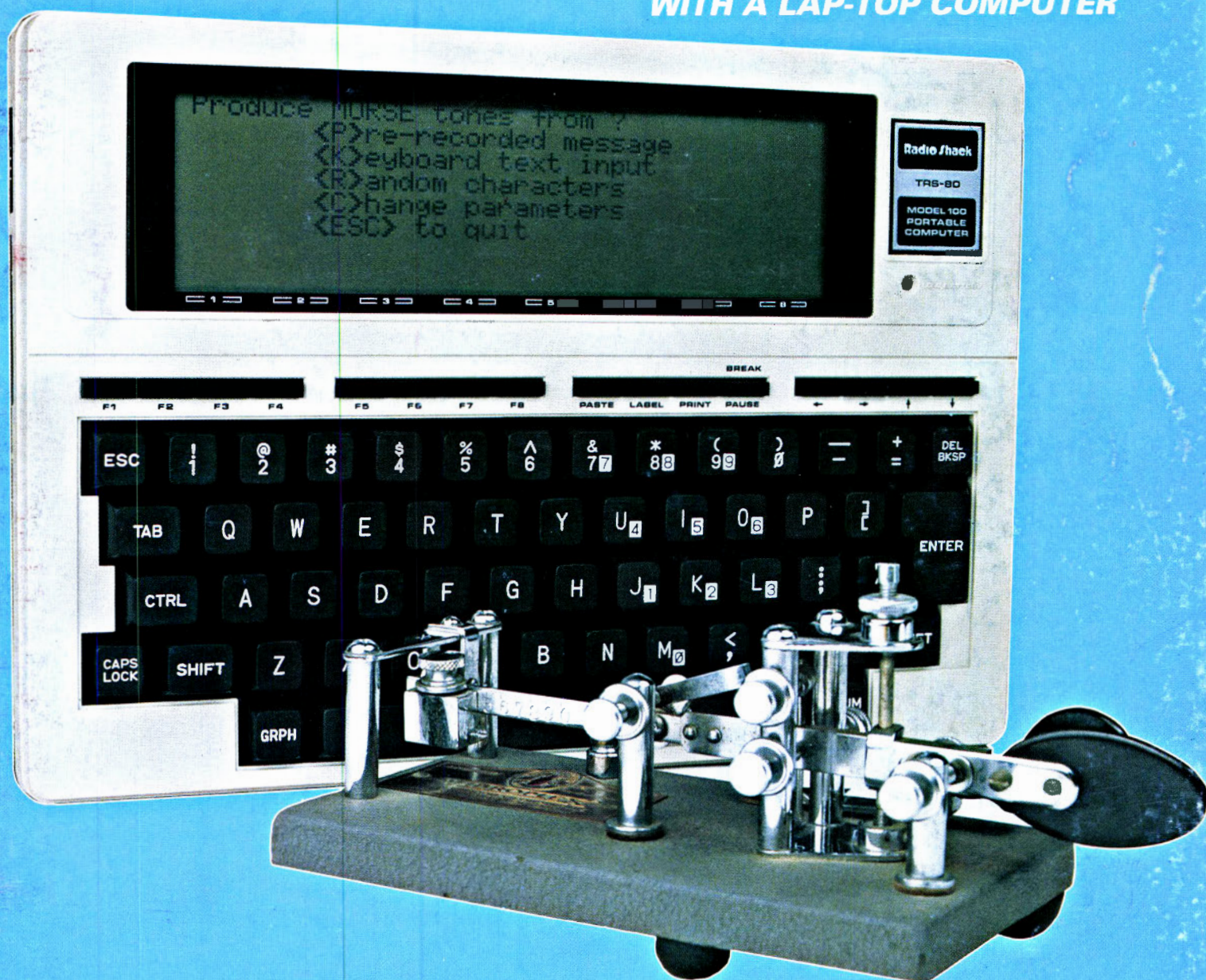


PRACTICAL  
WIRELESS

# PW

**GETTING THE BUG  
FOR MORSE  
WITH A LAP-TOP COMPUTER**



MARCH 1990  
£1.60

ISSN 0141-0857



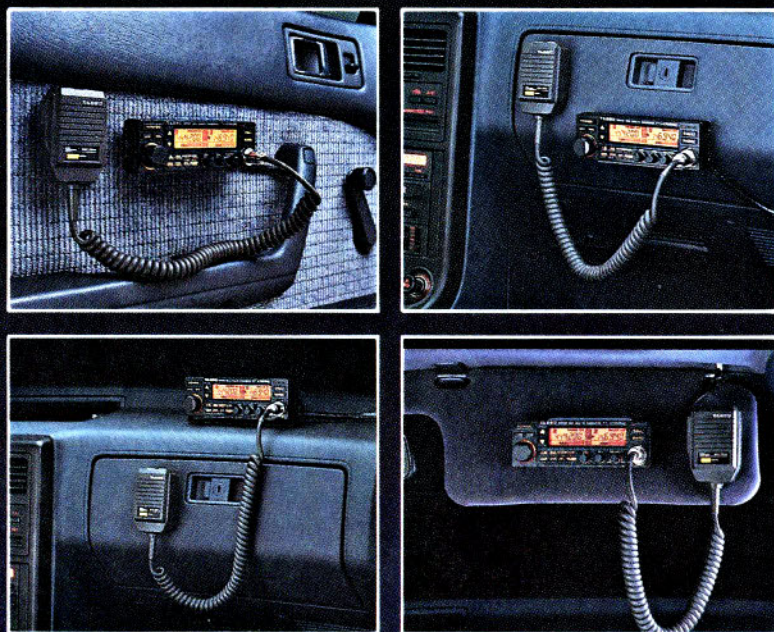
**BUILD - THE BADGER CUB 2 METRE TRANSMITTER  
ALSO - A 2 METRE COLLINEAR ANTENNA**

**REVIEWS - ICOM 901A VHF/UHF MOBILE TRANSCEIVER  
AND THE AEA PK-88 PACKET TERMINAL**

**PLUS  
PACKET RADIO - COMPETITION - TEN SPOT  
AND LOTS, LOTS MORE INSIDE YOUR BIGGER,  
BRIGHTER PRACTICAL WIRELESS**



# YAESU'S DUAL BANDER GOES PLACES OTHER MOBILES DON'T.



**Introducing Yaesu's FT-4700RH dual-band mobile.** Choose Yaesu's FT-4700RH, and you open the door to a lot of tight spaces.

While other dual banders just won't fit in today's small cars, the FT-4700RH utilizes a versatile "remote head" design. So you can mount the "brains" on your dash, visor, or door, and hide the "muscle" under your seat. Optional YSK4700 required for remote operation.

## **High-performance package.**

Packing a solid 50-watt punch on 2 meters (40 watts on 70cm), the FT-4700RH includes Dual-Band Watch for simultaneous monitoring of both bands, with independent squelch settings on the main and secondary bands. When you transmit, opposite band monitoring goes on in a full-duplex mode.

You can adjust the relative volume of the two receive channels with the balance control, too. And with Yaesu's bright LCD display, transceiver status is clearly visible in sunlight or shade.

## **Convenience on the road.**

Human engineering, long a Yaesu speciality, is an important aspect of the FT-4700RH design. The ten-button front panel keypad includes a "do-re-mi" audible command verification, and all important controls are backlit for night operation.

Frequency range 144-146MHz on 2m and 430-440MHz on 70cm. Nine memory channels on each band. High/low power selection (low power five watts). One-touch reverse repeater shift button. Optional CTCSS module. And 16-key DTMF microphone.

**Optional accessories.** FTS-8 CTCSS unit. MH-15D8 DTMF microphone with 10-telephone number memory. SP-3 or SP-4 External Speakers. And YH-1 Headset/Boom Mic or MF-1A3B Flex-arm Boom Mic, both with SB-10 PTT Switch Unit. YSK4700 Remote Kit.

**Discover Yaesu's FT-4700RH today.** And see what "high performance" really means. For dual-band mobile operation Yaesu's FT-4700RH really fits! Call us today for details of your nearest authorised Yaesu dealer.

**South Midlands Communications Ltd,**  
S M House, School Close, Chandlers Ford  
Industrial Estate, Eastleigh, Hampshire, SO5  
3BY. Telephone (0703) 255111, Fax (0703)  
263507, Telex 477351 SMCOMM.



**FT-4700RH control head**  
(1<sup>15</sup>/<sub>16</sub>" x 5<sup>7</sup>/<sub>8</sub>" x 1")

# YAESU



MARCH 1990  
(ON SALE FEB 8)  
VOL. 66  
NO. 3  
ISSUE 996

#### Editorial and Advertisement

##### Offices:

Practical Wireless  
Enefco House  
The Quay  
Poole  
Dorset BH15 1PP  
☎ Poole (0202) 678558  
(Out-of-hours service by  
answering machine)  
FAX Poole (0202) 666244  
Prestel 202671191

#### Advertisement Manager

Roger Hall G4TNT  
PO Box 948  
London SW6 2DS  
☎ 01-731 6222  
Cellphone 0860 511382  
FAX 01-384 1031

#### Advert Copy and Make-up

(Poole Office)  
Marcia Brogan  
☎ Poole (0202) 678558 or 676033  
FAX Poole (0202) 666244

#### Editor

Rob Mannion G3XFD

#### Assistant Editor

Dick Ganderton C.Eng MIEE G8VFH

#### Art Editor

Steve Hunt

#### Technical Features Editor

Elaine Richards G4LFM

#### Technical Projects Sub-Editor

NG ("Tex") Swann G1TEX

#### Technical Artist

Rob Mackie

#### Editorial Assistant

Sharon George

#### Administration Manager

Kathy Moore

#### Accounts Manager

Alan Burgess

#### Clerical Assistant

Rachel Parkes

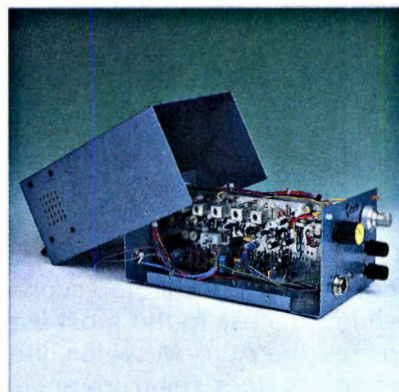
# Contents March 1990

## Regular Features

111	Advert Index
88	Backscatter
106	Book Service
23	Competition Corner
71	Errors & Updates
104	Helplines
17	Keylines
20	News Desk '90
72	PCB Service
43	Radio Diary
18	Receiving You
36	Services
19	Subscriptions
36	Wanna Swap
68	Wireless-Line



27



33



73

## 27 PW Review

### Icom IC-901E dual-band rig

Rob Mannion G3XFD & G1TEX

## 33 The PW Badger Cub

Mike Rowe G8JVE

## 41 A Collinear for 144MHz

G4WUP

## 42 Understanding Circuit Diagrams - 23

Ray Fautley G3ASG

## 48 Ten Spot

John Petters G3YPZ

## 51 No Linear - No HF DX!

Peter Barville G3XJS

## 53 Practically Yours

Glen Ross G8MWR

## 59 Receiver Sensitivity Signal and Noise

Gordon J. King G4VFX

## 66 Keyed-in Morse

G1TEX

## 70 PW Irwell QRP Transmitter Part 3

Rev. George Dobbs G3RJV

## 73 Radio Personality Ron & Joan Ham

## 77 Packet Update 9

Roger J Cooke G3LDI

## 82 PW Review

### The AEA PK-88 TNC

Chris Lorek G4HCL

## 86 G'day - News from Down Under

Greg Baker



# ICOM

## Count on us!

# IC-R7000, 25-2000 MHz

## Commercial quality scanning receiver



With 99 programmable memories the IC-R7000 covers aircraft, Marine, FM Broadcast, Amateur Radio, television and weather satellite bands. For simplified operation and quick tuning the IC-R7000 features direct keyboard entry. Precise frequencies can be selected by pushing the digit keys in sequence of the frequency or by turning the main tuning knob. FM wide/FM narrow/AM upper and lower SSB modes with six tuning speeds: 0.1, 1.0, 5, 10, 12.5, 25KHz.

The IC-R7000 has 99 memories available to store your favourite frequencies including the operating mode. Memory channels can be called up by pressing the memory switch then rotating the

memory channel knob, or by direct keyboard entry. A sophisticated scanning system provides instant access to the most used frequencies. By depressing the Auto-M switch, the IC-R7000 automatically memorises frequencies that are in use whilst it is in the scan mode, this allows you to recall frequencies that were in use. The scanning speed is adjustable and the scanning system includes the memory selected frequency ranges or priority channels. All functions including the memory channel readout are clearly shown on a dual-colour fluorescent display. Other features include dial-lock, noise blanker, attenuator, display dimmer and S-meter and optional RC-12 infra-red remote controller, voice synthesizer and HP 1 headphones.

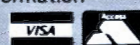
**Icom (UK) Ltd.**

**Dept. PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.**

**Helpline:** Telephone us free-of-charge on 0800 521145. Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.

**Datapost:** Despatch on same day whenever possible.

**Access & Barclaycard:** Telephone orders taken by our mail order dept., instant credit & interest-free H.P.







# ICOM

## Count on us!

# IC-765 HF ALL BAND TRANSCEIVER



We enjoy listening. It's part of what we do well. So when ICOM heard you talking, our engineers designed a transceiver specially for you – the serious DX enthusiast with worldwide contacts in mind. The result is the new super advanced IC-765, an HF all band transceiver built to expand your HF world.

The IC-765 is equipped with ICOM's exclusive DDS (Direct Digital Synthesizer) System, a fully automatic antenna tuner, an electronic keyer with iambic operation and a full break-in function.

### Fully Automatic High Speed Antenna Tuner

A built in CPU automatically memorises the pre-set position of each band without pre-set controls. tuner speed is ultra fast since tuning starts from a preset position. If the tuner cannot tune from the previous preset position, the re-try function changes the preset position and memorises the best position.

### 10Hz Digit Display

The large fluorescent display shows 7 digits for the operating frequency, the 10Hz digit is displayed.

### Band Stacking Register

Each band memorises the last used frequency, mode and IF filter condition (narrow or wide).

### Complete System for CW Operators

The IC-765 has many advanced functions for CW operators such as CW pitch control, a built-in electric keyer, a keying speed control and high speed full break-in capability.

### New PLL Circuit

The advanced ICOM DDS System ensured high speed PLL lock-up times, clear signal emissions, and high C/N characteristics. A high speed PLL provides very fast CW full break-in performances.

### Convenient Miscellaneous Functions

- 105dB dynamic range
- 10dB preamp and 10, 20 30 dB attenuator
- 99 memory channels
- Split memory on channels 90-99
- Built-in FL32A and FL52A CW narrow filters
- Programmed scan and memory scan
- IF, shift and Notch filter
- Fast/Slow/OFF Selectable AGC
- RF type speech compressor
- Noise blanker
- DATA switch for advanced data communications

### Icom (UK) Ltd.

Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

**Helpline:** Telephone us free-of-charge on 0800 521145. Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders. thank you.

**Datapost:** Despatch on same day whenever possible.

**Visa & Mastercards:** Telephone orders taken by our mail order dept, instant credit & interest-free H.P.





# MULTIMETERS from Cirkit

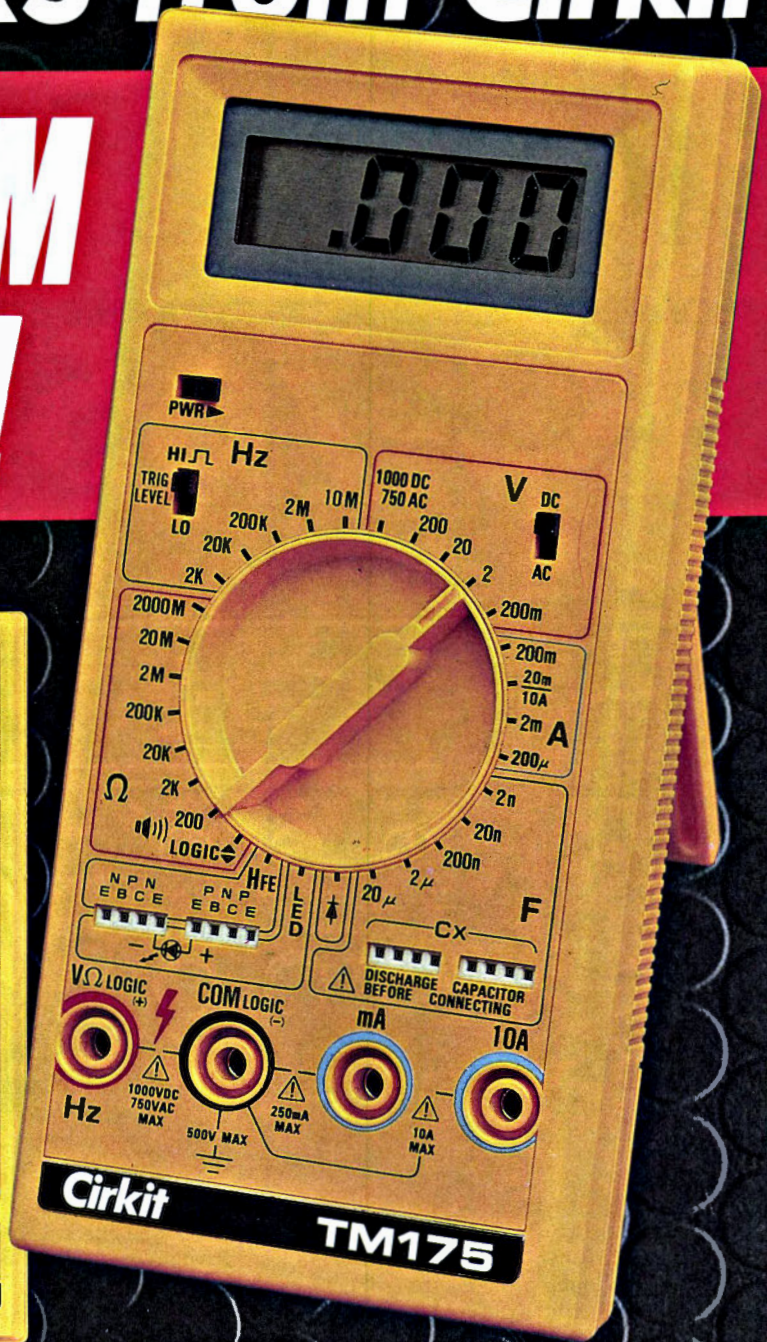
## THEY'RE D-MM GOOD VALUE!!



TM115



TM135



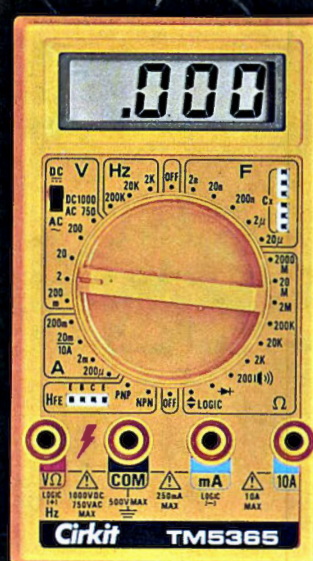
TM175

Cirkit's new range of Digital Multimeters offer a quite unbeatable combination of features and value:

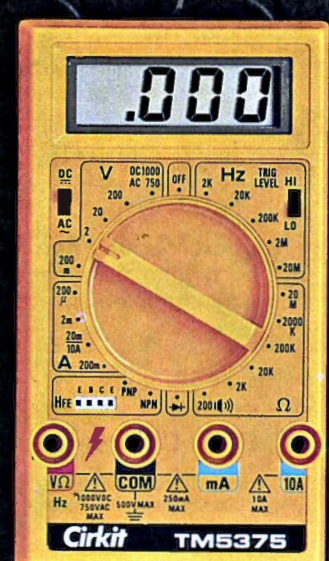
- Ranges include; frequency, capacitance and temperature
- Housed in strong ABS cases
- Overload protection on all ranges
- Full one year warranty
- 3½ digit, auto zero, auto polarity LCD, plus low batt indication
- 200 hour battery life
- All meters supplied with test leads, battery and manual



TM5315B



TM5365



TM5375



**TM5315B**

- Remarkable value
- 18 ranges
- 10A dc current



dc Volts: 200mV-1kV  
ac Volts: 200V, 750V  
dc current: 200uA-10A  
Resistance: 200Ω-20MΩ  
Continuity and diode test  
Basic dc accuracy,  $\pm 0.8\%$   
Size: 128 x 72 x 33mm

1+	5+	10+
<b>£17.38</b>	<b>£16.95</b>	<b>£16.52</b>

56-05315 ex VAT

**TM5375**

- Frequency measurement to 20MHz
- ac/dc current to 10A
- 24 ranges



dc volts: 200mV-1kV  
ac volts: 200mV-750V  
dc current: 200uA-10A  
ac current: 200uA-10A  
Resistance: 200Ω-20MΩ  
Frequency: 2kHz-20MHz  
Continuity, diode and HFE test  
Basic dc accuracy  $\pm 0.5\%$

1+	5+	10+
<b>£31.96</b>	<b>£31.16</b>	<b>£30.39</b>

56-05375 ex VAT

**TM5365**

- 30 ranges
- Frequency and capacitance measurement
- Compact size



dc volts: 200mV-1kV  
ac volts: 200mV-750V  
dc current: 200uA-10A  
ac current: 200uA-10A  
Resistance: 200Ω-2000MΩ  
Frequency: 2kHz-200kHz  
Capacitance: 2nF-20uF  
Logic, continuity, diode and HFE test

1+	5+	10+
<b>£32.96</b>	<b>£32.13</b>	<b>£31.33</b>

56-05365 ex VAT

**TM115**

- 0.5% accuracy
- Transistor HFE test
- 2/6 ranges



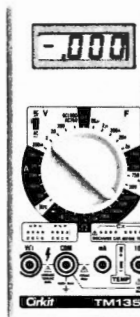
dc volts: 200mV-1kV  
ac volts: 200mV-750V  
dc current: 200uA-10A  
Resistance: 200Ω-2000MΩ  
Continuity, diode and HFE test  
Basic dc accuracy  $\pm 0.5\%$

1+	5+	10+
<b>£29.28</b>	<b>£28.49</b>	<b>£27.77</b>

56-00115 ex VAT

**TM135**

- Temperature measurement
- Capacitance measurement
- 40 ranges



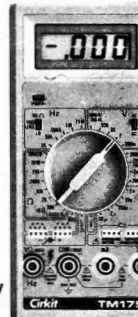
dc volts: 200mV-1kV  
ac volts: 200mV-750V  
dc current: 200uA-10A  
ac current: 200uA-10A  
Resistance: 200Ω-2000MΩ  
Temperature: 200°, 750°C  
Capacitance: 2nF-20uF  
Diode, HFE and continuity test.

1+	5+	10+
<b>£39.96</b>	<b>£38.96</b>	<b>£37.98</b>

56-00135 ex VAT

**TM175**

- Frequency measurement to 10MHz
- Capacitance measurement from 1pF to 20uF
- 39 ranges



dc volts: 200mV-1kV  
ac volts: 200mV-750V  
dc current: 200uA-10A  
ac current: 200mA-10A  
Resistance: 200Ω-2000MΩ  
Capacitance: 2nF-20uF  
Frequency: 2kHz-10MHz  
Continuity, diode, HFE, logic and LED test.

1+	5+	10+
<b>£49.99</b>	<b>£48.75</b>	<b>£47.52</b>

56-00175 ex VAT

**TO ORDER** Phone for same day despatch (0992) 444111 or use the order form below. Postage and packing is 90 pence per order.

Please despatch the following:

<input type="checkbox"/> × <b>TM5315B</b> at £20.89 (£17.38 + £2.61 VAT + £0.90 p&p)	<input type="checkbox"/> × <b>TM115</b> at £34.57 (£29.28 + £4.39 VAT + £0.90 p&p)
<input type="checkbox"/> × <b>TM5375</b> at £37.65 (£31.96 + £4.79 VAT + £0.90 p&p)	<input type="checkbox"/> × <b>TM135</b> at £46.85 (£39.96 + £5.99 VAT + £0.90 p&p)
<input type="checkbox"/> × <b>TM5365</b> at £38.80 (£32.96 + £4.94 VAT + £0.90 p&p)	<input type="checkbox"/> × <b>TM175</b> at £58.39 (£49.99 + £7.50 VAT + £0.90 p&p)

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Post Code: \_\_\_\_\_

Cheque ☐ Postal Order ☐

Access or Visa ☐

Expiry Date: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Cirkit**



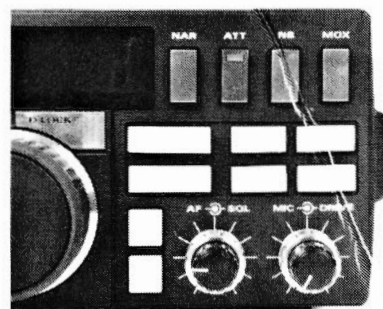
**Cirkit Distribution Ltd,**  
Park Lane, Broxbourne, Herts EN10 7NQ



**SMC****South Midlands Co****SCHOOL CLOSE, CHANDLERS FORD IND. EST., EASTLEIGH, HA****FREE FINANCE — BUY NOW SAVE MONEY****FANTASTIC PERFORMANCE, REALISTIC PRICE**

The FT-747GX is a compact SSB/CW/Am and (optionally) FM transceiver providing 100 watts of PEP output on all hf amateur bands, and general coverage reception continuously from 100kHz to 30MHz. A front panel mounted loudspeaker and clear, unobstructed display and control layout make this set a real joy to use. Convenient features include operator selectable coarse and fine tuning steps optimized for each mode, dual (A/B) vfos, along with twenty memory channels which store mode and skip-scan status for auto resume scanning of selectable memories. Eighteen of the memories can also store independent transmit and receive frequencies for easy recall of split-frequency operations. Wideband (6kHz) AM and narrowband (500Hz) CW IF filters are included as standard, along with a clarifier, switchable 20dB receiver attenuator and noise blanker. User programming for more advanced control by an external computer is possible through the CAT (Computer Aided Transceiver) System. The transmitter power amplifier is enclosed in its own diecast aluminum heat-sink chamber inside the transceiver, with forced-air cooling by an internal fan allowing full power FM and packet, RTTY, SSTV and AMTOR operation when used with a heavy duty power supply.

- ★ 160-10M HF TRANSCEIVER
- ★ GENERAL COVERAGE RECEIVER
- ★ ALL MODE (FM OPTIONAL)
- ★ 0-100W OUTPUT (25W AM CARR.)
- ★ CW NARROW (500Hz) STANDARD
- ★ LARGE CLEAR LCD DISPLAY
- ★ SIMPLE OPERATION (see pic below)



All major controls are grouped together for convenience and ease of operation.

**WARNING:** If you buy FT747GX not designed for the U.K. market, these may not be fitted with AM/CW filters which you may not be able to obtain.

## IMPROVED PERFORMANCE AT NO EXTRA COST!

Yaesu's FT757GXII is a HF compact transceiver which offers full featured performance just about anywhere, on holiday, on the road or in the shack. Remarkably similar to the FT757GX the FT757GXII has a number of improvements which enhance the pleasure and ease of operation with no detriment to the electrical performance. The improvements include memory storage of operation mode, slow/fast tuning selection, automatic step change according to mode, IF Notch filter, 10 memories and VFO to VFO scan.

Other standard features include RX coverage from 500kHz to 30MHz, TX from 160m to 10m (WARC bands included), 100W RF output, SSB (LSB+USB), CW, AM & FM, iambic electronic keyer and AF speech processor.

A whole host of options are available to increase the operating pleasure.

So no matter where you are why not try Yaesu's FT757GXII full featured transceiver.

### OPTIONAL ACCESSORIES

FP75HD Heavy Duty P.S.U.	£239.00	FAS-1-4R Remote Antenna Sw	£80.00
FP700 20A P.S.U.	£219.00	FC75AT Automatic ATU	£349.00
FL7000 500W solid state linear amplifier £1600.00			



- ★ All mode SSB (USB+LSB) CW, AM and FM
- ★ All Band Tx (General Coverage RX)
- ★ 100% Duty cycle (100W, CW, FM 25W AM)
- ★ Pushbutton mode selection
- ★ Switchable VFO steps (All modes)
- ★ New Notch Filter
- ★ Dual VFOs and 10 memories (Freq & Mode)
- ★ Computer compatibility (with optional interface)

## NOW EVEN BETTER the FT757GX MK2

**LEEDS**  
SMC (Northern)  
Nowell Lane  
Industrial Estate  
Leeds LS9 6JE  
Leeds (0532) 350606  
9-5.30 Mon-Sat  
Closed Sat afternoon

**CHESTERFIELD**  
SMC (Midlands)  
102 High Street  
New Whittington  
Chesterfield  
Chest. (0246) 453340  
9.30-5.30 Tues-Sat

**JERSEY**  
SMC (Jersey)  
1 Belmont Gardens  
St. Helier, Jersey  
Jersey (0534) 77067  
9-5 pm Mon-Sat  
Closed Wed

**BIRMINGHAM**  
SMC (Birmingham)  
504 Alum Rock Road  
Alum Rock  
Birmingham B8 3HX  
(021-327) 1497/6313  
9.00-5.00 Tues-Fri  
9.00-4.00 Sat

**AXMINSTER**  
Reg Ward & Co Ltd  
1 Western Parade  
West Street  
Axminster  
Devon EX13 5NY  
Axminster (0297) 34918  
9-5.20 Tues-Sat



**SOUTHAMPTON SHOWROOM open 9.00-5.00 Monday to Friday, 9.00-1.00 Saturday. Service Dept open Mon-Fri 9.00-5.00.**

**SOUTH WALES AGENT:** John Doyle, Transworld Comms, Neath (0639) 632374 Day (0639) 642942 Eve. Closed Thursday.



# mmunications Ltd. — YAESU

NTS. S05 3BY TEL: 0703 255111 FAX: 0703 263507 TLX: 477351

## — 0% INTEREST SUBJECT TO STATUS

### NEW IMPROVED FT767GX



Yaesu have upgraded this popular HF and VHF/UHF base station transceiver. The improved version is now available with enhanced synthesiser performance and VFO tuning rate. Read Chris Lorek's review in "Ham Radio Today".

- ★ ALL MODE LSB/USB, CW, FSK, AM & FM
- ★ ALL BAND Transmit, General Coverage Receive
- ★ Optional VHF/UHF units (6M, 2M & 70cms)\*
- ★ 100% DUTY CYCLE (Key down CW for 30 mins)
- ★ Built in AUTOMATIC ATU (one memory on each band)
- ★ Computer & Packet radio compatibility

#### OPTIONAL ACCESSORIES:

50/767 6M Unit 10W O/P .....	£179.00
144/767 2M Unit 10W O/P .....	£179.00
430/767 70cms Unit 10W O/P .....	£225.00
FL7000 500W PEP HF Linear .....	£1600.00
SP767 External Speaker .....	£69.95
FIF232C Computer Interface .....	£75.00

For existing owners of the FT767GX who purchased their sets through Yaesu's official UK distribution network, Yaesu are offering an upgraded local unit for a nominal charge. Please contact us for details.



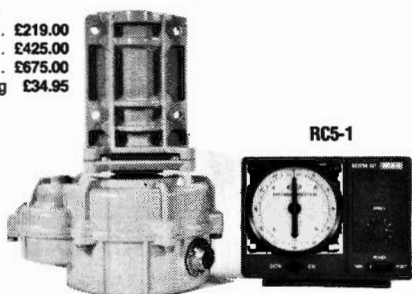
The CREATE company has, for the past twenty years, been the leading manufacturer of amateur and commercial antennas (mainly HF) in Japan.

Now available to customers in the UK through South Midlands Communications, the appointed distributor, are the popular CREATE HF beams to cover the 10/15/20 metre bands, HF baluns up to 10KW PEP and the exciting 10/15/20/40V dipole which has elements of only 19ft and is designed in such a way that it can be mounted in particularly awkward places. SMC also stock what must be one of the largest amateur antennas available, the 40 metre full sized beam, as well as 6 and 7 element and six metre yagis and professional quality log, periodic antennas for 50-1300 and 105-1300MHz. CREATE also manufacture rotators to exacting levels of precision and these have virtually no back lash, quiet gears, variable speed and large torque. All are now available from SMC stock. Please contact us NOW for full details.

### ROTATORS

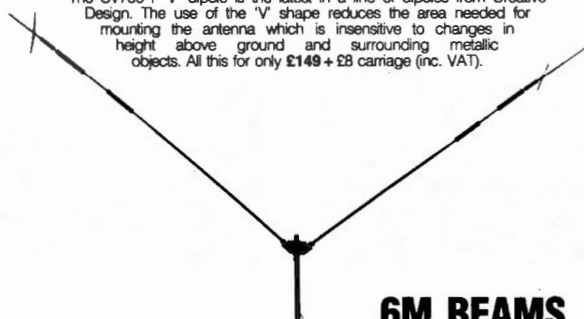
The RCS Series of rotators from Creative Design are built to meet the exacting standards required by both professional and amateur users. A range of models is available designed to cater for medium to large sized antennas. All the rotators are manufactured with high quality components allowing continued and reliable operation.

RCS-1 .....	£219.00
RCSA-3 .....	£425.00
RCSB-3 .....	£675.00
CK46 Rotary bearing .....	£34.95



RCS-1

The CV730-1 'V' dipole is the latest in a line of dipoles from Creative Design. The use of the 'V' shape reduces the area needed for mounting the antenna which is insensitive to changes in height above ground and surrounding metallic objects. All this for only £149 + £8 carriage (inc. VAT).



### 6M BEAMS

New from Creative Design are a range of 6m beams, the CL6DX 6 element, CL6DXX 7 element and CL6DXZ 8 element.

All these antennas are the result of long and continued research to achieve the best possible performance whilst remaining both cost effective and extremely robust.

CL6DX 6 ele 13dB* .....	£115.00
CL6DXX 7 ele 14.3dB* .....	£168.99
CL6DXZ 8 ele 14.5dB* .....	£225.00

\*Manufacturers figures.

### HF BEAMS

Introducing the NEW 318 series of DX Tribanders from Create which offer outstanding efficiency with High Q traps especially designed for 14, 21, & 28MHz. High grade materials are used to ensure long life, maximum reliability and light weight with no compromise in performance.

All beams supplied complete with balun

CD318JR 4 ele 10-15-20M 750W PEP Gain 7:7:5:8dB F/B 18dB	Only £299 P&P £5.90
CD318 4 ele 10-15-20M 2KW PEP Gain 7:8:8:5dB F/B 18:20:20dB	Only £349 P&P £5.90
CD318B 5 ele 10-15-20M 2KW PEP Gain 7:5:9:9:5dB F/B 20:18:20dB	Only £449 P&P £7.90
CL40B-4 3 ele Yagi 40M 4KW PEP Gain 8dB F/B 22-18dB	Only £999 P&P £12.50
CV48 40M vertical 2KW PEP 500W PEP Radial wires included suitable for ground or roof mounting	Only £210
AD385 Matching network 40/80M for CV48 remote switchable	Only £49 P&P £2.85
CV730V-1 V dipole for 10-15-20-40 1KW-2KW PEP 19' ele capable of being mounted anywhere	Only £149 P&P £3.50

### SMC NORTHERN (LEEDS) CLOSED SATURDAY AFTERNOONS

#### \*FREE FINANCE ON SELECTED ITEMS

On many regular priced items SMC offers Free Finance (on invoice balances over £120) 20% down and the balance over 6 months or 50% down and the balance over a year. You pay no more than the cash price! Details of eligible items available on request. \*Subject to status.

#### Free Interlink delivery on major equipment

Small items, Plugs, Sockets, etc by post £1.75. Antennas, cables, Wires & larger items. Lynx up to £5. Interlink delivery available, upon request for items other than radios from £7.30 depending on weight. Same day despatch whenever possible.

#### YAESU DISTRIBUTOR WARRANTY

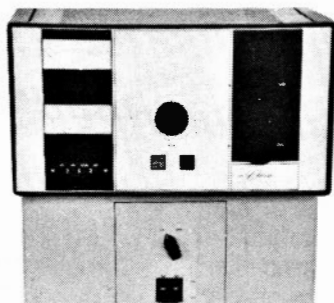
Importer warranty on Yaesu Musen products. Able staffed and equipped Service Department. Daily contact with the Yaesu, Musen-factory. Tens of thousands of spares and test equipment.

PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE



## AMPLIFIERS

## LINEARS QRO



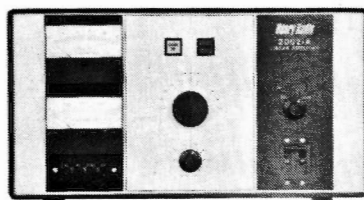
### TEMPO 3K PREMIER

160-10m HF Linear. 3kW P.E.P. RF Input.  
100W Drive. 1 x 3CX1200A Triode.  
**£2995.00**

Also available 3002A 2kW O/P. 2m version.  
100W Drive. 8877 Triode.  
**£2395.00**

### TEMPO 5K CLASSIC

80-10m 3kW RF O/P. 100-200W Drive.  
**£3895.00**



### TEMPO 2002A

2m Linear. Max. Input 2kW.  
25-40W Drive. Typical.  
1 x 3CX800A7 C/W Coax Relay.  
**£1395.00**

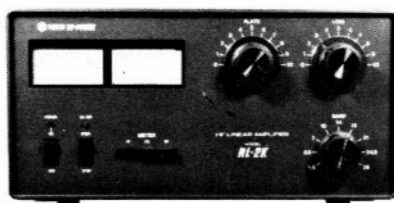
70cms 2004A. Max. Input 2kW.  
25-40W Drive.  
1 x 3CX800A7 W/O Coax Relay.  
**£1395.00**



### TOKYO HY-POWER HL1K

160-10m HF Linear. 1kW P.E.P. RF Input.  
70-120W Drive.  
2 x 4CX250B Valves.  
**£945.00**

Also available HL1K/6. 6M Linear. 10W Drive.  
2 x 4CX250B Valves  
**£945.00**



### TOKYO HY-POWER HL2K

160-10m HF Linear. 2kW P.E.P. RF Input.  
60-120W Drive.  
2 x 3-500Z.  
**£1425.00**



### SAGRA 600

2m Linear. 600W Output. 25W Drive.  
2 x 4CX250B.  
**£769.00**



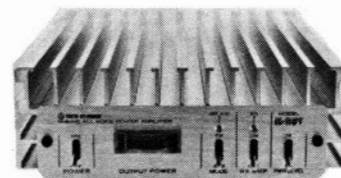
### YAESU FL7000

160-10m HF Linear.  
500W P.E.P. RF O.  
100W D. Four FT757GX, FT747GX, FT767GX  
**£1600.00**



HL100B/10	10m 10W in 100W out PEP	<b>£178.00</b>
HL100B/20	20m 10W in 100W out PEP	<b>£178.00</b>
HL100B/80	80m 10W in 100W out PEP	<b>£178.00</b>
HL66V	6m 10W in 50-60W out	<b>£129.00</b>
	RX Preamp	
HL166V	6m 3/10W in 80-160W out	<b>£249.00</b>
	RX Preamp	

HL37V	2m 3W in 32W out RX Preamp	<b>£ 89.00</b>
HL62V	2m 10W in 60W out RX Preamp	<b>£135.00</b>
HL110V	2m 2/10W in 100W out	<b>£215.00</b>
	RX Preamp	
HL180V	2m 3-25W in 120W out	<b>£295.11</b>
	RX Preamp	



HL36U	70cm 3/10W in 40-50W out	<b>£135.00</b>
	RX Preamp	
HL60U	70cm 12W in 50W out	<b>£178.00</b>
	RX Preamp	
HL130U	70cm 3-25W in 120W out	<b>£389.00</b>
	RX Preamp	

## LINEAR CLEARANCE SALE — ONLY AVAILABLE WHILST STOCKS LAST

LPM144-1-100	2m 1W in 100W out	<b>£165.00</b>
LPM144-10-100	2m 10W in 100W out	<b>£169.00</b>
LPM144-3-100	2m 3W in 100W out	<b>£195.00</b>
MML144/100LS	2m 1/2W in 100W out	<b>£140.00</b>
MML144/30LS	2m 1/2W in 30W out	<b>£100.00</b>

MML144/50S	2m 10W in 50W out	<b>£100.00</b>
MML432/100	70cms 10W in 100W out	<b>£275.00</b>
MML432/50	70cms 10W in 50W out	<b>£ 95.00</b>
MML432/30L	70cms 1/2W in 30W out	<b>£175.00</b>
MMT144/28R	Transverter 10m-2m	<b>£239.00</b>

MMT432/144R	Transverter 2m-70cms	<b>£175.00</b>
MMT432/28S	Transverter 10m-70cms	<b>£155.00</b>
MMT50/144	Transverter 2m-6m	<b>£240.00</b>
MMT50/28S	Transverter 10m-6m	<b>£240.00</b>
MMT1432/144S	Transverter 2m-70cms	<b>£175.00</b>

**CARRIAGE ON ALL THESE LINEARS £5.00**

**SOUTHAMPTON (0703) 255111**  
**CHESTERFIELD (0246) 453340**  
**AXMINSTER (0297) 34918**

**LEEDS (0532) 350606**  
**BIRMINGHAM 021 327 1497**  
For full addresses see previous page.





**SITUATED AT SOUTHERN END OF M23 — EASY ACCESS TO M25 AND SOUTH LONDON**

## RECEIVERS

HF225	£395
ICR71	£855
R2000	£595
VC10 V.H.F. Converter	£161
FRG8800	£849
FRV8800 V.H.F. Converter	£100
R5000	£875

## HF TRANSCEIVERS

TS950s	£3199
TS940s	£1995
TS440s	£1138
TS140s	£862
TS680s	£985
FT767GX	£1599
FT757GX2	£969
FT747GX	£659
IC765	£2499
IC751A	£1500
IC735	£979
IC725	£759
IC726	£989

## 2M TRANSCEIVERS

TH25E	£238
TH205E	£199
TH215E	£228
TS711E	£898
TR751E	£595
TM231	£289
FT411 + FNB10	£259
FT290R II	£429
FT211RH	£309
IC26E	£349
IC28H	£265
IC275E Inc PSU	£385
IC25E	£1069
IC25E	£275
IC25ET	£295

## 70CM TRANSCEIVERS

TS811E	£908
TR851E	£699
TH405E	£245
TH415E	£268
FT790Rii	£499
FT711RH	£349
FT712RH	£375
IC4GE	£299
IC4SE	£310
IC448E	£429

## DUAL BAND TRANSCEIVERS

TM721E	£699
TS790E	£1495
FT470R + FNB10	£423
FT736R	£1359
FT4700RH	£675
IC32E	£399
IC3210E	£499
IC2400E	£635
IC2500E	£675

## SCANNING RECEIVERS

ICR7000	£989
FRG9600M	£509
RZ1	£465
AR2002	£487
R535 Airband	£249
STANDARD AX700E	£575

## ANTENNA TUNER UNITS

FT7700	£59
FC757AT	£349
AT230	£208
AT250	£366
ICAT100	£379
MFJ941D	£105
MFJ949C	£158

## DATONG

AD370 Active Antenna	£77.62	3.00
FL3 Multimode Filter	£145.54	2.00
D70 Morse Tutor	£63.40	2.00
ASP Speech Processor	£93.15	2.00

## COAXIAL SWITCHES

SA450 2way SO239	£19.49	1.50
SA450N 2way N	£26.99	1.50
Drac 3way SO239	£18.69	1.50
Drac 3way N	£24.15	1.50
C54 4way BNC	£30.39	1.50
MFJ-1701 6way SO239	£30.72	1.50

## POWER SUPPLIES

BNOS 12/5E	£74.75	5.00
BNOS12/20E	£178.25	5.00
DRAE 6amp	£78.72	3.00
DRAE 12amp	£104.71	5.00
DRAE 24amp	£151.34	5.00

## HAND HELD RECEIVERS

R537S Airband	£69.00	2.00
Sony Air 7	£249.00	2.00
Win108 Airband	£175.00	2.00
AOR AR900	£199.00	2.00
YUPITERU MVT5000	£299.00	2.00

## PALOMAR ANTENNA PRODUCTS

Antenna Noise Bridge — Up to 100MHz	£59.95
Tuner-Tuner — Tune your ATU without transmitting	£99.95
LED S.W.R. Meter — Auto SWR up to 2kW P.E.P.	£124.95
9:1 Balun. For the T2FD Antenna.	£23.95
	£119.95

## ANTENNA RANGE

J Beam 'Minimax' Tribander	£378.35
J Beam TB3 MK3 Tribander	£365.70
Butternut HF6VX	£159.00
Butternut HF2v	£142.00
Cushcraft A3 Tribander	£299.00
Cushcraft 2M 215WB	£99.00
Tonna 20505 5ele 50MHz	£50.72
Tonna 20809 9ele 144MHz	£33.12
G Whip tribander 10-15-20	£44.39

## MORSE KEYS

Kent Morse key kits	£31.00	2.50
Kent Twin-paddle Kits	£39.50	2.50
Hi Mound MK704	£20.00	2.00
Hi Mound MK706	£22.00	2.00
Vibroplex original std	£81.79	2.50
Vibroplex Iambic std	£77.09	2.50
Benchcr BY2 Chrome Base	£76.97	2.50

## FILTERS

AKD HPF1	£6.75	1.00
AKD Braid Breaker	£6.75	1.00
AKD Notch Filter	£7.75	1.00
BNOS Low pass filter 6m	£29.95	1.50
LF30A Low pass filter	£32.26	2.00

## ANTENNA BITS

Hi-Q Balun 1:1 5kW PEP.	£13.95	1.00
Bricomm Balun 4:1 1kW	£14.95	1.00
Bricomm 7.1MHz Epoxy Traps (pair)	£12.85	1.50
Self Amalgamating Tape 10m x 25mm	£4.25	0.75
T piece polyprop Dipole centre	£1.60	0.25
Small ceramic egg insulators	£0.65	0.20
Large ceramic egg insulators	£0.85	0.20

## CABLES ETC.

URM67 low loss coax 50 ohm per metre	£0.95	0.25
UR76 50 ohm coax dia. 5mm per metre	£0.35	0.10
UR70 70 ohm coax per metre	£0.35	0.10
UR95 50 ohm coax dia. 2.3mm per metre	£0.40	0.10

## PALOMAR TUNER-TUNER™

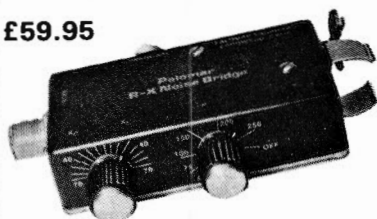


**£99.95**

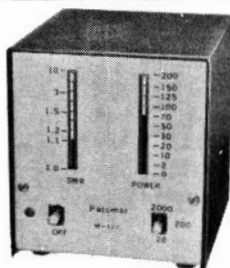
Do you use an antenna tuner? Then you need the new Palomar Tuner-Tuner to tune it to your operating frequency without transmitting. Just listen to the Tuner-Tuner's noise with your receiver. Adjust your tuner for a null and presto you have 1:1 SWR. It's as simple as that.

## PALOMAR R-X NOISE BRIDGE

**£59.95**



## PALOMAR SWR & POWER METER



**£124.95**

●The only meter that shows PEP output directly, accurately, instantly.

Shows power and SWR on bright red light bars. See PEP and SWR while you talk! Automatic "hands-off" SWR reading. Power ranges 20-200-2000 watts. Works from 1-30 MHz. Power required 12-V DC.

●Learn the truth about your antenna.

The Palomar R-X Noise Bridge tells you if your antenna is resonant or not and, if it is not, whether it is too long or too short. It gives resistance and reactance readings on dipoles, inverted Vees, quads, beams, multiband trap dipoles and verticals from 1 to 100 MHz.

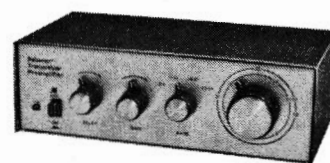
GOODS NORMALLY DESPATCHED WITHIN  
24 HRS. — PRICES CORRECT AT TIME OF GOING  
TO PRESS — E&OE

**MAIL ORDER & RETAIL**

**BREDHURST ELECTRONICS LTD HIGH ST, HANDCROSS, W. SUSSEX. RH17 6BW (0444) 400786**

Open Mon-Fri 9am-5pm except Wed 9am-12.30pm. Sat 10am-4pm

## PALOMAR PREAMPLIFIER



**£149.95**

Can't hear the weak ones when conditions are bad? Receiver lacks sensitivity on 20, 15 or 10? Get the world famous Palomar preamplifier. Tunes from 160 to 6 meters. Gives 20 dB extra gain and a low noise figure to bring out those weak signals. Reduces image and spurious responses too.

An RF sensing circuit bypasses the preamplifier during transmit. The bypass handles 350 watts.

## BALUNS SPECIAL ORDER ONLY



1:1 & 4:1  
HIGH POWER  
VERSIONS  
ALSO  
AVAILABLE

1.7-30 MHz. 350-W PEP. Ratios to match 50/  
75/100/150/200/250/300/375/450/600/800  
ohms. Specify ratio. Model PB **£23.95**



# When you are ready to graduate to real listening Look to Lowe



## The New HF-225 Receiver

I am delighted that the HF-225 has been a raging success world wide, and I will just quote a letter received from one of our American customers:—

"I received my Lowe HF-225 about a week ago. Since then I have enjoyed many pleasant hours listening to it. As a past owner of receivers such as the Sony ICF2010 and Grundig Satellit 650 and 500, I must say that none compare to your Lowe HF-225. Without question, for hour after hour listening, nothing compares. I especially like the Genie key pad. Why more receivers do not incorporate such intelligent ergonomics is beyond me. I also thought both the instruction manual and the short wave book were well written, with the shortwave guide particularly enjoyable."

The letter comes from Chris Williams in Massachusetts, but is typical of many letters we are receiving from all over the world about the HF-225.

Technically, the HF-225 distinguishes itself by having a low phase noise synthesiser, which gives a reciprocal mixing performance not far off that of "professional" receivers costing up to ten times the price, and that's not just advertising talk, it is really true. The synthesiser actually tunes in steps of 8Hz, which betters most other receivers and gives a smooth "VFO" feel when tuning. As one user has already commented "If you tuned the HF-225 with your eyes closed, you would believe you had a £5,000 receiver on the table".

The HF-225 has a range of low cost options which extend its appeal; such as a keypad for direct frequency entry, which simply plugs into a rear panel jack; an active whip aerial; a rechargeable battery pack for portable use; and an attractive carrying case which protects the receiver whilst allowing full operational use. The new D-225 detector option is really something special, because it gives true synchronous AM detection for dragging sensible programme quality out of a signal being affected by selective fading distortion. The same option also gives narrow band (communications) FM demodulation.

Every listener these days appreciates a receiver which offers facilities for memorising favourite or regularly used frequencies, and the HF-225 offers 30 memory channels for this purpose. Using the memories has been made particularly versatile, because the operator can review the contents of the memories whilst still listening to the frequency he is using, or alternatively in the "Channel" mode, can tune through the memory channels using the main tuning knob, listening to each frequency as it appears on the display. Just like having a bank of single channel receivers under your control. Terrific for checking HF airband channels for activity.

Unlike most HF receivers on the market, the HF-225 comes complete with all filters fitted for every mode:— 2.2kHz, 4kHz, 7kHz, and 10kHz. There is also a 200Hz audio filter for CW, and if the D-225 detector is fitted, a 12kHz filter for FM. The correct filter for each mode is automatically selected by the receiver mode switch, but further selection can be made by the user from the front panel and the receiver remembers which filter was last used. True versatility and all built in at no extra cost. When selecting filters in use, the filter bandwidth is shown on the main display.

The display itself is a high contrast liquid crystal type, and shows frequency, filter bandwidth, detector lock (when D-225 is fitted), and whether the receiver is in memory mode. Automatic placing of the decimal point takes place as the receiver is tuned, so there can be no ambiguity in reading.

At the end of the day, what does the HF-225 offer you as a user? I can do no better than quote what was said by Rainer Lichte about the earlier HF-125:—"The HF-125 is a serious piece of equipment; don't be deceived by the unassuming front panel and the lack of spectacular features. The HF-125 will outperform most competitors. If you like an honest approach to receiver design, this is it. British understatement at its best".

**The HF-225 is even better.**

**HF-225 £395**

John Wilson

**FREE**

Send four first class stamps to cover the postage and we will send you, by return of post, you FREE copy of "THE LISTENERS GUIDE" (2nd edition), a commonsense look at radio listening on the LF, MF and HF bands. Its unique style will, I am sure, result in a "good read" but underneath the humour lies a wealth of experience and expertise. You will also receive detailed leaflets on our range of receivers and a copy of our current price list.

## LOWE ELECTRONICS LIMITED

Chesterfield Road, Matlock, Derbyshire DE4 5LE Telephone 0629 580800 (4 lines) Fax 580020 Telex 377482



# 26 YEARS IN SHORTWAVE

## When it comes to scanners Look to Lowe



### AR-3000

Continuous all-mode (including SSB) from 100kHz to 2036MHz makes the AR-3000 the most amazing receiver ever to be made. Trouble is, they can't make enough of them to meet the world wide demand, so there is a lengthy waiting list. Well worth patiently waiting for, the AR-3000 has stunned the market by its specification and sheer performance.

**AR-3000 £765**



### AR-2002

The best known, most respected scanner, in the world. The AR-2002 offers continuous coverage from 25-550MHz and 800-1300MHz, and all mode (AM, FM(W), FM(N)). This scanner has consistently been the leader in the field, and has yet to be equalled. Scanning, searching, just enjoying listening; it's all there with the AR-2002.

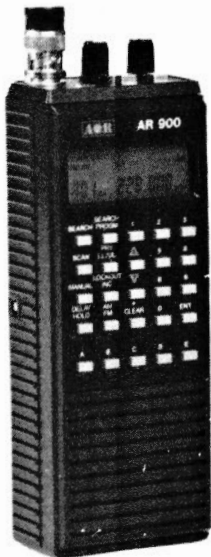
**AR-2002 £487**



### AR-950UK

A new addition to the AOR range is this base station/mobile scanning receiver, with all the features and performance we have come to expect from AOR. Frequency ranges 60-88, 108-136, 137-174, 220-290, 291-380, 406-470, and 830-950MHz. AM or FM available on any frequency. 100 memories. Everything in fact that you need in a scanner, and from the best maker in the world. The AR-950UK comes complete with mains power supply and two aerials for top performance.

**AR-950UK £249**



### AR-900UK

What a scanner! The AR-900UK covers all the bands you ever needed, in AM or FM modes (on any frequency); has 100 memories built in, enables you to monitor so much of interest — and all in a tiny hand held package. No wonder thousands are already in use. Designed for the UK listener, the AR-900UK offers every facility at a reasonable cost. Frequency ranges 108-136, 137-174, 220-280, 300-380, 406-470, and 830-950MHz. Send for details now.

**AR-900UK £235 NOW £199**



### AR-800E

The baby of the family, but what a baby. Covers 75-105, 118-174, 406-495, and 839-950MHz in AM and FM modes. Comes complete with rechargeable battery pack, charger, and flexy aerial. As with all AOR models, every channel spacing in current use can be programmed, so you needn't miss a transmission. All you ever wanted in a low cost scanner.

**AR-800E £199 NOW £165**

For the past 25 years Lowe Electronics have specialised in seeking out the best in radio and bringing it to our customers. Those customers will also tell you that we have another speciality — looking after them. Whatever is best in radio, we sell. Whatever we sell, we back with really expert advice and service. We are pleased to represent the best companies in the receiver world, and in addition to the AOR range shown here, we also distribute receivers from Signal Communications and WIN, two of the top names in Airband radio. For full information and a copy of our Airband Guide, simply send us four first class stamps and mention that you saw our ad. in Practical Wireless. Happy listening.

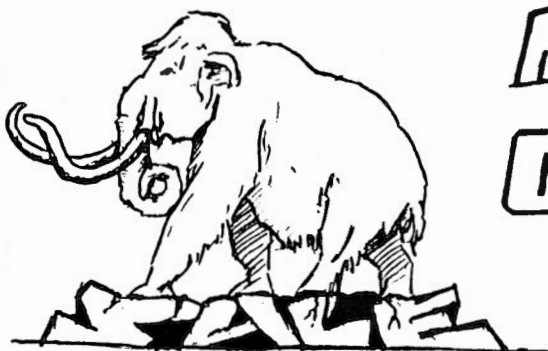
Shops in **GLASGOW** Telephone 041-945 2626, **DARLINGTON** Telephone 0325 486121, **CAMBRIDGE** Telephone 0223 311230, **BARRY** Telephone 0446 721304, **LONDON** Telephone 01-429 3256, **BOURNEMOUTH** Telephone 0202 577760

All branches are closed all day Monday.

Practical Wireless, March 1990



# Save £££'s now!



## MAMMOTH

## Discounts!

## On

## ICOM

YES! OUR BULK BUYING MEANS THE BEST DEAL  
FOR YOU... TOP DISCOUNTS,  
TOP TRADE-IN PRICES

FINANCE AVAILABLE ON OUR DISCOUNT PRICES  
(subject to status)

PHONE ANY OF OUR FIVE NUMBERS

### ARROW RADIO LTD

5 The Street. Hatfield Peverel.  
Chelmsford. Essex CM3 2EJ.  
Tel: 0245 381626/381673  
Fax: 0245 381436

Hours: 9-5 (Closed Thursdays)

#### GLASGOW SHOWROOMS

Unit 17, Six Harmony Row, Govan, Glasgow, Scotland G51 38A.

Tel: 041 445 3060.

Hours 8.30-5.30 Mon-Fri. (Closed Saturday).

#### AGENTS

LEICESTER — DAVE FOSTER Tel: 0533 608189

WIGAN — JIM COOK Tel: 0942 713405

Latest calls 8.30pm please!



RSGB CREDIT CARD.  
ACCEPTED

YOUR ORDER CAN BE TELEPHONED WITH CREDIT  
CARD DETAILS & DESPATCHED IMMEDIATELY!

FREE FINANCE ON MANY MAJOR ITEMS AT RRP.  
(Ask for details of qualifying items).

**NEW NW SHOWROOM OPEN  
AT GREENSWAY ARCADE,  
Gerrards Street, Ashton-in-Makerfield,  
Wigan, Lancashire**

Tel: 0942 713405

Jim Cook, G6TYB, is at your service Mon-Sat.



# ARROW — FOR THE BEST DEAL IN AMATEUR RADIO!!

## TH75E KENWOOD DUAL BANDER

with receive  
140/169 & 430/460 Mhz  
Nicad & Charger  
£398.00

NEW! C528 STANDARD  
DUAL BANDER  
with receive 130/172  
350/470 & 890/960 Mhz!  
£369.00



## NEW! IC-24E



ICOM mini dual bander  
2M & 70cms FM  
DISCOUNT PRICE £349  
incl. nicad, charger

## TS440S KENWOOD

HF Base Station  
with Internal ATU  
Please Phone for Price

NEW ICOM R1  
Micro-size hand scanner  
150kHz to 1300MHz  
£399.00



## TS140S or TS680S with 6M



Phone for  
Best Price

## SCANNER BARGAINS FROM AOR

AR800 Now  
only £169

AR900UK Now  
Only £199

AR950 NEW!  
£249



An SAE brings our Scanner Catalogue!

NEW! AR1000 15 — 1300MHz 1000 memories £249!!

## TR751E — FREE CREDIT

EXCELLENT 2 Metre  
performance from this  
great allmode rig.  
Dep: £199 + 9  
payments £44.44.



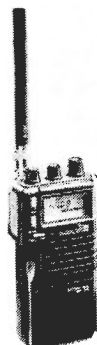
FRG8800  
YAESU EXCELLENT  
GENERAL COVERAGE  
RECEIVER  
ONLY £549

NEW IC-R72  
GEN. COVERAGE RECEIVER  
Compact size,  
100KHz to 30MHz  
£599.00

## NEW! IC2400 FREE CREDIT



NEW ICOM 2M & 70CM  
FM 45 W Full Duplex,  
simultaneous receive.  
£211 DEP. + 9  
payments £47.11.



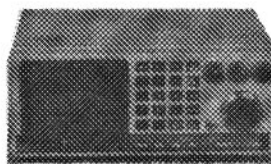
## IC-2SE

A 2M micro Handy & a  
SCANNER! Comes complete  
with nicad, charger & receive.  
Extended 80-190Mhz!  
DISCOUNT PRICE £249

## IC-4SE

Amazing micro 70cms handy  
with nicad + charger. Receives  
380-500 & 800-950 Mhz!!  
DISCOUNT PRICE £279.

## ONLY £499!!



The most remarkable Scanner  
yet. AX700 with Panoramic  
Display.

## JUPITER SCANNERS!

25-1300 Mhz with  
exceptional performance  
(really sensitive  
at 900 Mhz!)

MTV5000 Handheld £275  
MTV6000 Base/Mobile  
£349  
(Super slimline design)



## R-7000

ICOM's superb VHF/UHF/ SHF receiver



£895 DISCOUNT  
PRICE

## IC-726 ICOM HF MINI



A really great rig HF &  
SIX.AM/FM, Microphone,  
general coverage receiver,  
DISCOUNT PRICE £895.00

## IC735 STAR BARGAIN £865



with FREE  
SM6 Desk  
Mic!!

Finance arranged subject to status. APR typical 34.4%. Written quotations on request.

## Send SAE for COMET CATALOGUE COMET PRICE LIST JANUARY 1990

### NON RADIAL: Mobile antennas independent of vehicle ground plane

CHL21J 144/432MHz, Unity/2.15dB, 100W, Only 29cms long.....	£ 15.95
CHL23J 144/432MHz, 2.15dB/3.8dB, 100W, Only .44 metres.....	£ 17.95
CHL24J 144/432MHz, 2.15dB/5dB, 100W, 0.8 metres long.....	£ 25.30
CHL25OH 144/432MHz, 3.0dB/5.5dB 200W, 0.95 metres long.....	£ 32.60
2 x 4 SERIES + TRIBAND mobiles & base station antennas	
2 x 4M 144/432MHz 4.5/7.2dB 150 Watt 1.53 metres.....	£ 37.85
2 x 4 SERIES + DUAL BANDERS featuring the unique super linear converter system.	
2 x 4 MAX 144/432MHz 8.5dB/11.9dB 200 Watt S.4 metres "N" G. Fibre.....	£125.00
2 x 4WX 144/432MHz 6.5/9.0dB 200W 3.18 metres Glassfibre.....	£ 79.95
2 x 4 SUPER II 144/432MHz 6.0/8.4dB 200W 2.43 metres Glassfibre.....	£ 77.35
2 x 4FX Compact 144/432MHz 4.5/7.2dB 200W 1.79 metres.....	£ 55.80

### DUPLEX & TRIPLEXERS Zinc alloy diecast.

CFX5140 50/144/432MHz 800/800/500 Watt PEP 55dB isolation.....	£ 38.10
CF413N 432/1296MHz 500/200W PEP 55dB Isolation "N".....	£ 36.65
CF416 144/432MHz 800/500W PEP 60dB Isolation.....	£ 26.80

### SR SERIES to order only.

### MONO BANDER MOBILE ANTENNAS

CA28S 5/8 wave 3.5dB 300 Watt 1.32 Metres Base loaded.....	£ 15.00
CA287C 7/8 wave 5.2dB 200W 1.89 Metres double co-phase.....	£ 22.50
CA430TM 3 x 5/8 wave 432MHz 6.8dB 150W 1.47 metres.....	£ 29.95

### MONOBAND BASE ANTENNAS

ABC21 5/8 wave Ground Plane 144MHz 3.4dB 200W 1.4 metres.....	£ 24.50
ABC22A 2 x 5/8 wave 144MHz 6.5dB 2.87 metres.....	£ 36.00

ABC23 3 x 5/8 wave 144MHz 7.8dB 200W 4.5 metres.....	£ 59.50
ABC71 5/8 wave Ground Plane 432MHz 3.4dB .54 metres.....	£ 21.56
ABC72 2 x 5/8 wave GP. 432MHz 200W 5.8dB 1.07 metres.....	£ 34.85
CA712EF 432MHz Twelve x Half wave 9.5dB 3.10 metres HF & 50MHz.....	£ 55.00
CHA-5 Vertical with Loaded Radials for 80/40/20/15/10m 200W SSB 5.29 metres. Features Trifilar wound toroidal core.....	£219.95
52HB4 4 El.HB9CV Beam 10.4dB for 50MHz 400W SSB 3.2m.....	£ 67.90
CBL30 HF 1.7-30MHz Balun 1:1 1kW.....	£ 20.85

### CRZ/DISCONE & HANDHELD ANTENNAS

CRZ12DB A unique wide band Active antenna 500Hz to 1500MHz 1.24 metres with controller.....	£ 96.30
CH72S Designed for dual-band 144/432MHz handhelds 0/3.2dB BNC.....	£ 11.85
CH2S Floxi Half wave BNC. (self resonant).....	£ 11.95
CA2BN BNC Telescopic quarter wave.....	£ 10.95
ROD2 BNC 5/8 wave base loaded Telescopic (up to 8dB better than a helical).....	£ 12.95

### ACCESSORIES

CDS120 Power/SWR Meter 1.8/200MHz 15/60/200W PL259. Reads Peak & Average Power. Low Insertion Loss.....	£ 85.00
CDS270D Power/SWR Meter 140/525MHz 15/60/200W Peak & Averaging. Low Ins. Loss.....	£ 88.95
CM200 Miniature SWR/Power meter 140/150MHz 15/50 Watt.....	£ 32.45
CM400 Mini SWR/Power meter 430/450MHz 15/60W.....	£ 32.45
CF50MR 1 kilowatt Lo-pass filter 30MHz cut-off.....	£ 29.95

### MOUNT & BASE ASSEMBLIES

CA58M SO239 Socket with RG58 lead terminated PL259.....	£ 6.90
MS58 Strong Magnetic Mount SO239 RG58 lead with PL259.....	£ 19.95
CRD 58M Boom/Trunk Mount high quality with RG58 lead & PL259.....	£ 14.80
RS2 Stainless steel Gutter Mount.....	£ 10.85



Standard have done it again! You all know how popular the C500 is, well now here is their latest dual bander — the C528 (not to be confused with the Japanese only version, the C520). The European version has all the facilities that you want in a base station, let alone a hand held!

- ★ Direct 13.8V in for 5 Watts out.
- ★ VHF 2.5W, UHF 2W with CNB151 NiCad pack.
- ★ Dual displays
- ★ Power save function.
- ★ Multiple memories.
- ★ Priority channel.
- ★ Tone squelch (option).
- ★ Programmeable offsets.
- ★ Coded paging function.
- ★ Various scanning modes.
- ★ Programmeable step sizes.
- ★ 144-146 VHF, 430-440 UHF, 800-975 Rx only.
- ★ Separate Vol. & Squ. controls for each band.

★★★ HAND HELD ★★★

- ★★★ REPEATER FUNCTION ★★★
- All this in a package just 55mm wide x 157mm high x 31mm deep (2.5in x 7in. x 1.5in for us technical people).

**£379.00**

Norman.

PLEASE REMEMBER, WE ARE THE SOLE IMPORTER OF STANDARD EQUIPMENT IN THE UK AND WE ARE ABLE TO OFFER A FULL BACKUP SERVICE AND SPARES FROM STOCK.

**TRADE ENQUIRIES WELCOMED**  
PLEASE PHONE 01-450 9755  
★ STRICTLY TRADE PLEASE ★



**NOW £335!**  
**STANDARD**  
**C500**

Ask anyone who has one, his opinion of the well proven C500, and he will tell you that it can't be beaten. Thousands of users around the world are of the same opinion!  
We have now made it affordable by reducing the price still further to £335, so what are you waiting for?

**THIS IS, OF COURSE, THE EUROPEAN VERSION WITH FACTORY FITTED TONEBURST — PLUS MANY OTHER INCREDIBLE FEATURES NOT PREVIOUSLY AVAILABLE IN A HANDHELD.**

- ★ Frequency coverage 144-146 & 430-440MHz with Full Duplex available
- ★ Extended receive capability:- 130-169.995 & 410-470MHz
- ★ 2.5 to 5 Watts output (depending on battery pack)
- ★ High or Low switchable RF output
- ★ Step sizes:- 5/10/12.5/25/50KHz (user programmeable)
- ★ Keyboard programmeable repeater offset (0-39.9MHz)
- ★ Reverse repeater mode
- ★ Priority Channels available on both bands
- ★ Each band has 10 memories for frequency and repeater offset
- ★ Dual synthesised VFO's
- ★ User programmeable CALL button (instant QSY to your favourite channel — either band)
- ★ Numerous scanning modes (Pause or Busy — memories — band etc.)
- ★ Auto Power Off — with Alarm (4mA current drain on standby)
- ★ Battery Save on receive — 9 user programmeable Rx/Off ratios
- ★ Vacant Channel Search — for easier QSYing
- ★ Lock — disables keypad and/or PTT
- ★ Squelch Off button (saves twiddling the knob)
- ★ Low Battery indicator
- ★ Easy to read Liquid Crystal Display with backlight
- ★ LCD S/Power output meter
- ★ Can be powered directly from a car's cigar lighter (5W output)
- ★ Keypad or Rotary Knob frequency selection
- ★ Dimensions:- 173mm H x 60mm W x 34mm D

400 EDGWARE ROAD, LONDON W2  
01-723 5521 Tx 298765

OPENING TIMES: 9.30am-5.30pm Mon-Fri. 10am-4.30pm Sat.



Normally 24hr despatch but please allow 7 days for delivery

**NORMAN**  
**G4THJ**



# Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.

Telephone: Axminster (0297) 34918

## Yaesu

	P.O.A.	NEW
FT1000	1599.00	(—)
FT767	179.00	(3.00)
FEX767(2)	225.00	(3.00)
FEX767(70)	179.00	(3.00)
FEX767(6)	89.85	(2.50)
SP767	659.00	(—)
FT747GX	989.00	(—)
FT757GX	219.00	(4.00)
FP700	149.00	(3.00)
FC700	256.75	(4.00)
FP757HD	80.00	(3.00)
FAS14R	389.00	(7.00)
FT4700	429.00	(—)
FT290	399.00	(2.00)
FT690	7.50	(2.00)
YHA15	12.50	(2.00)
YHA44D	23.00	(2.00)
YM43	14.55	(2.00)
MMB15	225.00	(3.00)
FT411	239.00	(3.00)
FT470	389.00	(2.00)
FT23R	209.00	(3.00)
FT73R	229.00	(3.00)
FNB9	34.50	(2.00)
FNB10	34.50	(2.00)
FNB11	67.85	(2.00)
NC18C	17.71	(2.00)
SMC28	17.71	(2.00)
NC28	17.71	(2.00)
NC29	89.00	(3.00)
PA6	24.15	(2.00)
MH12A2B	31.05	(2.00)
MH18A2B	31.05	(2.00)
FNB3	41.00	(2.00)
FNB4	46.00	(2.00)
FNB5	10.00	(2.00)
FRG9600M	509.00	(—)
PA4C	29.00	(2.00)
MM810	10.00	(2.00)
NC9C	11.50	(2.00)
PA3	21.85	(2.00)
YM24A	31.05	(2.00)
FRG8800	649.00	(—)
FRV8800	100.00	(2.50)
FR17700	59.00	(2.50)
MH18B	21.00	(2.00)
MD18B	78.00	(2.00)
MF1A38	25.00	(2.00)
YH77	19.99	(2.00)
YH55	19.99	(2.00)
YH1	26.75	(2.00)
SB1	22.00	(2.00)
SB2	22.00	(2.00)
SB10	22.00	(2.00)
FT736 NEW	1,359.00	(—)
FT2311R	475.00	(—)
FT211RH	309.00	(—)
FT212RH	349.00	(—)
FL2025	115.00	(3.00)
FL6020	109.00	(3.00)
QTR24D	39.00	(3.00)

## ICOM

	P.O.A.	NEW
IC505	499.00	(—)
IC290D	642.00	(—)
IC228E	365.00	(—)
IC25E	275.00	(—)
IC26E	265.00	(3.00)
IC275E	1089.00	(—)
IC4GE	299.00	(3.00)
IC4SE	310.00	(—)
IC32E NEW	399.00	(3.00)
IC490	617.00	(—)
IC3210	499.00	(4.00)
IC2400E NEW	635.00	(—)
IC12E	428.00	(3.00)
ICR71	825.00	(—)
IC7000	957.00	(—)
IC765 NEW	2499.00	(—)
IC751A	1465.00	(—)
IC735	949.00	(—)
IC725	979.00	(—)
AT100	385.00	(3.50)
AT150	315.00	(3.50)
PS65	185.00	(3.00)
AH7000	82.00	(3.00)
SP3	61.00	(2.50)
CK70	7.00	(2.00)
EX257	41.00	(2.00)
GC6	43.00	(2.50)
AC2	14.38	(2.00)
BC35	70.15	(2.50)
BP3	28.90	(2.00)
BP4	8.20	(2.00)
BP5	60.95	(2.50)
CP1	6.90	(2.00)
DC1	17.25	(2.00)
HM46	24.15	(2.00)
HM9	21.85	(2.50)
HS51	41.25	(2.00)
LC24	7.60	(2.00)
LC41	8.20	(2.00)
LC42	8.20	(2.00)
SM8	82.00	(2.50)
SM10	116.20	(3.00)

## KENWOOD

	P.O.A.	(—)
TS950S	1995.00	(—)
TS940S	244.88	(3.00)
AT940	97.55	(3.00)
SP940	862.00	(—)
TS140	965.00	(—)
TS880S	1138.81	(—)
TS440	144.82	(3.00)
AT440	222.49	(3.00)
PS50	208.67	(3.00)
AT230	88.49	(3.00)
SP230	173.78	(3.50)
PS430	40.81	(3.00)
SM220	343.62	(3.50)
BS8	77.00	(2.50)
TL922	1495.00	(7.00)
TH205	238.00	(3.00)
TH45	289.00	(3.00)
TH75	215.26	(3.00)
TH215	252.13	(3.00)
TR751	699.00	(—)
TS790	1495.00	(—)
R2000	599.00	(—)
VC10	181.94	(2.50)
R5000	875.00	(—)
VC20	167.21	(2.50)
TM701	489.00	(5.00)
TM721	675.00	(5.00)
TM231E	269.00	(5.00)
TM431E	316.00	(5.00)
SMC30	28.31	(2.00)
MC50	46.08	(3.00)
MC80A	88.22	(3.00)
MC80	53.96	(3.00)
MC85	99.00	(3.00)
MC43	22.22	(2.00)
MC35	21.72	(2.00)
MC55	52.67	(3.00)
LF30	32.26	(2.50)
HS6	24.36	(2.50)
HS5	37.54	(2.50)
RZ1	465.00	(6.00)

### C W Keyers

	P.O.A.	(—)
HI-MOUND	42.49	(2.00)
HK703 Straight key (adjustable tension)	38.45	(2.00)
HK703 Straight key (adjustable tension)	26.35	(2.00)
HK704 Straight key (adjustable tension)	22.49	(2.00)
HK705 Straight key (adjustable tension)	21.80	(2.00)
HK706 Straight key (adjustable tension)	20.15	(2.00)
HK707 Straight key (adjustable tension)	109.00	(3.50)
HK802 Straight key (Deluxe-Brass)	104.50	(3.50)
HK803 Straight key (Brass)	34.50	(2.00)
MK703 Squeeze key	30.00	(2.00)
MK704 Squeeze key	32.78	(2.00)
MK705 Squeeze key	30.48	(2.00)

	P.O.A.	(—)
STARMASER	54.70	(3.00)
Dewabury	95.00	(3.00)

### Rotators

	P.O.A.	(—)
G250	78.00	(4.00)
AR200XL	38.50	(4.00)
G400	139.00	(4.00)
G400HC	169.00	(5.00)
G600RC	219.00	(5.00)
G200RC	445.00	(5.00)
G500	149.00	(5.00)
GR5400	279.00	(5.00)

### SWR/PWR Meters

	P.O.A.	(—)
HANSEN	52.75	(2.50)
W720S	16.50	(2.00)
JD110	31.50	(3.00)
YIMX	93.15	(3.00)
Yaesu Y560	81.65	(3.00)
Yaesu Y500	53.40	(3.00)
Hanson FS500H	53.40	(3.00)

### Miscellaneous

	P.O.A.	(—)
SMCS 2U	18.95	(2.50)
SMCS 2N	23.50	(2.50)
Kenpro KP21N	27.00	(2.50)
T30	10.29	(2.50)
T100	45.00	(3.00)
T200	65.00	(3.00)
WAI	24.95	(2.00)
PK232	299.95	(3.00)
Datong D70	83.40	(3.00)
Datong FL2	100.91	(3.00)
Datong FL3	146.51	(3.00)
Datong ASP	93.15	(3.00)
Datong ASP	93.15	(3.00)
Datong AD370	77.62	(3.00)
Datong PCI	154.80	(3.00)

### Antennas

	P.O.A.	(—)
D130	75.00	(3.00)
Jaybeam	348.45	(8.00)
Hygain	299.00	(8.00)
TH3JNR 3e HF Tribander	299.00	(8.00)
CD318 JR 4e HF Tribander	349.00	(8.00)
CD318 JR 4e HF Tribander	39.95	(3.00)
2/70cm Mobile	54.99	(4.00)
WX1	99.95	(4.00)
CA2X4Max		

Instant credit available

Mail/Telephone order by cheque or credit card Cheques cleared before goods despatched. (E&OE)



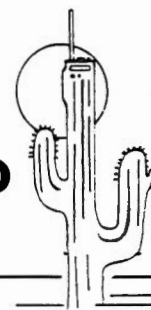
OPEN TUES-SAT. 9.00-5.30  
(CLOSED MONDAYS)

STOCK ITEMS USUALLY  
DESPATCHED WITHIN 48 HRS

DELIVERY/INSURANCE PRICES  
IN BRACKETS

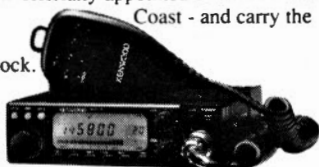


# NEVADA.....TALK TO THE WORLD



## TALK KENWOOD

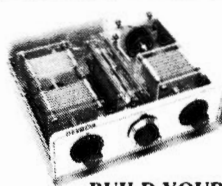
We are now officially appointed Kenwood dealers for the South Coast - and carry the complete range in stock. Here's a selection:-



TS 950SD New Digit HF Transceiver.....	£3199
TM 231E 2 Mtr mob .....	£289
TM 431E 70cm mob .....	£318
TM 701E 2/70cm mob .....	£469
TR 751E 2m multi-mode mobile .....	£599
TS 711E 2 Mtr multi-mode(s/soiled).....	£799
TS 440S HF.....	£1138
TS 940S HF.....	£1995

We always carry a large selection of used eqpt. ring for details

## TALK ATU'S



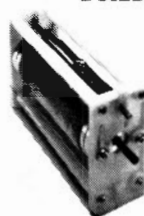
### TM 1000 1 KW ALL BAND ATU

Using our unique high power wideband roller coaster this ATU gives effortless matching of all long wire, G5RV, vertical and coax fed antennas. (Add £5.75 carriage for all models)

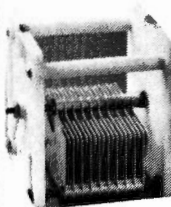
Standard Model TM1000.....	£168
Balun Model TM1000B.....	£199
Standard TM1000 Kit Form.....	£138

### BUILD YOUR OWN AMPLIFIER OR ATU WITH OUR

#### RANGE OF HIGH POWER COMPONENTS



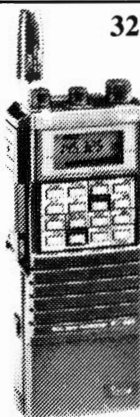
Roller Coaster 30 $\mu$ H.....	£29.95
Var. cap 150 pF (4Kv) (For mag. loops) .....	£16.95
Var. cap 250 pF (10Kv) .....	£19.95
Var. cap 250 + 250 pF (10Kv) .....	£28.00
Var. cap 750 pF (4Kv) .....	£28.00
Turns Counter (For Roller) .....	£15.95
Empty ATU Case.....	£26.00
2Kw Balun Assembly .....	£28.00



## TALK ICOM

As ICOM main South Coast dealers we are always pleased to discuss prices, part exchanges and finance.....Give Paul Martin, our ICOM specialist, a call now!

IC - 2SE .....	Call
IC - 32E 2/70 H/held .....	Call
IC - 3210E 2/70 Mobile .....	Call
IC - R7000 Receiver. ....	Call
IC - R71E Receiver. ....	Call
IC - 725 HF TCVR. ....	Call
IC - 735 HF TCVR .....	Call
IC - 751A HF TCVR .....	Call
IC - 761 HF TCVR .....	Call
IC - 765 HF TCVR .....	Call
IC - 228H 2m/45w. ....	Call
IC - 448E 70/25w. ....	Call



32E

## TALK SCANNERS

We probably carry the largest stocks of scanners in the UK. Our NEW BUMPER CATALOGUE features all the latest models.

Here is a small selection:-

### NEW FAIRMATE HP100E THE ULTIMATE HANDHELD

- \* Freq: 15 - 600 MHz  
830 - 1300 MHz
- \* 1,000 Channels of mem.
- \* Keypad or rotary control
- \* AM/Narrow FM/Wide FM
- \* Search steps from 5KHz to 995KHz.

