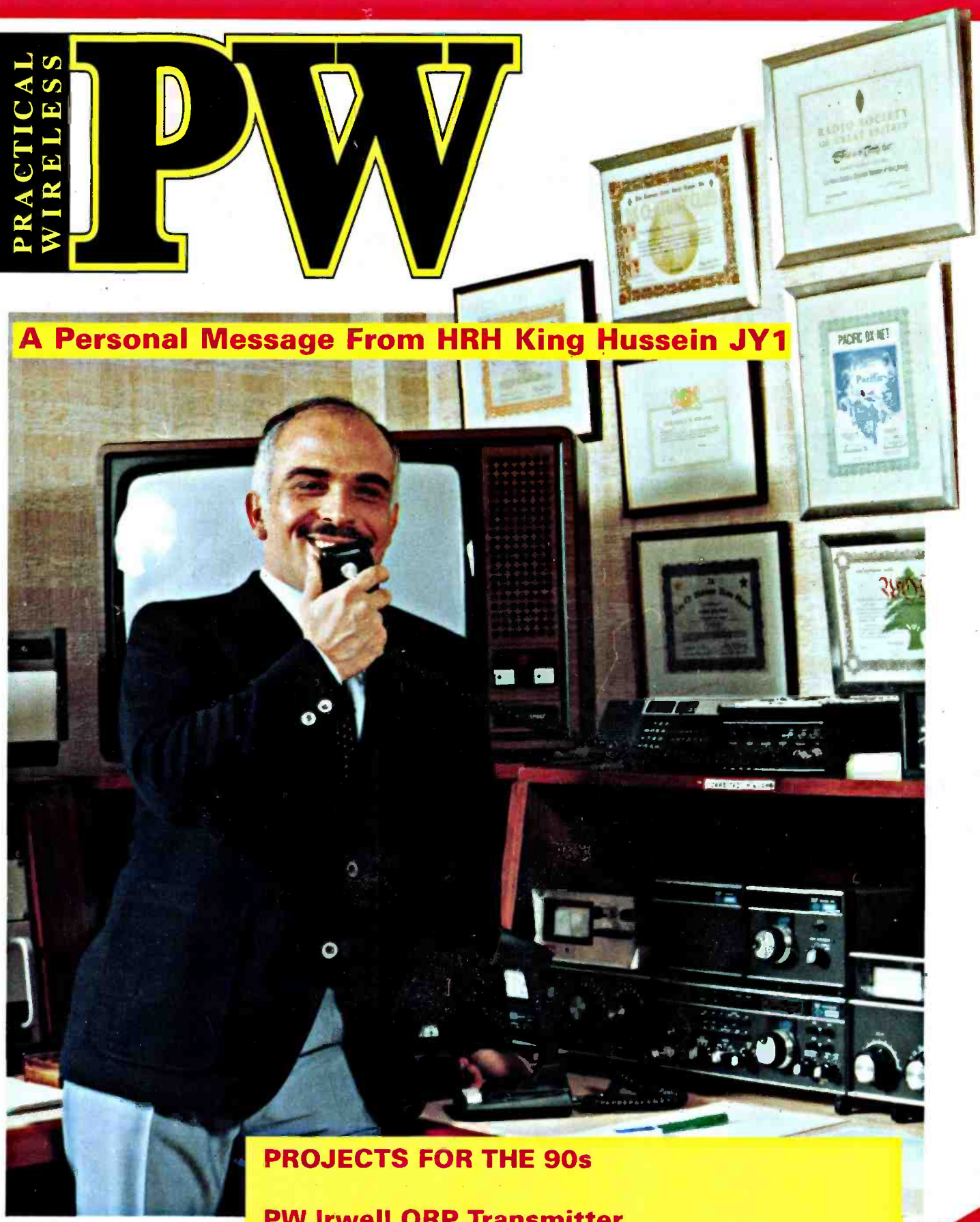
PRACTICAL WIRELESS

PW



A Personal Message From HRH King Hussein JY1

PROJECTS FOR THE 90s

PW Irwell QRP Transmitter
Active Receiving Antenna
PW 49'er Car Radio Short Wave Converter

PLUS - News, Reviews, Features,
10 Metre Page, Prize Puzzle
and Much, Much More

JANUARY 1990
£1.60

ISSN 0141-0857

9 770141 085006 01

THE NEW
FT-1000 FOR DYNAMIC DX

YAESU

The FT-1000 is a new top of the range all mode h.f. transceiver that is the result of more than 25,000 hours of intensive research by Yaesu's top design engineers. They have adopted a completely new approach to the application of digital and RF technology. The extensive use of surface mounted components has allowed *six* microprocessors and *five* Direct Digital Synthesisers to be integrated with a simple to use operator interface to give a highly reliable full featured transceiver that has been optimised for serious h.f. applications. Please write or call SMC or your local authorised Yaesu dealer for the full specifications of this dynamic new transceiver and discover how you can open up the bands.

YAESU

UK Sole Distributor

South Midlands Communications Ltd
S.M. House, School Close,
Chandlers Ford Industrial Estate,
Eastleigh, Hants SO5 3BY
Tel: (0703) 255111

Prices and specifications are subject to change without notice

PRACTICAL WIRELESS
PW

JANUARY 1990
(ON SALE DEC 14)
VOL. 66
NO. 1
ISSUE 994

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
Alan Burgess
Clerical Assistant
Rachel Parkes

Contents January 1990

Regular Features

LOOK INSIDE FOR NEW FEATURES & IDEAS AS PW RE-LAUNCHES INTO THE 90s

PUBLISHED on the second Thursday of each month by PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Printed in England by Blackmore Press, Shaftesbury, Dorset. Distributed by Seymour, Windsor House, 1270 London Road, Norbury, London SW16 4DH, Tel: 01-679 1899, Fax: 01-679 8907, Telex: 8812945. Sole Agents for Australia and New Zealand - Gordon and Gotch (Asia) Ltd.; South Africa - Central News Agency Ltd. Subscriptions INLAND £19.00, EUROPE £21, OVERSEAS (by ASP) £22, payable to PRACTICAL WIRELESS, Subscription Department, PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP.

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 sophisiticated 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, attentuator, 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 Miscellaneaous 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

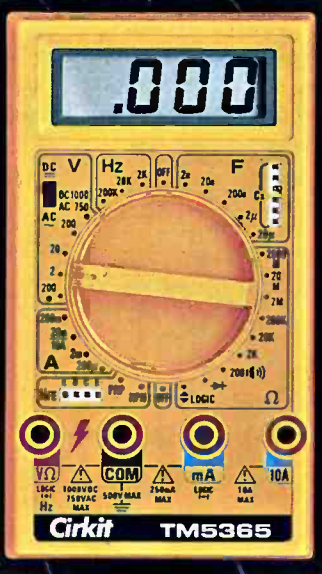
TM135

TM175

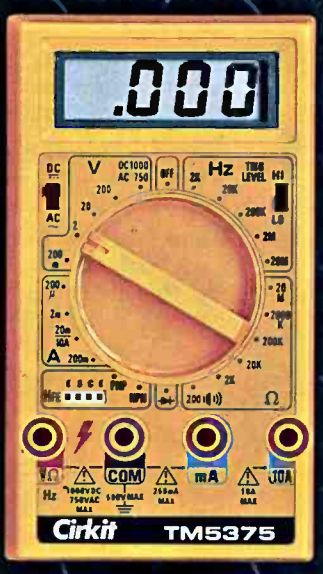
Cirkit's new range of Digital Multimeters offer a quite unbeatable combination of features and value:

- 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

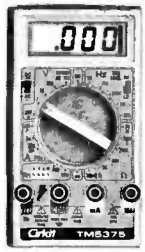
- **Remarkable value**
- **18 ranges**
- **10A dc current**

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

1+	5+	10+
£17.38	**£16.95**	**£16.52**

56-05315 **ex VAT**

TM5375



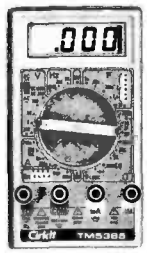
- **Frequency measurement to 20MHz**
- **ac/dc current to 10A**
- **24 ranges**

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 ±0.5%

1+	5+	10+
£31.96	**£31.16**	**£30.39**

56-05375 **ex VAT**

TM5365



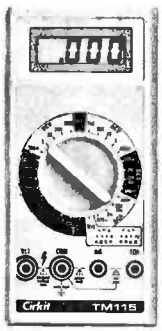
- **30 ranges**
- **Frequency and capacitance measurement**
- **Compact size**

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+
£32.96	**£32.13**	**£31.33**

56-05365 **ex VAT**

TM115



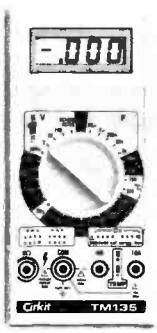
- **0.5% accuracy**
- **Transistor HFE test**
- **26 ranges**

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

1+	5+	10+
£29.28	**£28.49**	**£27.77**

56-00115 **ex VAT**

TM135



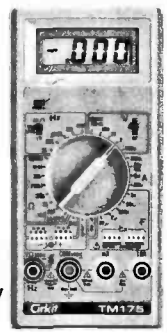
- **Temperature measurement**
- **Capacitance measurement**
- **40 ranges**

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+
£39.96	**£38.96**	**£37.98**

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+
£49.99	**£48.75**	**£47.52**

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:

☐ × **TM5315B** at £20.89 (£17.38 + £2.61 VAT + £0.90 p&p)
☐ × **TM5375** at £37.65 (£31.96 + £4.79 VAT + £0.90 p&p)
☐ × **TM5365** at £38.80 (£32.96 + £4.94 VAT + £0.90 p&p)
☐ × **TM115** at £34.57 (£29.28 + £4.39 VAT + £0.90 p&p)
☐ × **TM135** at £46.85 (£39.96 + £5.99 VAT + £0.90 p&p)
☐ × **TM175** 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

SMC WOULD LIKE TO WISH ALL OUR CUSTOMERS OLD AND NEW A VERY HAPPY CHRISTMAS AND PROSPEROUS NEW YEAR

CHRISTMAS OPENING HOURS

HQ SHOWROOM

DEC 22/23—9.00am–1.00pm
DEC 27/28/29—9.00am–1.00pm, 2.00pm–5.00pm
JAN 1—Closed
DEC 25/26—Closed
DEC 30—9.00am–1.00pm
JAN 2—Open as usual.

BRANCHES & AGENTS

AS ADVERTISED
ON NOTICES AT BRANCHES

Service Dept—Closed DEC 22–JAN 2

THE NEW FT1000

BRIEF SPECIFICATIONS

- ★ General Coverage Receiver 100kHz-30MHz
- ★ Ham bands TX 160-10m
- ★ Modes CW, USB, LSB, AM, FM, RTTY and PACKET
- ★ VFO steps 10Hz CW, SSB, RTTY, 100Hz AM, FM, PKT
- ★ Auto antenna impedance range 16.7 to 150 ohms
- ★ Selectable receiver band widths 2.4Khz, 2Khz, 500Hz, 250Hz
- ★ Dual band receiver tuning and monitoring with balance control
- ★ Power output up to 200 watts P.E.P. 50W AM
- ★ Sensitivity preamp on SSB/CW 0.25 micro volts 10dB S/N
- ★ D.D.S. Direct Digital Synthesiser
- ★ Dual selectable noise blankers with adjustable threshold
- ★ Frequency stability ± 20ppm (0 to +50°C) ± 200Hz F3 ± 0.5ppm (0 to +60°C), ± 150Hz, F3 with TXCO-1 fitted
- ★ 99 memories

ADDITIONAL FEATURES

Other features include adjustable IF width, IF shift, IF notch and APF controls. AGC presentable for fast, medium and slow + defeat, on/off selectable, preamp + adjustable attenuator -6dB, -12dB, -18dB,. Adjustable — mic gain, RF power o/p, processor and drive controls. Built in electronic keyer with adjustable speed control. Twin independent frequency displays with mode indication + much more.

FT736R THE KING OF VHF/UHF BASE STATIONS

- ★ UP TO FOUR BAND CAPABILITY
- ★ LSB/USB, CW & FM
- ★ FULL DUPLEX CROSSBAND OPERATION
- ★ MEMORY STORAGE OF UP TO 230 FREQUENCIES
- ★ KEYPAD FREQUENCY ENTRY
- ★ FOURTEEN VFO's
- ★ GLOBAL CALL CHANNEL
- ★ PROGRAMMABLE CHANNEL STEPS
- ★ ELECTRONIC KEYER OPTION
- ★ REMOTE PREAMPLIFIER SWITCHING
- ★ TXCO HIGH STABILITY REFERENCE OSCILLATOR

FT736R RRP £1359 C/W 2m & 70cms and full duplex

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

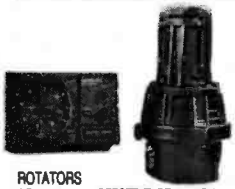
AXMINSTER
Reg Ward & Co Ltd
1 Western Parade
West Street
Axminster
Devon EX13 5NY
Axminster (0297) 34918
9-5.20 Tues-Sat

VISA

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.

SMC South Midlands Communications Ltd.

ROTATORS



Superb engineering standards combined with pin sharp setting accuracy means new technology from Yaesu create Kenpro Hygain.

ROTATORS		
AR200XL	OFFSET TYPE 3 WIRE	£49.50
G-250	BELL TYPE TWIST/SWITCH CONTROL	£78.00
G-400	BELL TYPE METER CONTROLLER	£139.00
G-400RC	BELL TYPE ROUND CONTROLLER	£169.00
G-600RC	BELL TYPE ROUND CONTROLLER	£219.00
HAM1V	BELL TYPE METER CONTROLLER	£327.00
T2X	BELL TYPE METER CONTROLLER	£499.00
G-800SDX	BELL TYPE 450 DEG VAR. SPD	£325.00
G-1000SDX	BELL TYPE 450 DEG VAR. SPEED	£368.00
G-2000RC	BELL TYPE ROUND CONTROLLER	£445.00
KR500	ELEVATION METER CONTROLLER	£149.95
G-5400B	AZIMUTH/ELE DUAL CONTROL	£375.00
G-5600B	AZIMUTH/ELE DUAL CONTROL	£435.00
RC5-1	BELL TYPE ROUND CONTROLLER	£219.00
RC5A-3	BELL TYPE VAR. SPEED AND PRESET	£425.00
RC5B-3	BELL TYPE VAR. SPEED AND PRESET	£675.00
ROTATOR HARDWARE		
AR200AB	ALIGNMENT BEARING AR200XL	£17.50
KS505	ROTARY BEARING 1½" MAST	£19.95
GS-065	ROTARY BEARING 2" MAST	£29.95
GC-038	LOWER MAST CLAMP G-400, 600 etc	£16.95
9523	CHANNEL MASTER BEARING	£19.95
CK46	ROTARY BEARING 1.5–2.5 MAST	£34.95
MC1	LOWER MAST CLAMP RC5 SERIES	£25.00
ROTATOR CONTROL CABLE		
RC5W	5 WAY G-400RC, 800, 1000SDX PER MTR	£0.48
RC6W	6 WAY G-250, 400, 600, RC KR500 PER MTR	£0.66
RC8W	8 WAY HAMIV, T2X 2000RC RC SERIES PER MTR	£0.72

CARRIAGE:
ROTATORS FREE, ROTATOR HARDWARE £2.85, ROTATOR CABLE £3.50 UP TO OVER 20 MTS, OVER 20 MTS £5.00.

MORSE KEYS

MORSE KEYS			p.p.
HK702	STRAIGHT KEY	£42.95	£3.00
HK703	STRAIGHT KEY	£38.45	£3.00
HK704	STRAIGHT KEY	£26.35	£3.00
HK705	STRAIGHT KEY	£22.49	£3.00
HK706	STRAIGHT KEY	£21.80	£3.00
HK707	STRAIGHT KEY	£20.15	£3.00
HK708	STRAIGHT KEY	£21.50	£3.00
HK710	STRAIGHT KEY	£39.95	£3.00
HK711	STRAIGHT KEY KNEE MOUNTING	£41.75	£3.00
BK100	MECHANICAL BUG	£34.95	£3.00
MK701	SINGLE LEVER PADDLE	£38.35	£3.00
MK702	SINGLE LEVER PADDLE	£36.25	£3.00
MK703	SQUEEZE KEY	£34.50	£3.00
MK704	SQUEEZE KEY	£20.00	£3.00
MK705	SQUEEZE KEY	£32.78	£3.00
MK706	SQUEEZE KEY	£30.48	£3.00
HK802	DELUXE BRASS KEY	£112.54	£3.50
HK803	DELUXE BRASS KEY	£107.75	£3.50
HK804	DELUXE BRASS KEY	£99.69	£3.50
MORSE EQUIPMENT			
KP100	SQUEEZE KEYER	£109.75	£3.50
DEWSKEYSTD	STAR MASTER KEYER	£54.69	£3.50
DEWSKEY M	STAR MASTERKEY MEMORY	£94.99	£3.50
D70	MORSE TUTOR	£56.35	FOC
DATA TERMINAL			
PK232/FAX/ NAVTEX	MULTIMODE DATA TERMINAL	£289.95	FOC

SWR/PWR METERS

FS710V

YS60

FS710V	50-150MHz	15/150W	PEP £107.80
FS300H	1.8-60MHz	20/200/1000W	£53.40
FS210	1.8-150MHz	20/200W	Auto SWR £65.50
FS301M	2-30MHz	20/200W	£42.25
FS301MH	2-30MHz	200/2000W	£42.25
FS711H	2-30MHz	20/200W	Head/Display £43.65
FS711V	50-150MHz	20/200W	Head/Display £43.65
FS711U	430-440MHz	5/20W	Head/Display £43.65
FS711C	26-30MHz	10/100W	Head/Display £24.55
FS500V	50-150MHz	20/200W	£81.95
W720S	130-440MHz	20/200W	Head/Display £52.75
SWR50B	3-5-150MHz		£36.75
FS20DL	3-150MHz	1/10W	£43.65
FS20D	3-150MHz	5/20W	£43.65
SWR3E	3.5-150MHz	20/200/1000W	£28.75
JD110	1.5-150MHz	10/100W	£16.50
T435	144/430MHz	20/200W	£65.00
YM6X	3.5-150MHz	Rel. Power/SWR Twin meter	£31.50
OSCAR-171B	3.5-150MHz	Rel. Power/SWR Twin meter	£26.65
SP425	140-524MHz	5/15/150W	£119.95
YS60	1.6-60MHz	20/200/2000W	£93.15
YS500	140-525MHz	4/20/200W	£81.65

Carriage on all power meters £4.00

COMET & HOKUSHIN ANTENNAS

New from Hokuskin, an exciting range of high performance antennas, the WX1 has been a best seller for some time now, available are its bigger brothers the WX2 and WX4. Both are multi section 2m/70cm colinears and the mechanical construction the best we have seen yet. On the mobile front a new mini dual band mobile, the HS-727SS, very similar to the Comet CHL21J, and tests with our network analyser confirm its compatibility with our existing range of gutter and mag mounts. Also available a low profile hatchback mount and cable, the SS-B1, two new dual band antennas, the very slim VM-720SKR and the compact HS-727VMS. Both are suitable replacements for the 70N2M. For the HF enthusiasts a compact 10m HB9CV dual driven element antenna that is extremely light and very cleverly constructed.

