE OF WIGHT: I. Moth, G4MBD, Claygate, Collwell Road, Freshwater, Lo.W. (Freshwater 753948)
- JERSEY: S. Smith, 19 Parade Road, St. Helier, Jersey, C.I. (Jersey 23249)
- LEITH (Nautical College): M. Gathergood, GM4KFK, c/o Halls of Residence, 24 Milton Road East, Edinburgh EH15 2PP.
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- MIDLAND: N. Gutteridge, G8BHE, 68 Max Road, Quinton, Birmingham B32 1LB. (021-422 9787)
- MID-ULSTER: D. Campbell, G14NKD, 109 Drumgor Park, Craigavon, Co. Armagh, Northern Ireland BT65 4AH.
- NORFOLK: P. Gunther, G8XBT, 6 Malvern Road, Norwich NR1 4BA. (Norwich 610247)
- NORTHERN HEIGHTS: G. Milner, G8NWK, 3 Briggs Villas, Queensbury, Nr. Bradford, Yorks. BP13 2EP.
- PLYMOUTH: Mrs. P. L. Day, G4KYY, 46 Beatrice Avenue, Saltash, Cornwall PL12 4NG.
- PONTEFRAC: N. Whittingham, G4ISU, 7 Ridgedale Mount, Pontefract, W. Yorkshire WF8 1SB.
- R.A.I.B.C.: Mrs. F. Woolley, G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton KT6 4TE.
- REIGATE: C. S. Barnes, G8FEE, 25 Hartswood Avenue, Woodhatch, Reigate, Surrey RH2 8ET.
- RHYL: B. Jones, GW8OYT, 6 Rhodfa Maes Hir, Rhyl. (Rhyl 37284)
- SALISBURY: A. C. A. Newman, G2FIX, 74 Victoria Road, Wilton, Nr. Salisbury, Wilts. SP2 0DY.
- ST. HELENS: P. Gaskell, G4MWO, 131 Greenfield Road, St. Helens, Merseyside. (St. Helens 31846)
- SOLWAY: S. R. Miles. — Address required.
- SOUTH BIRMINGHAM: T. Scrimshaw, G8RGQ, 10 Somerdale Road, Northfield, Birmingham B31 2EG. (021-459 8312)
- SOUTHDOWN: J. Pitt, G6BGT, 18 Kingsnere Court, Hurst Lane, Eastbourne. (Eastbourne 643463)
- SPEN VALLEY: I. F. Jones, G4MLW, 54 Milton Road, Liversedge, Heckmondwike, W. Yorks. (Heckmondwike 409739)
- STOURBRIDGE: M. Davies, G8JTL, 25 Walker Avenue, Quarry Bank, Brierley Hill. (Lye 4019)
- SURREY: R. H. Howells, G4FFY, 7 Betchworth Close, Sutton, Surrey SM1 4NR. (01-642 9871)
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- SUTTON COLDFIELD: A. D. Turner, G8TUR, 10 Jervis Crescent, Sutton Coldfield, W. Midlands B74 4PW (021-353 2061)
- SUTTON & CHEAM: G. Brind, G4CMU, 26 Grange Meadow, Banstead.
- SWALE: B. Hancock, G4NPM, Leahurst, Augustine Road, Minster, Sheerness, Kent ME12 2NB. (Minster 873147)
- THAMES VALLEY: J. Axe, G4EHN, 65 Ridgway Place, Wimbledon, London SW19 4SP. (01-946 5669)
- THANET: I. B. Gane, G4NEF, 17 Penhurst Road, Ramsgate, Kent. (Thanet 54154)
- TORBAY: H. Davies, G4DZH, 18 Bowland Close, Paignton, Devon TQ4 7RT. (Paignton 523063)
- TYNE-WEAR (Repeater Group): J. Laverick, G8DXF, 5 York Crescent, Newton Hall, Co. Durham DH1 5PU.
- TYNEDALE: K. Hatton, G4IZW, 8 Alnwick Street, Newburn, Newcastle, NE15 8PT. (0632-678828)
- U.K.H.F.M.G.: A. Dorsett, G8YLH, The Coach House, Dogmersfield Park, Dogmersfield, Hants. (Aldershot 850678)
- UNIVERSITY OF KENT, CANTERBURY: P. Cockerell, G6CSZ, Keynes College, U.K.C., CT2 7NZ.
- VALE OF THE WHITE HORSE: I. White, G3SEK, 83 Portway, Didcot, Oxon. OX11 0BA. (0235-812584)
- VERULAM: A. Gray, G4DJX, 44 Sherwood Avenue, St. Albans. (St. Albans 54190)
- WACRAL: L. Colley, G3AGX, "Micasa", 13 Ferry Road, Wawne, Nr. Hull, Yorks. HU7 5XU.
- WAKEFIELD: R. C. Sterry, G4BLT, 1 Wavell Garth, Sandal Magna, Wakefield. (Wakefield 255515)
- WEST KENT: P. Reeve, G4GTN, 2 Court Road, Tunbridge Wells, Kent. (Tunbridge Wells 24689)
- WHITE ROSE: D. R. Comber, G8UYZ, W.R.R.S., P.O. Box 73, Leeds LS1 5AR.
- WORCESTER: D. S. Pritt, G8TZE, 15 Paxhill Lane, Twynning, Nr. Tewkesbury, Glos
- WORTHING: Mrs. J. Lillywhite, 41 Brendan Road, Worthing, W. Sussex BN13 2PS.
- YEovil: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil, Somerset. (Yeovil 24956)
- YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

For anything radio you want to buy, sell, or exchange, use the Readers' Advertisement columns in "Short Wave Magazine"

no doubt the Hon. Sec. will be pleased to put you in the picture — see Panel for his details.

The **Meirion** gang have moved Hq to Nannau Country Club, Llanfachreth, Nr. Dolgellau, and we have it that the new committee is making things swing — details from the Hon. Sec. at the address in the Panel.

For the **Midland** group, the August 17 date is being left blank albeit, we understand, there may be a change of heart. In addition they have informals on Wednesday evenings, all at the club's own place at 294A Broad Street, Birmingham, opposite the Repertory Theatre.

In **Mid - Ulster** the local club seem to knock off in the summer, but we understand that they will have the AGM on the second Sunday in September, at the QTH of G14BAC in Bainbridge, starting at 3 p.m. This is a change from the normal first Sunday, just for once, to avoid SSB Field Day.

At **Norfolk** they have informals, with some CW tuition, on August 4 and 18; on August 11 there is a talk on simple aerials by G3PTB, and on August 25 G3IOR talks about UOSAT *Oscar 9*.

The **Northern Heights** crowd foregather at the Bradshaw Tavern, Bradshaw, Halifax. For details, contact the Hon. Sec. (see Panel) or even turn up one Wednesday.

The next stop is at **Plymouth**; here they have a Fox Hunt, which is being organised by G6EQM, and a meeting on August 16 at the Tamar Hotel, Crownhill, Plymouth.

Looking at the **Pontefract** newsletter we see that on August 5 there is a talk on two-metre D/F aerials by G4AAQ, and on August 19 a talk on the conversion of CB gear for amateur use by G3VTD. The informals are on August 12 and 26, and all are down for Carleton Community Centre, where the club have rooms on the top floor.

If you know of a blind or handicapped person who is SWL or licensed and not a member of **R.A.I.B.C.**, you should point them in the right direction — the Hon. Sec.'s address is in the Panel.

**Now Reigate**, which has a place at the Constitutional and Conservative Centre, Warwick Road, Redhill, Surrey, where they may be found on August 20 for a Members' Evening.

The **Rhyl** club has meetings on August 12 and 26, the latter being a D/F Hunt, while the former is a normal session, at the Ambulance Station, Rhyl.

Next we come to **St. Helens**, and here the venue is the Conservative Association Rooms, Boundary Road, St. Helens. Every Thursday is the routine with a programme fixed for most dates, the remainder being informals. On August 5 we note G3NNR/OE7 and G8XZT/OE7 are to talk about their amateur radio visit to the Austrian Tyrol.

Every Tuesday evening the **Salisbury** crowd head for their new Hq at Grosvenor House, 26 Churchfields Road, Salisbury; they make a thing of plenty of outdoor activity during the summer, details of which can no doubt be obtained from the Hon. Sec. at the address in the Panel.

Sad to say we don't have any of the details on the **Solway** club save that they are based on the Educational Settlement, Maryport, Cumbria; so we have to suggest a call to this establishment through which to make a first contact — if you do, ask the Hon. Sec. to give us the full name and address, and the meeting details too!

The **South Birmingham** crowd are based at West Heath Community Centre, Hampstead House, Fairfax Road, West Heath, Birmingham 31; the formal meeting is on the first Wednesday in each month, but in addition the shack is open for HF operating on every Thursday evening, and for VHF operating every Friday evening.

On the first Monday of each month, the **Southdown** group foregather at Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne; we don't have the current details for the August get-together, for which we refer you to the Hon. Sec. — see Panel.

**South Manchester** are to be found every Monday and Friday evening at Sale Moor Community Centre, Norris Road, Sale; Fridays are the 'proper' meetings, with a speaker or whatever, but



“... rather an interesting article here on making a tie-pin microphone ...”

the Monday evenings are taken at the club shack at the Centre and are, naturally enough, much more informal and operation-biased.