EVERY SET SUPPLIED WITH:-  
Full set high PWR nicads  
2 antennas, carrying case,  
earphone, DC cable, belt clip  
shoulder strap.(charger extra...£7.76)

£299

OTHER POPULAR MODELS:-

Black Jaguar Mk111.....	£199
Jupiter 11 mobile.....	£375
Jupiter 11 H/held.....	£299
Bearcat 200 XLT H/held.....	£299



### NEW MULTI PURPOSE PRE-AMP

SUITABLE FOR SCANNERS & TRANSCEIVERS

- \* 25 - 2100 MHz
- \* Full RF switching for transceiver use
- \* Low noise GaAs Fet
- \* Variable Gain
- \* Band pass filters

Boost reception on your scanner, handheld transceiver, communications receiver with this superb new unit high quality japanese workmanship

£79.95

SCANNER ANTENNAS

Nevada Discone (50 - 700 MHz).....	£24
WB1300 Discone (25 - 1300 MHz).....	£59.95
PA15 Colinear (200 - 960 MHz).....	£49.95



## TALK ACCESSORIES

### REMOTE MAST HEAD SWITCH

NEVADA CAS - A2 £49.95

Freq:- DC - 1.3 Ghz

Connectors:- 'N' Type

Power:- 150/300 Watts

SADELTA XL30 Mic

A new electret base mic, that will give your Kenwood, Yaesu, Icom, or other leading brand of Transceiver extra 'punch' and 'clarity'. The mic may be powered from the Transceiver direct or with an internal PP3 battery.

Introductory Offer £39.95

SADELTA CM 40 Mic

As the XL 30 above, but

with Vol/Tone controls

Introductory Offer £49.95

### NEW DOCKING BOOSTER

Boost the output of your 2mtr handheld to 25 watts suitable for use at Home or in the car.

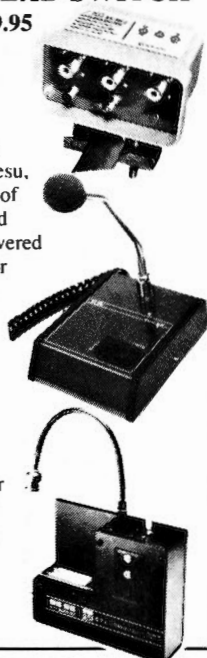
Model BS25

For ICOM, CTE, Kenpro

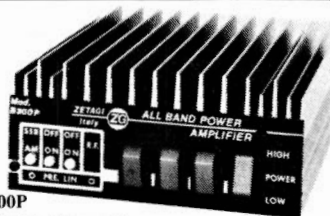
Model BS23

For some Yaesu models

Both Models £59.95



## TALK AMPLIFIERS



B300P

### MOBILE AMPS

B150 180w (26 - 30 Mhz) .....	£54.95
B300P 300w (6 - 30 Mhz+pre amp).....	£147.52
B550P 500w (6 - 30 Mhz).....	£237.00
B303 200w (6 - 30 Mhz).....	£114.67
TC50 15w (50 - 52 Mhz).....	£29.95
HL 66V 60w (50 - 52 Mhz) S/hand.....	£95
BRL31 28w (26 - 30 Mhz).....	£19.95
B250 250w (6 - 30 Mhz) 24 volt.....	£115



TC35DX 50 MHz amplifier

737 80w (26 - 30 Mhz).....	£35.41
735 35w (26 - 30 Mhz) .....	£18.54
B110 110w (142 - 170 Mhz).....	£145
BASE AMPLIFIERS	
B132 240w (6 - 30 Mhz) .....	£129
BV131 250w (26 - 30 Mhz) .....	£115
B507 300w (6 - 30 Mhz) .....	£278
HL1K/6 500w (50 -52 Mhz).....	£695

SEND IN NOW JUST £2 FOR OUR NEW BUMPER CATALOGUE (INCLUDES £2 VOUCHER)



# NEVADA COMMUNICATIONS.....WE TALK YOUR LANGUAGE

189 LONDON ROAD, NORTH END, PORTSMOUTH, PO2 9AE, ORDER HOTLINE 0705 662145



# Keylines

*PW* celebrates its 1000th issue with the publication of the July magazine and I would be most interested to hear from any of our veteran readers who have either taken *PW* from the early days, or from anyone who has memories from before the war. Our sister publication *Short Wave Magazine* has already put us in touch with some of our readers who have enjoyed the radio hobby with the help of both papers and I would especially like to hear your stories of those pre-war projects and how you built them.

Perhaps, out there somewhere, somebody has a receiver that they actually built themselves from a *PW* design - which is still in their possession and is still in working order!

It's much more likely that we shall hear about a receiver that was built by Grandad, now in the proud ownership of a grandson who knows the history of the equipment. If you are one such lucky owner, write to *PW* and tell us about it, as your family heirloom also forms an important aspect of *PW*'s heritage.

During the Second World War *PW* carried on publishing - despite the paper shortages and other restrictions. The magazine played an important role providing technical reading, information and necessary training for the many thousands of new radio and radar technicians who were needed during the hostilities.

Not surprisingly there's little mention of radar in specific terms until much later on in the wartime issues - for obvious reasons! However, radio enthusiasts were recruited in great numbers to work on radar and other important defence electronic systems. Were you one of them? Did you read *PW* in the war and did you find yourself reading the magazine in an unusual setting? I feel sure that there are many interesting stories to be told by readers who 'did

their bit' by working in the various aspects of radio communications and I hope to be able to share some of them with you in the July issue.

Thinking back to the Second World War made me think about the dangerous world of espionage - spies and spying to most of us! - and it doesn't seem to be so long ago to me when radio amateurs operating on 'Field Day' events and working mobile equipment were often thought to be spies!

It might seem rather funny to people nowadays to hear about groups of amateurs (suspiciously transmitting Morse signals from remote fields during the night) being confused with the practice of espionage - but it happened! There are many stories told about surprised club-station operators suddenly finding themselves surrounded by the local constabulary, who often took some convincing that the strange people they'd been tipped off about were doing it all for fun! The effect was even more

devastating to the radio operators when you bear in mind that the heavy tread of the approaching size fourteen boots was usually masked by the roar of the petrol-driven generator!

The problems for the mobile operator were often less funny. It wasn't much fun to be stopped by the police while they investigated the (often very strange looking) antennas and home-brewed equipment to be found on amateur radio-equipped cars in the late 50s and 60s. Mind you - my Morris Minor wasn't nicknamed the 'porcupine' for nothing! My home-brew h.f. gear and the ancient (even then!) much modified ex-p.m.r. RAYNET 144MHz equipment and associated omni-directional HORIZONTALLY polarised antenna attracted a lot of attention from the police. Most police officers were polite enough, although they occasionally demanded to see my amateur radio licence.

On the rare occasions I was carrying the then very large foolscap docu-

ment with me - they were none the wiser for reading it! However, my encounters with the police were amicable enough and I can claim at least two converts to the hobby through such encounters! But it was often an unpleasant experience to be flagged down and not something to be recommended!

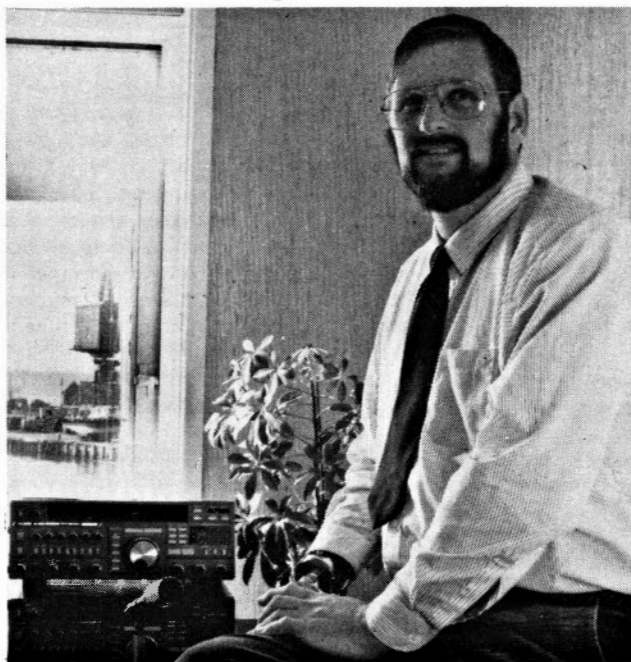
Nowadays an enormous number of vehicles on British roads seem to be fitted with radio telephones of either the cellular selective ringing type or the older p.m.r. 'base station' system. The growth of 'in-car communications' has laid to rest any possibility of a radio amateur attracting much attention when mobile operating, but that very growth has drawn the attention of many road users and safety organisations to the dangers of using hand-held microphones while driving on our congested roads at high speed.

On motorways I am often overtaken by motorists exceeding 70 m.p.h. while they are obviously chatting on the

'phone at the same time! Driving home from London via the M3 recently another driver overtook me as he was using a car 'phone and was so engrossed in the conversation he didn't notice a police patrol car directly behind! I don't know of course whether he got away with a warning or now faces prosecution, but it was a stark reminder to me to stay safe!

As I've got to be careful anyway because of the loss of my right hand, I operated mobile with a headset/boom microphone combination for many years. There are many commercially made lightweight microphone and headset designs available and I hope that many more operators will wear them and save their pockets - bearing in mind the well publicised police intention to clamp down on this dangerous habit - and possibly also save their lives by using a bit of common sense!

To finish off this month's Keylines I've got a sad little postscript for you regarding the Heathkit HW7 c.w. transceiver mentioned last month. I built this rig myself and used it for many years before passing it on to a friend. On reading January's Keylines, he contacted me to say that the transceiver is now resting at the bottom of the Caribbean Ocean and can perhaps claim to be the first HW7 to be under water! (perhaps worth a special callsign? Reception reports please with two IRCs for a QSL card!) Apparently the rig was loaned to a radio amateur working on a remote missionary station on one of the islands. It duly arrived and he had a few QSOs before a hurricane struck the island carrying the operator's shack complete with HW7, etc., into the sea. The loss of the transceiver was nothing compared to the damage on the island but I wish he'd been able to have a few more QSOs with it. Oh well, perhaps we'll send him a replacement - suitably waterproofed!



Rob Mannion G3XFD



# Receiving You...

## Dear Sir

I am writing this letter to inform you that I shall not be renewing my membership with the RSGB this year as I think that the £4.50 increase to the basic subscription for home corporate members is totally unjustified. This increase amounts to almost a 22% rise in the annual subscription. I know that the Society has not increased its membership rates in the last 20 months, but in the last 20 months the membership should have increased and should be higher now than ever before.

With the membership increasing every year and advertising rates in Radcom increasing in line with inflation, I can see no justification for such an increase. The Society should be looking for ways to increase its membership and not depleting it as they will do by raising the membership fees.

The Society should ask itself if it is so good, why are there so many radio amateurs and s.w.l. who are not members of the RSGB? My income, like many others, has not increased by 22% in the past 20 months - and please don't go on about the price of equipment, etc! I

don't smoke or drink and my family and I have not had a holiday in years. In fact, our last holiday was 11 years ago and my car can only be described as a 'banger'! So that I can get on h.f. I am having to sell other things that I own so I can buy a second-hand rig. There are many other amateurs like me who are on a low income.

The RSGB is no longer in the range of my pocket. I also have no wish to help fund a novice licence when we already have the RAE which is not that difficult to pass if the student puts their mind to it. So, like many other good amateurs, I will not be renewing my membership this year.

I know that I have no chance of getting this letter published in *Radcom*, as *Radcom* will not publish anything that is critical of the RSGB. It's a well known fact that the Society does not like criticism and this is why I am writing to you in the hope that you may publish my letter.

**M. G. Butler GW0MNP**  
**Bridgend, Mid-Glamorgan**

## The RSGB replies

David Evans G3OUF, Secretary and Chief Executive of the RSGB, replies to Mr Butler's letter.

"In replying to Mr Butler's letter I have to say that I believe the RSGB's new annual fee of £25 offers exceptional value for money. For £25 the RSGB defends and enhances the interests of all UK radio amateurs both nationally and internationally. A host of other benefits and services are available including: a monthly magazine, a free QSL bureau, planning permission and EMC advice, Intruder Watch, the Observation Service, discount book service, reciprocal licensing information, technical advice, slow Morse instruction, attractively priced equipment insurance, rallies, exhibitions and conventions, beacons and repeaters, RAYNET, special event call signs, propagation information, RSGB low interest rate credit card, GB2RS news, contests and awards, etc.

"In defending and enhancing the conditions under which UK radio amateurs operate, the RSGB has one of the finest records of any national society in the world. For example, the RSGB has led the World on packet radio licensing and was the first national society in Europe to negotiate permission for all of its amateurs to use the 50MHz band. Many other countries have since followed.

"Add to all of the above services the cost of the democratic process such as Council and committee meetings, the publication of an annual report and accounts, the annual meeting and elections for the Council and you will appreciate the costs in running a national organisation. However, like most national societies and countries in the world, membership and the numbers of licensed amateurs is either roughly static or drifting down at present.

"Mr. Butler urges the Society to recruit more members as a means of helping to keep fees down, but does not support the concept of a Novice Licence. Such a licence is seen by a large proportion of members surveyed, and the RSGB Council, as the prime way of bringing more people into amateur radio.

"The problem which sometimes does not seem to be appreciated is that if the number of licensed amateurs world-wide falls, then sooner or later the argument to decrease the size of amateur bands becomes irresistible to Governments, especially at a time when there are enormous commercial and other pressures on the radio spectrum. Indeed, at the major ITU (International Telecommunication Union) Conference to be held in 1992, many of the amateur bands could well be under threat. The Society will be involved in using the resources of all its members to defend the status quo and if possible enhance it at the 1992 WARC (World Administrative Radio Conference). Extra funds are also needed for other work which will be needed to defend the position of the UK radio amateur against any European legislation which, as 1992 approaches, threatens the hobby.

"The above case was put to all members when the fee increases, due from 1 March 1990, were announced in the January edition of *Radio Communication*. Naturally we are sorry that Mr. Butler has decided not to support the work of the Society. We are also sorry to note that Mr. Butler felt that his reasonable letter would not be published, since in the same issue that the RSGB fee increase was announced, there is a letter from a member griping about the QSL Bureau.

"To all those who are not members of the RSGB, I urge them to consider membership. There is safety in numbers and the Society has a fine record in defending the interests of UK radio amateurs. When you join any organisation it is not only for what you get out of the organisation, but also for what you can put back into it. The latter is the knowledge that you are funding the work which is necessary to maintain the basis of the hobby itself - defending the amateur bands without which there would be no amateur radio - 1992 is just around the corner."

**David Evans RSGB**

## G3XFD comments

*"Those of you who read my 'Keylines' editorial in January PWN, will realise I cannot support Mr. Butler's objection to the Novice Licence proposal. Amateur radio needs new blood and the novice approach is an excellent idea. I've often worked American Novice Licence holders on c.w. on the h.f. bands and have been very impressed with the quality of the Morse and the standard of operating. I've often been very surprised at the age of the person on the key! One of the best c.w. 'fists' I've heard in many years came from a ten year-old girl in Wisconsin! However, I must state here and now that I regard that the RSGB has made a fundamental mistake by aiming the recruitment drive at the wrong age group. To be successful you have to encourage the young people at around the age of six or seven. Many children are happily using very complex computers at school by the age of seven! With guidance, a large number of youngsters can (and have!) built working radio receivers. I consider that if the approach is left to the 'teens' - it will often be far too late in the day as the young people will usually be engrossed in computers, other interests and exams. Think early, for our young people have far more to offer to themselves and us than we can possibly imagine!"*



# Receiving You...

Send your letters to the Editorial Offices in Poole, the address is on our contents page. Writer of the Star Letter each month will receive a voucher worth £10 to spend on items from our PCB or Book Services, or on PW back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

Letters must be original, and not duplicated to any other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.

**Dear Sir,**

Following your 'Keylines' editorial in the February issue regarding valve circuits, I am hastening to write saying how much I would appreciate some valve circuits in *PW*.

I have been interested in amateur radio since the '30s and am therefore, a valve man and find solid state work difficult. It's not only because of the small size of everything but because if it does not work first time it is difficult, if not impossible to 'get into it to check current drain etc. With valve circuits all you have to do is unsolder a wire. I hope you'll be able to arrange something for the likes of me.

**H. H. Smith G3ARU**  
London E12

Keep looking Mr. Smith, we have one or two ideas 'up our sleeves' so to speak. Ed.

## ★★★★★STAR LETTER★★★★★

**Dear Sir,**

How about a write up on the large size rigs that are to be found on the second-hand market such as the Yaesu FT-102 (why so cheap?) and the FT-1 (why so dear?), etc. Some people don't want small 'pocket' h.f. rigs.

**Brian Grimes G0LGZ**

**Ventnor, Isle of Wight.**

An interesting idea Brian. What other older equipment would any of you like to see reviewed in *PW*? Write and let us know. Ed.

**Dear Sir,**

I must write and congratulate you on the wonderful new format for *PW*. Excellent paper, clean and clear printing, well set-out and with new and attractive titles. Many thanks for the new style magazine - may it long continue.

**George A. Ross G4IGI**  
Romford, Essex

**Dear Sir,**

I just had to put pen to paper after purchasing the new *PW* magazine. Having read the old style and finding it excellent, the new style is a thousand per cent better.

With the paper being whiter, it makes the reading easier on the eyes, and stands out much more. And as for the increase in price, it pays for the excellent quality for which you have supplied us with, especially the superb colour pictures throughout the magazine.

An excellent improvement by your staff. Keep up the good work!  
**Paul Hawkyard, Newcastle**

We are very pleased at the response from readers via the mail and telephone answering machine to the new-look *PW*. Obviously we are striving to keep costs down and provide you with a good magazine and are always pleased to receive your comments and ideas. Keep writing, we're receiving you! Ed.

**Dear Sir,**

I would like to add a little history to the highly informative article entitled 'The Father of Amateur Radio' by G3OXC in your January issue.

In the Admiralty Handbook of Wireless before 1939, the unit of capacitance was the 'Jar'. I cannot remember the electrical definition of the Jar or its relationship to the Farad. Perhaps an old timer amongst your readers could help?

**G. R. B Wilson G3APV**  
Seascale, Cumbria.

According to the *PW* office copy of the Admiralty Handbook of Wireless Telegraphy (1938 edition) 1 microfarad = 900 Jars. The book also states that the term was obsolete even in 1938. I've no doubt readers will remind us of other units and terms we've forgotten about. Ed.

## SUBSCRIPTIONS TO THE NEW STYLE PW

**BE SURE TO GET YOUR COPY OF THE NEW STYLE PW EVERY MONTH**

**SEND US THIS FORM OR CALL US ON 0202 665524 FOR CREDIT CARD ORDERS**

Please indicate the type of subscription required:

### PRACTICAL WIRELESS 1 YEAR

- ☐ £19.00 (UK)  
☐ £21.00 (Europe)  
☐ £22.00 (Rest of World)

### SHORT WAVE MAGAZINE 1 YEAR

- ☐ £19.00 (UK)  
☐ £21.00 (Europe)  
☐ £22.00 (Rest of World)

### SPECIAL JOINT SUBSCRIPTION

- ☐ £32.00 (UK)  
☐ £35.00 (Europe)  
☐ £37.00 (Rest of World)

Prices current at February 1990

Subscription to commence with issue dated.....

To: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enelco House, The Quay, Poole, Dorset BH15 1PP

Name.....

Address.....

☐ I enclose cheque/PO (Payable to PW Publishing Ltd) £.....

☐ Charge to my Access/Visa Card the amount of £.....

Card No.

Valid from ..... to .....

Signature.....

Credit Card Orders can be taken on (0202) 665524.



# Newsdesk '90

## Large Display Multimeter

The M4650 is a large, high resolution 4 1/2 digit liquid crystal display multimeter. It has the added advantage of data hold memory in addition to its other useful features.

The meter offers f.s.d. measurements of voltage up to 750V a.c., 1000V d.c., direct and alternating current up to 20A, resistance from 200Ω to 20MΩ, i.e.d./audible continuity testing, transistor  $h_{FE}$ , capacitance from 2000pF to 20μF and frequencies up to 200kHz.

A c.m.o.s. dual-slope a.d.c. is utilised for the auto-zero, polarity selection and over-range indication functions and the display has a range of annunciators including a low-battery indication and shows the units selected.

**Crotech Instruments Ltd.,**

**2 Stephenson Road,**

**St Ives,**

**Huntingdon,**

**Cambs PE17 4WJ.**

**Tel: (0480) 301818.**

**The 8th Annual  
Practical Wireless  
144MHz QRP Contest  
will take place on  
Sunday 17 June 1990  
0900-1700UTC**

Transmitter output  
power will be limited to  
three watts as usual. Full  
rules will be published  
in due course in  
Practical Wireless.  
Contest adjudicator:

Neill P. Taylor G4HLX.

## Special Event Stations

The Radio Club of Thanet will be activating three GB50 special event stations during the current year from Ramsgate to commemorate World War II events which took place 50 years ago.

In May, GB50DNK will be on the air from a Ramsgate Council building overlooking the harbour and will be commemorating the evacuation from Dunkirk and the fact that over 82 000 troops were landed at Ramsgate Harbour mainly from small boats, pleasure craft and Ramsgate lifeboat.

Also in May GB50SUN will be situated on board the *Sundowner* a 58ft long motor yacht which was one of the small boats taking part in the evacuation and rescued 130 men in one trip. The owner and captain of the vessel at the time was Commander Charles Herbert Lightoller the senior surviving officer of the *Titanic* disaster in 1912. The *Sundowner* has had a chequered career and carried out clandestine operations in 1939 for the government. It is hoped to operate GB50SUN/MM when the vessel makes a nostalgic trip back to Dunkirk at the end of May with Dunkirk veterans and other dignitaries, but space is limited and this may not occur.

In July GB50MAN will be active from RAF Manston, one of the front line aerodromes of World War II and will be

commemorating 50 years since the Battle of Britain.

It is hoped to activate all three stations daily during the respective months with the morning and early afternoon operation on the 40m band with later operation on 20 and 10m. The frequency to be used on 10m will be 28.845MHz commencing 1400UTC. Operation on 144MHz will take place as and when operators are available mainly at the weekends. The QSL operation will be organised by G3OPL who will acknowledge all cards received and direct applications will also receive an information sheet application to the respective operation returned with the QSL card. A s.a.s. with sufficient return postage please.

The Club is particularly interested to hear from Dunkirk veterans and anyone who flew from Mansy on during 1940 with the possibility of greetings messages being passed between them and the Mayor of Ramsgate and/or a Royal representative during the *Sundowner* operation, for the latter.

Further information can be obtained from Buster G3OPL. Tel: (0843) 597916, QTHR.

Stations who work all three GB50 calls are entitled to apply for the 'Seaweed Award' issued by the club. The cost of the award is £1 within the UK and 4 IRCs or 3 US dollars elsewhere.

The Awards Manager to whom all applications should be sent is **Butch G0CBY, QTHR.**

## The BATC Convention

The British Amateur Television Club (BATC) has moved its annual convention to a new venue this year. The new location is Harlaxton Manor, near Grantham Lincolnshire. The Manor is ideally situated being only 2 miles from the A1. The

committee spent a long time researching various sites, having received complaints about the lack of car parking space, the price of refreshments and the cramped exhibition areas. The new venue has none of these problems, with ample car parking space, and has good quality catering arrangements. The convention will be using a number of the large rooms of the Manor, which will allow more space for traders and the demonstration areas. As well as the exhibition, attended by many traders, there will be a full lecture programme covering several aspects of amateur television.

The Manor stands in many acres of beautiful grounds which will occupy the

XYL whilst you browse the trade stands, or attend the lectures and demonstrations. There are several local attractions which will make a visit to the area worthwhile for all the family. Belvoir castle (8km), renowned for the jousting tournaments held there during the summer months is open to the public.

Grantham town (5km), perhaps better known as Mrs Thatcher's birth place, has more historical connections as it is also the birthplace of Sir Isaac Newton.

The BATC looks forward to welcoming you to its convention, and hopes that readers will join them there.

## DX Association of Great Britain

Due to ill health E.A. Rickett has had to resign as secretary of the association. He will of course remain a member of the DX Association. This is to take effect from 1 February 1990. Would those who wish to contact the society please address all mail to

**Adrian Donaldson (DXAGB)**

**49 Arkalg Drive,**

**Crossford,**

**DUMFERMLINE, Fife KY12 8YW**



# Newsdesk '90

## WX Satellite Decoding Module

Previously, the display of polar-orbiting and geostationary weather satellites has meant interface units coupled to framestores or computer systems, sometimes putting this fascinating aspect of radio reception beyond most people's means.

Now, the APT-1 module enables you to display these satellite pictures on

any FAX system. It simply converts the APT transmission format into the FAX format but that isn't all.

The module incorporates a VOGAD i.c. to give a.g.c. for the APT signal, completely eliminating the black and white level controls, which are such a tiresome feature of framestores, and allowing the module to be driven from any convenient source of audio without adjustment. To let you change the display for

special effects, brightness and contrast controls are provided but these are pre-set for a standard display during calibration.

The clock frequency of the APT transmission is recovered in the APT-1 module and drives a divider chain to produce a synchronising signal. This eliminates the picture distortions due to Doppler effect and variations in tape speed on recorded transmissions. This signal can be reset by an external strobe pulse for picture phasing.

For users of our RX-8 multi-mode receive system, the module comes complete with everything to connect it into the existing RX-8 system and to control the functions and also a new software upgrade giving extra controls and facilities to make the best use of the module. Power to the module is supplied by the computer and no external supply is needed.

To receive the satellite transmissions, you will need a special v.h.f. satellite receiver as standard communication or broadcast receivers are not suitable. These satellite receivers are available quite cheaply from Maplin, Cirket, etc. For Meteosat reception, a 1.69GHz converter is also required.

The price of the APT-1 module, assembled, tested and calibrated, is £59 including p&p and VAT. For RX-8 users, it comes complete with all connections and software upgrade for a very special price of £39 if purchased at the same time as RX-8.

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



## Wide-band Pre-amp

The JIM M100 low-noise wide-band GaAs.f.e.t. pre-amplifier covers the frequency range 24-2150MHz. To ensure best possible performance, three switchable band-pass filters are included. With full built-in r.f. switching, this pre-amplifier is suitable for both receive and transmit applications. The BNC connectors mean that it can be simply connected to the operators favourite transceivers, scanning receivers, hand-held, etc., and the existing antenna put on top of the unit.

The M100 will also be of interest to the technician where it may be used in line with oscilloscopes, spectrum analysers and similar test equipment. The cost £79.95.

**Nevada,**  
**189 London Road,**  
**North End,**  
**Portsmouth,**  
**Hants PO2 9AE.**  
**Tel: (0705) 662145.**

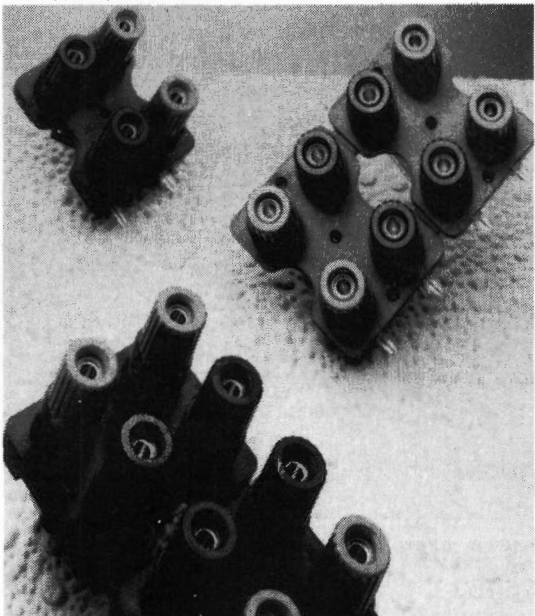
## Binding Posts

A new range of p.c.b. mounted binding posts with 4mm sockets has been introduced by Watts International Components Ltd.

Available with four or eight terminals, they have been designed for use in professional audio and hi-fi applications, and with test equipment where a non-fixed attachment or probe is required.

There is a choice of cap colours for easy identification in loom wiring use, and the posts accept a standard 4mm banana plug.

**Watts International Ltd.,**  
**No. 4 Phillips Business Centre,**  
**Terminus Road,**  
**Chichester,**  
**West Sussex PO19 2UL.**  
**Tel: (0243) 533479.**



## Catalogues

The Vintage Wireless Company have sent us their December 1989 Antique Wireless Newsheet. This 28-page loose folded item contains news, views, editorial and readers pages including a test of the K.B. Kitten two valver of 1932. There are also lists of classic BBC radio programmes and their availability on cassette. Obtainable for the sum of £5.00 for twelve issues.

Also from The Vintage Wireless Company is their

48 page component catalogue detailing such things as: accumulators, capacitors, coils, headphones and hardware, metal rectifiers, wires and cables, but the item that caught my eye was on the back page. This was a selection of material covering the period 1922 to 1934 including *Nellie the Nudist Queen*. by Stuart Ross and Joe Sargent. The above and their lists of valves, information sheets and books from **The Vintage Wireless Company Limited, Tudor House, Crossham Street,**



# Newsdesk '90

**Mangotsfield, Bristol**  
**BS17 3EN. or Tel: (0272)**  
**575442.**

Available from Attersbury Associates (Public Relations Services) Limited, on behalf of Hamlin LCD, is a brochure detailing Hamlin's manufacturing capability with Supertwist l.c.d. displays. The publication contains concise technical specifications for design and applications of these displays. Iso-contrast plots are available for each of the four fluids that are used in the displays. Copies free of charge from **Attersbury Associates on 01-859 6617 ask for Karen Mascarenhas, or David Griffiths of Hamlin on (0379) 644411.**

## Miniature Push Button Switches

The Mekanisk Elektrisk Compagni of Denmark have sent us details of their new surface or conventional p.c.b. mount switches. These have been designed to give maximum key travel and tactile feedback, in applications using a flexible foil overlay. The patented construction gives 1mm movement with an operating force of 150gram.

Sealing is to IP65 and the expected life is 5 million operations. The 10.1mm square 6.4mm high is suitable for SM or TH mounting using automatic pick up and place equipment. Interested?

**MEC A/S**  
**PO Box 26,**  
**Industiparken 23**  
**DK-2750**  
**Ballerup,**  
**Denmark.**

## Competition Results

Thanks to all those readers who sent in their entries for the PW Wordsearch Competition in the November and December issues. We were caught out with the number of entries received - after about three days we ran out of places to store them! Looking through the various grids, only two words seem to have caused any problems. The first was 'SHACK' which was on the right-hand side with part of the word on each piece of the competition. The other was 'YAGI' which was on the second piece of the competition on the left. It doesn't matter whether you marked one or all of the 'am' and 'fm' words, any of them count.

Anyway, the winner (the first correct grid out of the pile on the floor!) is:

**Peter Rice G6AYU** in Peterborough.

He wins the Standard C528 kindly donated by Lee Electronics in London W2.

The first runner-up is **George Mills** in Doncaster

He wins the Uniden 2830 kindly donated by Raycom of Oldbury.

The second runner-up is **S.P. Tomsett** of Hoddesdon.

They win the colour television.

The 100 other runners-up are:

Mr K Clayden, Isle of Wight; Kevin Roche, Beech; Mr M.D. Harfield, Brighton; M. Sundara Vadivel, India; Donald Macdonald, Isle of Lewis; Thomas Fusco, Co. Down; P.R. Hughes, Little Sutton; A.S. Clelland, FRG; R.H. Harbord G4YDY, Norwich; Mr J.R. Cottrell G1OKY, Wirral; Ken Thompson, USA; L.A. Stringer G4GZG, Ongar; J.E. Smith G1SRJ, Humbleton; C. Womack, Pontefract; Mr H.A. Williams G4WNA, Redcar; John Cottrell, Birmingham; Jean Dobersecq, France; Eric Dew, Bristol; Michael Grieg GM0MMN, Fife; H.W. Genschorek, Canada; N.J. Varnes, Wincanton; Mr B.I. Richardson, Isle of Wight; Mr A.J. Humphreys, Basingstoke; J. Savage, Exeter; John Portney, London; Mr R Fuller G8YQU, Nuneaton; Folke Johansson SM4HJ, Sweden; K. E. Miller, Tyne & Wear; F. J. Gibbons G3TBU, Kidderminster; Susan Redfern, Manchester; Mr R Parker G4ZBO, Kendal; B.T. Howat, Southport; Flight Lieutenant P.A. Bradbeer, BFPO 42; Alistair R Hill, Easlesham; R. Johnstone, Fort William; Larry W. Maddox, USA; Mark Fasham, Ramsgate; N. Porter, Surbiton; Mr Lim Chin Siang, Singapore; Mr J Sable, Braintree; Mrs Pauline Coburn, Wrexham; Charles Grech, Malta; Mr P. Haylor, Birmingham; Mr F.G. McCall, Co. Antrim; Denis Oakley, Warley; Gary Davis, Tamworth; Zhao Jiulong, China; Alan Benfield, Witney; Mr R Baldock, Birmingham; Shaun C Barker G7ENH, Stanton; E. Simmonds, Doncaster; Mr H.D. Green, Truro; Bernard Gay, Kings Norton; S. Hettick, Morpeth; P.J. Doyle, Woodford; Mr A.C. Miles G6RJS, Ilford; John Lund OZ9VW, Denmark; Mrs Lindy Jasper, Bognor Regis; Mr Michael Day, Guernsey; C.W.M. Anderson ZR6AFU, South Africa; Mr R Moat, Dover; G. Jarvie, Co. Londonderry; Mr W.B. Booth G7FCN, Bracknell; Bob Stone, Plymouth; Mr L. Wheeliker G0EZK, Doncaster; James Bodle, Stranraer; Colin Seymour, Tyne & Wear; Nick Mavrantis, Greece; Mick Behan, Co. Wicklow; Mr G.A.E. Johnson, London; Howard Seddon, Lancashire; D.W. Payne G3KCR, Crowborough; Mrs M. Stanley, Leeds; G.P. Truckel, Bristol; V. Cundall G3FAU, Stevenage; Mr L. Ullman, Canvey Island; Mr C. E. Blumfield, Shrewsbury; L.W. Thomas, Saltfleetby; Rolin Francis, Belgium; Mr M. Hadley, Birmingham; Mr N.J. Cleaver, BFPO 58; R.W. Moore, Isle of Man; A.G. Martin GJ3GCC, Jersey; Mr A.W. Johns, Saltash; D.A. McAtee, Gloucester; Ury Moskowitz, Israel; Mr M. Gregory, Locks Heath; G. Renggli G0GID, Bournemouth; C.R. Rogers, Peterborough; G. T. Bilbie G0BGW, Mansfield; Hamish Dally, Shetland; J.C. Kralingen, Holland; Mr R Craib, Aberdeen; Alec M Jones GM8HGD, Aberdeen; John Kirby, Chalgrove; Steve Curtis, Australia; Ken Ritzema G0MLP, Barnard Castle; Reynir H. Stefansson, Iceland; J.M. Garner G3KEC, West Looe; Mr F.C. George, Orpington.

Congratulations to all the winners, your prizes will be on their way very soon.

The January Crossword winners have been picked from the hat. The first prize of a £20 PW voucher has gone to Carolyn Gilbody in Belfast, the second prize of a six month PW subscription goes to Mrs E Meinwaring on the Isle of Wight and the 3rd prize of £10 in PW vouchers goes to John Williams from Stourbridge.

The February Spot the Difference results will be announced in the April 1990 issue.

**WANT TO HEAR THE LATEST NEWS AND UPDATES?**

**Ring WIRELESS-LINE on 0898 654632.**

Calls charged at 38p per minute (peak) or 25p per minute (off-peak).



# Competition Corner *Wordsearch*

S D Q B O C L I L C F A O P Y J J B V F D G W E D  
 S E Q L U B I Y A U R W I X N R S K A T T S Z O G  
 O M G S R E R P A O Y S Y N V Y F T F A S Z Z K C  
 F P P M T E A T T R H P R P T O S S I A Y B Z S I  
 H B S J T C I Y B X X E A O K E R H P U A S I H F  
 N D F T I M Q U K K Q B F B T R R D J N C A D L Q  
 T V A T S A H W W G C Q I Y D C N F D K E R U P V  
 P B O N A K X R Z X M R F U D A U W E R M V I C S  
 Y R A I L X S E U I I I N D B G I D I R V A Y C T  
 Y R E H N D A T N U Z I W J K D L A N A E C R Y L  
 T V K R T F Z L O W C C F V T Q L Y U I A N J F V  
 G P Q J E B V I C A L D C H U A T X R N E H C Q E  
 E K V U K T G F D Y E V B E U I K S U H Z T T E S  
 Z Q B S D E T T T D E U M X D X Y B D D S V E O X  
 F J O O O A Y A R Q N P G N Z K X G Z G Q S J R R  
 K F K O A S Y L C A T S W T M D E A U B Y K T Z S  
 B R L I R C W O I S B C H C L F P E V C L P F V I  
 F G E K C A M L Z N K T O T E Z F D K Q G L U P V  
 N O S S D N E M T Z E C N O I T A G A P O R P O M  
 G Z O K I B Y N W O C S A O P Z L P P I H M Y B P  
 E Q O O I S D M I O F H W B W F C B Q O X X E L Z  
 F S C O D T T W B L E F E S V A J A R Q W Z H W G  
 D G P I C E D O C R L L G U K X T Q M B J M U S Q  
 X O I C L B B L R V U O X E A V H T C D A D M S F  
 W X B T B S Z G E A K Z C N O X E J S X M J S A I

## PRIZES...

First prize will be awarded to the first correct entry drawn from a 'hat' on

Monday 19 March 1990 and the winner can choose either a one year PW subscription or £20 in vouchers for the book service.

The two runners-up drawn from the same 'hat' can choose from either a six month PW subscription or £10 in book vouchers.

AERIAL  
 BACKSCATTER  
 BANDPASS  
 BANDWIDTH  
 BARTG

BATTERY  
 CAPACITOR  
 CIRCUIT  
 COLLINEAR  
 FILTER

INDUCTOR  
 INTERFERENCE  
 KEYLINES  
 NICAD  
 PCB

PROPAGATION  
 RESISTOR  
 SSTV  
 TRANSMIT  
 WATTS

Twenty different 'radio' words have been hidden in the letter grid. They have been printed across (forwards or backwards), up and down or diagonally, but they are always in a straight line without odd letters in between. You can use the letters in the grids more than once for different words, and they're not all used. Once you have found all twenty words, mark them on the grid and send in your answers.

Send your entry to PW Publishing Ltd., March 1990 Wordsearch Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP. Closing Date last post received Friday 16 March 1990. The Editor's decision on the winner is final, no correspondence will be entered into.

Name .....

Address .....

Please tick choice of prize if you win.

☐ Subscription

☐ Vouchers

Postcode .....

# ARE

## COMMUNICATIONS

6 ROYAL PARADE  
HANGER LANE  
EALING  
LONDON W5A 1ET



SEE YOU THERE  
ON MARCH  
9TH AND  
10TH.

## "A DREAM COME TRUE"

TO ALL FT 290 OWNERS, OR FOR THOSE WHO  
WANT TO OPERATE HF FROM THEIR  
2 METRE RIG.

TOKYO HI POWER HAVE PRODUCED THIS  
SUPERB TRANSVERTER DRIVEN FROM  
144-146MHz AT 3-10W AND PRODUCING  
40 WATTS OF EITHER FM OR SSB ON EITHER  
10-15-20-40-80 METRES.

THE UNIT IS ABOUT THE SAME SIZE AS THE FT 290.

SO WHY NOT ENJOY THE IMPROVING  
CONDITIONS ON THE HF BANDS USING YOUR 2m  
EQUIPMENT.



**£249** — CASH/  
CHEQUE/  
CREDIT  
CARD  
OR 48 PAYMENTS  
OF £8.36



### Kenwood TS440S & Auto ATU

One of the finest HF transceivers ever  
produced by Kenwood. Whether used as a  
base station or mobile — its superb  
specification rates it high amongst its  
competitors.

Special Exhibition Offer TS440S with auto  
ATU **AND FREE** Revex 30amp power  
supply — at list price or 48 payments of  
£43.06.

**£1,282**

AT LAST THE "LONDON SHOW" IS  
ABOUT TO HAPPEN. EVER SINCE  
THE DAYS OF "ALLY PALLY"  
THERE HAS BEEN AN OUTCRY  
FOR ANOTHER AMATEUR RADIO  
EXHIBITION IN LONDON — SO AT  
LAST THE SOUTHGATE CLUB HAS

WHEN IT COMES TO BREAKING  
THE PRICE BARRIER — WE ARE  
RARELY BEATEN. NOW A  
SUPERB DUAL BAND  
TRANSCEIVER FROM STANDARD  
AT AN AMAZING **£289.00**  
CASH/CHEQUE/CREDIT CARD  
OR NO DEPOSIT AND  
48 MONTHLY PAYMENTS OF  
**£9.70 PER MONTH**

- Dual band operation 144-146 and 430-440MHz, Full duplex.
- Receiver coverage: 130-169.995 and 410-470MHz.
- Programmable step sizes 5/10/12.5/25/50kHz.
- 5 watts output on both bands (With optional CNB120).

- Dual synthesised VFOs.
- Programmable ctcss tones 67-250.3Hz (With optional CTD/N500).
- Programmable Repeater Offset on either band between 0-39.9MHz.
- Reverse Repeater facility.
- Dual Watch priority channel.
- Programmable Call Channel on both bands.

- Ten programmable memories, including repeater offset, tone squelch etc, on both bands.
- Four different scanning modes.
- Battery save facility.
- Switchable Frequency lock and TX inhibit, from keyboard.
- Switchable 20dB Attenuator.
- High or Low power control.
- Squelch defeat switch
- Illuminated Wide Angle L.C.D. display.
- Digital 'S' Meter/Power output display.
- Low battery Warning indicator.
- TX LED indicator.



**STANDARD  
C500  
£289.00**

LICENSED CREDIT BROKERS A.P.R. 29% SUBJECT TO STATUS



LAUNCHED A NEW SHOW AT AN EXCELLENT VENUE. PICKETTS LOCK AT ENFIELD WILL PROVE TO BE A FAVOURITE WITH BOTH TRADERS AND VISITORS AND WE LOOK FORWARD TO YOUR VISIT.



Brenda  
G4VXL

Both Brenda and Bernie will be pleased to welcome you to our stand NA/NB at Picketts Lock



Bernie  
G4AOG

## ICR7000HF Receiver 500kHz — 2GHz



YES, 500kHz to 2GHz CONTINUOUS receive in one unit. Using the ICR7000 multimode facilities, this probably makes the "2 in 1" ICR7000HF Receiver the most versatile scanner available today. Because of the enormous frequency coverage, the ICR7000HF has 200 mode sensitive channels for increased flexibility.

NO  
DEPOSIT

Now available on A.R.E. super credit terms.  
48 monthly payments of £33.22 A.P.R. 29%  
Cash/cheque/credit card price

**£989.**



**The R-5000 from Kenwood**  
100kHz-30MHz. SSB/AM/CW/FM/FSK  
CV-10 converter 118-174 MHz

Now available on 48 monthly  
payments of £26.70 or  
cash/cheque/  
credit card **£795**

**PHONE 01-997 4476**

NO DEPOSIT  
48 monthly payments  
of £33.42

## REMEMBER

WE SELL ALL WELL  
KNOWN BRANDS. LET  
US QUOTE FOR YOUR CHOICE  
KENWOOD — ICOM — STANDARD

### 48 PAYMENTS CASH/CHEQUE/ CREDIT CARD

		POA
TS950		£925.00
TS680	£31.07	£825.00
TS140	£27.71	£3995.00
ICOM781	£134.36	£2245.00
ICOM765	£75.42	£895.00
ICOM735	£30.06	£895.00
ICOM726	£30.06	£699.00
ICOM725	£23.48	



**The NRD-525 from JRC**

J.R.C. ARE RENOWNED FOR THEIR  
COMMERCIAL RADIO EQUIPMENT AND THEIR  
AMATEUR BAND EQUIPMENT ENJOYS THE  
SAME REPUTATION

OR CASH/CHEQUE/  
CREDIT CARD **£995**

# GAREX THE ORIGINAL SCANNER SPECIALISTS

Pioneers in the UK scanner market. The Company that offers its customers the security of complete service backup. Experienced technical staff to help you make the right choice — we stock all major brands, so we don't pressurise you into buying the model we want you to have. Reliable equipment, fully tested before despatch with guaranteed factory-backed in-house maintenance if required. If we cannot service it, we don't sell it. You can trust Garex!

## SECONDHAND STALL!

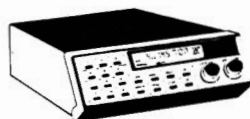
Our large turnover of scanners means we always have a range of fully reconditioned and guaranteed secondhand items. Ask for list.

## LATEST MODELS

Contact us for details.

### REVCO RS-3000

#### THE COMPACT SCANNER



- Size only 6"×2"×8"
- Covers: 26-32MHz, 60-90MHz, 118-180MHz, 380-512MHz
- AM & FM all bands
- Liquid crystal display
- 50 memories
- Scan, search, priority

**£225**

### AOR 2002

#### THE WIDE RANGE SCANNER

- Covers: 25-550MHz, 800MHz-1.3GHz
- AM & NFM & WFM on all bands
- Computer interface socket
- 20 memories
- Compact size
- 12V dc operation
- Up/down step control knob



**£487**

### AOR 800E

#### THE SMALLER HANDY-SCANNER

- Covers: 75-106MHz, 118-175MHz, 406-496MHz, 830-950MHz
- AM & NFM programmable on all bands
- Full scan & search functions are available
- 20 memories
- Measures only 2.5"×5.5"×2"
- Nicads, charger & BNC whip antenna included in the price



**£169.50**

### JIL SX-200N

#### THE SUPERIOR SCANNER



- The choice of the professionals
- Proven reliability
- Covers: 26-88MHz, 108-180MHz, 380-514MHz
- AM & NFM on all bands
- Positive action keyboard
- 16 memories
- 12V dc & 240V ac

**£325**

### JIL SX-400

#### THE PROFESSIONAL SCANNER



- Basic coverage 26-520MHz
- AM, NFM & WFM
- Expandable from 100kHz to 1.4GHz with SSB and CW
- Computer control options
- IF output terminals
- Specifications set by professionals

**£649**

### BLACK JAGUAR BJ200 Mk III

#### THE VALUE FOR MONEY HAND SCANNER

- UK version.
- Wide coverage 26-30MHz, 60-90MHz, 108-180MHz, 210-260MHz, 380-520MHz.
- AM and FM all bands, manual and programmable.
- Nicads, charger, soft case, flexwhip antenna.
- Car adaptors and other accessories available.

**£199**

### AOR900 UK

#### THE FAVOURITE HAND SCANNER

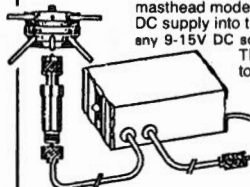
- UK version — full service backup.
- Covers 108-180MHz, 220-280MHz, 300-380MHz, 420-470MHz, 830-950MHz.
- AM and FM all bands, manual and programmable.
- 100 memories (5 banks of 20).
- Nicads, charger, flexiwhip antennas.

**£199**

## WIDE-BAND PRE-AMPLIFIERS

The problem with omni-directional wide-band antennas is their lack of gain. The REVCO PA3 range of wide-band pre-amplifiers complement the antennas and compensate for their shortcomings.

The basic specification of the products is similar: coverage 20MHz-1GHz, at 1GHz: minimum gain 13dB, noise factor 5.5dB. Choose from a mast-head version (PA3) or a standard die-cast box style (PA3I). Best results are normally obtained from the masthead model which gives a boost to weak signals which would otherwise have been lost in the feeder cable. Also feeder cable noise is not amplified which is the case if the amplifier is mounted at the base of the feeder. On the other hand, the die-cast box version requires no special installation and is readily taken out of circuit. The masthead model is supplied with a special power unit which feeds the DC supply into the antenna feeder. No psu is provided for the PA3I as any 9-15V DC source is suitable (current requirement about 25mA).



The PA3I finds application in instrument work, e.g. input to spectrum analysers, boosting the output from signal generators to give a low-power TX.

The standard version of the PA3I has BNC sockets and is designated "PA3I/B", available to special order N-type sockets ("PA3I/N") or SO239 ("PA3I/S").

A special feature of the PA3 series is a high-pass filter to attenuate frequencies below 20MHz; high-power HF & MF broadcast stations can be very troublesome!

PA3 Masthead, with PSU  
PL259 **£49.95**  
N-type **£53.95**

PA3I/B BNC **£35.50**  
PA3I/N N-type **£38.95**  
PA3I/S SO239 **£35.50**

## REVCON

The UK's favourite discone composed of traditional British quality engineering.

The REVCON works well without exaggerated advertising claims. It is designed to cover 50 to 500MHz, and thousands of satisfied users will testify to its efficiency. Unlike some manufacturers we do not quote inflated figures for gain. A gain figure is meaningless unless the reference point is stated.

Optional vertical whip feature: It is possible to fit a vertical whip section to a discone. We do not want to give you the "Hard sell" where this vertical element is concerned, but there is some evidence that it may improve the performance of the antenna around the resonant frequency of the whip. That's why we make it an optional feature.

Another option is the N-type connector instead of the popular SO239. N-types give a better UHF performance, but they cost a bit more. The choice is yours.

Because the REVCON is British-made by a company which has been in business for 30 years, you buy with confidence, knowing that there is back-up should anything go wrong.



Standard model (SO239 socket) **£35.95**  
N-socket model **£37.95**  
Cable and plugs available



## GAREX ELECTRONICS

MAIN DISTRIBUTOR OF REVCO PRODUCTS.

PRICES INCLUDE UK P&P and 15% VAT. Ask for details or our interest free credit.

HARROW HOUSE, AKEMAN STREET, TRING, HERTS HP23 8AA.  
Phone 0296 668684 or 044 282 8580. Callers by appointment only.





# The Icom IC-901E Dual Band VHF/UHF Mobile Transceiver



*Mobile operating today comes with the choice of many transceivers with multiple options. Rob Mannion G3XFD spent the Christmas holidays looking at a recent release from the Icom stable. G1TEX then put the rig through its paces in the PW test lab.*

When it comes to modern equipment, especially the 'all-singing, all-dancing' type found nowadays, I have great difficulty in understanding the masses of instructions and the fiddly controls. In fact, anyone at *PW* will inform you that I am certainly not 'computer friendly'. Sadly they're right - I just do not seem to relate well to any form of computer or microprocessor controlled system. This extends, unfortunately for me, to hand-held transceivers and other equipment that uses multi-purpose control switches. I can get into a terrible muddle before I get used to a particular system. However, the unusual IC-901E seems to have made friends with me in no uncertain way and I enjoyed operating it.

Driving out into the Dorset countryside to the high viewpoints near Blandford Forum I was able to listen and work many stations on 144MHz. The transceiver drew very favourable comments for audio quality on transmit and I found that, despite the very small size of the supplied speaker, the received audio reproduction was good and there was plenty of it to overcome the high noise levels in my work-weary Ford Escort estate. Despite being in an excellent location for v.h.f. and u.h.f., I did not hear much on the 430MHz band except packet radio bursts. Mind you, I have since found out from other local amateurs that this band is somewhat under-utilised in and around this area.

My biggest problem in using rigs such as the IC-901E is the physical size of the control switches. My extra-large hand and fingers seem to spread over controls, and without even realising it I can operate the wrong switch and cause problems and confusion for myself and the people I'm working. Despite the very small size of the rig - it's only fractionally bigger than the average car radio cassette-player - the transceiver really does pack a punch and (much to my surprise bearing in mind my difficulties with small-size modern equipment) I found it very easy to work on the air and made few mistakes. The switches were very positive, although they only required a light touch. The tuning

control (the tuning is in 25kHz steps) felt rather odd at first (it felt as if the action were following my movements after a slight delay) but I got used to it very quickly indeed and found it very pleasant to use.

There's no doubt in my mind that the most attractive option for most radio amateurs will be the complex facilities offered by the well designed remote control head. The detachable front panel was very clean and clearly laid out with a push-button either side of the front panel to release it. The eight function buttons on the right hand side of the box, although small didn't cause me any difficulty. Considering them in turn:

PWR is the on off button and successive presses change this state, as the front panel is operable remotely this button does not carry the full power of the machine.

V/M this toggles the v.f.o. control between one of the twelve memories available for each band, or for direct control using the main rotary control knob.

MHz pressing this causes each rotational click of the main control to increment in 1MHz steps instead of the pre-selected step. This allows rapid and easy frequency shifts on the 430-440MHz band.

CALL, this is a further memory which holds a calling channel on either band to control the transmitter.

H/L controls the r.f. power output of the transmitter stages switching the 144MHz output to either 5 or 50W and displaying an 'L' in the appropriate window. On the u.h.f. band the powers are 5 and 35W, and again there is an 'L' when in low power mode.

M/S changes the Main and Sub channels windows over. The main channel is the one on which transmissions take place and occupies the upper portion of the window. Physically, the characters of the main channel display are also larger, making them stand out distinctly.

SET allows the rotary control switch to be used to change the various parameters such as frequency, step rate, volume, squelch, on the basic IC-901, repeater shift etc. Repeated presses cause the various functions to be displayed in the window and the use of the rotary

REVIEW

# REVIEW

control to change any of these that have several possible values. For instance if the SET button is pressed until the word DUP appears, (this is a representation of the limitations of all seven segment displays) rotating the main control knob then causes the display to cycle through the three transmitter offset possibilities. These, of course, are above, below or on the same frequency as that used for reception. This offset itself may be preset to other than the normal value of 600kHz on v.h.f. The offset has only three choices available. When setting the sub-audible tone frequency there are 37 of them to cycle through. These range from 67 to 250Hz and the chosen frequency comes into use when the 'T' for tone squelch is enabled.

The final button to be described is the one that has the effect of allowing changes to be made to the 'SUB' band channel instead of the Main band channel.

Under that main display are seven smaller switches marked BAND, MODE T/T.SQL, TS CHECK, MW and S.MUTE. These are used less often than the buttons described previously. With the bare IC-901E, only the last four have any real meaning. TS changes the frequency step, CHECK allows listen on input when in repeater mode. The one marked MW is Memory Write and used to transfer data to one of the memories of which there are 12 for each band. Finally S.MUTE mutes the SUB band audio. As either band may be MAIN or SUB this applies only to the frequency shown in the lower half of the windows. On setting the volume and squelch for both MAIN and SUB these apply to which ever is which.

The illuminated liquid crystal display is excellent and the option of the removable control panel - it detaches from the main unit very easily - is an innovation that I personally have not seen for a long while. Some years ago remote operating facilities were popular and necessary (due to the large size of the equipment and the power supplies which had to be hidden away in the boot) with early car radio receivers and v.h.f. radio-telephone equipment. Re-introduced in this way, the option brings many advantages to the modern mobile operator. Space is at a premium nowadays in cars. Gone are the days of large under-dash parcel shelves, door pocket and transmission tunnels and therefore the majority of the chances of finding a suitable place to mount your rig. Most modern vehicles seem to be fitted with oddly-shaped moulded compartments and the streamlined interiors

leave the mobile operator with a real struggle to find a suitable location for the transceiver. When you have long legs and considerable bulk to go with it - the option to place the rig away from the possibility of knee and shin collisions is welcome.

While on air I found that the displayed control settings were very useful, especially the squelch and volume controls. I don't know about you but I've often left the squelch turned up too far and lost a QSO as a result. These display reminders are useful and must be an aid to safety, as there is no need to grope for the controls.

As the transceiver is fully capable of working on both 144 and 430MHz at the same time (the rig has a separate antenna input for the u.h.f.band) the receiver section of the rig on whatever band not being used for transmitting, is active. This does take some getting used to if both bands are active! In my case I was using 144MHz to transmit and receive on and had no antenna connected to the 430MHz socket. Not being used to full duplex facilities in an amateur radio transceiver, I was somewhat surprised that the speaker continued to emit receiver noise when I was transmitting and using one band. However, I soon got used to the effect and was only sorry that it was not possible for me to have a cross-band QSO with someone on 430MHz.

The facility to listen and monitor one band while working on another also proved to be a useful and interesting addition. The receiver seems to be very sensitive and I was able to hear (and work) several stations that would have normally been out of range of my usual transceiver operating into the cheap and cheerful mag-base quarter-wave 144MHz whip. During one evening of listening, I heard the Torbay repeater although I could not access it well enough to work anyone. The Swindon repeater usually gets into Dorset very well - especially on the high ground. I heard it for the first time at my home QTH using this equipment - while the car was parked right up next to the house and screened by a wall and two thick hedges.

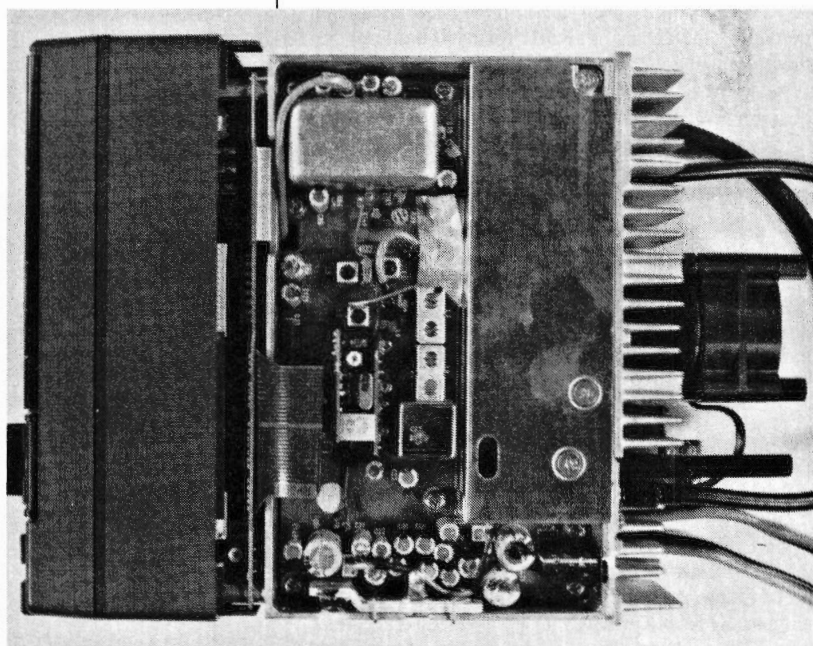
With the optional extra of a very long control lead (20m! Part No. OPC189) - fibre-optics come into play here - caravanners can take the rig control panel into their living quarters and happily operate from there. This removes the bother of having to take the equipment out of the car every time you park up for the night. It's things like this that make the rig a multi-use piece of equipment for the operator who wants more than either a mobile or base station rig.

Reading the handbook was a revelation in itself. I was completely taken aback with the various possibilities of the equipment. If you do buy all the optional extras you can end up with a medium wave receiver, a 28MHz f.m. transceiver, a v.h.f. stereo car receiver and a rig capable of working over to 1000MHz.

## Technical Details

The IC-901E is a combination of two transceivers in a common case. They each have their own antenna connections and r.f. stages, along with individual audio stages and speakers thus allowing independent reception of signals. This is not new, of course, as dual band rigs have been available for some time. What makes this stand out is the fact that it can become the centre of a complete system which may include not only the f.m. unit as supplied, but also add-on units to make the system into an almost fantastic array of other things. All the variations for the receiver can be seen in Table 1 which has been taken from the handbook.

Two of the additional band units allow monitoring or transmitting on secondary frequencies within each of the two main bands and could benefit from a little more explanation.





## Specifications

The measured values are enclosed in brackets.

### General

**Frequency Range** 144.000MHz to 146.000MHz in 5, 10, 12.5, 20 or 25kHz steps; 430.000MHz to 440.000MHz in 5, 10, 12.5, 20 or 25kHz steps

**Mode of operation** f.m. on both bands with standard IC-901E (s.s.b. and c.w. on v.h.f. available as optional extras)

**Power requirements** 13.8V +/- 15% at up to 13A (see below)

**Usable temperature range** -10°C to +60°C

**Overall dimension** when front panel fitted to rig 150 (wide) x 50 (high) x 191mm (deep) projections not included

**Weight** 1.6kg

### Receiver

**Max audio outputs** 1.4A(1.3A)

**Squelched outputs** 850mA

The receiver uses a double conversion technique VHF - 17.2MHz + 455kHz; UHF - 30.875MHz + 455kHz

**Sensitivity** less than 0.18µV for 12dB SINAD (0.17µV) on both bands. The test rig was fully quieted with 1.2µV.

With a deviation of more than 7.8kHz the audio became rather rough in tone. I assume this rig would easily deal with 12.5kHz channel spacing. One anomaly of this independent receiving capability was found in testing. When the u.h.f. received frequency is exactly 3 times the v.h.f. transmission, then a fully quieted but rough-toned signal is heard on u.h.f. causing howlround. It was measured at an input of 1.2mV of v.h.f. energy into the u.h.f. input. Retuning the v.h.f. transmission 15kHz or more caused this problem to disappear. Retuning the u.h.f. frequency 50kHz had the same effect. No noticeable effect of u.h.f. energy on the v.h.f. reception was measurable.

**IF rejection** >70dB on a fully quieted signal

**Audio output power** 2.4W at 10% into 8Ω, (maximum 3.5W into 8Ω)

### Transmitter

**Maximum deviation of frequency** 5kHz (4.7kHz)

**RF output and current requirements of the rig**

BAND	HIGH	LOW
144-146MHz	50W/13A (10A)	5W/5A (3.5A)
430-440MHz	35W/1A (7A)	5W/5A (3A)

**Spurious emissions** Less than 60dB on maximum r.f. output

**Number of memory channels** 12 channels plus one calling frequency per band.

	MW Band	VHF Band				UHF Band	
Frequency Coverage	520-1630kHz	76-108MHz	108-137MHz	137-200MHz	200-236MHz	300-500MHz	800-950MHz
Mode	a.m.	f.m.	a.m.	f.m.	f.m.	f.m.	f.m.
Tuning step (TS-A)	10kHz	100kHz	25kHz	25kHz	25kHz	25kHz	12.5kHz
Tuning step (TS-B)	1kHz	10kHz	12.5kHz	12.5kHz	12.5kHz	12.5kHz	25kHz

**Table 1**

**UX-R91E** - this receiver unit has all the functions of a normal car radio and more, as it covers medium wave from 520kHz to 1630kHz with selectable step rates of either 10 or 1kHz. The v.h.f. broadcast band of 76-108MHz is also fully covered in 10/1kHz steps. This covers the frequencies used by some East European countries as well as our own domestic coverage of both national and local stations. The frequency of reception and also the stereo balance may be set from the IC-901E. Scanning rate in this band is 100kHz or 10kHz. From 108 to 137MHz, the air band is also covered using the a.m. mode of reception. From here the reception mode changes back to f.m. and continues up to 236MHz which encloses both the amateur and v.h.f. marine frequencies, not to mention the various small bands set aside for such things as radio microphones. The rest of the official v.h.f. band is missed out and reception, using f.m., begins again at 300MHz and ranges up to 950MHz with a gap between 500 and 800MHz. This unit has the coverage of a scanner and could possibly replace one, especially as the frequency and mode are, controlled from the front panel of the IC-901E.

**UX-S92A/E** is an s.s.b. or c.w. unit which extends the v.h.f. band allowing multi-mode working on 144MHz and f.m. on u.h.f. The v.h.f. antenna is coupled through this unit and then to the antenna proper. A connection is available for the Morse key on the back panel of this unit. Two further interfaces are available to enable the main body of the IC-901 to be mounted remotely in the boot of the car, leaving only the control unit, microphone and front panel in the passenger area of the vehicle. When this method of mounting is employed, the supplied interconnecting cable is no longer used, but is replaced with a fibre-optic link. This would give an excellent immunity to

extraneous signals that could impinge upon a normal multi-way cable over this length. The booklet gives several suggestions for positioning the control unit remotely within this area of the car, including on the vanity mirror.

Also mentioned in the booklet are several other options, such as tone squelch for use in a selcall facility, which has an answer-back detect feature. This gives an indication that the other station is both operational and has received the call. As a further addition a d.m.t.f. (dual tone multi frequency) unit allows the use of the code squelch and pager functions. This paging function is not the same as the national system of paging, but is a beep tone to alert you to a call which has the sub-audio tone present. This may be turned off by the user. By using this facility one person may call either a group or a single person on a common channel, without others being aware of the traffic going on at the time.

**PW**

## Summary

I found the IC-901 an unusual and excellent little transceiver, ideal for cross-band and duplex working. The rig is full of potential for the caravanning, camping, boating or motorcycling radio amateur. It really is versatile and I think the term 'mobile' does not do it justice.

The IC-901E is available from **Icom (UK) Ltd., Sea Street, Herne Bay, Kent CT6 8LD. Tel: (0227) 363859.** The basic transceiver costs £799.00, the UX-R91E costs £TBA and the UX-S92E costs £379.00. We would like to thank Icom for the loan of the review model.

REVIEW

# WITH THE GRAND OPENING OF OUR NEW AMATEUR SHOP RAYCOM ANNOUNCES NEW DIRECT PHONE NUMBERS

SALES HOTLINE 021 552 0073 and HELP LINE 021 552 0051 (73's and 51's)

## JUPITER II



Save money when you buy this top-of-the-range scanner. 100 memories, coverage from 25-550/800-1300 MHz, priority channel monitor, channel lock-out delay and auto AM/FM switching go to make a great package and we add further value still.

Choose either a **free** broadband mag-mount or a **free** mast-mount SkyScan scanner antenna worth £14.95 and a **free** cigar adapter kit when you order your Jupiter II (and £20 off RRP!)

**£299.00 .. save £39.90**

## SPECIAL OFFERS

With every scanner or HF receiver purchase made mentioning this advert we will give you a copy of HIGH IN THE SKY, a new listeners guide to the Aircraft Bands.

Please ask for details of our extensive Second Hand Equipment List, there are many bargains to be found, and all the equipment has been tested by our workshop and carries a 3 month warranty.

### STOP PRESS

Jupiter MVT-6000 is now available, 25 to 550 Mhz and 800 to 1300 Mhz, in a mobile / base scanner for only £349.00 including a free accessory pack !!

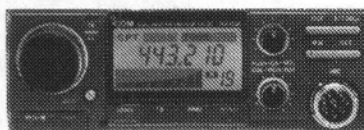
## ICOM IC-R7000



An unbeatable offer from Raycom - £30 off the retail price and a **free** Bearcat handy scanner covering 29-512MHz (with some gaps) worth £99.95 - a total saving of an incredible £129.95! Can't believe it? Send SAE for an information leaflet and offer details. Raycom Credit Card is available - just £96 deposit and £36 per month!

**£959.00 .. save £130.00**

## ICOM IC-3210



ICOM's popular dual bander, 25 watts on both bands, great looking and readable display, full duplex capability, 40 memories and input monitor for instant repeater check. All you need add is an antenna and we have taken care of that.

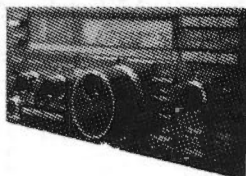
Regular retail prices:

IC-3210 .....	£499.00
Broadband mag-mount antenna .....	£14.95
<b>Total regular price .....</b>	<b>£513.95</b>
<b>Raycom package price .....</b>	<b>£479.00</b>

### SAVE £35!

Raycom Credit Card is available on this pack, just £48 deposit and monthly payments of just £18! Why wait, send for written details now!

## ICOM IC-725



ICOM's latest addition to the family, the 725 gives a full 100 watts of multi-mode power and is the second rig to use the DDS (Direct Digital Synthesizer) system. 10 Hz steps for smooth tuning, all mode squelch, 26 memories, and many other features make the 725 the starter rig for those who want more than a starter rig - it's unbeatable value - just look!

Regular retail prices:

IC-725 .....	£759.00
FM TX/RX (AM RX) board .....	£40.00
20 Amp PSU .....	£129.99
G5RV 1/2-sized antenna .....	£14.95
Fist mic .....	£21.00
<b>Total regular price .....</b>	<b>£964.94</b>
<b>Raycom package price .....</b>	<b>£849.00</b>

### SAVE £116!

Raycom Credit Card is available on this pack, just £85 deposit and monthly payments of just £32! Why wait, send for written details now!

## YAESU FT-747GX



HF all mode 100W transceiver, 0.1-30MHz, with the exclusive **Raycom** mod improving receiver dynamic range by 15-20 dB. Turns a good receiver into a **great** receiver. Ideal as a base and particularly suited for mobile/marine use with its light weight and click-stop dial. Save money with the **RAYCOM STARTER PACK** - it's unbeatable value - just look!

Regular retail prices:

FT-747GX .....	£659.00
Raycom RX mod .....	£59.00
20 Amp PSU .....	£129.99
G5RV 1/2-sized antenna .....	£14.95
Fist mic .....	£21.00
<b>Total regular price .....</b>	<b>£883.94</b>
<b>Raycom package price .....</b>	<b>£749.00</b>

### SAVE £135!

Raycom Credit Card is available on this pack, just £77 deposit and monthly payments of just £28! Why wait, send for written details now!

## YAESU FT-470



Yaesu's new dual bander is ex-stock at last and packed with features - dual display, dual band monitor, 4 VFO's and 42 memories, power saver, auto power off, CTCSS, DTMF autodial and a wide range of options - SAE for information sheet.

Regular retail prices:

FT-470 .....	£389.00
FNB-10 nicad 7.2v, 600mAh .....	£34.50
Wall charger .....	£17.71
Soft carry case .....	£10.58
Broadband mag-mount antenna .....	£14.95
<b>Total regular price .....</b>	<b>£466.74</b>
<b>Raycom package price .....</b>	<b>£425.00</b>

### SAVE £42!

Raycom Credit Card is available on this pack, just £45 deposit and monthly payments of just £16! Why wait, send for written details now!

RAYCOM COMMUNICATIONS SYSTEMS LIMITED, INTERNATIONAL HOUSE, 963 WOLVERHAMPTON RD, OLDBURY, WEST MIDLANDS B69 4RJ. TEL 021-544-6767, Fax 021-544-7124, Telex 336483 IDENTI G.

# RAYCOM

COMMUNICATIONS SYSTEMS LIMITED



### RAYCOM gives you more BUYING POWER

ALL MAJOR CREDIT CARDS ACCEPTED. B.C. ACCESS, DINERS. INSTANT CREDIT UP TO £1000 (SUBJECT TO STATUS) WITH RAYCOM CREDIT CARD (APR 34.5%). FREE CREDIT ON CERTAIN ITEMS AT MRP. CALL NOW FOR MORE DETAILS.

### ORDERING INFORMATION

WE STOCK ICOM, YAESU, BEARCAT, MFJ, BUTTERNUT, CUSHCRAFT, AEA, TONNA, NAVICO, TEN-TEC AND WELZ AMONG MANY OTHERS. SEND SAE FOR FULL LIST.

TEL: 021-552-0073

PHONE BEFORE 4PM FOR NEXT DAY DELIVERY BY COURIER (£15.00) - OR 2PM FOR DELIVERY BY POST (£10.00 P&P). PLEASE ALLOW TIME FOR CHEQUES TO CLEAR. MANY OTHER ITEMS IN STOCK. PLEASE CALL FOR MORE INFO AND FOR EXTRA SPECIAL DEALS!

INFOLINE 0836-771500 5-9pm (weekdays)

OPENING HOURS 9-5.30 MON TO SAT, LATE NIGHT FRIDAY 'TIL 7 PM. 73 DE RAY G4KZH, AND JULIAN



# RAYCOM EXCLUSIVE ACCESSORIES AND UPGRADES

## THE WORLD FAMOUS RAYCOM FRG-9600 MARK II & MARK V

The Yaesu FRG-9600 has always been a desirable scanner since its' first introduction, offering the user continuous coverage between 60-905 MHz with all modes (SSB up to 460MHz) at a good price and with all the options you would expect to get with a well designed scanner (TV and computer interfaces, mobile bracket, etc.) Raycom offers exclusive upgrades to new or existing units.

### FRG-9600 MARK II

We extend the frequency coverage to at least 950 MHz (this depends on individual units) and fit a low loss 'N' connector. By modifications to the front-end RF switching we retain the single connector and improve the sensitivity throughout the range, typically by 3 to 4 'S' points! Beware of imitations - nobody does it as well as we do!

### FRG-9600 MARK V

Incorporating all of the Mark II mods above, the Mark V adds a short wave converter board to give continuous coverage from 150 KHz to 950 MHz, retaining all the modes of the standard unit. An elliptical filter in the input circuit, combined with a high dynamic range active mixer results in a unit which will copy Radio 4 or Stateside 10 metre SSB as easily as 900 MHz FM cellphones. Please send S.A.E for an information leaflet.



FRG-9600 standard 60-905MHz .....	£479.00
FRG-9600 Mark II 60-950MHz .....	£499.00
FRG-9600 Mark V 0.15-950MHz .....	£625.00
FRG-9600 Mark II pack .....	£545.00
FRG-9600 Mark V pack .....	£699.00
Standard to Mark II upgrade .....	£40.00
Standard to Mark V upgrade .....	£149.00
Raycom Mark II to Mark V upgrade .....	£129.00
All packs include a mains power unit and ROYAL 1300 discone (as below), worth £85! Great value!	

## Grand opening offer, to Celebrate the Launch of our new Showroom.

Yupiteru MVT- 6000  
25 to 550 Mhz and  
800 to 1300 Mhz,  
ONLY £349.00 inc  
accessory pack.



## RAYCOM EXCLUSIVE POWER UNITS

### R1320 - 13.8 VOLTS AT 20 AMPS 100 WATT TRANSCEIVER RATED

This sturdy unit is imported directly by ourselves and represents great value for money! Further modifications are made in the Raycom workshops to improve safety, add extra features and to give additional RF immunity. A hefty mains transformer drives up to 25 amps (surge) through no less than seven 2N3055 pass transistors driven themselves by a 2N3055.

- ◆ 13.8 volt fully regulated
- ◆ 20 AMP output (30 minutes)
- ◆ 25 AMP surge
- ◆ Over voltage protection
- ◆ High current connectors fitted
- ◆ Designed for RF service

Fitted in an attractive case with chrome grab handles, the R1320 makes a worthy addition to any shack!

**R1320 13.8 v 20 amp PSU £129.99 inc. VAT**

## RAYCOM EXCLUSIVE ANTENNAS

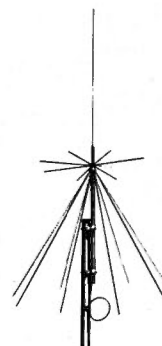
### ROYAL 1300 DISCONE

#### STAINLESS STEEL CONSTRUCTION

A quality unit manufactured in Britain, the Royal 1300 is ideal for wideband scanners & scanning receivers.

#### Specifications:

Receive 25-1300 MHz  
Transmit 50, 144,  
430, 900, 1200 MHz  
Power 200 watts  
Connector type 'N'  
Cable supplied  
RA519  
Type Discone 8+8  
Length 1.7 metres  
Weight 1 Kg



HR1300 discone ..... £59.50

## BB-145S BROADBAND MAGMOUNT

Another exclusive Raycom import, the BB-145S is a broadband 1/4 wave mag mount antenna for mobile scanners and 2 metre transceivers. Supplied complete with 4 metres of quality co-ax and PL259 plug, this easily installed antenna is compact in size due to the integral loading coil and is specified for 138-172MHz, but often loads at 70 cms!

BB-145S magmount ..... £14.95

**ARE**  
COMMUNICATIONS  
THE SHOP WITH THE SMILE

# MORE BARGAINS AT PICKETTS LOCK

## THE LONDON AMATEUR RADIO SHOW

WE HAVE BEEN FORTUNATE IN PURCHASING A LARGE QUANTITY OF  
YAESU FT 747 TRANSCEIVERS DIRECT FROM OUR AGENT IN JAPAN  
AND WE ARE PLEASED TO BE ABLE TO OFFER THESE AT THE  
AMAZING PRICE OF



AVAILABLE WITH NO DEPOSIT AND  
48 MONTHS TO PAY —£16.76 PER MONTH  
(SUBJECT TO STATUS) APR. 29%

# £499 INC VAT.

THE FT747 HF TRANSCEIVER SSB/CW/AM (AND  
OPTIONAL FM) 100 WATTS PEP OUTPUT ON ALL HF  
BANDS AND GENERAL COVERAGE ON RECEIVE.  
100kHz — 30MHz, DUAL VFO 20 MEMORIES.  
ALTOGETHER A SUPER ECONOMICAL HF  
TRANSCEIVER

Opening Hours Monday-Friday 9.30 to 5.30  
NOW OPEN SATURDAY MORNINGS 10.00-1pm

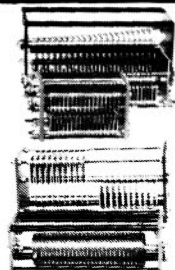
ARE Communications Limited, 6 Royal Parade,  
Hanger Lane, Ealing, London W5A 1ET, England  
Tel: 01-997 4476 Fax: 01-991 2565



BUY THE BEST — BUY



SOLID BRITISH ENGINEERING



### APCO CAPACITORS, ROLLER COASTERS AND BALUNS

BUILD YOUR OWN A.T.U. FOR £66.10

CAP-25S £17.90

CAP-25T £21.80

R/COAST £26.40 + £4.50 p&p

BUILD YOUR OWN LOOP WITH

OUR NEW CAPACITOR AND

MOTOR ASSEMBLY 80, 40, 30 £99.50

10, 12, 15, 17, 20 £55.15 + £3.00 p&p

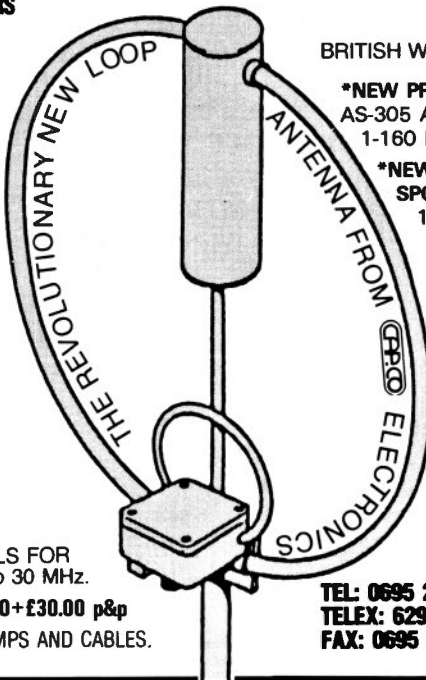
### FEATURES OF APCO LOOP ANTENNAS

- It has a very high Q
- A radiation resistance from 300 milliohms to never more than 0.8 of an ohm
- Has a bandwidth from 3kHz to 50kHz
- It has an SWR of 1.4 to 1 at the very least, 1.1 to 1 on most bands
- Will operate at virtually ground level
- The loop has a vertically polarised radiation pattern containing both very high and very low angle radiation (ideal as a DX antenna)
- Does not require an Antenna Tuning Unit
- Depending on the model used it only occupies from 80cm to 4m of space
- It is ultra compact, light and waterproof
- Planning permission is not necessary

YOU ONLY NEED TWO AERIALS FOR  
CONTINUOUS COVERAGE FROM 3.5 to 30 MHz.

COST OF THE TWO AERIALS—ONLY £665.50 + £30.00 p&p

THIS OFFER INCLUDES CONTROL BOX, CLAMPS AND CABLES.



SPC-300D



SPC-3000D



'STAY TUNED FOREVER'  
With a

APCO A.T.U.

BRITISH WORKMANSHIP AT ITS BEST

### \*NEW PRODUCT FROM APCO

AS-305 AERIAL SWITCHING UNIT

1-160 MHz, 3000 Watts PEP. £64.95 + £3.00

### \*NEW PRODUCT

SPC-100 A.T.U.

1-30 MHz, 300 Watts PEP. £79.50 + £5.00

See Press Reviews/Releases for  
further details

For more information on any of our  
products including high power  
A.T.U.'s, Loop Antennas for  
commercial use,  
send to:

### APCO ELECTRONICS LTD

UNIT 6  
PEEL ROAD INDUSTRIAL CENTRE  
PEEL ROAD  
WEST PIMBO  
SKELMERSDALE, LANCS.  
WN8 9PT

TEL: 0695 27948  
TELEX: 629575 CONGAS  
FAX: 0695 29125

COME  
AND SEE  
US ON OUR  
STAND AT THE  
FORTHCOMING.....

LONDON  
AMATEUR RADIO  
SHOW  
9TH/  
10TH MARCH



# The PW Badger Cub

Construction

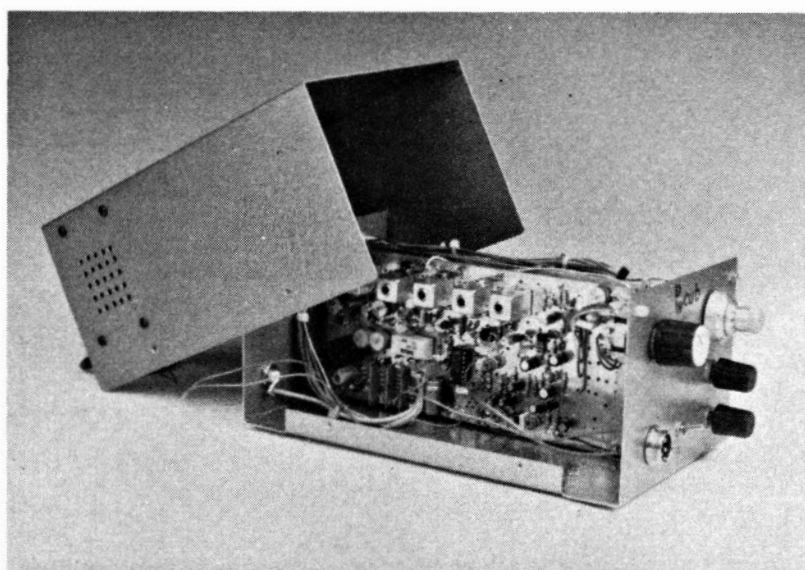
The PW Cub is a crystal controlled 144MHz f.m. transmitter which operates from a 12V supply and gives about 2W of r.f. output. It was originally designed to complement the PW Badger 144MHz receiver featured in the October 1988 PW. because of this, a 'netting' facility has been incorporated in the circuit of the Cub to enable easy tuning of the receiver. Also on the board is an antenna change over relay which can also be used to supply both power and antenna connections for the Badger.