WX2	WX4	HS-727SS	28HS-2HB
VHF/UHF Base	VHF/UHF Base	VHF/UHF Mobile	10m 2 ele HB9CV
144/432MHz	144/432MHz	144/432 mini	Dual driven element
6/8dB gain	7.8/10.8dB gain	1/4 5/8 wave	6dBi gain
200W max	200W max	100W max	500W PEP max
£75.00	**£99.00**	**£16.95**	**£65.00**

MOBILE ANTENNAS

2QW	2m 1/2 wave	£4.95
2NE	2m 5/8 wave folding	£13.25
78B	2m 7/8 wave	£15.00
78F	2m 7/8 wave folding	£21.50
88F	2m 8/8 wave	£24.10
258	70cm 2 x 5/8	£29.37
358	70cm 3 x 5/8	£33.73
268E	70cm 2 section colinear	£32.80

DUAL BAND MOBILE

CHL21J	Mini dual band mobile	£14.95
CHL23J	Small dual band mobile	£16.90
CA2X4KG	2m 2 x 5/8 70cm 4 x 5/8	£39.95
70N2DX	2m 6/8 70cm 3 x 5/8	£37.75
HS-727SS	Dual band mini antenna NEW	£16.95
HS-727VMS	2m 1/2 70cm 2 x 5/8 NEW	£25.95
VM-7020SKR	2m 1/2 70cm 2 x 5/8 NEW	£24.95

DUAL BAND BASE ANTENNAS

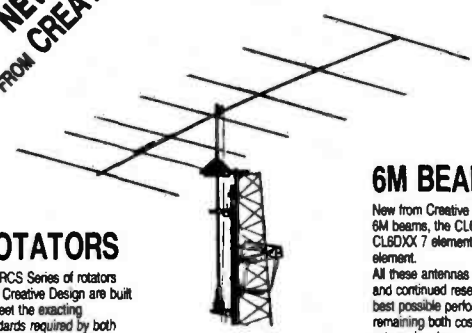
WX1	2m/70cm colinear	£54.99
WX2	2m/70cm colinear	£75.00
WX4	2m/70cm colinear, high gain	£99.00
CA2X4WX	2m/70cm colinear	£79.00
CA2X4MAX	2m/70cm colinear, high gain	£99.95
CF416MN	Duplexer 1.3-500/400-540MHz	£25.50
HS790DN	Duplexer Mess 1.6-150/410-460MHz	£25.50

ANTENNA MOUNTS

GCCA	Gutter mount and cable	£14.25
HDTMCA	S/S trunk mount and cable	£19.50
SOMM	Mag mount and cable	£12.75
TBR	S/S hatch back mount NEW	£11.25
RS17	Mini hatch back mount NEW	£12.50
RS16	Mini gutter mount NEW	£12.50
SS-B1	Mini back mount & cable NEW	£26.50
CK-3LX	Cable assembly for RS16, 17, TBR	£19.95

CARRIAGE BASE ANTENNA £7.50, MOBILE ANTENNAS £4.00, CABLES AND MOUNTS £3.50

NEW FROM CREATE



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 methods is available designed to cater for medium to large shed antennas. All the rotators are manufactured with high quality components allowing continued and reliable operation.

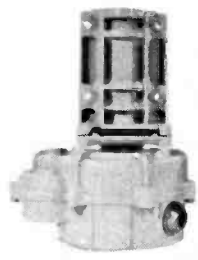
RC5-1	**£219.00**
RC5A-3	**£425.00**
RC5B-3	**£675.00**
CK-46 Rotary bearing	**£34.95**

6M BEAMS

New from Creative Designs 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 5 ele 13dB*	£115.00
CL6DXX 7 ele 14.3dB*	£168.99
CL6DXZ 8 ele 14.5dB*	£225.00

*Manufacturers figures



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

LEEDS (0532) 530606
BIRMINGHAM 021 327 1497

For full addresses see previous page.

Most people know us as the sole appointed UK distributors for Kenwood amateur radio products. We have always stocked a wide range of other items, from transceivers such as the JST-135 to humble copper wire, so just for a change why not have a short selection of some of these different products. Read it carefully; you will be surprised at the variety.

LOWE HF225 LOW COST HIGH PERFORMANCE GENERAL COVERAGE RECEIVER		Price	Carr.
HF225	NEW 30kHz.–30MHz.AM/SSB/CW General coverage receiver	395.00	8.00
D225	Narrow band FM and Synchronous AM detector	39.50	1.00
K225	GENIE PAD. Key pad for direct frequency entry	39.50	1.00
B225	Internal rechargeable nicad battery pack	49.50	2.50
W225	Active whip aerial. Ideal for portable use with B225	19.50	2.50
C225	Deluxe carrying case for HF125/HF225	23.86	3.00
S225	Wharfedale speaker and lead for HF125/HF225	49.50	3.00

Options for HF125 still available. Phone for details

JAPAN RADIO COMPANY QUALITY EQUIPMENT		Price	Carr.
NRD525	General coverage receiver 0.09–34MHz.	1095.00	8.00
CMK165	Optional VHF/UHF converter 34–60, 114–174, 423–456MHz.	391.35	8.00
CMH530	RTTY Demodulator option. Fits internally	102.19	1.50
CMH532	RS232 interface module for remote operation	91.75	1.50
CFL231	0.3kHz. Crystal filter option	126.37	1.00
CFL232	0.5kHz. Crystal filter option	126.37	1.00
CFL233	1.0kHz. Crystal filter option	126.37	1.00
CFL218A	1.8kHz. Crystal filter option	117.89	1,00
NVA88	Matching loudspeaker for NRD525 and JST135	62.86	2.50
CC232	JRC cable for RS232 interface	60.25	2.00
JST135	160–10M Transceiver with general coverage receive	1195.00	8.00
NBD520	Matching 35A PSU for JST135	299.00	8.00
NFG230	Remote automatic ATU. Microprocesser controlled	599.00	8.00
NFG97	Matching manual ATU with power meter etc	240.04	8.00
CMH741	RS232 Interface board JST135	156.12	1.50
CFQ3003	JST135 to NRD525 transceive interconnecting cable	99.52	2.50
CDD366	Notch follow unit (needs daughter board)	79.00	2.00
CMH742	Daughter board unit. Required to mount notch unit	56.15	2.00
CMH78	ECSS detector unit	198.00	8.00
CFL243	Bandwidth control unit	299.00	2.00
NTV56	Base station desk microphone for JST135	90.10	2.50

VHF/UHF MONITOR RECEIVERS AND SCANNERS		Price	Carr.
AR2002	VHF/UHF scanning receiver 25–550MHz, 800–1300MHz.	487.30	8.00
AR3000	NEW all mode scanning receiver 100kHz–2036MHz.	765.00	8.00
MB2001	Mobile mounting bracket for AR2002/2001	11.34	1.00
RZ1	KENWOOD Wide range scanner.	465.00	8.00
AR800E	Hand held scanner. 75–105, 118–174, 406–495, 830–950 MHz.	199.00	8.00
LC800	Leatherette case for AR800E	2.73	0.50
AR900UK	NEW 6 band hand held scanning receiver	235.00	8.00
LC900	Leatherette case for AR900UK	3.55	0.50
FS10M	10 channel pocket scanner Crystals extra	98.00	2.50
CRYSTALS	Most marine channels available from stock for FS10M	4.60	0.50
HS1300MT	NEW Receive pre-amp. 25–1300MHz. Ideal for wide band scanners	25.86	1.50

KANTRONICS PACKET TERMINALS		Price	Carr.
KPC2	AX25 Packet Terminal (plus WeFax)	165.00	8.00
KPC2400	As KPC2 PLUS 2400 baudPacket operation	224.00	8.00
KPC4	Dual Port Packet Terminal (plus WeFax)	242.00	8.00
KAM	All mode Terminal Unit (plus WeFax)	285.00	8.00

SOFTWARE		Price	Carr.
PACTERM	for VIC 20	18.50	1.50
PC-COMBO	for IBM PC (or compatible) Terminal & WEFAX	39.50	1.50
C64-COMBO	COMMODORE C64/128 (Check peek(65408)<>0)	39.50	1.50
WEFAXEPS	IBM PC WEFAX pictures to Epson printer (Hi-Res)	12.00	1.50
KPTERM	BBC B programs (public domain)	2.50	1.50
YAPP	IBM PC Terminal Program (public domain)	2.50	1.50

ACCESSORIES		Price	Carr.
IBMLEAD	RS232 lead for IBM PC	12.00	1.50
BBCLEAD	RS232 lead for BBC computer	12.00	1.50
KM2400	2400 Baud Packet adapter for KAM and KPC4	88.95	1.50
KANBB	Battery Back-up smart socket	22.00	1.50
62256	32k Static RAM (if not already fitted)	16.50	1.50
WDT	Watch Dog Timer	11.50	1.50
MANUALS	Set of spare manuals	15.00	1.50

KEYS AND KEYERS		Price	Carr.
KKX1	Self contained morse practice oscillator	14.95	1.50
HK708	Straight key. Ball bearing pivots. Non skid base	21.82	2.50
HK702	Deluxe version of above on marble base	43.30	3.00
MK704	Squeeze paddle	20.25	1.50
EK150	Electronic keyer. Built in sidetone. Solid state or relay keying	133.75	3.00
SMK2	Star Master Key. Electronic keyer. Needs paddle	54.71	3.00
CMK1	CMOS memory keyer. Needs paddle	95.00	3.00
BY1	Bencher Iambic paddle with black base	67.42	3.00
BY2	Bencher Iambic paddle with chrome base	76.97	3.00
BY3	Bencher Iambic paddle with GOLD plated base	141.75	3.00
BST1	Bencher single lever paddle with black base	57.42	3.00
BST2	Bencher single lever paddle with chrome base	76.97	3.00

SIGNAL COMMUNICATION Specialist manufacture of air band receivers		Price	Carr.
R535	Airband receiver. Covers VHF and UHF bands	249.00	8.00
IF535	Computer remote interface. Allows easy access to memories	30.00	3.00
R535MEMS	Memory program for IBM computers	12.00	1.00
BBCLEAD	RS232 lead for BBC computer	12.00	1.00
IBMLEAD	RS232 lead for IBM PC r	12.00	1.00
PS12	Mains adapter for R535/R532 and similar receivers 12V 300mA.	8.50	2.00
BP535	Nicad battery pack for R532/R535	32.68	2.00

LOWE ELECTRONICS LIMITED

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

25 YEARS IN AMATEUR RADIO

BT535	Dry battery case for R535. (batteries not included)	**14.51**	**1.50**
LC535	Leatherette case to fit R532/R535 and BP535	**9.86**	**1.00**
RB535	Rubber flexible antenna for R535	**6.70**	**0.50**
TW535	Telescopic whip for portable use with R532/535	**7.46**	**0.50**
CH535	AC charger for BP535/BP535	**8.50**	**2.00**

EMOTATOR NEW RANGE OF ROTATORS		Price	Carr.
105TSX	Medium duty rotator with controller	**159.69**	**8.00**
747SRX	Heavy duty rotator with controller	**347.24**	**8.00**
1211	Lower mast clamp for 105TSX	**16.28**	**2.50**
1217	Lower mast clamp for 747SRX	**35.35**	**2.50**
452	Universal flexible coupling for 105TSX	**23.48**	**3.00**
451	Universal flexible coupling for 747SRX	**31.12**	**3.00**
300	Stayed support bearing 28–62mm mast diam.	**29.53**	**3.50**
303	Mast support bearing 28–62mm mast diam.	**19.68**	**3.50**

DAIWA ROTATORS AND ACCESSORIES		Price	Carr.
MR750E	Multitorque rotator round controller	**254.07**	**8.00**
MR750PE	As above but with round and preset controller	**290.32**	**8.00**
LMC	Lower mast clamps for pole mounting	**17.81**	**3.00**
MR750U	Additional motor unit to increase torque and braking	**82.17**	**3.00**

DAIWA POWER and SWR METERS		Price	Carr.
CN410M	3.5–150MHz mobile cross needle power/SWR meter	**61.72**	**1.50**
CN460M	140–450MHz mobile cross needle power/SWR meter	**65.40**	**1.50**
NS448	900–1300MHz SWR/Power 5/20 W	**86.60**	**2.50**
NS660P	1.8–150MHz.SWR/PEP/RMS meter. Extra couplers available	**115.00**	**2.50**
U66VN	Extra coupler head for NS660P 140–525MHz	**55.27**	**1.00**
SC20	20 metre extension cable	**29.21**	**1.00**
CNW919	2M Power meter and antenna tuning unit	**147.40**	**3.00**
DP810	Digital SWR/Power/PEP meter.1.8–150MHz, 100MW–1.5kW	**132.80**	**2.50**

AC POWER SUPPLY UNITS		Price	Carr.
PS30XM	Daiwa heavy duty PSU 30A max 24A rated	**129.50**	**8.00**
PS120M	Daiwa AC PSU 3–15V variable 12A maximum	**79.50**	**8.00**

MOBILE AERIALS HOKUSHIN RANGE		Price	Carr.
320	2m stainless 1/4 wave on PL259 plug	**3.30**	**1.00**
RG4M	Base for all above units inc. coax ready fitted with PL259	**6.26**	**1.00**
12B	Car wing mount with SO239 top and bottom	**5.73**	**1.00**
GSS	Heavy duty gutter/boot mount to take RG4M base	**6.26**	**1.25**
HSTMB	Trunk mount base with SO239 socket and cable	**15.42**	**1.50**
HS780N	145/435MHz Diplexer	**25.47**	**1.50**
HS727VM	2/70 antenna 1/2 wave on 2m 5/8+5/8 on 70cm	**24.38**	**3.00**
HS727VME	2/70 antenna 6/8 on 2m. 5/8+5/8+5/8 on 70cm	**37.42**	**3.00**
MA200S	Deluxe magnetic base. For most of above aerials	**24.00**	**2.00**

NEW SUPER SLIM RANGE		Price	Carr.
VM2SS	Super slim 2m. 1/2 wave mobile antenna	**19.53**	**3.00**
VM7SS	Super slim 70cm. 1/2 wave mobile antenna	**17.39**	**3.00**
VM720SS	Super slim 2m/70cm. mobile antenna	**23.54**	**3.00**
SSB2	Small boot lip/hatch antenna base assembly. Fits some gutters	**22.32**	**2.00**

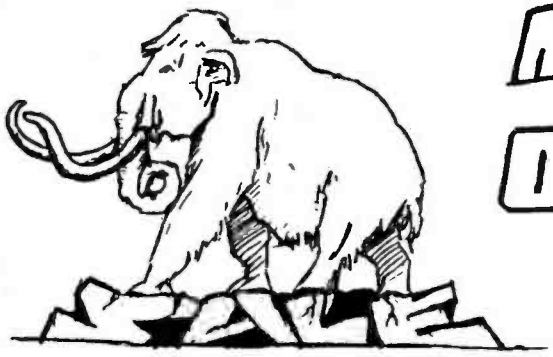
BASE STATION AERIALS		Price	Carr.
HS5VK	80–10m HF vertical. Including loaded radial elements 1kW rating	**218.00**	**8.00**
G8100	8 Band base station antenna	**109.25**	**8.00**
GP23	High performance 2m 3 section colinear	**51.97**	**8.00**
HSWX1	144/430MHz dual band base station vertical	**59.62**	**8.00**
HSWX2	NEW High performance 144/430MHz. base station vertical	**79.72**	**8.00**
GPV7	High performance 70cm 5/8+5/8+5/8 base station colinear	**45.59**	**8.00**
REVCONE	30–500MHz Discone antenna. British and well made	**32.26**	**8.00**
D130N	DIAMOND wide coverage aerial for scanning receivers 25–1300MHz	**79.34**	**8.00**
LAB	Air band ground plane aerial	**18.42**	**2.50**

ANTENNA ACCESSORIES		Price	Carr.
CS201	Two way 50 ohm coax switch. 0–500 MHz	**13.69**	**2.50**
CS201G	As above but with N-type sockets	**35.00**	**2.50**
CS401	Four way 50 ohm coax switch. 0–500 MHz	**69.09**	**2.50**
CS4	4 way coax switch BNC connectors DC–1.5GHz	**30.39**	**2.50**
EIS	Small egg insulator. Glazed ceramic 4cm long	**0.61**	**0.50**
EIL	Large egg insulator. Glazed ceramic 5cm long	**0.79**	**0.50**
HS50B	HF BALUN 1.8–50MHz. 1:1 ratio 1kW if less than 2:1 SWR	**24.21**	**1.50**
DDC	Deluxe dipole centrepiece	**2.25**	**1.00**
RI3	3 inch ribbed insulator. (polythene)	**0.60**	**0.50**
FS3	3 inch polythene feeder spreaders. (post per 10)	**0.18**	**0.50**
TRAPKIT	Trap dipole kit including 7MHz.	**28.38**	**2.50**
TRAPS	7MHz. traps only to make up your own antenna	**12.56**	**1.50**
CUWIRE	25m Pack 14SWG. copper	**8.62**	**1.50**
CPC	Centrepiece insulator for dipole	**5.53**	**0.75**

OTHER ACCESSORIES		Price	Carr.
SWR50	The ever popular twin meter SWR bridge 1.8–150 MHz	**24.61**	**2.00**
DL60	60 W dummy load with SO239 fitting	**10.96**	**1.00**
WA1	AKD wavemeter. 120–450 MHz. Absorption type	**25.94**	**1.50**
METEOR600	600 MHz frequency counter. Mains or battery	**148.35**	**3.00**
1300HA	NEW MODEL handy frequency counter. With built in preamp	**159.00**	**2.50**
2400H	NEW MODEL 2400 MHz. handy frequency counter	**280.00**	**3.00**
CC12	Deluxe carrying case for 1300HC/2400	**9.91**	**1.00**
PS13/24	Mains power supply for 1300HA/2400	**8.50**	**2.00**
TW535	Telescopic whip for 1300HA/2400	**7.46**	**0.50**
T414	Multi arm instrument vice system with magnifier	**6.34**	**1.50**
MH1	Screw fixing mic clip	**0.22**	**0.50**
MH2	Self adhesive mic clip	**0.29**	**0.50**
MH3	Magnetic fixing mic clip	**0.32**	**0.50**

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.