At **Spalding** they have an influx of new members, and a further group in the pipeline, not to mention RAE studies being organised for the autumn. Details of the club from the Hon. Sec. — see Panel for her address.

Nice to hear again from **Spenn Valley** after some while. They have moved their Hq to Old Bank Working Men's Club, Mirfield, every other Thursday from July 22; the first three gatherings will be of the noggin-and-natter variety to get acclimatised to the new place.

August 5 and 19 are the dates for **Stevenage**; for the former they have a natter evening, but on the 19th there is a Beginners' Evening with all newcomers welcome, at British Aerospace Plant 'B', Argyle Way, Stevenage, in the Staff canteen.

We now have to note that for August, the **Stourbridge** crowd have *no meetings*; the restart comes on September 6 at Longlands School, Brook Street, Stourbridge.

**Surrey** have August 2 shown for a talk on Satellite Communications, and on August 16 there is a Barbecue; both these are at *TS Terra Nova*, 34 The Waldrons, South Croydon.

Between the 11th and 14th of August, the **Sutton Coldfield** club are mounting an exhibition at the Central Library (their Hq, incidentally) to celebrate their 25th Anniversary. The normal meetings are on the second and fourth Monday *except during August*.

On now to **Sutton & Cheam**, and here we have to refer you to the Hon. Sec. for the details of the August events. His details are in the Panel.

A new group come to be mentioned now; they are known as **Swale** and they have fortnightly meetings at Sittingbourne Town Hall, the August dates being 9th and 23rd, for which the programme was still to be settled at the time of their letter. Details from the Hon. Sec. — see Panel.

A Ladies' Night is down for **Thames Valley** for August 3, at Thames Ditton Library Meeting Room, Watts Road, Giggs Hill, Thames Ditton, Surrey. More details on this and subsequent meetings from the Hon. Sec. — see Panel.

For **Thanet**, August will be comprised of Operating Evenings at the Hq at Birchington Village Hall on alternate Friday evenings. In addition they will be putting G2IC/P on the air at the annual Phoenix Fair on August 7 at Ramsgate. More details from the Hon. Sec. — see the Panel for his vital particulars.

Like many others, Plymouth club and **Torbay** both noted the black-out on all bands on the Sunday of NFD — all the Torbay

gang could hear was Plymouth's G3PRC/P plaintively asking "is there anyone out there?" on 7 MHz about 20 minutes before stumps were drawn. The Torbay Rally is down for August 29 (details from G4DZH, OTHR) and as for the club meetings these are every Friday evening at Bath Lane, rear of 94 Belgrave Road, Torquay.

The Hon. Sec. of the **Tyne-Wear Repeater Group** says he is ready to talk to any clubs in the area about arranging a talk on their activities; and no doubt he would be interested also in hearing from anyone interested in joining the Group. His details are in the Secretaries Panel.

**Tynedale** foregather at the Falcon Hotel, Prudhoe, Northumberland, Tuesday evening in the room at the end of the bar. We understand that teas, meals, drinks, are available at the Hotel for any visitor arriving from a distance. It sounds as though Bill the landlord is a good lad . . . he's even permitting the lads to drink his beer! The August dates are 10th and 31st.

**U.K. Horizontal FM** group recently held their AGM, and report they now have some 321 members in several countries. We rather like the idea of their Falklands Islands Appeal, for funds to help replace gear lost by the VP8s in the war with Argentina; any donations left over after the prime function has been dealt with, to go to RAIBC. It seems a good idea for other clubs to put in a donation to this appeal. Details from the Hon. Sec. — see Panel.

**University of Kent at Canterbury** have their shack and equipment open to members all the year round. During term-time they have a meeting on Tuesday evenings, in the shack. Details from the Hon. Sec. — see Panel.

The **Vale of the White Horse** gang are running a membership campaign; they have a main meeting on the first Tuesday of each month in the upstairs meeting room of the "White Hart" in Harwell village. We understand that they also gather informally at the pub on the other Tuesdays, so doubtless a listen for 'our' sort of chat in the lounge might be productive. . . .

On August 24, the **Verulam** gang have a joint meeting with Edgware for a bring-and-buy sale and some construction, namely the Edgware Project. This one is at the Charles Morris Memorial Hall, Tyttenhanger Green, Tyttenhanger, near St. Albans. Informals are on the second Tuesday of the month at the new R.A.F.A. Headquarters in New Kent Road, St. Albans.

The current **WACRAL** newsletter contains some pertinent points for the SWLs about ATUs, and we note that in this their 25th year of existence the membership is growing nicely. Details from the Hon. Sec. — see Panel.

August meetings at **Wakefield** are transferred to Room C, Unity House, Westgate; August 10 sees a Quiz, complete with buttons and buzzer(!) and on 24th they will be on the air and nattering. All being well, they will return to the normal Hq on September 7, but we suggest a check with the Hon. Sec. about this a bit nearer the date.

At **West Kent** the new-style newsletter says alternate Fridays, though our records say its the first and third Friday of the month — perhaps you should check with the Hon. Sec. about this before setting out; his address is in the Panel. The Hq address is the Drill Hall, Victoria Road, Tunbridge Wells.

Some time since we last heard from **White Rose**, and they are now meeting every Wednesday evening at Moortown Rugby Club. However, the facilities there are open to the members every evening of the week and at Sunday lunchtimes. The new committee seem to be putting together an attractive programme.

There are two clubs we know of in **Wirral**, and the letter we have is not too clear as to which one we are talking about; but doubtless the locals will be able to sort out the one that holds G4MGR and G8WDC, and which is making a shift into a new Hq at Irby Cricket Club on August 11. This first meeting will be an informal drink-and-chat occasion, but on August 25 they will have a surplus gear sale.

There are two alternative venues for the **Worcester**; both the Oddfellows Club and the "Old Pheasant" are in New Street. On August 2 they will be at the Oddfellows for a session on computers

in amateur radio, and on 16th they head for the "Old Pheasant" for a members' projects and natter evening.

The venue for the **Worthing** club evenings is the Pond Lane Amenity Centre, Worthing. On August 3 they will be hearing from Caxton's Apprentice — a seance? — and on 10th G8GKV will talk about 10 GHz. On August 17 there is a D/F Hunt and ragchew, and on 24th G8LBN and G8KOE survey the video scene. That just leaves August 31, on which they will have a Computing Evening.

Every Thursday evening at Building 101, Houndstone Camp one can find the **Yeovil** folk in session. On August 5 they have G3IOR's tape lecture on DX working from RSGB, and on 12th G3MYM talks about VHF propagation. Receiver basics are tackled by G3DSS on 19th, and on 26th there is a natter night.

Last but by no means least, **York**, where apart from the regular Friday evenings, they are fond of the 'great outdoors' — like Tollerton Horticultural Show on August 14, for example. The Hq is at the United Services Club, 61 Micklegate, York.

## Finis

That's the bottom of the pile for this month, and the dates for the next few months are in the 'box'. The gen should arrive by these dates, addressed as always to "Club Secretary", **SHORT WAVE MAGAZINE**, 34 High Street, Welwyn, Herts. AL6 9EQ.

## Rallies

**August 29**, B.A.R.T.G. Rally at Sandown Park Racecourse, Esher, Surrey, 10.30 to 5 p.m., admission 50p, GB4ATG talk-in station, live Amtor demonstration station on the HF bands, plenty of stands, including bring-and-buy, with the accent on RTTY, this is *the* rally for RTTY enthusiasts. **September 12**, Telford Amateur Radio Rally & Exhibition, Telford New Town, Centre Malls, Telford, Shropshire, opens 11 a.m. (10.45 a.m. for the disabled, with special parking and access facilities for them), GB4TRG talk-in on 2m. (S22) and 70cm. (SU8/22), all the usual attractions, catering and licensed bar, free parking and admission, follow the signs to Town Centre; details from G8DIR (Shrewsbury 64273), G8UGL (Telford 584173), or G3UKV (Telford 55416), all QTHR.

## Special Event Station

**August 20-23**, Dudley Amateur Radio Club will be operating GB4DAR in the grounds of Dudley Zoo, to mark their 21st anniversary, working on 144 MHz and HF, special QSL card, further details from Alan Johnson, G4FWR (QTHR).

## Stolen

*Arrow Electronics Ltd.* inform us that the following equipment was stolen from their van at Elvaston Castle Rally: FT-221R (serial no. 6H080713), brand new Daiwa CN1001A automatic ATU, brand new Sommerkamp TS-280FM 2m. FM transceiver, Mk. II model. If you are offered similar equipment under suspicious circumstances, please ring Arrow Electronics, reversing charges, to check, tel: Brentwood 219435/226470.

## Planning Permission Help

Stephen Craske, B.Sc., CPA, EPA, G3ZLS, has written to tell us that he is offering, for an appropriate fee, to prepare and submit planning applications to erect aerials for fellow amateurs, negotiate with the local authority on their behalf and put their case in an appeal to the Secretary of State where necessary. His address is 347 Widney Road, Knowle, Solihull, West Midlands. (Tel: 05645-70235.)