## Block Diagram

Shown in Fig. 1.1 is the overall block diagram of the PW Cub. Use this in conjunction with the circuit diagram Fig. 1.2 and the following description. The crystal oscillator TR1 is a standard Colpitts oscillator running at just over 12MHz on standard fundamental frequencies. Trimming to exact frequency is achieved by adjustment of a series capacitor for each channel crystal. The output of this oscillator is phase modulated by the output of TR8, which follows a microphone amplifier and may also contain an audio tone burst for repeater access. The phase modulated signal is fed to a tuned buffer amplifier TR2, which is a BF244 f.e.t.

The following stages are frequency multipliers with TR3 being a tripler stage and TR4 and 5 are both doubler stages to the final frequency of 144MHz. The first two multiplier stages are f.e.t.s, to give less loading and so better *Q* of the tuned circuits. The second doubler, TR4 has a capacitive tap to reduce loading and to match the input impedance of the final bipolar doubler TR5. Capacitors C25 and 26 serve to both tune the doubler stage and match into the driver stage TR6, a BSX20 type transistor. This stage is fitted with a small heatsink as it dissipates some heat. Capacitors C28 and 29 tune this stage and match into the final p.a. transistor TR7, which is fitted with a substantial heatsink. This transistor is an r.f. power type MRF237 in a TO5 can.

The r.f. energy is tuned and filtered through a network comprising L7 through to C38 where it is applied to one set of contacts on relay RL1 and ultimately to the antenna. The other pair of contacts on RL1 are used to provide 12V power to either the Badger on receive, or the Cub on transmit. On receive, if the Net switch is pressed, then only the Cub's oscillator and multiplier stages are energised which the Badger may then be tuned into. As the microphone is not 'live' at the time of pressing the netting switch, no 'howl-round' shriek should occur



even if the audio is turned to a high setting.

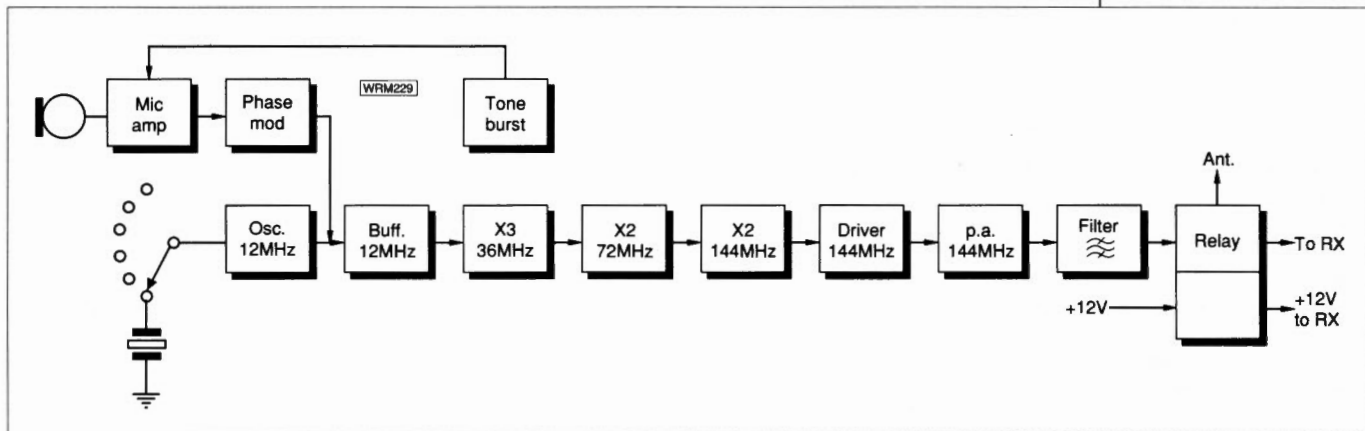
The audio stages are straight forward amplifiers with the microphone gain control (R17) feeding into TR10. Thus providing sufficient gain to give limiting action with diodes D2 and D3. Roll-off of the audio high frequencies is provided by C44 across the deviation control R23. Transistor TR9 provides post clipping gain to drive the phase modulator transistor and the network comprising of R28, 29. Capacitor C49 provides further low pass filtering. Overall maximum deviation is set by R23. In the prototype, over 5kHz of deviation was obtainable.

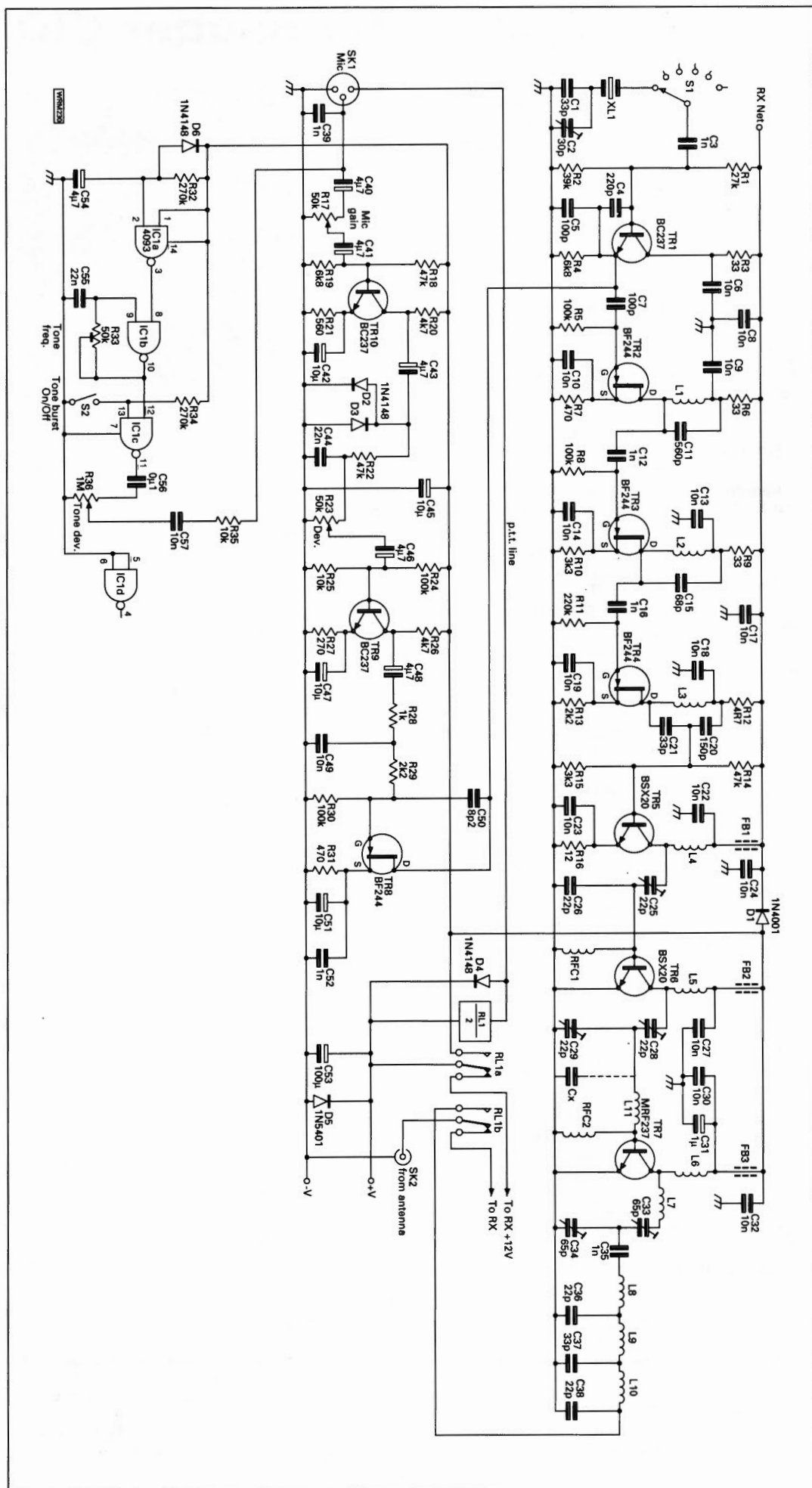
The tone burst amplifier uses a 4093 type c.m.o.s. NAND Schmitt trigger, with the first gate and associated components controlling the length of the toneburst. Refer now to the waveform and timing diagram, Fig. 1.3, along with the circuit.

On applying 12V to the circuitry, pin 2 of IC1a follows the charging curve of C54 via R32. At around half supply rail, the gate changes state and the output on pin 3 goes low once more. Gate IC1b has, during this period of a high level on pin 8, been oscillating with a frequency controlled by C55 and R33, and is set at 1750Hz later. These gated oscillations are allowed to reach R36 when the switch S2, connected to pin 13, is as shown. If Pin 13 is taken to the negative line, then this gate is inhibited and no tone oscillations are produced. Integrated circuit IC1d is, at present, not used and so both inputs are tied to negative.

*Starting in this issue Mike Rowe G8JVE describes this addition to the PW Badger, turning it into an ideal low-cost rig for 144MHz f.m.*

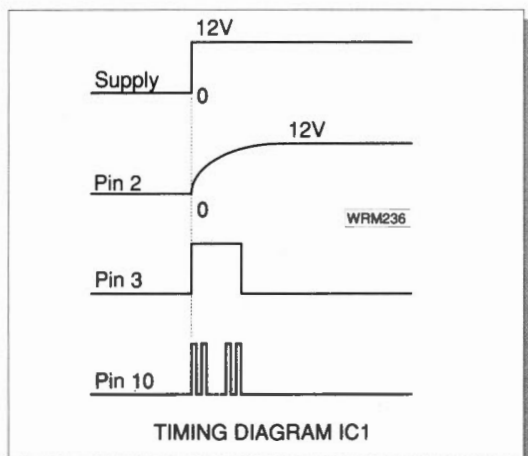
**Fig 1.1: The overall block diagram of the PW Badger Cub.**



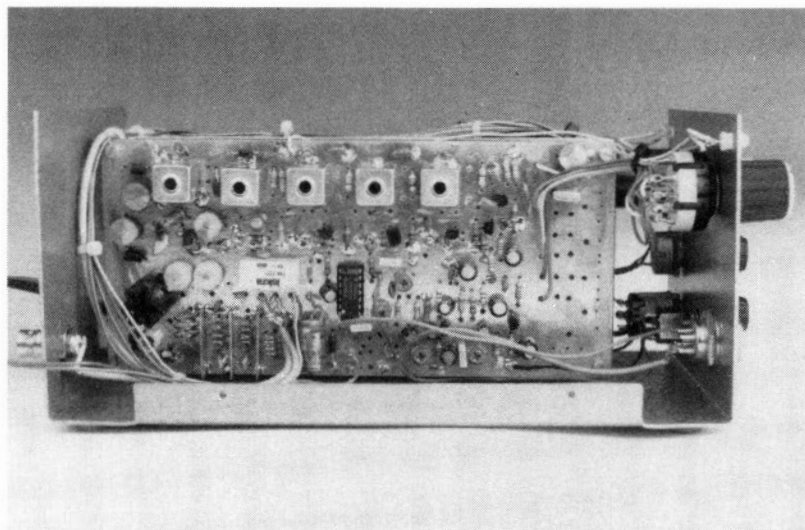


**Fig. 1.2: The full circuit diagram of the PW Cub. Showing the three separate areas of the design. The top portion is the r.f. strip above the modulator stage, with the tone burst circuit based on IC1 below**





**Fig. 1.3 . Waveforms to be found on some of the pins on IC1.**



The **PW Cub** shown mounted in the **Badger box**. It may be seen that only one crystal has been fitted, although there is space for six. The screens are visible low down towards the left hand side of the board, separating the r.f. coils.

## Shopping List

### Resistors

0.25W 5% Carbon film

4.7Ω	1	R12
12Ω	1	R16
33Ω	3	R3,6,9
270Ω	1	R27
470Ω	2	R7,31
560Ω	1	R21
1.0kΩ	1	R28
2.2kΩ	2	R13,29
3.3kΩ	2	R10,15
4.7kΩ	2	R20,26
6.8kΩ	2	R4,19
10kΩ	2	R25,35
27kΩ	1	R1
39kΩ	1	R2
47kΩ	3	R14,18,22
100kΩ	4	R5,8,24,30
220kΩ	1	R11
270kΩ	2	R32,34

Variable 5mm Cermet p.c.b. mounting

50kΩ	3	R17,23,33
1MΩ	1	R36

### Capacitors

Miniature Ceramic plate

8.2pF	1	C50
22pF	3	C26,36,38
33pF	3	C1,21,37
68pF	1	C15
100pF	2	C5,7
150pF	1	C20
220pF	1	C4
560pF	1	C11
1nF	6	C3,12,16,35,39,52
10nF	17	C6,8-10,13,14,17-19,22-24,27,30,32,49,57

Miniature Polyester

22nF	2	C44,55
0.1μF	1	C56

Min Electrolytic 16V radial leads

1μF	1	C31
4.7μF	6	C40,41,43,46,48,54
10μF	4	C42,45,47,51

Min Electrolytic 25V axial leads

100μF	1	C53
-------	---	-----

Trimmers film

2-22pF	3	C25,28,29
5-65pF	2	C33,34

Trimmer ceramic

5-30pF	1-6	C2 and similar for additional channels
--------	-----	--

### Coil data

Coil types are of the Toko S18 type available from Bonex

Coil	Core	Colour
L1	Ferrite	White
L2	Ferrite	Violet
L3	Ferrite	Yellow
L4	None	Orange
L5	None	Yellow
L6	None	Blue

Other coil details

L7	3turns 24s.w.g. 5mm i.d.
L8	4turns 24s.w.g. 3mm i.d.
L9	4turns 24s.w.g. 3mm i.d.
L10	4turns 24s.w.g. 3mm i.d.
L11	1turn 24s.w.g. 3mm i.d.
RFC1	22 turns 26s.w.g. on FX1115 ferrite bead
FB Thread	an FX1115 ferrite bead on a 22s.w.g. wire link

### Semiconductors

Transistors

BC237	3	Tr1,9,10
BF244	4	TR2-4,8
BSX20	2	TR5,6
MRF237	1	TR7

Integrated Circuits

4093	1	IC1
------	---	-----

Diodes

1N4001	1	D1
1N4148	4	D2-4,6
1N5401	1	D5

### Miscellaneous

Crystal 12MHz range, S18 single screening cans; Relay Bonex Part No. 610067; s.p.s.t. Min toggle switch; Push to make switch; Heatsink for TR7; Ferrite beads FX1115 5 off; Veropins; 1-pole 6-way rotary switch; Min coaxial cable; Multi strand hook-up wire; Mounting pillars; p.c.b.

All components for the prototype were obtained from either Bonex or Maplin with the exception of the crystals which are available from Gollidge Electronics at £5.50 per channel or £30 inclusive of VAT and P&P, for a set of 6 channels of your choice. Ask for the **PW Cub** crystals and the channels or frequencies required.

**HOW  
MUCH ?  
£ 65.00  
HOW  
DIFFICULT  
Advanced**

# Wanna Swap!

## Send your swaps to our editorial office in Poole, no traders...we do check.

Have a 10kg box full of new components, thousands of items all useful. Would exchange for valves of any description. Ken, Tel: Selly Oak 3688

Have Trio communication receiver 9R-59DE and operating manual, would exchange for photographic equipment. S Barnes Tel: Brookwood Surrey 3678

Have 2 weeks holiday for two in my home in Greece. Would exchange for commercial Marine distress/safety frequencies watch receiver h.f. or v.h.f. Write for details to: Kromidakis Mikali, Skines Kydonias, Xania Kriti, Greece.

Have Sharp MZ80K computer with Epson Mx80F/T printer plus much software. Would exchange for a Packet TNC or 144MHz f.m. transceiver. M. Costello 3 Northern Avenue, Henlow Beds, or Tel: 0462 815533

Have NAD Electrostatic headphones with separate power unit, plus Maxcom 4E legal f.m. CB. Would exchange for a realistic DX100 receiver. Tel: Cranwell 61130

Have R206 receiver and or cash adjustment. Would exchange for FRT-7700 a.t.u., FRV-7700 v.h.f. converter and matching speaker. Keith Heselton, 3 Upavon Court, Penhill, Swindon, Wilts SN25HD

Have many types of valves. Would exchange for complete copy of *Wireless World Radio Valve Data 7th edition*. Also looking for comprehensive CV to civilian valve conversion book. R. Southall. Tel: Lincoln 20520.

Have f1300 lap-top computer MOD200 3 x 24K RAM, DS3.5in disk drive, lots of programs and disks, DMP105 fast printer and six ribbons, eight manuals, newsletters, bar-code wand, RS232 tester. A total working system. Only six months old, all boxed as new. Would exchange for v.h.f./u.h.f. hand-held or very good 430MHz hand-held plus cash adjustment, or 430MHz mobile with power, no cash. Tel: (0473) 85203.

Have Philips 4307 7in reel-to-reel tape recorder or Eddystone 640RX. Would exchange for Eddystone EA12 or 888A amateur only receiver. R.E. Kay G3NSW, 7 Lea Drive, Blackley, Manchester M9 2AL. Tel: 061-759 7084.

Have FDK Multi-700AX 144MHz 25W transceiver in good working order. Would exchange for base type scanner. A. Hopkins, 104 Everill Gate Lane, Broomhill, Wombwell, Barnsley, South Yorkshire S73 0YJ.

Have a Handie v.h.f. 144MHz American model covering 140 to 170MHz, battery pack and speaker mic. Would exchange for a video camera. Paul Daly. Tel: 01-961 6627.

Have Trio 144MHz f.m. hand-held transceiver. Would exchange for Drake RV-7 remote v.f.o. for use with Drake TR7 transceiver. Also have KW E-ZEE match and KW SWR meter for consideration. Stan G3XON. Tel: Guildford 36953.

Have Trio h.f. transceiver. Would exchange for 144MHz multi-mode or dual band mobile, w.h.y? Dave. Leave a message on GB7AAA for G1BGF.

Have Collins R361, 432MHz receiver, BC1000 (WS31), Commodore Pet computer, components from post WWII era, including tens of valves, coils on ceramic formers, HF transformers. Would exchange for any of TX12, a.t.u. matching TX12, B47, R216, Pye Westminster. P. Werba G7FXO. Tel: (0929) 4235805 evenings.

Have Data General DG-1 portable personal computer with full size l.c.d. screen, two 720K disk drives, internal NiCad pack, mains p.s.u., NiCad charger and carrying case. Complete with MSDOS 3.21, IBM BASIC and various software. Would exchange for Yaesu FRG-9600 or similar v.h.f./u.h.f. receiver or a modern colour video camera/camcorder. Also have Genicom 3400 wide carriage line printer with serial interface and Digisolve CC2123 V21/23 Hayes-compatible Modem. Would exchange for FRG-7 or similar general coverage h.f. receiver. Mike Gathergood G4KFK, 24 New Road, Datchet, Slough, Berks SL3 9JB. Tel: (0753) 40520.

# Services

## Queries

We will always try to help readers having difficulties with a Practical Wireless project, but please note the following simple rules:

- 1: We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
- 2: We cannot deal with technical queries over the telephone.
- 3: All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
- 4: Make sure you describe the query adequately.
- 5: Only one query per letter please.

## Back Numbers & Binders

Limited stocks of many issues of PW for the past years are available at £1.80 each including post and packing.

Binders, each taking one volume of PW, are available price £3.50 each (£1 P&P for one, £2 for two or more).

Send all orders to the Post Sales Department.

## Subscriptions

Subscriptions are available both in the UK and overseas. Please see the advertisement on page 19 for the latest prices.

## Constructional Projects

Each constructional project is given a rating to guide readers as to its complexity.

**Beginner:** A project that can be tackled by a beginner who is able to

identify components and handle a soldering iron fairly competently.

**Intermediate:** A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

**Advanced:** A project likely to appeal to an experienced constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP kits, both of whom advertise in the magazine.

The printed circuit boards are available, mail order, from the Post Sales Department - see page 72 for the latest prices.

## Mail Order

All PW services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank), Access, Mastercard or Visa please.

## Wireless Line

This is an information service for the radio enthusiast, updated each Friday. Calls cost 38p per minute peak time and 25p per minute off-peak. The number to ring is: (0898) 654632.



# TESTING! TESTING! TESTING!

**PROFESSIONAL EQUIPMENT  
AT AMATEUR PRICES**



**INCREDIBLE  
VALUE AT JUST  
£174<sup>95</sup>  
UCT50**

## 1 GHz Universal Counter Timer

This high quality, 10Hz to 1GHz multiple function counter has an 8-digit, high brightness, 7-segment LED display and a high stability crystal oscillator for maximum accuracy. The meter has six function switches – 3 Frequency Modes, Period, Totalise and Check Modes. A HOLD switch allows you to halt the display whilst the count continues. The unit has heavy-duty rubber feet and a fold-away tilt stand. Supplied with a 2m mains lead, a 1m lead with a BNC plug at one end and red and black crocodile clips at the other, plus a comprehensive operator's manual.

## 20MHz Triple-Trace Oscilloscope

A precision laboratory 3 channel – 3 trace oscilloscope packed with features you'd expect to pay TWICE the price for:

- ★ Sensitive vertical amplifier 1mV/div allows very low level signals to be easily observed
- ★ 150mm rectangular CRT has internal graticule to eliminate parallax error
- ★ X-Y mode allows Lissajous patterns to be produced and phase shift measured
- ★ TV sync separator allows measurement of video signals
- ★ 20ns/div sweep rate makes fast signals observable
- ★ Algebraic operation allows sum or difference of Channel 1 and 2 to be displayed
- ★ Stable triggering of both channels even with different frequencies is easy to achieve
- ★ 50mV/div output from Ch 1 available to drive external instrument e.g. frequency counter
- ★ Hold-Off function permits triggering of complex signals and periodic pulse waveforms



**AN INCREDIBLE  
PRICE OF ONLY  
£349<sup>95</sup>  
TTO50**

## Multipurpose Dip Meter

A multipurpose transistor dip meter covering the range 1.5MHz to 250MHz in six overlapping ranges. This unit can be used as a dip meter or absorption wavemeter and an audio signal output is also provided for connection to a crystal earpiece. Battery check function. Supplied with a comprehensive operator's manual.



**ONLY  
£49<sup>95</sup>  
MDM50**

## Co-Axial Cable Stripper

This handy stripper tool will quickly become indispensable. Removes the inner and outer sheath of co-axial cables simultaneously and will accommodate cables from 4mm to 7mm diameter.



**ONLY  
£7<sup>95</sup>  
CCS50**

All items subject to availability

**Maplin ELECTRONICS**

**CREDIT CARD HOTLINE**



**0702 554161**

PHONE BEFORE 5PM FOR SAME DAY DESPATCH

**POP INTO A MAPLIN SHOP TODAY AND DISCOVER  
A UNIQUE SHOPPING EXPERIENCE**

All items will be on sale in our shops in Birmingham, Bristol, Leeds, Hammersmith, Edgware, Manchester, Nottingham, Southampton, Southend-on-Sea, Reading and Newcastle.

After 5pm you will be connected to our 24 hour answering service with which you can leave your order. Please have ready your Customer Number, reference numbers, and Credit Card details when you telephone.

Order Coupon		Send this coupon to P.O. Box 3, Rayleigh, Essex SS6 8LR	
Quantity	Description	Code	Price

Name	If order below £9.25 add 75p, if between £9.25 and £10 make up to £10		
Address	Add Carnage	75p	Total
Post Code			

I authorise you to debit my Credit Card account for the cost of goods despatched.

Credit Card No.

Access Amex Visa Delete as required.

If ordering by Credit Card please sign

Expiry date of Credit Card



# KENWOOD



Every once in a while, something comes along which marks a true turning point in amateur radio equipment. Such was the case when Trio-Kenwood introduced the TS-120 series; the first of the small solid state HF transceivers to appear.

Following the trends of the last few years towards more "sophisticated" equipment (really meaning more and more complicated), we have seen Kenwood engineering directed more towards better performance, particularly in HF transceivers; performance which has become a standard of excellence for others to try and match.

The culmination of Kenwood design thinking is a new transceiver which I think is another turning point in HF equipment. This is the TS-140S, and I can tell you that reading the enthusiastic comments coming from happy owners, I can confidently say that the TS-140S is the "HF transceiver of the year."

The TS-140S continues the successful "1" series, which began with the TS-120S, developed into the TS-130S and has now reached what I consider to be that new direction in amateur radio equipment. In the TS-140S, Kenwood designers have given the

user a receiver section with real performance which matches today's expectations, and remember that Kenwood have consistently set the standards for many years.

It is almost impossible for any manufacturer to give every potential customer everything that the customer wants, but there is little doubt that many people have been asking for "simplicity". However, it is also possible to carry the "simplicity" concept too far, resulting in a transceiver which is certainly low priced but lacks facilities which many users see as essential. I happen to believe that Kenwood have achieved the right balance in the TS-140S.

In my opinion, the TS-140S in combining performance with simplicity at an attractive cost is giving real satisfaction to the radio amateur who wants to enjoy his hobby of communicating, rather than counting the buttons on the front panel.

73.  
John Wilson  
G3PCY/5N2AAC

## LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE Telephone 0629 580800 (4 lines)

**Sole Appointed UK Distributor for KENWOOD Amateur Radio**



# KENWOOD



## **TS-790E – Just when you thought it was impossible**

Impossible to design and produce a multi band VHF/UHF transceiver which would render all others obsolete? But this is what Kenwood have done with the TS-790E, in the same way that the TS-940S set new standards which have not yet been beaten, or the TR-751E 2 metre multimode, which is still without any serious competition. Kenwood have the magic touch which gives the customer what the customer wants, in a package which is easy to use, performs like a dream, and is simply a delight to own.

The TS-790E gives you all-mode operation on 2 metres, 70 centimetres, and with an optional internally fitted section adds 23 centimetres as well. Power output is 45 watts on 2, 40 watts on 70, and 10 watts on 23; and there is little doubt that the receiver performance will better any previous transceiver.

It is fashionable in some quarters to sneer at the microprocessor, but Kenwood write the software in their processors with the aim of giving the user complete control over a wide range of facilities and not confusing the issue. In this respect, the TS-790E adds a new dimension to VHF operating, with its dual (triple) band monitoring, cross band operation, full duplex facilities, and a wide range of features to make life easy for the operator.

John Wilson  
G3PCY/5N2AAC

**TS-790E £1,495.00 inc VAT**

## **LOWE ELECTRONICS LTD.**

Chesterfield Road, Matlock, Derbyshire DE4 5LE

Telephone 0629 580800 (4 lines)

**Sole Appointed UK Distributor for KENWOOD Amateur Radio**



## STANDARD®

PLEASE REMEMBER, WE ARE THE SOLE AUTHORISED IMPORTER OF STANDARD EQUIPMENT IN THE UK  
AND WE ARE ABLE TO OFFER A FULL BACKUP SERVICE AND SPARES FROM STOCK



### C150

The Standard C150 supercompact 2m transceiver having all the usual features that you would expect from a modern microprocessor controlled radio – plus several new ones.

- ★ Frequency range 144-146MHz (with extended Rx capability. ★ Up to 5W RF output (switchable HI-Mid-Low) ★ 20 memories (20 banks of 10). ★ Power requirements 5.5-16V dc. ★ Superb sensitivity – less than 0.1µV (120dB SINAD). ★ 6 different monitoring methods (dual Watch modes). ★ 14 different scanning modes! ★ Individual and group call paging functions available. ★ Semi-duplex operation with separate Tx and Rx frequencies. ★ Squelch Off button. ★ Battery Save and Automatic Power Off facilities. ★ Built-in S-meter. ★ Splash proof case. ★ Soft touch buttons & knobs. ★ Rotary knob or pushbutton frequency selection. ★ PTT and keyboard locks (rotary knob is left active). ★ Sockets for external microphone, speaker and power supply. ★ A comprehensive range of accessories is available, including DTMF and CTCSS. ★ Size 124mm H x 55mm W x 31mm D.

**£230.00**



### C500

- ★ Full Duplex. ★ Frequency coverage 144-146 & 430-440MHz (extended Rx capability 130-169.995 & 410-470MHz). ★ 2.5W output (depending on battery). ★ Hi/Lo switchable RF output. ★ User programmable step sizes (5/10/12.5/25/50kHz), repeater offset (0-39.9MHz) and CALL button (instant QSY to a favourite channel – either band). ★ Reverse repeater. ★ Priority Channels (both bands). ★ 10 memories per band (frequency & repeater offset). ★ Numerous scanning modes (Pause or Busy-memories-band etc.). ★ Auto Power Off with Alarm (4mA on standby). ★ Battery Save on Rx (9 user programmable Rx/Off ratios). ★ Keypad & PTT locks. ★ Squelch Off button. ★ Low Battery indicator. ★ Can be powered directly from a car's cigar lighter (5W output). ★ Rotary knob or Keypad frequency selection. ★ Dimensions 173mm H x 60mm W x 34mm D.

**£359.00**

### AX 700E

AT LAST – a scanner from Standard! For longer than I care to remember people have been asking why Standard do not make a scanner – well now they do. I now have English speaking leaflets available which an s.a.e. will bring you post haste. You can see from the photograph that the AX 700E has maintained Standard's reputation for innovation. The strange looking liquid crystal display not only shows the frequency, mode and so on, it is also a pandemonium for those of you who are new to scanning! I had better explain what that is. The vertical line on the left hand side of the display is the frequency at the centre of the line along the bottom is the frequency range. This range can be set to 100, 250 or 1000kHz. The frequency displayed at the top is the frequency at the centre of the line. In other words, if the displayed frequency is 145.50MHz and the width of the display is set to 1000kHz, then the left hand side would be 145.00MHz and the right hand side would be 146.00MHz. Now comes the magic. Every time a signal comes up within that frequency range (i.e. 145-146MHz), it will show up as a spike on the display. The height will show the signal strength and the position will indicate the frequency. By simply turning the tuning knob a cursor can be slid along to line up with the new signal and its exact frequency will be displayed at the top of the screen! To receive the new signal, just press a button and that signal becomes the one you are listening to. The signal is picked up in the middle of the screen. The width of the spikes is governed by the setting of the step size (10, 12.5, 20 or 25kHz) so you can see that it is possible to monitor the activity on up to 100 channels simultaneously. If, for instance, you are looking for a specific signal but you only know the band that it is in and not the spot frequency, just set up the appropriate band edges and then sit back and watch the display. Any signals that then appear can be instantly spotted and tuned to in seconds. That's what a pandemonium can do for you. The rest of the scanner, it covers 50 to 160MHz with AM and FM (wide & narrow), it is powered by 13.8V dc and it measures just 180mm W x 180mm D x 75mm H. There is a lot more to it but I can't decipher Japanese, but we should have some English leaflets by the time that you read this ad, and maybe even some radios, so come into the shop and see for yourself. You can even play with our new active antenna which should be ideal for use with this set.

**£575.00 (PSU EXTRA)**

Norman G4THJ



TRADE ENQUIRIES WELCOMED  
PLEASE 'PHONE 01-450 9755  
★ STRICTLY TRADE PLEASE ★

### C5200

This new generation dual band mobile transceiver is virtually two radios in one box. 700ms and 2m each have their own displays showing frequency, S-meter and so on.

Both bands can be heard simultaneously through the built-in speaker or through one of two external speakers. Each band has its own Volume and Squelch controls and there is also an Automatic Mute control that can mute the audio from one band while the other is being received.

Full duplex is available (Tx/Rx either frequency) and the Rx frequency can be tuned while transmitting (45 Watts available on each band).

Each band has 4 different scan modes and 10 memories. Five step sizes are available and different ones can be set for each band, for instance 12.5kHz for 2m and 25kHz for 700ms.

The supplied microphone gives remote control of some of these functions and Tone Squelch and AQS units are available as optional extras.

This radio really is different – come into the shop and try it for yourself.

**£599.00**



400 EDGWARE ROAD, LONDON W2  
01-723 5521 Tx 298765

OPENING TIMES: 9.30am-5.30pm Mon-Fri. 10am-4.30pm Sat.



Normally 24hr despatch  
but please allow 7 days  
for delivery.



# A Collinear for 144MHz

Construction

Collinear antennas offer advantages over the normal quarter or half wave antenna, but good all round coverage and increased gain over the smaller antennas are tempered by an increase in cost. With this in mind, I decided to develop a simple collinear that was also cheap to construct.

Loading coils and ground planes always seem to cause problems for the home constructor. To minimise these problems this antenna is based on the 'J pole' which requires only one loading coil and no earth plane. The overall construction is shown in Fig. 1. The antenna is made up of three main parts, each of which is made from aluminium tubing. The lower and upper pieces are a sliding fit into the main stem tube. These pieces are constructed from 1/4in tube with a sidewall thickness of 20s.w.g., whilst the main stem is made from 3/8in tube also with a sidewall thickness of 20s.w.g. These are obtainable in 4m lengths from aluminium suppliers.

## Construction

Starting with the loading coil, the assembly is constructed on a 75mm long piece of Type 66 nylon rod with a diameter of 16mm (Fig. 1 shows the cutting and drilling dimensions). If making your own pieces, then a 7mm drill normally gives a clearance hole suitable for the 1/4in required for the top section, and a 10mm drill should prove adequate for the other hole. The recommended self tapping screws will penetrate both walls of the tubing. Using a file, flatten an area which will give better clamping to the coil when the time comes to make connections.

The coil itself is formed by winding 6 close spaced turns of 1mm enamel covered copper wire on the rod, leaving sufficiently long tails to make the connections later on. When completed the wire 'tails' should be pushed through the 1.2mm cross holes. Then, scrape off the enamelling where the connections are to be made.

Cut the top element to the correct length as this requires no other work, but the main stem should be cut some 16-20mm longer as shown in the enlarged view diagram. A 1.7m length piece of the 1/4in tube is used to form the feed section of the antenna. If available, a hard former of 45mm diameter will allow the bend to be made with more accuracy and ease. A point 780mm from one end of this piece, is to the correct leg of the curve. Finally cut the short leg to the correct length of 737mm as shown in Fig. 1. This gives two legs of uneven length, the longer one will be inside the main stem giving more strength at the spacing bar support point. The shape is correct when this piece lays flat afterwards. Assemble the three pieces together using Fig. 1 as a guide, and check the continuity between the feed point and the top section of the antenna. Any reading greater than about  $0.1\Omega$  should be corrected. The loading coil must now be made weather-proof by several coats of a good marine polyurethane varnish.

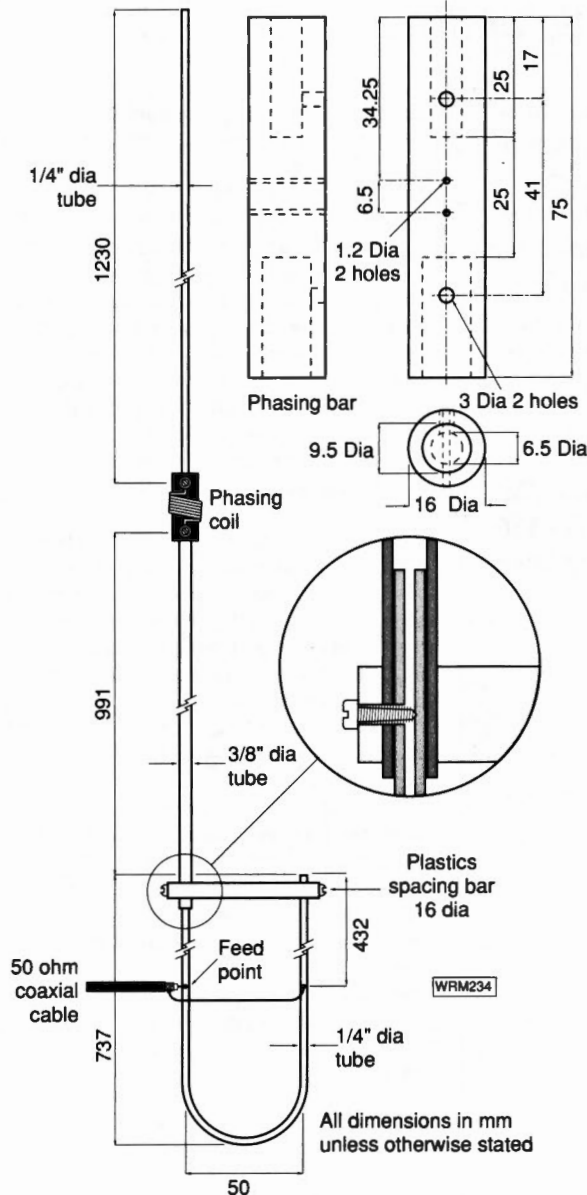
## Setting-up

Support the antenna as high up as possible and in the open, make temporary connections of the coaxial cable with crocodile clips and check the v.s.w.r. using a frequency of 145.300MHz. It should be possible to achieve a v.s.w.r. reading of 1.1:1 or lower at this frequency.

PW

*Build your own Collinear Antenna for 144MHz. G4WUP shows you how in this short article*

Fig. 1.



The nylon parts shown in the diagram will be made available from PW at a cost of £10.95 inclusive of VAT, post and packing. Ask for the PW March '90 Collinear Spacers. Please allow 28 days for delivery.

## Shopping List

1m 3/8in (with 20s.w.g. sidewall) tubing  
1.23m 1/4in (with 20s.w.g. sidewall) tubing  
1.7m 1/4in (with 20s.w.g. sidewall) tubing  
160mm of 15mm diameter Type 66 Nylon rod  
750mm of 1mm (20s.w.g.) enamelled copper wire  
2 off No. 4 by 12mm panhead self tapping screws  
2 off No. 6 by 12mm panhead self tapping screws  
Polyurethane varnish

**HOW MUCH ?**  
**£ 18.00**  
**HOW DIFFICULT**  
**Intermediate**

## Theory

# Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

*How do we know when the antenna and network are resonant and presenting the correct value of resistance to the transmitter? Directional wattmeters or reflectometers are an answer, Ray Fautley G3ASG explains.*

Let's start with a couple of questions.

- (i) Why are directional wattmeters so-called?
- (ii) What are they used for?

Directional wattmeters are so-called because, when connected between a source of power and a load, they are able to differentiate between power flowing in one direction - from source to load - which is the direction it is supposed to go; and power flowing in the opposite direction - reflected from load to source - which is the direction it is not supposed to go. In other words, directional wattmeters can indicate power flowing in different directions. They are also called 'reflectometers' as they are able to indicate reflected power, another term for the power flowing the 'wrong way' from load to source. They can be used:

(i) To measure power into a resistive load (in watts) (ii) To measure standing wave ratio (s.w.r.) existing on an antenna feeder (iii) To indicate when the power reflected back to a source (such as a transmitter) has been reduced to a minimum. If they can be used to measure power into a resistive load, then they can also be used to measure power into an antenna, provided that the antenna and feeder together may be represented by a particular value of pure resistance.

To illustrate this, look at Fig. 23.1. Assume that the transmitter requires a load of 50Ω and that the directional wattmeter has been calibrated to measure power correctly when connected to a resistive load of 50Ω. If these assumptions are correct, the only measurement we need to make is that of the voltage appearing across the 50Ω resistor (after the transmitter has been switched on!) to determine the power dissipated in the resistor. From  $P = E^2/R$

If the measured voltage across the resistor is, say 50V r.m.s., the power in the resistor will be:

$$P = \frac{50^2}{50} = \frac{50 \times 50}{50} = 50W$$

So, all we really need is an r.f. voltmeter! Well, that's all right as long as the load is a pure resistance of 50Ω. What happens if it isn't? Well, the wattmeter will still only read the voltage across the load and if the load is complex with a reactive component, the reading on the wattmeter scale will

be very far from indicating the true power in the resistive part.

Remember only resistance dissipates power and the voltage measured by the meter would be that appearing across the whole complex load, not just the voltage appearing across the resistive part. So, what's inside one of these reflectometers? The main components are shown in Fig. 23.1. A brief description of operation in matched and un-matched conditions follows.

### Matched Condition

When the output terminals are connected across a pure resistance, say 50Ω: (i) The r.f. voltage across C2 will be in phase with the line voltage at point X (ii) The r.f. current through T1 primary will be in phase with the line voltage. (iii) The r.f. voltage developed across R1 will be in phase or exactly 180° out of phase with the r.f. voltage across C2, depending on which way round T1 secondary is wired.

It should be connected so that the R1 voltage is 180° out of phase with C2 voltage, thus is the two r.f. voltages are made to be equal, the resultant reading on the r.f. voltmeter will be zero. That is, no reflected power.

### Un-matched Condition

When the output terminals are connected to a complex impedance such as would appear if a random length of wire and an earth were to be connected to the output terminals. (i) The r.f. voltage across C2 would still be in phase with the line voltage at point X (ii) The r.f. current through T1 primary would not be in phase with the line voltage (iii) The r.f. voltage across R1 would change, both in phase and amplitude (iv) As the two voltages applied to the r.f. voltmeter, one from C2 and the other from R1, are neither exactly equal in amplitude nor exactly opposite in phase; the r.f. voltmeter will read, indicating a mis-match.

To enable the directional wattmeter to read forward power when connected to a pure 50Ω load, the connection to T1 secondary must be reversed by a switch, thus enabling the two voltages from C2

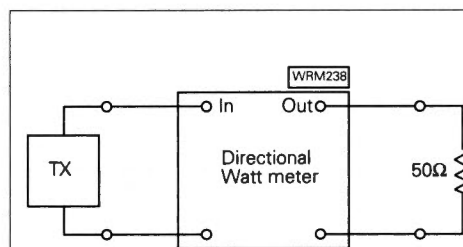


Fig. 23.1

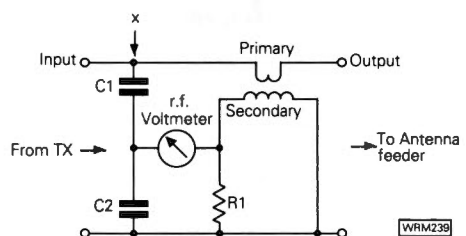


Fig. 23.2



and R1 to add together instead of subtracting. This forward reading on the meter can be calibrated in terms of power dissipated in  $50\Omega$ . So, what is the use of the directional wattmeter to the amateur trying to match his antenna to his transmitter? Since the meter is able to indicate reverse power, i.e. power reflected from the load back towards the transmitter; if there is any such reflected power one thing he does know is that he has not got a match! So given this as a starting point, where does he go from there? In fact, this is the most usual case, for unless the antenna itself has been designed and constructed to present an impedance which is purely resistive and equal numerically to the characteristic impedance of the feeder to which it's connected, (with the directional wattmeter also intended to be used at the same value of resistance) there will be some indication of the reflected power, that is a mis-match.

So, what can we do about this mis-match which will certainly appear as soon as we attempt to operate on a band for which the antenna was not designed? Let's assume that a simple random length wire is required to be used on as many h.f. amateur bands as possible. The only way to operate with the maximum efficiency possible over several bands is to ensure that at whatever the required frequency, the antenna presents a resistive  $50\Omega$  to the transmitter. This can be achieved, but not for nothing! The price is to use an antenna tuning unit (a.t.u.). This device is an impedance matching network covering the frequency range required, usually all h.f. bands except for 1.8MHz. Top band (1.8MHz or 160m) is often treated separately as it requires a very large inductor when matching a short length antenna. Another reason is that the low power level permitted on this band allows the use of smaller components with lower voltages and current ratings than are required for use on the other bands.

We dealt with impedance matching in Parts 20 to 22 of the series, so we have already got some clues for tackling the problem. In those articles, the way ahead could be ascertained if we knew what the actual impedance of the antenna was at the frequency we wanted to operate. Indeed, determining this antenna impedance either as a series or a parallel network is quite a difficult task, even if an impedance measuring bridge is available.

The average amateur is not likely to have access to such a bridge, so what can he do? The answer is to design an a.t.u. which is capable of operation over as wide a range of frequencies and impedances as possible. Where do we start? What do we define as:

- (i) a wide range of frequencies?
- (ii) a wide range of impedances?

The range of frequencies is determined by the amateur bands to be covered, say 3.5 to 29.7MHz (80 to 10m bands). The range of impedances to be covered is much more difficult to assess. A realistic approach is to use variable components which have low minimum reactances and high maximum reactances. This is to enable the reactive part of the antenna impedance to be tuned out, and as this reactance may be either inductive or capacitive, variable inductors and capacitors having low minimum values and high maximum values are necessary.

A further problem is that as the resistive component of the antenna impedance may be higher or lower than that required by the transmitter (which is commonly  $50\Omega$ ) and our a.t.u. must be capable of converting upwards or downwards. From the previous parts about impedance matching, it can be seen that the way the matching components are connected determines whether a step-up or step-down or resistance results. The theoretical problem of designing such an a.t.u. is very much greater than the practical problem of actually using it to resonate and match antenna systems to provide a  $50\Omega$  resistive load for the transmitter. It is the directional wattmeter which is the important piece of equipment, for all that is necessary is to vary the a.t.u. controls until the reflected power indicated is zero, whilst the forward power is maximum.

All the complicated impedance matching is then done for you without having to determine first the actual reactance and resistance of the antenna system for each different amateur band. To cover as many practical cases as possible, one of the requirements therefore is for the matching components to be connected in different ways to enable both upward and downward matching to be achieved. Possible ways of doing this will appear at some later date, as the design and operation of a.t.u.s is quite another story!

PW

*A directional watt-meter is an important piece of equipment in the shack. Most of the work is done for you while you watch the dial as you adjust the a.t.u. controls.*

# Radio Diary

**February 24:** The Rainham Radio Rally will be held in the Parkwood Community Centre, Deanwood Drive, Rainham, Gillingham, Kent. Doors are open from 10.15am to 4pm (10am for disabled visitors). The usual traders will be there along with a Bring & Buy stall and refreshments. Talk-in GB4RRR on S22 and SU22. **Bob GOLKE. Tel: (0634) 362154.**

**March 3:** The Tyneside Amateur Radio Society Rally will be held at the North-Eastern Exhibition Centre at Gosforth Park Race Course (1 mile North of Newcastle upon Tyne). The usual trade stands, Morse tests and Bring & Buy, refreshments will all be there. There's ample free parking. Talk-in on S22 and SU8. **Terry G6VEG. Tel: 091-264 8196.**

**\*March 9-10:** There will be an amateur radio show at Picketts Lock Centre, Picketts Lock Lane, Edmonton, London N9. Details from: **London Amateur Radio Show, 126 Mount Pleasant Lane, Brickett Wood, Herts AL2 3XD.**

**\*March 18:** The Norbreck Amateur Radio, Electronics and Computing Exhibition organised by the Northern Amateur Radio Societies Association (NARSA) at the Norbreck Castle Exhibition Centre, Blackpool. **Peter Denton G6CGF. Tel: 051-630 5790.**

**March 18:** The Wythall Radio Club will be holding their 5th annual radio rally at Wythall Park, Silver Street, Wythall, Worcestershire. That's on the A435 near junction 3 on the M42,

Continues over...

# Radio Diary

south-west of Birmingham. Rally opens at 11am. There will be three halls plus a marquee, the usual trade stands, flea market, a large Bring & Buy, bar and snacks with talk-in on S22. Admission 50p. **Chris Pettitt G0EYO. Tel: 021-430 7267.**

**March 18:** The Tiverton Radio Clubs Mid Devon Rally will be held at the Pannier Market, Tiverton. There's ample free parking, food and drink available, club-room open all day. Talk-in on S22 with doors opening at 10am. **G4TSW, Mid Devon Rally, PO Box 3, Tiverton, Devon EX16 6RS.**

**March 25:** Dover (YMCA) ARC are holding their QRP Convention and table fair at Dover YMCA ARC, Dover. Doors open from 10.30am to 4.30pm. **G0BPS. Tel: (0303) 276171.**

**March 25:** The Cunninghame & District Amateur Radio Club will be holding their rally at the Magnum Centre, Irvine.

**March 25:** The Pontefract & DARS 11th Components Fair will take place in the Carleton Community Centre, Pontefract from 11am to 4.30pm. There will be the usual stands, a bookstall, Bring & Buy and a licensed bar. Talk-in on S22. Admission free. **B. Atkinson. Tel: (0977) 704067.**

**April 8:** The 4th Launceston Radio Rally will be held in Launceston College. There will be the usual traders, Bring & Buy, hot snacks and a bar available. Doors open 10am with Talk-in on S22. **Maggie. Tel: (040921) 219.**

**April 8:** The Cambridgeshire Repeater Group Amateur Radio Rally will be held at the Philips Radio Communications - Catering Centre, St Andrews Road, Chesterton, Cambridge. Doors open 10.30am, auction items accepted from 9.30am. **G.M. Gardner G0HEM. Tel: (0799) 23689.**

**April 8:** The Swansea ARS are holding their 9th Amateur Radio Trade Rally in the Swansea Leisure Centre. This is situated on the A4067 Swansea-Mumbles coast road. There will be trade stands, catering facilities, a licensed bar, bookstand, Bring & Buy, etc. **Roger Williams GW4HSH. Tel: 0792 404422.**

**April 15:** The Centre of England Amateur Radio Rally will be held at the Motorcycle Museum, Bickenhill, near the NEC Birmingham. It's being held in three large exhibition halls and free ample parking. **Frank Martin G4UMF. Tel: (0952) 598173.**

**\*April 21-22:** The RSGB are holding their Convention and Exhibition at the NEC, Birmingham.

**April 22:** The Marske rally will be held in the Marske Leisure Centre, Marske by the sea. Doors open 10am. **Mr Phoenix G7CBR, 1 Conway Road, Redcar, Cleveland. Tel: (0642) 48005.**

**April 29:** The Bury Radio Society will be holding its annual Hamfeast at the Castle Leisure Centre, Bolton Street, Bury. Doors open at 11am (disabled at 10.30am). Talk-in on S22 and SU8. Catering facilities and a licensed bar are available as well as the giant Bring & Buy. **C. Marcroft G4JAG, Mosses Community Centre, Cecil Street, Bury.**

**\*May 13:** The VHF Convention will take place at Sandown Park Racecourse, Esher, Surrey.

**\*May 13:** The Yeovil Amateur Radio Club will be holding its 6th QRP Convention in the Preston Centre, Monks Dale, Yeovil. **D.J. Bailey G1MNM, 7 Thatcham Close, Yeovil, Somerset BA21 3BS.**

**\*May 20:** The 33rd Northern Mobile Rally will be held at the Great Yorkshire Show Ground, Harrogate. **Mike G0MKK. Tel: (0423) 564353/507653.**

**May 20:** The 7th National Amateur Radio Car Boot Sale will be held at the new venue of Stockwood Park, Luton. This is easier to get to (not far from junction 10 on the M1). Private sellers £7 in advance or £9 on the day, traders £20. **Clive G4ENB. Tel: Luton 27907.**

**May 20:** The Cambridge & District ARC are holding their 5th Annual Rally & Radio Car Boot Sale at Coleridge Community Centre, Radegund Road, Cambridge. Doors open at 10.30pm. **Brian G4TRO. Tel: (0223) 353664.**

**May 27:** The 14th Annual East Suffolk Wireless Revival will be held at the Civil Service Sportsground, Straight Road, Bucklesham, Ipswich. There will be a Bring & Buy, Car Boot Sale, a transceiver clinic, 50MHz demo station, all the usual traders and lots more including a children's play area. **Paul Whiting G4YQC. Tel: (0473) 642595.**

**May 28:** The 1990 Bircotes Radio Rally will be held near Bawtry, Doncaster. Doors open at 11am (10.30am for the disabled). Talk-in on S22. Details and or booking forms from: **Pat Smith, 23 Florence Avenue, Balby, Doncaster. Tel: (0302) 857526.**

**\*June 10:** The Royal Naval Amateur Radio Society Annual Mobile Rally will be held in the Sports Field, HMS Mercury, near Petersfield, Hants from 1000-1700.

**\*June 24:** The Annual Longleat Mobile Rally will be, as usual, held at Longleat near Warminster, Wilts. **Shaun O'Sullivan G8VPG. Tel: (0225) 873098.**

**July 1:** The York Radio Rally will be in the Tattersall Building, York Race Course, The Knavesmire, York. Doors open at 11am with an entrance fee of 50p (children admitted free). There is ample free parking. On show will be amateur radio, electronics and computing, arts and crafts, there's a grand Bring & Buy, Morse tests, lectures on various aspects of amateur radio, a raffle and talk-in on S22. A licensed bar and cafe will be available for refreshments. The Knavesmire is well signposted and there will be additional RAC signs round the main approaches to York. **Frank Webb G3ZKS. Tel: (0904) 625798.**

**July 1:** Newport ARS are holding their 3rd Grand Surplus Equipment and Junk Sale at the Brynglas Community Education Centre, Brynglas Road, Newport. The Sale is open from 10.30am to 4pm (10am for the disabled). **Kevin GW7BSC. Tel: (0633) 262488.**

Lancastrian Rally. PW and the organisers of this event offer sincere apologies for any inconvenience caused by the premature advertising of the rally, which is planned for January 1991.

**\* Practical Wireless & Short Wave Magazine in attendance.**

If you are organising a rally and would like it mentioned in *Practical Wireless*, then drop us a line, preferably as soon as you have fixed the date but no later than six weeks in advance (marking your envelope Rally Calendar) and we'll do the rest. Please make sure that you include all the essential details such as the venue, starting time, special features and a contact for further information.



# AMATEUR RADIO COMMUNICATIONS LTD.

**AUTHORISED ICOM, YAESU AND STANDARD DEALER**



## STANDARD

- \* Direct 13.8V in for 5 Watts out.
- \* VHF 2.5W, UHF 2W with CNB151 NiCad pack.
- \* Dual displays.
- \* Power save function.
- \* Multiple memories.
- \* Priority channel.
- \* Tone squelch (option).
- \* Programmable offsets.
- \* Coded paging function.
- \* Various scanning modes.
- \* Programmable step sizes.
- \* 144-146 VHF, 430-440 UHF, 800-975 Rx only.
- \* Separate Vol. & Squ. controls for each band.

**PRICE £379**

## POINTS TO CONSIDER WHEN CHOOSING THE EMPORIUM TO BUY YOUR NEW RIG FROM:

1. The largest selection of new and secondhand equipment in the North of England.
2. All demo transceivers are available for back to back tests enabling you to choose the make or model best suited to your requirements.
3. Adequate stocks of all equipment kept.
4. 98% of all servicing and guarantee work carried out in house — often while you wait, therefore eliminating the 2 or 3 weeks delay while your equipment is returned to the main importer.
5. A friendly and expert advice service both technical and practical.

**OUR AIM IS 100% SATISFACTION**



**IC-765 FREE SM6 £2249**

**25-500 and 850-1300**



**JUPITER BASE MVT6000 £379 incl. P.S.U.**

**JUPITER H/HELD MVT5000 £299**

- External: 12V DC
- Internal: 4 x HP7 batts
- Telescopic Whip
- BNC Socket



**IC-2SE**

**RX Coverage 80-180MHz £275**



**NOW IN STOCK**

**The Ultimate in Pocket Scanners NEW FAIRMATE HP-100**

- 25-550 830-1300MHz coverage
- 1000 channel memory
- 10 independent search bands
- Complete with nicads, 2 antennas, carrying case, etc.

**£299**

Phone for more details

**ALWAYS A GOOD SELECTION OF SECOND HAND AND COMMISSION SALES, PHONE FOR MORE INFORMATION.**

HF Log for the Amiga Computer Card Index/Contest log/dupe sheet. Will hold 4000 entries.

**£12 + £2 P&P**



**38 Bridge Street, Earlestown, Newton-le-Willows, Merseyside WA12 9BA. Only 1 mile from Junction 23 — M6**

**Telephone: N-le-W (09252) 29881**

**Fax No: 09252 29882**

**OPEN TUES-SAT 10 a.m. - 5 p.m.**



**INSTANT FINANCE AVAILABLE SUBJECT TO STATUS**

**Prices correct at time of going to Press.**

**E & EO.**

**MICROWAVE MODULES • TONNA • JAYBEAM • SANDPIPER • BNOS • AKO • CAPCO • REVEX • STANDARD**

## Quality

## MORSE KEY UNITS

The Kent hand key is used world wide by professional and amateur operators alike. The silver contacts are mounted in precision fine pitch threaded screws fitted with positive locking nuts which are instrument knurled for ease of precise adjustment. Our shielded ball race bearing pivots are renowned for their superiority over all keys using plain and bush type bearings. The key is available in kit form or ready assembled. The kit takes less than an hour to complete, resulting in a key of unrivalled professional standard.

**KEYS OF UNBEATABLE QUALITY AT UNBEATABLE PRICES!**

	Kit form	Assembled
Straight hand key	<b>33.50</b>	<b>41.00 + 3.00 p&amp;p</b>
Twin paddle key	<b>42.50</b>	<b>51.50 + 3.00 p&amp;p</b>
Single paddle key	<b>33.50</b>	<b>41.00 + 3.00 p&amp;p</b>

S.A.E. for details



**R. A. KENT (ENGINEERS)**

243 Carr Lane, Tarleton, Preslan, Lancs. PR4 6YB  
Tel: 0772 814998 Fax: 0772 815437

**G6XBH**

**GIRAS**

**G8UUS**

**Visit your Local Emporium**

Large selection of New/Used Equipment on Show

**AGENTS FOR:**

**YAESU • AZDEN • ICOM • NAVICO • ALINCO**

**ACCESSORIES:**

Welz Range, Microwave Modules, Adonis Mics, Mutek Pre-Amps, Barenco Mast Supports, DRAE Products, BNOS Linears & P.S.U.'s  
★ ERA Microreader & BPS4 Filter, SEM Products ★

**AERIALS, Tonna, New Diamond Range of Mobile Whips, Jaybeam**  
**BRING YOUR S/H EQUIPMENT IN FOR SALE**

**JUST GIVE US A RING**

## Radio Amateur Supplies

3 Farndon Green, Wollaton Park, Nottingham NG8 1DU  
Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)  
Monday: CLOSED Tuesday-Saturday: 10.00 a.m. to 5.00 p.m.

**Tel: 0602 280267**

R.A.S. (Nottingham)

R.A.S. (Nottingham)

## VALVES

\*High Quality  
\*\*Very High Quality

Prices correct as when going to press but may fluctuate. 15% VAT incl.

A1065	2.40	EF89	0.80	EY51	0.90	PL81	1.30	UCC85	0.70
A2293	7.00	EC52	0.65	EF86	1.45	PL82	0.70	UCH42	2.50
A2900	12.75	EC91	0.55	EF89	1.80	EY86/87	0.75	UCH81	0.75
AP8	1.40	EC92	1.70	EF91	1.80	EY88	0.65	UCL82	1.80
AP93	1.45	EC81	1.25	EF82	2.15	EZ80	0.80	UF41	1.85
AP35	1.46	EC82	0.95	EF85	1.40	EZ81	0.60	UF80	1.80
AT14	0.80	EC83	1.10	EF96	0.85	GM4	11.05	UF85	1.45
B124	6.90	EC84	0.65	EF83	0.75	GM4	8.30	UL84	1.50
CY31	2.40	EC85	0.75	EF184	0.75	GY501	1.50	UL80	1.80
DAF70	1.75	EC88	1.25	EF812	0.75	GZ32	2.80	UM80*	2.30
DAP96	1.35	EC1189	1.20	EF200	1.85	GZ33	4.20	UM84	1.30
DET22	32.90	EC804	0.65	EH90	0.85	GZ34	2.45	UY82	1.10
DF92	0.95	ECF80	1.25	EL32	0.85	GZ34*	6.00	UY85	0.85
DF96	1.15	ECF82	1.25	EL34	3.25	GZ37	3.95	VR105/30	2.75
DK78	1.15	ECF802	1.80	EL34*	9.50	KT77*	16.10	VR150/30	2.75
DL32	1.70	ECF82	1.65	EL82	0.70	ML4	3.20	VR150/30	2.75
DY86/87	0.65	EC81	1.25	EL84	1.35	ML6	3.20	VR150/30	2.75
DY802	0.70	EC84	0.90	EL86	1.45	MX120/1	29.50	Z759	19.90
E32C	1.95	EC180	0.75	EL90	1.75	N78	9.90	Z800U	3.45
E180CC	9.80	EC182	0.95	EL91	6.50	O82	1.70	Z801U	3.75
E1148	0.75	EC185	0.95	EL95	1.80	PCL82	0.95	Z803U	21.15
EA78	1.60	EC186	1.10	EL504	2.30	PCL84	0.85	Z900T	4.30
EB34	1.15	EF9	2.80	EL519	7.70	PCL86	0.80	1A3	1.80
EB91	0.60	EF22	3.90	EL822	7.50	PCL80S/85	0.95	1L4	0.95
EB33	2.20	EF37A	2.45	EL822	11.50	P8500/510	5.60	UAB80	0.75
EB30	1.20	EF39	1.40	ELL80SE	4.50	PL200	1.10	UBF80	0.95
EB31	1.15	EF80	0.65	EM80	1.50	PL200*	2.80	UBF89	0.95
EBF80	0.75	EF83	3.50	EM87	2.85	PL36	1.80	UC84	0.75

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc.

POSTAGE £1-£2 65p; £3-£5 85p; £5-£10 £1; £10-£15 £1.20; £15-£20 £1.75; Over £20 £2.30. Over 2kg at cost. Delivery by return.

**COLOMOR (ELECTRONICS) LTD 170 Goldhawk Rd, London W12 8JH**  
Tel: 01-743 0899 Fax 01-749 3934. Open Monday to Friday 9 a.m.-5.30 p.m.

## ANTENNAS TONNA (F9FT)

**THE VHF/UHF ANTENNA SPECIALIST**

50MHz	144/435MHz	POWER SPLITTERS
5 element.....£50.71(a)	9 & 19 element Oscar.....£81.67(a)	2 way 144MHz.....£48.36(b)
		4 way 144MHz.....£57.53(b)
		4 way 435MHz.....£45.89(c)
144MHz	1250MHz	4 way 435MHz.....£55.76(c)
4 element.....£29.39(a)	23 element.....£81.67(b)	2 way 1250MHz.....£38.35(c)
4 element crossed.....£37.26(a)	4 x 23ele - stacking frame - power splitter.....£175.00(a)	4 way 1250MHz.....£43.36(c)
9 element fixed.....£33.12(a)		2 way 1296MHz.....£38.35(c)
9 element portable.....£35.19(a)		4 way 1296MHz.....£43.36(c)
9 element crossed.....£32.10(a)	1296MHz	2 way 2300MHz.....£38.35(c)
13 element.....£49.06(a)	23 element.....£32.29(b)	4 way 2300MHz.....£43.36(c)
17 element.....£86.24(a)	4 x 23 ele - stacking frame - power splitter.....£175.00(a)	
435MHz	55 element.....£49.27(a)	<b>ANDREW HELIAK</b>
9 element.....£38.43(a)	4 x 55 ele - stacking frame - power splitter.....£250.00(a)	LD4-50A.....£4.70/m
19 element.....£36.64(a)		N Connectors.....£16.80(c)
19 element crossed.....£42.44(a)		
21 element 432MHz.....£47.61(a)	2300MHz	TELESCOPIC MASTS - STACKING FRAMES - COAXIAL CABLE - ROTATORS ETC.
21 element ATV.....£47.61(a)	25 element.....£43.47(b)	

All prices include VAT. Please add carriage (a) £5.00 (b) £2.20 (c) £1.20. U.K. MAINLAND ONLY. ACCESS or VISA cardholders telephone your order for immediate dispatch. Callers welcome, but by telephone appointment only, please. Send 50p for our catalogue which contains the full specifications.

**RANDOM ELECTRONICS (P)**  
SOLE U.K. DISTRIBUTOR  
FREEPOST, ABINDON, OXON, OX14 1BR.  
Tel: (0235) 23080 (24hrs)



## PHOTO ACOUSTICS LTD

58 High Street, Newport Pagnell, Bucks. MK16 8AQ. 0908 610625

Telephone

### Kenwood

		P&P
TS950SD	NEW Top of the range HF Transceiver complete with Digital Processing Unit, Auto ATU and filters.	3198.00
TS950S	NEW Top of the range HF Transceiver complete with Auto ATU but without other options.	2489.00
TS940S	HF Transceiver with general coverage receiver.	1995.00
AT940	Automatic ATU 180W-10M Ham bands. Fits inside TS940S	244.88 (5.00)
SP940	External speaker unit with switched filters.	87.56 (5.00)
TS440S	HF Band Transceiver with general coverage receiver	1138.81
AT440	Internal automatic ATU for TS440S 80-10M Ham bands	144.82 (4.00)
PS50	Heavy Duty PSU for TS440S	222.48 (12.00)
TS140S	HF Transceiver 160-10M Ham bands with general coverage receiver	862.00
TS680S	HF Transceiver 160-10M plus 6M Ham bands with general coverage receiver	985.00
PS430	Main PSU for TS140S or TS680S	173.78 (12.00)
SP430	Matching speaker for TS140S/680S	40.81 (5.00)
MB430	Mobile mounting bracket for TS140S/680S	15.80 (3.00)
AT230	All band ATU and power meter. General purpose ATU	208.87 (12.00)
TL922	160-10M 2KW HF linear. 3-500Z valves included	1495.00
LF30A	HF Low pass filter 1KW rating	32.26 (3.00)
YK80C	500 Hz CW filter for TS440S/TS530/TS830/R5000	48.08 (2.00)
YK80C	270Hz CW filter for TS440S/TS530/TS830/R5000	54.64 (2.00)
YK80S	2.4kHz SSB filter for TS440S	47.40 (2.00)
YK80SN	1.8kHz SSB filter for TS440S/TS530S/R5000	46.74 (2.00)
MC50	Deluxe Dual impedance Desk microphone. 4 pin plug	48.08 (4.00)
MC80A	Deluxe Desk microphone with built-in pre amp	88.22 (4.00)
MC43S	Up/Down hand microphone for 8 pin rigs	22.22 (2.00)
HSX2	Mobile microphone with control box	39.80 (4.00)
TS780E	NEW Dual Band all mode transceiver 2M/70cms with 1296MHz option	1495.00
TR751E	2M multimode mobile/fixd transceiver	599.00
TM231E	NEW Compact 2M mobile transceiver. 50/10/5W	269.00
TM431E	NEW Compact 70cm mobile transceiver. 35/10/5W	318.00
TM701E	NEW Compact 2M/70cm mobile transceiver. 25W	469.00
TH25E	2M FM compact handheld transceiver	238.00
TH45E	70cm FM compact handheld transceiver	269.00
TH75E	NEW 2M/70cm handheld transceiver with dual watch display	399.00
HMC2	Headset/mic with VOX/PTT	34.25 (3.00)
SMC31	External speaker microphone	28.79 (2.00)
SMC32	Miniature speaker microphone with earphone socket	23.95 (2.00)
TH205E	2M handheld transceiver with LCD display	199.00
TH215E	2M handheld transceiver with keypad entry	228.00
TH405E	70cm handheld transceiver with LCD display	245.00
TH415E	70cm handheld transceiver with keypad entry	268.00
HS5	Deluxe headphones for all KENWOOD equipment	37.54 (4.00)
HS6	Ultra light deluxe headphones	24.36 (3.00)

### Yaesu

		P&P
FT-1000	NEW Top of the range HF transceiver 160-10M Ham Bands with general coverage receiver. Modes CW, USB, LSB, AM, FM, RTTY and Packet. Fitted Auto ATU. 200W output	2995.00
FT-747GX	HF Transceiver 160-10M Ham bands with general coverage receiver. 100W	859.00
FP700	Power supply for FT747/FT757. 20 amp	219.00 (12.00)
FP757HD	Heavy Duty Power supply (100pc duty cycle)	258.75 (12.00)
FT767GX	HF Transceiver 160-10M Ham bands with general coverage receiver	1599.00
50/767	6M module for FT767	179.00 (5.00)
144/767	2M module for FT767	179.00 (5.00)
430/767	70cm module for FT767	225.00 (5.00)
	*****ONE ONLY LEFT FT767/6M module*****	
FT411	2M FM handheld transceiver. Keypad entry. (Radio only)	249.00
FT811	70cm FM handheld transceiver. Keypad entry. (Radio only)	225.00
FT470	2M/70cm FM handheld transceiver with Dual watch display. (Radio only)	389.00
FT250RMKII	2M Multimode transceiver, portable/mobile/fixd. 2.5W output	429.00 (12.00)
FT690RMKII	8M Multimode transceiver, portable/mobile/fixd. 2.5W output	429.00 (12.00)
FT736R	2M/70cm Multimode Base station	1359.00
FEX736/50	6M module for FT736R	238.00 (5.00)
FEX736/1.2	1.2GHz module for FT736R	425.00 (5.00)

### Standard

		P&P
C150	2M handheld transceiver. Keypad entry. Extendable frequency range on fix.	230.00 (5.00)
C500	2M/70cm handheld transceiver	359.00 (5.00)
C528	NEW 2M/70cm handheld transceiver with Dual Watch Display, up to 5W output, Tone squelch option.	378.00 (5.00)

### Receivers

		P&P
Low HF225	NEW 30kHz-30MHz. AM/SSB/CW General coverage receiver	396.00 (12.00)
D225	Narrow Band FM and Synchronous AM detector for HF225	38.55 (2.00)
K225	Genie Pad. Keypad for direct frequency entry on the HF225	39.50 (2.00)
NRD525	Top of the range General coverage receiver 0.09-34MHz	1095.00
CMK165	Optional VHF/UHF converter for NRD525. 34-80, 114-174, 423-456MHz	381.35 (5.00)
R5000	HF General coverage receiver	875.00
VC20	Optional VHF converter for R5000 108-174MHz	167.21 (5.00)
R2000	HF general coverage receiver	595.00
VC10	Optional VHF converter for R2000 118-174MHz	161.94 (5.00)
R21	Wide Band scanning receiver 500kHz-950kHz	465.00
AR2002	VHF/UHF scanning receiver 25-550MHz, 800-1300MHz	487.30
AR800E	VHF/UHF Handheld scanning receiver. 75-105, 118-174, 406-495, 830-950MHz. AM/FM selectable.	169.00
AR900UK	VHF/UHF Handheld scanning receiver. AM/FM selectable. 100 memories, 108-136, 137-174, 220-280, 300-380, 406-470, 830-950MHz	199.00
LC800	Leatherette Case for AR800	2.95 (0.75)
LC900	Leatherette Case for AR900	3.55 (0.75)
WIN108	VHF Airband receiver. 100-136MHz	175.00
R535	Airband receiver. Covers VHF and UHF airband	249.00
RS375	VHF Airband handheld receiver, tunable 118-136MHz	69.55
FRG8800	HF general coverage receiver 0.15-30MHz. All modes	648.00
FRG9800	VHF/UHF scanning receiver 60-950MHz. All modes	509.00
FRV8800	VHF converter for FRG8800 118-175MHz	100.00
AX700E	VHF/UHF scanner 52-804MHz with built in Panoramic display	575.00
Jupiter II	VHF/UHF handheld scanner 25-550 & 800-1300MHz	299.00
ICM-IC1	NEW All band handheld scanning receiver. 150kHz-1300MHz. 100 memories. AM/FM selectable	399.00
IC-R100	NEW All band receiver. 500kHz-1800MHz. 121 memory channels. AM/FM selectable	499.00
IC-R72	NEW HF general coverage receiver. 100kHz-30MHz. 99 memory channels	599.00
IC-R71E	HF General coverage receiver. 0.1-30MHz. All modes. (FM optional). 32 memories	855.00
IC-R9000	HF/VHF/UHF scanning receiver. 100kHz-2000MHz. Has built in Spectrum Scope and 1000 memories	3995.00
IC-R7000	VHF/UHF Scanning receiver. 25-1000MHz & 1025-2000MHz. 99 memories	889.00
PRO-2005	VHF/UHF Scanning receiver. 400 memories. 25-520 & 760-1300MHz. AM/FM selectable	338.95
PRO-2022	VHF/UHF Scanning receiver. 200 memories. 68-88, 108-136MHz, 136.005-174, 380-512 & 80-960MHz	239.95
PRO-2024	VHF/UHF Scanning receiver. 60 memories. 68-88, 118-136MHz, 138-174 & 380-512	179.95
PRO-57	VHF/UHF Scanning receiver. 10 memories. 68-88, 136-174 & 380-512MHz	119.95
PRO-34	VHF/UHF Handheld scanning receiver. 200 memories. 68-88, 108-136MHz, 136.005-174, 380-512 & 80-960MHz	248.95
20-006	Telescopic whip aerial with BNC connector. Extends portable scanner range. Nine sections centre loaded 25-1300MHz	6.99
270-1580	DC adapter. Power your portable scanner through your vehicles lighter socket. Reduces 12VDC to 34.5V/6VDC at 300mA	11.99
AMVHF	Aircraft Pocket Radio	14.95

### Aerials & Accessories

		P&P
Revcone	Discone antenna. 50-550MHz coverage. Ideal for use with scanner	33.75 (5.00)
Royal 1300	Wide Band Discone antenna. 25-1300MHz	59.95 (5.00)
AH7000	Wide Band Discone antenna. 25-1300MHz, complete with 15M of Low loss coax	82.50 (5.00)
20-006	Telescopic whip aerial with BNC connector. Extends portable scanner range. Nine sections centre loaded 25-1300MHz	6.99 (1.00)
HB9CV	2M 2 element beam. Ideal for loft!	3.95 (4.00)
HB9CV	70cm 2 element beam	3.95 (3.00)
HB9CV	6M 2 element beam	12.95 (5.00)
Sim Jim	2M antenna	8.95 (4.00)
Halo	2M SSB antenna	5.95 (4.00)
GRV	Full size 102' long. Covers 80-10M	18.95 (4.00)
GRV	Half size 51' long. Covers 40-10M	14.95 (4.00)
Trap Dipole	80-10M Trap dipole kit. Length 110'	18.95 (4.00)
Trap Dipole	160-80M Trap dipole kit. Length 230'	27.95 (5.00)
Baluns	1:1 Ratio. 500W	12.95 (2.50)
Baluns	4:1 Ratio. 500W	12.95 (2.50)
Traps	40M traps - 7.1MHz. 500W	8.50 (3.00)
Traps	80M traps - 3.7MHz. 500W	8.50 (3.00)
Copper wire	500M reels of copper wire	7.06 (3.00)
78F	*****Full range of Jaybeam and Tonne Aerials*****	
2E	2M wave mobile antenna	24.50 (3.00)
2E	2M wave mobile antenna	14.95 (3.00)
272VM	2M/70cm mobile antenna	25.95 (3.00)
272VME	2M/70cm High gain mobile antenna	40.95 (3.00)
320E	2M wave antenna. PL259 fitting	3.50 (2.00)
SAGMS	Mag mount. Large limpet mag mount with rubber skirt	20.50 (3.00)
HSTMB	Boat mount for any of the above aerials	15.46 (3.00)
SSB2	Hatch back mount for any of the above aerials	22.35 (3.00)
2106	Heavy duty Hatch Back mount for above aerials	27.27 (3.00)
GSS	Gutter mount	6.95 (1.50)
RG4M	4M lead with SO239 socket and PL259 to go with gutter mount	6.95 (1.50)
D24N	2M/70cm Duplexer	28.95 (3.00)
GF151	2M ON-GLASS 3dB wave mobile antenna	27.99 (4.00)
GF411	70cm ON-GLASS 3dB antenna	28.99 (4.00)
Active	*****Full range of G-Wave Aerials*****	
Global	Antenna. Covers 0-40MHz. Comes complete with power supply and bracket	45.00 (5.00)
CT1010	SWL Antenna Tuner. Covers all bands from 100kHz-30MHz	89.00 (5.00)
Flex	200W Fan cooled dummy load	88.00 (3.00)
DL60	2M Flexible wave antenna, BNC connector	11.00 (1.50)
FRT7700	20W continuous dummy load	11.00 (1.50)
	SWL antenna tuner	59.00 (3.00)

### Books & Maps

		P&P
Confidential Frequency List 1989 edition		7.95 (1.00)
The complete guide to VHF/UHF frequencies 25-2000MHz. 1989 ed		6.95 (1.00)
HF Oceanic Airband Communications		3.95 (0.75)
NEW VHF/UHF Airband frequency guide		5.95 (1.00)
World Radio and TV Handbook		17.95 (1.50)
Better Short Wave reception		5.30 (1.00)
HF Antennas for all Locations		7.25 (1.50)
Radio Amateur Examination Manual		5.95 (1.50)
Morse Code for the Radio Amateur		3.25 (0.75)
Radio Communication Handbook. Vols. 1 & 2		13.85 (2.50)
Practical Wire Antennas (NEW for 1989)		8.25 (1.50)
How to Pass the RAE		3.80 (1.50)
Logbook		3.50 (1.00)
VHF/UHF Manual		10.99 (2.00)
Amateur Radio Operating Manual		8.95 (1.50)

### Power Supplies & Linear

		P&P
DRAE 24 amp power supply		151.35 (12.00)
DRAE 12 amp power supply		104.71 (12.00)
DRAE 6 amp power supply		78.72 (5.00)
BNIS 12/20E 10 amp power supply		178.25 (12.00)
BNIS 12/10E 10 amp power supply		132.25 (5.00)
BNIS 12/5E 5 amp power supply		74.75 (5.00)
Osawa PS300M Heavy Duty power supply. 24 amps. Variable volt		128.50 (12.00)
BNIS LP144-10-50 2M 50W linear with preamp. 3W input		138.00 (5.00)
BNIS LP144-10-100 2M 100W linear with preamp. 10W input		138.00 (5.00)
BNIS LP144-3-100 2M 100W linear with preamp. 3W input		235.00 (5.00)
BNIS LP144-14-100 2M 100W linear with preamp. 10W input		205.00 (5.00)
BNIS LP144-14-180 2M 180W linear with preamp. 3W input		355.00 (5.00)
BNIS LP144-14-180 2M 180W linear with preamp. 10W input		305.00 (5.00)
BNIS LP144-25-180 2M 180W linear with preamp. 25W input		305.00 (5.00)
BNIS LP50-3-50 6M 50W linear with preamp. 3W input		138.00 (5.00)
BNIS LP50-10-50 6M 50W linear with preamp. 10W input		138.00 (5.00)
BNIS LPW50-10-100 6M 100W linear with preamp. 10W input		235.00 (5.00)
BNIS LPW432-10-50 70cm 50W linear with preamp. 10W input		205.00 (5.00)

### Satellite Receiving Equipment

		P&P
Cambridge TV Satellite receiving system. Stereo, 48 channel Remote control. (NEW Square Type Dish)		259.95 (12.00)
Slowflew 2 Weather satellite decoder and frame store. Also decodes FAX and Slow Scan Television pictures. With Colour generator.		715.00 (12.00)
Meteorcast Receiver		270.25 (12.00)
Meteorcast Preamp		92.00 (3.00)
Meteorcast Dish, stand, and feedhorn		199.00 (12.00)
Computer Interface and Software for decoding Weather Satellite pictures, using the Commodore AMIGA A1000		289.00 (12.00)
WX237 Seven Channel Weather Satellite Receiver. VHF		275.00 (5.00)
2X7137/C Crossed Two element aerial for Weather Satellite Receiving		43.12 (12.00)

### CW/RTTY Equipment

		P&P
BY1	Bancher Morse Key (Black)	87.45 (3.00)
BY2	Bancher Morse Key (Silver)	77.00 (3.00)
HK708	Straight Morse Key	21.85 (3.00)
HK702	Deluxe version of above on Marble Base	43.40 (3.00)
HK706	Straight Morse Key	23.25 (3.00)
HK705	Straight Morse Key	24.00 (3.00)
HK704	Straight Morse Key	22.25 (3.00)
HK707	Squeeze paddle	20.25 (3.00)
NK705	Squeeze paddle on Marble Base	32.20 (3.00)
Star Master Keyer	Electronic Keyer	54.70 (4.00)
Star Memory Keyer	Electronic Keyer with Memories	95.00 (4.00)
Datong	070 Morse Tutor	83.40 (3.00)
PK 232	All mode Terminal Unit. Packet, Amort, RTTY, CW, ASCII, FAX, and NAVTEX. Works with any computer equipped with an RS232 Interface (now with Mailbox)	319.95 (5.00)
AMT-2	All mode terminal unit. Amort, RTTY, CW, ASCII. Works with Commodore 64, BBC-B etc	189.00 (4.00)
	*****Software to suit different computers available for the PK232 and AMT-2*****	



## NEW — NEW — NEW KENWOOD TS950S/SD



Available NOW this superb all band, all mode HF transceiver has too many features to mention, so send for details or come in and try one!  
TS950SD = £3199.00  
TS950S = £2499.00

## NEW — NEW — NEW Yaesu FT-1000



Available NOW this NEW Top of the range all band, all mode HF Transceiver from Yaesu. Again too many functions to list, so please send for leaflet!  
FT-1000 = £2995.00

## Icom IC-725



Compact HF transceiver with General coverage receiver. 26 memories, 100 watts output. All band, all mode, (FM optional).  
£759.00 FM unit = £40.00

## NEW — NEW — NEW Standard C528

Available NOW the superb NEW C528 Dual Band handheld from Standard. This unit has dual watch facility and extended receive coverage 800 — 975MHz.

£379.00 P & P = £5.00



## NEW — NEW — NEW Icom IC-24ET

Available NOW this super compact and lightweight Dual Band handheld has a host of features including Dual watch facility, Full duplex capability, 5W output to name but a few!

£385.00 P&P = £5.00



## Kenwood TH-75E

This high quality Dual band handheld is excellent value for money. Not only does it have Dual watch facility and Full duplex capability, but it comes complete with nicad, charger and aerial.

Only £398.00 P&P = FREE

## ON-GLASS ANTENNAS

We have in stock the GF151 1/2 wave VHF mobile aerial and the GF411 3dB gain UHF colinear. Both of these aerials perform exceptionally well and have a frequency coverage as follows:  
GF151 138-175MHz and the GF411 430-470MHz.

GF151 = £27.99

GF411 = £28.99

P&P £4.00

## Kenwood TM231E



Compact 2M FM mobile transceiver. 50/10/5W.  
Only £289.00 P&P = £5.00

## Kenwood TM431E



Compact 70cm FM mobile transceiver. 35/10/5W output.  
Only £318.00 P&P = £5.00

## Kenwood TM701E



Compact 2M/70cm FM mobile transceiver. 25W on both bands. Full Duplex capability.  
Only £469.00 P&P = £5.00

## NEW — NEW — NEW — NEW — NEW AR-1000 Handheld Scanner

### Basic Specification:—

Frequency Ranges: 15-600MHz and 805-1300MHz.