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 ELECTRONICS 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!

Access VISA

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).

COMMENT!

In June 1965 when I started business as "LST Components" (from my callsign — G3LST); I choose Practical Wireless for my very first advertisement.

So our relationship is 24 years old and I am most sincere in wishing:

CONGRATULATIONS TO PRACTICAL WIRELESS ON THE NEW LOOK!

Incidently, if anybody has one of my 1974 adverts, send it to me & I'll send you a FREE LOGBOOK!! — nostalgia dies hard!

73 DE PETER G3LST

ARROW — FOR THE BEST DEAL IN AMATEUR RADIO!!

NEW KENWOOD HF. TS-950S

TS950S "NOW AVAILABLE. . . £3199"

NEW! IC-24E

ICOM mini dual bander 2m & 70cm FM
DISCOUNT PRICE £365
incl. nicad, charger

FT747GX SPECIAL HF Mobile
£599 BARGAIN PACK INCLUDES FM & MICROPHONE!!!

FT470R DUAL-BANDER

Yaesu's famous mini for 2m & 70cm Handy. ONLY £389.00 Inc nicad & charger.

£389

TS140S — *FREE CREDIT*

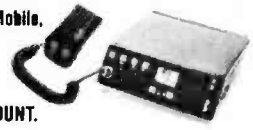
Superb HF mini from Kenwood. Dep: £173.00 + 6 payments £114.83.

IC — 32E

Best value yet in Dual Band handy's
ARROW PRICE £369!!! (Incl. nicad & charger)

NAVICO AMR1000

A great 2m FM 25W Mobile, SPECIAL PACK price £247.00 with FREE MOBILE ⅝ ANTENNA GUTTER MOUNT.



TR751E — *FREE CREDIT*

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

AR800E BARGAIN

AOR hand scanners only £169

FT736 V/UHF Base

SPECIAL PRICE £1275
WITH MO1B8 DESK MIC!

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 70cm handy with nicad + charger. Receives 380-500 & 800-950 MHz!! DISCOUNT PRICE £279

NEW MTV6000 Mobile/Base Scanner by Yupiteru only £349.00 Superb! only equalled by the MTV5000 hand scanner at only £275.00. They both cover 25–550 & 800–1300 MHz.

NEW ICOM's IC-R1 only £399 covers 150kHz to 1300MHz, ICR100 covering 500kHz to 1800MHz £499 and R72 new SW receiver 100kHz to 30 MHz £599 with ICOM quality these are bound to be good so don't miss out order now from our initial stocks. (discounts available of course!)

And ARROW stock BEARCAT/UNIDEN, SONY, AOR, STANDARD, You name it, we'll give you a good price!

R-7000

ICOM's superb VHF/UHF/ SHF receiver

£895 DISCOUNT PRICE
OR £90.00 dep. + 18 payments £56.08

IC-726 ICOM HF MINI

A really great rig HF & SIX.AM/FM, Microphone, general coverage receiver, DISCOUNT PRICE £899.00

IC735 *FREE CREDIT*

One of the best HF mini's ever.
£325 dep. 9 payments £72.67

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

COMET ANTENNAS

An excellent performance combined with super quality at a BARGAIN price from our directly imported range including:

CHL21J Micro mobile 144/432 0/2.15dB .29M 150W £14.95
CHL23J Mini mobile 144/432 2.15/3.8dB .5M 150W £16.75
CHL25J Mobile 144/432 3/5.5dB .93M 120W £29.95
CA-702 Mobile 144/432 3/5.5dB 200W £24.22
CA-2x4FX Base 144/432 4.5/7dB 2.02M F/Glass £52.50
CA-2x4WX Base 144/432 6.5/9dB 3.18M F/Glass £74.00
CA-2X4SUP Base 144/432 6/8.4dB 2.54M £69.00
CA-2x4 MAX Super gain 144/432 8.5/11.9dB 5.4M F/Glass £125.00

CA-ABC22A Base Colin. 2M 6.5dB 2.87M £35.00
CA-ABC23 Base Colin. 2M 7.8dB 4.5M £59.50
50CA-285E 5/8 Wave Mobile 144 ..... £15.00
CA-ROD2 BNC loaded tele.whip for Handy's £12.95
Comet Meters NEW!
CD120 SWR+Power 15/60/200W with PEP & averaging 1.8-200MHz £86.95
CD270D SWR + Power as above for 140-525MHz £88.95
CFX140 Triplexer for 50/144/432 MHz £33.40

Send SAE for COMET CATALOGUE....

FULL RANGE OF EQUIPMENT FROM ALL MAJOR MANUFACTURERS CAN BE SEEN & TRIED AT OUR SHOWROOMS IN CHELMSFORD & GLASGOW. OUR AGENTS IN WIGAN & LEICESTER WILL BE PLEASED TO DEMONSTRATE ANY ITEM. CATALOGUES & COLOUR BROCHURES ARE AVAILABLE ON MOST ITEMS, WE APPRECIATE A STAMPED SELF ADDRESSED ENVELOPE, WE WILL ALSO SEND YOU A QUOTE, WE CAN EVEN OFFER FINANCE BY POST (subject to status) JUST CALL FOR PRICE & TELL US WHAT YOU WANT OR HOW YOU WANT TO BUY.

SR STANDARD

C112E/K Series VHF FM

FEATURES

Probably the worlds smallest 2mtr Handheld

(also available in 70cms)

- Size 110mm H × 53mm W × 32.5mm D
- 5 Watts @13.8V DC in, or CNB414 NiCad pack
- Adjustable output powers
- Programmable battery save
- Auto power off
- Presetable on/off periods via internal clock
- 5 scan modes, including memory scan
- 2 × 10 memory banks
- Switchable steps 10/12½/25 kHz
- Selectable memories using rotary switch
- Rotary channel or keypad programmable (with CKP412 option)
- 4 multifunction keys for simple programming
- Expandable RX frequency range

"THINK SMALL- THINK STANDARD"

SPECS

RECEIVER:

Circuitry	Double Conversion Superheterodyne
Intermediate Frequency	1st IF: 21.8 MHz (Upper heterodyne of C412K Series) 21.8 MHz (Lower heterodyne of C412E/C112E Series) 2nd IF:455 kHz (Lower heterodyne)
Sensitivity (12 dB SINAD)	Less than 0.16 μV
Threshold Squelch Sensitivity	Less than 0.1 μV
Selectivity (2-signal method)	More than 50 dB
Audio Frequency Output	200 mW (at 8 ohm 10% distortion)
S/N Ratio at 1 μV Input	More than 25 dB (C412) More than 28 dB (C112)

Performance specifications are subject to change without notice.

ACCESSORIES

CMP111	Speaker/Mic	32.50
CMP112	Small size Spkr/Mic	31.00
CNB412	7.2 V 400 M/A NiCad pack	39.00
CNB414	12 V 600 M/A NiCad pack	60.00
CWC150	Wall Charger for CNB412	12.95
CWC151	Wall Charger for CNB414	15.50
CCA412	Charging Sleeve	9.50
CMC150	Mobile Charger	12.95
CMB111	Mobile Bracket	9.50
CSA150	Desk Top Charger	55.00
CHP111	Headset Boom Mic	32.50
CTN412	Tone Squelch Unit	39.50
CTD412	D.T.M.F.	39.50
CKP412	Key Pad	24.95
CLC412	Case	10.50

£239.00

DONT FORGET

We stock- Plugs – Sockets – Power Supplies – Morse Keys – SWR Meters – Dummy Loads – Coax Cable – Switches – Rotators – Aerials by- Jaybeam, Diamond, Araki – M.E.T, in fact everything a good Ham Radio Shop should stock.

We are also main agents for Icom, Yaesu, Navico as well as Standard, so give us a call.

MAY I WISH YOU ALL A MERRY CHRISTMAS AND A VERY HAPPY NEW YEAR

— NORMAN —

Here are two *more* authorised dealers
BORDER COMMUNICATIONS
ADITI COMMUNICATIONS

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

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

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

VISA Access

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

leelectronics

NORMAN G4THJ

Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.
Telephone: Axminster (0297) 34918

Yaesu

FT767	HF Transceiver	1599.00	(—)
FEX767(2)	2m Module (767)	169.00	(3.00)
FEX767(70)	70cm Module (767)	215.00	(3.00)
FEX767(6)	6m Module (767)	189.00	(3.00)
SP767	Speaker	89.95	(2.50)
FT747GX	Budget HF Transceiver	659.00	(—)
FT757GX	MkII HF Transceiver	989.00	(—)
FP700	20A P.S.U.	219.00	(4.00)
FC700	Manual ATU	149.00	(3.00)
FP757HD	Heavy Duty 2m P.S.U.	258.75	(4.00)
FAS14R	Remote Aerial Switch	80.00	(3.00)
FT4700	New 2m/70cm Dual Band FM Mobile	675.00	(7.00)
FT290	MkII Super 290 2m Multimode 2.5W	429.00	(—)
FT690	MkII 6m M/Mode 2.5W	399.00	(2.00)
YHA15	2m Helical	7.50	(2.00)
YHA44D	70cm ¼ wave	12.50	(2.00)
YM43	Speaker Mike	23.00	(2.00)
MM815	Mobile Bracket	14.55	(2.00)
FT411	New 2m H/H Keyboard	225.00	(3.00)
FT811	New 70cm H/H Keyboard	239.00	(3.00)
FT470	New 2m/70cm Dual Band H/H	389.00	(3.00)
FT23R	2m Mini H/H	209.00	(3.00)
FT73R	70cm Mini H/H	229.00	(3.00)
FNB9	Nicad Battery Pack (23/73)	34.50	(2.00)
FNB10	Nicad Battery Pack (23/73)	34.50	(2.00)
FNB11	Nicad Battery Pack (23/73)	67.85	(2.00)
NC18C	Charger (23/73)	17.71	(2.00)
SMC28	Charger (23/73) 13A Plug	17.71	(2.00)
NC28	Charger (23/73)	17.71	(2.00)
NC29	Base Charger (23/73)	69.00	(3.00)
PA6	Car Adapt Charger (23/73)	24.15	(2.00)
MH12A2B	Speaker Mic	31.05	(2.00)
MH18A2B	Speaker Mic Miniature (23/73/727)	31.05	(2.00)
FNB3	Spare Battery Pack (FT209)	41.00	(2.00)
FNB4	Spare Battery Pack (FT709)	46.00	(2.00)
FNB5	Empty Cell Case (FT727)	10.00	(2.00)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
PA4C	Power Supply for 9600	29.00	(2.00)
MM810	Mobile Bracket	10.00	(2.00)
NC9C	Charger	11.50	(2.00)
PA3	Car Adaptor/Charger	21.85	(2.00)
YM24A	Speaker Mike	31.05	(2.00)
FRG8800	HF Receiver	649.00	(—)
FRV8800	Converter 118-175 for above	100.00	(2.50)
FRT7700	RX ATU	59.00	(2.50)
MH18B	Hand 600 8pin mic	21.00	(2.00)
MD18B	Desk 600 8pin mic	79.00	(2.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lightweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	L/weight Mobile H/set-Boom mic	28.75	(2.00)
SB1	PTT Switch Box 208/708	22.00	(2.00)
SB2	PTT Switch Box 290/790	22.00	(2.00)
SB10	PTT Switch Box 270/2700	22.00	(2.00)
FT736 **NEW**	2/70cm 25W Base Stn.	1,359.00	(—)
FT2311R	23cm FM Transceiver	475.00	(—)
FT211RH	2m 45W FM Mobile	309.00	(—)
FT212RH	New 2m 45W FM Mobile	349.00	(—)
FL2025	25W Linear	115.00	(3.00)
FL6020	6m 10W Linear	109.00	(3.00)
QTR24D	World Clock	39.00	(3.00)

Antennas

VLF	50-500MHz RX Discone	22.50	(3.00)
D130	26-1300MHz Discone	75.00	(3.00)
Jaybeam	TB3 MkIII 3e HF Tribander	348.45	(8.00)
Hygain	TH3JNR 3e HF Tribander	299.00	(8.00)
Creative	CD318 JR 4e HF Tribander	299.00	(8.00)
Creative	CD318 JR 4e HF Tribander	349.00	(8.00)
CA2X4KC	2/70cm Mobile	39.95	(3.00)
WX1	2m/70cm Base Fibre Glass	54.99	(4.00)
CA2X4Max	2m/70cm Base Fibre Glass	99.95	(4.00)
IC765 **NEW**	HF Transceiver	2499.00	(—)
IC761A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
IC725	HF Base Transceiver	979.00	(—)
AT100	100W ATU (751/745)	365.00	(3.50)
AT150	150W ATA (735)	315.00	(3.50)
PS55	Ext PSU (735)	185.00	(3.00)

ICOM

IC505	50MHz multi-mode portable	499.00	(—)
IC290D	2m 25W M/Mode	542.00	(—)
IC228E	2m 25W FM Mobile	365.00	(—)
IC2SE	2m Handheld	275.00	(—)
IC2GE	FM H/Held **NEW**	265.00	(3.00)
IC275E	New 2m 25W Base Stn IC75E	1089.00	(—)
IC4GE	70cm H/Held **NEW**	299.00	(3.00)
IC4SE	70cm H/Held **NEW**	310.00	(—)
IC32E **NEW**	2m/70cm Dual Band H/Held	399.00	(3.00)
IC490	70cm 10W M/Mode	617.00	(—)
IC3210	2m/70cm FM Dual Band Mobile	499.00	(4.00)
IC2400E **NEW**	2m/70cm Mobile	635.00	(—)
IC12E	23cm H/H	428.00	(3.00)
ICR71	Gen Cov RX	825.00	(—)
IC7000	VHF/UHF Scanner	967.00	(—)
AH7000	25-1300MHz Discone	82.00	(3.00)
SP3	Ext Speeker	61.00	(2.50)
CK70	DC Cable (R70/R71)	7.00	(2.00)
EX257	FM Board (R70/R71)	41.00	(2.00)
GC5	World Clock	43.00	(2.50)
AC2	Waterproof Bag all Icom H/H	14.38	(2.00)
BC35	Desk Charger	70.15	(2.50)
BP3	Battery Pack 8.4V (2/4E/02/04E)	29.90	(2.00)
BP4	Empty Battery Case (2/4E/02/04E)	9.20	(2.00)
BP6	Battery Pack 10.8V	60.95	(2.50)
CP1	12V Charge Lead BP3/7/8	6.90	(2.00)
DC1	DC/DC converter operate from 12V	17.25	(2.00)
HM46	NEW Mini speaker mic	24.15	(2.00)
HM9	Speaker/Mic	21.85	(2.50)
HS51	Headset inc PTT/Vox unit	41.25	(2.00)
LC24	Micro + BP22/23	7.50	(2.00)
LC41	IC32 + BP3	9.20	(2.00)
LC42	IC32 + BP5	9.20	(2.00)
SM8	1.3kμ/600μ 8P Basa Mic	82.00	(2.50)
SM10	Comp/Graphic Mike	116.20	(3.00)