# PHASE LOCKED LOOPS — WHAT ARE THEY?

## A SIMPLE INTRODUCTION

I. D. POOLE, G3YWX

LOOKING through the advertisements in the electronics magazines, one sees phase locked loops used increasingly in the various equipment being offered. They are used in many applications: for example in the regeneration of a steady reference signal, as in a colour television to regenerate the chrominance reference signal from the colour burst reference in the transmitted TV signal; in frequency synthesisers; in FM demodulators; and in many other applications.

At one time a phase locked loop involved the use of a lot of analogue circuitry. However with the integrated circuits which are currently available it is possible to use just one integrated circuit and a handful of peripheral components to construct a complete phase locked loop.

A phase locked loop is a form of negative feedback system consisting of a voltage controlled oscillator, low pass filter and a phase detector, as shown in Fig. 1. The output of the voltage controlled oscillator is compared with an incoming reference signal, this phase output is then filtered to remove the unwanted high frequencies, and the resulting 'error' voltage is fed back to control the input of the voltage controlled oscillator to reduce the error.

It can easily be shown that phase is the differential of frequency (with respect to time) and there can only be a frequency difference between the voltage controlled oscillator and the reference when the phase is changing. When the system is 'locked' to the reference signal the error voltage has been reduced by the system from being a varying signal proportional to the frequency difference, to a steady error voltage proportional to the phase difference. This phase difference is required to produce an error voltage to keep the voltage controlled oscillator on the correct frequency, and it can be reduced by placing an amplifier after the low pass filter.

The operation of the phase locked loop can be considered in more detail in conjunction with Fig. 1. When there is no applied signal there will be no error signal, and the voltage controlled oscillator will run at its natural frequency,  $F_0$ . If an input is applied with frequency  $F_r$  then an error voltage will be generated by the phase detector, containing the signals  $F_0 + F_r$  and  $F_0 - F_r$ . This is then filtered by the low pass filter to leave only  $F_0 - F_r$ . This signal can then be amplified and applied to the control input of the voltage controlled oscillator so that the phase difference, and hence the frequency difference, is reduced. The error voltage will pull the voltage controlled oscillator towards that of the reference until the system stabilises and there is a constant phase difference between the two signals. This phase difference is required to generate the error voltage to keep the oscillator on the required frequency.

As mentioned earlier, when no signal is applied, then no error voltage will be applied to the oscillator. If a signal is then applied the phase detector will generate the sum and difference frequencies. If the difference frequency is higher than the passband of the low pass filter then again no error voltage will be applied to the oscillator. If the reference is swept towards the oscillator frequency then there comes a point when the error frequency comes within the passband of the low pass filter and causes the loop to lock. Therefore the capture range of a phase

locked loop can be defined as the frequency range over which the loop can gain acquisition. It can be seen that this is largely dependent on the filter characteristics.

There are various design parameters which have to be taken into consideration when choosing the passband of the low pass filter. If the passband is made too narrow then the loop will be less likely to be disturbed by noise which may be present. Secondly, if the filter time constant is made long, i.e. the filter is made narrow then the loop can be made to store the reference frequency if it is lost temporarily, due to a break in transmission. However if acquisition is lost then it does make it more difficult to regain lock, as the capture range will be reduced. The ability to store or remember a frequency will also mean the tracking rate will be reduced; this is the rate of frequency change for which the loop will remain locked. This criterion is especially important in applications where the frequency may be changing rapidly.

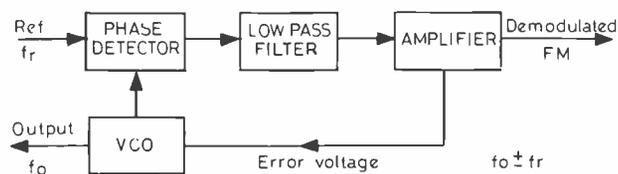


Fig. 1 BASIC PHASE LOCKED LOOP

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877

If the loop has gained acquisition and the reference frequency is then moved it will be found that the loop will remain in lock over a certain range, the lock range. This range is governed by two major factors. The first one is the range over which the oscillator can be made to swing, and if the reference goes beyond that limit then the oscillator will be unable to follow and lock will be lost. Secondly a phase detector is sensitive to both phase and amplitude. If the reference signal decreases in amplitude then the phase error will increase to compensate for this. Thus the effective lock range will be reduced at lower signal levels because lock is lost if the phase error exceeds  $\pm 90$  degrees. Thus a large signal level or a high gain amplifier placed after the low pass filter will enable the full range of the oscillator to be used.

The choice of cut off frequency of the low pass filter will depend on the use to which the phase locked loop is to be put. If the loop is required to track signals quickly then the filter cut off frequency has to be increased otherwise the filter will tend to store the error voltage for too long and acquisition will be lost. Increasing the cut off frequency of the filter does have other effects, namely that the sum frequency from the phase detector will be attenuated less and

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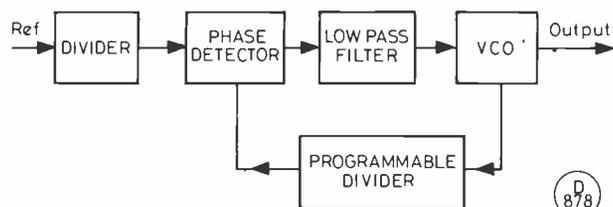


Fig. 2 BASIC FREQUENCY SYNTHESISER

this may give rise to spurious signals. The other adverse effect of increasing the filter cut off is to increase the amount of noise in the system.

The effect of noise in the system is difficult to predict because noise calculations have to be analysed statistically. However, it can be seen that the effect of noise is more critical near the edge of the lock range where any noise present may cause the phase difference between the reference and oscillator signals to exceed  $\pm 90^\circ$  and resulting in the loss of acquisition. Noise will show up on the input signal as both amplitude and phase modulation. The use of a limiter ahead of the phase detector can be shown to reduce the effect of noise and give near optimum performance for the loop. This is because the amplitude modulation of the signal is removed, and the noise appears only as phase modulation.

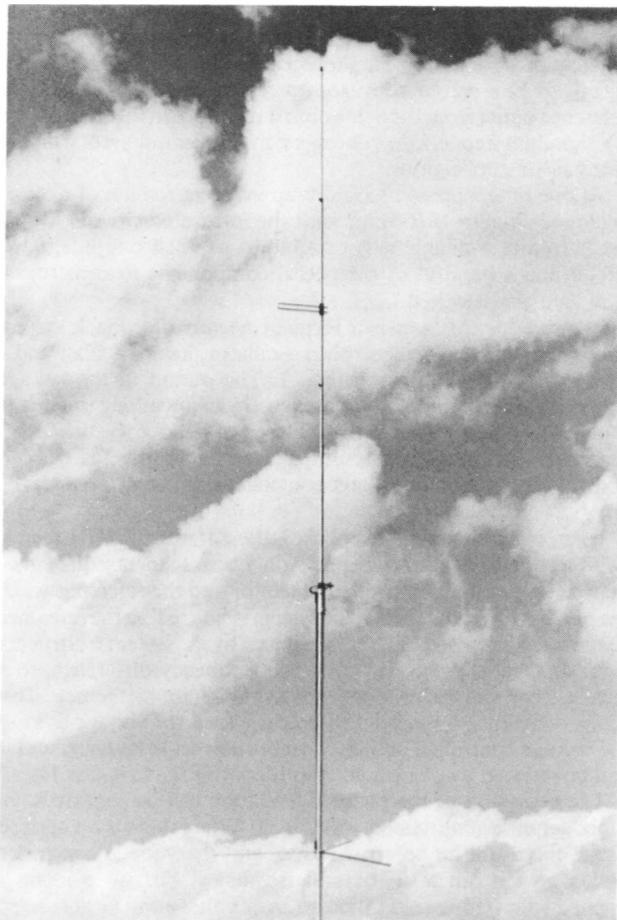
### Applications

Phase locked loops can be used in a great many applications: frequency synthesis, AM demodulation, etc., but probably two of the most common uses within amateur radio are in FM demodulation, and frequency synthesis.

When a phase locked loop is used to demodulate an FM signal the voltage controlled oscillator tracks the instantaneous signal frequency. As the reference or signal frequency varies so the voltage controlled oscillator is pulled up and down to follow the reference. To accomplish this the error voltage must vary, and this voltage is used to give the demodulated output. When using a phase locked loop to demodulate an FM signal the filter should be made sufficiently wide to accommodate the expected modulation. The loop must maintain lock at all times under extremes of modulation as in high frequency peaks. With the filter bandwidth being wide this means that the loop will gain acquisition very easily. This method of demodulation is cheap and easy to use and avoids the use of coils, as the voltage controlled oscillators usually only require an external capacitor to operate. This attribute is especially useful in mass production where coils are expensive to use in comparison with a single capacitor, normally required as the frequency determining element in the phase locked loop. Also, because the voltage to frequency characteristics of the voltage controlled oscillator can be made to be virtually linear over the range which would be used, they introduce very little extra distortion and are widely used in hi-fi applications for this.