Frequency Selection: By direct keypad entry or by Tuning knob on top panel.

Memory Channels: 1000 arranged conveniently in Ten banks of 100, with direct keyboard access to any memory.

Search Bands: Ten Bands which come pre-loaded with the ten most important UK bands of interest. Note these frequencies are pre-loaded in the factory and any search band can be easily re-programmed by the user.

Reception Modes: AM, FM (narrow) and FM (wide) which gives access for the first time to FM broadcast and TV sound in a handheld scanner.

Frequency Steps: User programmable from 5 to 995kHz, in any multiple of 5kHz or 12.5kHz.

Scan Speed: 20 channels per second.

Search Speed: 40 channels per second.

Power Source: 4.8v rechargeable Nicad.

Please note that the battery pack is four separate 600mAh AA size cells which are provided, but the user can easily remove them and replace them by four standard AA pencils. Also and most importantly, the AR-1000 can be powered from any external DC supply of 13.8V nominal, which not only powers the receiver but also charges the Nicad batteries.

All the performance and features which we wanted from AOR are here in a stylish handheld package, measuring only 70 x 35 x 170mm and weighing a mere 300g (excluding batteries).

The AR-1000 comes complete with the following accessories:—

- Set of 600mAh Nicad batteries
- 240V mains charger
- DC power cord with cigar lighter plug
- Soft carrying case
- Belt clip
- Carrying strap
- Earpiece
- High performance DA900 flexible gain antenna

AND NOW THE BIT YOU HAVE ALL BEEN WAITING FOR!!!!

Price: £249.00

P&P £4.00

## Base/Mobile Scanners

### NEW Icom IC-R100

HF/VHF/UHF scanner

£499.00

### PRO-2005 VHF/UHF

scanner

£339.95

### Icom IC-R7000 All mode

VHF/UHF scanner

£989.00

### Icom IC-R9000 All mode

HF/VHF/UHF scanner

£3995.00

AUTHORISED AGENTS FOR KENWOOD, ICOM, YAESU & STANDARD. FULL SERVICE FACILITIES AVAILABLE

SPEND UP TO £1,200 INSTANTLY WITH A PHOTO ACOUSTICS LTD. CREDIT CHARGE CARD — APPLY FOR DETAILS

PART EXCHANGE WELCOME. ASK FOR KERRY G6JZF OR ANDY G4YOW

RETAIL SHOWROOM OPEN MONDAY-FRIDAY 9.30-5.30, Saturday 9.30-4.30

Goods normally despatched with 24 hours. Please allow 7 banking days for cheque clearance. Prices correct at time of going to press — E&OE

# Ten Spot

As expected normal F2 contacts from the UK to Asia, Australia and the Pacific have been commonplace, with QRP achieving quite remarkable distances.

At G3YPZ, a limit of 10 watts s.s.b. brought daily QSOs with Stateside, JA, USSR, etc., but some interesting ones were HI8, A61, ZP5, CX2, V31, FH8, CO2, VU2, etc., all worked with a 5λ/8 groundplane at 6m from the flat Fenlands of North Cambridgeshire. ZL4OD was also netted from the mobile installation on November 6.

Whilst on the subject of ZL, it is worth checking the band for long path openings during our evening times - a freak c.w. QSO with ZL2GG occurred on November 8 at 2246 - he was the only signal on the band - so even if you think that the band is dead - it may not be.

The current mobile antenna used is the converted DV27 ex-CB whip. This is an efficient and cost-effective antenna. It is a shortened and helically loaded 1λ/4 wave with an adjustable screw in section at the top.

With the section fully out, the antenna tunes with 1:1 v.s.w.r. on 29.60MHz and with the top section adjusted for the lowest v.s.w.r. it will tune anywhere in the band.

## Aurora

A number of auroral events have taken place over the past few months. One notable example being on Friday November 17. The tell-tale signs were all there - DX stations developing a very rapid flutter and Stateside disappearing in favour of fairly uneven signal from the Southern Hemisphere, then no DX at all and the characteristic rough distorted Scandinavian and 'G' stations.

The opening lasted at least until 2230 when activity seemed to die

*The Autumn DX season of 1989 produced examples of just about every type of propagation on the 28MHz band, John Petters G3YPZ gives us a few details*

out. Contacts with G3LAZ Luton, Beds; G4SKX Stockton; G0DBE (5 watts) Liverpool and GM4WKA Elgin were made from Cambridgeshire. An unusual QSO took place between G3YPZ, G3LAZ and UA3IGP who reported auroral flutter on both 'G' signals. This was at 1815 - long after normal F layer propagation had died out to the USSR.

Please let me know about your auroral experiences!

During the exceptionally good tropo openings on 144MHz during late November, there was little evidence of anything of a similar nature on 28MHz. A strange Sporadic-E opening did, however, occur on November 27 when the band - well open to the USA - suddenly produced extremely short skip European, followed by even shorter skip inter 'G' and then again Southern Europe.

At 1730 on 29.060MHz I worked DL9EBO on 2-way a.m., with S9 signals. A few minutes later K2UTC was worked on s.s.b. By 1850 Stateside had gone and DH2VM was worked with S9 signals that soon faded away into the noise - typical Sporadic-E. At the same time a few Caribbean and South American stations were copyable.

At 1950 on 29.600MHz f.m. G4TRU called into a local contact, again with S9 plus signals from Exeter, Devon, well over 320km away. Andy was running 50 watts with 1λ/2 horizontally polarised

dipole, G0LGF (Norwich) and G4NEY/M (Cambridge) and G3YPZ were running verticals - polarisation is not critical with Sporadic-E or F layer propagation due to the signal path being twisted and turned.

Within 10 minutes G4TRU started to fade out and HB9CBG in Zurich was worked for over 20 minutes. The evening finished with an s.s.b. QSO with I2RR at 2039 who was 20dB over S9. Incidentally, many of the European beacons were audible throughout the evening.

Were other PW readers active on the band on November? Let me know what you heard or worked.

## Fancy VK6 on FM?

Graham Rogers VK6RO at Perth, Western Australia is around and looking for Europe most mornings on 29.600 or 29.510MHz QRM permitting. I first worked Graham back in the last cycle when his signal could be heard reliably most days. I was delighted to renew the acquaintance again on October 26. Contact was established at 1250UTC and completed at 1309 during which time VK6RO was varying from S2 to S9 plus.

A power reduction from 100 watts down to 1 watt was tried at Graham's end with 1 watt just detectable and 10 watts workable. Graham managed to read my 4 watts from the Icom 1050. Graham's set-

up consists of a TS-440S into a 3-element Yagi.

Since the last cycle, VK6RO has worked the following prefixes - all on 29MHz f.m.

A4, A9, BV, BY, CT, DL, DU, EA, EA6, EA8, F, FK, FR, FT8Z, G, GD, GI, GJ, GM, GW, HA, HB, HL, I, JA, JD1, W, KH2, KH6, KH0, KL7, LA, LX, LZ, OD, OE, OH, ON, OZ, P2, PA, S7, SM, SP, SV, TA, TL, UA, UI8, UL, UO, V8, VK9X, VK9Y, VQ9, VS6, VU, YO, YU, ZC4, ZL, ZS, ZS2, 3B8, 3B9, 4S, 4X, 5B, 8Q, 9J (a.m.-f.m.), 9M2, 9V.

An impressive list and Graham must be congratulated for this outstanding achievement. Many amateurs would be delighted to work so many rare ones on s.s.b. let alone f.m.


If you are searching for long haul DX on f.m. be prepared to be patient, because the mode suffers very badly from phase distortion. At times the carrier can be fully quieting but the modulation unreadable. Surprisingly, a.m. suffers much less from this problem.

Talking of a.m., those who still have their old DX100, DX40, LG300, KW Vanguard rigs of yesteryear could find a whole new (or more accurately old) mode of operation. Look above 29.000MHz when the band is open to the States and delight in how amateur radio used to sound. Those that have multi-modes can join in the fun also, as well as the many that have old CB rigs from the illicit days - but be sure you get the right documentation from the DTI.

**PW**

**Your comments and observations to:**

**G3YPZ, Rose Cottage,  
Hannath Road,  
Tydd Gote,  
Wisbech,  
Cambs PE13 5NA.**

CONFIRMING QSO TWO WAY		<b>VK6 RO</b>	
TO <b>G3YPZ/P</b>		<b>AX6 RO VI6 RO</b>	
DATE <b>26-OCT-89</b>		<b>VK6R EXPERIMENTAL LICENCE</b>	
R. <b>54</b> T. <b>1246</b> UT			
BAND <b>10</b> FREQ <b>29510</b>			
QTH <b>PERTH</b>			
RIG <b>TS440S 100W</b>			
ANT <b>3 EL YAGI</b>			
TKS QSO PSE/ QSL		FM	
			
<b>Graham Rogers</b> <b>22 Grace St, FERDALE 6155, WESTERN AUSTRALIA</b>			

**Fig. 1**  
**Graham**  
**VK6RO's QSL**  
**card.**



**Fig. 2**  
**Graham**  
**VK6RO**



®

T  
A  
N  
D  
Y  
C  
O  
R  
P  
O  
R  
A  
T  
I  
O  
N

# High Technology Test Equipment

## 30-Range Digital Multimeter

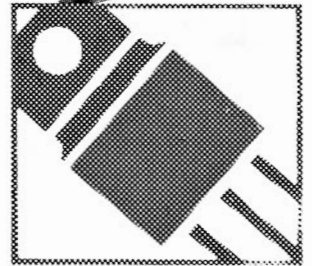
**£69<sup>95</sup>**

Features front-panel socket for transistor and capacitor tests. Low battery indicator, diode check function and continuity sounder. Measures to 1000 VDC, 750 VAC, 10 amps AC/DC current, 20 megohms resistance. 20  $\mu$ F capacitance and transistor gain. Requires 9v battery . 22-194



## Probe Style Autoranging Multimeter

**£29<sup>95</sup>**



Data hold function enables you to freeze the display and to remove it from the circuit for more convenient reading.

Measures to 400 volts AC/DC and resistance in K-ohms up to 2 megohms. Includes 2 button batteries. Overload protected. With carrying case ..... 22-165

## Regulated Power Supply

**£59<sup>95</sup>**



13.8 VDC Regulated Supply. Ideal for use with HAM transceivers. 5A continuous. 12A intermittent. 15A surge. 240 VAC, 50 Hz. Fused ..... 22-7001

**Tandy®**

**For The Best In  
High Quality Electronics**

Over 400 Tandy Stores And Dealerships Nationwide. See Yellow Pages For Address Of Store Nearest You.

InterTAN U.K. Ltd., Tandy Centre, Leamore Lane, Walsall, West Midlands, WS2 7PS. Tel: 0922 710000



**"Thanks for the nice signal report, OM.**

**The station here is home-brew."**

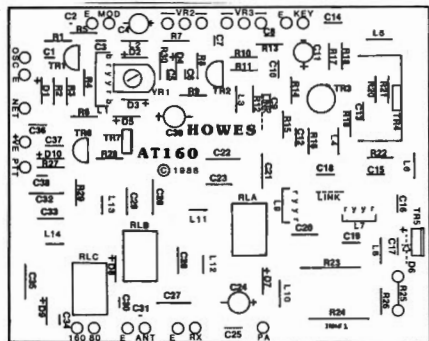
It's a great feeling to be able to say you built the equipment yourself, not to mention the enjoyment you gain from doing the construction. You can feel sorry for the guy, who spent over three grand on his new set, and isn't enjoying his radio as much as you are. Sure his set seems to have knobs for everything, but somewhere along the black box production line, they took the fun out. How many extra QSOs do you get with 1000 memories, and fifty less than essential functions?

May we suggest a rig that offers the challenge and pleasures of low power communication, combined with the fun of building it yourself?

## SINGLE BAND CW TRANSMITTERS

These little rigs are simple to build, but offer a nice sounding CW note that you can be proud of. Key shaping and output filtering are provided, as is one crystal to get you on the air. RF output power is adjustable with an onboard control. Provision is made for connecting a VFO (HOWES CVF range) for full band coverage, and you can also add a DcRx Direct Conversion receiver for transceive operation if you wish.

CTX80	(80M 5W)	Kit: £13.80	Assembled PCB: £19.90
CTX40	(40M 3W)	Kit: £13.80	Assembled PCB: £19.90
MTX20	(20M 10W)	Kit: £22.90	Assembled PCB: £29.90
CVF VFO	(80, 40 or 20M)	Kit: £10.40	Assembled PCB: £16.90
50pF	Tuning capacitor to suit VFOs:		£1.50



Parts Location overlay on AT160 PCB

## DUAL BAND AM/DSB/CW TRANSMITTER

The **HOWES AT160** transmitter is great for the 160M club net, local nattering on AM, and long distance working on CW. 10W PEP output is available on both 80 and 160M bands. Front panel controls are provided for output power and carrier level. Excellent modulation quality is provided by a low level balanced modulator, class A driver stages, and plenty of RF negative feedback. Full key shaping is provided. The transmitter is broadband with no tuned circuits to align. Harmonics are -40dB or better with relay switched output filters. One crystal (80M) is provided, as is PTT switching (including antenna relay).

Matching microphone amplifier and dual band VFO kits are available.

AT160	(Dual Band TX)	Kit: £34.90	Assembled PCB: £53.90
VF160	(Dual Band VFO)	Kit: £19.90	Assembled PCB: £34.20
MA4	(Mic Amp for TX)	Kit: £ 5.60	Assembled PCB: £ 9.90

## DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVERS

These receivers make a great introduction to amateur radio for the novice, besides being widely used by experienced QRP (low power) operators as part of a transceiver. Modes are SSB and CW, with up to 1W of audio output for 'speaker or 'phones. These are straightforward, single band receivers, and give amazingly good results. A "hardware" package to suit (case, dial, tuning caps, knobs, sockets etc) is available. There are versions for 20/30M, 40M and 80M amateur bands.

DcRx	Kit: £15.60	Assembled PCB: £21.50
DcRx Hardware:		£15.50

## DXR10 10, 12 & 15M COMMUNICATIONS RECEIVER

This three band receiver gives SSB and CW reception on the three highest frequency shortwave amateur bands. These are commonly known as "DX" bands, and you can hear stations from all over the World. You don't need a big antenna for these frequencies, and this set will give great results with a simple wire dipole (details in the kit instructions). Performance is excellent.

DXR10	Kit: £24.90	Assembled PCB: £36.90
DXR10 Hardware:		£14.00

## ACCESSORY KITS

We have lots of add-on goodies to tempt you with. Could you fancy extra filters, or perhaps a digital frequency display? Need a good quality ATU?

CTU30	All HF Bands ATU 30W	Kit: £27.90	Assembled PCB: £33.90
CM2	Quality Mic with VOGAD	Kit: £11.90	Assembled PCB: £15.90
CSL4	SSB & CW Dual B/W Filter	Kit: £9.90	Assembled PCB: £15.90
DCS2	"S meter" for receiver	Kit: £7.90	Assembled PCB: £11.90
DFD5	Digital Counter/Display	Kit: £39.90	Assembled PCB: £59.90
SWB30	SWR/Power Indicator	Kit: £12.50	Assembled PCB: £17.30

All **HOWES** kits come with a good quality Printed Circuit Board, full clear instructions, and all board mounted components. If you would like more information, please send an SAE for a free catalogue or information sheets on any specific products. Technical help and Sales are available by 'phone during office hours.

PLEASE ADD £1.00 P&P to your order total.

73 from Dave G4KQH,  
Technical Manager.





# No Linear - No HF DX!

Feature



*It seems to be a generally held belief (amongst the general public as well as amongst many amateurs) that amateur radio is an expensive hobby and that high power is the only way of getting through. Peter Barville G3XJS would like to dispel these myths once and for all.*

It is not possible these days to work DX on the h.f. bands unless you are using high power. The pile-ups are too big and only the 'big boys' will get through. Therefore, the h.f. bands are only for those with a fat cheque book and it is a waste of time going on the bands with 100W and a dipole, let alone trying just 2 or 3W from a home-brew rig.

This is certainly a view I hear expressed quite frequently and I wonder if this is your view of h.f. operating? Tuning around the bands, particularly when there is some rare DX about, it is very easy to take one listen to the melee of stations and decide that this aspect of the hobby is not for you.

I became interested in h.f. DXing around 1979, during the last sun spot peak, and at the time was running a commercial transceiver, a 400W linear and a 3-element tri-bander. Over a period of 3 or 4 years I had a lot of fun, using s.s.b. and c.w. to work about 300 DXCC countries. However, in 1983 I sold the rig and antenna because I had become despondent with the h.f. DX scene - it was becoming increasingly dominated by bigger and bigger linears, each attempting to 'outgun' the opposition. I decided that this was not much fun and hardly my idea of amateur radio.

## Opposite Directions

I chose to move in the opposite direction and try some low power operation. With my old (but excellent) Drake receiver I listened around 3.560MHz - the 80m QRP c.w. frequency - and was amazed to discover that I could hear stations from around the UK who were running flea power and yet conducting solid QSOs. Some were using power levels of one watt or less, yet I was hearing them with little or no difficulty - I was **hooked**. In a lot of cases, but certainly not all, the equipment being used was home-brew and, of course, it's true to say that QRP equipment lends itself very readily to home construction. For me, this was an added attraction as I have always enjoyed building equipment - even if some of the end results have not always been quite what I would have hoped for - hi!

In contrast to what I had left behind on the h.f. bands, it seemed to me that I had 're-discovered' amateur radio.

I built a couple of 3.5MHz band QRP rigs and spent a year or two working (and meeting) fellow enthusiasts. In the process I discovered just how popular the QRP movement is in the UK and across the world.

After a while, I began to realise that the number of countries I had worked with QRP on 3.5MHz was slowly increasing - GW, GM, ON, PA0, F, etc., and entirely by accident here I was chasing DX again! On the face of it, I was now doing it the hard way though, because my 3.5MHz band antenna was only a low trap dipole and I was using a maximum of 3W output. Yet, to my amazement, my QRP c.w. started to give me contacts into Asia, USA and Africa as well as across Europe. Because these results were so unexpected, the additional challenge of making the DX QSOs with such low power and relatively simple and cheap rigs, gave me tremendous satisfaction and enjoyment. Working DX with a commercial transceiver and linear was never as much fun as this!

I set myself a 'target' of 50 confirmed countries on 3.5MHz QRP c.w., but wondered whether it would prove possible. The last two or three proved hard work (they always do) but eventually that elusive 50th QSL arrived!

## Build a Rig

By this time, I was keen to build myself a rig for the h.f. bands - not to get into the rat race of h.f. DXing again, but to try some low power around the bands and hopefully have some enjoyable QSOs. I chose to build the G3OGQ multi-band transceiver (RadCom 1983 and 1985) which is a fairly time consuming project, but one which has proved very successful for me. Although it is capable of running about 50W of c.w. and s.s.b., it was my hope that QRP c.w. operation with it on the h.f. bands would prove as rewarding as had my earlier 3.5MHz activity. To replace the 3-element Yagi that I had

sold, I put up a 2-element tri-bander - a DX32 at about 10m - which I thought ought to provide some reasonable contacts.

Now I could venture onto the h.f. bands with my massive 3W signal, I wondered what would be in store for me. I was, of course, very pleased when stations around Europe came back to me with good reports. Any surprise I felt with some of those reports, was far outweighed by the surprises and amazement expressed by stations I worked when they discovered my power level! Sure enough, I was making plenty of QSOs and soon discovered that it was possible to work some of the more exotic countries.

It wasn't long (surprise, surprise) before I began to enter one or two DX pile-ups. Of course, it was a bit 'tongue in cheek' as first - after all, how could I expect to compete with the competition, many of whom would undoubtedly be running anything up to a kilowatt. However, I soon discovered that I very often made the QSO despite the pile-up and realised that a respectable DXCC score could well be possible using QRP.

Even then, I don't think I expected my efforts to be as successful as they have subsequently proved to be. At the moment, the DXCC score stands at 213, with over 200 confirmed. In fact, at times I think it harder to obtain the QSL card from stations than it is to work them!

Therefore, these results surely indicate that the statements in my opening paragraph cannot be correct - it is certainly not necessary to use expensive high power h.f. equipment in order to work DX. It can be very easy to work even some very rare DX on c.w. with a comparatively modest station. I will agree that not everybody is able to put up an h.f. beam, but most will run considerably more power than me, and that will balance things out somewhat. I also agree that to work h.f. DX on s.s.b. will normally demand more than a 3W station, although I know there are plenty of QRP s.s.b. operators who enjoy their fair share of success. As a rule, however, your chances of working the DX will be much enhanced if you try that 'outdated' mode - c.w. In fact, it seems to have just about everything going for it, not only is it such an effective mode for working DX, but the rig can be fairly simple, home-built (if that's your cup of tea), and cheap.

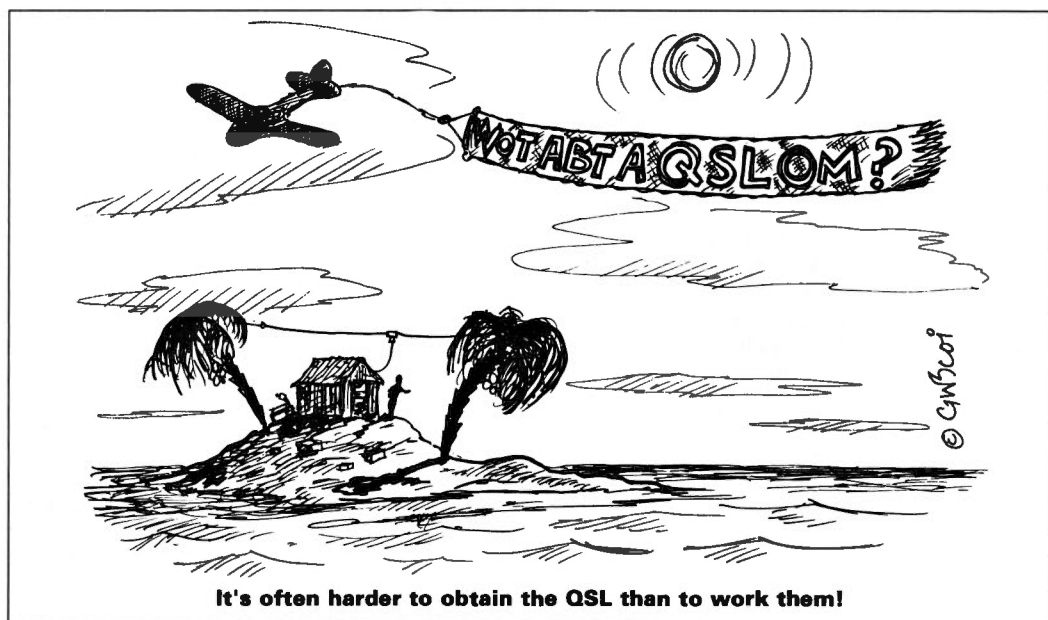
## An Asset

If you would like to fill your log with some juicy DX callsigns, there is one invaluable asset you can employ that is infinitely cheaper than a linear (and is probably more effective), and even cheaper than a c.w. rig. In fact, it is completely free!

That asset is simply the ability to listen. I believe that many operators miss out on DX more as a result of their apparent inability (or reluctance) to listen carefully, than any short-comings in the efficiency of their stations. The successful DXer spends more time listening than he does transmitting. He will winkle out the rare stations when they first appear on the band and make his QSO before the 'pack' descends, but if a pile-up has already developed then he will listen carefully to the DX station's operating procedures. He will ascertain when to call, and whether to call 'co-channel', or to call slightly off frequency - 'split frequency working'. This is the secret of success - particularly when trying to work c.w. DX. The received strength of your signal is of less importance than where and when you call, and this explains why QRP operators can and do enjoy so much success.

Of course, as with a lot of things in life, practice makes perfect. If c.w. is a mode you're not too proficient in, then a c.w. pile-up will be a little daunting at first. But don't despair because, apart from anything else, you will only need to exchange reports (usually 599) and won't have to worry about name, QTH, etc. Again, time spent listening (to other peoples QSOs) will help you become accustomed to the usual procedures and abbreviations.

Get used to making normal 'rag-chew' QSOs before entering the fray of a pile-up, because they tend to be handled at a comparatively high speed and you will need a basically sound c.w. ability in order to understand what is going on. Your first task of course, when coming across a pile-up, is to find and identify the DX station. You may well find stations calling across a spread of up to 5kHz (sometimes even more), and the DX will normally be at, or just below, the bottom edge of the mass of calling stations. Listen for the signal that is giving a callsign followed by a report (599 is normally abbreviated to 5nn) and then perhaps a 'QRZ'





followed by another callsign and report. He may not announce his own callsign very often, and when he does he may add details of the QSL route before going on to take more calls.

Different DX stations adopt slightly different operating procedures, but they all fall into roughly the same pattern. For example, if I am calling in a pile-up, I will know I am being worked when I hear the DX send: "G3XJS 59". In the interests of brevity, he may well not send a "K" or "BK" at the end of his transmission. In reply, I would send something like: "QSL 599 599 G3XJS TU". The abbreviation "TU" means thank you. I could perhaps send: "TU 599 599 73 de G3XJS" instead. His acknowledgement may simply consist of: "TU", or perhaps "QSL QRZ" and that will complete the QSO. The others who have been waiting will start to call. Unless there is a query, perhaps over your callsign, it will be all over in a trice!

### Before Calling

Before even calling the DX though, you will need to know exactly where to call. If you are lucky, and have been doing some diligent listening, you may have found him calling CQ, in which case you will need to call him on (or very close to) his own frequency. If however, there are already a number of stations calling, then you should listen carefully, find the stations he is working and establish whether they are on his frequency or slightly to one side. Normally, stations tend to spread out by moving h.f. of the DX, perhaps only 500Hz or so to start with, but increasing to a few kHz if the size of the pile-up increases. The DX will probably give some indication of his tuning intentions by sending: "UP" or "UP2" at the conclusion of a QSO. In this case, UP2 is not a prefix, but means 'I am listening 2kHz up from my transmit frequency'. So be guided by the DX, but find for yourself the stations as he works them, and call around their frequency - but ONLY when the previous QSO finishes! You will not be very popular if you call while he is still trying to complete a QSO, or is looking for calls from

another part of the world (e.g. "USA only"). When you do transmit, send only your own callsign once or twice, do not send the DX callsign as part of your transmission - it is obvious who you are calling!

Bear in mind that the DX will be using a narrow c.w. filter and if you can put your transmission in the centre of its passband, then the chances are very high that he will work YOU if the other stations are calling in the wrong place. The worst place to call if the DX is working 'split' is right on his frequency. Not only will you not get through, but you will be causing a great deal of QRM to others who may then miss a QSO themselves if you have prevented them from hearing the DX giving them their report. Such operating leads to 'self-appointed policemen' telling you to "UP" - hi.

Clearly, life is easier if you are using a transceiver with a remote v.f.o., but it is by no means essential. A great deal can be achieved just by careful use of an r.i.t., or x.i.t., control. Indeed, I have yet to get round to building myself a separate v.f.o.

You may decide that c.w. pile-ups are not for you, but don't give up too quickly. They take a little getting used to, and can be very productive (even for a modest station) in the search for DX. I have frequently been amazed when I have worked some very rare and sought after stations against a great deal of high power competition in large pile-ups. DX can be found and worked without joining a pile-up of course, but these days it is unusual for a rare country or station not to attract a lot of attention very quickly. Whether you go in for pile-ups or not, there is a great deal of satisfaction and fun to be had from making contacts with low power and I know that some of my QRP colleagues work DX with power levels of one watt or less.

Even if you're not too worried about working some of the rarer DX and you simply wish to have some enjoyable QSOs around the world, give it a try. Particularly now the h.f. band conditions are approaching their optimum, you don't need to spend a fortune to work the VKs and ZLs, etc. Remember, provided you are prepared to use the key, you won't need a linear - all you need is a pair of ears! **PW**

## Practically Yours

### Feature

*In this issue Glen Ross G8MWR begins a series describing practical test equipment. This month we start with a function generator*

To judge from the correspondence received it seems that there is good demand for constructional information and details on test equipment. Over the next few issues it is intended to provide constructional details for a wide range of such equipment such as simple signal generators, capacity bridges, power meters and so on.

### Function Generator

Let us begin with the details for a wide range test oscillator. In the form described, the unit covers a range of 20 to 20000Hz, but this range could easily be extended to cover 0.001Hz to 1MHz. Over the design range the unit will provide simultaneous sine, square and triangular (or ramp) waveforms. An added bonus is that the duty cycle is variable over large range, so providing a means of producing narrow pulse outputs. This is achieved by using the square wave output and suitably adjusting the duty cycle. The waveforms produced are extremely clean and the third harmonic distortion (t.h.d.) on the sine wave output can be lower than 0.5%.

### Circuit Description

The full circuit diagram is shown in Fig. 1 where it may be seen that a dedicated chip type 8083b takes care of the generator functions. The frequency range is covered by the combination of C2 and R2. To extend the range of the basic circuit C2 could be replaced by a series of switched inverse values of C2, (larger capacity lower frequency). Resistor R2 is mounted on the front panel and should ideally be equipped with a good quality epicyclic reduction drive to enable more accurate frequency setting. Alternatively a 10-turn potentiometer and turns counter could be used, as these may now be obtained at reasonable cost.

### Wave Shaping

The duty cycle of the oscillator is controlled by R6 and this should also be front panel mounted. Only if the output is displayed on an oscilloscope will the full value of this control be appreciated. It is possible, by choosing a suitable waveform and adjusting this control, to generate practically any waveshape that

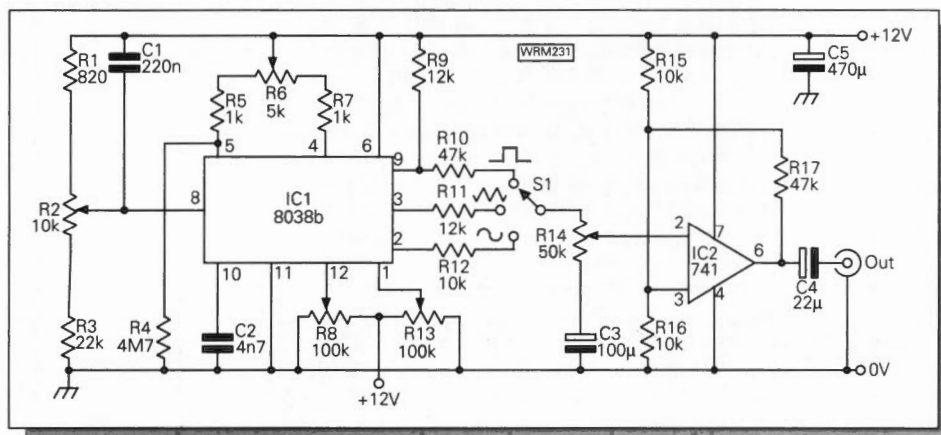


Fig. 1

you could reasonably require. The preset resistors R8 and R13, which are p.c.b. mounted, are used to minimise distortion on the sinusoidal output. If available a wave analyser should be used to set their optimum points, but more than adequate results may be obtained by observing the sinewave output on an oscilloscope while adjusting them. To do this simply, with the duty cycle set to 50%, adjust R8 and R13 for the most symmetrical output that can be obtained. Should an oscilloscope not be available, then dispensing with both of these presets all together may be the best idea. If this is the case then a fixed resistor of 82kΩ should be connected from pin 12 of IC1 to negative, and pin 1 should be left unconnected. Under these conditions the t.h.d. on the sinewave output will be around 2% or less, but still adequate for most purposes.

### Outputs

The three outputs available at pins 2, 3 and 9 of IC1 have differing levels. The three combinations R9/10, R11 and R12 in conjunction with the input impedance of the buffer stage IC2 serve to give a similar output level for all three waveforms. Switch S1 selects the required waveform and the panel mounted R14 controls

the output level available from pin 6 of IC2. This has been added to buffer the output of IC1 and ensure a constant output level into differing load impedances.

### Multi-outputs

An alternative method is to make all three waveforms available simultaneously. If this is desired then S1 is dispensed with and each output is taken via its own level control to a buffer amplifier similar in all details to that of IC2 and the surrounding components. Adding this last option is highly recommended, considering the small cost of incorporating it. The unit has very modest power drain and will run on a power supply of between 10 and 30V, and a p.s.u. made up from components rescued from old cassette recorder or radio would be adequate to power it.

### Construction

There is nothing at all fussy about the construction of the unit which may be built on Veroboard. Should you intend extending the range covered towards the upper limits of 1MHz then a p.c.b. would be preferable and IC2 would require changing to a faster type. A die-cast metal box could be used to contain the project and Fig. 3 shows a suggested layout for the front panel. Since the unit was originally built I had a requirement for a swept signal output to assist with the filter alignment. It was that this was easily achieved using the circuit of Fig. 2. The timebase output of an oscilloscope is connected to the terminals marked TB, allowing R2\*, which should be panel mounted, to control the frequency swing available. In use this system works best with timebase speeds of between 2 and 20ms per centimetre.

PW

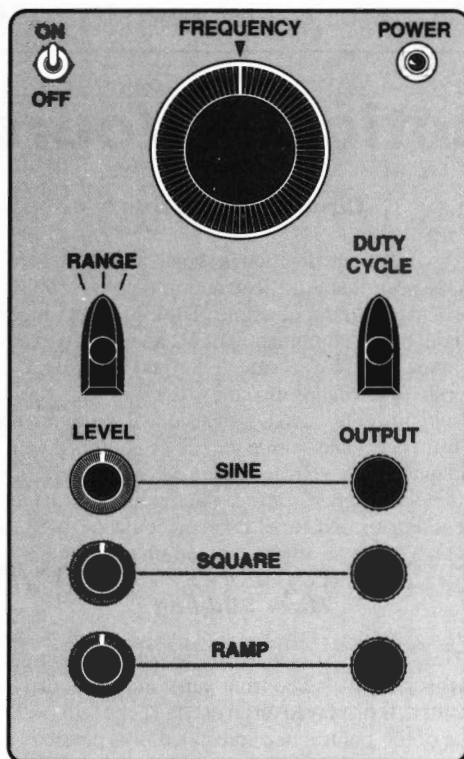


Fig. 3  
Suggested layout for  
the front panel.

### Component Shopping List

#### Resistors

0.125W 5% carbon film	
820Ω	1 R1
1kΩ	2 R5,7
10kΩ	3 R12,15,16
22kΩ	1 R3
12kΩ	2 R9,11
47kΩ	2 R10,17
4.7MΩ	1 R4

#### Miniaure preset

100kΩ	2 R8,13
-------	---------

#### Rotary panel mounted

5kΩ	1 R6
10kΩ	1 R2
50kΩ	1 R14

#### Capacitors

Disc ceramic	
4.7nF	1 C2
220nF	1 C1
Electrolytic 35V working	
22μF	1 C4
100μF	1 C3
470μF	1 C5

#### Semiconductors

Integrated circuits	
741	1 IC2
8038b	1 IC1



**You are cordially invited to the most  
colourful and prestigious Amateur  
Radio event in Britain. The new**

# **LONDON**

## **AMATEUR RADIO SHOW**

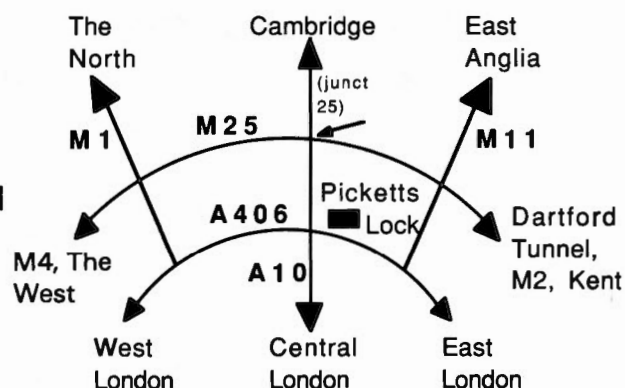
**makes it's debut on Friday March  
9th ( <sup>10.00am</sup>  
to 6.00pm ) and Saturday March 10th  
( <sup>10.00am</sup>  
to 5.00pm ) at Picketts Lock Centre, Picketts  
Lock Lane, Edmonton, London, N9.**

Talk-in on 2m and 70cm  
Facilities for the disabled  
Free parking for 3000 cars  
Grand prize draw each day  
Special Interest Group section  
On-site leisure and camping (not included in admission)

Morse Testing facility  
Huge exhibition area  
Bars and restaurants  
Easy access by road  
Bring and Buy sale

**Admission £1.00  
(75p for advance bookings  
of 10 or more tickets).**

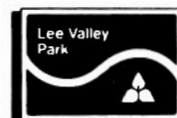
For advance ticket sales please send  
cheque and SAE to The Secretary,  
London Amateur Radio Show,  
126 Mount Pleasant Lane,  
Bricket Wood, Herts, AL2 3XD.



**Don't miss this superb event! LeeValley**

Presented in conjunction with Southgate Amateur Radio Club

**Leisure Park**



# London Amateur Radio

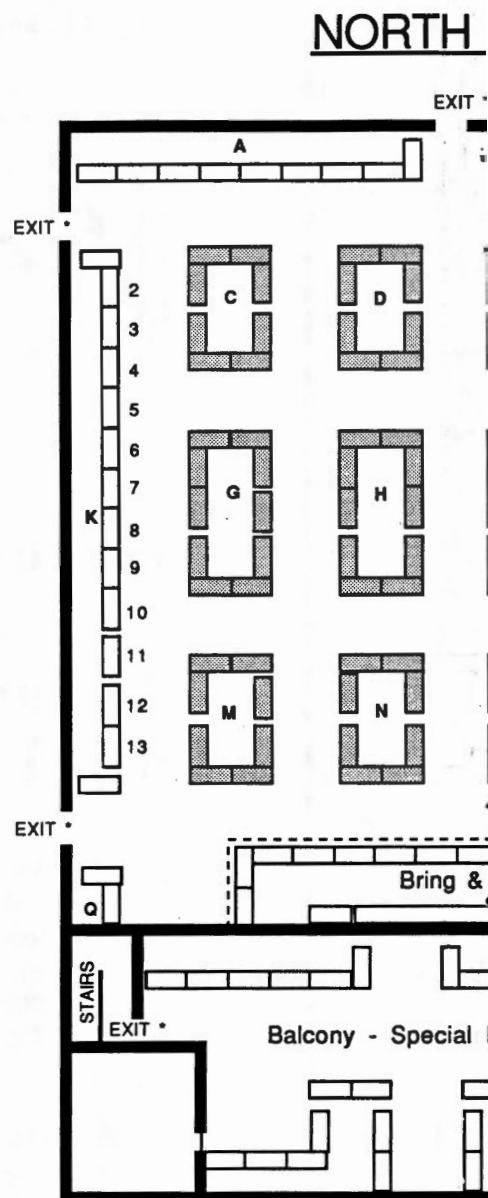
## LONDON AMATEUR RADIO SHOW

It has been several years since London hosted a full size radio show but happily that is about to change with the arrival of the London Amateur Radio Show at Picketts Lock. As you can see from the floorplan and list of exhibitors, most of your favourite dealers will be there and there are rumours of some exciting new radios being announced at this show.

The venue, in the Lea Valley Leisure Park, should make an ideal day out for all the family and while you're at the show we hope that you will stop by our stands (RA & RB) and tell us how you like the new look PW.

### Don't miss this superb event!

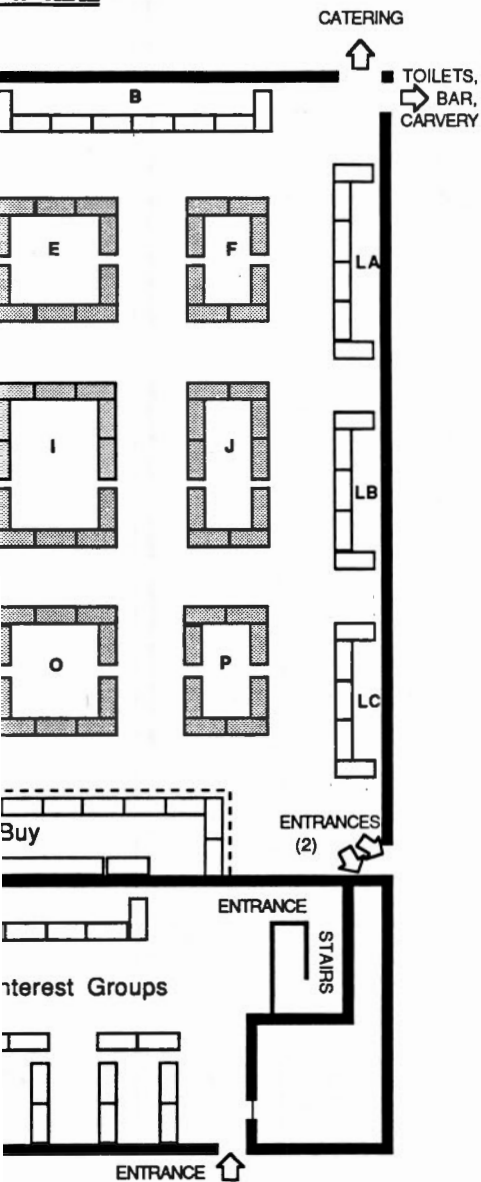
Presented in conjunction with Southgate Amateur Radio Club



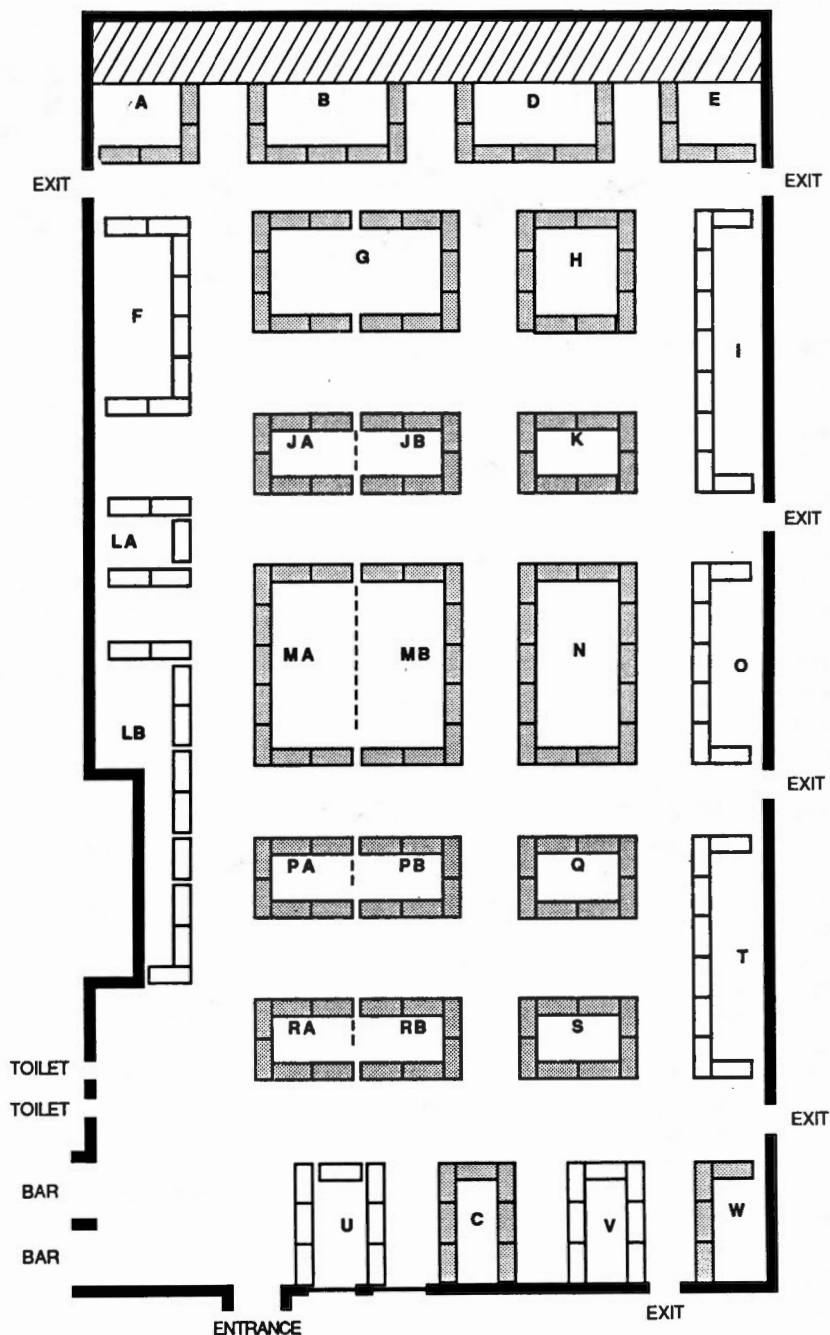


# Radio Show-Hall Layouts

NORTH HALL



SOUTH HALL



**Don't miss this superb event!**

Presented in conjunction with Southgate Amateur Radio Club

# Index to Company names and Stand Locations for the

## LONDON AMATEUR RADIO SHOW

COMPANY NAME	LOCATED		
A.J.P.	North — Balcony	Merlin Systems	North — E
A.R.E. Ltd.	South — MA & MB	MFM Supplies (Rugeley)	North — K
A1 Electronics	North — G	Morgan Smith H.J.	North — G
Air Training Corps	North — Balcony	Navico Ltd.	South — O
Amdat	South — W	Nevada Communications (Nevada)	South — I
Amsat — UK	North — Balcony	New Cross Radio	North — N
Andrews Computer Service	South — A	Newton Engraving	South — L
Arrow Electronics Ltd.	North — H	Nipco	South — U
B.A.R.T.G.	North — Balcony	Oasis Computer Services	South — N
B.N.O.S. Electronics Ltd.	North — LA	Photo Acoustics Ltd.	North — A
Badger Boards	South — LA	Poole Logic	North — M
Birkett J.	North — M	Practical Wireless /SW Mag.	South — RA & RB
Bonex Ltd.	South — D	Procomm (UK)	South — JA
Capco Electronics Ltd.	South — PA	PTV Electrical Services	North — G
Cheshunt & District A.R.C.	South — LA	Quartslab Marketing Ltd	North — Q
Commonside Hardware Serv	North — K	R & D Electronics	North — G
Compelec	South — LB	R.A.O.T.A.	North — Balcony
Dataphone Electronics	North — C	R.F. Engineering	North — Balcony
Dee Comm	North — F	R.N.A.R.S.	North — Balcony
Dewsbury Electronics	South — S	R.N. Electronics	South — U
Display Electronics	South — G	R.S.G.B.	North — D
Dressler Communications Ltd.	South — F	Radio Shack Ltd.	North — B
ECS Services	South — JA	RAIBC	North — K
Radio Bygones Magazine	North — Balcony	Rich Electronics	South — C
G4ZPY Paddle Keys	South — L	Royal Signals A.R.S.	North — Balcony
Garex (Startop Comms Ltd.)	North — J	S & S Electronics	South — L
Giacomelli	North — O	S.E.M. Ltd.	South — N
GQRP Club	North — F	S.G.S. Electronics	North — I
Heatherlite Ltd.	North — I	Sandpiper Communications	South — PB
Hilton Plant Ltd.	South — U	Siskin Electronics	North — P
I.C.S. Electronics Ltd.	South — Q	Standing	North — Balcony
I.S.W.L.	North — Balcony	Syon Trading/Bricomm	South — B
Icom (UK) Ltd.	South — T	System Enclosures Ltd.	South — LB
K.W. Communications Ltd.	South — K	T.A.R. Communications	South — H
Kanga Products	North — F	Taurus Electrical Services	South — N
Kent R.A.	North — M	Technical Software	South — LA
Keytronics	South — JB	Telford Electronics	North — K
Lee Electronics (Communique)	North — LB	Telstar Satellite TV Ltd.	South — LB
Loutronics	North — E	W.A.B. Awards	North — Balcony
Marco Trading	South — JB	W.H. Westlake Electronics	South — E
Mechanelec Ltd./Comp Junk Shop	North — D	Waters & Stanton	North — LC
		Wilson Valves	North — N
		Wraith T.	South — V



# Receiver Sensitivity Signal and Noise

Feature

If we could amplify just the wanted signal, then we would be able to read even the weakest of signals merely by adding more r.f. gain to the front-end of our receivers! Unfortunately, when we add gain, not only do we increase the background noise of the signal itself but we also tend to introduce extra noise resulting from the process of the amplification.

Let's look at the sort of signal we might wish to amplify. In Fig. 1a you can see a signal comprising a number of discrete frequency components (e.g. a modulated signal), rising from a relatively low noise floor. The signal to noise ratio (S/N) can be regarded as the amplitude difference between the noise floor and the signal peak. This 'distance' along the amplitude axis is commonly expressed as a dB ratio. In Fig. 1b you can see the same signal, but this time relative to a higher noise floor and hence with a smaller S/N.

In many cases the readability of a signal is determined by the S/N. Thus, while signal (a) may represent R5, the higher noise floor of the signal (b) may impair the readability to R3 or R4 at best. What, then, can we do to make a signal such as (b) more readable? There are two primary things: one, of course, is to reduce the noise floor and the other to increase the signal amplitude.

All right, we may say, let's increase the r.f. gain by bringing in a pre-amplifier since this will increase the signal amplitude. Yes, certainly the amplitude will be lifted, but so also might the noise floor by the same amount. In that case the S/N will be unchanged - readability would not have improved despite the signal meter indicating S9 plus! We shall be seeing that there are times when a dedicated low-noise pre-amp can improve the S/N; but there are other times when the S/N might be further worsened by a pre-amp. We have undoubtedly encountered these effects when using the antenna pre-amp combined with some v.h.f. linears, where switching in the pre-amp dramatically steps up the S-reading yet does little to enhance the readability of a weak signal.

If we want to increase the signal amplitude, then one of the best bets is to improve the antenna at the operating frequency or by using a beam array directed for maximum signal response consistent with the best discrimination against QRM.

## Noise Power Bandwidth

It is possible to reduce the noise floor at the expense of signal bandwidth and in this respect a

couple of interesting diagrams are given in Fig. 2. At (a) a very high noise floor is shown which almost buries the wanted signal, yielding a very poor signal to noise ratio. The same signal is also present at (b), but this time it is passed through a narrow band-pass filter. Now, because the noise power falls as the bandwidth of a given signal spectrum is decreased, so the noise floor falls and the wanted signal, within the reduced operating bandwidth, rises above the noise and a very much enhanced S/N occurs, as shown.

From the first principles, the improvement in S/N corresponds to the ratio of the full bandwidth to the reduced bandwidth. By way of an elementary illustration, let's suppose that the full bandwidth is 5kHz and the filter bandwidth 100Hz (both to the -3dB or half-power points), then the ratio is 50:1. Hence the improvement in S/N is 50 times, or 17dB (power). This can certainly make the difference between a non-readable signal and a perfectly readable one!

Such a small bandwidth, of course, is only realisable with Morse code or data signals. Speech calls for significantly wider bandwidths; but, although the very narrow Morse-type of filtering cannot be used for s.s.b. signals, somewhat wider band-pass filters can be desirable, though the S/N improvement is less than with c.w. signals. With f.m. signals, of course, the requirement is for even wider bandwidths; but even with this mode it seems possible to reduce the channel width to something less than 25kHz, anyway. We shall possibly be hearing more about this at a later date.

## What About Sensitivity?

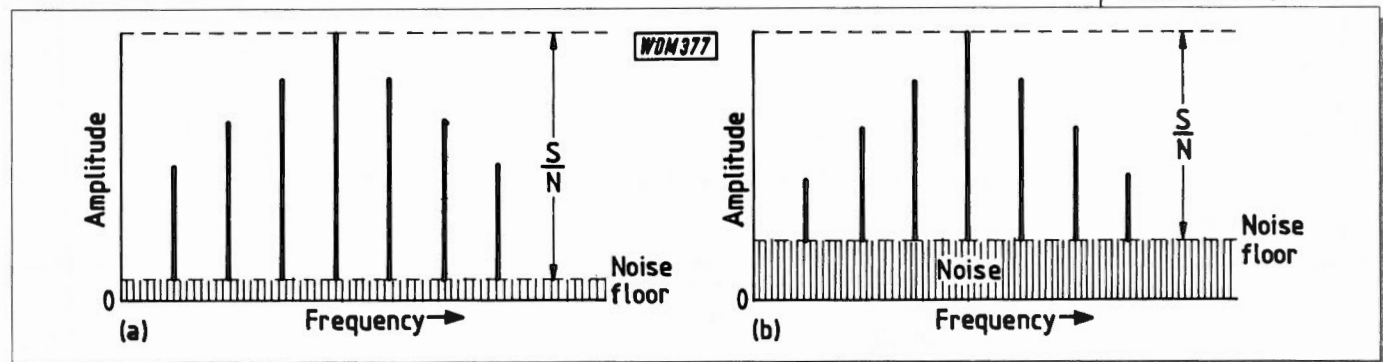
Now having set the stage so to speak, let's see what is meant about sensitivity. The basic expression for sensitivity is merely the antenna signal level required for a stated S/N. Instead of an antenna, a modulated signal generator is correctly coupled to the receiver and the receiver tuned to the signal produced by the generator. It is usual to set the modulation somewhat below the maximum appropriate to the particular mode under test. The modulation level should be stated in the spec.

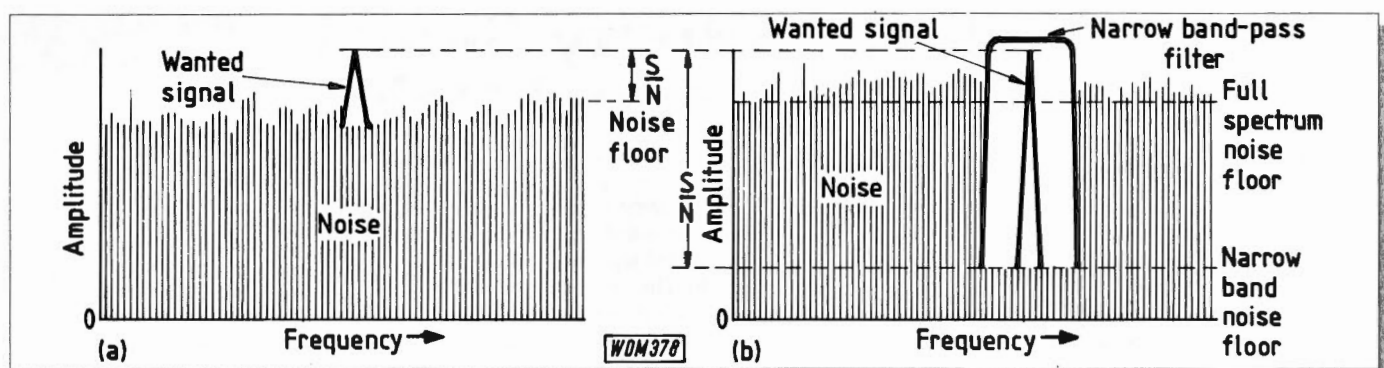
Of course, a meter is required at the output of the receiver, instead of the speaker or 'phones, to set a 0dB datum at the modulation level and volume control setting used. An audio millivoltmeter is highly suitable, and this is connected across a suitable value resistor which is replacing the speaker

*If it were possible to increase the amplification of a weak signal in total isolation we would have no problems.*

*Unfortunately, as Gordon J. King IEng, AMIERE G4VFFV points out, life isn't that simple.*

**Fig. 1: A signal spectrum rising from a relatively low noise floor (a) and a similar signal rising from a higher noise floor (b), showing the signal-to-noise ratios (S/N)**





**Fig. 2: A wanted signal almost buried by noise over a relatively wide spectrum (a) resulting in a very poor S/N. Part (b) shows how the S/N can be greatly improved by passing the signal through a narrow band-pass filter**

at the output of the receiver. To achieve the 0dB datum, the r.f. output from the signal generator is set fairly high to start with. After setting 0dB on the meter by adjusting its sensitivity and/or receiver's volume control, the modulation is switched off and the meter's sensitivity stepped up allowing the meter to read noise only down to about -10dB or so, as required.

Sensitivity at any appropriate S/N can be determined by adjusting the r.f. level and making sure that the 0dB reference is correct at each r.f. input. The diagram in Fig. 3 shows that we are not really measuring the true S/N because when the 0dB datum is set, especially at low r.f. inputs, the meter must be reading the noise as well as the signal. The ratio is thus  $S+N/N$ . It would not be valid to make a sensitivity measurement by switching off the r.f. completely because, then, the receiver's a.g.c. system might increase the r.f. and i.f. gain at zero signal level. The effects of the a.g.c. should, in any case, be considered. It is sometimes best to switch it off if possible. Ratios of  $S+N/N$  of 10dB sensitivity are often given in the specifications.

### The RF Level

The way that the signal is coupled from the signal generator to the receiver can yield a conflict between measured performance figures and specifications. It is, of course, very important always to ensure that the generator is terminated accurately to match the antenna input impedance of the receiver. In addition, the performance data should state whether the signal level corresponds to potential difference (p.d.) across the matched input or e.m.f. (electromotive force) from the generator direct. As p.d. corresponds to half e.m.f., the difference between e.m.f. (e.g. open circuit voltage from generator) and p.d. is shown in Fig. 4. Probably most reviewers of amateur radio equipment indicate sensitivity in terms of p.d., but unless the load coupling is accurately matched there will be errors. Many signal generators have their attenuators related to e.m.f., so if the generator indicates, say, 2μV (e.m.f.) for the required S/N, the sensitivity in terms of p.d. will be 1μV. The frequency spectrum over which the measurement is made will influence the results. Some engineers use 'weighting' circuits or low pass filtering so that the S/N performance relates more to the subjective (how we judge it by our ears) effect.

### Signal Noise & Distortion (SINAD)

Rather than actually switching off the modulation to measure the noise content at the given r.f. input, an alternative method uses a distortion factor meter to 'notch out' the modulated audio signal at the output of the receiver, so that the meter then indicates the ratio between the signal

plus noise plus distortion to the noise plus distortion ( $S+N+D/N+D$ ), which is often called the SINAD ratio. Dedicated meters are available for this sort of measurement, combining the readout proper, bandpass filtering and weighting and an automatically nulling notch filter. This tunes accurately onto the modulated tone and thus puts a 'notch' at that audio frequency, so that at the output (e.g. input to the readout) there remains the noise and harmonics (e.g. distortion), which are then read on an r.m.s. basis as a dB value below the datum value originally established by the instrument. The scheme is shown in Fig. 5.

It is possible, of course, to employ an ordinary audio distortion factor meter which some engineers, including me, regard as more convenient. The sensitivity is commonly referred to as a SINAD ratio of 12dB, which corresponds to a distortion factor meter reading of 25 per cent. The generator, of course, must produce modulation suitable for the mode under test, however, for s.s.b. it is feasible to apply an unmodulated carrier and adjust the receiver's tuning for a suitable (1kHz) beat note. This, then, represents the modulation which can be notched out in the usual way to achieve the SINAD ratio.

A similar thing can be done for c.w. measurements. However, where the S/N of very narrow band c.w. is being attempted, account should be taken of the noise power which is being removed by the notch filter. Notch filters for SINAD tests are very narrow, but so also are some c.w. filters! To avoid noise-power error, therefore, it may be desirable to quote mere S/N (not SINAD) for c.w. sensitivity measurements. With f.m. the generator should provide a deviation some two-thirds of the full deviation of the system (for example, around  $\pm 3.3$ kHz for narrow band f.m. (n.b.f.m.)).

The output of the receiver under test should be properly loaded (with a suitable resistor to match the speaker's impedance) and the volume control kept fairly low to avoid overload distortion. An output of about 50mW is a good level. This corresponds to 632mV across 8Ω or 447mV across 4Ω. It sometimes helps to monitor the modulation on a pair of phones or the receiver's speaker if this can be switched off when the actual measurement is made. The receiver must always be very accurately tuned to the generator signal.

### Noise Signal

Noise signal is born of the random movement of electrons in electronic circuits. It is the bane of all electronic engineers - not to mention radio amateurs! Over the years many things have been done and techniques evolved to try to minimise its effect; but it is still with us! From our 'phones or speakers it manifests as a hiss like the sound of car tyres on a wet road. When made up of components



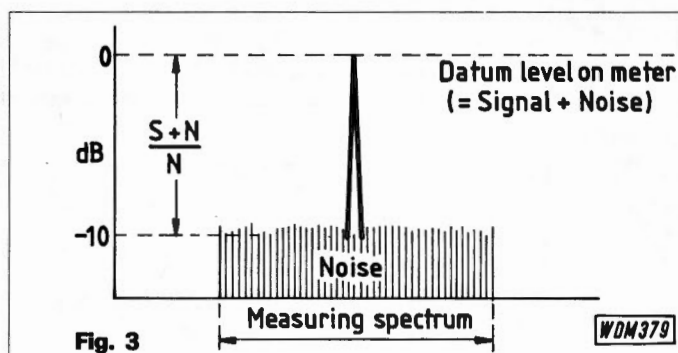


Fig. 3

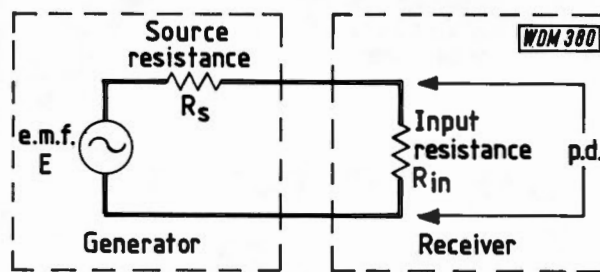


Fig. 4

covering a wide frequency spectrum it is called white noise, by analogy with white light which contains all the colours of the rainbow. Owing to the filters and response characteristics of our receivers the noise we hear is more 'pink' than white. It is weighted noise. Even so, over the air we often hear it referred to as 'white noise'.

### Noise Power

Power in the noise signal is equal to the product  $kTB$  where  $k$  is Boltzmann's constant ( $1.38 \times 10^{-23}$  joules/K),  $T$  is temperature kelvin (K) and  $B$  is bandwidth in hertz,  $K$  is referred to absolute zero ( $-273.16$  degrees C), so at an ambient of  $17^\circ\text{C}$ ,  $T$  calculates to a shade over  $290\text{K}$ , which is the noise temperature 'standard'.

As an example, the noise power in a resistor at  $17^\circ\text{C}$  works out close to  $4 \times 10^{-21}\text{W}$  per unit bandwidth (e.g. per Hz). Thus at  $10\text{Hz}$  bandwidth it would be  $4 \times 10^{-20}\text{W}$ , at  $20\text{Hz}$   $8 \times 10^{-20}\text{W}$ , at  $40\text{Hz}$   $1.6 \times 10^{-19}\text{W}$  and so forth. In other words, the noise power increases by  $3\text{dB}$  (it doubles) each time the bandwidth is doubled and decreases by  $3\text{dB}$  (it halves) each time the bandwidth is halved. This, of course, directly relates to the noise power bandwidth discussed earlier.

### Equivalent Noise Voltage

It is interesting to consider what sort of noise voltage noise power produces across a given resistor value over a stated bandwidth. Let's suppose that the noise power is acting in, say, a  $50\Omega$  load resistor over a bandwidth of  $2000\text{Hz}$  ( $2\text{kHz}$ ) at an ambient temperature of  $17^\circ\text{C}$ . Then, to work out the equivalent noise voltage we can use the simple expression of voltage equals the square-root of the product of the power is watts and the resistance in ohms.

We thus derive  $(kTB)0.5$ , where  $kTB$  is the noise power part and  $R$  the resistance. It should be noted that the noise power is that occurring in a matched load of the same value as  $R$  and is independent of the value of  $R$ . Substituting the figures, the noise voltage across the matched load resolves to  $2 \times 10^{-8}$  or  $0.02\mu\text{V}$ . With  $R$  at  $1\text{k}\Omega$  and  $B$  at  $5\text{kHz}$ , the noise voltage is around  $0.14\mu\text{V}$ . The open-circuit e.m.f., of course, is double these values, given by  $(4kTB)0.5$ , which is regarded as an r.m.s. voltage in series with the conductor resistance  $R$ . The noise voltage, of course, is amplified along with the antenna signal, and the effective  $S/N$  is further impaired by the noise contribution of the r.f. amplifier itself.

### Noise Factor & Noise Figure

Noise factor is the input  $S/N$  to the output  $S/N$ , both direct ratios, while noise figure is the  $\text{dB}$  Practical Wireless, March 1990

difference between the two when themselves expressed as  $\text{dB}$  ratios. For example, a  $5:1$  noise factor is  $7\text{dB}$  noise figure (e.g.  $10\log 5 = 7$ ).

If an amplifier produced zero noise (not possible!) the noise at the output would be the direct contribution of the input noise (e.g. from the antenna and load). In practice the output noise is bound to be greater. The noise figure is a measure of the 'noisiness' of the amplifier.

As an example, an output  $S/N$  of, say,  $2\text{dB}$  resulting from an input  $S/N$  of  $9\text{dB}$  would indicate a noise figure of  $7\text{dB}$ , this stemming essentially from the nature of the transistor and r.f. amplifier design.

Clearly, then, for the most effective operational  $S/N$  we need a receiver with a low noise figure, along with a reasonably strong antenna signal. However, at h.f., especially on the l.f. bands, a low noise figure is of very minimal consequence owing to the noises arriving from the antenna system itself! These tend virtually completely to mask the receiver noise. Just consider, for instance, the  $3.5\text{MHz}$  band after dark and not only QRM, QRN, atmospheric noises in general, but also the multiplicity of intermodulation products stemming from many strong signals, which not only produce a dramatic rise in overall noise level but also diminish the effective dynamic range! The noise level on this band can be greater than  $40\text{dB}$  ( $10\,000$  times) more powerful than the noise generated by the receiver.

### Noise Above $28\text{MHz}$

The noise figure plays a more important role at frequencies above about  $28\text{MHz}$ , where the antenna noise is essentially cosmic and hence more sanitary. At v.h.f. and above, therefore, we should strive for receivers with the lowest possible noise figures. Modern  $144$  and  $430\text{MHz}$  band rigs are, in fact, designed with a low noise figure in mind. This is aided by the use of low-noise r.f. amplifier transistors, and the design focusing on low noise performance rather than maximum possible gain.

It is not particularly easy to improve on the noise figure achieved by the manufacturer of a v.h.f. or u.h.f. rig without, perhaps, a minor redesign of the r.f. amplifier stage, for it is the first stage of a rig which is generally more important from the aspect of  $S/N$  ratio improvement than subsequent stages. Sometimes a change of r.f. transistor can help and/or careful realignment of the front-end for the lowest noise figure (e.g. best  $S/N$ ). After purchasing some years ago a Yaesu FT-480R  $144\text{MHz}$  rig, I was able to attain a very worthwhile improvement in noise figure merely by 'optimising' the drain current of the  $3\text{SK}59\text{Y}$  r.f. transistor and realigning!

If one has a 'deaf'  $144\text{MHz}$  band rig, there's always the temptation to hook in an external antenna pre-amplifier. Working  $144\text{MHz}$  band s.s.b. on a not-very-strong signal without the pre-amp, one can be fooled into concluding that the pre-amp is a

**Fig. 3: When measuring sensitivity a  $0\text{dB}$  datum is first established by the signal. The modulation is then switched off and the noise alone read as a  $-10\text{dB}$  value. However, because when the datum is established the meter is reading both the signal and the noise, the ratio is really  $S+N/N$  (signal plus noise over noise). The test spectrum will also determine the amount of noise indicated (see Fig. 2)**

**Fig. 4: Showing the difference between e.m.f. (the open circuit voltage,  $V$ ) and the p.d. (potential difference) across the matched coupling to the receiver. When the generator source resistance exactly matches the receiver's antenna input impedance, the p.d. is half the e.m.f. Because the antenna impedance of the receiver can affect the voltage, some engineers prefer to indicate antenna input voltage in terms of e.m.f. rather than p.d. - see text.**

# DEWSBURY

G4CLX

# ELECTRONICS



TS-140S £862.00



TS-940S £1995.00



TS-440S £1138.00

APPROVED  
KENWOOD  
DEALER



APPROVED  
KENWOOD  
DEALER



## IF IT'S KENWOOD IT MUST BE DEWSBURY

A FULL RANGE AVAILABLE



R2000 £595.00



R5000 £875.00

WAVECOM W4010



THE FINEST DECODER IN THE WORLD  
NOW WITH FAX. FROM £942 - SAE DETAILS

## REPAIRS

PROFESSIONAL  
INDUSTRIAL  
AMATEUR  
PMR

### Repairs and Service

- ★ 7 Working days guaranteed turnaround (subject to availability of parts)
- ★ 24 hour industrial service available
- ★ Collection and delivery of equipment, fully insured, arranged on request
- ★ Repairs to Kenwood, Yaesu, Icom, Ten Tec and all types of marine communications equipment



STAR MASTER - KEYER £54.70

FULL RANGE OF KENWOOD PRODUCTS STOCKED

We are also stockists of DAIWA — POCOM — JRC — TAR — WAVECOM — VIBROPLEX —  
MICROWAVE MODULES — B.N.O.S.

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG

Telephone: Stourbridge (0384) 390063/371228

Fax: (0384) 371228

Instant finance available subject to status. Written details on request.





# DEWSBURY

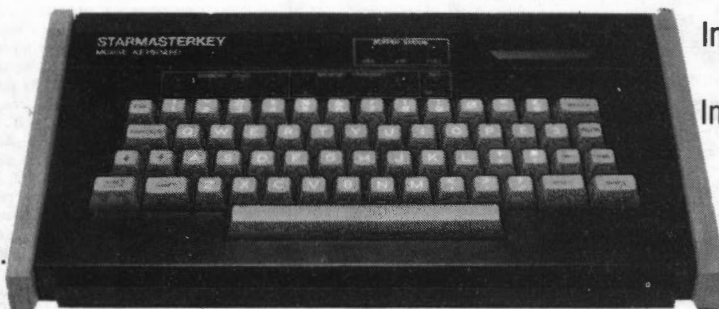
## G4CLX

# ELECTRONICS

From the makers of the world renowned STAR MASTERKEY a new MORSE KEYBOARD.

Send perfect morse as easily as typing a letter. It has never been as easy to send morse.

Variable transmission. Speed 1-99 wpm or 100-200-300-400 wpm for Meteor Scat operation.



**£199.95**  
INC VAT  
**P&P £5**

4 Message Memories each of 255 characters.  
26 scratch pad memories each of 127 characters.  
All memories stored on non volatile Ram. Messages stored for up to 5 years.

Indication of speed on 7 segment display.

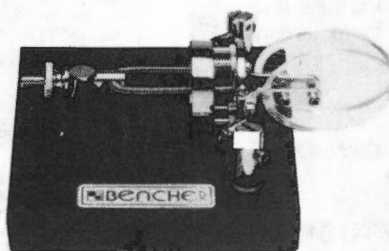
Indication of operating mode on leds.  
Sidetone and relay output for all types of transmitter.

Full QWERTY keyboard with real keys.

Metal cased for RF immunity.



**STAR MASTERKEY  
CMOS MEMORY KEYS**  
8 MEMORIES, BEACON  
MODE, DIRECT & GRID  
BLOCK KEYING. FULL  
DETAILS IN PREVIOUS ADS.  
STILL ONLY **£95.00**



**STAR MASTERKEY MKII**  
DOT-DASH MEMORIES  
IAMBIC OR SIDE SWIPE,  
SEMI AUTOMATIC MODE,  
12 VOLT OR INTERNAL  
BATTERY.  
**PRICE £54.70**

FULL RANGE OF BENCHER KEYS

POST, PACKING AND INSURANCE ON EITHER KEYS £3.00

FULL RANGE OF KENWOOD PRODUCTS STOCKED

We are also stockists of DAIWA — POCOM — JRC — TAR — WAVECOM — VIBROPLEX —  
MICROWAVE MODULES — B.N.O.S.

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG

Telephone: Stourbridge (0384) 390063/371228

Fax: (0384) 371228

Instant finance available subject to status. Written details on request.



# WOOD & DOUGLAS?

## YES, WOOD & DOUGLAS

We're still around and going stronger than ever! Despite the fact that it is nearly 24 months since we last advertised, we still receive a regular flow of orders for our wide range of amateur radio kits.

### Why hide our light under a bushel?

Because the many amateurs in professional radio communication activities spotted the fact that we were a source of high quality well engineered radio products that could make their busy engineering lives that much simpler. The result is a £1M turnover company providing professional equipment in the OEM, broadcast and security industries and employment for 20 enthusiastic people.

### So why advertise now?

To update our faithful followers that we have moved. Not just to any factory, but to a unique, purpose designed headquarters that will give us 10,200 square feet of production space.

### Where is it?

From the address it looks a long way from Youngs Industrial Estate but in fact it is just over the county boundary, less than a mile and a half distance. The phone numbers should be noted as these have recently changed.

*If you would like to know more about W & D, our products, either amateur or professional, then send a large stamped addressed envelope for a catalogue. Our many years of experience in amateur radio, telemetry modules, video links and radio talkback make us a prime source to satisfy your needs.*

Wood & Douglas, Lattice House  
Baughurst, Basingstoke  
Hampshire RG26 5LL

Telephone: (0734) 811444 Fax: (0734) 811567



# WOOD & DOUGLAS

VHF/UHF COMMUNICATIONS PRODUCTS

**H.T. TRANS** Prio 200/250V Sec 1720V at 550 Ma for FW Bridge £55. **COLLS** Roller Coaster tuning coils 20 Uh nom 2/20 Mc/s 36 tra on 2" ceramic former ext size 6 1/2 x 3 x 3" new. £28. **TAPE AUDIO** 1/2" on 7" spools 1800ft at present recorded with morse training lessons 4 tapes £11.50. **OPTICAL ACCS.** misc selection of items inc eyepiece, lens cell, lenses, prisms, mirrors, mostly new. 10/12 items. £23. **LASER DETECTOR HEADS** part of Simfire weapons simulator head contains 3 coils with internal electronics contained in weatherproof housing 3 1/2 x 3 1/2" reqs ext power modern equip. £14.50. control units also available. **POWER UNIT** General purpose bench HT/LT PU for 240V olps HT var 0 to 500V. 100Ma to 350V & 6.3V AC at 3 amps ct fitted V/Ma meter, screw term connec, in case. £38. **MONITOR CRT** part of Army D11 Tx. Modulation monitor tunes 2/22Mc/s in 5 bands as 2 1/2" CRT. TB & Y amp. etc also as 2x Ap Osc at 1015 & 1805c/s to enable two tone tests to be made on SSB Tx circa, reqs ext power with circ. £34.50 suitable trans for conversion. £7.50. **SIG GENS** Marconi TF995A/2 AM/FM 1.5 to 220Mc/s var o/p & deviation, fine & coarse atten, metered o/p neat unit size 17 x 12 x 9" tested with book. £115 also American USM-44 10/420Mc/s narrow band AM sig gen for 230V bench unit tested. £95. **CONT METER** No.1 portable Geiger Counter with meter Ind 0.1 to 10 Mill/Rontg also provision for phones two part unit contained in carry bag with phones & cable, req 300V, details of transis PU supplied tested with book. £45. **AERIAL** SWT type J of R1154/55 Inst selects Ae etc. £18.50. **R.F. UNITS** spare front ends for R210 Rx tunes 2/16 Mc/s in 7 bands with 455Kc o/p with valves & circ. £18.50. **A.F. OSC** Advance J1 for 240V Sine wave o/p 15c/s to 50Kc in 3 bands o/p at 5 & 600 ohm tested. £28. **MICROWAVE HEAD UNITS** part of ARAX-10 equip covers 2/11 Gz in 3 bands uses crystal video Rx with TWT amp one for each band with 4 signal olps per band req ext in case size 15 x 11 x 20" £95. **S.S.B. ADAPTORS** part of Army R234 Rx for use with 100Kc IFs as 3 filters provides low level audio o/p uses some 22 min valves reqs ext power & 100Kc drive on 19" panel with meter etc with book. £33. **SPEAKER P.A.** Army type 11" dia 15 ohm nom 20 watts weatherproof. £26. **FLASH UNITS** aircraft strobe type flash units in weatherproof fittings 3" dia for use on 24V DC (will work on 12V with lower o/p) kit comprises 2 x flash tubes, transis power unit, cables these flash alt port strbd, made by Helle. £35 set. **ARC-44 AIRBORNE T/Rx** compact unit intended for use in Helicopters covers freq range 24 to 51.9 Mc/s in 280 100Kc chan, F.M. nom D/P 8 watts into 50 ohm comprises T/R, Dynamotor, Chan Sel box, for use on 28V DC approx 5 amp uses min & sub min valves, also supplied with transis Intercom amp, with circ. £35 also available 8ft fibre glass whip with base & matching unt. £16.50. **CRYSTAL CAL.** small bench unit giving 100Kc & 1 Mc/s o/p in case for 240V £28. **METER PANEL** fitted with 4 miniature 1 Ma meter contained in case size 5 x 2 x 2" new £14.50. **AERIAL AMP & Dist** unit for use in freq range 162/174Mc/s provides 4 olps from single I/P reqs 12/24V DC as N type aka as 2 two stage transis amp on ea o/p. £16.50. **SPEAKER UNIT** Army AFV apk unit in metal case 5 1/2" dia by 3 1/2" deep speaker 2.5 ohm new. £11.50. **TUNER HEAD** 88/108Mc/s with 10.7 IF out req 12V manual tuned typed, 3 transis new. £7.50. **TRANS ISOL** 240/240V at 500 watts in metal case. £18.50. **PYE T470 BASE TX** Fm 420/430Mc/s for 240V with circ. £45. **METAL BOXES** misc selection of small enclosed boxes suitable RF use etc some die cast all with int fittings 6 for £9.50. **PLUG IMA.** Type A for use with Telequip D.43 Scopes @ £14.50. **ROTARY CONV.** 1/P 18V DC D/P 230V AC 180 watt 50c/s sine wave, approx 18 amp 1/P new. £45.

Above prices include Carr/Postage & VAT. Goods ex equipment unless stated new.  
SAE with enquiry or 2x20p stamps for List 44/1.

### A.H. SUPPLIES

Unit 12, Bankside Works, Darnall Rd, Sheffield S9 5HA.  
Phone. 444278 (0742)



**MERLIN WAY, BOWERHILL,  
MELKSHAM, WILTSHIRE SN12 6TJ.**  
Tel: 0225 706886. Fax: 0225 708594



### WIZARDS PACKS

#### THIS MONTH'S WIZARDRY The WIZARD PRECISION FILTER

240 volts AC, 13 amps input, 4 off IEC 6 amp sockets output, On/Off switch, Precision Potter block RFI filter, VDR, Mains lead and Plug, Merlin made case and built and tested.

This filter helps to remove your RF from the house wiring.

Price £27.48 VAT Paid P&P £3.00

#### The WIZARD'S best 13.8 volt PSU kit so project

In the kit: Pre built PCB, Super Mains Transformer, 3 inch Cube Heatsink, 6000uF Electrolytic, 25amp Bridge Rectifier, 12V DC Fan, Mains Filter, Overvolt Relay, LED Indicators, Amp Meter, Fuse Holders, Terminals and On/Off Switch.

This PSU has an output of 8amps and 8 to 18amps intermittent. With a full set of data sheets.

Price £33.80 + £4.50 P&P

#### LINEAR AMPLIFIER BUILDERS

8 off 220uF 400V Electrolytics with mounting clips

Price £15.00 post paid

Printed Circuit Permanent Magnet Motor/Generator with toothed belt reduction drive. Input/Output 2VDC to 30VDC at upto 10Amps. Price £14.00 + £3.50 P&P.

New in Controller Card for the above and others Input power + and - opto 50VDC. This will give a single 5k ohm pot variable speed forward and reverse. Price £7.50 + £2.50 P&P.

**COMPRESSORS** - East rotary air/vacuum pump 20psi/29invec, 1/12th HP 240Vac motor. Good for Desoldering/Airbrush work. Just £17.00 + £3.00 P&P.

**IN THE WIZARDS DEN!** - We have from time to time the following new and S/H stock. Printers, Monitors mono/colour. Valve amps and PSUs. Lots of odds and ends.

**MORE DATA** - Ring the wizard on 0225 706886 (Day time) 0225 763027 (Home). For more information or for a visit to the works.

**PAYMENT** - Access, Cheque, PO and Cash Post and Packing on components £1.50, over £20.00 £1.00. Please add VAT to total.

Thank you John and Adrian the Sorcerers Apprentice!

We would like to thank all our new customers of 1989 for their support. By the way if you have a project you would like to be manufactured, we are always on the lookout for new Wizardry.

Sorry for the delay over the list, but we have put all our stock on computers and this has taken time, this is the Wizards worst enemy!

#### WELL A HAPPY CHRISTMAS AND ALL THE BEST IN 1990 FROM JOHN THE WIZARD

By the way if you would like to see our Kits and Packs in 1990. We cover just about all the UK at Rallies and Exhibitions, if you would like a list of these, just give me a ring!

#### Storno Mobile Radio Telephone

Type 634  
68-98 MHz  
12.5 kHz Channel Spacing  
± 2.5 kHz Deviation  
Max Bandwidth 1000 kHz  
RF Output Power 10 watts  
Mod FM  
Sensitivity 0.7uV  
12 Volt or 24V Input DC with Control Gear and Data OK for 4 mt.

Price £25.00 + £5.00 P&P

#### THE WIZARD POWER CUBE Specification

- 1 20 Amp Hour Dryfit Battery
- 2 Inbuilt Mains Charger
- 3 RF Filtered
- 4 Solar Cell Input (Cells optional)
- 5 Compact Size/Portable
- 6 Merlin Made

Price £76.00 + P&P £8.00



worthwhile device by the way the S-meter reading shoots up when it is switched in! Any pre-amp will give higher S-meter readings and make s.s.b. signals louder; but is the S/N improved? Try tuning an R3/R4 s.s.b. signal without the pre-amp, and then switch in the pre-amp. After resetting the volume control to get the audio level the same as before, determine whether the signal is now R4/R5. If it isn't, then there's not much point in having the pre-amp in circuit. In fact, it could be doing more harm than good merely by amplifying all the signals - weak and strong ones - and hence dramatically reducing the overload margin of the receiver, and possibly inciting spurious responses and intermodulation products in the r.f. amplifier and mixer stages! In other words, the dynamic range of the receiver could be impaired by as much as the gain of the pre-amp. The craft, then, is not particularly for high gain, but for the best noise figure!