C W Keyers

HI-MOUND			
HK702	Straight key (adjustable tension)	42.49	(2.00)
HK703	Straight key (adjustable tension)	38.45	(2.00)
HK704	Straight key (adjustable tension)	26.35	(2.00)
HK705	Straight key (adjustable tension)	22.49	(2.00)
HK706	Straight key (adjustable tension)	21.80	(2.00)
HK707	Straight key (adjustable tension)	20.15	(2.00)
HK802	Straight key (Deluxe-Brass)	109.00	(3.50)
HK803	Straight key (Brass)	104.50	(3.50)
MK703	Squeeze key	34.50	(2.00)
MK704	Squeeze key	30.00	(2.00)
MK705	Squeeze key	32.78	(2.00)
MK706	Squeeze key	30.48	(2.00)
STARMASTER			
Dewsbury	Electronic Keyer Unit (No Paddle)	54.70	(3.00)
Dewsbury	Electronic Memory Keyer (No Paddle)	95.00	(3.00)

Rotators

G250	Light Duty	78.00	(4.00)
AR200XL	Light Duty	38.50	(4.00)
G400	Medium Duty	139.00	(4.00)
G400HC	Medium Duty (Round Face)	169.00	(5.00)
G600RC	Medium/Heavy Duty	219.00	(5.00)
G200RC	Heavy Duty	445.00	(5.00)
G500	Elevating Rotator	149.00	(5.00)
GR5400	Azimuth/Elevating	279.00	(5.00)

KENWOOD

TS950S	NEW Transceiver	P.O.A.	(—)
TS940S	9 Band TX General Cov RX	1995.00	(—)
AT940	Auto/ATU	244.88	(3.00)
SP940	Ext Speaker	87.65	(3.00)
TS140	HF 9 Band Gen. Cov. TX/RX	882.00	(—)
TS6805	HF/6m TX Gen. Cov. RX	985.00	(—)
TS440	9 Band TX General Cov RX	1138.81	(—)
AT440	Auto/ATU	144.82	(3.00)
PS50	H/Duty PSU	222.49	(3.00)
AT230	All Band ATU/Power Meter	208.67	(3.00)
SP230	External Speaker Unit	66.49	(3.00)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(3.00)
SM220	Station Monitor	343.62	(3.50)
8S8	Band Scope Unit (830/940)	77.00	(2.50)
TL922	10/160 2kW Linear	1495.00	(7.00)
TH25	NEW 2m H/Held	238.00	(3.00)
TH45	NEW 70cm H/Held	269.00	(3.00)
TH75	NEW 2m/70cm H/Held	P.O.A.	(—)
TH205	2m H/H	215.26	(3.00)
TH215	2m H/H Keyboard	252.13	(3.00)
TR751	2m 25W M/M Mobile	599.00	(—)
TS790	VHF/UHF Transceiver	1495.00	(—)
R2000	Gen Coverage HF/RX	599.00	(—)
VC10	118-174MHz Converter (R2000)	161.94	(2.50)
R5000	General Coverage HF/RX	875.00	(—)
VC20	118-174MHz Converter (R5000)	167.21	(2.50)
TM701	NEW 2m/70cm FM Mobile	469.00	(5.00)
TM721	2m/70cm FM Mobile	675.00	(5.00)
TM231E	NEW 2m FM Mobile 50/10/5W	289.00	(5.00)
TM431E	NEW 70cm FM Mobile 35/10/5W	318.00	(5.00)
SMC30	Speaker/Mic TH21/4/2600	28.31	(2.00)
MC50	4P Desk Mic	46.08	(3.00)
MC60A	8P Desk Mic	88.22	(3.00)
MC80	Electric Desk Mic	53.96	(3.00)
MC85	Desk Mic Audio Level Comp	99.00	(3.00)
MC43	8P Fist Mic	22.22	(2.00)
MC35	4P Fist Mic	21.72	(2.00)
MC55	Mobile Mc (6p.o. 8p)	62.67	(3.00)
LF30	HF Low Pass Filter	32.26	(2.50)
HS6	Lightweight H/phones	24.36	(2.50)
HS5	Deluxe H/phones	37.54	(2.50)
RZ1	500Hz-950MHz AM/FM Scanner	485.00	(6.00)

SWR/PWR Meters

HANSEN			
W720S	130/440MHz 20/200W	62.75	(2.50)
JD110	1.5-150MHz	12.50	(2.00)
YMIX	3.5-150MHz	31.50	(3.00)
Yaesu Y580	1.6-60MHz	93.15	(3.00)
Yaesu YS500	140-525MHz	81.65	(3.00)
Hanson FS500H	1.5-30MHz	53.40	(3.00)

Miscellaneous

SMCS 2U	2 Way SO239 Switch	18.95	(2.50)
SMCS 2N	2 way 'n' Skts Switch	23.50	(2.50)
Kenpro KP21N	2 way Switch 'n' Socket Deluxe	27.00	(2.50)
T30	30W Dummy Load	10.29	(2.50)
T100	100W Dummy load	45.00	(3.00)
T200	200W Dummy load	65.00	(3.00)
WAI	Wavemeter 120-450MHz	24.95	(2.00)
PK232	Packet/RTTY Terminal	299.95	(3.00)
Datong D70	Morse Tutor	63.40	(3.00)
Datong FL2	Audio Filter	100.91	(3.00)
Datong FL3	Audio Filter/Autonotch	145.51	(3.00)
Datong ASP	Processor 4pin	93.15	(3.00)
Datong ASP	Processor 8pin	93.15	(3.00)
Datong AD370	Active Antenna	77.62	(3.00)
Datong PCI	General Coverage Converter	154.80	(3.00)

VISA

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

ACCESS

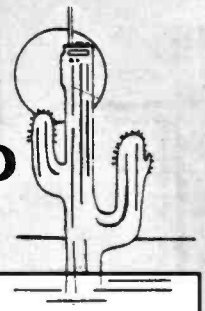
OPEN TUES.-SAT. 9.00-5.30 (CLOSED MONDAYS)

STOCK ITEMS USUALLY DESPATCHED WITHIN 48 HRS

DELIVERY/INSURANCE PRICES IN BRACKETS

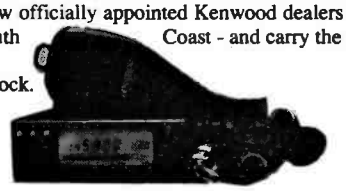
NEVADA...

.....TALK TO THE WORLD



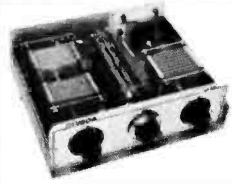
TALK KENWOOD

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



TS950SD New Digit HF Transceiver	£3199
TM 231E 2 Mtr mob.	£289
TM 431E 70cm mob	£318
TM 701E 2/70cm mob	£469
TR 751E 2/70 mobile	£599
TH 75E 2/70cm H/held	CALL
TS 711E 2 Mtr Multi Mod *(s/soiled)*	£799
TS 440S HF	£1138
TS 940S HF	£1995

TALK ATU'S



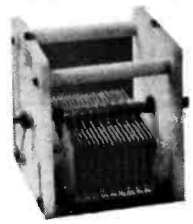
TM 1000 1 KW ALL BAND ATU

Using our high power roller coaster this ATU gives effortless matching of all long wire, G5RVvertical and coax fed antennas

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

(Add £5.75 carriage for all models)

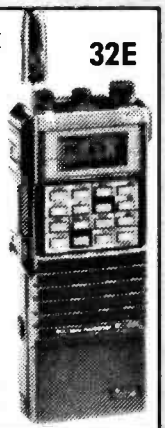
BUILD YOUR OWN AMPLIFIER OR ATU WITH OUR RANGE OF HIGH POWER COMPONENTS



Roller Coaster 30 µH	£28.00
Var. cap 250 pF (8kV)	£19.95
Var. cap 250+250 pF (8kV)	£28.00
Var. cap 750 pF (4kV)	£28.00
Turns Counter (For Roller)	£14.95
Empty ATU Case	£26.00
2kW Balun Assembly	£28.00

TALK ICOM

We have just been appointed ICOM dealers for the South Coast.....Call Paul Martin our ICOM specialist for info and prices.



IC - 2SE	Call
IC - 4SE 70cm H/held	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 - 228H 2m/45W	Call
IC - 448E 70/25W	Call

TALK SCANNERS

We probably carry the largest stocks of scanners in the U.K. Our **New Bumper Catalogue** features all the latest models. Here is a selection:-

New Jupiter 11 H/held	£299
New Jupiter 11 Mobile	£379

BEARCAT

200 XLT H/held	£229
100 XLT H/held	£199
100 XL H/held	£179
55 XL H/held	£99
590 XLT Mobile	£199
760 XLT Mobile	£249
145 XL Base	£115
175 XL Base	£169
210 XL Base	£169
Black Jaguar BJ200 111	£199
Sony Air 7	£229
Sony Pro 80	£299

SCANNER ANTENNAS

Nevada Discone (50 - 700 MHz)	£24.00
WB1300 Discone (25 - 1300 MHz)	£59.95
PA15 Colinear (100 - 960 MHz)	£49.95

ABIS SCANNER PRE-AMP

- 25-2100 MHz
- Low noise GAAS Fet
- Variable Gain
- Switchable Band - Pass Filters

NOW IN STOCK

£79.95

STOP PRESS STOP PRESS

JUST ARRIVED

The new fairmate H/Held Scanner. Just look at its incredible specifications.

- 1000 memory channels
- 25 MHz-1300 MHz
- Wide Band FM/narrow FM/AM

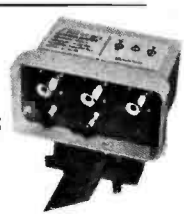
All fully selectable with many more features. Full details next month.

Price..... £299 (charger extra £7.76)

TALK ACCESSORIES

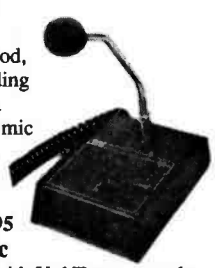
REMOTE MAST HEAD SWITCHES

NEVADA HF2 £39.95
Freq:- 1.8 - 185MHz
Connections:- S0239
Power:- 1,000 W Pep



NEVADA CAS - A2 £49.95
Freq:- DC - 1.3 GHz
Connectors:- 'N' Type
Power:- 150/300 Watts

SADELTA XL30 Mic



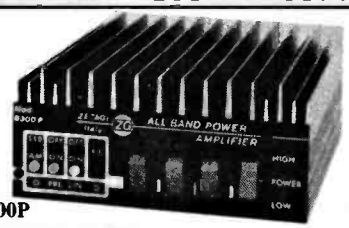
A new electret base mic, that will give your Kenwood, Yaesu, Icom, or other leading brand of Transceiver extra 'punch' and 'clarity'. The mic may be powered from the Transceiver direct or with an internal PP3 battery.
Introductory Offer £39.95

SADELTA CM 40 Mic
As the XL 30 above, but with Vol/Tone controls
Introductory Offer £49.95

NEVADA DUMMY LOAD

A professionally built 50 Ohm dummy load that is good to 3 GHz! using 'N' type connector
Introductory Offer £29.95

TALK AMPLIFIERS



B300P

TC50DX 50Mhz amplifier

MOBILE AMPS

B150 180W (26 - 30MHz)	£54.95
B300P 300W (6 - 30MHz + preamp)	£147.52
B550P 500W (6 - 30MHz)	£237.00
B303 200W (6 - 30MHz)	£114.67
TC50 15W (50 - 52MHz)	£29.95
BRL35 45W (26 - 30MHz)	£29.95
BRL40 70W (26 - 30MHz)	£34.50
BRL31 28W (26 - 30MHz)	£19.95
B250 250W (6 - 30MHz) 24 volt	£115
737 80W (26 - 30 MHz)	£35.41
735 35W (26 - 30 MHz)	£18.54
B110 110W (142-170 MHz)	£145

BASE AMPLIFIERS

B132 240W (3-30 MHz)	£129
BV131 250W (26-30 MHz)	£115
B507 300 W (3-30 MHz)	£278

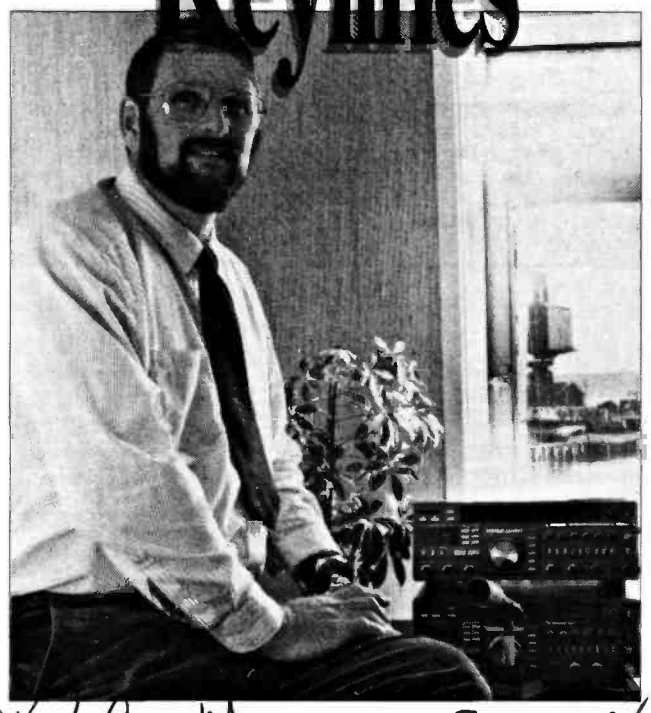
VISA

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



Rob Mannion G3XFD

Some observers consider the radio hobby is dying. Others state that the pastime, whether from a transmitting amateur, short-wave listener or constructor's point of view, is at least in terminal decline.

National radio societies the world over, with the possible exception of Japan, are reporting falling membership and a dramatic drop in the number of young people taking up the hobby. Not so many years ago, it was not uncommon to find radio enthusiasts working in all aspects of the radio and electronics industry. Suddenly however, the majority of young people in industry seem to have become very much computer-orientated. Digital electronic systems are their reason for being, and radio communications and the other aspects of electronics as a job or pastime seems, with few exceptions, to have lost the ability to attract new and younger blood.

Why should this be? A walk down the main shopping areas of almost any town within the UK will show that there are many outlets for consumer electronics. Many towns have shops where components can be bought and, for those not fortunate enough to have direct access to shops, there are the various mail-order companies. Despite this, the hobby is still not attracting youngsters at the rate it should be, especially when the potential career prospects are considered.

I believe that the fall-off in recruitment - so to speak - is due to the almost total lack of publicity for the radio hobby in the UK. Certainly, in the last 20 years or so, the public have become aware of many new areas of new technology. Colour TV, video recorders, computers, microwave cookers, CB radio, all are known, used and talked about by the public at large. It is not uncommon to find five and six-year old children at work on computers during their school time. This has come about through advertising and is usually accompanied by excellent public relations. Availability of the product and necessary ancillary equipment at reasonable prices, backed by excellent user-friendly instructions and handbooks ensured success.

Radio hobbyists have always had the reputation of being a little odd. Perhaps we are, but the image of the eccentric radio amateur promoted by the late and great Tony Hancock, hasn't worn off since that particular programme was made nearly 30 years ago.

The onset of the imported CB radio craze - for that's what is was for very many people - brought the radio hobby to the notice of the popular media. Unfortunately, and with very few exceptions, the mass media within the UK did not know, or could not be bothered to find out the difference between licensed amateur radio stations and the American influenced CB service.

If CB radio had been introduced to the United Kingdom some 20 years ago, the service could have developed into a form which would have made it much more acceptable to everyone. As it was, those with the power to assist in these matters chose to look the other way and pretend that the need did not exist. Unfortunately for all, the arrival of American 'CB' films suddenly provoked a great surge of interest. Just as suddenly the service was legalised, but the transatlantic influence meant that the ordinary English speaking listener needed an interpreter to use the 27MHz f.m. channels!

Many people were against CB radio but I must honestly state I was for the service. Fortunately, for the most part, the 'cowboy' image has passed. The service has settled down and has been been naturally moulded to serve our culture and provided the introduction to radio communications that eventually led many people onwards from CB to amateur radio.

This is the main reason why everyone actively involved in all aspects of the radio communications hobby should support the proposed amateur radio novice licence. I fervently hope that we get this facility in the UK. The novice system could form a major part of the drive to attract newcomers to the hobby...if it is coupled to a properly organised public relations drive.

Publicity for the radio hobby in Britain has usually been of a negative nature. Often it has been the result of a court case, or report in the media with only a tenuous connection to the hobby. Such reports can appear under headlines such as "Radio Ham obliterates emergency communications" or "Radio ham eavesdrops on neighbours 'phone calls" and so on .

Cases similar to those mentioned have appeared in the national press in various forms and under misleading headlines. Although many incidents have no connection with the hobby of radio, the negative publicity is read by many people.

America seems to be the home of public relations. Fittingly, the national society, the ARRL, representing the transmitting radio amateur, novice and listener in the USA, , certainly has a high profile when it comes to publicity. You can be sure that there aren't many people in North America who don't have some idea what a 'Radio Ham' is!

The national society, the Radio Society of Great Britain really does need the full support of their members to promote the hobby.

For too long, we've been that odd little group (you know...the people who hide themselves away in little rooms or sheds at the bottom of the garden or under the stairs) who only seem to appear at garden fetes and exhibitions. It's time we stood up and show ourselves to be what we are and that the hobby can lead to a lifetime interest or career for many people.