The other major use of phase locked loops, that of frequency synthesis can be accomplished in several ways. The basic loop shown in Fig. 1 can be modified by adding multipliers for dividers into either input or both inputs to the phase detector to alter the relationship between the reference frequency and the voltage controlled oscillator signal. If a divider is placed between the voltage controlled oscillator and the phase detector having a division ratio of  $N$ , the loop will lock when the oscillator is  $N$  times the reference frequency. If then the divide ratio is altered, the frequency of the oscillator can be varied by integral multiples of the reference frequency. In most amateur applications steps of 25 kHz or less are required. As stable oscillators around this frequency are not easy to construct, an oscillator with a higher frequency is used and is then divided down as shown in Fig. 2. This is the basic mode of operation of most frequency synthesisers. More complicated functions can be performed by adding extra functions and tailoring the operation to suit the requirements.

This is by no means an exhaustive study of phase locked loops, but more a simple introduction (hopefully) to their modes of operation and also their uses. They are of course used in many more applications than are mentioned here, but it was felt that many of these were outside the scope of this article. The explanations of the operation of the loops have also been kept to a qualitative form as the introduction of mathematics only complicates the subject and would add little or nothing to one's understanding.



In 1981 Cushcraft Corp. of New Hampshire, U.S.A., introduced a Mark II version of their very popular 'Ringo Ranger' colinear, incorporating an additional lower section with radials and a 'blitz bug' lightning protector. The theoretical gain advantage is 1.1dB over the original model, but in practice the net effect in many cases has proved to be much greater. Now Cushcraft have produced a modification kit to allow owners of the original version to update their antennas to the latest specification, and the ARX2K conversion pack (for use with any original ARX2, mounted on a 1 1/4" dia. supporting mast) is available from Cushcraft stockists at £14.20.

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# “A Word in Edgeways”

## Letters to the Editor

*The views expressed here are not necessarily those of the Editor, nor should they be taken to represent any particular SHORT WAVE MAGAZINE policy.*

*Dear Sir* — I am writing in answer to Mr. Quest's letter in the July issue.

Our definition of Christian is “those in communion with whatever part of the church they feel is right for them”. It is for the individual to decide what degree of commitment is correct. We are not exclusive and welcome others to join our net, without raising questions as to belief or lack thereof.

Our common faith in Christ is fully as good a reason for existence as a club, as are the more usual ones — which range from geography, interest in a particular facet of amateur radio, to even employment by the same company. WACRAL is affiliated to the RSGB, and is associated with the G-QRP Club and RAIBC. We have our 25th anniversary this year and hope to operate a special event station during our conference.

May I close on a personal note and say that I joined WACRAL as a direct result of seeing a similar mention (which was no more an advertisement than the recent one) over two years ago in *Short Wave Magazine*.

Brian Hancock, G4NPM, Publicity Officer,  
World Association of Christian Radio Amateurs and Listeners

*Dear Sir* — As a member of WACRAL and chairman of a YMCA (Young Men's Christian Association) radio club, may I make a few comments on Anthony Quest's letter in the July issue regarding WACRAL.

Anthony has not taken the trouble to investigate the Association from the sweeping generalisations he makes; it sounds like he has a chip on his shoulder. *Short Wave Magazine* has quite rightly given space in the “Clubs Roundup” column to a *bona fide* club.

WACRAL used to be known as WAMRAC — the World Association of Methodist Radio Amateurs and Clubs. Even under this title it was not an exclusive Methodist radio amateurs' club. The phrase “committed Christians only” is Anthony's, and was not mentioned in *S.W.M.* in connection with WACRAL except in the context of Anthony's letter. If he does not want to join WACRAL no one will compel him to do so. However I see no valid reason why the club should not be mentioned in *S.W.M.* — it is also mentioned in *Practical Wireless* and *Radio Communication*.

I would expect *S.W.M.* to be unbiased in the material it publishes. Why should it not also publish material from Jewish, Hindu, Buddhist, or Muslim radio amateur associations if asked to do so? Journalism in a democratic society is about free speech and I would be sorry to see *Short Wave Magazine* influenced by a prejudiced individual.

David Hutchinson, M.B., G14FUM, Chairman,  
Belfast YMCA Radio Club (G16YM)

*Dear Sir* — After reading Anthony Quest's (no call sign?) letter in the July issue, I doubt whether he realises how bad the situation *re* mysterious societies really is. In addition to these Christians there is a mysterious body going under the code name RSGB, which appears to run a special network ostensibly for communication in emergencies — though everyone knows that police, fire and ambulance vehicles are all fitted with radio. Moreover, there are all these taxis which have radio communication.

Also, there is a body called Sprat which seems to go under the aegis of an Anglican priest and which presumably appeals to the

fishing industry. This one is particularly suspect because its members seem to make great use of the secret Morse code, which everyone knows is out of date in modern radio work.

But to an Englishman the phrase “committed Christians only” doesn't mean much: would Mr. Quest (no call sign?) kindly elucidate.

Philip Short, G3CWX

*Dear Sir* — There is among us a gentleman who manufactures aerials commercially and who monitors the LF bands for QSOs concerning aerial problems (which most of us have sooner or later). He then sends off a sheaf of literature advertising his products; I've had three identical bundles in twelve months.

Although the use of the amateur bands and the Call Book as part of a marketing technique doesn't infringe the licence regulations as I understand them, it would be interesting to know what readers think of the practice — and in particular of the consequences if, say, a mere *half* of your advertisers followed suit. . . .

Peter Jackson, G3ADV

*Dear Sir* — With regard to Mr. Jaques' letter in June “Word in Edgeways”, let us get the subject of standards into perspective.

It is a fact of life that many accepted standards of personal behaviour have undergone some change over the past few years, and in reflecting this Amateur Radio is no exception. There will always be those who treat every activity as a joke and, whether through arrogance or ignorance, cause annoyance to others.

There are idiots and bad operators on other bands, not just 2 metres (have you listened on Eighty lately!), but this is far outweighed by the vast majority of highly competent and polite operators, many of whom have only recently received their licences.

With regard to CB, 27 MHz has obvious limitations and the drift of people from this fraternity into amateur radio clubs can only be advantageous, both in swelling their ranks (and coffers) and the public relations aspect. It would seem that CB is here to stay, and rather than antagonise them, let's educate them.

David Noakes, G6IYD

*Dear Sir* — Having read *Part I* of the Rev. G. C. Dobbs' latest series, in the June issue, I request that he be immediately elevated to the Peerage. Dobbs' Law (lore?) should be made part of the R.A.E.

I expect you've guessed — I like it!

A. W. Machin, G4HLJ

*Dear Sir* — With reference to the article in the June issue on improving the FT-707 transceiver, Yaesu informed us, in August 1980, of some modifications to the RF unit to improve the intermodulation performance of the receiver, but this was only required in sets with serial numbers earlier than XX07XXXX — which in the UK was only the first few batches sold. Modification details were contained in a technical bulletin, number 26.

We also have stocks of the improved RF unit for customers who wish to change the board themselves.

G. M. Taylor, Sales Adviser,  
South Midlands Communications Ltd.

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Address your letters for this column to “A Word in Edgeways”,  
SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts.  
AL6 9EQ.

# COMMUNICATION and DX NEWS

*E. P. Essery, G3KFE*

**W**HAT can we say about conditions, in weather or band terminology, without groaning? As far as the sunspots are concerned we seem to have slipped off the high plateau and down, down, down — that is, on the occasions when the static crashes have been at a low enough level to enable one to get a fair idea of the underlying state of the band. As to the weather, June was appalling and July, at the time of writing, no better. Definitely not fair!

Bearing all these comments in mind, one should also remember that being in the right place at the right time can still 'assist' the conditions towards some better DX.

## 10 MHz

This band is, not surprisingly, not heavily reported; being CW-only — apart from the clowns — and free to a great extent from the competitive element, not to mention the lack of many countries having the band, makes for an olde-worlde charm all its own — long may it remain so!

Perhaps one of the most useful forces acting on the band is the G-QRP Club; and *Sprat* Issue 31 is a special 10 MHz issue, cram-full of useful bits and pieces for the band, and ways of getting there with rigs without the original provision.

Ex-G3ASX is back on the scene with an R-1000 after a break of some thirty years. Dave offers his clippings from the band, as follows: VO1AW, GD5AVE, VP2MIX, FG7GB, VK2VA, KK2XGH (a beacon run by N4DR using 20w. to a dipole), VE1ASJ, VK5AM, ZL1AH, VE2QW, VE3UT, VK3MR, HB0BFN/M, EA1IE, OK3TCA/P, C31YC, VE7QH, PA0PF, OZ9XD, VE1CEG, OK1KRQ, PA3BYI, Z33IS, OK3CEP, YU3TZZ, LA4DM, PA0PFW, and DJ6EA.

Turning now to G2HKU (Minster) we note first that at last Ted has been able to get back to work; but that has not stopped him from booking in VK2BKH and VK3MR.

Nice to hear again from G2BY in the Isle of Wight; Bert has been using his Bitternut Vertical on 10MHz, by virtue of a small re-adjustment, and of late has been concentrating on the early mornings and late evenings. The tally so far is some 28 VKs, 3 VEs, plus XT2AW, C6ABA, 3X5DX, FC8TT, and an all-time new one in the shape of ZK2VU. Around 2200, VK3MR has been noted and worked a few times.

Our final reporter on this band is GM4CXP (Borders) who claims he has come down "in order to see just what G3FPK of *VHFB* is doing on HF!"