### Improving the Overall Noise Figure

Nevertheless, a well designed pre-amp, such as those produced by the small, specialised British firms can certainly enhance the S/N performance of a v.h.f. front-end if the rig itself isn't endowed with a particularly exciting noise figure. As already mentioned, it is the first r.f. amplifier which is the critical one from the noise performance aspect. Total noise of a system takes account of the input circuits, r.f. amplifier, mixer, etc., according to the expression:

$$N_f1 + \frac{N_f2 - 1}{G_1} + \frac{N_f3 - 1}{G_1 \times G_2} + \dots$$

where  $N_f1$ ,  $N_f2$ ,  $N_f3$ , etc., are the noise factors of the first, second, third, etc., stages and  $G_1$ ,  $G_2$ , etc. are the direct ratio power gains of the first, second, etc., stages. Let's suppose that our 144MHz band rig has a noise figure of 4dB (2.5 noise factor) and we hook in a pre-amp with 2dB noise figure (1.58 noise factor) and 14dB gain (25:1 power ratio), then by using the first part of the foregoing expression we obtain:

$$1.58 + \frac{2.5 - 1}{25} = 1.64 \text{ noise factor}$$

or 2.15dB noise figure

Thus, by using this low noise pre-amp we have achieved a 1.85dB improvement in noise figure over the rig without a pre-amp. Quite a worthwhile improvement which would undoubtedly be noticeable on a weak s.s.b. signal, possibly making an R3/R4 signal into an R5 one!

We can do even better than this by putting the

pre-amp at the top end of the feeder, near the antenna. If, for example, the feeder at 144MHz has a loss of 3dB, the signal at the input of the pre-amp will be twice the power, thereby improving the S/N by 3dB. However, the total noise figure will worsen since in effect 3dB will be knocked off the pre-amp gain, leading to a total noise figure of 2.3dB, which is still very good.

If the feeder is fairly long and hence lossy, it certainly pays to site the pre-amp close to the antenna; but with an ordinary antenna system the pre-amp at the rig end of the feeder will do a good job if its noise figure is less than that of the rig. A relay, r.f. or 'hard-switched' operated, by-passes the pre-amp in the transmit mode.

In summary then, the noise factor of an ideal receiver can be defined as the number of times by which the signal power from the antenna must exceed kTB to provide unity S/N! In terms of practical performance, a receiver with 10dB S+N/N with an input of 1μV to 3μV is very good. At v.h.f. and above, higher sensitivities are being achieved; but at h.f. the 'usable sensitivity' is invariably established by atmospheric and other noises below 12MHz, as already noted.

Because of the reduced noise-power bandwidth required for reading Morse code, receiver sensitivity is commonly higher in this mode. In fact, with a narrow-band c.w. filter a S/N advantage up to 20dB becomes possible in with respect to s.s.b. This means that a signal just bordering on R5 c.w. would need to be raised by more than three S-points to provide similar readability on s.s.b. Or, put another way, a c.w. transmitter with 100 times less power would provide a similar readability. Hence the popularity of c.w. QRP.

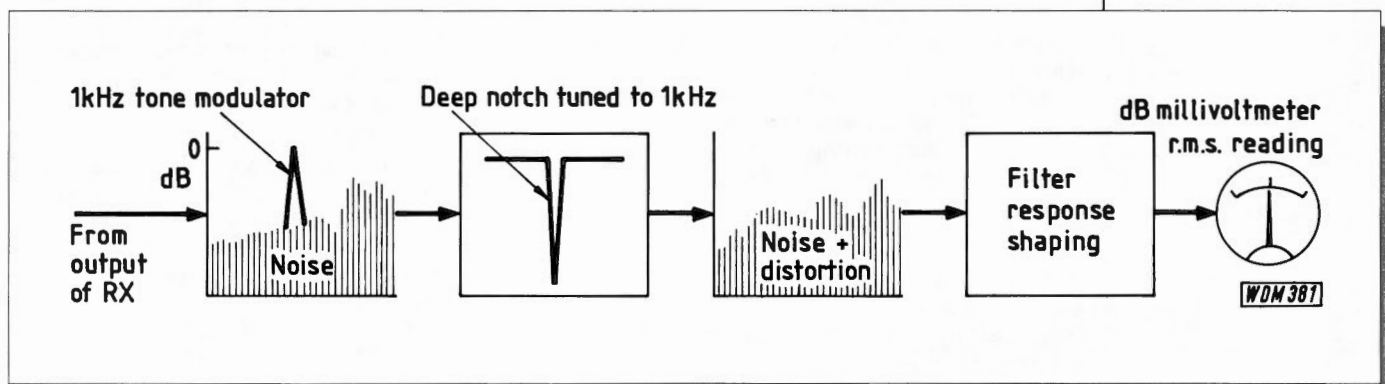
### Dynamic Range

The noise floor is also caused to rise by spuri and intermodulation effects generated in-band by the large-signal limitations of all receivers. Viewed from the large-signal side of the dynamic range sandwich, the 'usable dynamic range' can be regarded as that dB range over which the multiplicity of signals can increase such that the intermodulation products (essentially third and odd-order) do not result in a significant rise in noise floor. In other words, a receiver with a good dynamic range performance is not only adequately sensitive for the band in use, but also one whose spuri and intermodulation products are well tamed.

We have seen, therefore, that receiver sensitivity is certainly not the 'be all and end all' of receiver performance. A more important consideration, in fact, can be how well a receiver can handle strong signals.

PW

**Fig. 5: Showing the signals and instrumentation for a SINAD sensitivity test. The receiver r.f. input is adjusted for a SINAD ratio of 12dB (corresponding to a distortion factor meter reading of 25%), making sure that the 0dB datum is correctly set for each r.f. level change. The SINAD sensitivity is given by the signal generator, usually expressed as μV (p.d.)**



# Keyed-in Morse



*This Morse training program, written by G1TEX, takes advantage of the availability and convenience of a portable computer to provide random Morse characters on the move or at unusual times*

Although I have held my Class 'B' licence since early 1986, it is only recently that I have made any determined efforts to learn Morse. The days that separated the Morse classes, run by Phil G0KKL, meant that any advances in ability made during the sessions were eroded by not listening to Morse inbetween times. I had tried commercial tapes, but these proved unsuitable in my case. The sounds of chairs scraping and intestinal activity of the person generating the Morse were distracting on one tape and I found myself listening less and less. Finally Phil said "You have a computer, why don't you write a program to train yourself"? The listing reproduced here is the result of being unable to answer that question.

## Starting Point

I have several computers, but the one I chose for the program is a Tandy Model 100. This small portable computer has 32KBytes of memory, runs from batteries and has various utility programs built into it. Not only that, but it also has a good, if not fast, version of BASIC. I had an Olivetti M10 version of this computer previously and the program will run on that, also I believe NEC make a copy of this machine although I do not know the model number of their machine.

Basically, the program will turn characters, saved previously in a text file, or a pseudo-random series of characters into the equivalent Morse tones. Either numbers or letters or mixed letters and numbers may be produced, with the possibility of limiting the characters to those that cause problems.

When typing the listing in, each BASIC line should have no spaces between the words, except where they have a textual meaning. So there should be no attempt to make the listing on your machine look tidy. The spaces within the program line will only slow the maximum speed down, which might eventually make the Morse less useful.

## Definitions

Only lines 1 and 2 produce Morse sounds, all the others are there for support and organisation. Sound is produced by the BASIC command SOUND tone, duration. Where tone is an inverse number, i.e. high number-low note, and duration is in fiftieths of a

```

0 GOTO 1000
1 SOUND TN,DI:FOR Y=0 TO WC:NEXT
:RETURN
2 SOUND TN,DA:FOR Y=0 TO WC
:NEXT:RETURN
3 PRINT C$;:FOR Y=1 TO WW:NEXT:RE-
TURN
4 FOR X=1 TO LEN(MC$):IF MID$(MC$,X,1)
="." THEN GOSUB 1:NEXT:RETURN
ELSE GOSUB 2:NEXT:RETURN
5 X=(INSTR(MA$,C$)-1)/2+1:MC$=MC$(X)
:GOSUB 4:GOSUB 3:IF INKEY$=
CHR$(27) THEN GOTO 10 ELSE RE-
TURN
6 FOR X=1 TO 2*WW:NEXT:PRINT " ";:RE-
TURN
10 CLOSE:CLS:PRINT " Produce MORSE
tones from ? ":PRINT "[P]re-recorded mess-
age":PRINT "[K]eyboard text input"
:PRINT "[R]andom characters":PRINT
"[C]hange parameters":PRINT "[ESC] to
quit"
11 IN$=INKEY$:IF IN$="" THEN GOTO 11
12 IF IN$="P" OR IN$="p" THEN GOSUB 200
:GOSUB 100:GOTO 10
13 IF IN$="K" OR IN$="k" THEN GOSUB 300
:GOSUB 100:GOTO 10
14 IF IN$="R" OR IN$="r" THEN GOSUB 400
:GOSUB 100:GOTO 10
15 IF IN$="C" OR IN$="c" THEN GOSUB 500
:GOTO 10
16 IF IN$=CHR$(27) THEN CLS:END ELSE
GOTO 10
100 IF LEN(MS$)>0 THEN MC$=".-."
:GOSUB 4:GOSUB 6:CLS:FOR N=1 TO
LEN(MS$):C$=MID$(MS$,N,1):IF C$=""
THEN GOSUB 6:NEXT ELSE GOSUB 5
:NEXT
120 RETURN
200 CLS:FILES:PRINT "Please use only a file
name":INPUT"with 'DO' in it":FL$
:OPEN FL$ FOR INPUT AS 1:CLS
210 IF NOT EOF(1) THEN INPUT#1,MS$
:GOSUB 100:GOTO 210
220 GOTO 10
300 CLS:INPUT"Please input your text up to 4
lines>":MS$:CLS:GOSUB 100:GOTO 10
400 CLS:PRINT "[L]etters":PRINT "[N]umbers"
:PRINT "[ESC] to RETURN"
401 IN$=INKEY$:IF IN$="" THEN GOTO 401
402 IF IN$="L" OR IN$="l" THEN GOTO 410
403 IF IN$="N" OR IN$="n" THEN GOTO 420
404 IF IN$=CHR$(27) THEN RETURN
405 GOTO 400
410 CLS:PRINT "Enter the characters to be prac-
ticed or press [ENTER] key for the al-
phabet..":INPUT RN$:IF RN$="" THEN
RN$="ABCDEFGHIJKLMNOPQRSTUVWXYZ
WXYZ":GOTO 450 ELSE GOTO 450
420 RN$="0123456789"
450 RL=LEN(RN$):CLS:PRINT "Please wait
generating the characters":FOR X=1 TO
VAL(RIGHT$(TIMES,2)):RN=RND(X)
:NEXT:MS$=""
451 FOR GP=1 TO 30:FOR CH=1 TO 5
:RN=RND(9)*RL+1
:MS$=MS$+MID$(RN$,RN,1)
:NEXT:MS$=MS$+" ":NEXT

```

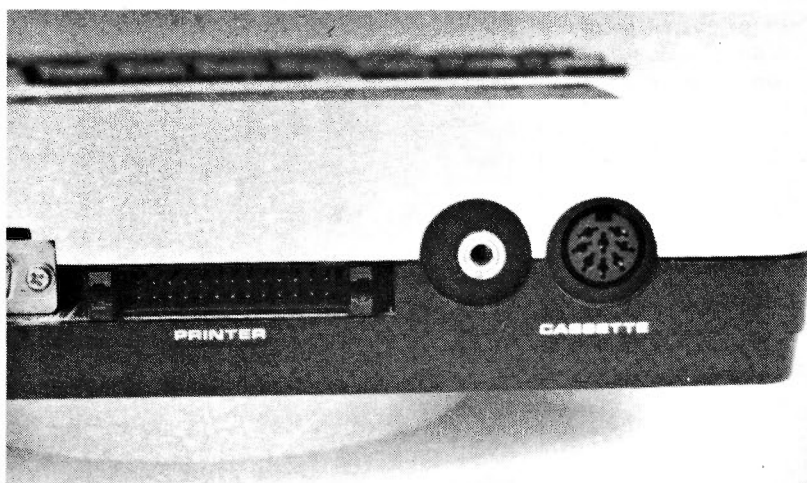


```

452 CLS:PRINT "[ESC] to quit":PRINT " any
    other key to continue"
455 IN$=INKEY$:IF IN$="" THEN GOTO 455
456 IF IN$=CHR$(27) THEN GOTO 10 ELSE
    RETURN
500 UP=0:CLS:PRINT "Change which parameter
    ?":PRINT "[T]one of character":PRINT
    "[S]peed of character":PRINT "[W]ait peri-
    ods":PRINT "[ESC] to quit"
501 IN$=INKEY$:IF IN$="" THEN GOTO 501
    ELSE IF IN$=CHR$(27) THEN RETURN
502 IF IN$="T" OR IN$="t" THEN GOTO 520
503 IF IN$="S" OR IN$="s" THEN GOTO 530
504 IF IN$="W" OR IN$="w" THEN GOTO 540
505 GOTO 500
520 UP=0:CLS:PRINT "press":PRINT "[1] to go
    higher":PRINT "[0] to go lower":PRINT
    "[ESC] to return"
521 IN$=INKEY$:IF IN$="" THEN GOTO 521
    ELSE IF IN$=CHR$(27) THEN RETURN
522 IF IN$="1" THEN UP=-0.1*TN ELSE IF
    IN$="0" THEN UP=0.1*TN
523 MSS="k":TN=TN+UP:GOSUB 100 :GOTO
    500
530 CLS:PRINT "Press":PRINT "[1] for faster"
    :PRINT "[0] for slower":PRINT "[ESC] to
    return"
531 IN$=INKEY$:IF IN$="" THEN GOTO 531
    ELSE IF IN$=CHR$(27) THEN RETURN
532 IF IN$="1" THEN DI=DI-1:DA=3*DI
    :GOTO 590
533 IF IN$="0" THEN DI=DI+1:DA=3*DI
    :WC=2.5*DA:GOTO 590
534 GOTO 530
540 CLS:PRINT "Press":PRINT "[1] for shorter
    pauses":PRINT "[0] for longer pause"
    :PRINT "[ESC] to return"
541 IN$=INKEY$:IF IN$="" THEN GOTO 541
    ELSE IF IN$=CHR$(27) THEN RETURN
542 IF IN$="1" THEN WW=WW*.75:GOTO 590
543 IF IN$="0" THEN WW=WW*1.5:GOTO 590
544 GOTO 540
590 TN=TN+UP:MSS="kkkkk":GOSUB 100
    :GOTO 500
1000 CLEAR 5000:DI=3:DA=3*DI: WC=
    2.5*DA :WW=4*WC:TN=2000
1010 DIM MCS(36):FOR X=1 TO 36 :READ
    MCS(X) :NEXT
1020 MAS="aAbBcCdDeEfFgGhHiIjJkKlLmM
    nNoOpPqQrRsStTuUvVwWxXyYzZ1122
    3344556677889900"
1025 GOTO 10

1030 DATA "-.", "-..", "-.-.", "-.."
1031 DATA ". ", ".-.", "-.-.", "...."
1032 DATA "..", "-.-.", "-.-.", "-.-."
1033 DATA "-.-.", "-.-.", "-.-.", "-.-."
1034 DATA "-.-.-.", "-.-.", "-.-.", "-.-"
1035 DATA "-.-.", "-.-.", "-.-.", "-.-."
1036 DATA "-.-.-.", "-.-."
1037 DATA "-.-.-.", "-.-.-.", "-.-.-.", "-.-.-"
1038 DATA ".....", "-.-.-.", "-.-.-.", "-.-.-"
1039 DATA "-.-.-.-.", "-.-.-.-"

```



The 'spare' plastic panel used for the audio output socket.

second the variable DI holds the length of a dot, and DA the length of a dash. Their relationship is set in line 1000 at 1:3. Variables WC and WW hold inter-character, and inter-word pause values. The Morse characters themselves are held in an string array MCS(), and lines 1030 to 1039 hold representations of A-Z and 0-9. Please note again that lines 420 and 1020 have no spaces. Similarly in line 410 beginning THEN RN\$="A...YZ". The string RN\$ holds the characters from which the random Morse will be produced in lines 450-456.

### Menu Choices

The main menu is presented in line 10, with lines 11-16 selecting and calling the various subroutines. Pressing the [ESCAPE] key whilst Morse is being produced will result in the program returning to this menu within a few seconds. Pressing [ESCAPE] at this menu causes the program to terminate. Once you are sure that the program works, and a copy has been saved to tape or disk, line 16 may be amended to ....THEN MENU ELSE GOTO 10, instead of its present form.

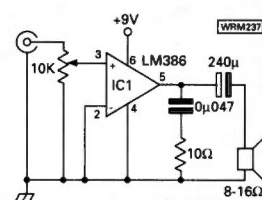
### Parameters

Lines 500-590 provide a means, within the program, of changing various parameters. These being the length of the dots and dashes, the pauses between characters and words, and the tone of the Morse produced. Generally choosing '1' causes a speeding up or raising of pitch, and choosing '0' the opposite. The rate of change of these parameters may be varied by altering the step factors used to vary the value of each variable. Remember strange things occur if the dot length reaches zero, or the pitch becomes a negative number.

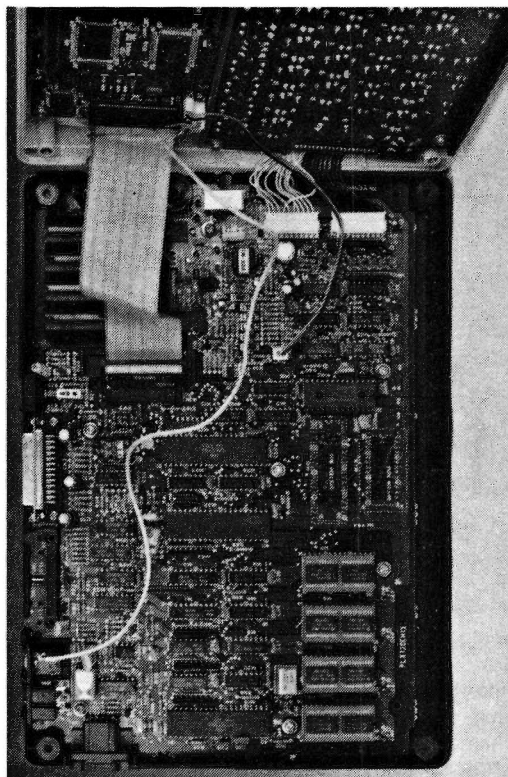
### Pre-recorded Text

The only area not covered is the use of prewritten text, which may be created with the inbuilt text editor. These files which the system uses the '.DO' extension to signify a textual document, are read in, at up to 240 characters and spaces at a time. Each character read in will be sounded as Morse, followed by putting it on screen just before sounding the next. This use of prewritten text allows a more natural style of word sizes, rather than the unnatural 5 character groups created in a pseudo random manner

Experiments with an amplifier showed that a better tone was produced if an audio amplifier as below was used. If this also has a tone control, then very smooth sounding Morse may be produced which sounds more like the real thing.



**View inside the case showing the miniature coaxial cable connecting the buzzer output to the 3.5mm jack socket on the back panel.**



in line 451. The latter half of line 450 is an attempt to create a differing series of characters each time the program is run. (Other computers may use the RANDOMIZE command to achieve this).

#### **Minus points**

The Morse characters become more staccato and less ideal as the dot time is shortened and is too mechanical to be the only training used. It should augment the periods of listening to Morse created by hand, either in a club or by listening to the radio. Finally the volume of the Tandy is not in the earsplitting range, so a method of making more sound was sought. Sound is produced using a ceramic sounder behind the badge on the upper right hand side of the front panel. An audio frequency signal is sent to this sounder to produce the 'tinny' tone. On my model there was an unused plastic panel onto which a 3.5mm jack socket could be fixed, to allow the inbuilt sounder to be bypassed and an amplifier to be used.

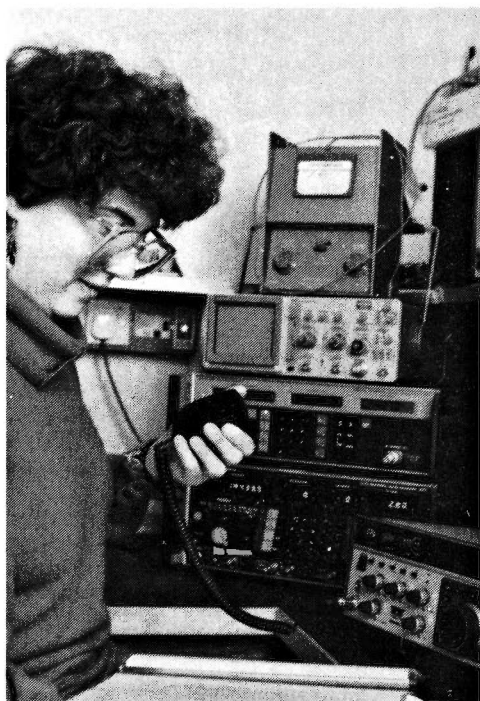
This has not made learning Morse any easier, in fact I have spent less time learning, but I now have no excuse for not being able to practice. Five minutes listening may be achieved at any time of the day or, much to my long suffering XYL's disgust, the night.

Dah-Di-Dah.

**PW**

# **WIRELESS-LINE**

***Your connection for up-to-date information on all aspects of amateur radio and home construction.***



***Dial 0898-654632 for the latest news on Propagation, HF, VHF & Satellite Operating, DX, Special Event Stations, Exhibitions, Rallies, Cancellations and all the other news.***

***Read to you by Elaine Richards G4LFM, the bulletin is up-dated each Friday.***

***Don't forget - for the latest news, contact Wireless-Line on 0898-654632.***

***Calls are charged at 38p per minute Peak, 25p per minute off-peak.***



# ICOM

## IC-735.



**Credit facilities available**

- Small Compact Size.
- 100kHz-30MHz General Coverage Receiver.
- 100 watts.
- 105dB Dynamic Range.
- FM Standard.
- 12V Operation
- Large LCD Readout.
- 12 Memories.
- CI-V Communications Interface
- HM12 Microphone.



**Icom (UK) Ltd**  
Unit 8/9 Sea Street Industrial Estate, Herne Bay, Kent CT6 8LD. Telephone: (0227) 369464.  
**Open: 9-5.30, Lunch 1-2pm. Mondays to Saturdays.**



# ICS

## ICS Electronics Ltd

### Superior Weather Information by Radio

#### FAX-1 Facsimile Demodulator



The Fax-1 prints weather maps, press photos, amateur facsimile, RTTY news and weather bulletins and Navtex weather and navigation warnings. It connects directly between the extension speaker socket of an HF SSB receiver and most commonly available computer printers, giving superb results with minimal operator intervention. A marine installation kit with 12 volt printer is available (the Marinepack). As used by professional weather forecasters, oil rigs, Whitbread Round the World Race yachts and discerning amateurs everywhere. Full details are contained in our catalogue, which is available on request.

**FAX-1: £279.95 (inc VAT) plus £5.00 post and packing.**

#### MET-2 Weather Satellite Receiver



The MET-2 receives signals directly from the geostationary Meteosat satellite to give an updated view of Europe every half hour. You can see the same pictures on the TV news.

It comprises an antenna, 20 metres of cable, a receiver and demodulator and software for IBM-PC, Amiga and Atari computers. Animation software and IBM-PC VGA support are optional extras.

With this system, ICS have achieved a dramatic price breakthrough. The MET-2 is the result of years of experience in manufacturing similar systems for the commercial and education markets. Send for details now!

**MET-2: £689.94 (inc VAT) plus £9.50 post and packing**

**ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD**  
**Telephone: 0800 525142 (Orders) 0903 731101 (Enquiries) Facsimile: 0903 731105**

## Construction

*In this final part of the PW Irwell, The Reverend George Dobbs G3RJV describes how to case the project and interconnect the modules to complete the QRP transmitter.*

# PW Irwell Part 3



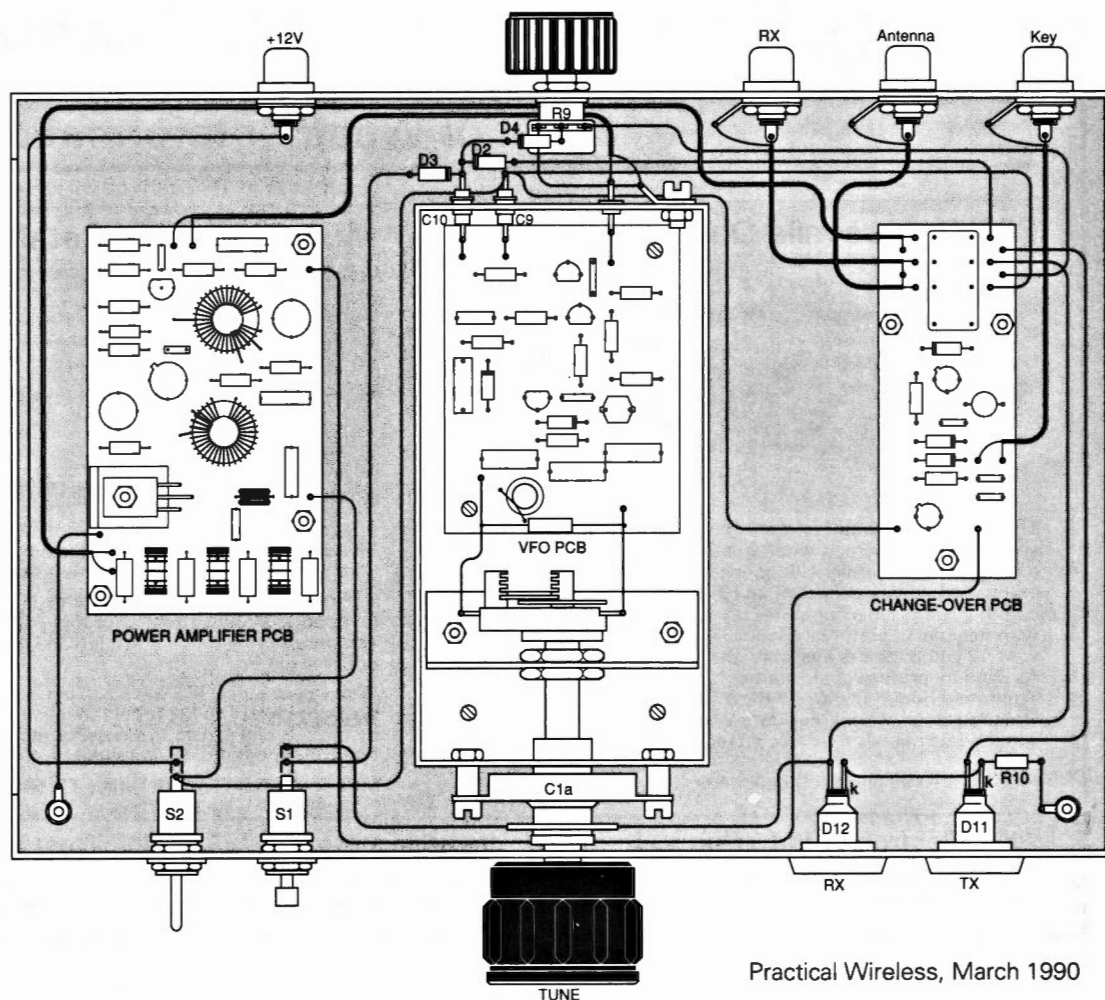
The prototype Irwell was built into a Minfordd Engineering Equipment Case Type J9 because the J9 case is both attractive and easy to drill. I drill the holes for controls slightly undersized and then enlarge them with a hand reamer to the correct size. The placement of the boards and controls is shown in Fig. 3.1. Mark and drill the holes for the various sockets and l.e.d.s then using standoffs, mount the boards in their respective positions. The case allows plenty of room for the boards, with the v.f.o. in its own box, placed in the centre. The signal leads must be wired with screened leads, and these are shown as the bold lines in Fig. 3.1. Ideally miniature 50Ω coaxial cable should be used. The commonest small coaxial cable available is type RG174, but often it is stiff and difficult to use for small interboard connections. In practice small screened cable, sold as microphone cable, may be used for the interconnections without too many problems.

## Front and Back

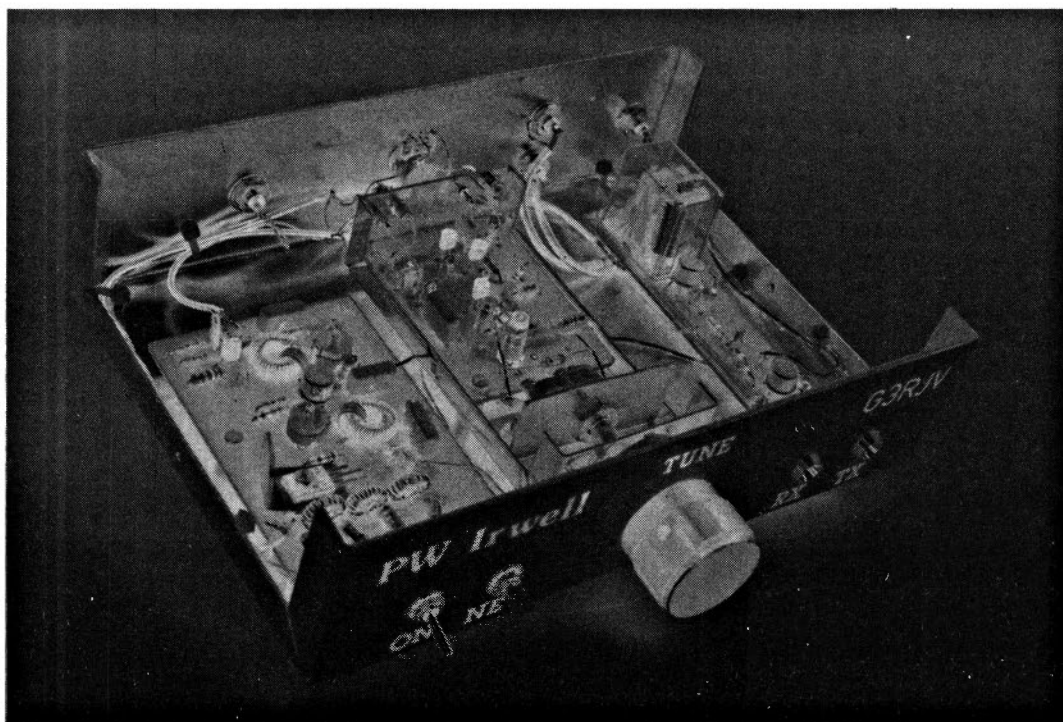
The front panel on the prototype was finished off with a false front made of thin white card, with legends produced using dry rub-down lettering. This card is protected by a layer of sticky-backed transparent plastic of the type used for covering books. The main connections into the Irwell are all on the back panel and consist of: 12V in, key, antenna and receiver. I have used phono sockets for all these terminations because they are cheap and standard in my shack, but any type of connector may be used. If phono sockets are used throughout it is essential to clearly mark and remember which socket is carrying the 12V input.

It is easy to overlook interconnections between the various boards, so work in a logical order. I would suggest beginning with the 12V input from the back of the case. Add all the power leads

**Fig. 3.1: Finished layout of the transmitter showing p.c.b. interconnections.**







**The Irwell in its finally assembled form.**

beginning with the 12V via S2, then adding +12, +TX and +RX interconnections leads. The v.f.o. cut-off control, R9, is mounted on the back panel of the outer case behind the the v.f.o.box. The signal connections starting from the v.f.o. may then be added.

### Putting It To Use

The Irwell requires a nominal 12V stabilised supply at a load of around 1A. One of the cheaper p.s.u.s available from radio shops should easily supply enough power. Bear in mind though, that a poorly regulated supply could result in a poor transmitter tone so please try to make sure that the smoothing is adequate.

The Irwell is actually very simple to use. The receiver is connected to the receiver socket SK3 which, on receive or with the unit switched off, connects to the antenna. When the key is pressed, relay RLA connects the antenna to the output of the p.a. board.

The transmitter does not have a built in sidetone monitor, as I prefer merely to back off the receiver gain control and listen to the actual signal. Most receiver front-ends will cope with the few watts of r.f. passing close to the input, but being cautious I

have added a little more receiver protection. The diodes D13 and 14 shown in Fig. 2.3 of PW Feb. '90, show how a pair of diodes may be mounted back-to-back across the receiver socket to limit the amount of r.f. voltage that can enter the receiver.

### Hints & Tips

Operating QRP is good fun, ask any of the several thousand members of the G-QRP Club and they will confirm this.

There are, though, a few simple rules which help to reduce possible frustration. Avoid just simply going on the band and calling "CQ". Listen for and call other stations after carefully netting onto their frequency. Using the tail-ending technique is a good method of QRP working, that is calling one of the stations at the end of an existing QSO. Wait for the final exchange and call the required station by using a 'two by two', that is his callsign twice then your own twice. Call just a little slower than the previous QSO speed. Avoid giving your power level until after a report has been given, this can be worth up to 2 extra S-points! Try listening on or near 7.030MHz for other QRP stations. Above all, expect to make QSOs and you will. Have fun!

**PW**

## Errors & Up-Dates March 1990

### **PW Review. Ten-Tec Omni V Transceiver, February 1990.**

An extra V crept into the headline of the review. The transceiver is of course, for the h.f. bands. We apologise for increasing the versatility of this excellent transceiver.

### **Errors & Up-Dates, February 1990.**

Readers wishing to build the PW 49'er In-Car Short Wave converter which appeared in the January issue (the p.c.b., layout, reference WR267, was reprinted in the February issue for the benefit of those readers wishing to make their own boards) can now obtain the ready-made board from the PW p.c.b. service @ £6 inclusive of P&P.



Printed circuit boards for *Practical Wireless* constructional projects are available from the PW PCB SERVICE. The boards are made in 1.5mm glass-fibre, and are fully tinned and drilled. All prices include postage, packing and VAT for UK orders.

Orders and remittances should be sent to: **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP**, marking your envelope **PCB SERVICE**. Cheques should be crossed and made payable to PW Publishing Ltd.

When ordering, please state the Article Title and Issue Date as well as the Board Number. Please print your name and address clearly in block letters, and do not send any other correspondence with your order. You may telephone your order using Access or Visa. A telephone answering machine will accept your order outside office hours.

Please allow 28 days for delivery. Always check the latest issue of *PW* for the current details of price and availability. Please enquire for p.c.b.s not listed here.

Board	Title of Article	Issue	Price £
WR269	GLYME	FEB 90	6.70
WR268	IRWELL (r.f. p.a.)	FEB 90	6.00
WR264	IRWELL (relay)	FEB 90	5.00
WR263	IRWELL (vfo)	JAN 90	6.00
WR267	FORTYNINER	JAN 90	6.00
WR266	TUNED ACTIVE ANTENNA	JAN 90	5.60
WR265	TUNED ACTIVE ANTENNA (psu)	JAN 90	5.60
WR261	AM TX FOR 1.8MHz	NOV 89	6.50
WR260	10MHz RECEIVER	OCT 89	5.00
WR259	10MHz RECEIVER	OCT 89	5.00
WR258	10MHz RECEIVER	OCT 89	5.00
WR257	LOW BATTERY WARNING	SEPT 89	5.88
WR256	ACTIVE FILTER	AUG 89	6.96
WR254	TX CONTROL FOR MOBILE USE	JULY 89	5.08
WR253	TS940S MODIFICATION	JUNE 89	5.54
WR252	TWO TONE OSCILLATOR	MAY 89	6.52
WR251	RF OPERATED RELAY	FEB 89	3.80
WR250	DC/AC POWER CONVERTER	JAN 89	3.22
WR249	"MARLBOROUGH" MF CONVERTER	DEC 88	4.60
WR248	"BADGER" 144MHz RECEIVER	OCT 88	9.10
WR247	ZENER DIODE TESTER	AUG 88	3.56
WR246	"PORTLAND" RF VOLTMETER	JULY 88	3.59
WR244	PRACTICE MORSE KEY	JULY 88	2.96
WR245	STOPBAND FILTER FOR PW BLENHIEM	JUNE 88	2.90
WR243	VHF MONITOR RECEIVER (AUDIO)	APRIL 88	2.30
WR242	"ORWELL" VARICAP TUNE OPTION	MAR 88	2.90
WR241	"ORWELL" MED. WAVE RECEIVER SET	MAR 88	
WR240	" "	" "	9.10
WR239	" "	" "	
WR238	"OTTER" 50MHz RECEIVER	JAN 88	7.10
WR237	RTTY TUNING INDICATOR	NOV 87	5.20
KANGA	HIGH STABILITY VFO (see issue)	OCT 87	-
WR236	"BLENHIEM" VHF CONVERTER	SEPT 87	4.50
WR235	MAINS ON/OFF FOR BATT RADIOS	SEPT 87	3.00
WR234	SIDE-TONE OSCILLATOR	JUNE 87	2.70
WR233	"DOWNTON" F-V CONVERTER	JUNE 87	3.90
WR232	"AXE" SIGNAL TRACER	MAY 87	
WR231	" "	" "	9.20
WR230	" "	" "	
WR228	"BLANDFORD" RECEIVE CONVERTER	APRIL 87	
WR227	" "	" "	9.70
WR226	" "	" "	
WR298	"ITCHEN" LCR BRIDGE	APRIL 87	3.40
WR225	"WOODSTOCK" SW CONVERTER	MAR 87	4.10
WR219	MASTHEAD PRE-AMP PSU	FEB 87	2.50

Board	Title of Article	Issue	Price £
WR218	MASTHEAD PRE-AMP FOR 144MHz	FEB 87	4.20
WR224	"WESTBURY" BASIC WOBBULATOR	JAN 87	3.50
WR214	MOD SRX-30D (AUDIO)	DEC 86	3.00
WR223	HIGH-IMP MOSFET VOLTMETER	DEC 86	2.90
WR222	"TAW" VLF CONVERTER	NOV 86	2.80
WR216	LF BANDS ACTIVE ANTENNA	NOV 86	2.40
WR220	GET STARTED LOW-COST CONVERTER	OCT 86	2.40
WR217	AUTOMATIC NICAD CHARGER	OCT 86	2.40
WR215	SIMPLE 50MHz CONVERTER	SEP 86	3.60
WR213	MOD FRG-7 (CARRIER Osc)	JUN 86	2.70
WR210	"ARUN" PARAMETRIC FILTER	MAY 86	8.10
WR211	"MEON" FILTER (SMALL)	APR 86	3.10
WR209	SIMPLE AUDIO OSCILLATOR	MAR 86	4.30
WR208	RF SPEECH PROCESSOR	MAR 86	4.10
WR207	CRYSTAL CALIBRATOR	JAN 86	2.10
WR206	RTTY/MORSE MODEM (Plug-in)	JAN 86	2.80
WR205	RTTY/MORSE MODEM	JAN 86	5.40
WR204	WQ MEDIUM WAVE LOOP	NOV 85	3.00
WR203	SIMPLE CAPACITANCE METER	OCT 85	2.80
WR199	"MEON" 50MHz TRANSVERTER	OCT 85	6.70
WR202	ECONOMY UHF PRE-SCALER	SEP 85	3.70
WR201	ADD-ON BFO	AUG 85	2.50
WR200	LOW-COST CRYSTAL TESTER	JUL 85	2.50
WAD302	BATTERY CHARGER CONTROLLER	JUN 85	3.00
WR197	"COLNE" (Osc/Converter)	JUN 85	3.90
WR198	"COLNE" (Product Det/Audio)	MAY 85	3.90
A005	"COLNE" (VFO)	APR 85	3.10
A004	"COLNE" 3.5/114MHz RX (RF Amp)	APR 85	3.10
WAD249	MOD FRG-7 (BFO)	FEB 85	3.00
WAD280**	TRIAMBIC KEYS	FEB 85	7.10
WA002	"TEME" (RECEIVER)	JAN 85	4.30
WA001	"TEME" (VFO/DOUBLER)	DEC 84	2.80
WR178	DART (Audio / change)	DEC 83	3.00
WR177	DART (p.a.)	NOV 83	3.00
WR176	DART (v.f.o.)	NOV 83	3.00
WAD246	"DART" FOLLOW-UP	DEC 84	4.00
WR196	"TEME" 7/14MHz WRP (TX)	NOV 84	3.70
WR195	STABLE TONEBURST	NOV 84	2.60
WR194	MOD FRG-7 (FM/SQUELCH)	NOV 84	4.50
WR189/92 Pair	BUG KEY WITH 528-BIT MEMORY	OCT 84	8.50
WR190	MOD FRG-7 (SWITCHING)	OCT 84	4.50
WR187	MORSE SENDING TRAINER	JUL 84	4.50
WR185	AUTO-NOTCH FILTER	JUN 84	6.50
WR184	SIMPLE TOP-BAND RECEIVER	JUNE 84	6.50
WR183	TOP-BAND DF RECEIVER	APR 84	6.50
WR179	TRANSCIVER VOX UNIT	MAR 84	6.50
WR161	"MARCHWOOD" 12V 30A PSU	JUL 83	2.40
WR165 ect set	"SEVERN" 7MHz QRP TX/RX	-	14.90
WR169	"SEVERN" (TRANSMITTER)	JUL 83	6.50
WR168	"SEVERN" (CH.OVER/SIDETONE)	JUL 83	6.50
WR166	"SEVERN" (RECEIVER/AUDIO)	JUN 83	6.50
WR165	"SEVERN" (VFO)	JUN 83	5.20
WR167	RTTY TERMINAL UNIT FOR ZX81	JUN 83	7.80
WR160	LMS REGENERATIVE RECEIVER	FEB 83	5.20
WR156	REPEATER TIME-OUT ALARM	NOV 82	5.20
WR143	ATV CONVERTER	APR 82	7.10
WR144	IAMBIC KEYS	MAR 82	6.50
WR126	"EXE" 10GHz TRANSCIVER	AUG 81	7.70
WR095	TRANSCIVER POWER SUPPLY	SEP 80	3.85
WR068	AF SPEECH PROCESSOR	JAN 80	5.20

## HAVING DIFFICULTY GETTING YOUR COPY OF PRACTICAL WIRELESS ?

**Be sure of getting your  
copy of PW each  
month. Place this  
regular order form with  
your newsagent... today**

Dear Newsagent,  
please reserve / deliver my monthly  
copy of PRACTICAL WIRELESS

Distributed by Seymour

NAME .....

ADDRESS .....

.....

.....

Signed .....



# Radio Personality

Ron Ham has had a very long career in radio which started with the construction of a 1-valve radio when he was 10 years old. Ron quickly caught the radio bug and was soon to be found working on Saturdays in a cycle and wireless shop. At 14 he left school and worked in the radio retail trade from 1945 and was much involved with the increasingly popular television service - busily installing receivers for customers. It was while watching a Philips TV receiver he'd installed that he saw Sporadic-E long-distance reception of TV signals for the first time and it was that incident that triggered his life long interest in the study of propagation.

From 1950 to 1953 he worked for the South Eastern Electricity Board and married Joan, who he had met in 1948, during 1953. Since then the two of them have been inseparable and work together on virtually every project undertaken, although Ron freely admits that he can't cook!

During 1953 Ron was busy installing TV sets at the time of the mad rush to see the Coronation via the fascinating new service and during this time gained a great deal of practical engineering experience working with low-band v.h.f. television.

## At Home

Since 1954 the couple have lived in the heart of the West Sussex countryside in the picturesque downland village of Storrington where Ron became a half-partner in a long established radio and electrical retail business - which is, he's glad to report, still thriving - until he took early retirement so as to concentrate on his writing and many other activities.

Living as they do in the beautiful West Sussex countryside, it comes as no surprise to find that both Ron and Joan are very keen gardeners. Along with their very large garden they have three greenhouses to look after and guests can always look forward to a good selection of home-grown vegetables at mealtimes. They are of course, also keen members of the active local horticultural Society.

Their cottage - 'Faraday' - is tucked almost under the slopes of the South Downs and it is hard to imagine that the outside world has ever intervened in the tranquil life of Storrington. However, as Ron delights in telling the visitor, the last war did come to Storrington and if it had come any closer they might have lost their



Ron and Joan Ham - a well matched pair.

home before they had even found it, because of a badly damaged German aircraft that had crashed almost opposite the house. This aircraft had been successfully attacked after it had raided Portsmouth and had not been able to gain enough height to fly over the South Downs. It crashed, narrowly missing what is now 'Faraday', in the field opposite the house. All the crew were killed and Ron recalls the story as it was told to him by a villager who was at the scene at the time and had witnessed the souvenir hunters amongst the wreckage.

Ron's own interest in aircraft, flying and radio led him to be an instructor for the Air Training Corps for many years. He encouraged many young people to take up radio as a hobby through this disciplined form of training and it was through his connection with the ATC that Ron and Joan first became involved in rifle-shooting. Although they are the last people to boast about their skills - they are both excellent shots and have enjoyed target match shooting for many years and are both qualified RAF marksmen.

*This month we offer a double value personality page as we profile the very well known and respected husband and wife team of Ron and Joan Ham. It's not often that such teams go together and it can be honestly claimed that Ron and Joan are unique and only come as a pair and to profile them separately wouldn't work!*



Amateur equipment of the 1950s - one of the many exhibits at Chalk Pits Museum.



# DDS Direct Digital Synthesis



Performance. Yours and your radio's. They go hand in hand. To be a truly world-class competitor, you've got to have a truly world-class rig. And it's here, now. The versatile new FT-1000 from Yaesu.

Designed for the elite global contest and DX operators. With state-of-the-art design including **direct digital synthesis (DDS)** for low noise and fast lock-up time. The FT-1000 will blow away your competition with a spectacular combination of power and operating flexibility. This HF transceiver boasts a list of

UK Sole Distributor *South Midlands Communications Ltd S.M. House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO*



# Performance.



features and options that other manufacturers still have on their drawing boards: Like **200 watts RF power output**; **Built-in TCXO\***, for superior frequency stability; **Independent filter selection**; **Dual receive with balance control** and **two tuning knobs** for simultaneous reception in tough pile-up situations. Using **BPF-1\*** allows cross-band dual receive.

And the FT-1000 options such as **digital voice-recording system (DVS-2)\*** for storing and playback "CQ Contest" messages. On RX the DVS-2 has a 16-second running memory for playing back garbled calls. There's also a **CW spot control**, so you can align your frequency to that of an incoming signal without having to transmit; Plus **direct keyboard frequency entry**; **Front panel RX antenna selector**; **Built-in cascaded filters**;

*The Best of the Best*

**Dual-mode noise blanker.** And the receiver front-end uses a **four JFET up-conversion mixer**, for high dynamic range.

This HF rig is the product of three years of intensive research and design. These efforts show in Yaesu's scrupulous attention to detail with features and options ergonomically designed to allow you to achieve a position of competitive dominance. To hear and be heard... Like never before.

See the exciting new FT-1000 at your Yaesu dealer today. It's the best of the best.

**YAESU**  
*Performance without compromise.*



## Propagation Interest

Propagation and astronomy has always been a great interest, especially the problems of Sporadic-E and tropospheric 'openings' and the resultant interference to television reception. In 1968 Ron designed and built a solar radio-telescope which worked almost daily until 1984 when it was honourably retired after many thousands of hours of observations. The building of an instrument of this type by a radio engineer who was not involved in professional astronomy attracted a lot of attention and Ron soon found himself appearing on the Tomorrow's World programme with James Burke, BBC *South Today* with Andrew Harvey and a science film entitled *All For Love* made by Yorkshire TV.

Between 1970-73 this enthusiastic and dedicated observer designed, built and ran an instrument for the radio observation of meteors as they entered the earth's atmosphere. The instrument ran for 15 hours a day and it gathered an enormous amount of information and statistics on radio signals reflected from the ionised trails left by the many meteors that burn up in the atmosphere every day. Several other models of Ron's instrument were built by other observers after they witnessed the original working at Storrington but Ron still has Mk 1, although it has now been retired. Between 1970 and 1975 Ron took part in over 50 of the BBC World Service *World Radio Club* programmes and its successor *Waveguide*. During this period he also presented a programme on BBC Radio Brighton dealing with amateur radio activity.

Many of Ron's broadcasts on radio and TV were associated with the late Frank Hennig, who for so many years contributed to the national radio network and the BBC World Service programmes. It was the sudden death of Frank Hennig, at 53, that made Ron decide that he should retire - if that is the right word - from business to concentrate on everything else.

Broadcasting work and mutual interests have also brought Ron into contact with another specialist, Patrick Moore. Ron and Patrick have worked and co-operated together closely for many years. Patrick contributes on a regular basis to the propagation pages in the 'Backscatter' section in *PW*. Despite being an

extremely busy man himself, the famous astronomer finds time to assist Ron Ham in his own specialist field from his own home in nearby Selsey.

Despite being an incredibly busy man, Ron finds time to be involved in the British Astronomical Association and has written for many technical journals including *PW* and our sister publication *Short Wave Magazine*. Since 1979 he has been immersed in the running of the vintage wireless collection at Chalk Pits Museum nearby in Amberley. This section of the museum is based on Ron's own collection and now is an ever-growing part of the proceedings. As Honorary Curator of the Museum - a title which is misleading as it cannot do justice to the amount of work involved! - Ron has appeared on TV and radio many times showing special guests around the unique displays of vintage German military radio equipment and the many other special exhibits, while Joan (amongst her many other activities at the huge 36 acre museum site) is the specialist librarian in charge of the historic wireless library.

## Team Work

Both Ron and Joan insist that they are not individuals but are part of a team! The couple complement each other in an extraordinary way and this can be illustrated by the fact that when Ron gives a talk on any one of a multitude of subjects, Joan operates the projector during the slide-show. When Joan gives a talk it's Ron's turn to be the projectionist!

Joan has made her own mark in West Sussex as a local historian, journalist, publisher and bookbinder! Along with her work as a freelance journalist for *PW*, *Short Wave Magazine*, etc., she writes for local papers and also researches, publishes and binds her specialist books with help from Ron.

Joan Ham's interests are also very wide and she is active in many local activities including the Horticultural Society of which she was Chairman and Secretary for many years. Along with the interests in science, physics and local history which she shares with her husband, Joan has a particular interest in Genealogy and has discovered much about the family name and history. This interest led her to become a member of the West Sussex Archives Society which provides her with another outlet for her skills and also helps her with the research for the various book projects which are planned or under way.

## Publishing Skills

As an author Joan has produced some interesting titles which are still proving to be popular. The first book was published in 1979 and featured Storrington in Pictures. Following the success of that book *Storrington In Living Memory* appeared in 1982 to be followed closely by *Storrington in Georgian and Victorian Times* and *The History of Storrington and District Horticultural Society* in 1987.

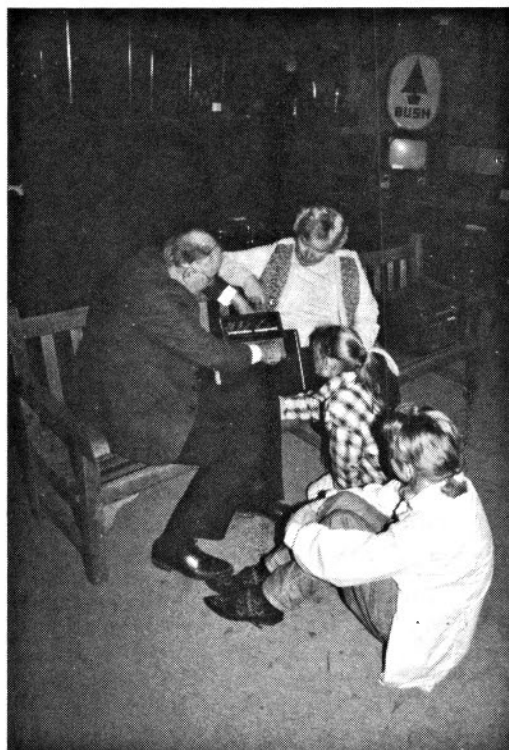
Another particular speciality that Joan has up her sleeve, is the restoration of ancient books and manuscripts which can entail many hundreds of hours of painstaking work. Her published book titles on local history have proved so popular that the couple are kept very busy in their bookbinding factory which has to double as a dining table at mealtimes!

No personality profile can ever do justice to this amazing couple. They really do come as a matched pair and as many past visitors (over 80 000 last year!) to the museum - which is set in old chalk-pit workings only a stone's throw from the mainline Amberley railway station - can verify, Ron and Joan Ham are very special pair of personalities!

**PW**

Practical Wireless, March 1990

**A little history  
and a lot of  
personal  
attention for  
Alexandra and  
Charlotte  
Mannion at  
Chalk Pits.**





# Packet Update 9

Feature

The launch of the new series of Microsats is due in early January. It was to have been early November but there has been a delay due to a technical problem with a previous launch. It will make a nice New Year present for us. Six are being launched, three of which will be of interest to the packet operator, Pacsat, Lusat and UoSat D from the University of Surrey team. The amateurs involved with these projects have put in an enormous amount of work, in design, construction and organisation of the satellites and are to be congratulated for their efforts. Most of the AMSAT and TAPR teams were involved in the Microsat project, whilst the University of Surrey team were responsible for the UoSAT D and E satellites.

Pacsat and Lusat are digital store and forward satellites. They will allow open access to a packet radio bulletin board to any amateur who has the correct equipment. They will use AX25, HDLC, NRZI as produced by any standard TNC. However, because these are operated from orbit, they will use mode JD. Mode JD, as defined by the Japanese, is 'Manchestered' FSK on the uplink and BPSK on the downlink. The hardware requirements are described in the Satellite column by Pat Gowen G3IOR. UoSat D will be carrying a packet radio experiment that will be operating a polling protocol with the satellite the master on top of AX25. This protocol will run in your computer and you will use a TNC running AX25 with a special modem. This satellite will operate 9600 baud FSK. The modem needed is K9NG compatible. These are available from TAPR and James Miller G3RUH.

The Pacsats will be used as flying BBS's in the usual way, using the satellites as a transmit device or a stored data device, enabling the 'human' to use it as he would a terrestrial BBS. It will also have real-time and stored telemetry files. However, the most interesting and innovative possibility is the introduction of a Broadcast Protocol. This will enable the reception of bulletins by a large number of terrestrial stations simultaneously. Assuming a 20K file on board the Pacsat BBS being read by 200 people. How long would that take? We only have a ten minute window every orbit, so the satellite will be tied up for a long time! However, with a broadcast protocol, all 200 stations would receive that file at one time. Another advantage of a broadcast protocol is that it does not require a transmitter at the receiving site. Also, the transmit and receive frequencies are on different bands. Pacsat will be the only transmitter on the downlink, thus removing the possibility of collisions, data-loss and QRM. This system, if it is successful, will be an ideal way of transferring large files around the globe. At present, all h.f. sysops have a 10K limit on bulletins, agreed at the last h.f. sysops meeting on the air.

## Bandplans - Again!

Two concerned comments on the bandplans for h.f. packet as they stand at the moment. The first comes from John TG9VT:

According to the h.f. bandplan for IARU region 1 (Africa, Europe, The Middle East, Mongolia and the USSR) the following sub-bands are recommended for packet radio.

3.590 - 3.600MHz  
14.089 - 14.100MHz  
21.100 - 21.150MHz  
28.120 - 28.150MHz  
29.200 - 29.300MHz

If this is true, it is feared we could end up with 9kHz of 14MHz allocation for RTTY - just enough for a few mailboxes and goodbye to rag-chewing or DX on 14MHz. Packet has been intruding on 14.095 mark and below and there is a net on 21.095.2MHz and at times the ARRL bulletin cannot be heard due to packet. Another comment comes from Tom OD5NG, who is also concerned. Tom operates an AMTOR link, also operates packet and his comments are given verbatim.

"We do badly need a better bandplan, but not one arbitrary arrived at by a small selection of users.

"It must be an internationally agreed one by all parties, in the meantime RTTY baudot has only 20kHz of the band and even this is often blocked with commercial traffic then below that we have AMTOR with even less (10kHz) followed by c.w. with 70kHz.

"One adverse effect I have noticed is that packet is coming lower and lower into the baudot and even into AMTORs small segment and consequently that the RTTY DX stations particularly are also having to move lower into the very small segment used by AMTOR.

"I do feel rather strongly about the encroachment of packet into the baudot segment and personally feel that until some agreement is reached, packet should remain in the slot just above the RTTY section.

"Packet is not the only growing mode short of space as AMTOR is very much in a similar position and my own personal opinion is that baudot, AMTOR and packet should all have a reasonable amount of space. With baudot/AMTOR/packet having 20kHz each. I also do think that c.w. could be moved down by say 20kHz to make space for packet and that AMTOR occupy the next 20kHz and baudot the next 20kHz.

"I stress that this is a personal opinion and I know there will be many in disagreement as well as in agreement, but time is running out and things are getting out of hand. We must sort ourselves out in an orderly manner.

"What do you think?

"73 de Tom OD5NG

"To comment, please use command: SB QST@ EU \$

"Or directly to OD5NG: SP AMTOR @ SK7CS (with "OD5NG" as subject)."

This all serves to re-enforce my views, stated in previous articles, that we do need separate segments for different modes. However, the success of the Microsat missions, more of which are planned for the future, may relieve the h.f. congestion, once a network of suitably equipped stations are available.

## International Packet

Jim Stone 4X1RU sent me a file earlier last month with his comments on the International scene as he sees it. Since he sent it, we have re-established forwarding with Moscow, in the form of Leo EK3ZO. Leo is at the Moscow State University and we have managed to pass traffic both ways. Leo Labutin UA3CR has some problems at the moment but he hopes to be back on in the near future. Here are Jims' very interesting comments:

The view from Israel, by: Jim Stone, 4X1RU dated 12 July 1989.

"Packet radio has expanded so much during this last year alone that as I write this the information contained here is rapidly becoming obsolete. The number of stations now using this mode has grown to the point where most BBS stations are simply over loaded due to the explosion of information which they are now handling. And if you think the v.h.f. networks are jammed, you should just see once what is happening on the h.f. international forwarding network.

"International forwarding is performed on v.h.f. as well as h.f. networks and it is obviously preferred to do forwarding, where ever possible on the v.h.f. bands and above. However, there are locations which are simply not accessible by any means other than h.f. These h.f. networks are being used, and sometimes misused, to provide the basic services of bulk store and forwarding between continents, between countries on the same continent and sometimes between stations in the same country where there is still no backbone v.h.f. network or the topography is prohibitive. The main purpose of the h.f. forwarding network is to handle long haul traffic.

"Most of this traffic is between countries where distances range up to approximately 5000km, but more typically up to 3000km. This traffic includes both bulletins and personal mail. There are a number of forwarding groups who pass traffic to one another on various frequencies primarily in the 80m, 20m and 15m bands.

*Roger Cooke  
G3LDI reports on  
the ever growing  
popularity of  
packet and the  
implications of  
satellite-packet  
radio.*

"My forwarding partners for both bulletins and mail are:

SV1IW, I1HUH, LA6HX, EA4DYX and 5B4TX.

"My forwarding partners for mail only are:

GB7LDI, PA0SCH, HB9AC, HB9GL, F6ABJ and DK1QG.

"Russia is a special matter since at various time I was forwarding to RA3APR, RS3A and EK3AZO, all in Moscow. At the present time, there is no one left with a license to operate packet radio other than possibly RA6APR in Armenia. With this group and their extensions into other forwarding groups on either h.f. or v.h.f., mail and bulletins reach every BBS within a few days.

"In addition, there is now a v.h.f. link to Cyprus, 5B4TX. Costis now receives all bulletins that I receive and he is able to feed other stations that would otherwise not be able to receive bulletins and mail, such as EA3RCN in Spain and CT1DIA in Portugal. This link has reduced a lot of unnecessary QRM on the h.f. bands.

"The inter-hemispherical links are probably the most interesting and the most difficult to run. There are only two links running between the Western and Eastern hemispheres. One of them is run from the west coast of the United States to Hawaii and then on to Australia. The second link is running between Washington DC, on the east coast to my station in Israel and now there is an additional station in England, GB7LDI, who is also a partner in this link. This came about since the United States has third party agreements for amateurs with only Australia and Israel. Therefore, there has been no other choice but to route all Far East traffic through Australia and Europe, Middle East and Africa via Israel, and now also England. This may all now be changing since I understand that the FCC has rewritten the amateur rules and regulations permitting third party amateur only traffic and should become effective on 1 September.

"The station near Washington DC is N4QQ-1 and is located at the QTH of Art, KB4ZJ, who has dedicated his station solely for the purpose for passing trans-Atlantic traffic. His station sits permanently, 24 hours a day, on 15 meters. On the HF side of the link, his station is passive and waits until either GB7LDI or 4X1RU call him. On the VHF side of his link he sends all his traffic to either N4QQ or W3IWI for further forwarding. These are essentially the only stations that he forwards to. N4QQ-1 is set up to work with BBS's ONLY to prevent other stations from blocking the primary forwarding link.

"N4QQ-1 handles all traffic for the Americas. We have been receiving traffic from Canada, Mexico, Venezuela, Argentina, Chile and Brazil. There is even a station in Tahiti (FO5) which sends traffic to France by first going straight to N4QQ to catch the trans-Atlantic link. And he gets answers. The amount of traffic varies but usually runs from 30 to 70 messages, total, going in both directions. In addition, all AMSAT bulletins over this link and, MBLBBS, RLIBBS, REBBS and RTTYDX bulletins are received.

"The distance between Washington and Israel is 9400 km. The probability of us ever having good working conditions is slight and therefore we use the fastest possible parameters so that packets can be accepted and acknowledged before QSB and severe multi-path can distort the signals. The critical parameters we use are:

PACLENGTH = 32  
RESPONCE = 0  
DWAIT = 0  
FRACK = 1  
MAXFRAME = 1  
AX25 = OFF (Level 1)  
RETRIES = 15

"There seems to be some misconception that when two BBS's are passing traffic on HF that another packet QSO can be tolerated simultaneously. This just results in a severe slow down of channel through-put and leads to 'everybody going nowhere, fast'.

"We are continually plagued by other packet stations calling CQ on top of us, RTTY stations calling CQ or just sending RY's, CW stations calling CQ and numerous other clever individuals sending strings of 'dits', trying,

and often succeeding, to dump the link. But with all this we are able to clear all traffic both ways every 24 hours 5 days out of 7. Half the problems are associated with QRM and the other half due to the lack of propagation.

"HF band conditions has been truly fantastic this Sun-Spot Cycle, but it won't continue forever. In a few years we will have to abandon 15m for 20m and the QRM there is horrendous. Hopefully, the PACSATs will be operational and the truly long haul circuits can be handled by satellite.

"I guess the most frustrating experience that has occurred is the failure to use packet radio to handle third party traffic during the earthquake in Armenia. Several months before this disaster struck, I had been in regular contact with Leo UA3CR on packet. He had been using my BBS as his 'HOME' BBS for several months and we had worked together spending many interesting hours getting our link to work good. Leo had then gone to the States and managed to acquire an IBM-PC some kind and MBL software. Within a few weeks he had the first Russian BBS operating under his son's, Evengi's, call sign, RA3APR. We were handling traffic several times a week between Moscow and Washington but there was not much traffic. Then the earthquake in Armenia struck. For several days I did not hear from Leo and then when we finally got together he told me that Evengi went to Yerevan to set up some kind of packet station with the call sign RA6APR. Leo was desperate for equipment. He was in contact with many amateurs in Europe and the United States to enlist their help. Many stations all over the world were ready and willing to assist. And help was sent. But then the problems became apparent. They turned out to be political and bureaucratic in nature and not technical. Equipment that arrived was held up in customs. Those individuals who came physically to help set up the amateur communications links were turned away. And the worst of all, even though within a few days after the earthquake, we had a good operational link on packet between Yerevan, Moscow, Israel and Washington, the United States and Russia never came to an temporary agreement on third party traffic.

"During the several months that followed I could tell from Leo's comments, which I was surprised to see aired, that he was terribly frustrated in his efforts to get things moving in Moscow. We all did the most we could but there are some things that remain beyond our influence.

"The primary justification for amateur radio is to give assistance during emergency situations. The international packet network is the ideal mode for handling traffic during such emergencies and this network is operational. It's daily use by countless stations all over the world proves that it is a dependable mode of operation for error free transmission of messages literally to any place in the world."

## HF Forwarding

The h.f. mail has increased just lately, most of it personal mail, with one American in London writing about three or four letters per day to his family, all of whom seem to be licensed. Nice way to keep in touch with home! As I am writing this, the personal mail in the last two days has topped 90. This is not including all the normal bulletins that are shipped over from N4QQ from ARRL, AMSAT and the like. So, as you see, h.f. packet does work! Manos SV1IW, has just automated his station with computer control in such a way that he can be polled on one frequency and automatically QSY to any one of nine others to find a clear one for forwarding. He is working on antenna rotor control as well. Humans are definitely becoming redundant!

## Odds and Ends

Please keep packet away from the beacon frequencies. There have been several complaints about QRM on 14.100MHz.

Please exclude packet from contests! A personal view, but wonder what you think?

That's about it for another month, comments please to G3LDI @ GB7LDI, QTHR or Tel: (0508) 70278.

73 and happy packeting.

**PW**



## SPECIALISTS IN DRESSLER ACTIVE RECEIVE ANTENNAS

**NOW NEW ARA 1500**  
50MHz-2000MHz

Phone for details

**ARA 900**  
£139 (N-TYPE £159)

**ARA 30**  
£129

**ARA 900**  
**ACTIVE ANTENNA**

50MHz to 1300MHz  
Gain 17dB Typical

### TECHNICAL SPECIFICATIONS

Noise Figure  
1dB at 50-150MHz  
1.5dB below 300MHz  
2.0dB below 350MHz  
2.7dB below 400MHz  
3.0dB below 500MHz  
3.8dB below 650MHz  
4.6dB below 1300MHz

£139.00 (PL259 Connectors)  
£159.00 (N-Type Connectors)

Intercept Point 3rd Order: +  
18dBm at Input  
Post £3.00 or Securitor £10.00  
extra.

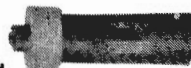


**ARA 30 ACTIVE ANTENNA**  
50kHz...40MHz WITH LIMITED  
PERFORMANCE UP TO 100MHz

Professional electronic circuitry  
with very wide dynamic range.  
Meets professional demands  
both in electronics and mechanical ruggedness. 1.2m long glass  
fibre rod. Circuit is built into  
waterproof 2.5mm thick  
aluminium tube. Ideal for  
commercial and swi-receiving  
systems. £129. See Review in  
August 1985 issue p.35

£129

Both antennas come complete with 7 metres of  
cable, interface, power supply and brackets.  
Dressler preamps available.



Also a wide range of masthead pre-amps available for most V.H.F. and U.H.F. frequencies, including scanner pre-amps from £89.

**Dressler**  
COMMUNICATIONS LTD.

**191 FRANCIS ROAD**  
**LEYTON - E10 6NQ - LONDON**  
TELEX 883609 LEXTON G  
PHONE 01-558 0854 01-558 1415  
FAX 01-558 1298

OPEN MON - SAT 9AM - 5.30PM  
INTEREST FREE HP FACILITIES AVAILABLE  
PROMPT MAIL ORDER



Prices correct at time of going to press. Please phone for latest  
quote.  
Or contact your local agent anytime on the following numbers:  
Stewart (Bromley, Kent) 01-466 5198, 0660 634326. Terry  
(Biggleswade, Beds.) 0767 316431.

## SPECIAL OFFERS

**IC-R9000**

INCLUDING  
ARA 30 +  
ARA 1500(N)  
£3,899



**IC-R7000**

INCLUDING  
ARA 1500(N)  
£999



**IC-R71**

INCLUDING  
ARA 30  
£855

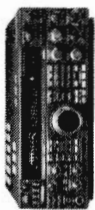


**KENWOOD R5000**

INCLUDING  
ARA 30  
£899



## KENWOOD



**NEW**  
**TS950**  
**H.F. TRANSCEIVER**  
EP.O.A.

Kenwood R5000 + ARA 30 ..... £899  
Kenwood R5000 ..... £799  
VC20 Converter ..... £180  
TS980 HF + 6 Mtr Inc. Microphone ..... £895  
TS940 Inc Auto ATU Inc. Microphone ..... £1,150  
TS790 270 + SAT ..... £2,000  
P.O.A.  
TM701 Dual Band ..... £479  
TM231 2m TX/RX ..... P.O.A.  
TH 75 New 270 Dual Band ..... P.O.A.

## ICOM



**IC781**  
**H.F. TRANSCEIVER**  
EP.O.A.

All ICOM stocked including accessories

IC 28E	IC 3210	Special Price	£ 349.00
IC 2	IC228	Special Price	£2249.00
IC 4SE	IC 765	Special Price	£ 449.00
IC 4	IC 781	Special Price	£ 459.00
IC 24	IC 901		
IC 32			
IC32		Special Price	£ 349.00
IC765		Special Price	£2249.00
IC3210		Special Price	£ 449.00
IC32SET		Special Price	£ 459.00

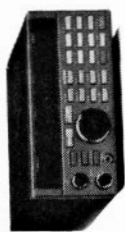
## SCANNERS

AOR 2525 5MHz-1500MHz ..... £575  
AOR 2002 ..... £459  
AR 900 ..... £199  
BC 2000XLT ..... £239  
RZ1 KENWOOD ..... £459  
Jupiter II INC. case, NICADS, belt clip, 12v car lead ..... £299  
NEW FAIRMATE HP100 ..... £299



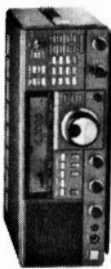
**STANDARD**  
**AX700**

PANADAPTOR DeLuxe  
£499.00



**FRG 9600**  
50 - 950 MHz  
£500.00

## YAesu



**FRG**  
**8800**

**HF RECEIVER**  
£595.00

**VHF CONVERTER** £100.00



**NEW**  
**FT1000**  
**H.F. TRANSCEIVER**  
EP.O.A.

FRG9600 ..... £475 FT747GX ..... £599  
FRG9600M ..... £500 FT757 MkII ..... £875  
FRG8800 ..... £585 FT23, 411, 4700, 787, 736  
FRV8800 ..... £100 + All Yassu available

## STANDARD

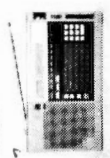
WE ARE **STANDARD** AUTHORISED DEALER

C500 DUAL BAND ..... £349  
C150 2 MTR ..... £230  
C528 DUAL BAND ..... £379

## SONY

**SONY ICF 2001D**  
76-108MHz  
116-136 AIRBAND  
153kHz-29.995MHz  
FM - AM - SSB 32 MEMORIES  
INC PSU, CARRY STRAP  
& EARPHONE

**£299**

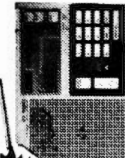


Sony ICF 7600DS FM/AM/SSB ..... £159  
Sony SW1 150-30M C/S + FM Stereo ..... £249  
Sony Pro 80-150kHz-108MHz, 115MHz-224MHz, AM-FM-SSB ..... £299  
Sony Air 7 ..... £229  
Sony AN1 Active Antenna ..... £55  
Sony Accessories Available

**SONY ICF 7600DS**

76-108MHz  
76-108MHz  
153kHz-29.995MHz  
Complete with case,  
mains power supply,  
earphone and  
frequency list.

**£159**



## JUPITER RANGE

MVT5000	25-1300MHz handy	299.00
JUP1	Case & belt hook	9.95
JUP2	DC cigar lead	4.95
JUP3	Set of 4 nicads	6.00
JUP4	Mains adaptor	14.50
DA900	Flexible antenna	9.00
MVT6000	Base/Mobile Rx	379.00

## ALINCO

ALD24E	2m/70cm mobile	399.00
DR110E	2m fm 45W mobile	299.00
DR410E	70cms fm 35W mobile	375.00
SR510E	2m/70cm mobile	549.00
ALX2E	2m micro handy	169.00
EBP3N	NiCad 450 mAh 7.2V	28.95
EBP2N	NiCad 160 mAh 7.2V	23.00
EDH10	DC to DC ALX2E	16.95
ESCS	Case/belt clip	14.00
DJ100E	2m handy tevr.	219.00
DJ100EX	Extended rx	229.00
DJ500E	Dualband hand	375.00
EBP9NAZ	NiCad 7.2V 500mAh	35.95
EBP6NAZ	NiCad 9.6V 450mAh	29.95
ELH230D	2m amp. 1-5W/10-30W	75.00
ELH260D	2m amp. 1-3W/50W	119.00

## AZDEN

PCS6000	2m mobile	329.00
---------	-----------	--------

## DIAMOND/REVEK

L20	15-50w load PL259	15.95
L20N	15-50w load "N"	22.95
SK100	Vswr 1.6-60 MHz	95.00
SK200	Vswr 1.8-200 MHz	65.00
SK400	Vswr 1.8-525 MHz	79.00
SK600	Vswr 1.8-525 MHz	119.00
SK1000	Vswr 1.8-1300 MHz	159.00
P500	30 Amp psu	149.00
W510	Vswr 1.6-300 MHz	79.00
W520	Vswr 1.8-200 MHz	59.95
W540	Vswr 1.8-525 MHz	63.00
W544	Vswr 1.8-525 MHz	119.00
W570	Vswr 1.8-1300 MHz	119.00
S20	Switch 1kW S0239	26.95
S20N	Switch 1kW "N"	45.00
rodD24N	With "N" & PL259	26.95

## DIAMOND ANTENNAS

CP4	10-40m vert	149.00
CP5	10-80m vert	189.00
D130N	Disc. 25-1300 MHz	82.00
X50	2m/70cm base	59.95
X500	2m/70cm base	129.00
CP22J	2m 6.5dB	49.95
EL770H	2m/70cm whip	30.00
NR72M	70cm 5.5dB PL259	24.00
M285	2m 5/8th PL259	14.95
EL2E	2m 7/8th PL259	32.95
RH702B	70cms gain BNC	26.00
DP-GL	Gutter mount	10.00
EC-H	PL259 cable kit	8.00
SPM	Mag. mount	23.95
TRA	Boot mount	26.95
D505	Mobile 1.5-1300 MHz	69.00
D707	Base 1.5-1300 MHz	99.00
MB100A	Low pro. mt. TNC	39.00
MA1100	2m/70cm whip TNC	26.00
MA1000	2m/70cm whip TNC	29.00
MA200	2m whip TNC	26.00

## SAGANT ANTENNAS

BL40X	1:1 balun	21.00
EL40X	80-40m 78ft	59.95
MT240X	80-10m 78ft	78.00
EL40XC	Traps for 80/40	16.95
SLIM-2	Stubby 2m BNC	9.95
SLIM-7	Stubby 70cm	9.95
S-Rod2	2m 5/8 BNC	12.95
S-Rod7	70cms version BNC	12.95
MG-YS	Magnetic mount	14.95
ZA1.9	Zepp 160m (46m)	87.00
ZA3.5F	Zepp 80m (40m)	55.00
ZA3.5	Zepp 80m (25m)	59.95
ZA7	Zepp 40m (20m)	49.00
ZA14	Zepp 20m (10m)	55.00

## TOYO

SAGMS	Mag mount rubber	19.00
-------	------------------	-------

## ADONIS MICROPHONES

AM303G	Base station mic.	49.95
AM503G	AM303 + comp.	65.95
AM805G	Meter & 2 outputs	79.00
AP-1	Icom mic adaptor	13.95
FX-1	Mobile goose neck	55.00
FX8	Noise cancelling	55.00
P80	Spare mic. leads	6.80

## MIZUHO QRP

MX3.5S	80m 2W SSB/CW	189.00
MX7S	40m version	189.00
MX14S	20m version	189.00
PM1	DC/DC 13.8V to 9.6V	19.95
MS1	Speaker microphone	29.00
XTALS	VXO xtals	10.00
BM6	Carry case	9.00
PL3.5S	80m 10W linear	129.00
PL7S	40m 10W linear	129.00
PL14S	20m 10W linear	129.00
PL1000	80-10m linear	189.00
CWS2	Sidetone CW	49.00
PR3S	Mobile mount	27.00
AN-4	40m 4ft whip	29.00
AN-14	20m whip (BNC)	29.00

## CREATE ANTENNAS

5130-1	50-1300 MHz 12dB	179.00
5130-2	105-1300 MHz 13dB	99.00
730V-1	40-10M Rigid dipole	149.00

## MISCELLANEOUS

AT1000	SWLHF atu	69.00
--------	-----------	-------

HP4A	TV Filter	7.95
FERRITE	1.5" Rings (TVI/AF)	0.60
HK708	Standard Morse Key	21.95
HK709	De-luxe Morse Key	23.00
HK702	Key marble base	42.00
MK704	Morse paddle	20.50
COK-2	Practice Osc	12.50
LF40/80	80/40 dipole kit	29.00
WAZ-1	Preamp 25-1300 MHz	69.00
GP125	3dB VHF Air Ant.	49.00
M125	Mag. airband ant.	29.00

## SPECIALIST PUBLICATIONS

SWLCLF	SW Freq List	7.95
CGTV/U	VHF/UHF Freq. (UK)	5.95
VHFUHF	VHF/UHF Airband	5.95
OCEANIC	HF Oceanic Air	3.50
MFG	Marine Freq. Guide	4.95
MORSE	Learning Morse	4.95
RTTY/FAX	RTTY & Fax Stns.	2.95
SCANI	Scanners 1	7.95
SCAN2	Scanners 2	9.95
BSWR	Better SW Reception	5.95
BSWR	Better SW Reception	5.95
VHF	VHF Handbook	5.95
SLWA	Low Cost Wire Ant	6.95
WRTVHB	World Radio & TV	17.95
ATC	Air Traffic (Adair)	6.99
ARHB	Airband Radio (Smith)	5.99
ATCIA	Air Traffic (Duke)	3.95
RAAH	Amateur Ant H'book	6.95
SWRHB	SW Radio Handbook	6.99
AAF	Airline Fleets 1989	4.99

## KENWOOD HF

TS950S	HF tevr. + ATU	2499.00
TS950SD	HF tevr. + ATU	3199.00
TS940S	HF all band tevr.	1995.00
AT940	Automatic atu	244.00
SP940	Ext. spkr. + filter	87.50
VS1	Voice synthesizer	32.25
TS440S	HF transceiver	1138.00
AT440	Internal auto atu	144.75
PS50	Heavy duty PSU	222.00
TS140S	HF transceiver	862.00
TS680S	TS140S + 6m module	985.00
PS430	Mains power supply	173.75
SP430	Matching speaker	40.75
AT250	Automatic atu	366.00
AT130	Mobile atu 80-10m	140.50
MB430	Mobile mount	15.80
SM220	9 band ATU etc.	208.50
SM220	Station scope	343.50
LF30A	9 band 2kW linear	1495.00
LF30A	HF Low pass filter	32.25

## MAIL ORDER OR RETAIL FAST, FRIENDLY EFFICIENT



## KENWOOD FILTERS & MICS

Most from stock - phone.

## KENWOOD VHF/UHF

TS711E	2m Base SSB/CW/FM	898.00
TS811E	70cm Base station	998.00
SP430	Matching speaker	40.75
TS790	2m & 70cms	1495.00
PS31	Matching psu	186.00
SP31	External speaker	63.00
TR751E	2m multimode mobile	599.00
TR851E	70cm multi-mode	599.00
VS1	Voice module	32.25
TM231E	2m FM 50w	289.00
TM431E	70cms FM mobile 35w	318.00
TM531E	23cms FM mobile	385.00
SP40	Mobile Speaker	21.00
SP50	Mobile Speaker	20.40
TM731E	2m/70cms mobile 50W	665.00
TM701E	2m/70cms FM 25W	469.00
TH75E	2m/70cms FM handy	398.00
TH25E	2m FM handheld	238.00
TH45E	70cms FM handheld	269.50
BC2	Charger	11.85
BT2	Dry case	11.86
SC8	Soft case	11.86
SC11	PB21H case	10.45
AD1	Screwed phono/BNC	3.95
TH205E	2m handheld	199.00
TH215E	2m handheld	228.00
TH405E	70cm handheld	245.00
TH415E	70cm handheld	268.00
SMC31	Speaker/mic	29.70
SMC32	Miniature speaker	23.95
BT5	Dry battery case	11.85
BC7	Rapid nicad charger	97.40
BC8	Compact nicad charger	38.80
SMC25	Spkr/mic	23.00

R5000	Deluxe HF receiver	875.00
VC20	Conv. 108-174MHz	167.00
R2000	HF receiver	595.00
VC10	Conv. 118-174MHz	161.95
RZ1	Rx 500 kHz-905 MHz	465.00

## YAESU HF

FT1747GX	HF Transceiver	659.00
FM board	FM board	40.00
FT1757GX2	HF Transceiver	969.00
FP700	20 Amp power supply	219.00
FC757AT	Automatic at	349.00
FP757HD	Heavy duty psu	259.00
MMB20	Mobile mount	25.00
FC700	Manual antenna tuner	149.00
FT1767GX	HF transceiver	1599.00
SP767	External speaker	69.95

## YAESU VHF

FT4700RH	2m/70cm mobile 50W	675.00
FT4700R	2m/70cm body	389.00
FT23R	2m body	209.00
FT73R	70cm body	229.00
FBA10	Cell case AA	11.50
FNB9	200mAh pack	34.50
FNB10	600mAh pack	34.50
NC27C	Mains charger FNB9	17.70
NC28C	Mains charger FNB10	17.70
NC29	Desktop charger	69.00
MMB32A	Mobile bracket	16.00
FNB3A	425mAh nicad FT727R	41.00
FNB4A	600mAh nicad FT727R	46.00
CSC17	Soft case	10.00
CSC18	Soft case	11.50
MMB21	Mobile mount FT727R	10.00
PA3	12V charger	21.85
NC9C	Mains charger	11.50
NC18C	Mains charger	17.50
YHA27	Dual Band helical	8.75
FT290R2	2m all mode portable	429.00
FT690R2	6m all mode portable	399.00
FT790R2	70cm mode portable	499.00
FBA5	Additional cell case	27.00
MH10F8	Speaker/mic	25.00
NC26C	Mains charger FBA-8	11.50
MMB31	Mobile mount	17.50
CSC19	Soft case	9.00
FT411	FT23 body	225.00
FT811	FT73 body	239.00
MMB34	Mobile mount	9.00
FT736R	Multimode 2m/70cm	1359.00
FT212RH	2m Tevr. FM 45W	349.00
FT712RH	70cms Tevr. FM 35W	375.00
MMB11	Mount FT290 MK1	29.95

IC4GE	70cms FM handy	299.00
IC448E	70cms FM mobile 25W	429.00
IC490E	70cms all mode mobile	625.00
IC32E	FM 2m/70cms 3/5W	399.00
IC24ET	FM 2m/70cms	385.00
IC3210	FM 2m/70cms 25W	499.00
IC2500E	FM 2m/70cms	635.00

## ICOM SUNDRIES

ICP515	Ext. 20 amp psu	165.00
ICP545	Ext. psu 8 Amp	129.00
ICP555	Ext. psu 20 Amp	192.00
EX310	Voice synthesizer	47.00
EX242	FM unit 740/745	44.00
SP3	External speaker	64.00
EX257	FM unit R70/R71	43.00
RC11	Remote for R71E	65.00
RC12	Remote for R7000	65.00
HM9	Speaker/mic	23.00

Most mics in stock! Phone.