So, to help the hobby live on into its second century, why don't we all help each other? Why can't more experienced enthusiasts lend a hand to schools, clubs, youth organisations and other groups? For many years, dedicated teachers (often licensed amateurs) and club leaders have encouraged beginners. *PW* applauds them, and will with *Short Wave Magazine* continue to support the hobby with constructional projects, technical features, news, latest developments and historical articles and much much more! Why don't you support yourself, your club and your hobby by helping others start off?

To survive into the next century, the radio hobby must have a public face. The RSGB's efforts in this direction must be supported by us all. Stand up and be counted. Evangelise! Make sure you get the right publicity! Tell your local paper! They are all interested if it is LOCAL. *PW*, accompanied by *Short Wave Magazine*, will be with you all the way.

Merry Christmas, Happy New Year and great radio for the 90s!

We apologise for the increase in the cover price to £1.60. However, we feel sure that readers will appreciate the higher quality reproduction that our whiter paper brings to the new-look Practical Wireless.

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,

I implore you to print the following words from the heart.

A few days ago the Council of the RSGB closed down my local repeater GB3NA. They told us the UK FM Group (Northern) was suffering from "Abuse". The DTI refuted this saying they , the DTI, were satisfied that there had been no abuse and that they were satisfied as to the operation of GB3NA. The council did NOT give sufficient time to consult the GB3NA group. We were given 48 hours. I deplore this action which shows the RSGB is out of order, out of date and out of touch. I doubt whether the RSGB would publish my comments hence my letter to your goodselves.

The RSGB may hold licenses for the repeaters but they do NOT issue them. I pay my licence fee to a more professional body..the DTI.

The real reason for the closure of GB3NA was I believe, a clash of personalities. This has been around for ten years. Meanwhile the amateur radio operators have been denied the use of GB3NA.

I thought I had joined the RSGB to protect my interests but alas I was wrong. There was a way to settle the clash of personalities but the RSGB choose to ignore it.

I feel sorry for some amateurs who because of disability and amateurs who are not allowed base antennas for propagation. Because of the Yorkshire terrain some amateurs who for one reason or another cannot afford high power equipment, have difficulty on simplex frequencies and consequently distance is limited unless you are a higher QTH. GB3NA is the real go-between with friends.

There will always be a clash of personalities so why 'punish' the rest of us? This move by a faceless minority leaves little to be desired and would appear to set a new precedent to close repeaters ad-lib. Anyone who is genuinely aggrieved should stand up to be counted NOW!

J. Caledon-Scott
G4LRS (Life member GB3NA group),
Barnsley,
South Yorkshire.

The RSGB replies:

Mike Dennison G3XDV, Assistant to the Secretary / Chief Executive of the RSGB (deputising for David Evans G3OUF, who was unavailable at the time) provided , on seeing a Copy of Mr. Caledon-Scott's letter the following reply in answer.

"For some time the Society has received complaints from a number of sources about the operating practices of some users of the South Yorkshire VHF repeater GB3NA. The RSGB's Repeater Management Group sent a letter to the local repeater group the UK FM Group (Northern), about this several months ago. At the last meeting of the Council- the RSGB's elected governing body- it was decided to close the repeater down for one month whilst officers of the Society had meetings with the repeater group and others in the repeater's coverage area to discuss how to improve operating standards. It must be emphasised that there is no suggestion that the UK FM Group (Northern) are operating the repeater illegally. Council's decision was made after careful consideration of views put by the DTI, the Society's own specialists and local elected representatives.

Although the DTI have been involved and have made a visit to one station in South Yorkshire, it is understood that they do not regard the abuse as serious enough for them to act further. However, the RSGB feels that, as licence holder for the repeater, it has a responsibility to ensure that operating standards are as high as possible. The closure was simply to create a climate which would lead to positive decisions on cleaning up the behaviour of a small but vociferous number of repeater users".

Mike Dennison G3XDV, RSGB.

GB3NA Update

As we were preparing for press, the RSGB provided an up-date on the situation and we are pleased to hear that GB3NA returned to service on Thursday November 23. The RSGB also took the opportunity to remind us that they had: "Negotiated with the licensing authority for permission to run amateur repeaters in the UK some 17 years ago. That the UK was one of the first countries in Europe to have repeaters.

The Society has negotiated each of the 400+ repeater licences, including GB3NA.

They hold and pay for each of these licences plus public liability insurance for all repeater groups.

The RSGB administers the repeater network, provides information and technical support and holds contracts with major site owners offering favourable terms for repeater groups."

G3XFD comments:

It is indeed unfortunate that such things are happening in amateur radio. Other repeaters appear to have problems and I have had some personal experience of some odd operating standards (to say the very least) since my return to v.h.f. (144MHz band mobile working). All I can say is that such behaviour from a small minority can do our hobby a great deal of harm, particularly when the incidents are reported in the mass media (often without the full facts!). I can only implore everyone to work together and give amateur radio a positive image. Be first with the good news! Readers should also be aware that January's Keylines were written before the GB3NA shut-down came to our attention. ***Editor.***

Dear Sir,

There is a follow-on to the fancy box law, which I am sure the author has inadvertently overlooked. It states that: "The only way to discover the fault in a failed project, is to retrieve it from the junk box six months later and strip it down to recover the components."

I would like to add another law (origin unknown), which states that: "The very first QSO made on a new antenna will be the best DX that one has ever worked, from then on the antenna system will perform neither better nor worse than its predecessor".

R. A. E. German G3OZT
Southampton

Sir,

I feel I must write to you to say how much I enjoyed the "Wordsearch" competition, it's a nice change from the heavy technical majority of *PW's* content.

Amateur Radio consists of a good number of enthusiasts who are much older than they would like to be and don't have much use for the high-tech stuff.

S.A. Carrigan G4OUJ
Wardle
Rochdale

Enjoy this January's competition!!! Editor

Competition Corner

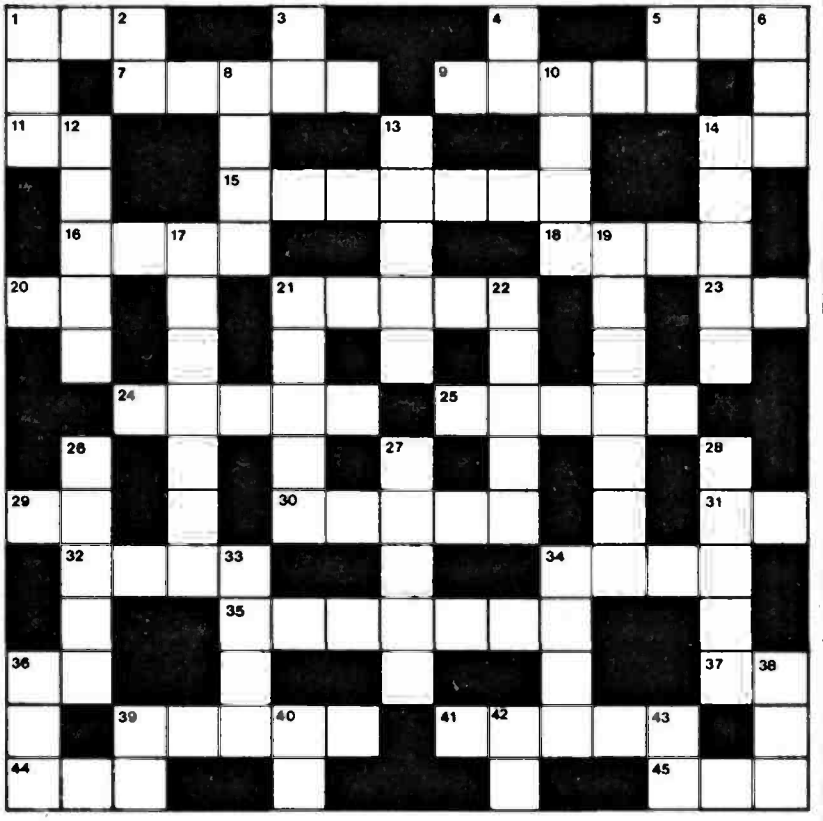
Clues

Across

1 Crystal manufacturers (1,1,1)
5 Meaty enthusiast (3)
7 Sunny radio signals (5)
9 RA 17L is nearly mischievous (5)
11 Morning frequency (1,1)
14 Prefix for Bolivia (2)
15 G (7)
16 CM or CO (4)
18 Limited Warrington company initially (1,1,1,1)
20 Prefix for Estonia (2)
21 Transmission connections between numbers (5)
23 Prefix for Norway (2)
24 19th Century high frequency experimenter, Sir Oliver (5)
25 Fishy receiver?! (5)
29 Prefix for Spain (2)
30 Stay on station (5)
31 Prefix for Pakistan (2)
32 Tedious contact waves on Severn (4)
34 River meet (4)
35 Frequency twinner (7)
36 Prefix for Chile (2)
37 Volume increase will turn (2)
39 Abnormal reception or eccentric enthusiast! (5)
41 Marvellous het (5)
44 Random access memory for sheepish computer (3)
45 Speak (3)

Down

1 Regulatory body for independents (1,1,1,)
2 Initially noisy measurement (1,1)
3 Old man (1,1)
4 Prefix for Japan (2)
5 Prefix for Korea (2)
6 Locator (3)
8 Region (4)
10 RST or Q (4)
12 Smaller than average equipment (5)
13 Part 6 of Making Waves takes to the air reflectively (5)
14 Prison rooms in parallel (5)
17 Twin white bear transistor (7)
19 Less blessed gets signals (7)
21 Dependent resistors need low weight (5)
22 Hear reliable noise (5)
26 Connecting lead (5)
27 Important controls for twiddling! (5)
28 FT manufacturer (5)
33 Transmission brink (4)
34 Snare antenna catches several bands (4)
36 Common CB location (3)
38 Give money for equipment (3)
39 Frequency modulation (1,1)
40 Sheffield suppliers (1,1)
42 G prefixed area (1,1)
43 Mail order component company (1,1)



Complete the crossword, fill in the form below and send your entry to PW Publishing Ltd., January 1990 Crossword Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP.
Closing Date 11 January 1990.
The Editor's decision on the winner is final, no correspondence will be entered into.

Name .....

Address .....

.....

.....

.....

Postcode .....

☐ Subscription ☐ Vouchers (please specify)

PRIZES...PRIZES...PRIZES...PRIZES...PRIZES...PRIZES...PRIZES

First prize winner can choose either a one year PW subscription or £20 in vouchers for the book service.
The **two runners-up** can choose from either a six month PW subscription or £10 in book vouchers.

Newsdesk '90

Kit News

The latest edition of the Kit News news sheet is available from Cambridge Kits if you mention *Practical Wireless* when you send them a 9 x 4in envelope. It contains details of the Kits available as well as tips and modifications. Each kit is supplied complete with case, screws, etc.

Cambridge Kits, 45 Old School Lane, Milton, Cambridge CB4 4BS.

QRP Contest

The eighth annual *Practical Wireless* 144MHz QRP Contest will take place on Sunday 17 June 1990 0900-1700UTC.

The 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.

Motorised Antenna Mount

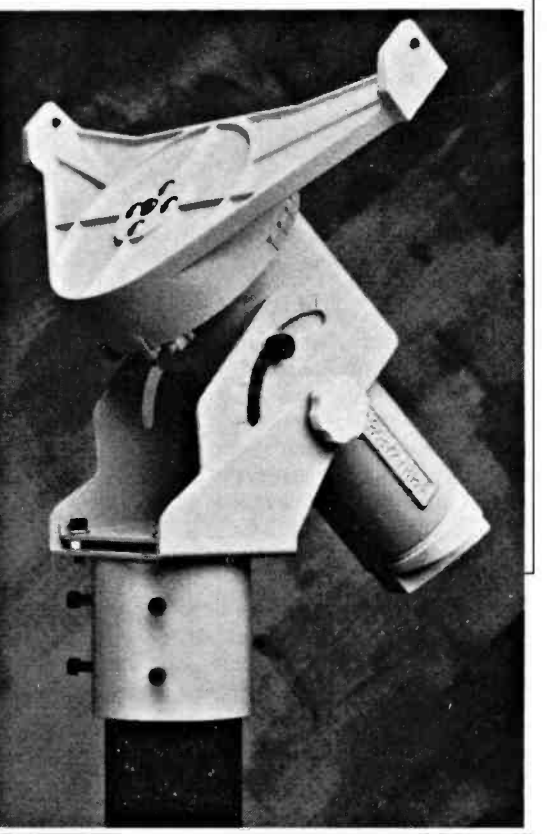
Among their satellite products, Chaparral Communications Inc have the PolarMotor. This is a motorised satellite antenna mount with a range of features. The drive components are fully encased and it has been designed specifically for the European satellite communications market.

The PolarMotor translates electrical commands from the satellite receiver into mechanical location requirements for a dish of up to 1.3m. It then physically moves the dish into the correct position to receive signals from specific satellite.

It is capable of a full 180° horizon to horizon arc and the integrated gear drive moves the PolarMotor through the 180°arc in less than 50 seconds.

The PolarMotor will be available from January 1990 and the price should be around £199.00. It is shipped completely assembled and factory tested and comes with an installation manual.

Chaparral Communications, 10 Campbell Road, Hanwell, London W7 3EA. Tel: 01-579 6587.



Mid Winter Sports

The G-QRP club will be holding the annual mid winter sports during the period December 26 to January 1 inclusive. An opportunity to work many countries on many bands. Not a contest as such, but is ideal for the Christmas period. Details from **George Dobbs G3RJV. Tel: (0706) 31812.**

DUBUS Contest

In order to further DX activity, DUBUS Info sponsors annual v.h.f./u.h.f. contests. These contests are held on the last full weekend of January, March, May, July, September and November from Saturday 1400 to Sunday 0200UTC.

Eligible entrants are all European radio amateurs (single op), operating within the terms of his/her normal licence.

The frequency band and the mode (c.w. only or mixed) determine the section. For example a 430MHz station using 'phone (and maybe c.w.) would be in the 430/mixed; a 144MHz station working solely in c.w. would be in the 144/c.w. section. A station may enter only one section for the duration of one contest.

The contest call is CQ DX TEST in c.w. and CQ DX CONTEST in telephony. The contest QSO exchange consists of RS(T) and the European QRA locator, e.g. 579 EL68f.

Scoring	144	432	1296	2320-5760	10386MHz
1-100km	0	0	0	1-75km 0	1-30km 0
101-200km	0	0	1	76-150km 1	31-60km 1
201-300km	0	1	10	140-250km 10	61-150km 10
301-500km	1	10	100	>250km 1/km	>150km 1/km
>500km			1/km		
501-700km	10	100			
>700km		1/km			
701-1000km	100				
>1000km	1/km				
Squares*	1	3	5	10	10

The final score is the product of QRB points and QRA square points. For example 3000 QRB points and 25 squares on 23cm would earn you a total of 3000 x 25 x 5 = 375000 points.

Each section's best three entries will receive a certificate. The callsign accumulating the highest number of points per mode during the calendar year will be awarded the DUBUS DX Trophy.

Neither duplicate contacts nor those via artificial or extra-terrestrial reflectors and through transponders/repeaters count any points. The partner station's QTH information should permit an accurate enough distance determination.

Contest logs should be submitted to the adjudicator(s) not later than the last day of the month that follows the contest.

Logs for 432MHz and above go to:

Frank Fischer DL4EA, Maarweg 135a, D-5000 Koeln 30, West Germany.

Logs for 144MHz go to:

Edmund Ramm DK3UZ, PO Box 1338, D-2358 Kaltenkirchen, West Germany.

Newsdesk '90

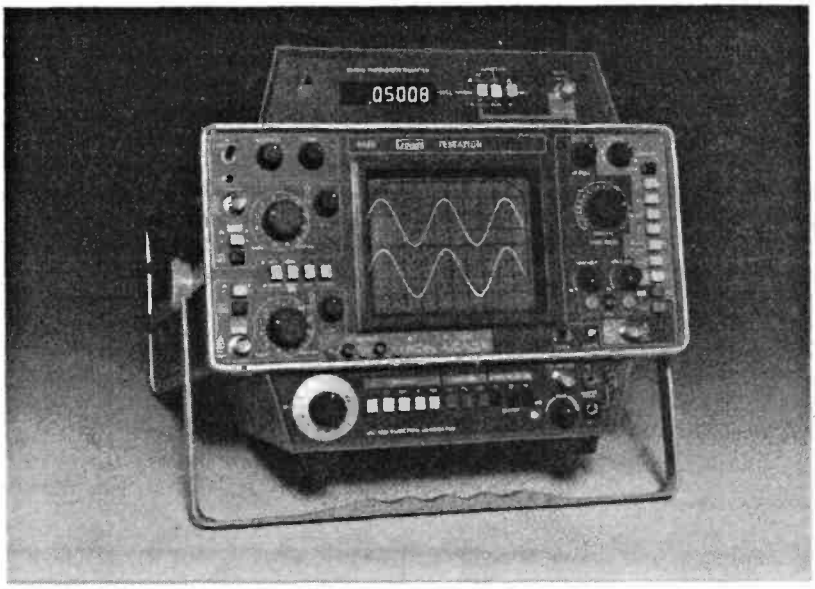
Enhanced Teststation

Crotech Instruments Ltd., has launched a new oscilloscope-based Teststation, the 4445.This combines a dual-channel 25MHz oscilloscope with a frequency counter and function generator in one package.

The frequency counter is a 20Hz to 35MHz unit, with an 8-digit display. Measurement accuracy is ±20p.p.m. with a ±30p.p.m. stability from 0 to 50°C.