Derrick uses an FT-101B to which a small modification has added 10 MHz transmitting, and he cheerfully admits to being among those to whom CW is the preferred way of operating. 10 MHz CW yielded QSOs with C31YC, DL3GG/YV5, LX1YZ, VE1ASJ twice, VK3MR, ZL1PZ, and 5Z4CS.

## Ten Metres

Mostly dead, save for a few short skip openings and the odd N/S opening to ZS and PY, says G3NOF (Yeovil); Don sums up quite effectively when he adds "no QSOs made".

G3PKS (Wells) has returned to the fold after a slight alteration to his loops; Jack says he tried a few CQs on a dead band and netted a few replies all too weak to be copiable, but including W1, W2, and N4 — no contacts, though.

G4LDS (Chelmsford) also noted the odd N/S opening and adds that he found the band, just occasionally, open to the East. Disregarding the Europeans, he offers 3X3JA, ZS1RH, 5N6RED, ZS4SS, ZC4NB, UA9FAT, PYs, 9X5SL, 9U5WR, VK9YC at 1600z, 7Q7LW, P29MF, VK6NAS, 4Z4DX; all these were on SSB, as Chris says that although he has been working on his Morse, he still lacks confidence to go out and get a CW QSO.

G2BY says he has found the band pretty dead, but it still has its knack of producing unexpected DX; that way Bert managed 9V1, CE3, HZ, 3B8, HI3, W5 and W6. G2BY says there is a lack of CW activity on the I.o.W., which he is happy about from the point of view of local QRM — though he has tried to give SSB a little whirl occasionally, but finds the interference so bad that it is a relief to get back to the old Vibroplex. On a different tack, Bert had a visit recently to Niton Radio, GNI, which brought back memories of sixty years ago, when G2BY learned his Morse by copying GNI working North Foreland, GNF. GNF's quenched-gap spark transmitter in those days had a "bell-like ring" to it on the air, unlike the one at GNI which sounded at RF more like a buzzer. G2BY could get his Morse practice 'live' in those days just by sitting outside the GNF 'shack' and listening to the quenched-gap, which was quite audible outside!

GM4CXP adds his voice to the general opinion of the state of the ten-metre band, but does offer his penn'orth by way of a CW contact with ZS1BS.

## Top Band

For the past couple of months, says G2BY, his activity on Top Band has been

nil — more, by at least the report, than most correspondents who just refuse it even a mention!

G2HKU says he has been on reduced activity thanks to the combined assaults of conditions and the gardening; but that is to include SSB to PA0PN, plus CW contacts with SM6EHY, UT5AB, GD4BEG, GW3NYY, OZ1W, UB5UKO, GM4KWS, and GW3YDX.

**"CDXN" deadlines for the next three months—**

September issue — August 5th  
October issue — September 2nd  
November issue — September 30th

*Please be sure to note these dates*

As for G4AKY (Harlow) it is all a matter of being around at the right time and place to 'remind' Dave to produce a list — but when he does, he turns up a cracker. However, neither Dave's FT-902DM nor his Racal receiver could do much about the S9 static levels that have been on the band, so there were only four continents to be noted. If we disregard for the moment the Europeans, and concentrate on CW, then we are left with W1ZM, K2GNC, K2DSV, AD1Z, WA2SPL, VE1ZZ, VE1AXT, VE1BVL, EZ9ABG, UF6FFU, LU9EIE twice (which Dave thought a bit surprising in view of recent events), plus gotaways ZS5LB, UH8DC, a PY4, W3s, W4s, W8s, and, known to have been on but not even heard, OA4AWD and ZD7BW. Turning to SSB, it was all European, but one of interest appeared as a gotaway — AM9JV on Melilla.

## Now Forty

As always, a band which has a lot more to offer than is apparent to the ear of the one using white-hot 1982 technology like a broadcast receiver! That having been said, one has to admit to a degree of surprise at the number of people who use it but don't report it.

Our first reporter is G2BON (Aldridge) who has a good old grouse about the amount of non-amateur signals in the 'exclusive amateur' segments of the our bands, and Forty in particular. Nonetheless Tom managed, by getting into the shack around 0500z for an hour, to effect SSB QSOs with 6W8AR,

AM9AM (Ceuta), CX2DC, and PT9ZE, using a G5RV at 30 feet and IC-701 as the prime mover.

Now we look at GM4CXP, that fugitive from the VHF's, who tackled CW on 7 MHz just long enough to pick out C31YD, plus some small fry.

Turning to G3PKS, Jack has a serious problem: he has slightly altered the configuration of his two loops, such that the proper description would be 'double-diamond', whence he feels someone might misunderstand the QSO statement "I'm working on a double-diamond here OM".

Leaving aside this little problem, G3PKS used the band for some SSB inter-G contacts but at times found it almost impossible to complete the over for the QRM from continentals at S9-plus, who would appear all over the band for a few moments and then as quickly drop out of audibility leaving just a great gap in the recovered information while they were present. Not something one can blame the continentals concerned for really, just propagation.

G2BY looked back at his log for this time last year and notes that things are far down this year in comparison; Bert feels this was due as much to lack of CW activity as anything. His own crop included quite a few W and VE stations.

The QRP rig at G2HKU was pressed into service on 7 MHz and, with it and a key, contacts were secured with OK1APB, LA3NQ, and YU7HYZ.

We nearly overlooked the letter from G4NKM (Blackheath, SE3) who has been working on his new house, and therefore has not been as active as he would have liked. One midnight session on Forty was quite useful though, for a first SSB QSO on the band with VK6HD, then UH8EAA, then VO1AB, all S9 with a *KW* trapped dipole on the slope and 100 watts p.e.p.

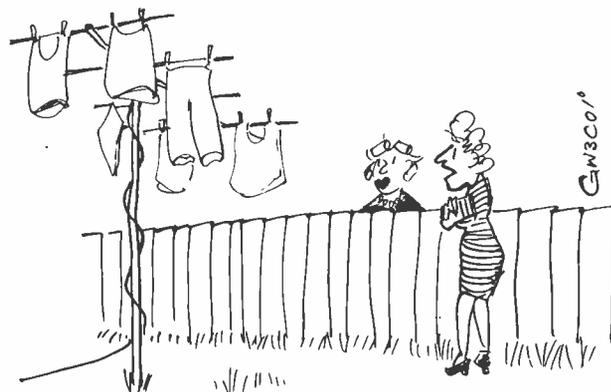
### Snippets

G4NKM, from the viewpoint of the new householder says he hopes to be more active this winter when there is less work to do — optimist!

The BARTG Spring 1982 contest results are to hand, and we note some 158 logs were received from around 70 countries known to have been on. G3HJC placed fourth in the single-op section to winner W3EKT; and in the multi-op section, the winner was G3ZRS with G3UUP fourth and GW6GW seventh.

Looking back into recent history, readers will recall our mentioning the lack of response from *Guinness Book of Records* to the proposition that KV4AA's record-breaking QSO total since 1976 deserved their recognition. Pretty obviously some readers took up the cudgels as we asked, as W1WY is pleased to report that there is some indication of movement at Guinness.

On a totally different tack, G3NOF noted that the LUs were back on the band



"... no, he doesn't mind when he's on Top Band ..."

from June 4, and enquires tartly whether their QSL address should be "via Task Force"?

Looking at the BY situation, we hear that they will be able to operate on SSB if all goes well, from 1983; and that they will have all bands 10-80 metres, including the three new ones. Further, there is a likelihood of a new BY station, namely BY1BC from the University of China in Beijing; and it is understood that the use of IRCs to China is OK. On a different tack, the front cover of June *QST* carries pictures of the various BY operators' QSL cards, and very nice they look too — worth the effort to make a QSO, quite apart from the DXCC angle!

Those who use QSL Bureaux, or even those who QSL direct, should always exercise patience; VK3BZ recently got a QSL for a QSO with W4AGI in 1932 — is a fifty years' wait for the QSL a record, we wonder?

Quite a crop of Silent Keys to be noted: UA3CA, UA3DV; ex-VP8FL, A. L. Bonner, and W2PV — a very well-known DX operator mentioned by both W1WY and Geoff Watts. Then AC3PT, ex-King of Sikkim; and HS1WR, President of Bangkok Radio Club. Top Band enthusiasts will all be saddened to hear of the death of W2EQS/FP8AS/W9NFC, Charles M. O'Brien; and the YLs will miss 4S7YL/ex-8Q7AC/VQ9YL, Soma Wickremasinghe.

### Eighty

Like all the other bands, 3.5 MHz has managed to stay in the doldrums, at least to DX addicts, although of course the inter-G telephony continues regardless of season or QRM. Down at the CW end, the DX is to be found in the first 5 kHz in the main, but it requires good receiver control and some stalking to raise. Up at 3560 kHz one will find the QRP Club members, and one hopes that readers with QRO who may hear and work a QRP station once with full power will cut back for any further

QSOs, so making it a lot easier for the other QRP chaps.

June was a very poor month for afternoon CW operating, says G2NJ (Peterborough); Nick found it all but deserted save for the static, until around tea-time. He mentions a QSO, around 2015z, by I3ZKJ/MM, who was working ON and OK stations from near Algiers when bound for Rotterdam. On a different tack, Nick ran across two old war-time colleagues during the month, having CW contacts with G2AA in Leicester and G2ZZ in East Ham.