LC3 Leatherette case

Most cases in stock! Phone.

GC3 World clock

## SONY

2001D	HF receiver + AIR	299.00
7600DS	SSB/AM HF receiver	159.00
PRO80	115 kHz-223 MHz	299.00
AIR7	108-174 MHz + BC	227.00
AN1	Active ant.	49.00

All accessories stocked. Please phone.

## MICROWAVE MODULES

144/30LS	2m 30W linear 1/3W input	105.00
144/50S	2m 10/50W amp	107.00
144/100	2m 25/100W amp	159.00
144/100	2m 1/100W amp	169.00

Most other models from stock. Phone.

## BNOS

12/12A	12 amp power supply	129.95
12/25A	25 amp power supply	193.20
L144/3/25	2m 25W amp	74.75
LP144/3/50	2m 3-50W	138.00

## DATONG

FL3	automatic notch filter	145.50
FL2	As above less notch	100.90
D70	Portable Morse tutor	63.40

Full range stocked. Please phone.

## YAYBEAM

TB3Mk3	HF 3 el. Tribander.....	345.00
TB2Mk3	HF 2 el. Tribander.....	234.00
4Y/6M	6m 4 element.....	54.00
LW5/2M	2m 5 element.....	20.50
LW8/2M	2m 8 element.....	26.00
Q4/2M	2m 4 element quad.....	41.00

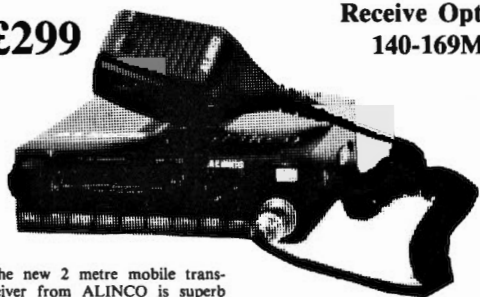
All other models normally from stock!



## ALINCO DR 110 2M 45 Watts!

£299

Receive Option:  
140-169MHz.



The new 2 metre mobile transceiver from ALINCO is superb value. Steps of 5, 10, 12.5, 20, 25kHz plus high power make it suitable for a wide number of applications. 14 memory channels and rotary dial control make operation a joy. Improved LCD display makes night operation much easier. The diminutive size (5.5" x 2.5" x 6.75") makes for easy installation in the modern car. Other features include up/down mic., 3 way scanning, 1750Hz tone-burst, reverse input, memory skip, and of course a full mobile mounting kit. Send for colour brochure today!

KENWOOD  
YAESU  
ICOM

MAIL ORDER  
FAST & FRIENDLY!

ALINCO  
DIAMOND  
JAYBEAM  
TONNA

Send for our catalogue and price list

For years we have been operating a mail order service. Now it even better! Here are the facts!

We have the widest range of ham products in the South. Nearly all products advertised in this magazine are stocked by us. All the famous names and a few lesser ones as well. Our price list contains nearly 800 items. We accept most major credit cards and can arrange budget finance deals if needed.

Each order is entered on a computer and can be traced in seconds. Despatch labels and invoices are automatically generated and most orders received in the morning leave the same day. Each one is carefully packed and fully insured at our own expense. 24 hour Securicor and Datapost is available on request. And if you have any quibbles with your order we are here to put it right quickly and professionally! We take the risk out of mail order buying and our customers keep coming back. That's why we are bigger than most!

## ALINCO DJ500E

£379

2m/70cms

Optional Receive  
range  
140-470/870-900MHz

- \*5, 10, 12.5,
- \*25kHz steps
- \*2.5 Watts output
- \*144-146/430-440MHz Tx
- \*Programme Shifts
- \*Full duplex
- \*Battery Save
- \*20 Memories
- \*Reverse Repeat



### NO EXTRAS!

#### Includes:

Rubber Aerial, Ni-cads  
Charger, Hand Strap,  
Belt Clip.

## "STILL THE MOST SENSITIVE" SCANNERS!

25-1300 MHz\*

Handheld  
JUPITER II

£299

25-1300 MHz\*

Mini-mobile/base £345  
JUPITER 6000 inc. P.S.U.



- \* AM/FM
- \* Direct up/down tuning
- \* 5, 10, 12.5, 25, 30 kHz steps
- \* 100 memories
- \* 10 programmable bands
- \* Step change frequency correction
- \* High speed scan 20 per sec.
- \* Carrier or audio scan
- \* Battery Saver
- \* Telescopic antenna (BNC)
- \* Fast memo load feature
- \* Individual memory unload
- \* Uses 4 x AA cells (Jupiter II)
- \* Size 7" x 2.5" x 1.5"
- \* 700 MHz first IF
- \* Proper English Manual
- \* Superb sensitivity.
- \* Does not cover 550-800MHz.

#### Best Buy!

The Jupiter scanners are now recognised as the best on the market. Ironically recent competitive models have underlined this fact!

#### Sensitivity.

The Jupiter is more sensitive than the competition. Our own tests and an independent review have shown this to be the case even at VHF. And when it comes to UHF, the Jupiter wins hands down.

#### Battery Saver.

How often have you had batteries go down on you? With the Jupiter you can reduce this problem. It has a built in battery saver that will dramatically reduce battery drain.

#### Channel Steps.

It's nice to be able to change channel steps. Most scanners have this essential feature. But with the Jupiter when you change steps the frequency is corrected to the nearest channel multiple. Some models don't offer this which means that you will end up with some horrific muddles on the display and lots of missed stations.

#### Memories.

The Jupiter has struck a realistic balance in the number of memories and banks. 100 memories is more than enough for most mortals. And conveniently they are all empty when you get the receiver! What is more, you can empty all memories in one go or just empty them one at a time. Check the competition on this!

#### Pre-programmed Bands.

The Jupiter is the only scanner that has pre-programmed bands with proper upper and lower limits retained in its memory. Just two buttons to press and the receiver will scan between the band limits. Again, no other model offers this simplicity.

#### Last frequency retained.

Whatever frequency you last listened to is remembered by the Jupiter and it will be there again when you switch back on. Imagine the frustration with some models that insist on re-setting the frequency every time you switch off.

#### User friendly.

If you have ever owned a scanner that does odd things or performs functions in a most complex way, then you will know how tempting it is to throw it across the room! The Jupiter never invites such harsh treatment. It does everything in a most sensible and easy to understand manner. The fact that it is extremely sensitive is also rather comforting. Of course we can supply almost any scanner from stock. The choice is yours. But we have this old fashioned idea that our customers should be happy with their purchase. With Jupiter we have no such worries!

FREE CATALOGUE & PRICE LIST! We now have an illustrated catalogue of some interesting products for the radio amateur that we have never had the space to advertise. Also details of new items coming along. Just drop us a first class stamp and we will send you this plus our price list of over 700 items!

## MIZUHO "MX" QRP SSB/CW RIGS

£189

Now in stock these 2 watt single banders for 80, 40 or 20 metres are real beauties. VXO control (one xtal supplied) gives 25kHz segments on 80 and 40, and 50kHz on 20 metres: Features IRT, noise blanker, S-meter, speaker, morse key. BNC socket. Powered from AA cells or external supply. Pocket size 66W x 39H x 142mm deep. As used by GRSRN on Ben Nevis. Over 100 in use already. Send for gen.



### A QRP STATION Free Offer!

Buy a Mizuho 80, 40 or 20m rig and we will give you a set of ni-cads, 12V DC charging lead and a GSRV aerial system completely free of charge! Limited offer so act now!

## SECONDHAND BARGAINS!

R532	VHF Airband	169.00	Jaguar	Handheld VHF/UHF Good	149.00
R535	VHF/UHF Airband Exc.	215.00	Air-7	VHF + BC Exc	169.00
R535	VHF/UHF Airband Good.	199.00	BC100XL	Handheld VHF/UHF Exc	159.00
R537S	VHF Air Exc	45.00	AOR900	Handheld VHF/UHF Exc	159.00
PRO-2004	Base VHF/UHF Exc	239.00	ALR22E	2m FM transceiver Exc	229.00
PRO-2021	Base VHF/UHF Good	149.00	TR7730	2m FM transceiver Fair	159.00
AOR-2002	Base VHF/UHF Exc	375.00	FT-900R	70cms SSB/FM Exc	289.00
AOR-2002	Base VHF/UHF Exc	369.00	FDK700E	2m FM Mobile Fair	139.00
PRO-2009	Base VHF/UHF Exc	109.00	FRT7700	Rx ATU Exc	49.00
PRO-32	Handheld VHF/UHF Exc	139.00	Darong	PC1 Rx converter Mint	89.00
PRO-32	Handheld VHF/UHF Good	129.00	DJ100E	2m Handheld Mint	179.00
PRO-34	Handheld VHF/UHF Exc	199.00	DJ500E	2m/70cm Handheld Mint	319.00
BC200XL	Handheld VHF/UHF Exc	159.00	DR510E	2m/70cm Mobile Mint	469.00
PRO-30	Handheld VHF/UHF Exc	129.00	DR110	2m FM Mobile Mint	249.00

ALL FULLY CHECKED  
3 MONTHS' WARRANTY

| E. & O.E.

RETAIL & MAIL ORDER:- 18-20 Main Road, Hockley,  
Essex SS5 4QS Tel: (0702) 206835, 204965  
Visa and Access by telephone. 24hr Answerphone.

WATERS  
& STANTON

## The AEA PK-88 Packet Radio TNC

Many beginners to packet radio are overwhelmed by the complicated all-mode terminal units on the market, offering l.e.d.s galore together with manuals stretching to over 100 pages long. It must be said that the PK-88 is similar in many respects, however the multiple l.e.d.s are there only as indicators to tell you what is happening. The long manual goes into detail about the many facilities available, rather than needing you to fully understand every line. As such, once connected to your computer and radio, you can be on the air within minutes. Most of the standard commands have sensible 'default' values already programmed in for you, so there is no need to worry about things such as what to set the Paclen to, and whether you need the AX25L2V2 'On' or 'Off' before you start!

The PK-88 will basically give the average amateur every facility needed to get going on packet, to link to other amateurs or 'Bulletin Board' stations and, if required, to automatically receive messages from other amateurs and even to act as an automatic 'digipeater' when the radio and TNC are left switched on but the station is unattended.

The PK-88 provides all the decoding, encoding and transmitter control routines needed to send and receive packet radio. You will need a 144MHz f.m. transceiver capable of operation on 144.650 and/or 144.675MHz to link it to. This does not necessarily need to be a sophisticated all-mode affair, many amateurs use a low-cost ex-professional radio crystallised onto 144.650MHz for this. Other frequencies are used to a much lesser extent on packet, such as 430MHz and h.f., but you will normally find the 145MHz band to have the greatest activity. The PK-88 comes fitted with internal headers for v.h.f./u.h.f., spare headers are also provided in case you wish to use the unit on h.f. While you're in the shack, you'll need to connect a simple terminal or a computer operating in 'terminal mode' with a suitable program to allow you to see what is happening and to have QSOs.

The unit is quite small, measuring 35 (H) x 150 (W) x 190mm (D), and operates from a 13.8V power supply requiring a supply current of 550mA.

### Computer Connections

The usual RS232 port connection is provided on the rear of the PK-88 to interface with your terminal or computer, as well as this a pair of headers are provided to give a t.t.l. level interface to some computers that do not have an RS232 connector fitted, the Commodore 64 for example. This interface requirement is worthwhile noting if you are considering purchasing a computer 'just for packet', make sure it can communicate through a serial port to the outside world! Unless you are using a dedicated terminal, you will also need some form of terminal program for the computer of your choice. Again make sure something suitable is available unless you have one of the popular computers such as a BBC or a PC clone for which an abundance of software is available. A straightforward pin-for-pin connecting lead is used between the TNC and your computer, if the thought of making one puts you off then several TNC suppliers and computer shops stock ready-made leads. Screened multi-way cable is advised to prevent any r.f. problems.

### Radio Interfacing

An 8-pin connector on the PK-88 links to your radio, this needs to be connected to the transceiver p.t.t., transmit audio, receive audio, and ground connections, an optional squelch line may also be connected if available at the radio end, to prevent the TNC transmitting when a carrier is present. The PK-88 may incidentally, be internally linked to allow either positive or negative polarity p.t.t. keying, many Japanese sets and early UK transceivers employ negative keying, whilst later UK sets such as the Europa and Olympic use positive keying.

### Powering Up

When first switched on, the PK-88 upon command goes through an 'Auto-Baud' routine, where it sends data to your terminal or computer at 300, 1200, 2400, 4800 and 9600 baud rates. Until the baud rate matches that set at your terminal, meaningless data appears on your screen, however when you have typed a few '\*' characters the PK-88 matches your terminal baud rate, digital word length and parity automatically, what could be simpler? The default values are 1200 baud, 7 bits and even parity, but these may be altered at will. An internal lithium back-up battery is used to store these and other pre-set command functions when power to the TNC is removed.

After the PK-88 has recognised your terminal parameters, the following message appears on the screen;

```
AEA PK-88 Packet Controller
AX.25 Level 2 Version 2.0
Copyright (C) 1986, 1987, 1988 by
Advanced Electronic Applications, Inc.
Release 29.APR.88
Checksum $D9
cmd:
```

The final 'cmd:' prompt indicates the unit is in 'Command' mode, i.e. awaiting any instructions, with the front 'CMD' l.e.d. being lit to indicate the unit's state.

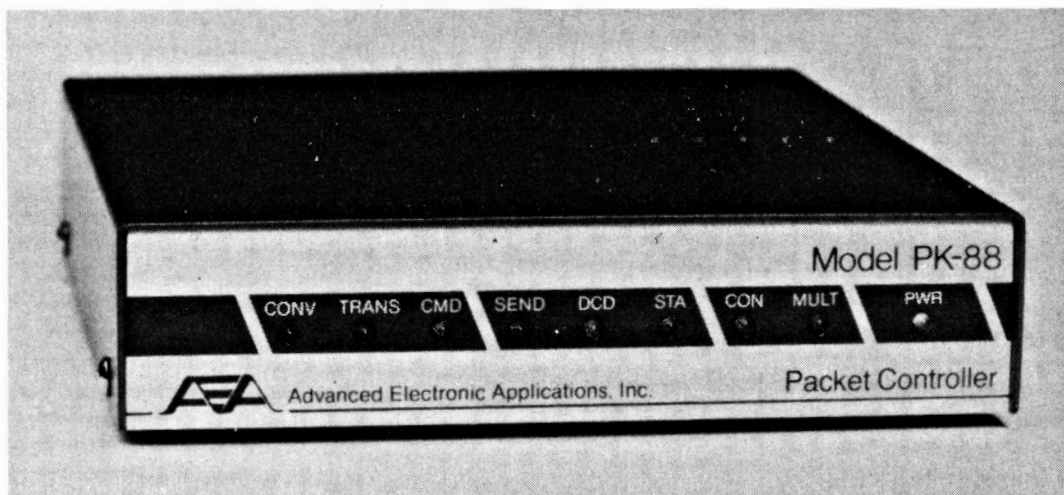
### Commands

The numerous commands which you may enter are common to those used by most other TNCs, the descriptions of all of these are beyond the scope of this review, indeed over 70 pages of the instruction manual are devoted purely to them! However the most commonly used are the simple commands such as 'Monitor' ON/OFF which allows you to monitor other traffic on the channel, 'MHeard' which gives a listing of the last 16 callsigns heard, and 'Connect' to attempt a 'Connection' to another named packet station. Other commands such as 'MYcall' to set your callsign, 'DIGIpeat' ON/OFF, 'DAYTime' to set the internal clock, 'CText' to set the automatic text sent to another station on connection and so on are used to a lesser extent, with the vast majority of other commands either being set once only or just left at their default values.

The front panel l.e.d. indicators show whether the TNC is in 'Command', 'Converse' or 'Transparent' mode, as an indication of the current control status. Further LEDs show the 'STA' which indicates if

*It has been said by many people that Packet Radio, offering 100% error-free world-wide digital communication, is today's most rapidly growing mode in amateur radio. Amateur satellites carrying store-and-forward packet radio message facilities orbit the earth, linking to the network of mailbox stations that automatically forward messages throughout day and night. Chris Lorek B Sc (Hons) AMIEE G4HCL reviews one of the popular 'starter' TNCs.*





any of your packets are awaiting acknowledgement, 'SEND' showing p.t.t. status, 'DCD' indicating data is present on air, 'Connected' and 'Multiple Connect' modes, and Power On.

### Maildrop

A useful feature of the PK-88 is an internal 'Maildrop' programmed internally to the TNC EPROM software. This allows stations to connect to your station in your absence provided your radio and TNC are left on, and to leave you a message to read upon your return. It uses a sub-set of the standard national bulletin board station commands such as 'Send', 'Read', 'Bye' and so on, to ensure familiarity. This also means that, with prior arrangement with your local BBS operator, your PK-88 has the facility to automatically receive auto-forwarded messages addressed to you from distant stations through the national BBS network.

The PK-88's internal message memory capacity is 8000 bytes, i.e. a few A4 size pages of text. In compliance with the UK licence regulations 3rd party messages are not allowed by the maildrop software, this means all stored messages are either from you or to you.

### Technicalities

The TNC uses the AMD7910 demodulator i.e. to ensure a reasonable rate of detection under noisy conditions, it has an input sensitivity of 5mV r.m.s. with a dynamic signal input range of 5mV to 770mV r.m.s.. An external modem may be connected if required, for 9600 baud usage on 23cm or store-and-forward packet satellites for example, HDLC rates of 45 to 19,200 baud are available from the TNC. A Z80 processor with a 32K battery backed RAM is used for operation, with 32K ROM.

The unit is compatible with TCP/IP protocol, and a software 'Host' mode may also be used to allow dedicated programmers to write support software to communicate using shorter commands, hence speeding things up by communicating directly with the computer.

Note that although many of the user commands

are TNC-2 compatible, the PK-88 is not a TNC-2 clone, hence it will not operate with TheNet EPROMS for individuals or groups wishing to set up this type of network node.

### On Air

After connecting the TNC up and setting the data rate accordingly on the Auto-baud routine, I commenced entering the preliminaries such as 'MYCALL G4HCL' and so on. It's often amusing to see the odd 'NOCALL' (the TNC default callsign) floating around on air, with their owner wondering why they're not having any luck until some kind amateur connects and tells them! Within two minutes of powering up I had 'connected' to my local BBS, and commenced listing the latest news and gossip message titles available for me to read.

After a period of successful operation from home, due to the TNC's compact dimensions I decided to become adventurous and take the unit out mobile, as a passenger in my car commuting between Cambridgeshire and Hampshire. My Z88 computer served as a terminal, a converted synthesised PMR rig purchased for £15 as the radio. On my journeys more than one amateur was astounded to see my periodic beacon 'Mobile CQ' message, with several QSOs resulting. It also certainly makes a change to be able to download the weekly RSGB news whilst travelling along, storing rally details and contest dates in computer memory rather than relying on frantic jottings on scraps of paper!

Throughout the review period the TNC operated perfectly when used with an Amstrad PCW9512, a BBC, and a Z88 lap-top, all operating in 'Dumb Terminal' mode to ensure I was testing the TNC itself rather than how clever any add-on computer software was. Further computer refinements are of course available, such as specialised programs for split screen operation, file downloading and uploading and the like. AEA for example have the PK-88 'Pakratt' program available for both PC Clones and the Commodore 64, this uses Host mode and offers more features than a simple terminal emulator.

PW

### Conclusions

The PK-88 appears to be an excellent starter TNC at a budget price of £129.95 inc. VAT plus £5 P&P, yet still has facilities such as Host mode and external modem expansion capability to provide for many future interests. The internal 'maildrop' is very useful to enable other stations to leave you messages in your absence, to be read locally on your return without the need for both amateurs to connect in to a remote BBS station.

My thanks go to ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD for the loan of the review sample.

REVIEW

# ICOM

## THE NEW IC-2SE, SIMPLE OR MULTI-FUNCTION 144 MHz FM TRANSCEIVER

Icom's tradition of building high quality, reliable handhelds continues with the IC-2SE an incredibly compact handheld designed with features that exceed larger, bulky handhelds. The IC-2SE proves that superior quality comes in all sizes.

4SE, 7cm  
VERSION  
NOW  
AVAILABLE

### Slim and unbelievably compact.

The IC-2SE measures only 49(W) x 103.5(H) x 33(D)\* mm with the BP-82 Battery Pack. Hold the IC-2SE in your hand to truly appreciate its miniature size. Weighing just 270g† with the BP-82, the IC-2SE will easily fit anywhere – on belts in shirt pockets, handbags, etc. \*1.9(W) x 4(H) x 1.3(D) in. † 9.5 oz.

### Simple design for operating convenience.

Even with its tremendous versatility and a wide variety of functions, the IC-2SE is easy to use. All functions are performed by a total of just six switches and three controls. The IC2SE includes both simple and multi-function modes. The result is two transceivers in one: both an easy-operation and multi-function transceiver. Simple mode ensures totally error-free operations. Multi-function mode allows you a variety of function settings depending on your operating requirements.

### Other advanced features:

Reduced size doesn't have to mean reduced quality. The IC-2SE proves this with a wide variety of advanced functions.

- Tuning control on the top panel for quick QSYing.
- Monitor function that allows checking of the input frequency of a repeater.
- Function display that clearly shows all information required for operations.
- Splash resistant design and durable aluminum die-cast rear panel for dependable outdoor operations.

### Options

• **BA-11, Bottom Cap.** Protective cap for terminals on the base of the IC-2SE.

#### • Battery packs and case.

BP-81 .....	7.2V, 110mAh
BP-82 .....	7.2V, 300mAh
BP-83 .....	7.2V, 600mAh
BP-84 .....	7.2V, 1000mAh
BP-85 .....	12V, 340mAh
BP-86 .....	Case for six R6 (AA) size batteries

#### • BC-72E, AC Battery Charger.

Desk top charger for the BP-81 - BP-85.

• **CP-12, Cigarette lighter cable with noise filter.** Allows you to use the IC-2SE through a 12V cigarette lighter socket. Also charges the BP-81 - BP-85.

• **FA-140SB, 144MHz flexible antenna.** Flexible antenna for 144MHz band operation. Same type supplied with the IC-2SE.

#### • HM-46, Speaker/Microphone.

Combination speaker and microphone equipped with an earphone jack. Clips to your shirt or lapel.

• **HS-51, Headset.** Headset with VOX function that allows you hands-free operation.

#### • Carrying Cases.

Carrying Case	Battery Packs, Battery Case
---------------	--------------------------------

LC-53 .....	BP-81
LC-55 .....	BP-81, BP-83 or BP-86
LC-56 .....	BP-84 or BP-85

#### • MB-30, Mounting Bracket.

Mounts the IC-2SE in a vehicle or on a wall.

#### • OPC-235, Mini DC Power Cable.

For use with a 13.8 V DC power supply

### FREE DRAW

Bring your QSL card to our stand at the Picketts Lock Exhibition for inclusion in our Free Prize Draw

Actual Size



Icom (UK) Ltd.

Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.



# Count on us!

## THE COMPACT HANDHELD WITH A SPLIT PERSONALITY

### 5 Watt Output Power.

Utilizing a specially designed ultra-small highly efficient power module, the IC-2SE delivers a full 5 W\* of output power. Bring those distant repeaters into range.  
\* At 13.8V DC

### 48 Memory Channels.

The IC-2SE has 48 fully-programmable memory channels and one call channel. Each memory and call channel stores an operating frequency and other information required for repeater operations.

### Convenient Repeater Functions.

The IC-2SE is equipped with programmable offset frequencies for accessing repeaters. All memory channels and a call channel store repeater information for your convenience. The IC-2SE includes a newly designed 1750 Hz tone call transmit function. A 1750 Hz tone call transmits when the PTT switch is pushed twice quickly.

### Power Saver for longer operating time.

The power saver ensures lower current flow during standby conditions. Operating times are much longer than with older, more conventional transceivers.

### Built-in Clock with timer functions.

The IC-2SE is equipped with an advanced 24-hour system clock with timer function. The transceiver automatically turns on when real time matches a pre-programmed time. This is perfect for scheduling QSO's. Auto power-off timers and other settings can be made in clock mode.

### Convenient Scan Functions.

The IC-2SE is equipped with VFO and memory scan.

• **VFO Scan.** VFO Scan repeatedly scans all VFO frequencies. In addition, unnecessary frequencies can be skipped.

• **Memory Scan.** Memory scan repeatedly scans memory channels.

### Auto Power Off Timer Function.

If you ever forget to turn the IC-2SE off, don't worry. It will turn itself off. Power-off time can be selected or deactivated using multi-function mode. Preserve battery pack power for the times when you need it most.

### Priority Watch.

Why interrupt calls to check other stations? Priority watch monitors a specified station every five seconds while you operate on a VFO frequency. Continue with your communications and let priority watch do the checking for you.



**Helpline:** Telephone us free of charge on **0800 521145** Mon-Fri 0900-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.

**Datapost:** Despatch on same day whenever possible.

**Visa & Mastercards:** Telephone orders taken by our mail order dept. instant credit & interest-free HP.



# G'day News from Down Under

Greg Baker  
finishes his latest  
report on the latest  
developments in  
Australian  
amateur radio

## QSP

Chris Edmondson, VK3YID.



A new, shorter regulations booklet, DOC71, has now been published though another, DOC72 *Amateur Service - Operating Procedures* is only now entering the printing phase before being released. Because of this, the regulations examinations are still being conducted on the old collectors item regulations book which was last modified in December 1978. This has caused confusion among candidates in this transition period and will continue until several months have elapsed from the release of DOC72 to allow the information in that booklet to filter through to all examiners and candidates.

The main changes to regulation, apart from deleting obsolete requirements, are the introduction of WARC '79 emission designations and a major change to novice licences.

### Novice Licences

The Australian novice licence from its introduction has restricted holders to transmit at limited power on three segments of the h.f. bands. There were two problems with this. One was that Australia's v.h.f.-and-above-limited licence holders could not communicate on air with h.f. only novices. The other was the problem of reciprocal licensing arrangements with Japan. With increasing tourism between VK and JA, anomalies became apparent, in that JA telephony only operators were able to receive v.h.f. privileges in Australia and Australia's novices, who are better grounded in radio theory, could not.

To solve these problems DoTC has permitted novices 10 watts f.m. voice on the 146-148MHz segment of the 2m band. Novices and most other amateurs are pleased with the change, though some die-hards in VK7 are reported to have moved their net into the 144-146MHz segment to avoid novice contacts.

### Callsigns

Because of a DoTC computer limitation and the difficulties involved in a manual system, VK9 calls are now issued randomly rather than as previously with the fourth character signifying location. Thus VK9L calls will not now necessarily come from Lord Howe Island.

The fourth character of VK callsigns are currently A to G inclusive, S and W for full calls; L,

M, N, P and V for novices; J and K for combined limited and novice calls and, though UK amateurs would be surprised to hear them, R for repeaters and T, U, V, X, Y and Z for limited calls. DoTC is not keen to issue I, O or Q but H will no doubt appear in due course.

### Loss of the 576MHz Band

The 576-585MHz (50cm) band, uniquely though temporarily, allocated to Australian amateurs until needed be broadcast services, has now been largely withdrawn. Operational ATV repeaters which use the 587-585MHz segment will be permitted to continue until these frequencies are needed in the coverage area for Band IV u.h.f. television. The pressure has come from the installation of large numbers of u.h.f. translator stations in Band IV and V, to give television coverage to hundreds of country towns across Australia. The WIA is looking to an ATV segment around 614-620 or 902-928MHz. Though the DoTC Spectrum Planning Section is examining the proposal, success is not likely.

### Ionospheric Prediction Service

Australia's propagation forecasts come from the Ionospheric Prediction Service (IPS) now renamed IPS Radio and Space Services. The IPS is based around the joint US-Australian solar observatory at Learmonth on North West Cape in Western Australia. This facility uses both a radio telescope and an optical telescope to constantly monitor the sun when it is above the horizon. Reports are compiled using this information and information for IPS's other solar observatory at Culgoora near Narrabri in New South Wales.

The IPS has become very active in recent times.

In the past, their main output as far as the amateur service was concerned, was the standard GRAFEX charts of predicted propagation conditions from east and west coasts to a dozen or so target areas. These charts show for all h.f. bands, and across the twenty-four hour period, the sorts of propagation conditions to be expected. These continue in *Amateur Radio Action* magazine but have died in the WIA's *Amateur Radio* which now only runs a brief ionospheric summary.

In addition, though, IPS now offers more services to amateurs and to the general community. First is a

Practical Wireless, March 1990



series of IPS user training courses. Each course costs \$A75 (£4) per person for an all-day session of 3 two-hour lecture and demonstration sessions. The first session covers the scientific principles involved in ionospheric prediction, the second covers propagation and prediction formats and the third examines solar activity and the effects of short term solar disturbances. Participants receive an IPS User Training Manual. The courses are held on rotation in state capital cities and large country towns. Those wanting the course either at different times or other places can get their own presentation at \$A500 (£225) per day plus the lecturer's travelling expenses and \$A25 (£11) per participant for manuals.

Second is the availability for a cost of \$A16 (£7) per year predictions for a user nominated eighteen circuits. Predictions are posted twelve times per year to subscribers.

Third is the IPS Frequency Prediction Calculator. This laminated sliding card calculator shows upper and lower frequency limits plus recommended frequency for paths of up to 1000 kilometres in the Australian region any time of day for any month, season or year. The cost is \$A14.50 (£6.50) per year which includes the laminated card body plus a new slide posted at three monthly intervals to subscribers. It is ideal for mobile operators wanting to choose the most appropriate frequency for their h.f. communications.

The fourth is the Sydney IPS Solar and Geophysical Report recorded telephone message service, which gives a rundown on solar disturbance warnings, solar activity, the geomagnetic field and provides predictions of flux number and indices.

The fifth is SAPS - the Stand Alone Prediction System computer program and data files. It is suitable for predictions across any circuit in the world and outputs a myriad of ionospheric prediction information to 40MHz. User information files of such data as antennas available and their characteristics and operating schedules can be included for SAPS to use in its predictions and recommendations. As a bonus, the system calculates beam heading and distance. The system is on seven 360KB 5.25in IBM XT or AT compatible floppy disks and includes an historical data set from 1938 to the present and with predictions to 1990. Data updates, latest predictions and other useful solar information are provided in the Solar Geophysical Summary sent monthly to all SAPS purchasers. Users input this data to their existing database. Cost for SAPS is \$A250 (£110). Advanced SAPS, ASAPS, will soon be available to SAPS users for an additional \$A100 (£45) and will provide more advanced features.

Finally, the sixth IPS service is a propagation report five times a day Mondays to Saturdays from Radio Australia. First daily report is at 0425UTC.

### Other News

My horror story of the decade comes from VK5. As part of South Australia's Jubilee 150 year celebration, a group of amateurs took VI5JA aeronautical mobile in a Cessna 172. That sounds normal enough, but the antenna arrangements have alarmed all pilots who have come across the details. The antenna was an 11m length of wire, wait for it,

weighed at the trailing end with a house brick! All the arrangement needed was a brief period of negative G-forces for the brick to smash through the fuel tanks, control surfaces or whatever. I shudder to think of it.

Australia's volunteers for the International Travel Host Exchange Scheme now exceed an astounding score. Any G amateurs interested in contacting these VK amateurs with a view to meetings and accommodation in Australia can contact the ITHE via the WIA at PO Box 300 Caulfield South, Victoria 3162, Australia, or the federal co-ordinator Ash VK3CIT at PO Box 539, Werribee, Victoria 3030, Australia.

*Amateur Radio* magazine has published a very useful list of current prices for a vast range of second-hand equipment in Australia. Covering about 250 transceivers, linear amplifiers, microphones, receivers, antennas and rotators, the list could be useful for any G amateur wanting to pick up gear on holiday here. I've sent a copy to a Hampshire *PW* reader interested in just that. For 4 IRCs, I'm happy to send the list to other interested *PW* readers as well. The compiler Jim Linton VK3PC at 4 Ansett Crescent, Forest Hill, Victoria 3131, Australia will no doubt do the same.

I reported some while ago that Australian Telecom was proposing to close the precise time and frequency station VNG. The station closed on 1 October 1987 leaving users to find alternative time and frequency standards. A VNG Users Consortium was formed in December 1987 to consider re-introduction of VNG services. It was estimated that \$A40 000 (£18 000) was needed yearly to maintain services plus another \$A10 000 (£4500) to relocate the VNG transmitters.

The \$A10 000 was raised from 55 users and sympathisers and the transmitters moved to Llandilo near Sydney. Test transmissions began on 4.5MHz late in 1988 but have now moved to 5MHz.

The Australian Government has announced that subject to normal rules and regulations, broadcast licences will in future be allocated to the highest bidder. The idea is to ensure windfall profits from the use of frequency spectrum accrue to the government rather than to private interests. While I support the idea in principle, I hope it's not the thin end of the wedge as far as services like the amateur service are concerned. Imagine how much spectrum amateurs could afford if money was the sole criterion for frequency allocations!

And so I don't finish two columns in a row on a low note, there's a little gem from Chris VK3SR and published in *Amateur Radio Action*.

In the 1920s the Melbourne Cup results were sent by telegram to Perth. Because this took at least an hour, Perth bookmakers took bets up to half an hour after the race was run. Some enterprising amateurs used the opportunity to send the results to fellow amateurs in the form of a code based on radio terms. For three years they raked in a tidy profit until short wave broadcasters relaying 3LO from Melbourne put an end to it!

VK amateurs or s.w.l.s with the news of interest to *PW* readers can send it to me at PO Box 93, Braidwood, NSW 2622, Australia.

*PW* readers who write and would like a reply PLEASE send a couple of IRCs for return postage. **PW**

# Back-Scatter

## HF Bands

Reports to

Paul Essery GW3KFE

287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

I started writing this piece in the run-up to the Christmas break, with the thought that there will be little activity on the bands, if only because mouths (and fists!) will be employed in rather more fundamental activities such as eating and drinking! To all those who sent Season's Greetings, my sincere thanks.

And, of course, I have a problem, in that the first issue in the new format omitted to indicate the deadline dates, so there was reduced input of data from which to construct this offering. So, please note they are: March 12, April 9 and May 14.

### Conditions

Not bad, at that!, of course, there are ups and downs, but that is part of the fascination of it all. Of course, the events of the past few weeks in Eastern Europe have tended to over-ride mere considerations of DX, and make me wonder if we shall see significant changes like these reflected upon our amateur radio scene.

### Goings-on

First, I hear that Conway Reef 3D and Banaba (Ocean) Is T33 will be added to the DXCC list on March 1. Cards may be offered after that date.

Talking of 3D, if you happen to have stumbled across 3D2XR, that was Mats SM7PKK on Rotuma. That takes the current DXCC countries total to 323 possible.

A new collection of prefixes to be noted; ES1- ES0 are the new ones for Estonia, from 1 January 1990. Also of course, by now most people will be aware of the LYs; but one believes there has also been a YL prefix from some station upon an island - does anyone know any details?

Laos is being well and truly knocked off the 'Most Wanted' lists in many a shack; firstly there was the XW8KPL activity, and then came XW8DX/XW8CW, located some 8km near enough for some visiting, and enabling the lads to knock Laos off their own totals! Operation by the HA lads was slated to continue at least to December 27, which rather wipes out the rumours of a Spratly visit. On the other hand rumour has it that a German station may visit Spratly for a period during March.

The Bouvet show should have come and gone by the time you read this; at the time of writing they were known to be en route but had not yet surfaced on 3Y. Just what is happening to the American Bouvet expedition on the other hand, seems clouded at the moment of writing, although I believe it is still intended to visit Bouvet, and it may surface after this comes to you.

However, one you should be able to catch after you've read this column is ST0; the news here is that PA3CXC has his permissions to operate as 6U0CW and 6U0DX; the dates

noted are either later February/early March, or late March/early April, the latter being rather more likely.

### Reports

The quiet geomagnetic conditions noted at times during the month have been the spur for some useful low-band openings, although just when things seemed quite nice on 80m radio-wise, the rains and the winds made it difficult in other directions - a shack-full of water or a fallen antenna do tend to inhibit one's activity a trifle!

### Pirates

Somebody in UK seems to have it in for the OYs.... Once again from the SW of England, this time using OY1B. If some kind soul would - with appropriate gestures of course! - find the person concerned and fit him with a suppressor, relations between G and OY would be improved. Come to think of it, amputation of the head is usually successful in such cases!

Another maggoty-headed individual is the one who persists in using the callsign G3WYD - if he says he is 'Don' from Bristol, then you hooked a Bristol Slim; the real one answers to Pat and is in Bishops Stortford.

### Contests

February 17-18 is the weekend of the ARRL DX CW Contest, and March 3-4 the SSB leg. There are several rule changes, so entrants should study December 1989 QST for the gory details. Note that this one has a separate section for single-operator all band QRP, defined as less than five watts output.

February 23-25 is the weekend to trawl Top Band for the DX stations brought out by the CQ WW 160m SSB contest.

### Top Band

This is a good 'un if only you have the room for a dipole firing E-W, or the courage for a high vertical and plenty of wire down below in the form of ground radials. Ideally of course, the high vertical - or a phased pair - and a nice string of Beverage covering the desired compass directions and a quiet electrical environment.

It was nice to hear again from G4AKY who notes that he is no longer with MoD but has moved to DTI. When he used to report in regularly on Top Band Dave was around the 100 countries worked, but now he assures us he almost meets the 4X4NJ definition of a 'mature Top Band DX-er' namely 160 or more countries

worked! One wonders what old W1BB thinks of that idea; Stew is much missed among the real Top Band addicts.

G2HKU (Minster) is another long-time Top Band operator, and Ted notes that he has used his s.s.b. for ON7BW, plus c.w. over to LX/OF3CB, LX7A, OH0MM, CT1A0Z, 4N9N, DF2RG, 4U0ITU, OY9JD and K03TPV.

As for G3BDQ (Hastings) this winter has seen a marked reduction in Top Band activity, in favour of 50MHz. In addition, John has eschewed the early-morning stuff, and the late-night activity, but his occasional evening managed c.w. QSOs with RL7PAJ, UA9KAA, CT1UP, CT1NK, Y03APJ, VE1ZZ, W1ZE, WB3AAI and 4X6DK.

Finally to G0HGA (Stevenage) who has tried the band using a 20m wire and some 10m to act as a counterpoise. At the time of Angie's letter this had yielded contacts with G4TNI, G2AGC and G3JUT, although the latter dipped down in very heavy QSB immediately after they had completed the essence of a QSO.

### The 3.5MHz Band

This again is a band where many people are inhibited from activity by the length of a half-wave dipole, and the fact that even if they have one, it won't cover all the band at reasonable s.w.r. The best compromise is probably to put up what you can, end-feed it against earth, and do as much as you possibly can to the earth. You won't have a band-flattener of a signal but you will be surprised at the improvement the work on earth and ATU can make.

G0HGA uses the same antenna for 3.5MHz as Top Band; on this band it made c.w. QSOs out to G3MCK, G8NT, G3USX, G3GIH, G3JUT, DL6UQ, DF1NY, DL6MAA, Y42AB, YU1KT, SP2LNW, LY3BS. LX7A and DL/PY2MIK.

Now I open the report of ON7PQ (Kortrijk) who offers as his 3.5MHz takings, c.w. of course, 8P9HT, P31AA, JF9DX, PY0GD, VK6HD, 7X4AM, FS/JA7RHJ, UW90Q/ RW9H, ZD8VJ, 6W6JX, K0ZZ (S. Dakota) and ZB0MM.

### The 7MHz Band

What a difference it makes to even the best receiver to have a decent switched attenuator for receiving available on this band.

G4XDJ (Billingham) comes in here, and notes that he worked c.w. with G4ITL, GW3PYD, GW4ZAG, GM3GKU, NN2U, VK3MRC, JW5NM, W4FDA, W2HT, NU1W, WA8M, SM6JWR, K6DC, UA3WEJ, UZ4PZG and G4AWI. The antenna for this activity was a grounded loop.

G0JBA (Sittingbourne) notes that

at the time of his letter he had strong SE winds, and GW was getting it rather more strongly. The antennas survived at Sittingbourne, and indeed here save for a minor failure which took me less than five minutes to repair. Of late, activity has been in the main 144MHz s.s.b. - shame on you!! - but nonetheless some operating and a lot of listening have been applied. On 7MHz the word is of lots of G, GI, GM, GW and western European stations but nothing of any significant interest.

Now to ON7PQ. Pat is a dab hand on this band, and his crop includes TU4DT, XF4T, JT1BJ, JW8XM, VK6HO, PY0GD, SU1RR, XT2KG, V31TP, EL2CX, XX900, K9EL/VS6, TL8CM, ZB2/F2JD, JA0SI heard one morning at 0703 on the long path, 9M2ZZ, HL1IE, XW8CW and VK2KM.

Next letter from G0HGA who notes that she has K1VV, K1BU, KY1H, W3NX, K3SUI, WA2YSJ, NM2E, K03F, N4HB, KU3X with five watts, KJ3Q, N2RR, KZ1J, K0FW/2, KA4IFF (YL op), N4RU, W4BPC, KF2/MM, VE2BOH, VE1AUU, VE1OK, J79DX, 8P9HT/K4BAI, HK1AMW, UZ9JXD, UA9MJA, CT3MAW, EA8AB, T77C, 4U1ITU, ZD8VJ, HB0PTB and a host of smaller fry.

Turning to G3BDQ, John managed s.s.b. with UF6VR, U18LAD, UM8MCW, 5T5CK, plus c.w. to JA1KQX, JA6CNL, JA0SI, JA0QNT, CT3MAW, VK2KM, VK3MR, KK4UJ, K1BU, RD8X/ UZ3QWX, UJ8JJK, 4X4YM, T77C, ZV7SY, UA0YO and KC6XO (Palau).

G2HKU went c.w. all the way, and his offering on this band includes OY7ML, UD6DKW, KY1H, UL7LEB, CT3M, N2MM and WZ4Z.

Finally for this band to G3NOF (Yeovil) who mentions his contacts on s.s.b. with PP2MAC and ZD8VJ.

### WARC Bands

Paucity of reports here again; G2HKU has c.w. to GW3SB and CT3FT, while G3NOF comments that he heard little on 18MHz, but did make contact with TU2QQ.

### The 28MHz Band

At times this band has been positively jumping. G3NOF notes 'opening time' was about 0800, and closing around 1900 with occasional extensions to 2030Z. Conditions haven't been quite on a par with previous months, but short path openings, 0900 for HL and JA, followed at 1000-1230Z by Asia and VK were noted. North Americans then took over until closing time, but little was heard of Africa or South America. Contacts using s.s.b. were rung up with A92FB, BY1PK, CT3FT, EL2CX, EL2FO, FS5R, HC2G, JAs, KH0AC, N1EDM/AM, TG0FRACAP (a conference station), TI1W, N9AG/J6L, OX3LX, TA3F, UW0MF in Zone 19, VK8NLV, VO2AA, VO2AC, WP4Q, XT2KG, XW8DX, XW8KPV, 3X1SG and 8P9EM.



# RST

RST MAIL ORDER CO.  
LANGREX SUPPLIES LTD,  
1 MAYO ROAD,  
CROYDON,  
SURREY CR0 2QP.  
**SPECIAL EXPRESS  
MAIL ORDER SERVICE**

AZ31	£ p	EM81	2.50	PY81	1.50	8AR5	25.00	607	3.75
CL33	6.00	EM87	2.50	PY82	1.50	8AS6	8.55	12AX7A	4.50
DY867	1.50	EN91	6.50	PY83	1.25	8AS7G	6.75	6BH6/K8	10.00
DY802	1.50	EY51	2.75	PY88	2.00	8AT8	1.25	6BA7	3.00
EB80C	10.33	EY86	1.75	PY500A	4.00	8AUSGT	5.00	6CS7	2.75
E180F	12.05	EY88	1.75	PY800	1.50	8AUS	2.50	6CS7M	2.50
E810F	36.48	EY300A	3.00	PY801	1.50	8AW8A	3.75	6S7	3.25
EABC80	1.25	EZ80	1.50	QOV02-6	19.50	8B7	3.25	6SK7	3.50
EB91	1.50	EZ81	1.50	QOV03-10	5.00	8B8	3.25	6SL7GT	3.00
EBF80	1.50	GY501	3.00	QOV03-10 Mult	15.00	8B8A	1.50	6SN7GT	3.00
EBF80	1.50	GY501	3.00	QOV03-20A	25.00	8BA7	5.00	6SS7	2.75
EC91	6.00	GZ33	4.75	QOV06-40A	27.50	8BE6	1.50	6U8A	2.25
EC93	4.50	GZ34 Mult/GE	7.50	QOV06-40A Mult	29.50	8BH6	2.50	6V6GT	4.25
EC93S	4.50	GZ37	4.75	QOV03-12	6.80	8B8	2.25	6X4	3.00
EC93B	1.75	KT61	7.50	R18	3.00	8BA6	2.50	6X5GT	1.75
EC93B	1.75	KT68	15.00	R19	9.24	8B07A	3.50	12AX7	1.75
EC93B Siemens	2.25	KT77 Gold Lion	12.00	SP41	6.00	8BR7	8.00	12BA8	2.50
EC95	3.50	KT88	18.00	SP61	4.00	8BR8A	3.50	12BE8	2.50
EC98	3.50	N78	15.00	U19	13.75	8BS7	6.00	12BH7A GE	8.50
EC931	8.55	OAC	3.25	U25	2.50	8BW6	6.00	12BV7A GE	7.00
ECF80	3.50	OB2	4.35	U26	2.50	8BW7	1.50	12E1	17.00
EC93S	3.00	OC3	2.50	U37	0.00	8BZ6	2.75	12H9T	4.50
EC942	3.50	OD3	2.50	UAB200	1.25	8C4	1.25	30FL12	1.38
EC981	3.50	PC99	2.50	UBF89	1.50	8C4	3.50	30P4	1.50
EC980	1.50	PC98	2.50	UCH42	4.00	8CB6A	2.50	30P19	2.50
ECL82	3.00	PC92	1.75	UCH81	2.50	8CD6GA	5.00	30P13	1.80
ECL83	3.00	PC97	1.75	UCL82	1.75	8CL6	3.75	30P14	1.80
ECL86	1.75	PC900	1.75	UCL83	2.75	8CS7 GE	5.25	57B9	70.00
EF37A	5.00	PCF90	2.00	UF89	2.00	8CH6	13.00	8G5	45.00
EF39	2.75	PCF92	1.50	UL41	10.00	8CW4	6.00	807	3.75
EF41	3.50	PCF96	2.50	UL84	1.75	8D6	3.50	811A	18.33
EF42	4.50	PCF901	2.50	UY41	4.00	8D05 GE	12.00	812A	32.50
EF45	2.50	PCF902	2.50	UY85	2.25	8D06B	4.75	813	55.00
EF54	3.50	PCF905	1.70	VR105/30	2.50	8EAB	3.00	8417 GE	11.50
EF55	3.50	PCF908	1.70	VR150/30	2.50	8EH5	1.85	866A	35.00
EF80	1.75	PC9200	3.00	Z759	25.00	8F6	3.00	872A	20.00
EF86	2.00	PC932	2.00	Z803U	25.00	8GK8	3.50	931A	16.50
EF91	2.50	PC933	3.00	Z803U	25.00	8H6	3.50	2050A GE	9.50
EF92	0.97	PC934	2.00	Z828	15.00	8HS6	3.77	5783	5.00
EF183	2.00	PC935	2.50	4CX20B	61.00	8J5	4.50	5814A	4.00
EF184	2.00	PC936	2.50	SR4GY	5.50	8J6	2.00	5842	10.00
EF90	1.75	PC935	2.50	5U4G	4.50	8J7	4.75	6900	5.00
EL32	2.50	PL508	6.00	5V4G	4.50	8J8A GE	8.50	8148B GE	15.00
EL33	7.50	PL1200	2.50	5Y3GT	3.50	8J8C	8.50	6550A	12.50
EL34 Mullard	10.00	PL36	5.23	5Z3	4.00	8J8C GE	11.25	68B3B GE	15.95
EL34 Siemens	4.50	PL81	1.75	5Z4GT	2.50	8K9ST	2.75	6973	8.75
EL36	7.50	PL82	1.50	5ZCL2	1.75	8K7	3.00	7025 GE	7.00
EL80	25.00	PL83	2.50	5B4ST	3.00	8K8	3.00	7027A GE	12.50
EL81	8.25	PL84	2.00	6AH6	5.00	8K8 GE	11.95	7581A GE	11.95
EL84	2.25	PL504	2.50	6AK5	5.99	8L6G	7.50	7589	13.00
EL86	2.75	PL508	5.50	6AL5	5.50	8L6GCSYL	9.00	7587	20.00
EL91	7.50	PL509	6.00	6AN5	6.52	8L6GC Siemens	4.50	7868	8.50
EL95	2.00	PL519	6.00	6AN5	4.75	8L6GC GE	9.50		
EL360	16.50	PL802	6.00	6AN8A	4.50	8L7	2.50		
EM34	6.50	PY33	2.50	6AOS	3.25	8L8	6.50		

Tel. 01-684 1166

Open daily to callers: Mon-Fri 9 a.m.-4p.m.  
Valves, Tubes and Transistors - Closed Saturday  
Terms C.W.O. only, allow 7 days for delivery.

Fax: 01-684 3056

Prices excluding VAT add 15%

Post and packing £1.00 per order + VAT  
VISA CARDS ACCEPTABLE OVER TELEPHONE

Telex 946708

## COMMUNICATION CENTRE OF THE NORTH

The largest range of communications equipment available in the North.  
Full range of receivers, transceivers, antennas, power supplies, meters.  
Ali tubing - wall brackets - rotators - insulators.

### FULL KENWOOD RANGE IN STOCK.

<b>BUTTERNUT</b>		<b>SCANNING RECEIVER RANGE</b>	
HF2V 40-80m vertical	£142.00	AR300 Base Station	£765.00
20 MRK 20m add on kit	£33.49	AR2002 Base Station	£487.00
HF6VX 6 band vertical	£159.00	AR950 Base Station	£249.00
TBR160S 160m Add on kit	£53.99	AR900 Hand Held	£199.00
HF4B Triband Mini Beam	£235.00	AR800 Hand Held	£165.00
NEW R5 5 Band Vertical	£259.00	JUPITER II Hand Held	£299.00
		JUPITER MV600 Base Station	£379.00
<b>CUSHCRAFT</b>		ICOM R700 Base Station	£980.00
A3 3 element Tribander	£329.00	RS35 Airband Base Station	£235.00
A4 4 element Tribander	£353.00	WIN 108 Hand Held Airband	£175.00
10-3CD 3 element 10m	£115.00	AR1000 Hand Held	£248.00
15-3CD 3 element 15m	£139.75		
20-3CD 3 element 20m	£238.00	<b>SWR/POWER METERS</b>	
AP8 8 band 25ft vertical	£164.00	MFJ 815 HF 2kw SWR/PWR	£57.32
AV55 5 band 25ft vertical	£123.00	Ym1E Twin Meter 3.5-150MHz	£32.00
18 element 2m Boomer	£106.00	DIAWA CN410M 35-150MHz	£61.72
15 element 2m Boomer	£85.00	DIAWA CN460M 140-450MHz	£65.40
		NS660P 1.8-150MHz + PEP	£115.00
<b>ANTENNA TUNERS</b>		KOYO-100 1.8-60MHz	£75.00
Kenwood AT230	£208.00	KOYO-200 1.8-200MHz	£60.00
MFJ 962B 1.5k Tuner	£241.00	KOYO-400 140-525MHz	£62.00
MFJ 949C 300W Versatuner	£157.00	<b>DUMMY LOADS</b>	
MFJ 941D watt Basic	£105.00	DL60 60 watt	£10.95
MFJ 1601 Random Wire Tuner	£42.02	MFJ2600 300 watt	£30.00
Kenwood AT250 Automatic	£366.00		

### A FULL RANGE OF RECEIVERS FOR AIR-BAND - MARINE - SHORT WAVE - AVAILABLE

GSRV full size £16.50, half size £14.50 Full range of Antenna - Accessories plus full range of VHF - UHF - HF mobile Antennas. Alpha HF Linears now available.

Full range of RSGB and ARRL publications in stock.  
Part Exchanges welcome. Second hand lists daily.

Send S.A.E. for details of any equipment.

HP terms. Access/Barclaycard facilities.

Open 6 days a week. 24 Hour Mail Order Service.

Goods normally despatched by return of post.

### FULL TEN-TEC RANGE NOW AVAILABLE

"Paragon", "Corsair",  
"Argosy", "Century", "Omni V"  
plus all accessories

Phone 0942-676790.

**STEPHENS JAMES LTD.**  
47 WARRINGTON ROAD,  
LEIGH, LANCS. WN7 3EA.

## GAREX ELECTRONICS WEATHER SATELLITE SYSTEMS

### SPECTACULAR NEW ATARI ANIMATED SYSTEM

Garex are proud to announce that they are the first appointed dealer for this incredible new Timestep product. Following on from Timestep's phenomenal success in the education market a special low cost Atari ST version of their animation system is now available. Simply plug in your existing receiver to view amazing pictures. For the ultimate, add a Meteosat receiver for unbelievably smooth 14 frame animation that is completely automatic once set up. Just watch the clouds roll by! New pictures are added twice an hour if required, the oldest being discarded automatically. This sophisticated package will run on any Atari ST1040 and compatible colour monitor, comes complete with all software and colour-keyed Atari interface unit.

£299.00

Optional 16 grey scale adaptor for colour monitor £24.95  
For those who would like a one-stop-shop, we offer the complete package of a ready-to-run system:

Meteosat Dish and receiver, Atari interface unit, Grey scale adaptor, 14in Colour Monitor, Atari ST1040 computer, software (including demo-disc) AND, OF COURSE, ALL PLUGS AND CABLES.

On your doorstep £1,695.00

### NEW COMMODORE "AMIGA" INTERFACE AND SOFTWARE

Superb high resolution pictures 600 pixels x 400 lines. Compatible with "PIXmate" THE fully featured image processing program. £299.00

### COMPACT FRAME STORE SYSTEM

The basic MICROWAVE METEOSAT system, no complications, a complete plug in and go package requires no computer, no software, and can be up and running, including dish alignment within 10 minutes. Nothing more to buy: Dish, Microwave Receiver, Frame Store, 12in b/w Monitor AND ALL PLUGS AND CABLES. Designed by Timestep, supplied by Garex £995.95

### SATELLITE ACCESSORIES

Meteosat Receiver. Dish input and 2 watt audio output	£270.25
Meteosat Preamp. 15dB gain 0.6dB noise figure GaAs FET	£92.00
NOAA 10 channel VHF Receiver	£155.25
NOAA BASIC Turnstile antenna	£34.95
NOAA BASIC Preamp. 3 pole filter, boxed, 14dB gain	£24.95

SAE for full details and prices of other 'separates'

★ ★ ★ ★

### GAREX VHF RECEIVERS

- ★ A simple but versatile design capable of covering spot frequencies in the range 25-200MHz.
  - ★ Excellent sensitivity (typically 0.4uV for 12dB SINAD)
  - ★ Double superhet (10.7MHz and 455kHz IFs)
  - ★ Choice of IF bandwidths from "W-SAT" to "12.5kHz" PMR standards.
  - ★ The basic receiver is single channel crystal controlled.
  - ★ Multichannel option.
  - ★ 2 watt audio output stage having a low quiescent current.
  - ★ Size: 153 x 33 x 13mm
  - ★ Requires 10-14V DC supply
- PRICES Stock Versions: (fully assembled, aligned and tested boards) 6m, 4m, 2m and weather sat £49.95  
Crystals extra, prices on request.  
★ Mains power supply module £15.50  
Other frequencies, special options, cased versions POA

### GAREX VHF PREAMPLIFIERS

#### ★ MINIATURE - GENERAL PURPOSE ★

- ★ Compact size: 34 x 9 x 15mm
  - ★ Can be made for any frequency in the range 40-200MHz
  - ★ 3dB bandwidth ±3MHz (at 145MHz)
  - ★ Input and output impedance 50 ohms
  - ★ 1dB compression ±10dBm
  - ★ Saturated output +15dBm
  - ★ Supply voltage 8-17V DC at 5-10mA
- Stock Versions (fully assembled, aligned and tested boards) 6m, 4m, 2m and Weather Sat £11.45  
Airband 118-136MHz (reduced gain) £11.45  
Other frequencies in the range 40-200MHz £13.75

### ★ HIGH PERFORMANCE

#### ★ 2 metre PRE-AMPLIFIER

- ★ 3 band-pass stages for improved selectivity
- ★ 16dB gain with 1dB NF
- ★ RF switched (fail-safe action): gas-filled relays
- Assembled, tested pcb £42.50  
Boxed version £49.95  
Gas-filled Relays as used in pre-amp £4.95

### MAIN DISTRIBUTORS FOR REVCO ELECTRONICS LTD

Prices include UK P&P and 15% VAT  
Ask for details of our interest Free Credit

**GAREX ELECTRONICS**

HARROW HOUSE, AKEMAN STREET, TRING HP23 6AA

TEL: TRING (044282) 8580

and CHEDDINGTON (0296) 668684

Callers by appointment only



# Back-Scatter

The next stop is to G0JBA who offers HH7PV, JE8NZE, JH1LBR, JH8QBY, RA9ST, VE3BRO, W8LXK, and, on f.m., VE6VVS.

G0HGA used 30 watts c.w. and a half-wave vertical, which netted a fifty-minute natter with N1FNN, N4AR, NE3P and K2SWZ.

Just a single foray on the band for G2HKU yielded a c.w. QSO with W6DU.

G3BDQ was one of those who worked XT6KG (The Yasmie crew, Lloyd and Iris Colvin), plus H18FHD, UV9FM, VK6HQ, ZD7CW. All were on s.s.b.

Turning to the all-c.w. offering of ON7PQ, Pat mentions XF4T, VS6BG, PY1DFF/PY0F, D44BC, CM0A, SU1RR, KH0AM, KH2D, TU4B, J6DX, ZP0YD, 8P9HT, OX3XR, TL8CM, VP5P, XT2KG, CEOFFD (Easter Island) and 3D2ML.

## The 21MHz Band

For many people this is the favourite; ON7PQ went the bundle on it, to the tune of 3C0GD, XF4T, W8NJR/J6L, KH0/JF2SKV, KH0AM, J79DX, KC6MX, 3D2ML, VP5P, V73AT, C6A/KR8V, TL8CM, XW8CW, Y11BGD and XT2KG.

On the other hand, G3BDQ seems to have confined himself to knocking off EC8ASD and 8P9EM.

As for G0HGA Angie uses the 28MHz vertical and managed KD2HE.

G0JBA offers a new prefix for him by way of ZM2BRS (a special from ZL), plus EC4CVA, VK2AMD, VK2AND, VK2KGY, VK2PEJ and VK3VAJ.

Opening on the long path at 0800Z, to HL/JA/VK/ZL, the band changes round to short path around 0900, G3NOF heard little from the Pacific area, but S. America was noted around 1000 and Africans around 1800-1900Z. As for the Yanks, they were about from around 1100Z until the band closed. Don booked in CO2RX, CP8HD, HL1CG, HL3UW, IQ1A, J88BS, JAs, JT1BV, JT1KA1, KG4DD, NP4WR, OH9SCL (Santa Claus Land!), OY9A, RA0AD/JT, UA2FEK, UA9WQ/RW9J, UH8AAQ, UL7GY, UM8QAF, UW0LT (Zone 19), V29QA, V31BB, VE7DGI, VK2XG, VP2VE, VQ9IF, XT2PS, XW8DX,

XW8KPV, Y11BGD, ZB2IZ, ZC4NC, ZL3RK, 9K2DB and 9N1RN.

## The 14MHz Band

G2HKU mentions that he used c.w. and managed VK3VJ, NL7G, WB6HGJ, 4S7NR who was running 4W to a crystal-controlled rig, N8ABL, KP4L and HK3RQ.

G3NOF notes that he hasn't been too active on this band but he lists his contacts, on s.s.b., with KL7XD, TA5C, UL7GWB, UW1ZC/UA10, XX9JG, XT2KG, XV2A, XW8DX, XW8KPV, 5H1TW, 9J1RL and 9Q5XX.

"Never really liked this band", says G0JBA, but he did manage to force himself to work EA7GOJ, and W1TTT.

Angela at G0HGA had a play in the CQ WW with 20W, and hooked lots of USA, W1-2-3-4-8-9-0 plus VE7ZZZ and CT3SM.

Just the one for G3BDQ, namely FY5YE, worked on the key.

ON7PQ keyed with 3C0GD, D44BC, JW9XG, KC6X0, SM00IG/YN, PA0GAM/ST2, NY6M/NH4, XX9AF, XT2KG, TL8CM and C6A/KR8V.

Now we go to Billingham and G4XDJ again; VE6RGT, JY6ZZ, VE30CP, UV9CBM, W5REA, SM6LJU, SM6MCW, G3KQN and SM6FFG all appear on his list.

## Finale

Make a note on your calendar to listen out for GB4SMC, and give us a call; 1500Z April 14 to 1500Z April 15. We'll be looking out for old friends.

Apropos that Nunavut bit last time around, G3NOF notes that VE8CB is already in the area, at Cambridge Bay. Doubtless VE8CB is keeping it quiet, since if Nunavut does become a new one, he'll get no peace thereafter!

Unfortunately, I have to finish this month with some sad news. Frank Anzaloni W1WY passed away on December 30 at the grand old age of 87. He will be very sorely missed by amateur all over the world, not least me, for his *Contest Calendar* which he has produced over the last 30 years.

**For the very latest in what's happening on the h.f. bands, call Wireless Line on (0898) 654632.**

See page 68 for full details

# Back-Scatter

## VHF Up

Reports to  
David Butler G4ASR  
Yew Tree Cottage

Lower Maescoed, Herefordshire HR2 0HP

## Solar Data for December 1989

For the last few days of November, continuing through to December 3, there was an increase in solar activity, with, on November 26 and 27, a number of flares and ionospheric disturbances. On December 1, at 1340UTC, a sequence of proton events started, continuing through to December 3. During the afternoon and evening of December 1, there was an aurora but it was not very spectacular. As to be expected, the geomagnetic A index was very unsettled during this period, with a sub-storm level of 30 units being reached on the 1st. Solar activity considerably lessened during the period between December 4 and 10, with an unexpected decline in solar flux levels every day. These levels continued to fall for the next few days, reaching a minimum of 166 flux units on December 14. The geomagnetic levels generally remained quiet until December 16 when Boulder recorded the A index at 15. The radio quality indices remained below normal all of the period, although there was a good 50MHz opening to North America on December 11. From December 15, the solar activity steadily increased, reaching 285 flux units on December 27, the highest level since last September. During the period between December 22 and 30, there were a large number of flares and by consequence, solar alert and magnetic alert were in force for most of this period. This activity caused a number of reasonable auroras to take place on the 144MHz band.

## The 50MHz Band

As to be expected, activity waned a little during December, although those fanatics with time to monitor the band 24 hours a day still managed to work the real DX. The latest forecast for sunspot maximum is that it will take place in March 1990. Operators of the 50MHz band should now book their annual leave for the months of February and March. Don't say you haven't been warned!

First up this month is a report from Scotland giving details of activity during November. Ian Wilson GM1XOG (SCD) runs an FT-690R, 10 watts and an HB9CV antenna at 20m above ground. Nothing was heard on the band until November 5 when contacts were made with SV1DH, SV1EN and ZC4MK. Conditions to North America were good on November 10, contacts being made with HC5K, a number of stations in the W1 call area, K8MMM and VE3KKL. P43AS, on Aruba, was worked, 59 bothways, on November 12 and many UK stations were worked on the following day via aurora. On November 16, another opening to the States gave

s.s.b. contacts with stations in the W1, W2, W3 and W8 call areas. An aurora, between 1430 to 1830UTC on November 17, gave Ian over 30 QSOs with stations in G, GI, GW, PA and OH. Contacts were then made, in the few days, with HC1BI on the 18th, FY5AU, HH7PV, HIBW, KP4A, PJ9EE, 8P6JW and stations in W1 and W3 on the 19th, and HC2FG, V47SIX, and 16 stations in W1, W2, W3 and VE3 call areas on November 20. F2 conditions remained excellent for the remainder of the month. Between November 20/26, Ian worked 56 stations in W1, W2, W3, W4, VE1, VE2, VE3 and VO call areas. Excellent results with 10W and an HB9CV.

Another station running with an identical system is Paul Feldhahn G7CFK (MCH). During the last week of November, 33 s.s.b. contacts were made with stations located in call areas W1, W2, W3, W4, W8, W9, W0, VE1, VE2, VE3 and VO. On November 23, HC5K (FI07) was worked at 1230UTC. Gotaways during the month included YV4DDK on the 19th and 8P6JW on November 21. The South American beacon FY7THF was heard putting in a good signal around 1038UTC on the same

day. Paul continued working the DX during December. In the period between December 7/14, the US was worked every day. More interesting contacts included EA8/GOKPW (IL18) and PZ1AP on December 13, and HH7PV (FK28) on the following day. Other DX stations heard but not worked were TU2MA on the 2nd, OA8ABT on the 3rd and the Ascension Island beacon ZD8VHF at 1058UTC on December 6.

John Hilton GM1ZVJ (LTH) has been on the band since June 1988 and has yet to work into England. John runs 2.5W from an FT-690R transceiver into a 1/4 wave whip antenna. I trust John operates with the set on its side so that the antenna is horizontal! During an Auroral-Es opening on December 2, at 0109UTC, contact was made with OH1ZAA (KP01) for a new country.

Moving down country to South Wales, Paul Baker GW6VZW (GWT) reports on the DX heard and worked during the latter part of 1989. A new continent, country and square was obtained by working HC5K at 1223UTC on November 21. AF1T (FN43) was worked the next day, giving Paul another new square. On November 26, Richard EL2B was heard but not worked, however V01QF (GN26) was worked later in the day. A number of other stations in North America were heard, including VY2ZZ (FN86) on Prince Edward Island. This latter station incidentally, confusing some of the inexperienced operators into thinking he was in the Yukon Territories (VY1) and not in the Maritime Provinces



(VE1). A change of propagation mode, Sporadic-E, on November 27, allowed Paul to work CT1WW at 1015UTC and SM7AED at 1715UTC. K3Z0 (FM18) was worked via F2 on November 30. December started off with a number of DX countries being heard. On the 2nd, V290A (FK97) on Antigua, popped out of the noise at 1230UTC. Frustratingly, TU20J, in the Ivory Coast, was heard on December 6, but the QSO floundered because the station was only speaking French. Other stations to be heard included PZ1AP, at 1215UTC, on December 9, and HH7PV and 8P6JW, around mid-day on December 13. Earlier in the day, on the 13th, a Sporadic-E opening to Scandinavia, allowed Paul to make contact with SM7FJE (JO65). A good opening to the States, on December 16, produced QSOs with KA1PE, W1RJA (FN31), W1GCI (FN42), WA10UB (FN43) and VE1JH (FN66). More stations, mainly in W1 and W2, were worked in the run up to Christmas. Among the s.s.b. contacts were K1GPJ (FN44), KA1MVB (FN54), WA2TEO (FN31), K2QIE (FN12) and VE1AOE (FN85).

**Bill Biltcliffe G6NB** (OFE) reports that due to a local telephone breakthrough problem, the maximum power used has been 10 watts into a 3-element Yagi at 10m. He finds it hard going competing with the new 'generation' of long Yagis and well sited stations. However, it's all good fun when the band is open. November 30 was particularly good when QSOs were made with KP4D, KP4EKG, HH7PV, VP2VI plus the usual run of VE and W stations. Short Sporadic-E openings gave contacts with CT1WW on November 27, OH3MM on December 7 and with SM6AEK, SM6PU, SM7AED on December 21. During December, many stations were worked in call areas VE1, VE2, VE3, W1, W2, W3, W4, W5, W8, W9 and W0.

**Dave Grey G8YB** (LDN) has seemed to have heard, if not worked, everything that was on the band during December. Contacts in the log included many stations in VE1, VE3, W0, W1, W2, W3, W4, W8 and W9. Notable DX stations and openings included W8VYF (EM79) on December 8, and K8EFS (EN72), K8WKZ (EN72), W8IDU (EN89), KD9IV (EN53), K9HMB (EN52), W9JUV (EN62) and AG9S (EN61), between 1745 to 1910UTC, on December 12. A Sporadic-E opening, between 1630 to 1700UTC, on December 21, gave QSOs with SM6PU, SM6AEK, SM7AED and OH3EX. Dave also made s.s.b. contacts, on December 23, with KG4SM (FK29), and, via crossband, OK3CM (JN88). Christmas Eve gave Dave a solitary contact with HC5K. Choice DX stations heard but not worked were D44BC (HK76) on the 16th, OABABT (FI21) on the 23rd, and HC2FG (FI07) on the 24th.

We now seem to be in a mid-winter lull, so writes **John Heys G3BDQ** (JO00). He reports that openings, on the south coast, are fewer and of quite short duration. John notes that the band may be open to North America for as short a time as 5 minutes. In a 35 minute opening, on November 30, contacts were made with stations in VE1, W3 and W4. It was very much the same the next day, with stations being worked in the same call areas in a 20

144MHz QRB Table

Station	Tropo	Aurora	Meteors	Sporadic-E
G0CUZ	2943	1758	1996	2943
G0OAZ	1251	876	2026	2249
G0EVT	3080	1640	1808	3080
G0FYD	1315	1624	—	2019
G0ISW	1059	566	—	2057
G0LBK	3060	1755	1876	2350
G1DWQ	1454	1812	—	1836
G1EFZ	1730	1757	1920	2375
G1KOF	3023	1421	—	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	—	2372
G3FPK	1835	1886	—	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MUT	1163	684	1533	2068
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1404	1774	2025	2172
G4ZTR	935	1535	—	1978
G6DER	1834	997	1957	2068
G6DZH	1357	711	—	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	—	2285
G6LEU	2620	910	—	2430
G6HHI	1742	—	—	2058
G8JDX	2667	1368	—	2663
G8LHT	3070	1780	1868	2512
G8MFJ	1209	1210	1329	2168
G8PYP	1083	1451	—	2318
G04XTT	3053	—	—	1700
G11JUS	3067	1614	1507	2216
G18YDZ	1216	1809	1901	2562
GJ4ICD	1620	1100	2050	2090
GM4CXM	1428	1750	2100	2023
GM4YXI	3160	1881	2048	2513
GW6VZW	2830	1473	—	2236
ON1CAK	1420	1166	1948	2725
ON1CDQ	1420	1166	1948	2124

minute opening. OABABT was heard very weakly, at 1250UTC on December 3, with a number of Canadian stations being worked between 1339 to 1350UTC. Some nice South American DX in the shape of FY5AU (GJ34) and HC5K (FI07) was worked on December 4. Later in the day, at 1318UTC, whilst beaming to the south-west, VE1ZZ was worked, presumably via back scatter. John was another operator to hear the French speaking TU20J on December 6. At the time he was working an SV station. Between 1349 to 1610UTC, a number of stations in W1, W8 and W9 were worked. Although openings were brief, the band was open nearly every day from December 9 through to December 20. Pick of the dx during this period included PZ1AP at 1200UTC on December 9 and D44BC heard at 1150UTC on the next day. 9Y4VU was heard at 1220UTC on December 15, followed 10 minutes later by a contact with KP2A. John has now worked 37 countries but claims to have missed a number of the easy ones such as ZC4.

One of the lucky UK operators to work all continents on 50MHz is **Jim Smith G1DWQ** (DOR). On November 1, at 0911UTC, he worked VK4ALM (QG56), managing to crack a large pile-up. On the same day, at 1239UTC, the first W station of the season was worked. Having got into the swing of working DX, Jim continued the trend by working, on November 2, 16 stations in call areas W1, W2, W3 and W4. The completion of WAC was accomplished on November 5, by a contact with ZC4MK at 1022UTC, after waiting nearly 2 hours in a mega pile-up. Just to make sure that Asia was really in the bag,

Jim worked VS6WV (Hong Kong) at 1159UTC, whilst beaming Stateside. Guantanamo Bay was worked on November 11, when KG4SM was contacted at 1248UTC. A good American opening on the 15th, put another 25 W/VE calls in the log book. An aurora, 2 days later, had Jim rattling the key, best DX in this event being FC1EAN (JN06) 55A 53A. It was back to the F2 DX on November 19, with PJ9EE, 8P6JW and many stations in W1, W2, W3 and W8, being worked from 1200UTC. A similar opening, on November 26, boosted the squares totals dramatically when numerous US stations were worked. It was a pleasure to break the monotony of the US openings by working, on November 30, at 0930UTC, C56/OH2FQ and later in the day from 1153UTC, HH7PV, KP2A and KP4EKG. New call areas, K9VGE (EN52) and WB0V (EN35) were contacted, between 1600 to 1700UTC on December 6. W5 was also heard but not worked. Jim mentions that by the middle of December he had notched up 132 Stateside contacts, 171 squares and 43 countries.

## The 144MHz Band

Propagation during December was pretty uninspiring, although some stations situated in northern England reported good tropo conditions during the weekend of the 144MHz Fixed station contest, giving contacts with stations in Sweden, Germany and Poland. A few UK stations reported contacts with Latvia and Lithuania. Propagation was very localised, the ducting

being caused by a subsidence inversion. Towards the end of the month there were a number of reasonable auroras. On December 29, some stations in eastern England, the Midlands and central Wales worked SK3LH (JP93). **Andy Stephen GM4IPK** (Shetland) reported an Auroral-E contact with UA1ZCL, the Russian station being heard for almost an hour.

**Noel Moore G17CMC** reports that on hearing an aurora on November 17, he opened the December *Practical Wireless* to re-read the article on auroral operation. Following my advice, Noel went on to work six G stations plus PE1CIO, ON1ALD and ON4KST, the latter being 59A+ in both directions. Noel mentions that his site in Belfast has a poor take-off and that he was very pleased to work these stations with a nominal 10W into a 10-element Yagi.

John GM1ZVJ running 100W into a 16-element Yagi, worked G1DFN (DHM) and G6IJM (LNH) in the aurora on December 1 and GM1SZF (HLD) in a similar event on December 4.

In an aurora on December 27, John Lemay G4ZTR (ESX) worked GM0GTU (IO77) and GM4JJJ (FFE). Another aurora, on December 30, produced a solitary contact with GM0JOL (HLD).

**Ian Wright GW1MVL** (CWD) caught both tropo and auroral propagation in early December. On December 1, tropo accounted for ON2AER & ON4AUC (JO11) and FC1AMZ (JN09), whilst the aurora on the same day gave contacts with G14KIS and GM4IPD. By the next day the tropo

QTH Locator Squares Table

Station	1296	430	144	Total
G31MV	48	124	429	601
G4KUX	—	120	372	492
G3UVR	82	135	246	463
G4RGK	50	124	284	458
G3XDY	91	148	206	445
GJ4ICD	59	119	263	441
G0DAZ	27	128	277	432
G3JXN	87	134	179	400
G0LBK	46	89	254	389
G1EFZ	—	93	263	358
G4XEN	—	111	274	385
G6HKM	46	109	217	372
G6DER	78	110	183	371
G4DEZ	49	49	249	347
ON1CAK	7	53	277	337
G4RRA	—	80	255	335
G3COJ	44	103	186	333
G4SSO	—	93	229	322
G4FRE	72	146	102	320
G1KDF	37	102	180	319
ON1CDQ	7	54	251	312
G4TIF	—	110	200	310
G1LSB	—	139	170	309
G4DHF	—	—	307	307
G1EGC	23	80	198	302
G8HHI	38	110	148	296
G8PNN	64	99	129	292
G6MGL	59	89	141	289
G4NBS	63	105	119	287
G8LHT	10	91	181	282
DL8FBD	—	—	280	280
G8ATK	45	91	143	279
G4MUT	31	93	153	277
G0EVT	—	57	206	263
G4PCS	—	3	258	261
G1GEY	11	77	168	256
G3NAQ	—	80	175	255
G6STI	24	69	152	245
G6DZH	—	87	154	241
G4IGO	—	—	238	238
G3FPK	—	—	236	236
G0EHV	—	75	160	235
GM4CXP	—	31	198	229
E15FK	—	56	172	228

Station	1296	430	144	Total
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	204	204
G8MKO	—	49	150	199
GJ6TMM	—	48	151	199
G1SWH	—	57	141	198
G4YCD	—	—	197	197
G11JUS	—	—	192	192
G4OOL	—	—	186	186
G4ZTR	30	50	97	177
G7ANV	—	—	153	153
G6MXL	16	45	91	152
GW6VZW	—	8	143	149
G4FVK	21	49	78	148
G4AGQ	1	42	104	147
G0FYD	—	1	142	143
G1DWQ	—	—	142	142
G8PYP	—	31	105	136
GW1MVL	—	22	109	131
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G8XTJ	—	—	116	116
G11MM	—	17	98	115
GM0HKB	—	—	107	107
G14OWA	—	—	103	103
GM0GDL	—	22	81	103
G1TCH	—	6	95	101
G1SWH	—	53	148	101
G1DDX	8	16	73	97
G1SMD	—	—	93	93
G6MEN	4	26	63	93
G7ENF	—	19	70	89
G1CEI	—	15	74	89
G4WHZ	7	—	76	83
G0ISW	—	17	59	76
G0HEE	—	—	73	73
G4UHY	—	—	73	73
G0HDZ	—	—	64	64
G1NVB	—	—	58	58
GM1ZVJ	—	—	48	48
GM0JOL	—	—	47	47
G2DHY	2	7	33	42
G7CLY	—	2	40	42
G7AHO	—	—	34	34

No satellite or repeater QSOs  
Starting date 1 January 1975

# Back-Scatter

front had swung around to Scandinavia, giving Ian contacts with OZ1BUR & OZ1JVX (both in JO46), OZ1ILY and SM6KYR (both in JO57), SM6MNS (JO67), SM6NET (JO68) and SM6RTN (JO78). The band was still in good shape on December 4 and s.s.b. QSOs were made with ON1CDQ (JO20) and DB8KJ (JO30).

The Scandinavian opening on December 2 didn't suit everyone. **Ela Martyr G6HKM** (ESX) reckons the signals were going straight over her head with only SM6NET, SM6RTN and LA9DI (JO59) making it into Chelmsford.

**David Law G0LBK** (YSS) thought that the Geminids meteor shower was poor compared to other years, the peak appearing at about 0500UTC on December 14. The longest reflection heard was about 6 seconds. Stations worked on c.w. included EA3BEW, HG7KPL, HG7UL/P, IONLK, IK0FEC and IK1LGV. David asks if meteor showers are getting worse or is he getting complacent? I'll have to make a few assumptions about when David was playing the meteors, probably 0000 to 0800UTC. Most of the contacts made were on a south-easterly beam-heading from Rotherham which, according to my calculations, would produce best results between 0200 and 0600UTC, the times when David was active. It is sometimes the case that operators can get poor results after upgrading the antenna system. Confused? Well, let me explain. A single long Yagi may have a typical vertical beamwidth of between 30 to 40 degrees. Noting that the ideal m.s. geometry is when the meteor trail is mid-way between both stations, and at an elevation angle of 45 degrees, a single Yagi, mounted high above the ground generally gives very good results, up to 2000km or so. In David's case, the antenna system consists of two 14-element NBS Yagis. The vertical beamwidth of this stacked array may possibly be as low as 15 to 20 degrees. Further calculations show that the ideal vertical angle for communication into Hungary and Italy should have been around 50 to 60 degrees. Perhaps this is the reason why the shower and reflections seemed poor. Each shower has different characteristics. The Geminids shower, for example, is noted for its long duration meteors peaking about three hours later than the main peak.

All this information about meteor scatter has reminded me that **Peder Rodhe SM6DWF** is interested in early morning schedules on c.w. via sporadic meteors. He is testing an automatic device for receiving high speed c.w. signals without the use of a tape recorder. He can receive speeds up to 2500 letters per minute. Peder's address is Kallsprangsgatan 5, S-413 20 Gotenborg, Sweden.

## The 430MHz and Microwave Bands

Not very much was reported regarding the u.h.f. and s.h.f. bands although tropo conditions were particularly good during the period December 2/3, enabling many contacts to be made from the UK into central Europe.