The function generator operates over a five decade range from 1 to 100kHz and generates sine, square and triangular waveforms as well as a t.t.l. output to an accuracy of ±5%. The output drive level is up to 7.5V (peak to peak) into 600Ω and 15V (peak to peak) into an open circuit. Source impedance is 600Ω.

Crotech Instruments Ltd. Tel: (0480) 301818.



Longer Lasting...

Duracell have introduced their new battery onto the market. Apparently it lasts up to 20% longer, contains little mercury (0.02%) and no cadmium and has a shelf life of four years with the date stamped on both the pack and battery. Some packs of batteries also carry a Duracell Battery Guide in the pack. You should see the new batteries on sale nationwide.

RAF Award

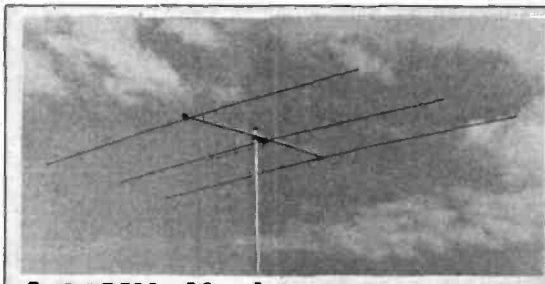
The Worked RAF Waddington Club Members Award is designed to promote the club and encourage on the air activity between club members and all other radio amateurs.

The award will be available to all licensed amateurs and s.w.l.s who have made simplex contacts or heard 25 club members on or after 6 November 1989.

To claim the award, log extracts including callsign, date, time, frequency, mode and club membership number of the station worked, should be submitted to the club secretary. Submissions must be verified by two licensed amateurs but this requirement is waived for club members.

The cost of the award will be £1 (or 50p to club members). A list of club members callsigns is available from the club secretary on receipt of an s.a.e.

Dave Bloomfield G0KUC, 8 Sunningdale Drive, Boston, Lincs.



A 28MHz Yagi

With the sunspot cycle due to peak sometimes early in 1990, the 28MHz amateur band couldn't be better.

The Cushcraft Ten-3 is a high performance, 3-element, Yagi. It has a 2.4m boom and fits a mast size of 1.5 - 2in. The reddi-match system provides a 50Ω feed for a standard PL259 connector. The antenna is power rated for 2000W p.e.p.

The manufacturers mention an 8dB forward gain and a front to back ratio of 25dB.

Look for stockists of Cushcraft products in the advertisements in *Practical Wireless* this month.

In Memoriam

John Murphy EI4FO
Died 3.09.89 aged 28

Amateur radio in County Wicklow suffered a great loss at the death of John EI4FO, after a short illness. While John's life was short, his contribution to amateur radio was immense.

John became interested in radio shortly after leaving school and quickly became licensed as a Class A operator. He then set about encouraging others. He gave courses for both the theory and c.w. exams in Bray and Wicklow. Of the 75 callsigns in Wicklow, John was responsible for teaching 50 of those. His encouragement to his students gave them great confidence.

While he was a keen DXer on h.f. (both c.w. and 'phone), John's greatest love was v.h.f. Indeed his shack has a whole wall of QSLs from all over Europe worked on 144MHz s.s.b. He was always alert to Sporadic-E, auroras, etc., and often activated the IO72 square from Wicklow Head (the only part of EI in that square).

John will be sadly missed by all who knew him, especially the many amateurs and s.w.l.s in Co. Wicklow. EI7GK

Voltage Indicators

Two new instruments available from TMK are simple, hand-held voltage testers.

Both models use two probes to measure a.c. and d.c. voltages to 440V in seven ranges with l.e.d. indication and input protection to 500V. Electromate also indicates voltage polarity, has a diode and lamp check facility as well as audible and visual continuity testing. This unit measures 152 x 53 x 30mm. Whereas the Voltmate only measures 185 x 32 x 32mm.

Electromate costs £ 33.75 and Voltmate costs £4.95 (both prices excluding VAT).

TMK Instruments, Building 3, GEC Estate, East Lane, Wembly, Middlesex HA9 7PJ. Tel: 01-908 3355.

Newsdesk '90

Bouvet Island Expedition

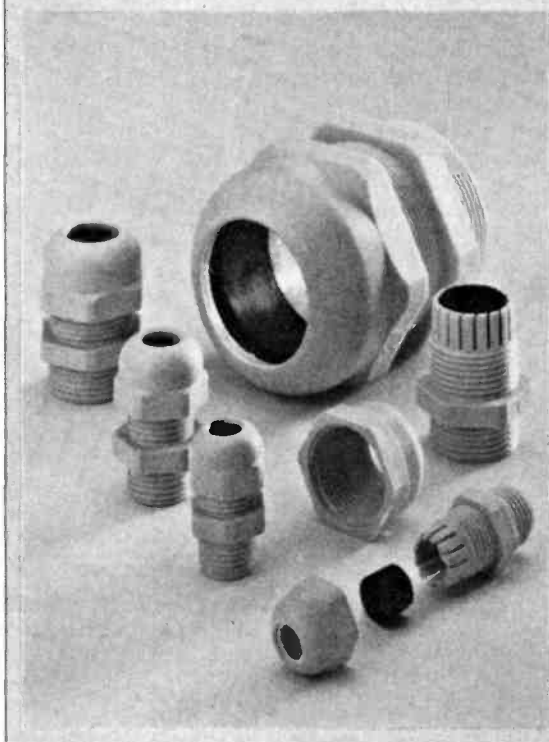
After almost two years of discrete development, planning and negotiations, if all goes as expected a 12-member radio operating team led by the Legion of Indianapolis DXers will attempt to start off the new decade with a bang when they land at Bouvet Island. Beginning on February 2, they should be there for a 10-12 day scientific research/radio operation.

The group consists of an 18-man landing team which includes geochemical, marine biologic and paleontological research scientists, survival and rescue experts, scuba divers, rock climbing specialists, emergency medical technicians and a two-man film/photography team representing the National Geographic Society's Magazine and the television programme Explorer.

The radio operating team will establish and man seven transmitting stations (3 s.s.b., 3 c.w. and 1 satellite). They aim for simultaneous contest-style operation intended to provide two-way radio contacts or s.w.l. receptions with all interested DXCC chasers world-wide. Special emphasis will be given to Pacific rim stations and low-band enthusiasts. They should be using all amateur bands from 1.8 to 28MHz including the new WARC bands as well as the OSCAR satellite.

The callsign to look out for is **3Y0B**.

Cable Glands



BoplaFlex cable glands provide a direct connection between enclosures and cables. A synthetic rubber seal provides waterproofing and protects against the ingress of dust. The cable glands are moulded in glass-filled nylon and are coloured light grey to match Bopla's range of enclosures.

A slotted internal structure provides strain relief for the cable and a ratchet construction prevents excessive tightening during assembly. They are available in eight sizes, for cable diameters from 7 to 36mm.

Bopla Ltd., 29 Faraday Road, Aylesbury, Bucks HP19 3RY. Tel: (0296) 399999.

Where is that Satellite?

Swift Television Publications are offering a more unusual satellite service for installers. They will produce a print-out for any location listing the azimuth and elevation (for fixed satellite systems) for the 30 satellites which beam signals across Europe. For motorised polar mount dishes, modified polar and apex elevation angles are given.

The cost of each print-out is £3.00. If you would like further details, contact:

Swift Television Publications. 17 Pittsfield, Cricklade, Swindon, Wilts SN6 6AN. Tel: (0793) 750620.

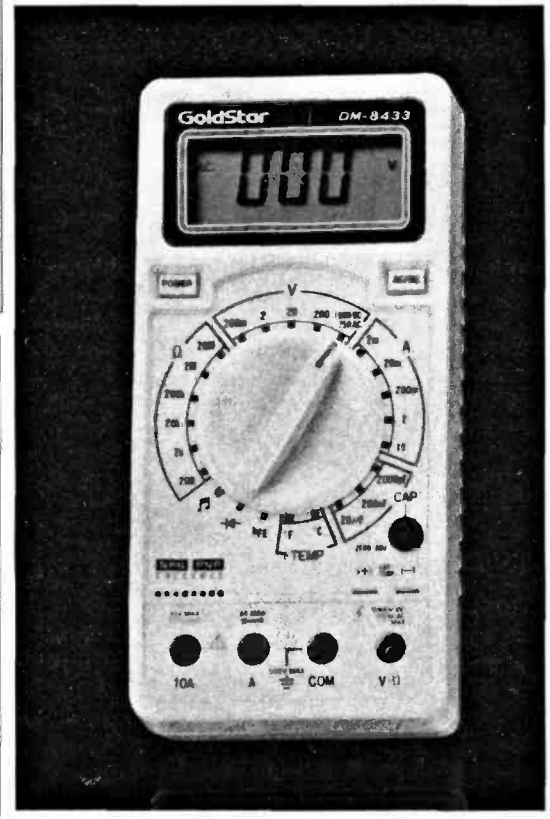
Hot & Cold DMM

The latest GoldStar 84 series digital multimeter from Alpha Electronics can also double as an accurate digital thermometer. The 8433, shown in the photograph, can measure from -20 to +150°C with the supplied temperature probe.

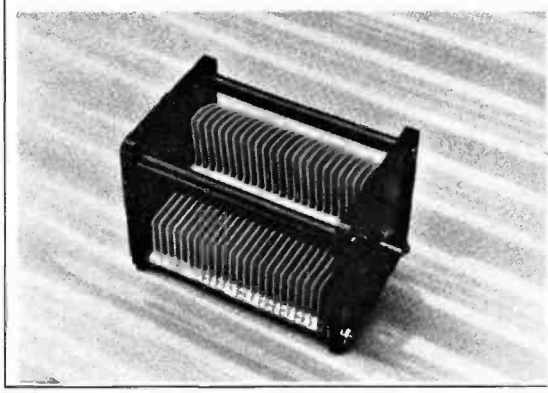
The large and clear liquid crystal display indicates d.c. voltage to 1000V and a.c. voltage to 750V. Both alternating and direct current are measured to 10A, resistance to 20MΩ and capacitance to 20μF with a 1pF resolution.

The unit comes with safety test leads, battery, spare fuse, operator's manual and temperature probe. It costs £64.50 excluding VAT.

Alpha Electronics Ltd., Unit 5 Linstock Trading Estate, Wigan Road, Atherton, Manchester M29 0QA. Tel: (0942) 873434.



High Power Capacitor



Nevada have introduced a new addition to their range of British made a.t.u. components, a 750pF high power variable capacitor. The capacitor uses high quality material and each one is hand assembled and tested before despatch. The capacitance range is from 2 - 750pF, it weighs 600g and measures 145 x 100 x 105mm. The TC750 is priced at £28.

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

Newsdesk '90

Catalogues

A wide variety of catalogues have arrived this month, all different shapes and sizes. At one end there are the Electromail and Maplin catalogues and at the other there's price lists and information sheets from Jandek.

The Electromail catalogue weighs some 1.87kg! Some of the new products included in the November to February edition are Sharp calculators, advanced graphic i.c.s, microprocessor crystals, infra-red emitters and detectors, weather resistant tywraps and satellite cable - to mention only a few. You can order from the Electromail catalogue, using your credit card, 24 hours a day. Mail order transactions must be accompanied by a cheque or postal order. **Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: (0536) 204555.**

The Maplin catalogue is some 575 pages in length. With this issue comes an offer of a handy continuity tester with all orders over £10. Recognising the increased interest in communications, this section has been increased by one third and includes a range of new mobile transceivers. The similarly expanded computer section features a 3-button serial mouse together with a 3-button track-ball, ideal for creating graphics. You can place credit cards orders day or night with Maplin too. Alternatively you can visit one of their twelve shops, all the addresses are given at the front of the new catalogue. The telephone number for mail order is **(0702) 554161**.

The new colour catalogue from Henry's is available by post or from their shops. The cost is £1.00 for callers and an s.a.e. with a £2.00 stamp for mail order. The catalogue contains purchase vouchers totalling £90.00. Supplements are regularly issued and there are three available now, test instruments, electronic components and security equipment. **Henry's Audio-Electronics, 404-406 Edgware Road, London W2 1ED. Tel: 01-723 1009 for components and 01-724 0323 for communications.**

Jandek have a range of kits now available, details of which can be obtained from their price list/information sheet.

Jandek, 6 Fellows Avenue, Kingswinford, West Midlands DY6 9ET. Tel: (0384) 288900.

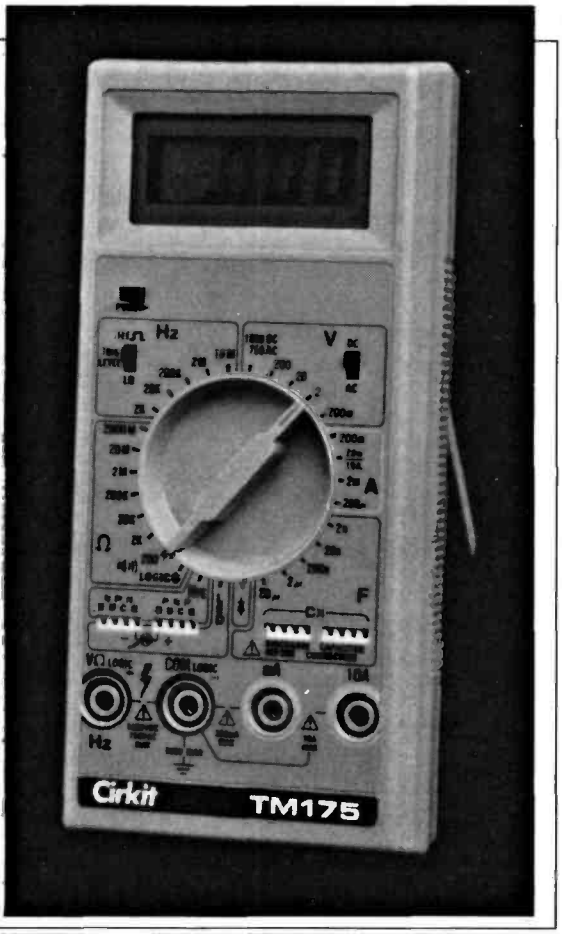
Multi-function Meters

Six new pocket-sized digital multimeters are now available from Cirkit Distribution which offer a combination of facilities previously found only on larger, more expensive, units.

The TM multimeters range from the basic TM5315B (which features d.c. and a.c. voltage ranges, direct current measurement, resistance as well as continuity and diode testing) to the advanced TM175. The top of the range model also measures capacitance from 2nF to 20µF, frequency up to 10MHz, hfe, logic, temperature and l.e.d. test facilities.

The prices for these meters start at under £20.00. For more details, contact:

Cirkit Distribution Ltd., Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111.



Special Event Stations

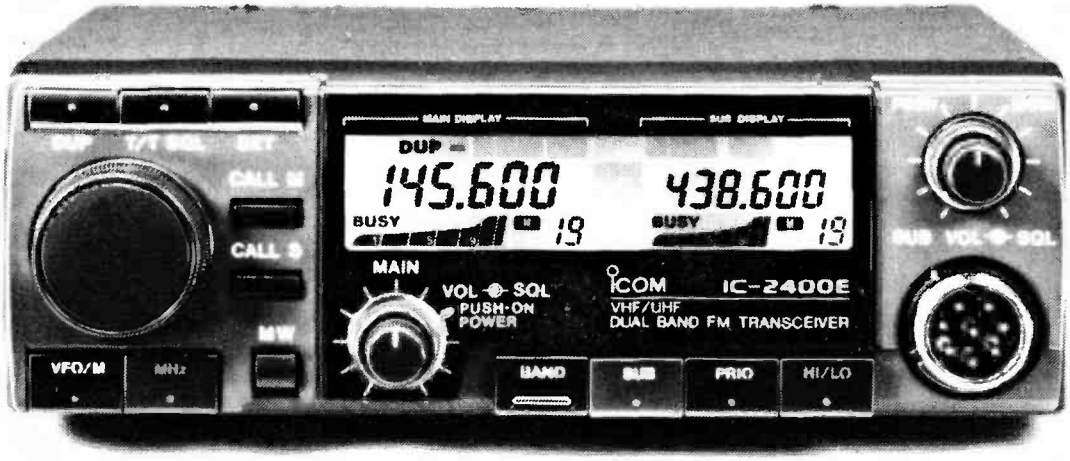
GB6RB: To celebrate the birthday of Robert Burns, this station will be operated by Ayrshire RAYNET from the Land O'Burns Centre in Alloway on Saturday January 27. The station will be active on 145MHz f.m., 3.5/7MHz 'phone and 14MHz RTTY, AMTOR and 'phone.

There is a commemorative A4 size certificate for all contacts and s.w.l. reports. UK stations need to send a second class stamp with their QSL card or s.w.l. report, EEC countries send 1IRC and other countries 2 IRCs. Send to PO Box 36, Prestwick, Scotland KA9 1AL.

For more information on this station, contact: **GM4SUC. Tel: (0292) 43127.**

ICOM

DUAL-BAND FM TRANSCEIVERS



IC-2400
144/430MHz
2mts 45W
70cms 35W

These new models from ICOM add a new dimension to the mobile scene. Enjoy the freedom of the open road and experience the advantages of simultaneous dual-band operation.

They are capable of receiving on both MAIN and SUB bands at the same time. While operating on one band, you can monitor a second band for activity. It is very easy to switch between the MAIN and SUB bands allowing you to reply immediately to calls received on either bands.

Full duplex operation lets you transmit on one band while receiving on the other for telephone style contacts. Each band can be independently regulated using separate volume and squelch controls.

Both models incorporate 20 memory channels and a call channel for each band, these memory channels store all the information needed for repeater operation.