The QRP rig of G2HKU was used to have CW contacts with G4AYG and G6AB, but he had to crank up the Big Box to raise PY1MAG.

G2BY mentions just the one QSO on the band, with G2NJ.

And, oddly enough, the list from G3PKS also mentions G2NJ, plus G5RV, G4NNU who was running two watts from Seaton in Devon, G3YIG and ON4SK — all at quite low levels and in marked contrast to the enormous babble of the SSB segment of the band.

It was CW all the way for GM4CXP, and it went out to EA6BD, PY1MAG, UA6APP, and UA9AJO.

### 21 MHz

Like all the others, suffering; but is has produced the odd crock of gold for the conscientious leprecaun.

G4NKM had only his indoor living-room bent dipole, and he accepts that this couldn't have helped much; but between all the household work, QSOs with HA1KZH and EA7BHO made a pleasant break.

G3NOF says that although the majority of his contacts were made on 21 MHz, in general signal strengths were low. In the mornings there were short-path openings to VK, JA, and USSR; during the afternoons and early evenings the band was often fairly good to the Middle East, Africa, and SE Asia, and there was

frequent summer short-skip stuff from Europe. SSB contacts were made with A4XCB, A4XYB, A92BW, DL7HZ/IM0, KB5PX/5N4, HH2SD, HS1ALP, JA2APA, JA3BOA, JA3YBF, JA7YAA, JA9YBA, 10YKUN/IG9, OH2BJK/OH0, OH1TD/4U/YK, ON4QP/LX, TA1MD, TJ1GH, TU2IJ, TU2JT, UA0WAM, UK0SAR, UK0WAA, V2AZE, VK6AJW, VK9NYG, VQ9PG, VS5GA, YB8VN, YB0AV, YB0WR, YC5OD, YV4CZO, ZP5AA, ZS2GH, 3B8FK, 5N3WDC, 6W8DY, 7X2KRC, 8P6OR, 8Q7BN, 8R1Y, 9V1TL, and 9L1MS.

Turning to G2BON, around 1000z Tom worked SSB to UK0WAA, and UK0SAR, at teatime JR6VNC, and around 2000z CX2CS and OE1EHB/YK.

The list from G4LDS includes CU5OK, HP1XKZ, JA1-8, KP4JJ, JW0P, PY6FH, PY6PA, UA9XVU, VE1UI/P/1, VE3DTR, VE3KTT, VE7EYI, W2GXX, K6UYH, WB1CPJ, KA1BVA, W4DO, KE4HW, K4HEU, a CW one with K1DWU, XP1AB, VP8AOE (S. Orkney), 4Z4RZ, 5H3DM, and 9U5WR.

Fifteen for G2HKU meant CW, and contacts with UA9FDW, 9J2NO, W6TEX/CT3, 4X6CJ, W2BA, and

VE3IPR.

Now on to G2BY, and Bert says the band was pretty poor until late evenings, when it opened to South America, yielding him contacts with PY, CE3, and JA, but not much else.

21 MHz for G3PKS is summed up very bluntly — not worth reporting!

Last but not least, GM4CXP; Derrick used CW to JA2LC, JE1HKW, JH6REM, PY1BFZ, PY2CSH, UA0BL, UF6FCZ, UK9CDG, VP9CB, and VU2GSM, while the SSB accounted for A4XYB, C31YC, C53CC, KV4X, and YV3UF.

## Twenty

Again the general consensus is 'poor' with G3PKS offering a Nil report, and G3NOF doing no more than to listen to the VP8s and work VP8NE in Port Louis.

On the other hand, the most used band for G2BON was definitely this one, and he notes SSB contacts with JY3ZH, V2AU, N4BAA, J73PP, J73PD, KE4CI/TF, TG9GI, ZB2HF, A4XJO, UM8MDX, K5YY/J8, WB8ZJW/HP1, CE0AE, TI2CCC, K5YY/J6, and 8P6MY, all between about 0500z and 0700z.

Turning to the list from G4LDS, he seems to have had lots of small-fry

Europeans, with such as YB4AEP, VK5AEV (who is ex-G8AT of Marconi, Chelmsford), VK2DUI, KA5KZF, W5BG in New Mexico, WA6JRW, WB6FRD, WB6UAU, W3ORU, and VE3CDP/P/W9.

The doings at G2HKU of course included the morning SSB skeds with ZL3FV and ZL3RS, plus W7ODP in Arizona; the Morse key was the tool to deal with K5YY/J8, K6DDO, HC1VU, 4X4DX, and KV4AA. Out of this lot came an interesting snippet from W7ODP who said that Arizona is the only state in the Union now not to use Summer Time.

The band has been in very poor shape says G2BY, but that didn't stop Bert from keying out to all W districts, VE, VS6, KH6, HZ, YV4, and a couple of FO8s.

GM4CXP seems to have stuck to CW on this band, and it yielded him PT7VJD, PY2GNO, UK0BAA, and VE1MLJ.

## Finis

That's it for another *CDXN*. The deadline for the next outing is in the 'box', and the address as always "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

## "G9BF CALLING"

**F**OLLOWING piece in March *S.W.M.*, Editor receiving enquiries re 20m. Moonbounce project progress from fans of G9BF. Well, OMs, the Tx is coming along FB; mind you, it don't look too pretty but who cares? Rather have rough-looking gear that works than smart, prissy job that won't ackle properly. Garden shed proving veritable Aladdin's Cave of WW2 QRO components, such as super wide-spaced variable condenser for PA plate tuning, OK for a least 5KV I reckon. Also found several PA tank coils made of copper tube that dear old Dad made way back.

Exciter part very simple. 6V6 CO with 7 megs. rock and 807 doubler. These bottles all good WW2 stuff sent lease-lend from U.S.A. Cost about five bob in real money in those days. As expected, big problem was to find hefty plate tranny. Went to a few rallies but nothing any good; all low voltage rubbish these days. But did meet very Old Timer, G2-plus-2, who said he thought he had a nice tranny for me, so fixed up a visit to his QTH. Flogged a couple of soft 829B's at the bring-and-buy stall and bought fistful of 800V, 5A diodes with part of the loot. Also copped two half-mile drums of field telephone wire for the rhombic. (Say, weird lot at rallies these days, eh? This spotty twit comes over and says, "Oi! I fink I recognise the old Hobson's there. It's the Duke of Hazzard from channel fifteen, innit?" "What the Hell are you on about?" I asked him. "Oh, sorry there," he says, "Fought you was one of me CB mates. Ten-four good buddy!" Dear me. What have we come to?)

Now about this tranny. Went over to the OT's place on the old motorbike and sidecar. Front door opened by wizened old crone,

a right candidate for the telegram from H.M. Queen. "He's out the back," she said, and promptly shut the door in my face. Went round side of house and saw ramshackle garden shed. Pushed open the squeaking door and there he was, sitting in front of a *real* AR station like Dad had when I was a lad. Right out of the 1930s and a joy to behold; lovely big round meters, glowing valves in 19" racks, beautiful brass key and D-104 mike.

"Ah. You're the young fellah for that transformer," he said, in a voice just like Henry Crun on the Goons, remember? Come to think of it, his XYL seemed a dead ringer for Henry's live-in girlfriend Minnie Bannister! Pointing to a corner of the shed he said, "It's under that lot, lad." Rummaged about and there it was. What a whopper, about the size of the old-fashioned biscuit tins and I guessed it weighed nigh on three hundredweights. Wiped off the dust and the label said, "3,500-0-3,500V 3A." Perfect. Didn't let on it was just the job and said, "It's a bit big, chum. I'll take it off your hands for a fiver." "Don't hurt yourself, will you," he said, but I told him it would take ten men and a boy to shift and would cost me to hire muscle and transport. So the deal was done, I coughed up the fiver and nipped back home on the bike.

Borrowed small van today, complete with brawny labourer, from local builder. (The guy owed me a favour after I fixed his hi-fi tuner. Actually, it was only a loose antenna plug but he now thinks G9BF a genius.) Primed the Muscle with home brewed beer and drove to Henry Crun's pad. Managed to hump the tranny into the van and drove my prize straight home, unloading it straight onto the L.N.E.R. luggage trolley. The Muscle said, "Sure t'is a wonderful brew you have there, sore." So I let him have a few more pints before pointing him towards the way we came. Slapped AVO across windings and meggered the brute and all seemed FB. QRT for bed now: more later. 73 es BCNU de G9BF.

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- KW trap dipole
- KW E-Z match
- KW traps
- KW Balun
- KW antenna switch.