Annual v.h.f./u.h.f. table  
January to December 1989

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G1SWH	67	33	71	7	93	24	60	9	—	—	364
G6HKM	57	46	—	—	82	29	50	18	36	10	328
G8LHT	56	17	34	5	79	31	53	15	8	4	302
G4ZTR	30	17	49	8	73	27	25	8	23	5	265
G0IMG	69	29	41	5	56	12	27	5	—	—	244
G1DOX	36	18	49	6	66	18	29	6	16	7	241
G6NB	70	44	—	—	56	17	26	4	—	—	217
GW6VZW	72	33	—	—	75	21	—	—	—	—	201
G4LDR	43	12	—	—	61	16	52	12	—	—	196
G8PPY	34	27	1	1	59	26	29	11	—	—	188
G4XEN	21	9	13	2	63	21	33	9	—	—	171
G04XTT	34	9	—	—	57	15	30	11	—	—	156
GM4CXP	28	11	4	1	61	19	4	2	—	—	130
G0EVT	24	24	—	—	40	29	6	7	—	—	130
GM1SZF	33	11	—	—	57	16	5	6	—	—	128
G0EHV	—	—	44	5	62	16	—	—	—	—	127
G0FYD	3	5	—	—	88	23	4	2	—	—	125
G8XTJ	40	14	—	—	54	13	—	—	—	—	121
G3EKP	25	15	27	6	25	7	5	4	—	—	114
G4VOZ	—	—	64	8	—	—	31	7	—	—	110
G1VJP	15	4	—	—	74	12	—	—	—	—	105
G1TCH	21	23	—	—	38	15	—	—	—	—	97
GW4HBK	—	—	61	7	—	—	24	4	—	—	96
G1CEI	5	5	—	—	51	14	8	4	—	—	87
GW1MVL	—	—	—	—	56	22	3	4	—	—	85
G7CLY	—	—	—	—	58	14	4	1	—	—	77
G7CFK	43	33	—	—	—	—	—	—	—	—	76
G3FPK	—	—	—	—	51	19	—	—	—	—	70
G1GEY	4	2	—	—	—	—	34	8	2	2	52
G4AGQ	—	—	16	3	14	8	9	2	—	—	52
GM1ZVJ	3	4	—	—	26	16	—	—	—	—	49
G0HGA	—	—	—	—	32	12	—	—	—	—	44
GBMXL	2	1	4	1	7	4	8	5	—	—	33
G0HDZ	—	—	—	—	25	4	—	—	—	—	29

**Geoff Pike G10GDP** (ATM) made the most of prevailing conditions on both the 430MHz and 1296MHz bands. Running a home-brew MRF646 430MHz amplifier at 40W output into a 19-element Yagi, a large number of qsos were made on December 3. Contacts into G were mainly restricted to stations in locator squares JO01, JO02 and IO90. Continental contacts included ON1BXQ, ON4ZN, PA0FRE, PA3AEF, PA3DTL, PA3DZZ, PE1GHG, PE1LGG, PE1LCL, all in JO21, and with PA0AP and PA0EZ in JO22. Most of these contacts were around a distance of 800km and Geoff comments that it was very difficult to decide on which band to operate. When he did make it to 1296MHz, the conditions were found to be just as good if not better than 430MHz. The beacon GB3MHL was first copied at 0700UTC at 599+ but no real DX was heard until 1256UTC. As with 430MHz, G contacts were restricted mainly to stations in locators JO01 and JO02. Continental QSOs were made with ON7YK, PA0FRE, PA2JOK, PA3AEF, PE1GHG, all in JO21, and with PA0AO in JO22. Best DX of the day occurred at 2040UTC, when DL2KBB (JO30BT) was worked over a 910km path, with S9 signals both ways. The 1296MHz station at G10GDP consists of an FT-290R, into an LMW transverter, driving a 2C39 p.a. to 30 watts output. The antenna system is a group of four 26-element DL6WU Yagis. A mast-head GaAsf.e.t. l.n.a. is also used, being particularly useful at this frequency. Geoff comments that this was his first tropo opening on 1296MHz. It was very enjoyable, but at the same time frustrating to hear GB3MHL for 6 hours before activity picked up. I suppose the 144MHz contest occurring at the same time didn't help matters much.

During the 430MHz cumulative contest on November 30, Ela G6HKM made 60 QSOs but nothing new was worked. Ela

was one of the few G stations to appear in the log of G10GDP on both 430MHz and 1296MHz on December 3. On the same days s.s.b. contacts on 1296MHz were made with G14OPH, G1SLE, G3UVR, G4OIG, G4XEN, G6LZO, G8UYR and DL2KBB. The previous day had seen contacts with ON1CAK and ON1CDQ.

## VHF News

As of January 4, another European country, Denmark, has obtained permission to operate on 50MHz. More details as and when I get them.

The RSGB VHF Committee would be interested in finding out if there are any nets, or stations using f.m. above 51.1MHz. If you know of any activity at the top end of the band, please let me know. Still on the 50MHz theme, the VHF Committee have recommended that 50.185MHz be used as the centre of crossband activity. This is to encourage crossband contacts to be moved out of the DX working zone between 50.100 to 50.130MHz.

Whilst on the subject of band occupancy, I have just received two letters, both commenting on the same theme. **Ron Wilson G4NZU** reports that the v.h.f. bands were very quiet during 1989. Ron reckons that the level of activity has been dropping quite noticeably over the last few years. Sporadic-E and Auroral openings do not seem to have excited the level of activity of former years. Contest activity has also declined, hence one must wonder what is happening to our hobby. Ron mentions that his c.w. ladder score has shown a steady drop over the years to such an extent that it is now a struggle to find new stations. A letter from **Pat G4AGQ** echoes the same. On the 70MHz and 432MHz bands little activity is noticed outside of contests. He has called CQ for a couple of hours on a number of Sunday

momings without any replies on either band. He also mentions that activity on 144MHz c.w. is well down on previous years. Pat suspects it is due to a combination of excellent h.f. conditions and the release of the 50MHz band to B class licensees. I personally don't think that the release of 50MHz is to blame. Most certainly band occupancy has been on the decline in recent years. You may recall that in last month's column I reported that the move from 25kHz to 12.5kHz f.m. channelling will now not be implemented purely because activity, even on f.m. has reduced. Statistics from the RSGB Repeater Management Group back this up. Perhaps everyone has gone onto Packet Radio. Who knows? What should we do about this decline? Does it matter at all? I would be interested to hear your views. Assuming of course that you can make the effort to write a letter!

**Des Carne G6HRH** (CNL) passes on the news that there are now two more stations active on 70MHz from Cornwall. Des, located in Par and Clyde G6XNH, in Newquay, both have Microwave Modules transverters and listen most days, beaming to the north-east. They also have an f.m. sked each evening on 70.425MHz using horizontal polarisation. Whilst on the subject of 70MHz f.m. it should be noted that the Chiltern DX Club Packet Cluster system officially started on January 1 using the call sign **GB7DXI**. Access is on 70.325MHz, the packet working frequency, or via WOK22 on 144.675MHz. Operators may care to note that 70.4875MHz is also used for packet radio.

## Wet Squares

The Royal Research Ship *Challenger* will soon be carrying out a scientific cruise, between March 1 to 31, in the Atlantic Ocean, west, and north of the UK. The ship





# Back-Scatter

will sail from Barry, South Wales, on March 1, via locator squares IO81, 71, 61, 51, 41, 42, 33, arriving in IO34 on or about March 4. The area covered by locator squares IO35, 36, 45, 46, 55, 56 will be visited between March 8 to 11. *Challenger* will then sail to Torshavn in the Faroe Islands via locator squares IO65, 66, 56, 57, 47, 48, 58, 59, IP50, 51 and 61, arriving overnight on March 19. It will then continue via IP72 to an area covered by locator squares IP81, 82, 83, 91, 92, being in this area between March 22 to 27. Moving southwards she will sail via IP81, 80, IO89, arriving in IO88 on March 29. *Challenger* will then proceed down the North Sea, through locator squares IO88, 98, 97, 96, JO05, 04, 03, 13, 12, docking in JO02, Great Yarmouth, on April 1. **Andy Adams GW0KZG/MM**, 2nd Engineer aboard R.R.S. *Challenger* will again be operating on 144MHz, using a Trio TR-9130 and Microwave Modules 100W amplifier into either an 8-element Yagi, or an 8 over 8 slot-fed Yagi by Jaybeam. A 5A/8 vertical collinear can also be used if necessary. Andy hopes to be active during any auroras and maybe try meteor scatter, although during this period there will be no meteor showers to aid communication. The dates are approximate and are subject to weather and operational delays. Operating times, to fit in with work schedules, will be 1200 to 1300UTC, and 1700UTC onwards. Some operation will be possible on Saturday afternoons, again depending on work loads. Operation will not take place during port calls, or whilst in Foreign Countries territorial waters. QSL cards can be sent either via the bureau, or direct to: Mr A Adams, 2nd Engineer, RRS Challenger, c/o Natural Environment Research Council, Research Vessel Services, No.1 Dock, Barry, South Glamorgan CF6 6UZ.

I can supply, on receipt of a stamped addressed envelope, a locator map giving a plot of the proposed cruise track. In addition you will also get a mapped plot of the cruise commencing April 4, lasting 30 days, covering most of the wet squares in the North Sea. Details of this trip will be in the April issue of PW.

Just a reminder that GW0KZG/MM is not the only station to be found sailing around the North Sea. For some time LA0DT/MM has also been active from a watery location in the North Sea. When active; he usually operates every other month; he can be found on 144.300MHz or 144.275MHz. He will also use c.w. if requested.

## Beacon and Repeater News

Recently the RSGB VHF Committee discussed which frequency within the 70MHz band should be utilised for unattended low power beacons running with a maximum power of 14dBW e.r.p. It was decided that a common frequency of 70.070MHz should be used for this purpose. Readers who are unclear on unattended station operation should refer to page 3 of the Amateur Radio Licence booklet BR68, issued by the DTI.

The packet radio mailbox, GB7DAD, located in Matlock, has recently

Annual c.w. ladder

Station		Band (MHz)				Points
		50	70	144	430	
G4ASR	121	7	386	1	515	
G4OUT	-	31	240	-	271	
G4NZU	7	19	236	3	260	
G0HGA	-	-	192	-	192	
G4XEN	7	-	144	9	160	
GM4CXP	29	1	114	1	145	
G0FYD	-	-	117	-	117	
GW4VX	-	-	73	-	73	
G4AGQ	-	15	53	-	68	
G4VOZ	-	46	-	8	54	
G3FPK	-	-	32	-	32	
G0FYD	-	-	31	-	31	
GW4HBK	-	22	-	-	22	
G0EOLY	1	-	14	-	15	
GW4VX	-	-	9	-	9	

Number of different stations worked since January 1 1989

commissioned two new ports, one on 50.650MHz for user access and a trunk link on 1.3GHz.

The Wirksworth packet node also has two new ports, one on 70.4875MHz and the other linking to the rest of the network on 1.3GHz. This is in addition to the existing port on 432.675MHz. You can get more information from G0CXD.

The Bury St Edmunds packet repeater, GB7EA on 144.650MHz has ceased operation permanently.

## PW VHF Award Scheme

In recent months I have received a number of applications for details of the PW v.h.f. awards. The scheme dates back to the days when Norman Fitch G3FPK wrote this column in *Short Wave Magazine*, so it has been decided to close the old scheme. Anyone who has already obtained their basic certificate can apply to the Editorial Offices for the appropriate incremental stickers. Details of any new schemes will be publicised as and when they are finalised.

## RF Software for IBM Compatibles

I don't really want to turn this column into a computer buff's corner but there are times when it is worth mentioning specific software of use to the v.h.f. enthusiast. For a number of years I have been handling the release of material based on articles by Ian White G3SEK on front end optimisation (TCALC) and long Yagi design (DL6WU). Additionally, I also distribute the US/UK RF library of BASIC programs. These programs cover r.f. design, Antenna design, Propagation and other areas.

Programs on the US/UK library disk include design of microstrip circuitry, v.h.f. front end optimisation, DL6WU Yagi design, gamma match design, an upgraded MINIMUF program, path loss calculators, WA1JXNs multi-function moon tracker, G3SEKs e.m.e. program, W9IPs famous meteor scatter program, satellite trackers and much, much more. A total of 33 excellent programs are crammed into one 360K disk. Two new program disks are also available. The first one is VK3UMs do-anything e.m.e. program - a real masterpiece. Facilities include tracking the moon, sun, stellar radio sources and quiet sky. The program will calculate mutual moon windows and spatial polarisation offsets for any two locations, and has a signal/noise calculator and a 2.5 minute sequence timer for good measure. The program is written in Turbo Pascal and is distributed as a compiled, ready to run .EXE file with full instructions. The other disk is MACE, an I.f. to v.h.f. circuit program, written by Roger Blackwell G4PMK. Specify the values of components and how they are to be interconnected, and MACE will predict the frequency and phase response of your circuit. The disk is distributed as a compiled and ready to run .EXE file, with documentation and sample circuit and device data files.

To obtain any of these three disks, sent me sufficient 360K formatted 5.25in disks plus return postage and packing. As you are getting this material free of charge, it would be appreciated if you could include some details for this column. Even an updated entry for the various tables would be useful.

## QRZ Contest!

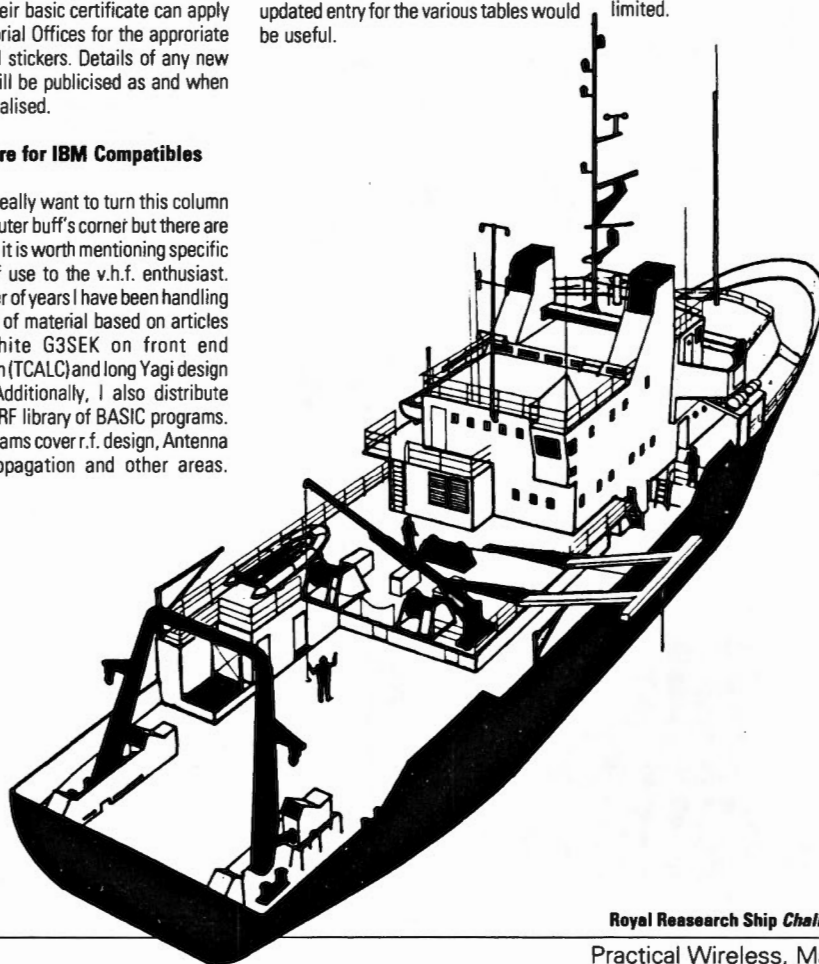
Stations equipped for 70MHz should note that cumulative contests will be run from 0900 to 1100UTC on February 11, February 25, March 11 and March 25. The Fixed station contest will also be run on March 25 and contestants can enter both sessions, using the same contacts, but with separate logs.

The 144MHz/432MHz contest is scheduled to run for 24 hours, starting at 1400UTC on March 3. There are 4 sections; Single operator portable, Single operator fixed, Multi-operator portable or fixed, Listeners. Single band entries will not be allowed.

The Derby and District Amateur Radio Society 144MHz contest will be held on Sunday March 11 between 1300 to 1700UTC. A full set of rules is available upon receipt of a stamped addressed envelope from the club at 119 Green Lane, Derby DE1 1RZ.

## VHF Tables

Just a reminder that the final table placings will appear in the April issue of PW. The new 5 band locator squares table will commence from the May issue. In the meantime please keep those reports rolling in. Letters in to me by March 26 at the very latest. In my role as RSGB VHF Manager I will be attending the IARU Region 1 Conference in Torremolinos, Spain, during the first week of April, and by consequence, time to write the column will be very limited.



Royal Research Ship Challenger



# Back-Scatter

## RTTY

Reports to

Mike Richards G4WNC  
200 Christchurch Road,  
Ringwood, Hants BH24 3AS

### Readers Letters

**Ian Hatton** of Chaddeston is a newcomer to RTTY and, like many, is starting as a short wave listener. His station at present comprises an ERA Microreader II decoder and a Philips D2935 receiver. The antenna system is a 10m vertical with 20m radials which should be very effective for DX. Having familiarised himself with the equipment, Ian is reporting very good results. His log of prefixes heard already makes impressive reading, so well done Ian and perhaps we may even work on the air one day.

**Michael Greig G6MMN** was the inspiration behind my feature on packet in Scotland a few months ago and has written with an update on his own progress. As you can see from his call he has now achieved his Class A licence which has meant a shift of interest towards RTTY and AMTOR of the h.f. bands. He has promised to send me a report of his experiences so I shall look forward to that and obviously publish details of any interesting features in the column. **Bill Atkinson G1LDG** has a software problem and hopes that a reader can help him out. Bill currently uses a Yaesu FRG-9600 receiver which is fitted with the CAT-233 interface. He would like to be able to control the FRG-9600 using a Spectrum 48K or Amstrad CPC-464 computer, but has been unable to find any suitable software. Can anyone out there help? If so, please drop me a line and I will pass on the details to Bill and publish them in the column.

If you have any problems (radio orientated that is!) please drop me a line and I will endeavour to help.

J & P Electronics, the producers of a wide variety of RTTY, FAX and SSTV software and hardware, have sent me samples of some amateur FAX signals that were received by a customer using a Spectrum computer. If I have organised my paperwork correctly there should be some examples in this column.

### RTTY Filter

BARTG (British Amateur Radio Teledata Group) have recently announced that they can now supply p.c.b.s for the G3ISD filter which they featured in the Autumn and Winter '89 issues of their magazine Datacom. This versatile filter design originated from an article in the American QST magazine and has subsequently been enhanced by Ted Hatch G3ISD. The key to the versatility of this filter is in the use of switched capacitor filter technology, which greatly simplifies the tuning of audio filters. This unit, known as the R5 Filter, actually employs two audio filters - a high-pass and a low-pass which, when combined, create a band-pass function. Both of the filters are electrically tunable in 100Hz steps over a range of 40Hz to 3600Hz giving the filter its excellent versatility. The out-of-band rejection at +30% of the low-pass and -30% of the high-pass frequencies is a creditable 51dB. The tuning can be achieved in a variety of ways, e.g. four BCD thumbs wheels, two 40-channel CB

switches, etc.

The power requirements are a modest 12-14V at approximately 200mA. Newcomers to this mode may well be thinking - "OK it sounds good, but what does it do for my RTTY operation?" So let's examine the process and see how a filter can help. I'll actually describe a RTTY signal, but the same principle applies to most of the data modes. The transmission system used for RTTY involves sending one of two carrier frequencies, one to represent each of the two possible states in RTTY - mark and space. When these carriers are received they appear as two audio tones and it is these that are then decoded by your terminal unit and computer. The number of errors in the display signal is very much dependent on how good your computer or terminal unit is at sorting out these audio signals. These signals are rarely noise free and are usually buried in all manner of unwanted whistles, whines, clicks and whirrs! This is where the filter can help, because it can take away a lot of these unwanted signals and so give your decoding equipment a far better chance of decoding the RTTY signals accurately.

Of course, as well as being very useful for RTTY and general data operation, the wide tuning range of the BARTG filter means that it can be equally effective on

s.s.b. The p.c.b. from BARTG costs £5.25 inclusive of post and packing and comes complete with instructions. The address for your orders is: **Mr E.J. Hatch G3ISD, 147 Borden Lane, Sittingbourne, Kent ME10 1BY.** Incidentally, if you would like to take up membership of BARTG, the 1990 UK subscription rate is £10 and the membership secretary is: **Miss Ann Reynolds G6ZTF, 169 Bell Green Road, Coventry CV6 7GW.**

### BARTG Spring HF RTTY Contest

Yes it's contest time again! This popular contest takes place on the weekend of March 17-19 and is always well worth having a go at. The period of operation is actually 0200UTC on March 17 till 0200UTC on March 19. Although this is a 48 hour period, only 30 hours of operation (that includes listening) is permitted. The 18 "rest" hours can be taken at any time, but must not be less than 3 hours and all times of operation must be recorded on the contest summary sheet.

#### Categories:

Single operator, all band. Single operator, single band. Multi-operator, all band. Short wave listener.

#### Bands:

3.5MHz, 7.0MHz, 14MHz, 21MHz and 28MHz amateur bands.

#### Stations:

Stations may not be contacted more than once on any band, but additional contacts with the same station may be made on other bands. Transmission on two or more bands at the same time is not allowed.

#### Countries:

The ARRL DX countries list will be used and each W/K, VE/VO and VK call area will be counted as a separate country.

#### Message:

This will comprise time, RST and message number. The time, in UTC, must be the full four figure group and the message number must be a three figure group starting at 001 for the first contact.

#### Points:

All contacts within own country score two points. Contacts to another country score ten points. In addition all stations can claim a bonus of 200 points for each country worked on each band, including their own. NOTE continents only count once.

#### Scoring:

A: Contact points x total countries worked.

B: Countries worked x 200 x number of continents worked (max 6). The final score is the total of A and B.

#### Log Sheets:

Separate log sheets are required for each band and these must show: band, date, time, callsign, message sent, message received, countries and points claimed. SWL log sheets need: date, time, callsign of station heard, report sent by

that station and callsign of the station being worked.

#### Summary Sheets:

These must show: full scoring, times of operation, address for correspondence and for multi-operator entries, names and callsigns of all the operators.

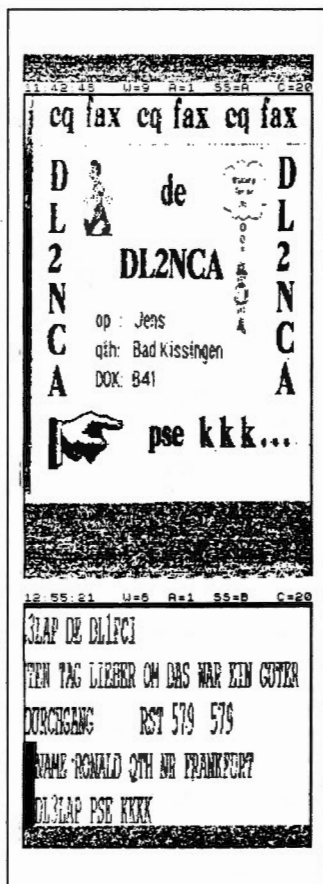
Entries and check logs must be received by May 26 at the following address: John Barber G4SKA, 32 Wellbrook Street, Tiverton, Devon EX16 5JW.

### AEA FAX/SSTV System

The latest press release from ICS Electronics reveals details of a brand new FAX and SSTV system from AEA Inc. which is designed to run on the Commodore Amiga computer and is called AVT Master. The FAX capability covers all the modes used by amateurs and a good range of commercial signals. Drum speeds are 60 r.p.m., 120 r.p.m. and 240 r.p.m. whilst the picture length is determined in lines at 400, 800 or 1200. Each received line is displayed as 1024 pixels, with each pixel set to one of sixteen grey levels. These images can be printed using the standard Amiga printer device and can be stored as standard Amiga IFF (Interchange File Format). This is a great advantage, as it allows the images to be manipulated and enhanced using a wide range of Amiga software packages.

There are various options for starting the reception process, including fully automatic where the program detects the start tone and synchronising pulses. This mode ends when the end of message tone is received. An unusual but very handy feature is the timed auto-start which puts the program into auto start mode at a particular time and then stops on successful receipt of a picture. I can see this being particularly useful for the reception of some of those very interesting pictures which are often sent from weather stations in the early hours. One very powerful facility is the ability to select a number of demodulation curves, including - linear, log, antilog, etc. This has great value when receiving photographs rather than charts and can be very useful for enhancing the visible detail in dark areas such as the land masses on Meteosat images. This facility is made even more powerful by the fact that you can make up custom demodulation curves, e.g. you could specify a log curve for the bottom quarter and leave the rest of the curve untouched. This gives immense potential for obtaining the best image quality for a given signal quality.

In addition to all this, the image can be flipped horizontally and vertically and even rotated through 90 degrees. If the image has been received on the wrong sideband and is negative, it can be corrected by inversion. There is also a real time low-pass filter included to process the received signal. Having received and manipulated the image you then have access to an assortment of text modes so that you can add all manner of useful detail. On the transmit side, you have all the aforementioned image manipulation features, plus the program can send any



FAX example from J&P Electronics

# Back-Scatter

Amiga IFF type file. These can either be generated by the AVT Master, one of the popular 'paint' packages or by digitising the output of a video camera. Providing your computer has enhanced memory, the program supports up to sixteen high resolution image memories, so a complete QSO could probably be stored in memory if necessary! Moving on to SSTV the AVT Master is really quite revolutionary, not only does it support all the existing modes but it adds a totally new narrow band mode. The narrow band mode uses a 400Hz

shift which is somewhat narrower than some of the more conventional signals which use up to 1100Hz or 1200Hz. The advantage of using a narrow band mode is one of reduced interference, as you wind in the i.f. and a.f. filters to a 400Hz bandwidth, this reduces a lot of the interference. Having achieved a reasonably clean picture you can of course use the picture manipulation features to further improve the result.

Another great advantage of the AVT system is that both sending and receiving

stations are crystal locked, so synchronisation is kept throughout the transmission even if large chunks are missing due to interference. This is a big improvement over some of the existing systems where interference causes all manner of alignment problems. The only snag with the system is that to take advantage of the narrow band modes both stations must have the AVT system. So before you rush out and buy the system, what are the system requirements? The AVT Master plugs into the parallel port of

the Amiga and uses some of the audio channels. The system will run on any Amiga (68000, 68020, 68030, with or without maths co-processor), models 500, 2000 or 2500. The minimum memory requirement is 1Mb, but the capabilities are enhanced if 1.5Mb are installed. It is with this extended memory that you get the sixteen image memories and faster operation. The AVT Master costs £299.95 inc VAT from **ICS Electronics, Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD.**

## The New Micro-satellites

At the time of writing this column, the cluster of six amateur radio satellites accompanying the SPOT-II Ariane launch are all mated, integrated with the launch vehicle platform, and are set and ready to fly into space. They have all been positioned and fixed around the 'ASAP' 'bolt-around' system, which permits the simultaneous orbital injection of all of the AMSAT satellites in one single release. The main mission, the SPOT-II satellite, is sitting right on top of our AMSAT birds in the final stage and will be the primary injection.

The original launch date and times has changed four times in a week and is now officially given as "postponed to 21 January 1990 at 0135.28UTC, due to a recorder failure on board the SPOT-II satellite." A 10 minute launch window follows the time and if the launch was aborted the next possibility would have come 48 hours later.

It was stated just before launch time that although the power system of each satellite would have been automatically actuated on release, no ground commands would be given to activate the systems until after 1.5 and 5 hours had elapsed. In the singular case of the AMSAT-Brazil 'DOVE' satellite, no 'on' command would be given until possibly much later. A sufficiency of time had to elapse to permit adequate separation from the other five satellites from the common launch injection, otherwise the proximity of the 145.825MHz f.m. speech transmitter could

give critical QRM problems to the 145MHz inputs of WEBERSAT, LU-SAT, PACKSAT, etc.

Dr. Martin Sweeting G3YJO, head of the University of Surrey AMSAT/UoSAT team, on return from the ESA French Guiana launch site, said that the preparation and integration team produced a hive of activity at Kourou, but, despite the hecticcy, all went very well indeed. The six satellites all checked out perfectly under their numerous final tests and were found to be fully functional.

Not all the information on all of the satellites is yet to hand. We still await the ATV data and format on the WEBERSAT, and details of data parameter and decodes on the various telemetry frames, and hope to have this available in time for the next issue.

As for the UoSAT pair, Martin states that the antennas in use on both the 'D' and 'E' satellites are linear, and not circularly polarised. Thus, to avoid rotational fade outs, and to keep QSB to a minimum, it is even more important for users to possess circularly polarised antennas at the ground stations, but either right hand or left hand will be acceptable.

The latest metered sets of elements for tracking and the resultant pass times will be issued regularly on the numerous AMSAT nets that were listed in last months column, but, to give you an idea where and when to look, here is a temporary provisional set for the cluster group provided by Richard Limebear G3RWL. They are based on a 9 November launch window, so will be fairly approximate to the general pass time average, unless any major offsets or postponements occur.

Satellite	Micro-Satellite Cluster.
Epoch Year	89
Epoch Day	313.08025463
Inclination	98.73 degrees
Right Asc. of Ascending Node	24.3439
Eccentricity	0.001362
Argument of Perigee	167.313
Mean Anomaly	240.63
Mean Motion	14.23617560
Decay rate or Drag factor	1.6E-06
Epoch Orbit Number	0

## RS-10/11

Many users think that RS-10/11 is being switched off from time to time, as the signal has been noticeable by its absence at known passes well within range. This commanding off as assumed is not the case. The scarcity of signals are due to daylight path attenuation of the 29MHz downlink by the dense 'E' layer ionisation, this is brought about by the high solar flux. Only too often, particularly when the satellite pass is at low elevation angles, daytime passes produce extremely low signal strengths deep in the noise, and when it is audible, the incoming tone is frequently very auroral, sounding like a rough hiss. The night- time dark path passes are clean, clear, invariably very strong, and free from the daytime multipath variables. Signals have been heard from RS-10 by many users when the satellite is well below horizon on the far side of earth, over the Pacific, above Japan, Alaska and California.

Of course, the re-angulation of the 145MHz uplink is insufficient to permit accessing the satellite at such times, but some degree of sub-horizon access is

possible to assist the optimum range limits. One such 'out of range' QSO was made by **Dave Rowan G4CUO**, who succeeded in working N5TAK in Arkansas for a new one, getting a RST 33A report to boot!

RS3A operator Andy Mirinov has been asked to reconsider putting the 21MHz uplink/29MHz downlink 'KA' mode on, as this would enable many round the world and indeed antipodal QSOs to be made by RS-10/11. He has so far declined to do so, as it is felt that the QRM produced by those using the 21MHz uplink satellite band section without adequately first listening could be embarrassing and counter productive. Similarly, most RS operators feel that abandoning the 3kHz sections of the passband each with individual computer a.i.c. command levels is a retrograde step, as it means that high powered stations seize most of the available power, so eliminating the modestly powered users. The fact that they still only produce a solar flux high attenuated weak downlink means they try to make up for it by using even more power, despite the fact that the 145MHz uplink attenuation is rarely more than 6dB.

Presumably, it is thought that it is better to have one or two strong signals produced over the noise rather than a large number of lesser readable signals under such conditions, but this practice does not do much to encourage the problem users to improve their downlink antennas rather than their linear outputs!

Finally, the users in USA say that they are unable to copy stations on s.s.b. between 29.390 and 29.400MHz, e.g. the top 10kHz of the current space band. The ROBOT is also very difficult to work, all due to an f.m. repeater output now being on 29.400MHz. As if simplex f.m. is not enough to contend with!

# Back-Scatter

## Amateur Satellites

Reports to  
Pat Gowen G3IOR  
17 Heath Crescent

Hellesdon, Norwich, Norfolk NR6 6DX

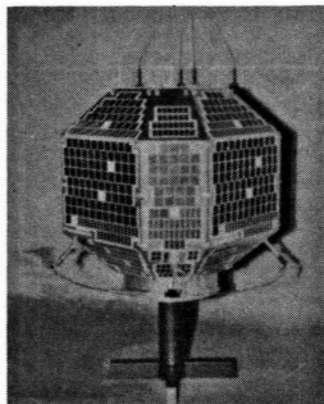


Fig. 1: JAS-1-B



Fig. 2: Phase III D



## **GX-2 FAX SSTV TRANSCEIVE FOR THE BBC COMPUTER**

Fantastic system supporting all modes of FAX and mono and colour SSTV. All facilities. Send for brochure. Complete system of EPROM, interface, leads, instructions only £99 or £119 with direct FAX printing option.

### **TX-3**

## **RTTY / CW / ASCII TRANSCEIVE**

Split-screen, type-ahead operation. Clock, review store, 24 large memories, callsign capture and much more. Needs TIF1 interface or T.U.

BBC-B/Master and CBM64 tape £20, disc £22

SPECTRUM tape £35, +3 disc £37 inc. adapter board (needs interface or T.U. also).

Also VIC20 RTTY/CW transceive program £20.

### **RX-4**

## **RTTY / CW / SSTV / AMTOR RECEIVE**

This is still a best-selling program and it's easy to see why. Superb performance on 4 modes, switch modes at a keypress to catch all the action. Text and picture store with dump to screen, printer or tape/disc. Needs TIF1 interface. BBC-B/Master, CBM64 tape £25, disc £27. VIC20 tape £25. SPECTRUM tape £40, +3 disc £42 inc. adapter board (needs interface also). Spectrum software-only version (input to EAR socket) tape £25, +3 disc £27.

**TIF1 INTERFACE** Designed for TX-3 and RX-4 software only available with them. Kit 20 (assembled PCB + cables, connectors) or ready-made £40, boxed with all connections.

## **RX-8 FOR THE BBC COMPUTER FAX, HF and VHF PACKET, COLOUR SSTV, RTTY, CW, AMTOR, UoSAT, ASCII RECEIVE**

Every possible feature and superb performance. Full printer and disc support. Send for our brochure or see review in Oct 89 Ham Radio Today.

Complete system of EPROM, interface, instructions, all leads and demo cassette £259.

BBC LOCATOR with UK, Europe, World maps £10, MORSE TUTOR £6, LOGBOOK £8, LOCATOR £7, RAE MATHS £9 for BBC, Spectrum, CBM64, VIC20, Electron. BBC, CBM64 programs available on DISC at £2 extra.

Prices include VAT and p&p by return.

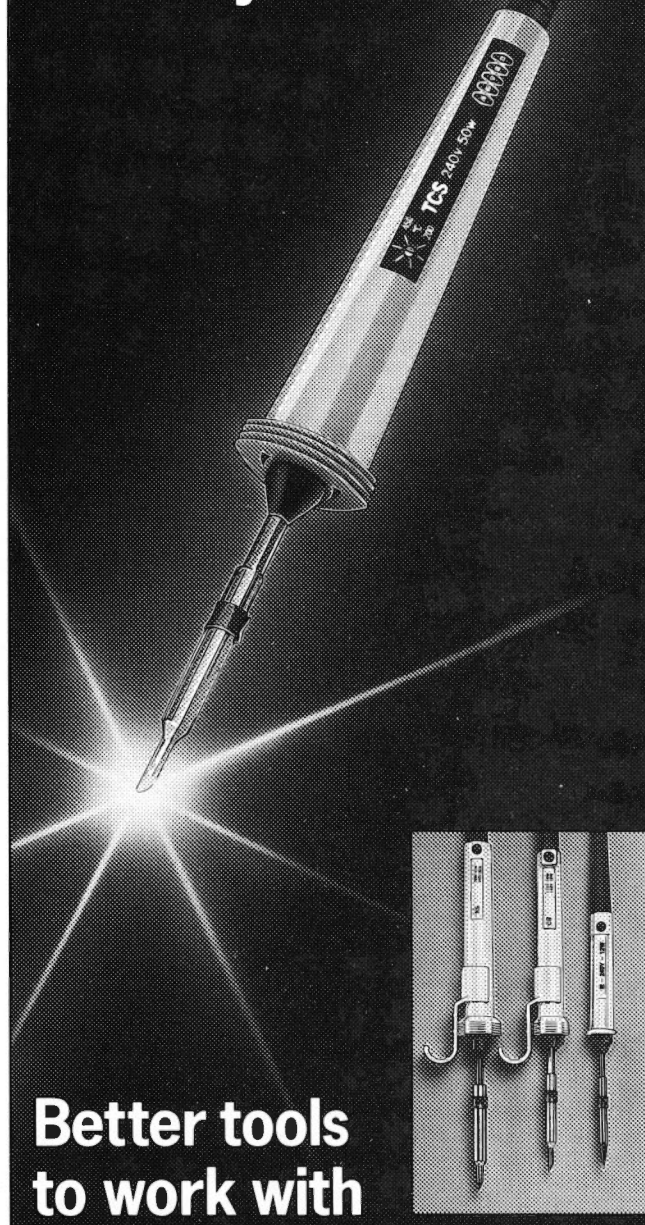


**technical software (P.W.)**

Fron, Upper Llandwrog, Caernarfon LL54 7RF  
Tel: 0286 881886



## **Our very simple offer to hobbyists**



## **Better tools to work with**

- Antex TCS 240V 50W and TCS 24V 50W.

- Temperature Controlled Soldering Irons for electronic and electrical applications – an essential item in the hobbyist's tool kit.

- Temperature range 200° to 450°C. Analogue proportional control  $\pm 1\%$ . Max. temperature achieved within 60 seconds.

PLUS

- Antex M-12W; CS-17W; and XS-25W. Available in 240 or 24 volt.

- Tools specially designed for fine precision soldering.

**Ideal for all electronics craftsmen and hobbyists.**

**For full information on the comprehensive Antex range of soldering irons, power supply units and accessories, please clip the coupon.**



Antex (Electronics) Limited, 2 Westbridge Industrial Estate, Tavistock, Devon PL19 8DE. Tel: 0822 613565. Fax: 0822 617598. Telex: 9312110595 AE G. Please send me full details of the full range of Antex soldering products.

Name \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_ (PW 3)

# Back-Scatter

## RS-12/13

Further to last month's input on the launch time possibilities, we now have provided from source the latest probabilities, plus the test findings on the coming pair of RS-12 and 13 transponders, which were integrated with the COSMOS NAVSAT at the end of 1988.

**Leonid Labutin UA3CR**, on his recent visit to Britain supporting the British North Pole Ski-Trek, described the forthcoming compound satellite. The very earliest launch date, he thinks, will be in April this year. May or June is thought to be more likely, but it could possibly be held over until the end of 1990. It will fly as a single unit with a COSMOS Maritime Navigational Satellite, the demand for which will determine the launch time. It will be placed into a 1000km (621 mile) high orbit, at an inclination of 83 degrees, giving a 103 minute period.

The transponders will give modes 'A' (2m to 10m), 'K' (15m to 10m), 'T' (15m to 2m) and any combination of these, e.g. 'KA', 'KT', etc.

The ROBOT system will be flown, and will also operate on modes 'A', 'K', 'KT', etc.

The measured mean power provision to RS-12 was 35 watts, and with RS-13 25 watts. The 10m downlink output power of both RS-12 and RS-13 was measured as between 0.45 watts and 1.2 watts. The 2m downlink transmit powers were found to be 12 watts for RS-12, and 8 watts for RS-13.

## RS-14

Whilst RS-12/13 is still awaited, probably not for long now, RS-14 is not far behind. Some six different USSR AMSAT groups are now busily working on this satellite, and are making good progress. The 'RUDAK-II' intended to fly with RS-14 has now been handed over from AMSAT-DL to UA3CR for incorporation and integration. If the descriptive handbook for this advanced digital communications system is required, a s.a.s.e. to Ron Broadbent G3AAJ QTHR, Secretary of AMSAT UK, will result in the availability and price. No further information has evolved on the condition of the original RUDAK aboard OSCAR-13, but hope still exists.

## OSCAR-13

A further memory wipe-out was suffered by this satellite just as soon as the 'hot' side of the highly active sun came round to face earth again. It was soon overcome by the command stations, who had the satellite up and running again within 24 hours. All users report that it is performing very well indeed, up to all expectations. Lots of new stations are appearing on this satellite, as the last section headed 'Satellite DXCC Listings' will show.

The current transponder operational schedule reads:-

Mode 'B' MA 000 to MA 110.  
Mode 'JL' MA 110 to MA 145.

Fig. 3: Updated list of active satellite stations

Callsign	Country	Tble	Notes
3A/DG1PJ	Monaco	1.00	*N
3D2JS/KA7APJ	Fiji Islands	2.00	NA
3D6QL	Swaziland	3.00	NA
4J1FS	M-V Island	4.00	*EXP
4S7EA	Sri Lanka	5.00	*A
4U1ITU	ITU, Geneva	6.00	*EXP
4X1AS	Israel	7.00	*A
5B40A	Cyprus	8.00	NA
5N0/JR8BUU	Nigeria	9.00	NA
5R8ADA	Madagascar	10.00	NA
5Z4DJ	Kenya	11.00	NA
6W1CK	Senegal	12.00	NA
7J1ACH	Minami Torishima	13.00	NA
706CAD	South Yemen	14.00	NA
7P8CM	Lesotho	15.00	NA
7X2AJ	Algeria	16.00	?A
8Q7AV	Maldives Islands	17.00	NA
9H1EJ	Malta	18.00	*VA
9K2DZ	Kuwait	19.00	*A
9M2DT	West Malaysia	20.00	*A
9X5HN	Rwanda	21.00	*?A
9Y4NP-d	Trinidad	22.00	NA
A71AD	Qatar	23.00	NA
A92P	Bahrain	24.00	NA
AL7JM	Alaska	25.00	*A
BY1PK	China	26.00	NA
C30BBO	Andorra	27.00	EXP
CGA/DG1PJ	Bahamas Is	28.00	*VAC
CE0A/K6MYC	Easter Island	29.00	EXP
CE3BEZ	Chile	30.00	*VA
CN8BA	Morocco	31.00	*A
CO2JA	Cuba	32.00	NA
CT1VZ	Portugal	33.00	*A
CT3BX	Maderia Islands	34.00	*A
CK2GB	Uruguay	35.00	*A
CY0SAB	Sable Island	36.00	EXP
DC8TS	West Germany	37.00	*VA
DP0GVN/DJ4SO	Antarctica	38.00	EXP
DU1POL	Philippines	39.00	*A
EA1KT	Spain	40.00	*A
EA6TO	Balearic Islands	41.00	*VA
EA8SK	Canary Islands	42.00	*VAC
E11CR	Ireland	43.00	*A
F9FT	France	44.00	*VA
FH8CL	Mayotte Island	45.00	*?A
FK1SU	New Caledonia	46.00	*A
FM5CS	Martinique	47.00	*A
FO0XX	Clipperton Island	48.00	EXP
FO8LO	F. Polynesia	49.00	EXP
FR3EK	Reunion Island	50.00	*?A
FS/AA4SC	Saint Martin	51.00	*EXP
FT3ZL-HRDBYME	Fr. Antarctica	52.00	*EXP
FT8X	Kerguelen Island	53.00	NA
FY0EK	French Guiana	54.00	*EXP
G4JUU	England	55.00	*VVVA
GD4CUO	Isle of Man	56.00	*EXP
G18HXY	Northern Ireland	57.00	*A
GJ6MMX	Jersey	58.00	*A
GM4DJS	Scotland	59.00	*A
GU/HB9PJM	Guernsey	60.00	*VAC
GW1MNC	Wales	61.00	*A
H44PT/G8BCG	Solomon Islands	62.00	NA
HB0HTA	Liechtenstein	63.00	*A
HB9RHV	Switzerland	64.00	*VA
HC1BI	Ecuador	65.00	*A
HC8E(HC1BI)	Galapagos Island	66.00	*VAC
HG2RD	Hungary	67.00	*A
H18/WA0NZI	Dominican Rep	68.00	*VAC
HK4CZE	Columbia	69.00	*A
HL9KT	Korea	70.00	*VA
HV2	Vatican City	71.00	NA
HZ1AB	Saudi Arabia	72.00	*A
IBCYS	Italy	73.00	*VA
IS0AGY	Sardinia	74.00	NA
J37AB	Grenada	75.00	*VA
JA1ANG	Japan	76.00	*VA
JD1/JA1YWX EX	Ogasawara	77.00	NA
JY4MB	Jordan	78.00	*A
KG4TM	Guantanamo Bay	79.00	*?A
KG6SL	Mariana Islands	80.00	?A

All transponders off from MA 145 to MA 150.

Mode 'S' (beacon only - no transponder activated) from MA 146 until MA 147.

Mode 'S' transponder on from MA 147 to MA 160.

Mode 'B' transponder on again from MA 150 to MA 255.

The omni-directional antennas (as distinct from the beams) will be used from MA 225, through perigee, to MA 035.

The current positional pointing is A.LAT +3.6 degrees, A.LON. +179.4 degrees (i.e. -0.6 degrees).

## JAS-1-B

A new firm launch date and time of February 1 between 0125 and 0200UTC

Callsign	Country	Tble	Notes
KH2/W1YRM	Guam	81.00	*VA
KH6JI	Hawaiian Is	82.00	*VA
W00YJ	US	84.00	*VA
KP4EK	Puerto Rico	85.00	*VA
KP5/KB6AFZ	Desecheo Island	86.00	VAC
KV4AD	St Thomas	87.00	NA
KX6BA	Marshall Islands	88.00	?A
LA1K	Norway	89.00	*A
LUBEH	Argentina	90.00	*VA
LX1RB	Luxembourg	91.00	*A
LZ1QM	Bulgaria	92.00	*A
OA4ZV	Peru	93.00	*A
OE6DGG	Austria	94.00	*A
OH0/OH2AQ	Aland Island	95.00	?A
OH0M/OH2AP	Market Reef	96.00	*EXP
OH5KC	Finland	97.00	*VA
OK1DTG	Czechoslovakia	98.00	*A
ON1KYC	Belgium	99.00	*A
OX3AM	Greenland	100.00	*?A
OY9JD	Faroe Islands	101.00	*?A
OZ1ABS	Denmark	102.00	*A
P29ZFS	Papua New Guinea	103.00	*NA
P4/KP4EK	Aruba	104.00	*BUS
PA0ZM	Netherlands	105.00	*A
PJ7/KA2MUM	Curacao	106.00	VAC
PJ8J/W1BIH	Brazil	107.00	*VAC
PY2ACM	Brazil	108.00	*A
PZ1AC	Suriname	109.00	NA
RA2FAG	Kaliningrad	110.00	*?A
SM4JWI	Sweden	111.00	*VA
SP6RLA	Poland	112.00	*?A
SU3AM	Egypt	113.00	NA
SV1IT	Greece	114.00	*A
T70A	San Marino	115.00	EXP
TF/WB9ZIF	Iceland	116.00	VAC
TG9SO	Guatemala	117.00	*VA
TIZSW	Costa Rica	118.00	*A
TZ/F9FT	Corsica	119.00	*VAC
TR8CA	Gabon	120.00	*A
TU4DA	Ivory Coast	121.00	*VA
TZ6FE	Mali	122.00	NA
UA0ALA	Asiatic Russia	123.00	*VA
UA6LJV	European Russia	124.00	*A
UB5EAG	Ukraine	125.00	*A
UC2AAB	Byelorussia	126.00	*A
UL7DD	Kazakhstan Russia	127.00	*?A
V3CAE	Belize	128.00	EXP
V85GA	Brunei	129.00	NA
VE6LQ	Canada	130.00	*VA
VK0?	Heard Island	131.00	EXP
VK5AGR	Australia	132.00	*A
VK9ZM	Willis Island	133.00	EXP
VP2ESE	Anguilla	134.00	?A
VP2V/K9PW	Br Virgin Island	135.00	VAC
VP50/W3HNC	Turks-Caicos Is	136.00	VAC
VP8ALJ	Falkland Islands	137.00	*A
VP9IB	Bermuda	138.00	*A
V56EL	Hong Kong	139.00	*?A
VU2DVP	India	140.00	*VA
XE1XA	Mexico	141.00	*A
XF4L	Revilla Gigeo	142.00	*EXP
XO0ZFZ/EA4LH	J.Fernandez Island	143.00	VAC
Y24BO	D. Rep Germany	144.00	*A
YB0UC	Indonesia	145.00	*A
Y11BGD	Iraq	146.00	*A
YJ3RG	Vanuatu	147.00	NA
YN3JUN	Nicaragua	148.00	*VA
YO2IS	Romania	149.00	*A
YU3N	Yugoslavia	150.00	*A
YV5Z	Venezuela	151.00	*A
Z21GH	Zimbabwe	152.00	?A
ZD7KD	St Helena	153.00	NA
ZD8MG	Ascension Island	154.00	NA
ZF1GC	Cayman Islands	156.00	*A
ZK1VL	N. Cook Islands	157.00	NA
ZK2RS	Niue	158.00	NA
ZL1AOX	New Zealand	159.00	*A
ZLBAFH	Kermadec Island	160.00	NA
ZR1L	South America	161.00	*VA

for JAS-1-b, the bigger and brighter FUJI-OSCAR-12 replacement, was given out just after Christmas by NASDA, JARL and JAMSAT. It is thus expected that at about the time you receive this issue of *PW*, it will be up and fully operational. One of the last pictures of JAS-1-b, to probably be known as FUJI-OSCAR-20 when in orbit, is shown by Fig. 1.

## Phase III-c

Dr. Karl Meinzer DJ4ZC, head of AMSAT-DL points out that despite the generous 880 000DM grant of the German Federal Government to the next elliptical orbit satellite project, an insufficiency of capital exists. Additional funding is still required, and needs to be sought from the world amateur radio community.

## Hams in Space

Information from **Chris Van der Berg PA0DLO** and TASS prove that the present MIR cosmonauts have had little time to come up for QSOs on 145MHz f.m., as the 26 November launch of the 19.5 metric tonne KWANT-II module gave them a very busy schedule. The solar panels of the addition were initially jammed, right over the thrusters, but were successfully unfolded on December 1. Two attempts were made to dock, but when the module was only 20 metres away, the navigational computer failed, and the docking was aborted. Attempts by the Alex pair to re-activate the computer also failed, so manual skills were brought in, re-manoeuvring the spacecraft on December 3 to give a good docking at 1222UTC that day. On 6 December, KWANT-II was removed from the main docking port and was fully coupled to the main side port on 8 December, now giving the 60 metric tonne combined spacecraft an 'L' configuration. All this was performed by the cosmonauts working in space suits from SOYUZ-TM-8, no easy task!

On December 10 the electrical system was coupled, and TM-8 was moved to the free docking port to permit taking another Progress docking on December 17. The large 'T' module is now due for launch on March 6, and after a weeks free flight will be docked to the already big MIR assembly, thus giving a symmetrical and stable space station again capable of easy manoeuvre and boosting.

From Bill Tynan W3X0, *QST* VHF/UHF columnist and AMSAT Vice-President for Manned Space Programmes, comes the latest news on the Shuttle amateur radio activity scene.

The bad news is that as the STS-35 mission now set for a lift off on April 26 is to be extended to 10 days, additional storage capacity is needed for food, water, etc. This means that Ron Parise WA4SIR, will no longer be able to take aloft the FSTV and SSTV system as intended. The good news is that the 145MHz voice f.m. and the packet TNC system will still go, the latter now using the on-board back up computer of the Shuttle itself.

Even better news is evidenced by the fact that Ken Cameron, scheduled to fly on Shuttle Mission STS-37 has just passed. his Amateur Radio Examination and has the callsign KA5EWP. Plans are now in progress in the hopes that both the Fast and Slow Scan TV experiment now aborted on STS-35 may fly on this STS-37 mission, soon after WA4SIR's activity.

## Quicker Keplerian Elements

Here are sets of 'smoothed' Keplerian element sets for our two elliptical orbiters provided by G3RUH and G4ULS respectively. They are devoid of long runs of many decimal places, having been abbreviated to a mean value giving more than a sufficiency of accuracy to keep in your computer sets for at least a year without change. The pass times given will be well within the limits of your timepiece



# Back-Scatter

and your beam elevation and azimuth accuracy.

Satellite	OSCAR-10	OSCAR-13
Epoch Year	89	89
Epoch Day	330.318	324.328282
Inclination	25.9	57.12
Right Asc. of Ascending Node	232.0	181.5
Eccentricity	0.6	0.6831
Argument of Perigee	96.0	215.48
Mean Anomaly	331.0	0
Mean Motion	2.0588	2.09699972
Decay rate or Drag Factor	0	0
Epoch Orbit Number	4855	1099

When the regular sets of Keplerian elements that emanate from NORAD, NASA and AMSAT and provided for us bi-monthly by Berger Lindholm appear, parameters that vary little, if at all, are seen to change considerably. What is more, the long string of decimal places supplied suggests an enormous accuracy, which is not the real case, as it is merely a fit at that time and point in space.

The point was noted last month by **John Branegan GM4IHJ**, when he noticed that the element sets for MIR, KWANT and SOYUZ-TM-8 indicated mean motions of 15.556072, 15.556276 and 15.5566281 respectively, which would indicate that MIR is separating from these attached modules by about 8km per day. He now points out that a similar elasticity is shown for SALYUT-7 and the attached COSMOS module, which, after a few weeks of absence, is now back transmitting again on 19.955MHz. At first it was thought that the beacon had been separated as a first stage to bringing SALYUT-7 back to earth this year, hence the parameters were closely scrutinised. Whilst the separate supplied elements showed a distinct separation between the spacecraft, visual observation proved them still to be connected.

As we have pointed out many times, the elements are not intended to be used

for precise scientific tracking, but merely to enable enthusiasts to track the various spacecraft to within reasonable limits. Even if we published the precise additional values that would permit accurate tracking for several passes ahead only, the average home computer tends to round off decimal places and produces an incremental error.

If you tire of typing in all those long numbers every two months, then it will please you to know that you will not see a significant departure from good tracking if you round up most of the elements supplied to the nearest first decimal place. On the proviso that you are sure to place in the full figures given for the Epoch, the Mean Motion and the Decay or Drag Factor (and this alone is subject to dramatic changes day by day in present solar conditions) you will not go far wrong.

I leave some of mine in the computer for months at a time, only bothering to change them to the latest set when the AOS, TCA and LOS are noticeably out of true due to the incrementing error. I then try the latest set and check them against a pass or two. If they do not fit, I subtly change the drag factor on the lower orbiters, or the mean motion on the higher ones, until a good fit results.

For those active on the packet radio network who feel the urge to regularly update their element sets, G1LYH is putting them out on this media the moment he has received them direct from source. 'L< G1LYH' will list his bulletins, and his notes on how best to use them.

## Phase-IV

Amateurs in North America are keen to pioneer the 'Phase IV' era, a phrase coined by Joe Kasser G3CZC in the January 1981 issue of *Orbit* magazine. The idea is to provide a pair of geostationary spacecraft, one to the east of the USA, and one to the west, which, requiring no tracking, means that high gain fixed antennas can be used by ground stations, providing continuous 24 hours per day

coverage to the majority of the worlds amateurs.

Such a concept is not without it's critics, who are concerned at the high relative cost of such a venture, the limitations of use to those not 'in view', and the sheer simplicity of access and use without the need for the skills required otherwise developed by those plotting and tracking the existing Phase 2 and 3 satellites. The debate is not unlike to that of the 'commercial or home-brew' argument, the c.w. test or code free' or even the 'full examination or novice licence' controversies, but with satellites comes the additional concern as to whether the limited finance available is being well spent, and whether satellites should be a simple to use chat-box for the masses or a means of training and education, or even both if that is possible.

Additionally comes the point that whilst the earlier satellites could be used and enjoyed by the whole world community of radio amateurs without recourse to expensive equipment and difficult technology, latter day satellites have appeared to be quite difficult to the newcomer and those without the needed supply of money and resources, both of which are short of availability in the majority of the world.

A similar debate is ongoing today due to the equipment costs and technology demands of both the packet satellites and the high elliptical orbiters, and this is reflected in the sources of activity, or rather the lack of it, on the more recent satellites compared with the early OSCAR and RS spacecraft.

Whilst mass use may provide the wide interest, the enlarged user numbers, and hence the finance needed to build and launch such AMSAT GEOSATS, the numbers actually able to use them may be limited more by income and frequency allocations than by the availability over their horizons.

Notwithstanding, AMSAT has already built a model of the projected Phase-IV

spacecraft, seen in our Fig. 2 this month, during it's unveiling at the Weber State College in Utah. Designer Dick Jansson WD4FAB is on the left, and the College President Stephen Naudauld on the right, the comparison of people to model giving an idea of the size of the structure. AMSAT have set a goal of \$80 000 US for funding, the first \$30 000 to be used for completion of the current microsats, the remaining \$50 000 for Phase-IV. Already donations exceed \$23 000 and are steadily growing.

## Satellite DXCC Listings

**Ed Steeb WA2RDE** of Buffalo, New York has provided Fig. 3, an updated list of stations active, current and past, on OSCAR-10 and 13. Ed suffixes the DXCC country and callsign with an indicator to show the status. '\*' indicates that the station is on OSCAR-13, 'A' shows he/she is currently active, 'VA' is very active, 'NA' not currently active, 'EXP' indicates a special DXpedition visit, 'VAC' is vacation, whilst '?' means current position unsure or unknown.

Ed points out that the '1D' following 9M8STA means that he was active on a day one operation only. He asks that amateurs provide input to him either via the mail (QTHR) via this column, or via the satellites themselves, providing the actual call or calls worked that are not on this latest list of countries, so that assistive updating is possible. His address is: Ed Steeb, WA2RDE, 15 Groveland Street, Buffalo, NY 14214, USA.

Already a number of OSCAR-13 user stations have worked over 100 different countries, among them being G4CUO, KL7GRF/6 and W6QUV. We suspect that many more such exist out there who are too modest to stake their claims! Any contributor may claim anonymity if desired!

**Dial Wireless Line for the latest news, see page 68**

## Solar

November 30 was a memorable day for **Cmdr Henry Hatfield** at his observatory in Sevenoaks. Between 1000 and 1500 his radio telescope recorded a high level of solar activity and in particular, a massive burst at noon on 1297MHz, Fig. 1. "There was more or less continuous noise at 136MHz as soon as the machine was switched on. This noise increased at about 1040 and remained high thereafter," said Henry. At 1145, when the sun came from behind a local yew tree he was able to use his spectrohelioscope and although he located four sunspot groups, 29 filaments and 11 quiescent prominences he was surprised to find nothing very vigorous. "An 'S' shaped plage in 030°N, 089°C was quite active, but certainly not flaring and there was nothing else very interesting," wrote Henry. Then suddenly,

at 1200, came that big 'blow' at 1297MHz which triggered the observatory alarm and within half a minute Henry's spectrohelioscope was back on and discovered a flare in 30°N, 089°, the 'S' shaped plage, Fig. 2 (taken at 1213), had turned into a ribbon flare and one other hot spot. Henry told me that by 1220 the ribbon was double and its bandwidth was 4

Angstroms. A further observation at 1400 found the area quieter, both ribbon flares had gone and been replaced with two thin ribbon filaments and two small sub flares were located just to the NE of the former active area.

At his observatory in Selsey, weather permitting, **Patrick Moore** observes the sun, by the projection method, as

frequently as possible and his drawings, showing the distribution of spots on the sun's disc for November 25 and 30 and December 6 can be seen in Figs. 4, 5 and 6 respectively. While **Ron Livesey** was using his optical equipment in Edinburgh or Glasgow, he identified 4 active areas on the sun on November 9, 14, 16 and 17; 5 on the 1st; 6 on days 2, 3, 7, 22, 23 and 25; 7 on the 27th; 8 on the 4th, 5th and 30th and 9 on the 6th.

The computer print-out in Fig. 8, kindly supplied by **Neil Clarke G0CAS** (Ferrybridge), clearly shows the very high level of solar flux during the first half of November and the big climb again on the 30th. Henry Hatfield recorded gentle bursting at 136MHz for much of the day on December 1 and 28 and **Ern Warwick** (Plymouth) heard a "noise flare up" on 28MHz on December 11 and 12.

# Back-Scatter

## Propagation

Reports to  
Ron Ham  
Faraday

Greyfriars, Storrington, West Sussex RH20 4HE

# Back-Scatter

## Auroral

Ron Livesey, the auroral coordinator for the British Astronomical Association received reports described as "glow, patch" from observers in Scotland for the overnight period of November 3, 6, 23, 24, 25, 27 and 28, "quiet arc or band" on the 7th and 8th, "rayed arc or rayed band", on the 6th and 26th, "Active forms, flaming, flickering" on nights 2, 3, 4, 5, 17 and 29 and "all sky aurora", from Denmark and Scotland on the 17th. "Ray bundles", were also reported from Eire, England and France on the 17th. "The storm of 17/18 was the 27 day repeat of the 21/22 October storm and was more intense," said Ron and added, "Aurora was visible in N.Scotland 1900-2300, S.Scotland 1830-2000, England 2000-2100, S.England 2120-2140, Denmark 1630-2250, Eire 1730-2200, Nova Scotia 0420-0520 and France 2200." **Doug Smillie** (Wishaw) noted the auroral effect on 144MHz radio signals on days 11, 13 and 17 and **Tony Hopwood** (Worcester) heard such signals on the 17th and 26th.

Ern Warwick noticed a small echo on the signals from The Rutherford Appleton Laboratory beacon (GB3RAL - 28.216MHz) on November 29 and 30 and on the American beacon (KH60/B - 14.100MHz) on December 1. He also reports weak

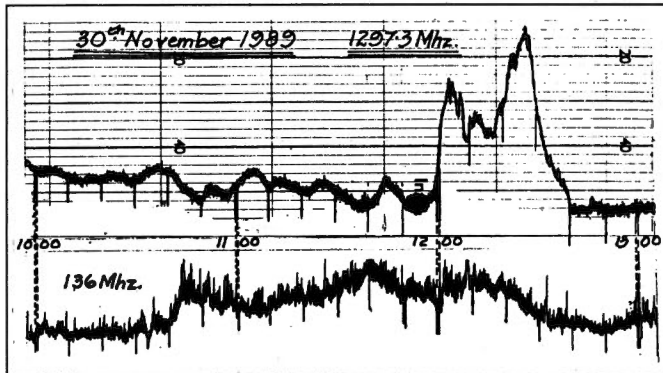


Fig. 1



Fig. 2

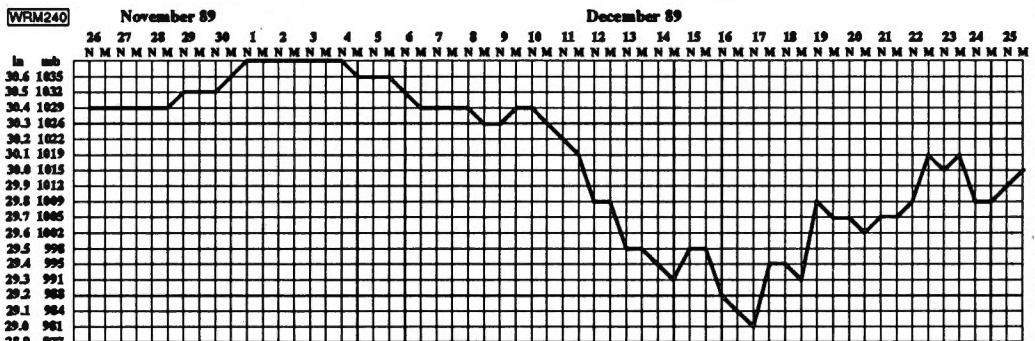


Fig. 3

Fig. 7



Fig. 4



Fig. 5

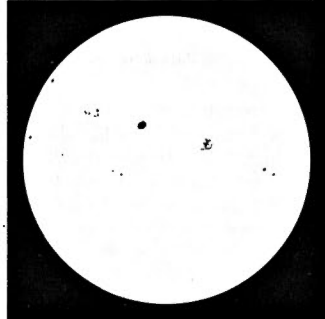


Fig. 6

Beacon	November					December																									
	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
AL7GQ			X					X																							
DF0AAB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
DL0IGI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
EA2HB																															
EA3JA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
EA6RCM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
IY4M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KA1NSV																															
KB4UPI		X		X		X	X	X	X					X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X
KC6BSJ																					X	X	X	X	X	X	X	X	X	X	
KD4EC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KE2DI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KF4MS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KJ4X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KK4M	X																														
KM4MY	X						X																								
KW7Y/B	X								X	X	X	X	X	X	X	X	X				X										
LA5TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							X					
LU1UG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
NX20/B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
N8KHE																															
N3GPP																															
OK0EG	X				X	X	X		X	X				X	X	X	X	X	X												
OH2TEN	X					X	X		X	X				X	X	X	X	X	X												
PT7AAC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PY2AMI				X				X	X	X	X	X	X	X	X	X	X	X	X												
SK5TEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
VE1MUF						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
VE2HOT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
VE3TEN																															
VE6YF										X	X	X	X	X	X	X	X	X	X												
VK2RSY	X						X	X	X	X	X	X	X	X	X	X	X	X	X												
VK5WI	X							X																							
VK6RWA	X								X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
WA4DJS		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
WA8RUF	X	X						X													X	X	X	X	X	X	X	X	X	X	
WB9VMY																															
WC8E	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
W3VD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
W3SV																															
W7JPI/B	X				X	X	X	X	X																						
W8UR	X	X	X	X				X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
W8FKL/4																															
W9UXO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												



# Back-Scatter

auroral effects on signals at 1900 on November 21, 1747 on the 22nd and on the 10MHz German beacon (DK0WCY) during the early evenings of December 27 and 29. In Storrington, **Fred Pallant G3RNM** suspected aurora when he heard "a good echo effect" on several Scottish stations at 1000 on December 10 and Ern Warwick logged echoes on the Italian beacon (IY4M) on the 6th and 14th, the American beacon (WA4DJS) on the 4th and 10th, signals from the UA4 area of the USSR on the 24th and some from Japan and the USA on 24MHz on the 5th and 6th.

## Magnetic

Although the Ap index up to November 19 was generally unsettled there were storm peaks on days 13, 16 and 17 which can be seen on the graph sent by Neil Clarke, Fig.9 and the beginning of a rise at the end. "From the 19th to the end of the month the field became quiet with just the odd unsettled day," said Neil and the various magnetometers used by Tony Hopwood, **Karl Lewis** (Saltash), Ron Livesey, **David Pettitt** (Carlisle) and Doug Smillie, between them, recorded magnetic storm conditions on November 5, 8, 9, 13, 14, 15, 17, 18, 19, 26, 27 and 29 with a note of "severe" on the 17th and 18th.

## Sporadic-E and 'F2'

Smearly and unlockable domestic television pictures were received on Ch. R1 (49.75MHz) during an 'F2' opening early on December 1 and a test card from Sweden, via Sporadic-E, on Ch. E2 (48.25MHz) between 1000 and 1115 on the 7th. In Meerut, India, **Lt. Col. Rana Roy** saw adverts and cartoons from Malaysia on Ch. E2 (48.25MHz) and Bangkok on Ch. E3 (55.25MHz), via 'F2'

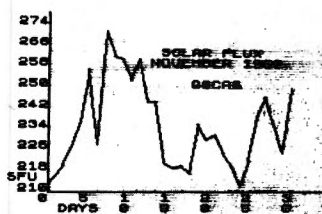


Fig. 8

early on the 3rd and I heard weak television sync. pulses on Ch. R1 again at 0850 on December 29. **Bob Brooks** (Great Sutton) identified Arabic announcers and dancers, via 'F2' on Ch. E2, at 0848 on December 1 and 18 and unidentifiable signals on Chs. R1 and/or E2 between 0800 and 1200 on days 2, 4, 23, 24, 27 and 30.

## Propagation Beacons

First, my thanks to **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), Henry Hatfield, **John Levesley G0HJL** (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), Fred Pallant, **Ted Waring** (Bristol) and Ern Warwick for their 28MHz beacon logs which enabled me to compile this month's comprehensive chart, Fig. 7.

Ted Waring heard "WABRUF/B MILFORD MI TEMPORARY GND WAVE PROP STUDY" on November 26 and Mark Appleby copied "DE KA1NSV/BCN CAPE COD, MA. 10 WATTS VERT DIPOLE" with an S2 'watery' signal on 28.258MHz at 1400 on December 16. Greg Lovelock logged "N3GPP/BCN 1 WATT BEAMING N/NE PLSE QSL TO BOB HOFFMAN 3038 NORTH BROOK DVE LANCASTER PA 17601" on 28.286MHz and Ern Warwick heard the ending, "HAPPY HOLIDAYS 73

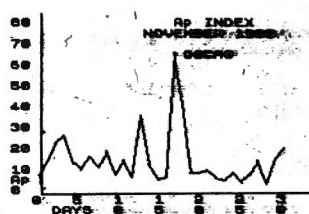


Fig. 9

73 DE N3GPP/BCN." Ern also reports a "very very strong" signal from OK0EG on December 4 and, in addition to a detailed 28MHz log, he heard, almost daily, the beacons IK6BAK and PY2AMI on 24MHz, OH2B, ZS6DN/B and 4X6TU/B on 14MHz and DK0WCY on 10MHz.

## Tropospheric

The slightly rounded atmospheric pressure readings, Fig. 3, for the period November 26 to December 25 were taken at noon and midnight from my own barograph. The v.h.f. radio and television bands II (87.5 - 108MHz) and III (175-230MHz) were open in varying degrees while the pressure was really high from November 26 to December 4. It peaked at 30.8in (1043mb) around noon on the 2nd. While these bands were open continental radio and television programmes were received in many parts of the UK on December 1, 2, 3, 4 and 7. On the 3rd and 4th, **Simon Hamer** (New Radnor) received a congestion of broadcast signals throughout Band II from many parts of Europe and Scandinavia. During another opening toward the end of the month **George Garden** (Edinburgh) parked his car near Inverbervie at 1600 on the 28th and logged BBC Radio Cumbria from Sandale "at phenomenal strength" and

ILRs Forth and Tees, while at the opposite end, in southern England, at 0850 on the 29th, I received strong signals from BBC Radios Bristol and WM and ILR GWR with adverts for the Swindon area, plus a couple of French stations. Another high pressure system was moving on January 3 and while parked in East Sussex, using my Plustron TVR5D with its own rod antenna, I received a strong negative picture from France in Band III and identified several Dutch and French stations in Band II.

## 934MHz

John Levesley UK-627 is the contest manager for the UK 934MHz Club and wishes to thank all those members and non-members who took part in their contest last October. The leading entrants came from East Sussex, Greater London, North Staffs and South Devon and during the event, contacts were made between stations in Avon, Berkshire, Cornwall, Cheshire, Clwyd, Devon, Dorset, Gloucester, Guernsey, Gwent, Hants, Hereford, IOW, Jersey, Kent, Lancashire, Leicester, Lincolnshire, Manchester, Merseyside, Midlands, Nottinghamshire, Oxford, Shropshire, Somerset, Staffordshire, Surrey, Sussex, Wiltshire, Worcestershire and Yorkshire.

In Walton on Thames, **Terry Wyatt UK-845** took advantage of the high pressure system of 1037mb on December 2 and 3 to work some u.h.f. DX and, in addition to contacts with stations ranging from the Isle of Wight to Harwich, he hit the jackpot of 488km by working UK-513 in Darlington, Co. Durham. "The longest distance QSO I have enjoyed on the frequency," said Terry. John Levesley received signals from the Channel Islands on December 1, 2, 9, 10, 23, 24, 25 and 26.

It has been a dramatic few months in international broadcasting, with stations in the Eastern Bloc benefitting from the revolutions - both peaceful and bloody - which have occurred during the end of 1989. In particular Romania's external service provided dramatic details of events there.

On December 22, Radio Bucharest's scheduled external programme at 1130 in French was replaced by the station's interval signal, which changed at around 1153 to tone and shortly after 1200UTC all transmitters went off the air. Nothing more was heard until 1830, when announcements in English and Romanian asked listeners to stand by for more information. At 1900, an announcement about the current situation in the country was heard on four frequencies in Romanian, French, English and three other languages. Broadcasts from Radio Bucharest were somewhat erratic on the following two days, but on Christmas Day, normal programmes resumed, but on less frequencies than scheduled. Meanwhile, regional broadcasting in Romania has restarted. Radio Free Timisoara-Romania

# Back-Scatter

## Broadcast Round-up

Reports to  
Peter Shaw

has restarted broadcasts in Serbo-Croat, several years after the station was closed, replaced by Radio Bucharest's three programmes.

Czechoslovakian radio has also made some changes recently. The long wave programme on 270kHz has a new signature tune and is no longer known as Hvezda, but Radio Station Czechoslovakia, or in Czech, Rozhlasova Stanice Ceskoslovensko.

Back in the west, Radio Canada's feared cutbacks were far less severe than had been anticipated. The station's output will remain at the present level and the

station is investigating the possibility of starting a live daily two-hour programme exchange with Radio Korea's international service. It is hoped that RCI will use South Korean transmitters for its new Mandarin service beamed towards mainland China, whilst the RCI Sackville transmitter will be used by Radio Korea for English and Korean programmes to the North American continent. RCI is also looking towards exchanging transmitter time with broadcasters in West Europe and the Mediterranean for a new Arabic service which it is hoped will be established in 1990. RCI still has some free air time on

the Sackville transmitter and plans to rent this out to almost anyone who wants it and the station is also thinking of carrying advertising between programmes. Radio Canada International is well on the way to completing its programme of work on antennas for use on the 13MHz band at the Sackville plant. The European and African 13MHz array is in half-working condition, whilst the South American array will be commenced during the early part of 1990.

The station is also contemplating the installation of two smaller 13MHz arrays for coverage of North America. Radio France International is to install three 500kW transmitters in Jibuti to carry French and Arabic programmes. The f.m. transmitters in Jibuti will also be built to carry French to the local community and these should be running by the end of 1990, although the h.f. station will take at least 18 months to complete. The Voice of America will start Tibetan language broadcasts during 1990, for two hours a day, although the station anticipates some problem finding Tibetan-speaking broadcasters in the United States. Radio



# QUARTZ CRYSTALS

**QuartzLab** MARKETING LTD

P.O. Box 19 Erith Kent DA8 1LH  
Telephone: 0322 330830 (24hr Ansafone)  
Fax: 0322 334904  
Telex: 8813271 GECOMS-G  
(Attention QUARTSLAB)  
**An SAE with all enquiries please  
PRICES NOW INCLUDE VAT**

## STOCK CRYSTALS

### CRYSTALS FOR 2 METRES

HC25 £2.70 FOR ONE CRYSTAL £2.50 EACH FOR 2 OR MORE

**TX CRYSTALS**  
12MHz 30 & 40pF

**RX CRYSTALS**  
44MHz Series Res  
14/15MHz 30pF  
Scanner Crystals  
SR9 crystals £3.45

R0-R7, S8-S23,  
& S32

HC6 £2.80 FOR ONE CRYSTAL £2.60 EACH FOR 2 OR MORE

**TX CRYSTALS**

**RX CRYSTALS**

R0-R7, S11, S20-23

4MHz 30pF

**4 METRE CRYSTALS FOR 70.26 IN HC6/U at £2.80 each**

TX 8.78250 RX 29.7800

**70CM CRYSTALS £5.50pr or £3.25 each**

For Pye PF1 PF2 & PF70 series Wood & Douglas and FDK MULTI U11

SU20 RB0 RB1 RB2 RB3 RB4 RB5 RB6 RB7 RB8 RB9 RB10 RB11

RB13 RB14 RB15

Also for MULTI U11 ONLY SU16 SU18

**CONVERTER CRYSTALS IN HC18/U AT £3.30 each.**

22.000, 38.866, 42.000, 56.000, 116.000

**FREQUENCY STANDARDS £3.20 each.**

HC6/U 1000kHz 10.000MHz

HC18/U 1000kHz 7.000MHz 10.000MHz 10.700MHz 48.000MHz 100.000MHz

**TONEBURST, LF. & MPU CRYSTALS IN HC18 £2.80 each.**

7.168MHz (For 1750 Hz Tone), 10.245 (for 10.7 I.F.)

3.2768 4.000 5.0688 10.245MHz 15.0000

**YAESU CRYSTALS FOR FT101's FT801 & etc £4.80 each.**

Many available ex stock (A list is available on request please send S.A.E.)

Full list available on request, please send SAE  
**PRICES NOW INCLUDE VAT**

## MADE TO ORDER CRYSTALS

### FUNDAMENTALS

FREQUENCY RANGE	PRICE	OVERTONES	PRICE
1 TO 1.5MHz	£12.48	3rd OVT 21.00 TO 65.00MHz	£5.25
1.5 TO 2.0MHz	£5.90	5th OVT 60.00 TO 110.00MHz	£5.90
2.0 TO 6.0MHz	£5.50	5th OVT 110.00 TO 125.00MHz	£8.60
6 TO 21MHz	£5.25	7th OVT 125.00 TO 175.00MHz	£11.00
21 TO 25MHz	£7.50		

**DELIVERY**  
2.0 to 175.0MHz 2 weeks approx. 1 TO 1.499MHz 3 to 4 weeks

Unless otherwise requested fundamentals will be supplied for 30 pf load capacitors and overtones for series resonant operation.

**HOLDERS - PLEASE SPECIFY WHEN ORDERING - else HC25U**

supplied for XTLS above 3MHz.

HC6U & HC33U 175MHz  
HC18U & HC25U 2-175MHz  
HC17 Add £0.50 HC45 Add £3.75

**DISCOUNTS:** Price on application for 10 + units to same frequency/spec. or bulk purchases of mixed frequencies.

**COMMERCIAL CRYSTALS:** available on fast delivery and at competitive prices.

**EMERGENCY SERVICE:** FOR XTLS 1 to 175MHz. Add the surcharge for each

XTAL. Days later to working days. 4 days + £12, 6 days + £7, 8 days + £5, 13

days + £3.

**CRYSTALS SOCKETS** HC25 £0.25 ea. HC6 £0.30 ea. **MINIMUM ORDER CHARGE**

£1.50 unless ordered with crystals.

**TERMS:** Cash with order post inc. to UK & Ireland. Cheques & PO's to QSL LTD.

**PRICES NOW INCLUDE VAT**

## MAKE YOUR INTERESTS PAY!

More than 8 million students throughout the world have found it worth their while! An ICS home-study course can help you get a better job, make more money and have more fun out of life! ICS has over 90 years experience in home-study courses and is the largest correspondence school in the world. You learn at your own pace, when and where you want under the guidance of expert 'personal' tutors. Find out how we can help YOU. Post or phone today for your **FREE INFORMATION PACK** on the course of your choice. (Tick one box only!)

Electronics	<input type="checkbox"/> Radio, Audio and TV Servicing	<input type="checkbox"/>
Basic Electronic Engineering (City & Guilds)	<input type="checkbox"/> Radio Amateur Licence Exam (City & Guilds)	<input type="checkbox"/>
Electrical Engineering	<input type="checkbox"/> Car Mechanics	<input type="checkbox"/>
Electrical Contracting/Installation	<input type="checkbox"/> Computer Programming	<input type="checkbox"/>
<input type="checkbox"/> GCE over 40 'O' and 'A' level subjects		

Name \_\_\_\_\_ Address \_\_\_\_\_  
**ICS** International Correspondence Schools, Dept. EE530 312/314 High Street, Sutton, Surrey SM1 1PR.  
Telephone 01-843 9568 or 041-221 2926 (24 hours)

## J. BIRKETT

### RADIO COMPONENT SUPPLIERS

**TRANSISTORS 2N 3421** Similar to 8F51 etc. @ 12 for £1.  
**6AS FETs** 18GHz Out of Spec Devices. Stripline Package @ 3 for £1.99.  
**EX-MILITARY COMMUNICATION RECEIVER R210** 2 to 16 MHz in 7 Switched Bands, AM, CW, SSB Aerial Inputs Long Wire Whip or Dipole, CW Filter, Noise Limiter complete with 240 Volt AC Power Pack, Loudspeaker and Lightweight Pair of Headphones @ £79.80 (carr. £8).  
**EX-MILITARY COMMUNICATION RECEIVER TYPE R210** in a unconverted condition @ £50 (carr. £6).  
**AIR SPACED VARIABLE CAPACITORS** 500+500pF Large Broadcast Type @ £3.50, Medium Type 500+500pF @ £3.30, Small 500+500pF @ £2.95, Wide Spaced 150pF @ £3.30, 10+10+20pF @ £1.50, 15+15pF @ £2.50, 200+350pF @ £2.50, 208+178pF @ £2.50, 125+125pF @ £1.95.  
**MINIATURE WIRE ENDED ELECTROLYTICS.** 4.7uF 50V.w., 10uF 63V.w., 100uF 10V.w. All @ 12 For £1, 56uF 6V.w. @ £1 per 100.  
**FETs** BF256 @ 20p, 2N3819 @ 20p, 2N3824 @ 25p, **Dual Gate MOS FET** 3N201 @ 80p, **Power FET** VN1 0KM @ 50p, VN1 0LM @ 40p, VN211 @ 40p.  
**TRANSISTORS 2N 3421** Similar To 8F51 @ 12 For £1.  
**ASSORTED MULTI-TURN TRIMPOTS** 9 For £1, 18 For £1.50.  
**ELECTROLYTIC CAPACITORS** 10uF 450V.w. @ 45p, 32+32uF 275V.w. @ 45p, 50+50uF 275V.w. @ 45p, 47uF 400V.w. @ 45p, 2uF 450V.w. @ 45p.  
**MOTOROLA HAND HELD UNF TRANSCEIVERS** Less Aerial with 2 Nicads Less Crystals £23.60 (P&P £1.50).  
**ACCESS AND BARCLAY CARDS** Accepted. P.&P. 60p under £5. Over Free. Unless Otherwise Stated.  
**C.M. HOWES AND WOOD AND DOUGLAS KITS** Available By Post and For Callers.



**25 The Strait  
Lincoln, Tel. 20767  
(LN2 1JF)  
Partners J.H.Birkett.  
J.L.Birkett.**

Books for radio amateurs

AERIAL ACCESSORIES AND MASTS

**ELLIOTT ELECTRONICS**  
for the Radio Enthusiast

MICROWAVE MODULES

INSTANT HP AVAILABLE  
WHILE STOCKS ON REQUEST

APPOINTED DISTRIBUTOR

**JAYBEAM AMATEUR ANTENNAS**

RIGS, ANTENNAS, SWR BRIDGES, POWER SUPPLIES, TEST GEAR, COMPONENTS, MORSE KEYS, COAXIAL CABLES, ROTATORS, MICS, PLUGS AND SOCKETS, SWITCHES  
Call us on (0533) 553293  
OR COME AND LOOK AROUND AT  
26/28 Braunstone Gate, Leicester

QSY OLD MAN TO

**QRP KITS AT QRP PRICES!**

**AN 80m CW QRP TX/RX KIT FOR £76.25!**

★ Ready Built — £126.50

★ Complete in EVERY detail!