For 23cms operation the IC-2500 features a AFC function which automatically tunes the receive frequency to the transmit station frequency. The AFC function eliminates the need to retune if a stations transmit frequency is off centre.

IC-2500
430/1200MHz
70cms 35W
23cms 10W

Icom (UK) Ltd.
Dept PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!

IC-751A HF ALL-BAND TRANSCEIVER

- **Amateur Bands 160m - 10m.**
- **General Coverage Receiver.**
- **105db Dynamic Range.**
- **100W Output (40w A.M.)**
- **32 Memories.**
- **Electronic Keyer.**
- **CW Semi/Full Break-in.**
- **HM36 Microphone.**

The ICOM IC-751A was created for the ham operator who demands high performance whether entering contests, chasing DX or just simply enjoying the shortwave bands. It is an all mode solid state transceiver with a host of features designed for the crowded HF bands of today.

Additional features include 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp and attentuator provides additional control when required. The FL32 9MHz/500Hz CW filter is fitted as standard with CW sidetone on Rx and TX modes. On SSB the new FL80 2.4Khz high shape factor filter is fitted.

The transmitter is rated for full 100% duty cycle with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's, scanning of frequency and memories is possible from the transceiver or the HM36 microphone supplied.

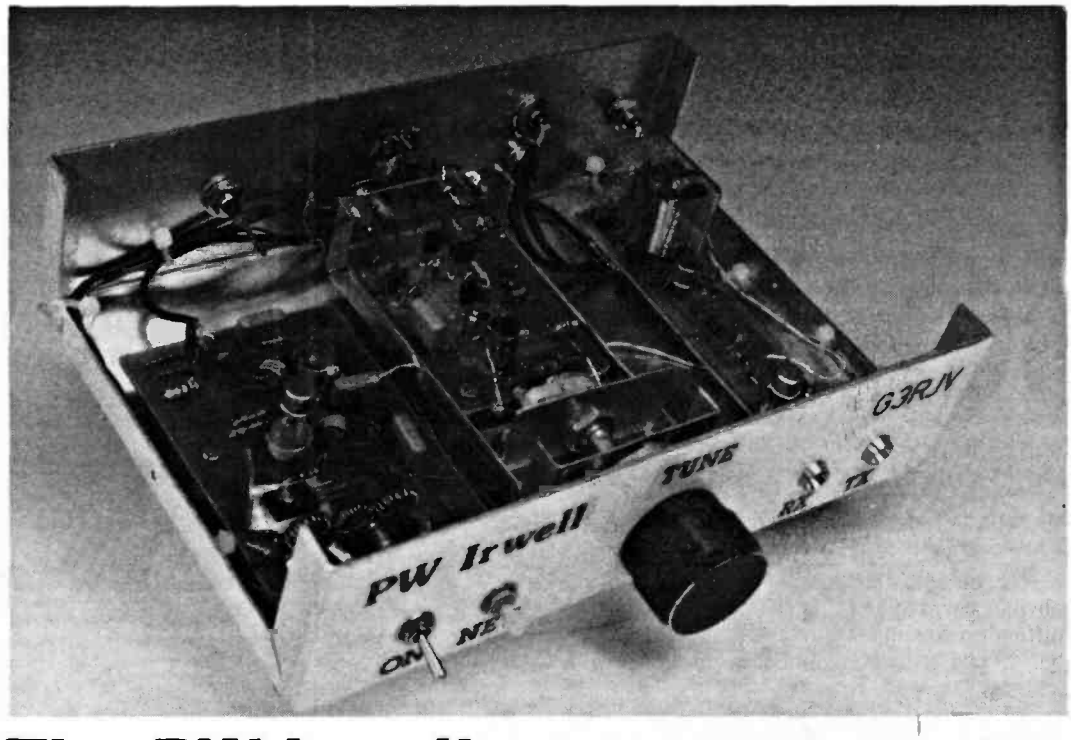
The IC-751A is supplied for 12v operation but can be used with either internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available:- PS35 internal AC power supply, PS15 external AC power supply, EX310 voice synthesizer, SM8 desk microphone and SP3 external loudspeaker.

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.

Construction

It is all too easy, in these days of the expensive, all-singing, all-dancing Far Eastern black box, to forget that building your own equipment is an excellent way of getting onto the bands. We also tend to forget that power is not always a guarantee of success. Beginning in this issue and using these two ideas, this article, by The Reverend G. C. Dobbs G3RJV, describes a low power 7MHz transmitter. This easily built transmitter, using only a good communications receiver, is an excellent way to put together a first station, or as a compliment to the main station.



The PW Irwell. A QRP CW Transmitter

Amateur Radio is a strange hobby, on the one hand most of the equipment we use these days is commercial, and yet at heart many amateurs would like to be active on the bands with home-built equipment. The excuses for not using home-built equipment usually involve lack of time or lack of expertise. Some are a little more novel. A valve fan recently wrote to me bemoaning the lack of new circuitry for valve equipment. He said with valves he can understand and visualise what they are doing. But added that he had noticed in the *RSGB Handbook* section on transistors that "silicon is a conductor with no free electrons when pure, but, it can be doped with impurity". The writer added, "Is this the sort of thing a gentleman would do!?".

This little project brushes aside all such excuses. It is inexpensive and simple to build, uses dependable circuitry and if built with care, should work first time. It is also a project suitable for any gentleman, or lady!

The Irwell is a QRP c.w. transmitter for the 7MHz band capable of 3 or 4 watts of r.f. output. Used alongside a station receiver or the receive portion of a transceiver, it provides a viable little QRP transmitter. Currently there is a lot of QRP c.w. activity on the 7MHz band. Listen around 7.030MHz most days and you will hear a variety of QRP signals, many of them from members of the

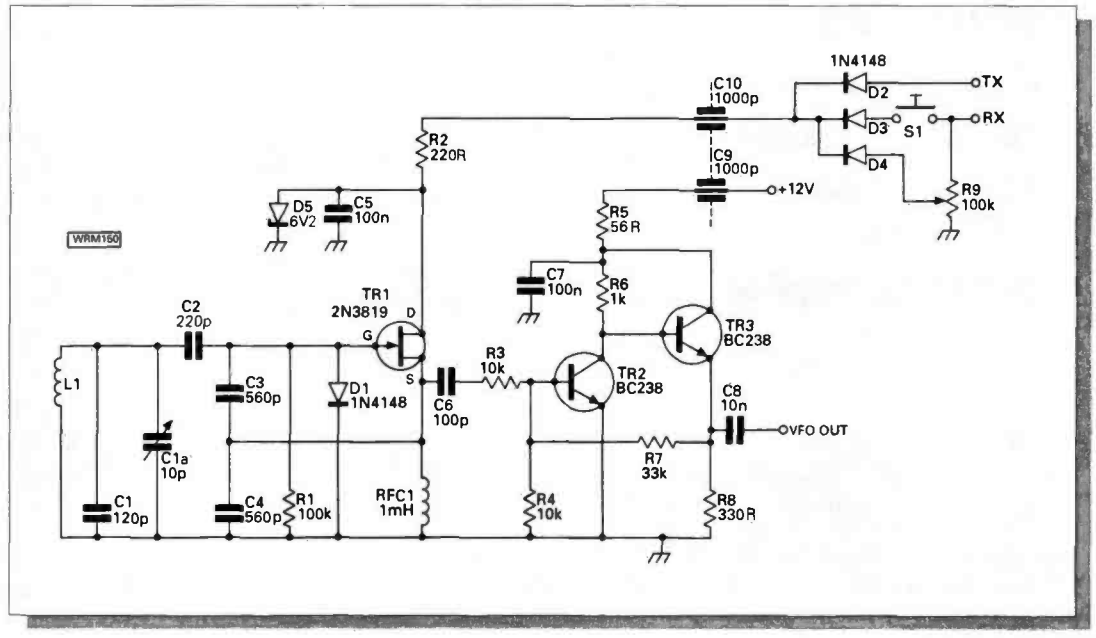
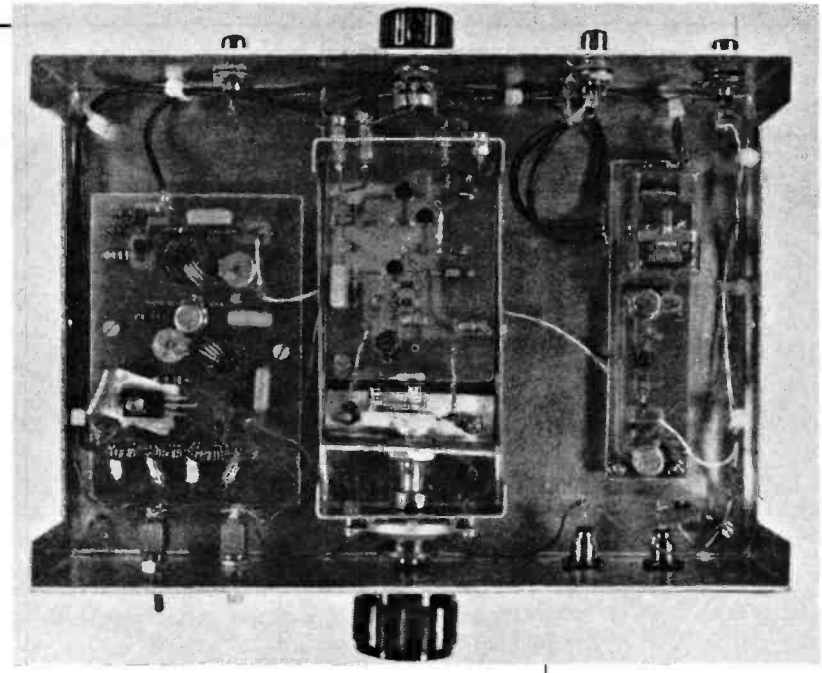


Fig. 1.1

G QRP Club. You will find them making contacts all over the UK and Europe, and sometimes more substantial DX contacts.

These circuits are dependable rather than original. Experienced constructors of QRP equipment will recognise the transmit board as the G3RJV favourite transmitter circuit and the v.f.o. board as 'everyones favourite v.f.o. circuit'. All of the components are easy to obtain. The only pieces of test equipment required are an analogue multimeter, a home-made diode r.f. probe and a monitoring receiver or frequency counter.

The Irwell is divided into three sections, each with its own printed circuit board which can be built and tested individually. Although printed circuit boards are shown, and these are available from *PW*, the circuits could also be built on perforated matrix board.



The Oscillator

The variable frequency oscillator (v.f.o.) is the obvious board to build first. It is perhaps the most difficult board and it is reccomended that this be built and tested before the transmitter board is added. I have often heard tales of woe about v.f.o. construction: oscillators that will not oscillate, oscillators that refuse to stay on frequency and oscillators that sound like a sick frog.

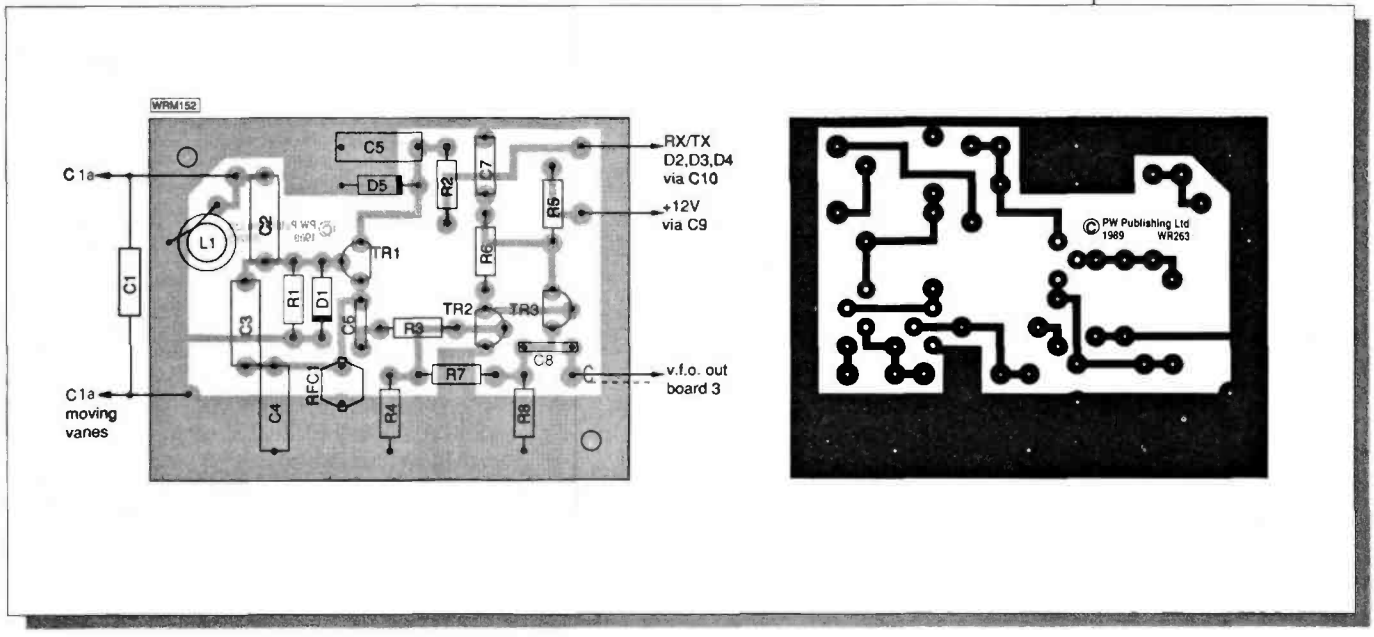
The circuit in Fig. 1.1 is a version of the v.f.o. circuit that has become a classic for radio constructors in recent years. It has stood the test of time, being based upon an original insulated gate f.e.t. oscillator circuit described by W2YM in *QST* of December 1966. This is the Seiler, parallel tuned, form of the Colpitts circuit. A diode is added in the oscillator gate input to provide a degree of automatic bias to aid stability. The two stage buffer amplifier, TR2 and TR3, has negative feedback to reduce the effects in changes of the output on the frequency stability of the oscillator.

Whatever the merits of this circuit, it has proved itself in many variations over the years because it works. If I require a v.f.o., almost without exception, this is the circuit I will use. It seems to combine good frequency stability with a high output. No matter which circuit is used, good frequency stability in a v.f.o. depends largely upon the manner in which the circuit is built and the choice of frequency determining components.

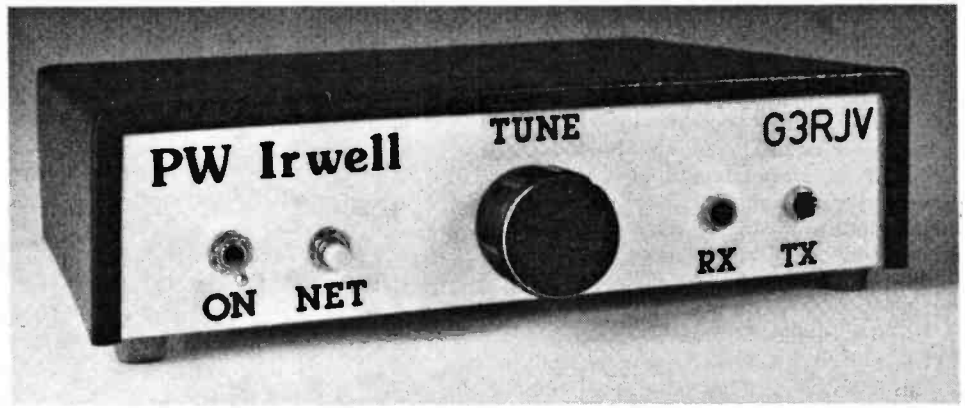
An oscillator must be built in a sturdy and mechanically stable manner, wherever possible in its own screened box. All components must be rigidly mounted and good solder connections are essential. The variable capacitor, C1a, is a good quality air-spaced component. Capacitors C1-4 are part of the frequency determining circuit and low temperature coefficient capacitors are required. Negative temperature coefficient capacitors are often quoted but are almost impossible to obtain and silvered mica capacitors are expensive and often large. In this v.f.o., polystyrene capacitors are used to good effect.

The tuning capacitor, C1a, has a value of 10pF which more than covers the c.w. sector of the band. A Jackson C804 type is ideal if expensive, but a surplus air-spaced variable capacitor, if it is of good quality, will also be suitable. I used a surplus capacitor in the prototype which had a nominal value of around 30pF and carefully pulled off vanes until I obtained the required v.f.o. coverage. The inductor L1 consists of 25 turns 0.4mm enamelled copper wire close wound on a standard 4.8mm

Fig. 1.2



The completed Irwell



(3/16in.) former with a core. When the winding is complete, secure the turns with modelling glue or beeswax. The windings must be firmly secured to the former. Some constructors use modelling cement but I favour beeswax, melted on the soldering iron tip and run along the winding.

The oscillator, TR1, and the buffer stages, TR2 and TR3, have differing power supply points. This arrangement may look complex but it is the easiest way to allow the v.f.o. to be set onto the frequency of the station to be worked and yet not to interfer with this signal during receive periods. These days many radio amateurs are not familiar with using a separate transmitter and receiver. The usual technique was, and indeed still is, to tune the transmitter v.f.o. onto the frequency of the desired station and to zero beat the v.f.o. with the station, this is called 'netting'. The v.f.o. should not be left running on the transmitting frequency during the receive periods but switching a v.f.o. on and off will result in bad frequency stability.