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10-80 metres, 100 watts (Switchable to 10 watts). Notch Filter. Full break-in on CW. Automatic normal sideband selection plus reverse. 12 - 14v D.C. input. All solid-state. For the price of £320.00+VAT. **A WINNER AT LOW COST.**

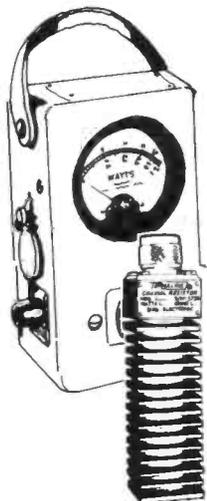
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Individual Prices for Bird Equipment	MODEL 43 Thru-line Wattmeter	£121.90
	MODEL 8080 25 Watt Load Resistor	£ 62.10
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	Choice of 4 plug-in elements from	£ 43.70
(ALL PRICES INCLUDE VAT, POSTAGE & PACKING)		
Mobile Service Test Set Packages now available direct from Aspen.	<b>PACKAGE 1 (Ref:43/80/4)</b> (25 Watts) • Bird 43 Thru-line Wattmeter • 8080 Terminate RF Coaxial Load Resistor • Choice of 4 plug-in elements from table below (H elements £8.63 each extra) • 4275-100 Variable RF Signal Sampler ALL HOUSED IN SPECIALLY DESIGNED CUSHION FIT CARRYING CASE ONLY <b>£373.75</b> COMPLETE.	
	<b>PACKAGE 2 (Ref:43/85/4)</b> (50 Watts) • Bird 43 Thru-line Wattmeter • 8085 Terminate RF Coaxial Load Resistor • Choice of 4 plug-in elements from table below (H elements £8.63 each extra) • 4275-100 Variable RF Signal Sampler ALL HOUSED IN SPECIALLY DESIGNED CUSHION FIT CARRYING CASE ONLY <b>£396.75</b> COMPLETE.	
<b>PACKAGE 3 (Ref:43/80/6)</b> As Package 1 but with choice of 6 plug-in elements ONLY <b>£454.25</b> COMPLETE.	<b>PACKAGE 4 (Ref:43/85/6)</b> As Package 2 but with choice of 6 plug-in elements ONLY <b>£471.50</b> COMPLETE.	

(ALL PRICES INCLUDE VAT, POSTAGE & PACKING)

Power Range	STANDARD ELEMENTS (Catalogue Numbers)					
	Frequency Bands (MHz)					
	2-30	25-60	50-125	100-250	200-500	400-1000
5 Watts	—	5A	5B	5C	5D	5E
10 Watts	—	10A	10B	10C	10D	10E
25 Watts	—	25A	25B	25C	25D	25E
50 Watts	50H	50A	50B	50C	50D	50E
100 Watts	100H	100A	100B	100C	100D	100E
250 Watts	250H	250A	250B	250C	250D	250E
500 Watts	500H	500A	500B	500C	500D	500E
1000 Watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 Watts	2500H					
5000 Watts	5000H					

For further details on these Special Offers and information on the complete Bird range call Aspen on 01-866 6513. TELEPHONE ORDERS ON ACCESS & BARCLAYCARD GLADLY ACCEPTED.



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# Sound Advice - Sound Value

A GOOD START is essential to short wave listening and expert advice is important in achieving this. If you've made up your mind to buy a receiver you should be aware it will perform only as well as the antenna it sees. The old adage regarding wire antennas "as long and as high as you can" is still good, but at best is only good for PEAK PERFORMANCE on one or two frequencies, or at worst none.

Whichever frequency you tune your receiver to, for PEAK PERFORMANCE on all frequencies you need good matching between your Receiver and Antenna to get the best from it. If you plan to listen on the high frequency bands up to 30MHz then you know you can't have an antenna for every frequency! BUT we can offer you MUCH IMPROVED PERFORMANCE

from your receiver by using an antenna tuning unit that will electrically change the length of your antenna to match the frequency you select. In other words - A MATCH FOR ALL FREQUENCIES.

You'll see many antennas being advertised under gimmicky names, but when it comes down to it they're only random wires or odd configurations. At the end of the day, if you're expecting the performance the manufacturers specified, then you'll have to buy an antenna tuning unit. DON'T! We'll give you one ABSOLUTELY FREE when you buy your FRG 7700 or FRG 7700M, as well as complete advice on an antenna to suit your available space (which should only cost you a couple of pounds!).

1 YAESU FRG 7700 + FRT 7700 £329.00  
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What can you lose? So get cracking MAKE A GOOD START! HAVE PEAK PERFORMANCE FROM THE OFF AND DON'T FORGET, ADD £5.00 IF YOU REQUIRE SECURICOR DELIVERY.

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**2 METRE STOCK CRYSTALS.** Price £1.96 for one crystal. £1.74/crystal when two or more purchased.

	HC8/U	HC6/U	HC25/U 30pF and 40pF TX	HC25/U 20pF and 30pF RX	HC25/U 25pF and 20pF TX	HC6 & 25/U SR RX
R0	4.0277	8.0555	12.0633	14.9688	18.1250	44.9666
R1	4.0284	8.0569	12.0854	14.9916	18.1281	44.9750
R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
R3	4.0298	8.0597	12.0895	14.9972	18.1343	44.9916
R4	4.0305	8.0611	12.0916	15.0000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	44.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
R7	4.0326	8.0652	12.0979	15.0083	18.1468	45.0250
S8	—	—	12.1000	14.9444	18.1500	44.8333*
S9	—	—	12.1020	14.9472	18.1531	44.8416*
S10	—	—	12.1041	14.9500	18.1562	44.8500*
S11	—	—	12.1062	14.9527	18.1593	44.8583*
S12	—	—	12.1083	14.9555	18.1625	44.8666*
S13	—	—	12.1104	14.9583	18.1656	44.8750*
S14	—	—	12.1125	14.9611	18.1687	44.8833*
S15	—	—	12.1145	14.9638	18.1718	44.8916*
S16	—	—	12.1167	14.9667	18.1750	44.9000*
S17	—	—	12.1187	14.9694	18.1781	44.9083*
S18	—	—	12.1208	14.9722	18.1812	44.9166*
S19	—	—	12.1229	14.9750	18.1843	44.9250*
S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
S21	4.0423	8.0847	12.1270	14.9805	18.1906	44.9416
S22	4.0430	8.0861	12.1291	14.9833	18.1937	44.9500
S23	4.0437	8.0875	12.1312	14.9861	18.1968	44.9583

SR = Series Resonance \*HC25 only

**Also in stock:** R0 to R7 and S8 to S23 for following: Belcom FS1007, FDK TM56, Multi 11 Quartz 16 and Multi 7, Icom IC2F, 21, 22A and 215, Trio Kenwood 2200, 7200. Uniden 2030 and Yaesu FT2FB, FT2 Auto, FT224, FT223 and FT202

**Also in stock** 4MHz TX in HC6/U for 145.8MHz. Icom crystals TX for 145.6MHz (RRO). 44MHz RX crystals in HC6 for 145.8 and 145 (RRO). All at above price.  
**4 METRE CRYSTALS** for 70.26MHz in HC6/U at £2.25. TX 8.78250MHz. RX 6.7466 or 29.78MHz in stock.

**70cm CRYSTALS** in stock 8.0222 and 12.0333 in HC6 £1.86. Pye Pocketfone PF1, PF2, PF70 and Wood and Douglas £4.50 a pair or TX £2.25, RX £2.50. SUB (433.2) RBO, RB2, RB4, RB6, RB10, RB11, RB13, RB14 and RB15.

**CONVERTER CRYSTALS** in HC18/U at £2.86. In stock 38.666, 42.000, 70.000, 96.000, 101.000, 101.500, 105.666 and 116.000MHz. 26.000HC £2.00  
**tone BURST AND I.F. CRYSTALS** in HC18/U at £2.25 in stock. 7.168MHz for 1750kHz and 10.245MHz for 10.7MHz IF's.

**FREQUENCY STANDARDS** in stock £2.75. HC6 200kHz, 455kHz, 1000kHz, 5.000MHz and 10.000MHz. HC13 100kHz, HC18 1000kHz, 7.000MHz, 10.700MHz, 48.000MHz and 100.000MHz. 4.000HC18 £2.00

#### MADE TO ORDER CRYSTALS SINGLE UNIT PRICING

	Price Group	Adjustment Tolerance ppm	Frequency Ranges	Price and Delivery	
				A	B
Fundamentals	1	200 (total)	10 to 19.999kHz	—	£23.00
	2	200 (total)	20 to 29.999kHz	—	£16.50
	3	200 (total)	30 to 159.999kHz	—	£10.50
	4	200 (total)	160 to 999.999kHz	—	£6.00
	5	50	1.00 to 1.499MHz	£10.50	£6.00
	6	10	1.50 to 1.999MHz	£4.75	£4.40
	7	10	2.00 to 2.599MHz	£4.75	£4.40
	8	10	2.60 to 3.999MHz	£4.55	£4.10
	9	10	4.00 to 20.999MHz	£4.55	£4.00
	10	10	21.00 to 24.000MHz	£6.00	£5.40
3rd OVT	11	10	21.00 to 59.999MHz	£4.55	£4.00
5th OVT	12	10	60.00 to 99.999MHz	£5.00	£4.50
5th, 7th & 9th OVT	13	10	100.00 to 124.999MHz	£6.15	£5.50
	14	20	125.00 to 149.999MHz	—	£6.00
	15	20	150.00 to 225.000MHz	—	£7.50

Unless otherwise requested fundamentals will be supplied with 30pF load capacity and overtones for series resonance operation.

**HOLDERS** — Please specify when ordering — 10 to 200kHz HC13/U, 170kHz to 170MHz HC6 or HC33/U, 4 to 225MHz, HC18 and HC25. Where holders are not specified crystals above 4MHz will be supplied in HC25/U.