★ VFO, AF Filter, Sidetone etc!

★ Fully Detailed Manual!

Other Super Kits include:  
3 BAND RECEIVER, ATU's, AUDIO FILTER etc etc... all 'well styled' and complete!

For full details of the DTR3 and the rest of our range, send a SAE to:

**LAKE ELECTRONICS, 7 MIDDLETON CLOSE, NUTHALL, NOTTINGHAM NG16 1BX.**  
Or ring Alan G4DVW on (0602) 382509 (callers by appointment only).



## USED AMATEUR EQUIPMENT?

I Buy, Sell & Exchange

**WANTED!** — Your TOP QUALITY USED EQUIPMENT! We pay best prices for all types of used amateur radio equipment. Is YOUR gear for sale? Is it in top condition? Why not give us a call? If our offer isn't up to your expectation, why not sell your gear through our 'RIGSEARCH' service? Our new showroom is open where we can display your rig until sold, or alternatively you hang on to it until we find a suitable buyer. This service costs you nothing, your gear is offered to every prospective purchaser that calls, and we achieve the price YOU require. All with least hassle for you. Why not give us a try?

**DON'T FORGET — IF YOU'RE SELLING, IT'S G4TNY and RIGSEARCH!**

**BUYING?** — If you're looking for quality used amateur equipment, it has to be G4TNY. We have a large stock of used equipment ourselves, but, if we don't have what you're looking for, our new amateur radio brokerage RIGSEARCH possibly will.

**WHY NOT VISIT OUR NEW SHOWROOM? MUCH EQUIPMENT NOW ON DISPLAY ONLY 5 MINS FROM DARTFORD TUNNEL & M25.**

Phone Dave, G4TNY on (0708) 862841 or (0836) 201530. From 9.30 am to 7 pm, Tuesday to Saturday.

SAE PLEASE FOR LISTS. CALLERS BY APPOINTMENT, PLEASE.



**MAIL ORDER?  
OVERNIGHT DELIVERY  
NOW AVAILABLE!**

**G4TNY AMATEUR RADIO**  
UNIT 14, THURROCK COMMERCIAL CENTRE, JULIET WAY,  
SOUTH OCKENDON, ESSEX RM15 4YG.



**PART  
EXCHANGE  
POSSIBLE**



# Back-Scatter

Portugal started using a new 300kW sender in early December which should benefit reception particularly in Africa, but may also aid reception here in the UK.

## European Stations

All times UTC (=GMT)  
In Nicosia, the Cyprus Broadcasting Corporation sends Greek to the UK on Friday, Saturday and Sunday for thirty minutes at 2215 on 9.535, 7.18 and 6.18MHz. Radio Berlin International in East Germany has made some changes to its programme line-up following suggestions from listeners. A new programme *Viewpoint* is heard on Wednesday, whilst *Berlin in Focus* is a new Friday broadcast. English to Europe is carried:

0600 on 5.965 & 6.115MHz  
0845 on 6.04, 6.115, 7.185 & 9.73MHz  
1045 on 6.115MHz  
1200 on 6.115, 9.665 & 17.78MHz  
1400 on 6.115MHz  
1445 on 9.73MHz  
1645 on 7.295 & 9.73MHz  
1815 on 7.26, 7.295 & 9.73MHz  
2045 on 6.115 & 1.359MHz  
2245 on 5.965MHz  
Radio Budapest's English schedule for Europe:

**DX programmes**  
1045-1100 on 15.22, 15.16, 11.91, 9.835, 9.585 and 7.22 (Sun DX) 1130-1145 on same frequency (Sat DX)  
1615-1630 on same frequencies (Mon and Thurs DX)

**Daily mainstream programmes**  
1930-2000 on 15.16, 11.91, 9.835, 9.585, 7.22 and 6.11MHz 2100-2130 on same frequencies

From Iceland, the Riskisutvarpid Short Wave service beams programmes to Europe: 1215-1245 on 15.79, 15.767, 13.861 and 11.418 (all u.s.b.) 1855-1930 on 17.44, 15.78, 15.767 & 13.855MHz (all u.s.b.) These are relays of Iceland's domestic RAS 1 channel. The Voice of the Mediterranean in Valletta, Malta has English: 0600-0700 on 9.765 & 1.557MHz 1400-1500 on 11.925MHz

Radio Mediterranean, also in Valletta, has a daily English programme at 2230 for

sixty minutes on 6.11 and 1.557MHz Relays to Moscow of the domestic Republican radio stations on short wave on the USSR are currently:

**Ukrainian**  
0100-1515 on 6.03MHz  
1520-0015 on 15.385MHz

**Belorussian**  
0315-1700 on 6.15MHz  
1705-2000 on 15.27MHz

**Uzbek**  
0200-1725 on 5.945MHz  
1730-2000 on 17.84MHz

**Kazakh**  
0100-1800 on 9.69MHz  
**Georgian**

0200-1600 on 7.125MHz  
1605-2000 on 15.24MHz

**Azerbaijan**  
0300-1730 on 7.30MHz  
1735-2100 on 9.675MHz

**Lithuanian**  
0400-1655 on 6.01MHz  
1900-2200 on 9.695MHz

**Moldavian**  
0315-1900 on 6.075MHz  
1905-2050 on 15.36MHz

**Latvian**  
0400-1855 on 5.920MHz  
1900-2200 on 9.695MHz

**Kirghiz**  
0000-1645 on 9.735MHz  
1650-1850 on 17.785MHz

**Tajik**  
0015-1805 on 9.785MHz  
**Armenian**

0555-1515 on 7.175MHz  
1520-2000 on 15.11MHz

**Turkmenian**  
0515-1555 On 7.145MHz  
1600-1900 on 17.635MHz

**Estonian**  
0330-0430 on 5.98MHz (Mon-Fri)  
0430-1500 on 5.98MHz

1505-2330 on 9.56MHz  
**Tatar**  
0330-1555 on 11.945MHz

The English Service of Radio Moscow to Great Britain and Ireland is broadcast at 2000 for one hour on 9.685, 7.17, 7.115, 6.165, 6.03 and 1.143MHz. Radio Station Peace and Progress to Europe is at 2200 for an hour on 9.58, 7.36, 7.205, 6.145,

4.795 & 1.386MHz. Overseas services from some of the Soviet Republics have broadcasts in English, including:

**Radio Yerevan in Armenia**  
0345-0400 on 17.69, 17.665, 15.18, 9.765 & 7.40MHz (to N America)  
2150-2200 on 9.48, 7.30, 7.205 & 6.045MHz (in French to Europe)

**Estonian Radio, Tallin**  
2100-2200 on 9.56, 5.925, 1.332, 1.215 & 1.035MHz (either Swedish, English or Estonian)

2130-2200 Monday on 5.925MHz  
**Radio Vilnius, Lithuania**  
2230-2300 on 6.10MHz & 666kHz

**Radio Kiev, Ukraine**  
1900-1930 on 7.115, 6.165, 6.09 & 6.01MHz

0030-0100 on 17.69, 17.655, 15.18, 9.764 & 7.40MHz (to N America)

**Radio Tashkent, Uzbekistan**  
1330-1400 on 15.47, 11.785, 9.60, 9.54 & 5.945MHz (to Asia)

## African & Middle Eastern Stations

Radio Douala in Cameroon has been noted on the new frequency of 4.975MHz instead of the announced 4.795MHz. This may be a simple operating error by transmitter staff. The station broadcasts in English and French 0400-2400 with English 0500-0600, 1300-1500, 1705-1845. National Guinean Radio in Conakry has been noted on 4.9MHz with French and vernaculars at around 2000. The clandestine station, Iran's Flag of Freedom Radio, changed its frequency to 11.615 in parallel with 15.10MHz between 1630 and 1820. Turkish Police Radio has been heard during the afternoon period on new 7.362MHz, replacing the channel of 6.34MHz, which has been in use since the mid 1970s. The station operates between 0600 and 1600. The frequency of 7.38MHz has also been noted. The Voice of Turkey in English to Europe is now:

2100-2150 & 2300-2350 on 9.795MHz.

## Asian & Pacific Stations

Radio Australia introduced a new schedule at the end of 1989, with

programmes tailored more specifically to audiences in the Pacific region. Times of the media programme, *Communicator*, have changed, and the programme is now heard on Sunday at 1430 and Monday at 0730. Suggested frequencies are now:

0400-0630 on 11.91MHz (Shepparton 100kW)

0700-1000 on 9.655MHz (Shepparton 100kW)

1530-2030 on 7.205MHz (Carnarvon 300kW)

2100-0700 on 15.24MHz (Shepparton 100kW)

In New Zealand, Print Disabled Radio in Levin has been allocated the new frequency of 3.935MHz. The station will operate 2100-1100 daily, which should provide a potential catch here in Europe. English from Radio Pyongyang, North Korea, beamed to Europe:

1300-1350 on 11.735, 11.335, 9.60 & 9.345MHz

1500-1550 on 11.76, 9.977, 9.64 & 9.325MHz

1700-1750 on 11.76, 9.977, 9.64 & 9.325MHz

2000-2050 on 9.977, 9.64, 9.345 & 6.576MHz

The station KYOI in Saipan is no more - the Christian Science Monitor, which has owned the station for some time, has altered the call sign to KHBI (standing for Herald Broadcasting International). The station now has two 100kW transmitters and the old antenna system has been refurbished, which will greatly improve geographical coverage.

## N, C & S American Stations

Changes to RAE's English services have been made, with programmes restricted to weekdays only, with no announcements as to when weekend English programmes will return. Currently, the schedule is:

1630-1730 & 2100-2200 on 15.345MHz

0100-0200 & 0300-0400 on 11.71MHz

Radio Havana Cuba has altered its schedule to Europe in English to:

1900-2100 on 11.80MHz

## ATV, HDTV and all that

This month's article is all about ATV but this time it's the other ATV, advanced television. Confused? I hope you won't be when you've read this.

All the same these days it seems you're not fit to follow your chosen profession or hobby unless you're in command of all the abbreviations and acronyms. Most of them are TLAs (three-letter abbreviations) in fact, but that does not make them any more meaningful at all: a few are more or less obvious (once they have been explained to you) but not all are memorable.

TV is full of these abbreviations at the moment, largely because transmission techniques and receiver technologies are

changing (or at least the manufacturing interests wish they would!). Because of this you may be a bit baffled by all the jargon and I thought I'd take a bit of time out to clear things up.

There is of course a rearguard reaction

to these novelties: in the satellite world the proprietors of Sky Television have taken the attitude that there's little wrong in the existing PAL system or at least it's quite good enough for programmes like *The New Price is Right* and *Sale of the Century*.

I'm inclined to agree personally but if I had my way we'd all be back on 405 lines, so we had better keep this article entirely objective.

## New Techniques

All of these new technologies may be important one day. It's unlikely that they will all be adopted, but some of the techniques to which they relate are bound to filter down to domestic reception and surplus equipment one day. For this reason alone - and because you like to keep abreast of what's happening in the world of TV, you may care to note what the abbreviations stand for.

All of these new ideas are intended to

# Back-Scatter

## ATV

Reports to  
Andy Emmerson G8PTH  
71 Falcutt Way  
Northampton NN28PH

# Back-Scatter

make TV better, generally by improving the definition of the picture. That's not all though, and there are some fundamental differences in what you do and how you do it which may not be obvious at first sight. There is a distinction, for instance, between extended definition and improved definition. Some improvements can be made entirely at the receiver end, but most imply changes to the transmitted signal as well. Some of the new transmission systems are compatible with existing receivers and some are not. Some use digital techniques, others are still analogue. Some of the improvements can be implemented straightaway and some can not. Some can be applied to terrestrial TV, others only to satellite or cable transmissions.

## IDTV and EDTV

The most basic split is between IDTV and EDTV. The term IDTV means improved definition TV and that means adding extra lines to the structure of the signal which implies a fundamental change from existing TV standards. EDTV is extended definition TV, which is taken to mean anything to do with making improvements to the existing PAL, SECAM or NTSC picture.

IDTV will retain the existing 4:3 aspect ratio of the picture (4 units wide by 3 units tall); other systems are likely to use a 16:9 'letterbox' or motion picture-style format. Further technical details are given below.

HDTV is generally taken to mean that the picture definition is greater than twice the existing resolution: anything less than this is only EDTV. HDTV schemes include

1050-line and 1125-line systems for NTSC countries and a 1250-line one for Europe. These schemes have a wide ('letterbox') aspect-ratio picture.

## Dossier

Here is a summary of the main expressions which you may come across and what they stand for.

**ACTV** - advanced compatible television. An American 1050-line, 59.94Hz HDTV system compatible with existing broadcasts.

**ATSC** - Advanced Television Systems Committee. A USA body investigating ATV systems.

**ATV** - advanced television, i.e. anything more advanced than what we have at present.

**DIGIT 2000** - a chip set made by ITT Semiconductors and intended to be incorporated in new generation TV receivers. The chips are capable of processing PAL, SECAM, NTSC, C-MAC, D-MAC, D2-MAC and NICAM transmissions.

**EDTV** - extended definition television. EDTV-WIDE involves changing the aspect ratio and adapted TVs will change picture format automatically. The extra picture information will, of course, only be seen on sets equipped to display this.

**EPAL** - extended PAL. A system devised by the BBC some while ago for sending PAL signals with additional picture information in the frequencies above the 6MHz sound carrier. Suitably equipped receivers would use this to display improved pictures.

**EUREKA 95 Project** - a 1250-line, 50Hz

system widely backed in Europe. Conversion to/from 625 line systems is easy but 24 f.p.s. film transfer is still a problem because of the 1Hz flicker.

**EUREKA EDTV** - a European 625-line, 50Hz system with 16:9 picture. Much cheaper than 1250 lines and may become a European standard.

**HD-MAC** - high definition multiplexed analogue component. European proposal for HDTV by upgrading the existing MAC system. A high definition analogue video signal of about 25MHz bandwidth is reduced so that it can fit within a transmission channel of 12 MHz bandwidth.

**HDTV** - high definition television. Back in 1936 this meant 405 lines monochrome TV (with absolutely no colour compatibility problems). Nowadays, it means anything better than your existing system, be it 525 or 625 lines.

**HDVS** - a 1125-line, 60Hz HDTV system already in use for some television production. Most support comes from Japan. Not directly compatible with any existing system.

**HIGH-SCAN** - a proprietary design of multi-standard TV receiver made by Thomson which takes normal 625 line transmissions and electronically enhances the picture. It can display both 4:3 and 16:9 format pictures and can take a HDTV adapter.

**Hi-Vision** - (see HDVS).

**IDTV** - improved definition television. At the transmitter end improvements can be made in encoding and filtering, but most of the improvements will be in the receiver. For instance a frame store will allow the picture refresh rate to be

increased to 100Hz, totally eliminating the flicker effect.

**MAC** - multiplexed analogue component. Extended bandwidth transmission system intended for use on satellite and cable systems, having a high immunity to interference.

**MUSE** - multiple sub-Nyquist sample encoding. Japanese signal encoding technique that reduces the amount of signal needed to send a HDTV picture.

**NTSC** - (National Television Standards Committee or 'never twice the same colour'). The existing 525-line colour system used in the Americas, Japan and elsewhere.

**PAL** - (Phase Alternating Line or 'perfection at last'). The 625-line colour system used in Britain, most of Europe, Australia and New Zealand and elsewhere.

**SECAM** - (Sequence a Memoire or 'system essentially contrary to anything American'). An ingenious and much under-rated 625-line colour system used in French territories and the Soviet bloc.

**SUPER NTSC** - an American 1050-line, 29.97Hz system which is cheap to implement and completely compatible with existing NTSC channels and receivers.

**NB:** this list is not claimed to be exhaustive, since so many new techniques (and acronyms) are appearing now. It is hoped, however, that all the explanations are accurate and meaningful.

## Sign-off

Once again that's it for this time. Please continue to send in your comments, reports and letters ready for the next article. Thanks.

# Helpline

USE THIS COLUMN WHEN YOU THINK THERE'S NO HOPE FOR THAT ODD PROBLEM... SOMEONE, SOMEWHERE MIGHT BE ABLE TO HELP!

Does any reader know of a company that produces a good **logbook for the short wave listener**? George Brooks is looking for one that's horizontal A4 format, spiral bound and around 50-100 pages. He would like one that has no limit to the number of lines per entry so that it can be ruled off when completed. **George Brooks, 73 Percy Road, Ramsgate, Kent CT11 7JB.**

A **Grundig Satellit 210 model 7001** has lost some of its controls, the KW2-9 tuner selector knob and the tuner dial knob. Does anyone know the whereabouts of spares for this piece of equipment. **K. Coulbeck, 98 Legsbey Avenue, Grimsby, Lincs.**

Mr W Smith recently bought an **AR900** UK scanning receiver. During his initial 'fumbblings' he confused the scanner and it covered a range well outside the spec, but doesn't know how he did it. Does anyone know what to do? **Mr W Smith, 36 Lundhill Road, Wombwell, Barnsley, South Yorks S73 0RB.**

Where can a c.w./RTTY/AMTOR program for the **Atari 520 STFM** computer be purchased? **R. McKinnon, 9 Brandywells, Kingsnympton, Umberleigh, North Devon EX37 9SP.**

Has anyone got circuit information on a **Sony 9-90UB Mono TV**. It was built around the late 1970s, it has a 9in screen and seems to be 405/625

lines. Other information required is a mod for switching pos/neg. **Mike Evans, 120 Loughton Way, Buckhurst Hill, Essex IG9 6AR.**

P.F. Thompson has recently bought the book *Solid State Short Wave Receivers for Beginners* by R.A. Penfold and hasn't been able to obtain the **Denco** tuning coils. The manufacturers say they are no longer made. Can any reader help with a possible source, equivalents or winding details? **P.F. Thompson, Flat 3, 29 Cannon Place, Brighton, Sussex BN1 2FB.**

Does anyone have a copy of the **September 1989 issue of SWM** as John Fryatt wants the 'Hot Rodding the ICF-2001D' article. **John Fryatt, 22 Alverstone Road, Manor Park, London E12 5NJ.**

Mr Hartwell has been told of an article which appeared in *Popular Electronics* sometime between 1957 and 1960 describing a **non-parabolic microphone for picking up birdsong**. The unit was made up of a bundle of aluminium tubes of different lengths. **Harry Hartwell, Ffos Y Ffin, Llanfair Clydogan, Llanpeter, Dyfed, Wales SA48 8LL.**

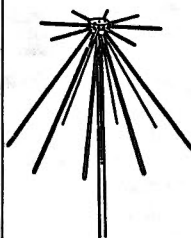
Circuit diagrams and technical information is being sought on the **Safgan oscilloscopes, type DT-520** by the Brighton College Electronics Department. If you can help, the address is, **Patrick Billingham G4AGO, Brighton College, Eastern Road, Brighton BN2 2AL.**



# REVCO

## WHEN QUALITY COUNTS

### REVCONC



The UK's favourite discone composed of traditional British quality engineering.

The REVCONC works well without exaggerated advertising claims. It is designed to cover 50 to 500MHz, and thousands of satisfied users will testify to its efficiency. Unlike some manufacturers we do not claim a wider frequency coverage, and we do not quote inflated figures for gain. A gain figure is meaningless unless the reference point is stated.

Optional vertical whip feature: It is possible to fit a vertical whip section to a discone. We do not want to give you the "hard sell" where this vertical element is concerned, but there is some evidence that it may improve the performance of the antenna around the resonant frequency of the whip. That's why we make it an optional feature.

Another option is the N-type connector instead of the popular SO239. N-types give a better UHF performance, but they cost a bit more. The choice is yours.

Because the REVCONC is British-made by a Company which has been in business for 30 years, you buy with confidence, knowing that there is back-up should anything go wrong.

### RADAC



This Wide-band antenna offers an interesting alternative to the discone. It is simply an array of dipoles, but the clever bit involves arranging the dipoles to maximise bandwidth and minimise interaction. The RADAC can be set up for a range of frequencies from 27MHz to 500MHz, and because very good impedance matches can be obtained the user can specify any six frequency bands in this range for optimised performance, either for receiving, or more usefully, for transmitting. For example, all the Amateur Bands from 10m to 70cm can be covered in one antenna. If you are in the PMR business, the RADAC can be customised for your needs. Aircraft listening enthusiasts can specify VHF & UHF Airband coverage.

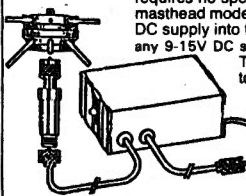
What a versatile antennal Design and engineering excellence from REVCO!

### WIDE-BAND PRE-AMPLIFIERS

The problem with omni-directional wide-band antennas is their lack of gain.

The REVCO PA3 range of wide-band pre-amplifiers complement the antennas and compensate for their short-comings.

The basic specification of the products is similar: coverage 20MHz-1GHz, at 1GHz: minimum gain 13dB, noise factor 5.5dB. Choose from a mast-head version (PA3) or a standard die-cast box style (PA3I). Best results are normally obtained from the masthead model which gives a boost to weak signals which would otherwise have been lost in the feeder cable. Also feeder cable noise is not amplified which is the case if the amplifier is mounted at the base of the feeder. On the other hand, the die-cast box version requires no special installation and is readily taken out of circuit. The masthead model is supplied with a special power unit which feeds the DC supply into the antenna feeder. No PSU is provided for the PA3I as any 9-15V DC source is suitable (current requirement about 25mA).



The PA3I finds application in instrument work, e.g. input to spectrum analysers, boosting the output from signal generators to give a low-power TX.

The standard version of the PA3I has BNC sockets and is designated "PA3I/B"; available to special order N-type sockets ("PA3I/N") or SO239 ("PA3I/S").

A special feature of the PA3 series is a high-pass filter to attenuate frequencies below 20MHz; high-power HF & MF broadcast stations can be very troublesome!

### ON-GLASS ANTENNAS

This type of antenna mount has been around for a long time, but they are very difficult to produce successfully at VHF. The Cellular Radio industry has popularised the glass-mount, but there are fewer design problems at 900MHz, because the coupling assemblies are small. REVCO's extensive experience in making the UK's best Cellular On-glass has led to the production of superior quality VHF and UHF models. Here are a few facts which you should know:

**Coupling efficiency:** apart from the question of effective power transfer to the outside world, you don't want too much RF floating around inside the car, do you? Not healthy for vehicle electronic systems, and possibly not good for humans either. REVCO glass mounts feature very efficient power transfer.

**Sticking power:** no good if they fall off half way home. A properly installed REVCO stays on. Should you change your car, a refit kit is available.

**Simplicity:** Some of the competition has a multitude of loose components: the REVCO has 2 pre-assembled parts: inside and outside. What could be simpler?

**Weather-resistance:** REVCO antennas are made from corrosion resistant materials so you can leave them out in the rain with confidence. It is not necessary to plaster the product with silicone rubber to keep the water out.

The REVCO glass mounts do cost a bit more, which reflects these superior features.

REVCO also make a full range of mobile antennas for frequencies from 27MHz to 950MHz, and new products are constantly under development. Contact your local Dealer or in case of difficulty write, phone or fax. Trade enquiries welcome.

**Revco Electronics Ltd, Old Station Yard, South Brent, S Devon TQ10 9AL Tel: 0384 73394 Fax: 0384 72007**

ANNOUNCING THE



# NATIONAL CONVENTION AND AMATEUR RADIO EXHIBITION

Saturday 21 April — Sunday 22 April

NATIONAL EXHIBITION CENTRE, BIRMINGHAM

The premier Amateur Radio Exhibition of the year — supported by an extensive programme of lectures, presentations and events.

TRADE ENQUIRIES WELCOME

TEL 0277 225563  
office hours

... the place to be!



0202  
665524

## HOW TO ORDER

**POST AND PACKING; add 75p for one book, £1 for two or more books, orders over £25 post and packing free, (overseas readers add £1.50 for one book, £2.50 for two or more for surface mail postage) and send a postal order, cheque or international money with your order (quoting book titles and quantities) to PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP. Please make your cheques payable to Practical Wireless, payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 665524. Books are normally despatched by return of post but please allow 28 days for delivery. Prices correct at time of going to press. Please note: all payments must be made in Sterling.**



0202  
665524

\* A recent addition to our Book Service. O/P = Out of print, O/S = Out of stock.

## RADIO

### AIR & METEO CODE MANUAL

10th Edition

Joerg Klingenfuss

Detailed descriptions of the World Meteorological Organisation Global Telecommunication System operating FAX and RTTY meteo stations, and its message format with decoding examples. Also detailed description of the Aeronautical Fixed Telecommunication Network amongst others. 289 pages. **£14.00**

### BETTER RADIO/TV RECEPTION

A. Nallewalle, A. T. Cushan and B. D. Clark

An Australian book giving guidance and advice to listeners seeking reliable reception of distant radio stations, and to DX listening hobbyists. 134 pages. **£9.95**

### BETTER SHORTWAVE RECEPTION (USA)

W. S. Orr W6SAI and S. D. Cowan W2LX

Receivers, antennas, propagation, DX listening techniques for the short waves and v.h.f. 158 pages. **£8.50**

### PASSPORT TO WORLD BAND RADIO 1990

This book gives you the information to explore and enjoy the world of broadcast band listening. It includes features on different international radio stations, receiver reviews and advice as well as the hours and languages of broadcast stations by frequency. 398 pages. **£12.95**

### SCANNERS (Third Edition)

Peter Rouse GU1DKD

A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating procedures. 245 pages. **£7.95**

### SCANNERS 2

Peter Rouse GU1DKD

The companion to Scanners, this provides even more information on the use of the v.h.f. and u.h.f. communications band and gives constructional details for accessories to improve the performance of scanning equipment. 216 pages. **£9.95**

### SHORT WAVE RADIO LISTENERS' HANDBOOK

Arthur Miller

In easy-to-read and non-technical language, the author guides the reader through the mysteries of amateur, broadcast and CB transmissions. 207 pages. **O/P**

### RADIOTELETYPE CODE MANUAL

10th Edition

Joerg Klingenfuss

This book gives detailed descriptions of the characteristics of telegraph transmission on short waves, with all commercial modulation types including voice frequency telegraphy and comprehensive information on all RTTY systems and c.w. alphabets. 96 pages. **£8.00**

### THE SATELLITE EXPERIMENTER'S HANDBOOK (USA)

A guide to understanding and using amateur radio, weather and TV broadcast satellites. 207 pages. **£9.25**

### 1934 OFFICIAL SHORT WAVE RADIO MANUAL

Edited by Hugo Gernsback

A fascinating reprint from a bygone age with a directory of all 1934 s.w. receivers, servicing information, constructional projects, circuits and ideas on building vintage sets with modern parts. 260 pages. **£9.95**

### HIGH POWER WIRELESS EQUIPMENT

Articles from *Practical Electricity* 1910-11

Edited by Henry Walter Young

A reprint of interesting practical articles from the early days of radio. 99 pages. **£6.85**

## BEGINNERS

### AN INTRODUCTION TO RADIO DXING (BP91)

R. A. Penfold

How to find a particular station, country or type of broadcast

and to receive it as clearly as possible. 112 pages. **£1.95**

### BEGINNER'S GUIDE TO RADIO

9th Edition

Gordon J. King

Radio signals, transmitters, receivers, antennas, components, valves and semiconductors, CB and amateur radio are all dealt with here. 266 pages. **£8.95**

### ELECTRONICS SIMPLIFIED - CRYSTAL SET

CONSTRUCTION (BP92)

F. A. Wilson

Especially written for those who wish to take part in basic radio building. All the sets in the book are old designs updated with modern components. 72 pages. **£1.75**

### QUESTIONS & ANSWERS RADIO

Eugene Trundle

Basics of electrical theory, radio and semiconductors, receivers, amateur and CB radio, and test equipment. 110 pages. **O/P**

### THE SIMPLE ELECTRONICS CIRCUIT AND COMPONENTS Book One (BP62)

The aim of this book is to provide an in-expensive but comprehensive introduction to modern electronics. 209 pages. **£3.50**

## TELEVISION

### AN INTRODUCTION TO SATELLITE TELEVISION (BP195)

F. A. Wilson

Answers all kinds of questions about satellite television. For the beginner thinking about hiring or purchasing a satellite TV system there are details to help you along. For the engineer there are technical details including calculations, formulae and tables. 104 pages. **£5.95**

### A TV-DXERS HANDBOOK (BP176)

R. Bunney

Information on transmission standards, propagation, receivers including multi-standard, colour, satellites, antennas, photography, station identification, interference etc. Revised and updated 1986. 87 pages. **£8.95**

### GUIDE TO WORLD-WIDE TELEVISION TEST CARDS Edition 3

Keith Hamer & Garry Smith

Completely revised and expanded, this is a handy reference book for the DXTV enthusiast. Over 200 photographs of Test Cards, logos, etc., world wide. 60 pages. **£4.95**

### SATELLITE TELEVISION INSTALLATION GUIDE

2nd Edition

John Breeds

A practical guide to satellite television. Detailed guidelines on installing and aligning dishes based on practical experience. 56 pages. **£11.95**

## THEORY

### COMMUNICATION (BP89)

Elements of Electronics Book 5

F. A. Wilson

Fundamentals of line, microwave, submarine, satellite, digital multiplex, radio and telegraphy systems are covered, without the more complicated theory or mathematics. 256 pages. **£2.95**

### FILTER HANDBOOK A practical design guide

by Stefan Niewiadomski

A practical book, describing the design process as applied to filters of all types. Includes practical examples and BASIC programs. 195 pages. **£25.00**

### FROM ATOMS TO AMPERES

F. A. Wilson

Explains in simple terms the absolute fundamentals behind electricity and electronics. 244 pages. **£3.50**

### LEVEL II RADIO & ELECTRONICS THEORY

Ian Ridpath ZL1BCG

A sequel to Amateur Radio & Electronics Study Course, covers advanced theory to a level for most technician courses. The handwritten format aims to make the student feel these are his own notes. 169 pages. **£6.70**

### PRACTICAL ELECTRONICS CALCULATIONS AND FORMULAE (BP53)

F. A. Wilson

This has been written as a workshop manual for the electronics enthusiast. There is a strong practical bias and higher mathematics have been avoided where possible. 249 pages. **£3.95**

### SOLID STATE DESIGN FOR THE RADIO AMATEUR

Wes Hayward W7ZOI and Doug DeMaw W1FB

Back in print by popular demand! A revised and corrected edition of this useful reference book covering all aspects of solid-state design. 256 pages. **£10.95**

### The ARRL ELECTRONICS DATA BOOK

Doug DeMaw W1FB

Back by popular demand, completely revised and expanded, this is a handy reference book for the r.f. designer, technician, amateur and experimenter. 260 pages. **£8.95**

## LISTENING GUIDES

### AIR BAND RADIO HANDBOOK

David J. Smith

Listen to conversations between aircraft and ground control. The author, an air traffic controller, explains more about this listening hobby. 174 pages. **O/P**

### AIR TRAFFIC CONTROL

David Adair

A guide to air traffic control with maps, drawings and photographs explaining how aircraft are guided through crowded airspace. 176 pages. **£6.99**

### DIAL SEARCH

5th Edition 1988/89

George Wilcox

The listener's check list and guide to European broadcasting. Covers m.w., l.w., v.h.f. and s.w., including two special maps. 46 pages. **£3.25**

### FLIGHT ROUTINGS 1989

T. T. Williams

Identifies the flights of airlines, schedule, charter, cargo and mail, to and from the UK and Eire and overflights between Europe and America. 104 pages. **O/P**

### GUIDE TO BROADCASTING STATIONS

20th Edition 1989/90

Philip Darrington

Frequency and station data, receivers, antennas, Latin American DXing, reporting, computers in radio, etc. 240 pages. **£9.95**

### GUIDE TO FACSIMILE STATIONS 9th Edition

Joerg Klingenfuss

This manual is the basic reference book for everyone interested in FAX. Frequency, call sign, name of the station, ITU country/geographical symbol, technical parameters of the emission are all listed. All frequencies have been measured to the nearest 100Hz. 318 pages. **£12.00**

### GUIDE TO FORMER UTILITY TRANSMISSIONS

3rd Edition

Joerg Klingenfuss

Built on continuous monitoring of the radio spectrum from the sixties until the recent past. A useful summary of former activities of utility stations providing information in the classification and identification of radio signals. 126 pages. **£8.00**



## GUIDE TO UTILITY STATIONS

8th Edition

Joerg Klingenfuss

This book covers the complete short wave range from 3 to 30MHz plus the adjacent frequency bands from 0 to 150kHz and from 1.6 to 3MHz. It includes details on all types of utility stations including FAX and RTTY. There are 15802 entries in the frequency list and 3123 in the alphabetical call sign list plus press services and meteorological stations. 502 pages. £19.00

## HF OCEANIC AIRBAND COMMUNICATIONS

3rd Edition

Bill Laver

Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. 29 pages. £3.50

## INTERNATIONAL RADIO STATIONS GUIDE (BP255)

Revised and updated in 1988, this book shows the site, country, frequency/wavelength and power of stations in Europe, the Near East and N. Africa, North and Latin America and the Caribbean, plus short wave stations worldwide. 128 pages. £4.95

## MARINE UK RADIO FREQUENCY GUIDE

Bill Laver

A complete guide to the UK s.w. and v.h.f. marine radio networks. Useful information, frequency listings and the World Marine Coastal Phone Stations. 82 pages. £4.95

## NEWNES SHORT WAVE LISTENING HAND BOOK

Joe Pritchard G1UQW

A technical guide for all short wave listeners. Covers construction and use of sets for the s.w.l. who wants to explore the bands up to 30MHz. 288 pages. £12.95

## THE COMPLETE VHF/UHF FREQUENCY GUIDE

Updated 1988

This book gives details of frequencies from 26-2250MHz with no gaps and who uses what. Recently updated, there are chapters on equipment requirements as well as antennas, etc. 88 pages. £5.95

## THE INTERNATIONAL VHF FM GUIDE

7th Edition

Julian Baldwin G3UHK and Kris Partridge G8AUU

The latest edition of this useful book gives concise details of repeaters and beacons worldwide plus coverage maps and further information on UK repeaters. 70 pages. £2.85

## THE POCKET GUIDE TO RTTY AND FAX STATIONS

Bill Laver

A handy reference book listing RTTY and FAX stations, together with modes and other essential information. The listing is in ascending frequency order, from 1.6 to 27.1MHz. 46 pages. £2.95

## SHORT WAVE LISTENERS CONFIDENTIAL FREQUENCY LIST

Bill Laver

Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz. £7.95

## VHF/UHF AIRBAND FREQUENCY GUIDE (Updated)

A complete guide to the airband frequencies including how to receive the signals, the frequencies and services, VOLMET and much more about the interesting subject of airband radio. 74 pages. £5.95

## WORLD RADIO TV HANDBOOK 1989

Country-by-country listings of long, medium and short wave broadcast and TV stations. Receiver test reports. English language broadcasts. The s.w.l.'s "bible". 576 pages. O/P

## INTERFERENCE

### INTERFERENCE HANDBOOK (USA)

William R. Nelson WA6FGG

How to locate and cure r.f.i. for radio amateurs, CBers and TV and stereo owners. 253 pages. £6.75

### RADIO FREQUENCY INTERFERENCE (USA)

What causes r.f.i.? Are all r.f.i. problems difficult, expensive and time-consuming to cure? These questions and many more are answered in this book. 84 pages. £4.30

## AMATEUR RADIO

### AMATEUR RADIO CALL BOOK (RSGB)

Winter 88/89 Edition

Now incorporates a 48-page section of useful information for amateur radio enthusiasts. 310 pages. £7.00

### AMATEUR RADIO OPERATING MANUAL (RSGB)

A mine of information on just about every aspect of amateur operating. International call sign series holders, prefix lists, DXCC countries list, etc. 204 pages. £6.16

### AMATEUR RADIO SATELLITES the first 25 years

Arthur C. Gee G2UK

This souvenir publication mainly a pictorial account of the pattern of developments which have occurred over the last 25 years. 34 pages. £2.25

### AN INTRODUCTION TO AMATEUR RADIO (BP257)

I.D. POOLE

This book gives the newcomer a comprehensive and easy to understand guide through amateur radio. Topics include operating procedures, jargon, propagation and setting up a station. 150 pages. £3.50

### HINTS AND KINKS FOR THE RADIO AMATEUR

Edited by Charles L. Hutchinson and David Newkirk

A collection of practical ideas gleaned from the pages of QST magazine. 152 pages. £4.95

### HOW TO PASS THE RADIO AMATEURS' EXAMINATION (RSGB)

Clive Smith G4FZH and George Benbow G3HB

The background to multiple choice exams and how to study for them with sample RAE papers for practice plus maths revision. 88 pages. £5.65

### PASSPORT TO AMATEUR RADIO

Peprinted from PW 1981-1982

The famous series by GW3JGA, used by thousands of successful RAE candidates in their studies. Plus other useful articles for RAE students. 96 pages. £1.50

### PRACTICAL IDEAS FOR RADIO AMATEURS

Ian Poole G3YWX

Offers a wealth of hints, tips and general practical advice for all transmitting amateurs and short wave listeners. 128 pages. £5.95

### QUESTIONS & ANSWERS AMATEUR RADIO

F. C. Judd G2BCX

What is amateur radio? The Radio Amateurs' Exam and Licence. Technology, equipment, antennas, operating procedures and codes. 122 pages. £3.95

### RADIO AMATEUR'S GUIDE TO RADIO WAVE PROPAGATION

(HF Bands)

F. C. Judd G2BCX

The how and why of the mechanism and variations of propagation in the h.f. bands. 144 pages. £8.95

### THE 1990 ARRL HANDBOOK FOR THE RADIO AMATEUR

This is the 66th edition of this very useful hardback reference book. Updated throughout it has several new sections covering oscilloscopes, spectrum analysers, digital frequency synthesis, phase-noise measurement and new constructional projects. 1200 pages. £15.95

### \*THE ARRL OPERATING MANUAL

Another very useful book from the ARRL. Although written for the American radio amateur, this book will also be of use and interest to the UK amateur. 684 pages. £12.95

### THE ARRL SATELLITE ANTHOLOGY

The best from the Amateur Satellite News column and articles out of 31 issues of QST have been gathered together in this book. The latest information on OSCARs 9 through 13 as well as the RS satellites is included. Operation on Phase 3 satellites (OSCAR 10 and 13) is covered in detail. 97 pages. £4.95

### THE COMPLETE DX'ER

Bob Locher W9KNI

Now back in print, this book covers equipment and operating techniques for the DX chaser, from beginner to advanced. 187 pages. £7.95

### THE RAE MANUAL (RSGB)

G.L. Benbow G3HB

The latest edition of the standard aid to studying for the Radio Amateurs' Examination. Updated to cover the latest revisions to the syllabus. 132 pages. £5.65

### THE RADIO AMATEUR'S DX GUIDE (USA)

15th Edition

This guide contains information not easily obtained elsewhere and is intended as an aid and quick reference for all radio amateurs interested in DX. 38 pages. £2.95

### THE RADIO AMATEUR'S QUESTIONS & ANSWER REFERENCE MANUAL

3rd Edition

R. E. G. Petri G8CCJ

This book has been compiled especially for students of the City and Guilds of London Institute RAE. It is structured with carefully selected multiple choice questions, to progress with any recognised course of instruction, although it is not intended as a text book. 258 pages. O/P

### VHF HANDBOOK FOR RADIO AMATEURS (USA)

H. S. Brier W9EGQ & W. I. Orr W6SAI

VHF/UHF propagation, including moonbounce and satellites, equipment and antennas. 335 pages. £7.95.

### VHF/UHF MANUAL (RSGB)

G. R. Jessop G6JP

Theory and practice of amateur radio reception and transmission, between 30MHz and 24GHz. 520 pages. £8.94

## MAPS

### IARU LOCATOR MAP OF EUROPE

DARC

This multi-coloured, plastics laminated, map of Europe shows the AIRU ("Maidenhead") Locator System. Indispensable for the v.h.f. and u.h.f. DXer. 692 x 872mm. £5.25

### RADIO AMATEUR'S MAP OF NORTH AMERICA (USA)

Shows radio amateur prefix boundaries, continental boundaries and zone boundaries. 760 x 636mm. £2.50

### RADIO AMATEUR'S PREFIX MAP OF THE WORLD (USA)

Showing prefixes and countries, plus listings by order of country and of prefix. 1014 x 711mm. £2.95

### RADIO AMATEUR'S WORLD ATLAS (USA)

Seventeen pages of maps, including the world-polar projection. Also includes the table of allocation of international call sign series. £3.50

## DATA REFERENCE

### DIGITAL IC EQUIVALENTS AND PIN CONNECTIONS (BP140)

A. Michaels

Equivalents and pin connections of a popular selection of European, American and Japanese digital i.c.s. 256 pages. £5.95.

### INTERNATIONAL DIODE EQUIVALENTS GUIDE (BP108)

A. Michaels

Possible substitutes for a large selection of many different types of semiconductor diodes. 144 pages. £2.25.

### INTERNATIONAL TRANSISTOR EQUIVALENTS GUIDE (BP85)

A. Michaels

Possible substitutes for a popular selection of European, American and Japanese transistors. 320 pages. £3.50

### LINEAR IC EQUIVALENTS AND PIN CONNECTIONS (BP141)

A. Michaels

Equivalents and pin connections of a popular selection of European, American and Japanese linear i.c.s. 320 pages. O/P

### NEWNES AUDIO & HI-FI ENGINEER'S POCKET BOOK

Vivian Capel

This is a concise collection of practical and relevant data for anyone working on sound systems. The topics covered include microphones, gramophones, CDs to name a few. 190 pages. Hardback. £9.95

### NEWNES COMPUTER ENGINEER'S POCKET BOOK

This is an invaluable compendium of facts, figures, circuits and data and is indispensable to the designer, student, service engineer and all those interested in computer and microprocessor systems. 203 pages. Hardback. £8.95

### NEWNES ELECTRONICS POCKET BOOK

5th Edition

Presenting all aspects of electronics in a readable and largely non-mathematical form for both the enthusiast and the professional engineer. 315 pages. Hardback. £8.95

### NEWNES RADIO AMATEUR AND LISTENER'S POCKET BOOK

Steve Money G3FZX

This book is a collection of useful and intriguing data for the traditional and modern radio amateur as well as the short wave listener. Topics such as AMTOR, packet radio, SSTV, computer communications, airband and maritime communications are all covered. 160 pages. Hardback. £8.95

### NEWNES RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK

17th Edition

Keith Brindley

Useful data covering math, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semi-conductors, components, etc. 201 pages. Hardback. £6.95

### NEWNES TELEVISION AND VIDEO ENGINEER'S POCKET BOOK

Eugene Trundle

This is a valuable reference source for practitioners in "entertainment" electronic equipment. It covers TV reception from v.h.f. to s.h.f. display tubes, colour camera technology, video recorder and video disc equipment, video text and hi-fi sound. 323 pages. Hardback. £9.95

### POWER SELECTOR GUIDE (BP235)

J. C. J. Van de Ven

This guide has the information on all kinds of power devices in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. 160 pages. £4.95

## RSGB RADIO DATA REFERENCE BOOK

G. R. Jessop G6JP

The 5th Edition of an essential book for the radio amateur's or experimenter's workbench.

244 pages. Hardback £8.56

## SEMICONDUCTOR DATA BOOK

A.M.Ball

Characteristics of some 10000 transistors, f.e.t.s, u.j.t.s, diodes, rectifiers, triacs and s.c.r.s. 175 pages. £9.95

## TRANSISTOR SELECTOR GUIDE (BP234)

J. C. J. Van de Ven

This guide has the information on all kinds of transistors in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. 192 pages. £4.95

## FAULT FINDING

ARE THE VOLTAGES CORRECT?

Reprinted from PW 1982-1983

How to use a multimeter to fault-find on electronic and radio equipment, from simple resistive dividers through circuits using diodes, transistors, i.c.s and valves.

44 pages. £1.50

## GETTING THE MOST FROM YOUR MULTIMETER (BP239)

R. A. Penfold

This book is primarily aimed at beginners. It covers both analogue and digital multimeters and their respective limitations. All kinds of testing is explained too. No previous knowledge is required or assumed.

102 pages. £2.95

## MORE ADVANCED USES OF THE MULTIMETER BP265

R.A. Penfold

This book is primarily intended as a follow-up to BP239, Getting the most from your Multimeter. By using the techniques described in this book you can test and analyse the performance of a range of components with just a multimeter (plus a very few inexpensive components in some cases). The simple add-ons described extend the capabilities of a multimeter to make it even more useful.

85 pages £2.95

## OSCILLOSCOPES, HOW TO USE THEM, HOW THEY WORK

Ian Hickman

This book describes oscilloscopes ranging from basic to advanced models and the accessories to go with them. 133 pages. O/P

## PRACTICAL HANDBOOK OF VALVE RADIO REPAIR

Chas E. Miller

The definite work on repairing and restoring valved broadcast receivers dating from the 1930s to the 60s. Appendices giving intermediate frequencies, valve characteristic data and base connections.

230 pages. Hardback £20.00

## SERVICING RADIO, HI-FI AND TV EQUIPMENT

Gordon J. King

A very practical book looking at semiconductor characteristics, d.c. and signal tests, fault-finding techniques for audio, video, r.f. and oscillator stages and their application to transistor radios and hi-fi.

205 pages. £10.95

## TRANSISTOR RADIO FAULT FINDING CHART (BP70)

C. E. Miller

Used properly, should enable most common faults to be traced reasonably quickly. Selecting the appropriate fault description at the head of the chart, the reader is led through a sequence of suggested checks until the fault is cleared. 635 x 455mm (approx) £0.95

## CONSTRUCTION

### HOW TO DESIGN AND MAKE YOUR OWN P.C.B.s (BP121)

R. A. Penfold

Designing or copying printed circuit board designs from magazines, including photographic methods.

80 pages. £2.50

### INTRODUCING QRP

Collected articles from PW 1983-1985

An introduction to low-power transmission, including constructional details of designs by Rev. George Dobbs G3RJY for transmitters and transceivers from Top Band to 14MHz, and test equipment by Tony Smith G4FAI.

64 pages. £1.50

### MORE ADVANCED POWER SUPPLY PROJECTS (BP192)

R. A. Penfold

The practical and theoretical aspects of the circuits are covered in some detail. Topics include switched mode power supplies, precision regulators, dual tracking regulators and computer controlled power supplies, etc.

92 pages. £2.95

### POWER SUPPLY PROJECTS (BP76)

R. A. Penfold

This book gives a number of power supply designs including simple unregulated types, fixed voltage regulated types and variable voltage stabilised designs. 91 pages. £2.50

## PRACTICAL POWER SUPPLIES

Collected articles from PW 1978-1985

Characteristics of batteries, transformers, rectifiers, fuses and heatsinks, plus designs for a variety of mainsdriven power supplies, including the PW "Marchwood" giving a fully stabilised and protected 12V 30A d.c.

48 pages. £1.25

## QRP NOTEBOOK

Doug DeMaw W1FB

This book deals with the building and operating of a successful QRP station. Lots of advice is given by the author who has spent years as an ardent QRP'er. All the text is easy-to-read and the drawings large and clear.

77 pages. £4.95

## TEST EQUIPMENT CONSTRUCTION

R.A. Penfold

Describes, in detail, how to construct some simple and inexpensive, but extremely useful, pieces of test equipment.

104pages. £2.95

## 50 (FET) FIELD EFFECT TRANSISTOR PROJECTS

F.G.Rayer

50 circuits for the s.w.l., radio amateur, experimenter or audio enthusiast using f.e.t.s. 104pages. £2.95

## ANTENNAS (AERIALS)

AERIAL PROJECTS (BP105)

Practical designs including active, loop and ferrite antennas plus accessory units. 96 pages. £2.50

### ALL ABOUT CUBICAL QUAD ANTENNAS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Theory, design, construction, adjustment and operation of quads. Quads vs. Yagis. Gain figures.

109 pages. £5.50

### ALL ABOUT VERTICAL ANTENNAS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Theory, design, construction, operation, the secrets of making vertical work.

191 pages. £7.50

### AN INTRODUCTION TO ANTENNA THEORY (BP198)

H. C. Wright

This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved.

86 pages. £2.95

### ANTENNA IMPEDANCE MATCHING

Wilfred N. Caron

Proper impedance matching of an antenna to a transmission line is of concern to antenna engineers and to every radio amateur. A properly matched antenna as the termination for a line minimises feed-line losses. Power can be fed to such a line without the need for a matching network at the line input. There is no mystique involved in designing even the most complex multi-element networks for broadband coverage. Logical step-by-step procedure is followed in this book to help the radio amateur with this task.

192 pages £11.95

### BEAM ANTENNA HANDBOOK (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Design, construction, adjustment and installation of h.f. beam antennas. 198 pages. O/P

### HF ANTENNAS FOR ALL LOCATIONS (RSGB)

L. A. Moxon G6XN

Taking a new look at how h.f. antennas work, and putting theory into practice. 260 pages. £5.19

### \*NOVICE ANTENNA NOTEBOOK

Doug DeMaw W1FB

Another book from the pen of W1FB, this time offering "new ideas for beginning hams". All the drawings are large and clear and each chapter ends with a glossary of terms. 130 pages £5.95

### OUT OF THIN AIR

Collected Antenna Articles from PW 1977-1980

Including such favourites as the 2L Special and "2BCX 16-element beams for 2m, and the famous "Slim Jim", designed by Fred Judd G2BCX. Also features systems for Top Band, medium wave/long wave loop designs and a v.h.f. direction finding loop. Plus items on propagation, accessories and antenna design. 80 pages. £1.80

### PRACTICAL WIRE ANTENNAS - Effective HF

Designs for the Radio Amateur

John D Heyes G3BCQ

Wire antennas offer one of the most cost-effective ways to put out a good signal on the h.f. bands and this practical guide to their construction has something to interest every amateur on a budget. 100 pages. £7.53.

### SIMPLE, LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Efficient antennas for Top Band to 2m, including "invisible" antennas for difficult station locations.

191 pages. £6.75

### THE ARRL ANTENNA BOOK (USA) 15th Edition

A station is only as effective as its antenna system. This book covers propagation, practical constructional details of almost every type of antenna, test equipment and

formulas and programs for beam heading calculations. £12.95

## THE ARRL ANTENNA COMPENDIUM (USA)

Volume One

Fascinating and hitherto unpublished material. Among the topics discussed are quads and loops, log periodic arrays, beam and multi-band antennas, verticals and reduced size antennas. 175 pages. £9.25

## WIRES & WAVES

Collected Antenna Articles from PW 1980-1984

Antenna and propagation theory, including NBS Yagi design data. Practical designs for antennas from medium waves to microwaves, plus accessories such as a.t.u.s, s.w.r. and power meters and a noise bridge. Dealing with TVI. 160 pages. £3.00

## W1FB'S ANTENNA NOTEBOOK

Doug DeMaw W1FB

This book provides lots of designs, in simple and easy to read terms, for simple wire and tubing antennas. All drawings are large and clear making construction much easier. 124 pages. £5.95

### 25 SIMPLE AMATEUR BAND AERIALS (BP125)

E. M. Noll

How to build 25 simple and inexpensive aerials, from a simple dipole through beam and triangle designs to a mini-rhombic. Dimensions for specific spot frequencies including the WARC bands. 80 pages. £1.95

### 25 SIMPLE INDOOR AND WINDOW AERIALS (BP136)

E. M. Noll

Designs for people who live in flats or have no gardens, etc., giving surprisingly good results considering their limited dimensions.

64 pages. £1.75

### 25 SIMPLE SHORT WAVE BROADCAST BAND AERIALS (BP132)

E. M. Noll

Designs for 25 different aerials, from a simple dipole through helical designs to a multi-band umbrella.

80 pages. £1.95

### 25 SIMPLE TROPICAL AND MW BAND AERIALS (BP145)

E. M. Noll

Simple and inexpensive aerials for the broadcast bands from medium wave to 49m. 64 pages. £1.75

## THE RADIO AMATEUR ANTENNA HANDBOOK

William I. Orr W6SAI & Stuart D. Cowan W2LX

Yagi, quad, quagi, l-p, vertical, horizontal and "sloper" antennas are all covered. Also towers, grounds and rotators. 190 pages. £6.75

## COMPUTING

AN INTRODUCTION TO COMPUTER

COMMUNICATIONS (BP177)

R. A. Penfold

Details of various types of modem and their applications, plus how to interconnect computers, modems and the telephone system. Also networking systems and RTTY.

96 pages. £2.95

### AN INTRODUCTION TO COMPUTER PERIPHERALS (BP170)

J. W. Penfold

Covers a wide range of computer peripherals such as monitors, printers, disk drives, cassette recorders, modems, etc., explaining what they are, how to use them and the various types of standards.

80 pages. £2.50

### MICROPROCESSING SYSTEMS AND CIRCUITS (BP77)

Elements of Electronics Book 4

F. A. Wilson

A comprehensive guide to the elements of microprocessing systems, which are becoming ever more involved in radio systems and equipment.

256 pages. O/P

## MORSE

### INTRODUCING MORSE

Collected Articles from PW 1982-1985

Ways of learning the Morse Code, followed by constructional details of a variety of keys including Iambic, Triambic, and an Electronic Bug with a 528-bit memory.

48 pages. £1.25

### THE MORSE CODE FOR RADIO AMATEURS (RSGB)

Margaret Mills G3ACC

A guide to learning to send and receive Morse code signals up to the 12 w.p.m. required for the radio amateur aspiring to a Class A licence having passed the RAE.

19 pages. £2.88

### THE SECRET OF LEARNING MORSE CODE

Mark Francis

Designed to make you proficient in Morse code in the shortest possible time, this book points out many of the pitfalls that beset the student.

87 pages. £4.95



# Shhhhhhh

Keep this  
to yourself!

**NEW**

the  
**TRX404  
TRANSCEIVER**

is going to  
upset the  
competition

...JUST LOOK AT  
IT'S FEATURES



## FEATURES

- ★ **A UNIQUE NOISE SQUELCH SYSTEM** Ensuring you hear only FM transmissions through the Squelch and not interference.
- ★ **A SUPERB RECEIVER** Using double crystal filters that drastically reduce co-channel interference (Bleedover).
- ★ **A PROVISION FOR SELECTIVE CALLING** Using our new SR316D Sel Call unit that simply plugs into a socket provided on the TRX404.
- ★ **A SWITCHABLE 'ROGER' BLEEP**
- ★ **A 4 WATT TRANSMITTER THAT DELIVERS 'PUNCH'.**



MATCHING SELECTIVE CALL UNIT - £59.95

AND ALL FOR JUST

**£79.95**

AVAILABLE FROM AUTHORISED  
DEALERS THROUGHOUT THE UK



**THE TRX404 27MHz TRANSCEIVER IS AVAILABLE IN TWO MODELS**  
 MODEL TRX404UK. ON THE STANDARD UK CHANNELS  
 MODEL TRX404 FULLY APPROVED C.E.P.T. RADIO  
 MODEL SR316D MATCHING SEL CALL UNIT FOR BOTH MODELS

DISTRIBUTED IN THE UK BY:—

# NEVADA

## TEAM UP WITH THE BEST

189 LONDON ROAD NORTH END PORTSMOUTH PO2 9AE

(0705) 662145



# Classified Ads

*Whilst prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine*

## Service Sheets

<b>ACCESS</b>	<b>TECHNICAL INFORMATION SERVICES (PW)</b>	<b>VISA</b>
<b>MASTERCARD</b>	76 Church St., Larkhall, Lanarkshire ML9 1HE	<b>EUROCARD</b>
Immediate quotes - Phone 0698 884585 Mon-Fri 9-5, 0698 883334 any other time <b>IMMEDIATE DESPATCH OF ALL Phone Orders by ACCESS, VISA etc. or to Listed Customers</b>		

**WORLD'S LARGEST COLLECTION OF SERVICE MANUALS ... from £3.50 to £50 ... Most unobtainable elsewhere**  
 Every issued **FULL SIZE SERVICE SHEET** in stock; CTV's or Combinations **£3.50/Singles £2.50; Plus -SAE**  
**LSAE for any Quotation, plus huge FREE Catalogue, STREE Review, Pricelists, etc.**  
 \* For £3 ... Comprehensive Service Manuals & Sheets Catalogues PLUS 1989 Chassis Guide & £4 Vouchers  
**Spectrum Repair & Service Guide £5.00.** Video Recorders Service Guide 3rd Ed **£20.00**  
**Giant Collection of 10 Huge Binders covering all main CTV's to end 1989, (FREE Updating) £265**

## Components

Large numbers of standard frequencies in stock for amateur, CB, professional and industrial applications.  
Stock crystals **£5.50** each (inc. VAT and UK post).  
Any frequency or type made-to-order from **£6.50**.  
Phone or SAE for lists.

**TECHNICAL MANUALS**, AR88, CR100, R210, HR0, £4 each. Circuits only 150 pence, plus LSAE, lists thousands. **BENTLEY**, 27 De Vere Gardens, Ilford, Essex IG1 3EB. Phone 01-554 6631.

\*\*\*\*\*

\* Available for Colour Televisions, Mono Televisions, Video \*  
\* Recorders, Audio Equipment, Hi-Fi Systems, Car Radios, \*  
\* Cameras, Test Equipment etc etc \*  
\* Over 100,000 stocked, originals and photostats. \*  
\* LSAE Enquiries with Make/Model wanted. \*

FREE catalogue Unique Repair and Data Guides for LSAE  
**MAURITRON (PW), 8 CHERRY TREE ROAD,**  
**CHINNOR, OXON, OX9 4QY**

Tel: (0844) 51694 Office hours Fax: (0844) 52554 Anytime

\*\*\*\*\*

## Wanted

Rare and obsolete types a speciality! Special prices for wholesale quantities. Orders from Govt. Depts., PLCs, overseas etc. welcome. Also CRT, IC, Klystrons, Magnetrons, Transistors, USA valves etc.

**RETAIL:** Minimum order £20:

ECC81 **£1.50**, ECC82 Brimar **£1.50**, ECC83 **£0.95**, ECC83 low microphony **£3.50**, EL34 **£3.25**, 4CX250B **£45.00**, 4CX350A Eimac **£100.00**, 4CX1000A Eimac **£425**.

Discounts for quantity.  
Please add 15% VAT + £1.15 P&P.  
Phone or Fax for immediate quote - minimum order £20.

**Phone (0403) 210729 Fax (0403) 40214.**  
**Visa and Access accepted.**

**VALVES TYPE MS-PEN,** MVS-Pen, 41MP 431V for  
Cossor wireless model 40. (0925) 764586.

## Kits

**MICROTRANSMITTER, VHF/FM**, 14 x 28mm, free microphone, £4.50. **VOX**, 9-12V, £7.99. **Beeper transmitter**, VHF, £7.99. **SAE list kits**, built units, plans. **ACE (PW)**. 99 Greenheath, Hednesford, Staffs. (05438) 71902.

**CALL MARCIA BROGAN ON  
0202 676033 FOR ALL YOUR  
ADVERTISING QUERIES**

**WANTED VALVES ESP.** KT66, KT88, PX4, PX25, Klystrons, Magnetrons, Transistors, I.C.s, Plugs, Sockets. If possible send written list - we reply same day. Cash waiting. **BILLINGTON VALVES**, 39 Highlands Road, Horsham RH13 5LS. Callers please phone for appointment. Tel. (0403) 210729. Fax: (0403) 40214. Telex: 87271.

**DENCO PLUG IN COILS.** B9A base also Denco IFTs.  
Tel. (0226) 288718.

**SURPLUS ELECTRONICS COMPONENTS**, test gear, computers amateur, bought for cash. (0425) 274274.

**WANTED GARRARD TYPE A SERVICE MANUAL.**  
E. LOVERIDGE, 59 East St. Trallwn, Pontypridd, S. Wales  
CF37 4PL.

**ORDER FORM** PLEASE WRITE IN BLOCK CAPITALS

Please insert this advertisement in the next available issue of Practical Wireless for.....insertion/s.  
I enclose Cheque/P.O. for £.....(42p per word, please add 15% VAT to total). Rates and Postal Address at top of page.  
(Cheques and Postal Orders should be made payable to Practical Wireless).

**CATEGORY HEADING .....**

Name .....

Address .....

[illegible]



## For Sale

**TRANSCIEVER VOX** Circuit. Simply connect between microphone and transceiver. Send SAE for details (state make/model of transceiver). PROELECTRON, 35 Cromwell Road, Cheltenham, GL52 5DN

**QSL CARDS.** Individual and personal designs. In 1/2/3 colours. A new service from K CARDS. Send SAE for details to 289 Church Street, Blackpool FY5 3HJ.

**R. F. BYRNE QSL DESIGN!** from £5. S.A.S.E. for details: G6MEN P.O. Box 32 Shrewsbury SY1 1ZZ.

**ELECTRONIC KEYS** - PEK1. Built and tested PCB Module. Only £22 (inclusive). For full specification send SAE to PROELECTRON, 35 Cromwell Road, Cheltenham, GL52 5DN.

**RCS VARIABLE VOLTAGE D.C. BENCH POWER SUPPLY**  
1 to 24 volts up to half amp. 1 to 20 volts up to 1 amp. 1 to 16 volts up to 1 1/2 amps. D.C. Fully stabilised. Twin panel meters or instant voltage and current readings. Overload protection.

Fully variable.  
Operates from 240V A.C.  
Compact Unit size 9 x 5 1/2 x 3ins

### RADIO COMPONENT SPECIALISTS

337 Whitehorse Road, Croydon SURREY, U.K.  
Tel: 01-684 1665  
List, Large S.A.E. Delivery 7 days Callers Welcome Closed Wednesday

## Veteran & Vintage

**FOR VALVES, SERVICE DATA, AMPLIFIERS AND RADIOS.** Try The Vintage Wireless Co., first. Send for free information package. 1990 Catalogue available April £4.00. Cosham Street, Mangotsfield, Bristol BS17 3EN. Tel: 0272 565472.

**VALVE DATABASE FOR IBM PCs.** 360k 5 1/4". £9.50 SAE or phone. Calderhead 27 Glencairn Drive, Glasgow G41. 041-423-0600.

**FOR SALE** Radio Valves and service sheets. 4 Stainecross Avenue, Huddersfield. (0484) 651408.

### SCOOP PURCHASE. THE CATS WHISKER 50 YEARS OF WIRELESS DESIGN.

By Johnathan Hill  
The last 100 copies of this classic book now out of print. A comprehensive and stimulating large format hardback edition invaluable to vintage enthusiasts. Fully illustrated from authors vast collection. Published at £9.95. Postage £1.20. 2 Copies sent for £20. Post Free.

### THE VINTAGE WIRELESS BOOK LISTING.

Published regularly containing 100s of out of print, old and collectable wireless and T.V. books, magazines etc. Send two 1st class stamps for next copy or £1.50 for next 4 issues. **WANTED** Pre 1960 Wireless Books Magazines and associated printed items. CHEVET BOOKS. 157 Dickson Road North Shore. Blackpool, Lancs. FY1 2EU. TEL: (0253) 751858. Callers Welcome

## INDEX TO ADVERTISERS

AH Supplies .....	64
ARE Communications .....	24, 25, 32
Arrow .....	12, 13
Antex .....	97
Amateur Radio Communications .....	45
Birkett, J .....	102
Bredhurst Electronics .....	9
Cambridge Kits .....	93
Capco .....	32
Circuit .....	4, 5
Colomor .....	45
Datong .....	93
Dewsbury .....	62, 63
Dressler Communications .....	79
ERA .....	93
Elliott Electronics .....	102
F J P Kits .....	93
Garex .....	26, 89
G4TNY .....	102
Howes, CM Communications .....	50
ICS Electronics .....	69
ICS Intertext .....	102
Icom (UK) .....	Cover iii, 2, 3, 69, 84, 85
Kent, R A .....	45

## Computer Soft/w & Hard/w

### COMPUTERS AND RADIO

Improve computer decoding of RTTY, CW & SSV signals with our audio filter

RTTY only or C.W. only (unboxed but fully Built & Tested) ..... £7.00  
RTTY/CW (ditto and with tuning LED) ..... £13.50  
CONSTANT LEVEL ..... £3.00  
AMPLIFIER ..... £23.00

**RMS-3 THE FILTER** RTTY/CW/SSV with AGC in one superb unit ..... £35.00  
When ordering above units, please state software supplier. This will enable us to supply correct filters.

**TERMINAL UNITS RECEIVE ONLY (RTTY/CW)** ..... £45.00  
The above units provide Audio, TTL and DCL outputs on RX. The output level is constant and full output is achieved with inputs between 10mV and 5V of audio.

**SPECTRUM 128 + 2**  
CASSETTE PORT ADD-ON. Enables owners of the Spectrum 128 + 2 to run existing programmes which require the audio signal being fed into the cassette port. There is no need to open the computer, simply connect to the expansion port ..... £19.50  
For further details of these and our other products, send a see or see earlier advertisements.

### J.B.P. ELECTRONICS LTD.

Unit 45, Meadowmill Estate, Kidderminster DY10 1HH  
Tel: (0562) 753893

**PC-MONITOR PROFESSIONAL** for IBMPC and Yaesu FRG-8000. 1000memory channels, scanning, logbook, lots more. 5 1/4" £25.00 (requires FIF-232C interface). SIMON COLLINGS, Southwold, Harnham Lane, Withington, Cheltenham, Gloucestershire GL54 4DD. Enquires welcome.

**COMMODORE COMPUTERS** (+4, C16, 64, 128). "MICROCOM" cw/rtty tx/rx with superb Morse tutor. "TURBO LOG" ultimate high speed station log. "MICROCOM INTERFACE" ready built. S.A.E. to:- Moray Micro Computing, Enzie Slackhead, Buckie, Moray, AB5 2BR. (Tel. 0542 7384).

**IBM/COMPATIBLE SHAREWARE CATALOGUE**, 7000 + files, wordprocessors, spreadsheets, communications, Ham & games. Send £1.50 or 2 disks & return postage. AK SHAREWARE, 54 Sheldrake Road, Christchurch, Dorset BH23 4BP.

## Antennas

**TRAPS FOR D.I.Y.** Tribander beams and Anti-T.V.I. Trap-Dipoles. Aerial D.I.Y. Bits, Baluns, Data: 28p SAE. Aerial Guide £1. G2DYM, Uplowman, Devon, EX16 7PH (03989) 215.

## PLEASE MENTION PW WHEN REPLYING TO ADVERTISEMENTS

## Educational

**COURSE FOR CITY & GUILDS**, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses GCSE, Career and professional examinations, etc.) write or phone: THE RAPID RESULTS COLLEGE, Dept. JX31, Tuition House, London SW19 4DS. Tel. 01-947 7272 (9am-5pm) or use our 24hr Recordacall Service: 01-946 1102 quoting JX31.

**ELECTRONICS WORKSHOP** Repairs, rebuilds, modifications, advice. Specialists in valve equipment. See also PAYL School. Green GINAK Chylean, Tintagel, Cornwall. (0840) 212262.

**R.A.E. PAY AS YOU LEARN** Correspondence. £2 Per lesson includes tuition. See also Electronics Workshop. Green C. Eng., M.I.E.E. Chylean, Tintagel, Cornwall. (0840) 212262.

## Miscellaneous

**GZVF LOOP ANTENNAS COMPLETE WITH ATU FOR H.F. HAM RADIO BAND TRANSMISSION** (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) AND SWL's, AND LONG AND MEDIUM WAVE BANDS FOR BCL's. Loops 21 inches square or triangle. No special skills required. Circuits, Parts Lists with sources of supply assembly/data. **HIGH FREQUENCY LOOP** 80 to 10 Metres £5. **LONG AND MEDIUM WAVE LOOP** for BCL's £3. **LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP** 1500 to 10 Metres **FOR THE BCB AND SWL £2**. **SHORT WAVE ATU FOR LOOP OR LONG WIRE ANTENNA £4**. **SHORT WAVE ATU BUILT IN PRE AMP FOR LOOP OR LONG WIRE £7**. Pre-amp LW, MW and SWave £2. **MW LOOP** with pre amp ATU £3. **PRE AMP FOR GZVF HF Loop or ATU £4**. SAE details. All projects DIY. Metal Detector £2. PhotoCopy HRD manual £4. F.G. Rylands, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF Tel. (0703) 775064.

**HEATHKIT U.K.** Spares and Service Centre. Cedar Electronics Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel: (0684) 73127.

## Rallies

## TRAFFORD RALLY THE GREAT NORTHERN RALLY

at

## G - MEX

Greater Manchester Exhibition and Events Centre

**SUNDAY 4th MARCH 1990**

All the usual attractions including **FREE DRAW** and **BRING & BUY**. **MORSE TESTS**. Licensed Bar, Hot & Cold Meals, Tea & Coffee. Large, Single Ground Floor for Easy Access.

30,000 sq ft of space - lots of room. Many more Amateur Radio Traders than ever before with all the best equipment. Plenty of parking, both free & paid for. Open 10.30am for all. Close at 5pm.

**PRIORITY QUEUE FOR THE DISABLED**

Admission £1 all classes.

\*\*\*\*\*

Trafford Amateur Radio Club invite you to attend this event, which will be the rally to attend in 1990. Talk-in on S22 via GB1GMX.

All enquiries on 061-748 9804 or 061-881 3739

**Don't miss out on the best in amateur radio - come to the one and only Great Northern Rally**

# YOUR LOCAL DEALERS

## SOUTH WALES

### ELECTRO MART

Receivers, scanners, Howes Kits, components etc. part exchange welcome.

96 High St, Clydach,  
Swansea  
Tel: 0792 842135

## ASHTON-U-LYNE MAIL ORDER AND RETAIL

### PROCOM Electronics

### ELECTRONIC DISTRIBUTORS

Specializing in Electronic Components and Surplus

13 Clarence Arcade,  
Stamford Street,  
Ashton-U-Lyne  
Lancashire  
OL6 7PT  
Open Mon to Sat  
Tel: 061 343 2782

## LONDON

### Henry's

27MHz/934MHz Rigs & accessories in stock.  
Lists - S.A.E. (A4) - 26p  
Full catalogue (TG/P) - large S.A.E. £1.00  
404 Edgware Road,  
London W2 1ED  
Tel: 01-724 0323  
(Open 6 days a week)

## DERBYSHIRE

### RILEY'S T.V. SERVICES LTD.

SUPPLIERS OF:-  
SCANNERS - C.B. 27-934 MHz -  
AERIALS - TEST METERS - TOOLS -  
TELEPHONE KITS AND CABLES

125 LANGWITH ROAD  
HILLSTOWN  
CHESTERFIELD S44 9SP  
PHONE 0246 826578

CLOSED WEDNESDAY

## HERNE BAY

### ICOM (UK) LIMITED

The Official Icom Importer  
Unit 8, Sea Street  
Herne Bay, Kent CT6 8LD  
Tel: 0227 369464

Fax: 0227 360 155  
Open Mon-Sat 9-5.30,  
(Lunch 1-2.00 pm)

## SOUTHAMPTON

### South Midlands Communications

Official Yaesu Importer

S.M. House, School Close,  
Chandlers Ford Industrial Estate,  
Eastleigh Hants SO5 3BY.  
Tel: 0703 255111

## PORTSMOUTH

### Nevada Communications

Importers of the Nevada  
range of 934MHz equipment  
189, London Road,  
North End, Portsmouth,  
Hants, PO2 9AE  
Tel: 0705 662145

## DEVON

### Reg. Ward & Co. Ltd.

The South-West's largest amateur  
radio stockist. Approved dealer for  
Kenwood, Yaesu and Icom

1 Western Parade,  
West Street, Axminster,  
Devon, EX13 5NY  
Tel: 0297 34918

(Closed 1:00-2:00 and all day Monday)

## BUCKINGHAMSHIRE

### Photo-Acoustics Ltd.

Approved Kenwood, Yaesu and  
Icom dealer (part exchange  
always welcome)

58 High Street, Newport Pagnell,  
Buckinghamshire MK16 8AQ  
Tel: 0908 610625

(Tues-Fri 9:30-5:30, Sat 9:30-4:30)  
Closed Mondays

**TO FILL THIS  
SPACE  
CALL:**

**0202 676033**

## YORKSHIRE

YAESU  
ICOM

### Alan Hooker Electronics

42, Netherrall Road, Doncaster.

Tel: 0302 35690  
Open Mon-Sat 10-5pm  
Closed Thursdays

## MERSEYSIDE

### MGR COMMUNICATIONS

ICOM - YAESU - Navico - Aerials -  
M.M. & Kits - Scanners -  
PMR - MARINE & BAND III  
Part-ex welcome

48 Shrewsbury Rd., Unit 5, Milton St.,  
Oxon, Waterloo Ind.  
Birkenhead L43 2HZ Est.,  
051 653 3437 Widnes, Cheshire  
051 420 2559

## SOUTH WALES

MAIL ORDER  
RETAIL

### A.C.S. SYSTEMS

PACKET RADIO: ST-PC-AMIGA COMPUTERS  
AMATEUR SOFTWARE FOR MOST  
COMPUTERS  
SATELLITE TELEVISION SYSTEMS

### ICS DEALER FOR DATA COMMUNICATIONS

19, CILHAUL TERRACE, MOUNTAIN ASH, MID GLAMORGAN  
SOUTH WALES, CF45 3ND. TEL 0443 476040 SAE  
CALLERS BY APPOINTMENT 9am-5pm Mon-Sat LIST

**PLEASE  
MENTION  
PRACTICAL  
WIRELESS  
WHEN REPLYING TO  
ADVERTISEMENTS**

## WEST SUSSEX

MAIL ORDER  
RETAIL

YAESU  
ICOM

### BREDHURST ELECTRONICS LTD.

High St., Handcross, West Sussex  
Tel: (0444) 400786



Situated at the Southern end of  
M23. Easy access to M25 and  
South London.  
Open Mon-Fri 9am-5pm  
except Wed 9am-12.30pm.  
Sat 10am-4pm.

YAESU  
ICOM

# PRACTICAL SCANNERS FROM RADIO SHACK

You can only wonder in amazement at how scanners are getting smaller with more features than you ever dreamed of, such as hand helds with 1000 memories, 25 to 1300MHz etc. I must admit to being very sceptical with the specs of some of the latest, and as to whether the term 'author's licence' had been in force. There is only one way to test the pudding and to try the 'newest kid on the block' the FAIRMATE HP-100E. Starting in reverse order from 99% of our customers and radio amateurs I waded through the owner's manual (9 A5 pages of information in English) and decided to compose a Charlie Chaplin (less words and more pictures) instant simplified operation sheet to make life easier for our customers, one will be with each set. The scanner is FANTASTIC! Unbelievable performance from a hand held, even a frequency lockout in Search mode, a truly practical scanner for Practical Wireless scanner listeners, £299 including carriage from RADIO SHACK. FAIRMATE HP-100E £299.

### OTHER SCANNERS IN STOCK

PRO-2005 25-1300MHz 400 Channels, PRO-34 200 Channel hand held,  
PRO-2024, PRO-2022, PRO-38, PRO-57, AR-800, AR-900, AR-950,  
AR-1000, AR-2002, Jupiter MVT-5000 & MVT-6000, Bearcat 200XLT  
to name but a few ...

Call us for the latest prices.

### MAIL ORDER & EXPORT A PLEASURE

73s - Terry G3STS  
**COME AND GET  
A BARGAIN!**



## RADIO SHACK LTD

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 Fax: 01-328 5056 Telephone: 01-624 7174

188 BROADHURST GARDENS,  
LONDON NW6 3AY





# ICOM

## Count on us!

# LISTEN TO THE WORLD IN DETAIL

## IC-R9000 COMMUNICATIONS RECEIVER



The world is now at your fingertips with ICOM's elite new IC-R9000, a communications receiver truly in a professional class all of its own. With the IC-R9000's continuous all mode, super wideband range of 100KHz to 1999.8MHz, ICOM's unique CRT display and numerous scan functions, local and distant spots on the globe are now within earshot in one single receiver.

The IC-R9000's versatile receive capability allows you to receive many different mode signals. Listen to AM used by broadcast stations and VHF airband. Use SSB (U.S.B./L.S.B.) and CW to receive Commercial and Amateur stations on shortwave.

Tune into CB (Citizen Band), Marine and Amateur stations using FM or use wide

FM to receive FM broadcast stations and TV signals. FSK (Frequency Shift Keying) is also built in for receiving RTTY from news agencies. With an advanced range like this you'll have no trouble in hearing stations near to home or on the other side of the planet.

Watch the IC-R9000? Using your TV set or video recorder with a video input connector, you can receive VHF and UHF TV broadcasts. Also the built in CRT can display ATV (Amateur Television) on both the 430 and 1200MHz amateur bands. With the introduction of the IC-R9000 you now have the technical quality required to enjoy HF, VHF and UHF communications. For more detailed information contact your local ICOM dealer.

### Icom (UK) Ltd.

Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

**Helpline:** Telephone us free-of-charge on 0800 521145. Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders. thank you

**Datapost:** Despatch on same day whenever possible.

**Visa & Mastercards:** Telephone orders taken by our mail order dept. instant credit & interest-free H.P.





# Double Tops

**DUAL BAND VHF (45W)/UHF (35W)**

**FM MOBILE TRANSCEIVER**

*When only the best is good enough – and*

*you still want something better...*

- ★ **Cross Band Full Duplex**
- ★ **4 Scanning Modes**
- ★ **10 Function Memory Channels**
- ★ **Highly Visible Colour LCD Display**
- ★ **Illuminated Front Panel Controls**
- ★ **5 Channel Spacing Steps**
- ★ **Built-in Duplexer**
- ★ **Function Keys have Unique Audible Tone**
- ★ **Bell Function**
- ★ **Compact & Lightweight**

#### Accessories Included:

- ★ **Hand-held microphone**
- ★ **Mobile mounting bracket**
- ★ **Mounting hardware**
- ★ **Power cable**



**ALINCO**  
from MAPLIN  
the authorised  
distributor

This very high quality 2m/70cm FM dual band mobile transceiver has been specially designed to provide maximum performance and operating convenience in an ultra compact package. An impressive array of features gives maximum flexibility in mobile installations. The transceiver has an output power of 45W (VHF) 35W (UHF) and incorporates a high/low power switch. The unit is provided with 10 programmable memories. Channel spacing is in 5, 10, 12.5, 20 and 25kHz steps. There are four scanning modes:

1. VFO scanning of the entire band.
2. Memory scanning of selected memories.
3. Programmed band scanning of a selected segment of the band.
4. Priority scanning allows selection of a frequency, in VFO or memory, to serve as a priority frequency.

A duplexer is built-in so that when an antenna for both bands is in use, only one feeder cable for the transceiver is necessary.

The unit is supplied with a comprehensive instruction manual. It is illegal to transmit with this unit unless you hold a Radio Amateur's Class B (or A) licence.

**Quote Reference DBT50 £499.95**

## PLUS TOP VALUE AMATEUR RADIO VHF FM Handheld 2m Transceiver

- ★ **Ultra compact, lightweight design**
- ★ **6.5W Output Power**  
(with optional 12V battery pack)
- ★ **Simple Operation**
- ★ **Easy to See LCD Display**
- ★ **10 Channel Memories**
- ★ **Battery Save**
- ★ **Function Lock**
- ★ **Tone Burst**
- ★ **Amazing Compact Size Only 3×6×17 cm approx.**

A very high quality, lightweight, 2m handheld transceiver, incorporating many useful features. This transceiver is extremely simple to operate, most functions can be performed with one hand!

**Quote Reference AHT50 £219.95**

#### 12V Ni-Cad Battery Pack

For use with either above hand-held transceivers.

A 12V 700mAh battery pack with integral DC-DC converter which allows the transceiver to be powered from a car cigarette lighter socket.

A charger is also available for use with this pack.

Battery Pack NBP50 £59.95 Charger NBC50 £14.95



## VHF/UHF FM Dual Band Handheld Transceiver

- ★ **6W VHF/5W UHF Output Power**  
(with optional 12V battery pack)
- ★ **Cross Band Full Duplex Operation**
- ★ **Frequency selection by Direct Keyboard Entry or Step Up/Step Down**
- ★ **Automatic Battery Save Function**
- ★ **20 Memory Channels**
- ★ **Built-in DTMF Keypad and Encoder**
- ★ **Amazing Compact Size Only 3×6×19 cm approx.**

This unit is very compact and is one of the smallest dual band transceivers currently available. With the battery pack supplied output power is 2.5W for VHF and 2W for UHF. Frequency selection is either by direct keypad entry of the required frequency or by using step up/step down buttons in increments/decrements of 5kHz, 100kHz and 1MHz. An automatic battery save (ABS) function will extend battery life considerably. There are 20 memories (10 VHF and 10 UHF) for storing operating, offset and tone frequencies. The scanning facility has a priority function which has the ability to scan between chosen VHF and UHF frequencies. A 10dB RF attenuator is switch selectable and can be used in areas of high RF saturation.

**Quote Reference DHT50 £369.95**



**Maplin ELECTRONICS**

P.O. Box 3, Rayleigh, Essex SS6 8LR.

**CREDIT CARD HOTLINE**

**0702 554161**



**PHONE BEFORE 5PM FOR SAME DAY DESPATCH**

or call in at a Maplin store in Birmingham, Bristol, Leeds, Hammersmith, Edgware, Manchester, Nottingham, Newcastle-upon-Tyne, Reading, Southampton and Southend-on-Sea.

Add 75p for carriage on all mail orders. If only ordering a catalogue, just add 50p carriage.

Subject to availability. Prices may change after May 1st 1990.

**SEE THE COMPLETE RANGE OF TRANSCEIVERS AND LOTS MORE IN OUR BUMPER 580-PAGE CATALOGUE ON SALE NOW AT ALL BRANCHES OF WHSMITH – PRICE £2.25!**