**DELIVERY** Column A 3 to 4 weeks. Column B 6 to 8 weeks.

**DISCOUNTS.** 5% mixed frequency discount for 5 or more crystals at B delivery. Price on application for 10 or more crystals to same frequency specification. Special rates for bulk purchase schemes including FREE supply of crystals used in UK repeaters. The above prices apply to small quantities of crystals for amateur use. We would be pleased to quote for larger quantities or crystals for professional use.

**EMERGENCY SERVICE SURCHARGES** (to be added to A delivery prices). 4 working days £12. 6 working days £7. 8 working days £5. 13 working days £3. Surcharges apply to each crystal not each order and are subject to VAT.

**CRYSTAL SOCKETS** HC6/U and HC25/U 20p. MINIMUM ORDER CHARGE £1.50.

**TERMS.** Cash with order, cheques and postal orders payable to QSL Ltd. All prices include postage to UK and Irish addresses. Please note Southern Irish cheques and postal orders are no longer acceptable. Please send bank draft in pounds Sterling.

**PRICES ARE EX VAT. PLEASE ADD 15%**

**MARKETING LTD. P.O. BOX 19, ERITH, KENT, DA8 1LH**  
Telephone: 01-690 4889 (9-5) 24 hr. Ansafone: Erith (03224) 30630  
Telex: 8813271 GECOMS G (Attention QUARTSLAB).



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2 ALEXANDER DRIVE, HESWALL  
WIRRAL, MERSEYSIDE, L61 6XT

Tel: 051-342 4443. Cables: CRYSTAL, BIRKENHEAD.

## CRYSTALS MANUFACTURED TO ORDER

Prices shown are for "one off", to our standard amateur specs., closer tolerances are available. Please send us details of your requirements.

- A Low frequency fundamentals in HC13/U or HC6/U**  
Total tolerance ±100 ppm. 0° to 70°C.  
6.0 to 9.99kHz HC13/U £32.80  
10 to 19.99kHz HC13/U £31.00  
20 to 29.99kHz HC13/U £23.08  
30 to 59.99kHz HC13/U £21.73  
60 to 79.99kHz HC13/U £15.69  
80 to 99.99kHz HC13/U £13.08  
100 to 159.9kHz HC13 + 6/U £11.32  
160 to 399.9kHz HC6/U £7.83  
400 to 499.9kHz HC6/U £7.00  
500 to 799.9kHz HC6/U £7.83
- B High frequency fundamentals/overtones**  
Adj. tol. ±20ppm. Temp. tol. ±30 ppm -10° to +60°C.  
800 to 999.9kHz (fund) HC6/U £11.01  
1.0 to 1.499MHz (fund) HC6/U £11.25  
1.5 to 2.59MHz (fund) HC6/U £5.36  
2.6 to 20.99MHz (fund) HC6/U £4.87  
3.4 to 3.99MHz (fund) HC18 & 25/U £6.75  
4.0 to 5.99MHz (fund) HC18 & 25/U £5.36  
6.0 to 21MHz (fund) All holders £4.87  
21 to 25MHz (fund) £7.31  
25 to 30MHz (fund) £9.00  
18 to 63MHz (30/T) £4.87  
60 to 105MHz (50/T) £5.61  
105 to 125MHz (50/T) £8.44  
125 to 180MHz (70/T) £8.62  
149 to 180MHz (90/T) £12.75  
180 to 250MHz (90/T) £13.50

Delivery - Mid range 1 MHz to 105 MHz normally 4/6 weeks. Other frequencies 6/8 weeks.

Holders: Low Frequencies 6 to 150kHz HC13/U, 150kHz to 3.4MHz HC6/U, 3.4MHz to 105MHz HC6/U, HC18/U or HC25/U, over 105MHz - HC18/U and HC25/U.  
HC33/U (wire end HC6/U) is available on request as per HC6/U.  
HC17/U (Replacement for FT243) available as per HC6/U at 35p surcharge on the HC6/U price.  
Unless otherwise specified, fundamentals will be supplied to 30pf circuit conditions and overtones to series resonance.

### EXPRESS SERVICE

Many types of made to order crystals are available on our "EXPRESS SERVICE" - with delivery of three days on our class "A" service. Telephone for details.

### COMMERCIAL AND PROFESSIONAL CRYSTALS NEW FASTER SERVICE

We are now supplying crystals to most commercial and MIL specifications in the range 1MHz to 60MHz ordered in small quantities in 2 1/2 weeks AT NO EXTRA CHARGE. We also have even faster EXPRESS SERVICES available for that VERY URGENT order.

We can also supply crystals for commercial applications e.g. Microprocessor, TV, etc., at very competitive prices. Let us know your needs and we will send you a quote by return, alternatively telephone or telex our Sales Engineer Mr. Norcliffe who is normally available in the office for technical enquiries between 4.30 and 6.30 p.m.

TERMS: CASH WITH ORDER - MAIL ORDER ONLY. PRICES INCLUDE P. & P. (BRITISH ISLES) EXCEPT WHERE STATED - OVERSEAS CHARGED AT COST.

## TWO METRE CRYSTALS

CRYSTAL FREQUENCY RANGE USE (TX or RX) and HOLDER	4MHz TX-HC6/U		6MHz TX-HC25/U		8MHz TX-HC6/U		10MHz RX-HC6/U		11MHz RX-HC6/U		12MHz TX-HC25/U		14MHz RX-HC25/U		18MHz TX-HC25/U		44MHz RX-HC6/U		44MHz RX-HC25/U		52MHz RX-HC25/U	
	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e
144.4 (433.2)	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e	b	e
144.800	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
144.825	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
144.850	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.000/ROT	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	a	c	c
145.025/R1T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.050/R2T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.075/R3T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.100/R4T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.125/R5T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.150/R6T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.175/R7T	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.200/R8R	a	a	c	c	a	c	c	c	c	e	e	e	e	e	e	e	e	e	e	e	e	e
145.300/S12	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.350/S14	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.400/S16	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.425/S17	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.450/S18	a	a	e	e	e	e	e	e	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.475/S19	a	a	e	e	e	e	e	e	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.500/S20	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.525/S21	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.550/S22	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.575/S23	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.600/R0R	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.625/R1R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.650/R2R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.675/R3R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.700/R4R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.725/R5R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.750/R6R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.775/R7R	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
145.800/R8R	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a
145.950/S38	a	a	c	c	a	c	c	c	b	b	b	a	a	a	a	a	a	a	a	a	a	a

PRICES: (a) £2.15, (b) £2.55, (c) £2.80, and (e) £4.87.

AVAILABILITY: (a), (b), (c) stock items, normally available by return (we have over 5000 items in stock). (e) 4/6 weeks normally but it is quite possible we could be able to supply from stock. N.B. Frequencies as listed above but in alternative holders and/or non stock loads are available as per code (e).

ORDERING. When ordering please quote (1) Channel, (2) Crystal frequency, (3) Holder, (4) Circuit conditions (load in pf). If you cannot give these, please give make and model of equipment and channel or output frequency required and we will advise if we have details.

### DOUBLE BALANCED MIXER

We are now stocking two new double balanced mixers which are pin compatible with both the MD10B we used to stock and also the SBL1, but have much superior specifications covering 500 kHz, to 500 MHz. The M18 is non hermetically sealed @ £6.09. The M8 is hermetically sealed @ £7.83.

## 70 cm CRYSTALS

Due to the much higher multiplication involved compared with 2 metres all our stock 70cm crystals are to much higher tolerances than our standard amateur spec. crystals.

We are stocking the following channels: RB0, RB2, RB4, RB6, SU8, RB10, RB11, RB13, RB14, RB15, SU18, and SU20. TX & RX for use with: - PYE UHF Westminster (W15M), UHF Cambridge (U10F), Pocketfone (PF1) and UHF PF70 Range, and STORNO CQL/CQM 662 all at £2.55.

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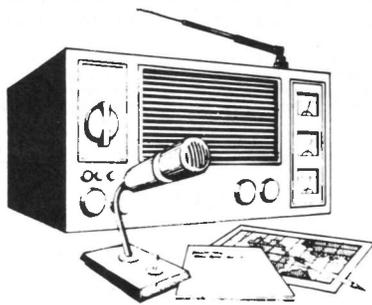
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**Selling:** Icom IC-720A Tx/Rx, optional filters fitted, with PS15 power supply, both as new, £775. — Phillips, G8WYT, QTHR. (Tel: Haywards Heath 450265).

**Sale:** Dentron HF-200A HF transceiver, 80-10m., 200W p.e.p., fully broadbanded, with power supply and new 20m. mobile whip, the lot £260 or near offer. — Ring 0279-28055.

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**Offering:** Eddystone EC-10 Mk. II, mains/battery, instruction manual, excellent condition, unused last four years. What offers? — Ring Hemingway, 04866-2331 (Surrey) evenings.

**September issue: due to appear August 27th. Single copies at 80p post paid will be sent by first-class mail for orders received by Wednesday, August 25th, as available. — Circulation Dept., Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.**

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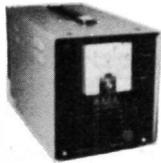
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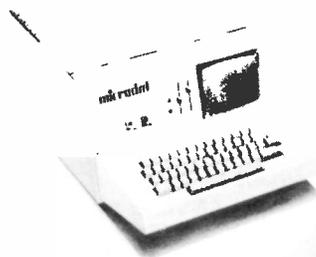
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