A common method of preventing the v.f.o. interfering with reception is to offset the v.f.o. during receive periods. The 'netting switch' method shown in Fig.1.1 offers a less problematic solution. Using this circuit all three parameters are met: v.f.o. on during transmission periods (of course); being able to switch on the v.f.o. during receive periods to net onto a station, and having no distinguishable v.f.o output during reception in normal use.

In the transmit mode the oscillator is provided with power from a 12V line, (+TX) only present during the transmitting state. During receive periods power comes from a 12V line (+RX), only present during reception. The +RX line has a potentiometer, R9, which, in conjunction with a switch S1, offers two alternatives. Resistor R9 may be adjusted until TR1 just falls out of oscillation. Since TR1 is still conducting, and as most of the long term stability depends upon the working temperature of TR1, the oscillator will still be on frequency when the full voltage is restored to TR1. The switch, S1, is used for the netting facility. If S1 is depressed the oscillator will come on during the receive condition and can be heard in the receiver. Diodes D2, 3 and 4 isolate these supplies from each other.

The v.f.o. is built on a single printed circuit board as shown in Fig. 1.2. It is not a compact layout because v.f.o. circuits are usually more stable if the layout is not crowded and the interconnection tracks are well separated. Both the component layout, and track pattern are shown in the drawings. The board fits nicely into the inexpensive Minffordd Engineering Box type A8. The variable capacitor is secured on an aluminium L shaped bracket which allows a small 6:1 epicyclic inline drive to be fitted inside the box. Avoid using the cheaper friction slow motion drives which are prone to backlash. The drive has to be accurately aligned with the capacitor shaft to prevent binding. If in doubt slot the holes for adjustment and tighten when in position - I always do that!

The v.f.o. cut-off control, R9, is not mounted inside the box. The back of the box has two 1000pF feed-through capacitors for the two supply lines and a non-capacitive feed-through for the output. Do not confuse them.... I know of more than one constructor who has used a feedthrough capacitor for the output and wondered where the v.f.o. signal had gone....the capacitor had decoupled it to ground of course!

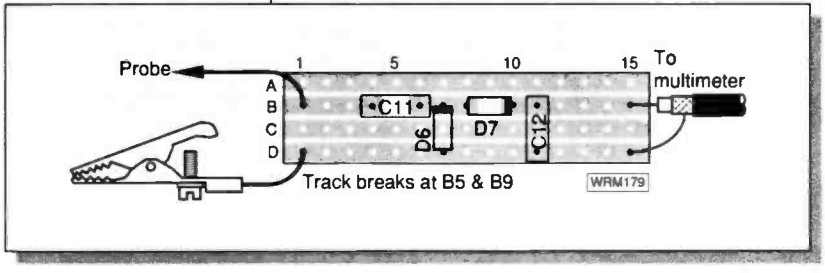
The coil former for L1 is mounted vertically by pushing its base into a tight fitting hole drilled in the board. The earthy end of its winding is soldered directly to the board. The top end of the winding is secured to a stiff tinned copper wire, of 1.0mm diameter or larger, which connects between C2 and the fixed vanes of C1a. Another similar wire connects the moving vanes of C1a to the ground of the printed circuit board. Capacitor C1 is also soldered between these two wires.

Testing of the v.f.o. is simple, if a frequency counter is available, this can be connected to the output and the frequency is read direct. If no counter is available, connect a short length of wire to the output and listen for the signal on a receiver tuned to the 7MHz band. After carefully checking the component positioning and wiring, connect both power inputs to a low power 12 volts supply. Close the vanes of C1a, then the core of L1 may be gently rotated until the signal is heard at 7MHz, or displayed on the counter. The frequency will shift after the lid is added to the box, so cut a hole in the box lid in line with the core of L1 to enable adjustments to be completed once the lid is in place.

Shown in Fig. 1.3 is the circuit of a simple r.f. probe which may be used to align the transmitter board, but it can also be used to check the output of the v.f.o. Using this probe and a 20kΩ per volt multimeter the output from the prototype v.f.o. read about 0.6V.

This concludes building the v.f.o. Part Two will continue with the transmit amplifier and changeover board. **PW**

Fig. 1.3



Shopping list

HOW MUCH ?
£ 45.00
HOW DIFFICULT
Intermediate

Resistors

0.25W 5% Carbon film

56Ω	R5,21
100Ω	R16,17
220Ω	R2,15,19
330Ω	R8
680Ω	R10
1kΩ	R6,12,14,18
2.2kΩ	R11
10kΩ	R3,4
33kΩ	R7
100kΩ	R1

0.5W 5% Carbon film

33Ω	R22
47Ω	R20

Rotary potentiometer

100kΩ	R9

Capacitors

Polystyrene foil

120pF	C1
220pF	C2
270pF	C26,29
560pF	C3,4
680pF	C27,28

Disc ceramic

100pF	C6
10nF	C8,13-16,18
100nF	C5,7,11,12,19,21,22,24,25

Screw-in feed-through

1000pF	C9,10

Electrolytic 16V radial lead

4.7µF	C17

Variable

10pF	C1a, Jackson C804 or similar, see text

Trimmer

5-65pF	C20,23

Semiconductors

Diodes

1N4001	D10
1N4148	D1-4,6-9,13,14

Light emitting diodes

D11,12	colour to suit

Zener diode

6.2V	D5

Transistors

BC238	TR2,3,6
BD131	TR8
2N2905	TR4,5
2N3819	TR1
2N3866	TR7

Coils and inductors

L1	25t 0.4mm (28 s.w.g.)enamelled (e.c.) wire on former with core, see text.
L2	40t tapped at 20t 0.4mm (e.c.) on T50-2 toroidal core.†
L3	4t thin insulated wire, wound over L1.
L4	40t tapped at 20t 0.4mm (e.c.) wire. on T50-2 toroidal core.†
L5	4t thin insulated wire, wound over L4.
L6	18t 0.4mm (e.c.) wound on a T37-2 toroidal core.†
L7	21t 0.4mm (e.c.) wound on a T37-2 toroidal core.†
L8	19t 0.4mm (e.c.) wound on a T37-2 toroidal core.†
RFC1	1mH fixed inductor (Cirkit 7BS series suitable).†
RFC2	10t 0.25mm(32 s.w.g.) e.c. wire on a ferrite bead (Cirkit 26-43000101 type suitable)

Miscellaneous

Boxes: Type A8 for the v.f.o. and J9 equipment case for project §; Relay 12V 2 pole change over,Cirkit type TRK22 †; Epicyclic reduction drive †; single-pole latching switch; single-pole non-latching switch; phono sockets for power; Morse key; TX & RX. connections; interconnecting wire of various colours; miniature coaxial cable; insulated feed-through circuit board pins; 6BA nuts, bolts and short spacers; earthing tags; a piece of 1mm aluminium sheet about 40 x 50mm size; Kknobs to suit.

§ Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd LL41 4NE Tel: (0766) 762572
† Cirkit, Park Lane, Broxbourne, Herts EN10 7NQ Tel: (0992) 444111.

Radio Diary

January 27: The Lancastrian Rally will be held at the University of Lancaster. **Sue Griffin G1OHH. Tel: (0524) 64239.**

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 G0LKE. 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, 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 Club's 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: The Pontefract & DARS 11th Components Fair will take place in the Carleton Comunity Centre, Pontefract from 11am to 4.30pm. There will the usual stands, a bookstall, Bring & Buy and a licensed bar. Talk-in on S20. Admission free. **B. Atkinson. Tel: (0977) 704067.**

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 of the 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.

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

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 SAE 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!

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!

R1312 - 13.8 VOLTS AT 12 AMPS 25 WATT TRANSCEIVER RATED

Designed for business and amteur radio use, these conservatively rated units make an ideal match for a 25/35 watt base or mobile unit requiring 8 amps continuous or up to 15 amps surge. Utilising full spec. Motorola devices these units are individually tested under maximum load conditions and are designed and manufactured in Britain exclusively for Raycom.

- 13.8 volt fully regulated
- 8A continuous, 12A 40% TX/RX, 15A surge
- Overvoltage and short circuit protected

R1312 13.8V 12 amp PSU £59.50 inc. VAT

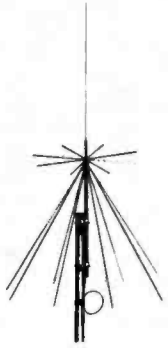
R1320 13.8V 20 amp PSU £129.99 inc. VAT

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 **1kg**

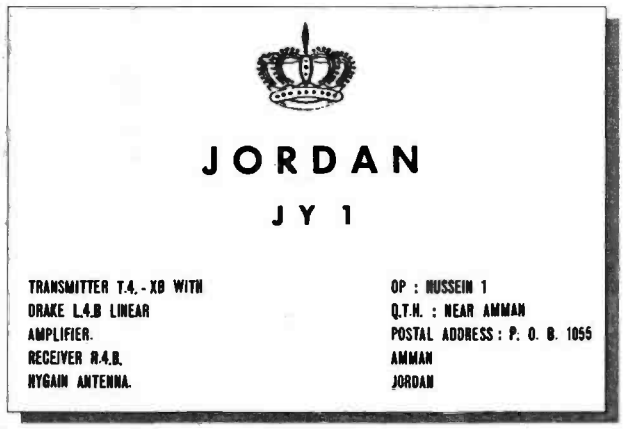


HR1300 discone £59.50

BB-145S BROADBAND MAGMOUNT

Another exclusive Raycom import, the BB-145S ia a broadband ¼ 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



JORDAN

JY 1

TRANSMITTER T.4.-XB WITH
DRAKE L.4.B LINEAR
AMPLIFIER.
RECEIVER R.4.B.
HYGAIN ANTENNA.

OP : HUSSEIN 1
Q.T.H. : NEAR AMMAN
POSTAL ADDRESS : P. O. B. 1055
AMMAN
JORDAN

Radio Personality

A Personal Message To The World Of Amateur Radio Communications From HRH King Hussein JY1

Amman

28 October, 1989

My involvement in Amateur Radio goes back to the early sixties. I look at Amateur Radio as a means of self-education in many fields apart, from the field of Communications. I learnt more about different parts of the world through the many fellow Radio Hams I came into contact with.

It has long been my belief that only through communication can people know each other and eventually come to understand the different peoples which is one important step towards attaining world peace.

I would like to mention that a great service is provided by Radio Hams especially during emergencies and natural disasters when they provide help to people in need throughout the world.

A Radio Ham should never hesitate to pick up the mic, listen carefully, never mind if the signal is weak, and to spend the time and the effort to lend a hand to someone who is in need of help.

God bless you all.

73s

JY1

Our hobby attracts people from all walks of life. In coming months the Personality Profile will feature many more enthusiasts from the wide world of radio and electronics.

Feature

Droitwich... Engraved on the Dial

In this feature, Rob Mannion G3XFD aims to look at some of the famous broadcasting stations of the past, some of which have been established for 50 years or more, and especially those still providing a service.

The BBC Long Wave Radio 4 transmitter located at Wychbold, near Droitwich in Hereford and Worcester, is a prime example of a station whose name has been engraved on the dial for generations and has been re-equipped to provide many more years service to the nation.

Droitwich entered service on Thursday 6 September 1934. Surprisingly, when the importance of the station is considered, the 150kW transmitters were started up by the briefest and most informal ceremony of all, a wave of the hand from Admiral Sir Charles Carpendale, the Controller of the BBC. The first programme broadcast by the station began with the BBC Orchestra led by Lawrence Turner and conducted by Aylmer Buest playing Eric Coates *The Merrymakers*.

The first day's duty for the transmitter only involved the half-hour programme in the afternoon followed by another in the evening. However, the 150 press-men, who had completed their journey to the then rather rural surroundings by Midland Red bus, had witnessed the baptism of a transmitter which went on, and has continued to provide outstanding service for the BBC and listeners in Britain and Europe.

By October 7 the new transmitter had taken over the entire National Programme from the Daventry transmitter and the latter was then used for the important Empire Service.

Work to test the suitability of the Wychbold site had begun as far back as 1932. Geographical location, plus the proximity of the Worcestershire salt-mines, played an important part in the decision to choose the site, some 26km south of Birmingham. The aim from the beginning was to provide a national service on long waves and the transmitter and associated equipment were to set many precedents for the BBC.

Tallest Masts

The twin 215m stayed-lattice masts were considerably taller than the previously highest BBC mast of 153m, and are still in service. Power supply engineering at the new station also broke much new ground, in that the diesel-driven generators provided a.c. rather than d.c.

Until the public electricity supply reached the station in mid-1940, the station was powered entirely by four 750h.p. diesel engines, mounted on a 900-tonne concrete block floating on cork to reduce vibration. Each generator was coupled directly into a 470kW 3-phase alternator set. The alternator outputs were at 415V and the h.t. supplies for the transmitters were obtained from mercury-arc evacuated steel tank rectifiers. Transmitter filament supplies were obtained from specially isolated motor-generator sets to ensure safety, as each valve filament could be as high as 20kV above earth potential.

The main building housing the transmitter, which was designed by the Marconi Company in close co-operation with BBC engineering staff, is seen as being very much in the 1930s style by interested modern motorists as they drive by on the nearby M5 motorway. The square-edged, flat-roofed, building with tall windows and long hallways is very much of its period and even now, some 55 years on, the buildings and transmitting masts can be an awe-inspiring to those who drive by, especially if they happen to be listening to Radio 4 as they do so!

Droitwich also had regional programme service duties. The original method of providing the extra antenna was by running the necessary wire up one of the two long wave supporting masts. As these masts were so high, the BBC equipped them with electrically powered lifts, the first time that such an installation had been provided as an aid towards maintenance.

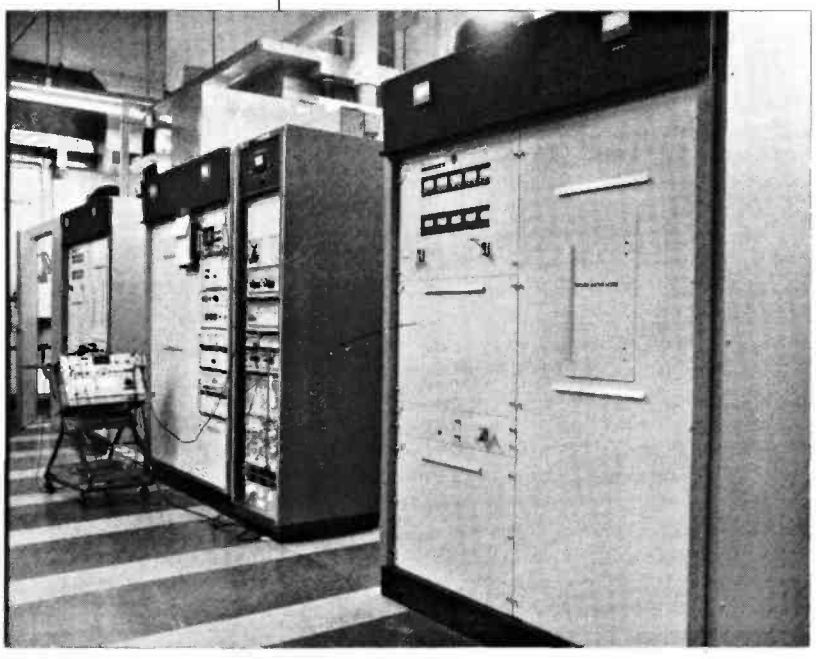
Several interesting problems arose during the design of the station. For example, it was necessary to produce a good response characteristic from the long wave antenna, which had an asymmetrical impedance characteristic at the driving point. A solution was found by placing a suitably designed matching network between the transmitter and the feeder to the antenna. The network enabled a substantially flat frequency response to be provided for modulating frequencies between 30Hz and 8kHz.

The transmitter required six valves in the output stage, four working and two spare. It was necessary to use valves capable of dissipating approximately 120kW, but none were available when the station was planned!

New Valve Type

This problem was solved by the Marconi-Osram Valve Co. which designed the type CAT14 valve, requiring anode potentials of 20kV. It was decided to use series modulation in the penultimate r.f. stage of this transmitter but this provided another problem in that a specially designed filament-supply motor-generator sets were required as the valve filaments were up 20kV above earth.

The especially designed output valves for the new transmitter required a new approach for the e.h.t. supply. This was solved by using mercury-arc rectifiers. Teething problems caused by the evacuated steel tank mercury arc rectifiers



One of the modern Marconi Transmitters providing today's output of 500kW
BBC Photograph

backfiring (more than one anode striking at one time) causing a loss of supply, became so severe at one stage that a temporary thermionic rectifier was installed to supply the 30A 20kV h.t. until a solution was found

The Droitwich building itself was a departure from normal BBC practice in that the transmitter hall was built with two storeys. The water-cooled valves had to be supplied with cooling water through long hoses to provide enough insulation against the unusually high anode voltage.

Transmitter units were installed on the first floor, with their hose coils mounted on the ground floor in the lower parts of the units, which also housed the coils and capacitors associated with the anode circuits and the transducers. The ground floor also accommodated the rotating machinery supplying the filament power, auxiliary h.t. and grid-bias to both regional and national transmitters. All these machines were operated remotely from a large control desk on the first floor.

A 50kW medium wave transmitter was installed later and entered service carrying the Midland regional programme on 17 February 1935, replacing the Daventry transmitter. The regional transmitter used a directional antenna system suspended from triatics on one of the main long wave masts. The radiation pattern was adjusted to increase the signal strength in the Birmingham area and the north Midlands generally.

Preparations for War

War in Europe was now approaching fast and the BBC were planning ahead, trying to envisage every conceivable situation. The Corporation had to plan to provide a service to the nation in the event of hostilities, and at the same time deny the enemy incidental direction finding facilities from individual transmitters.

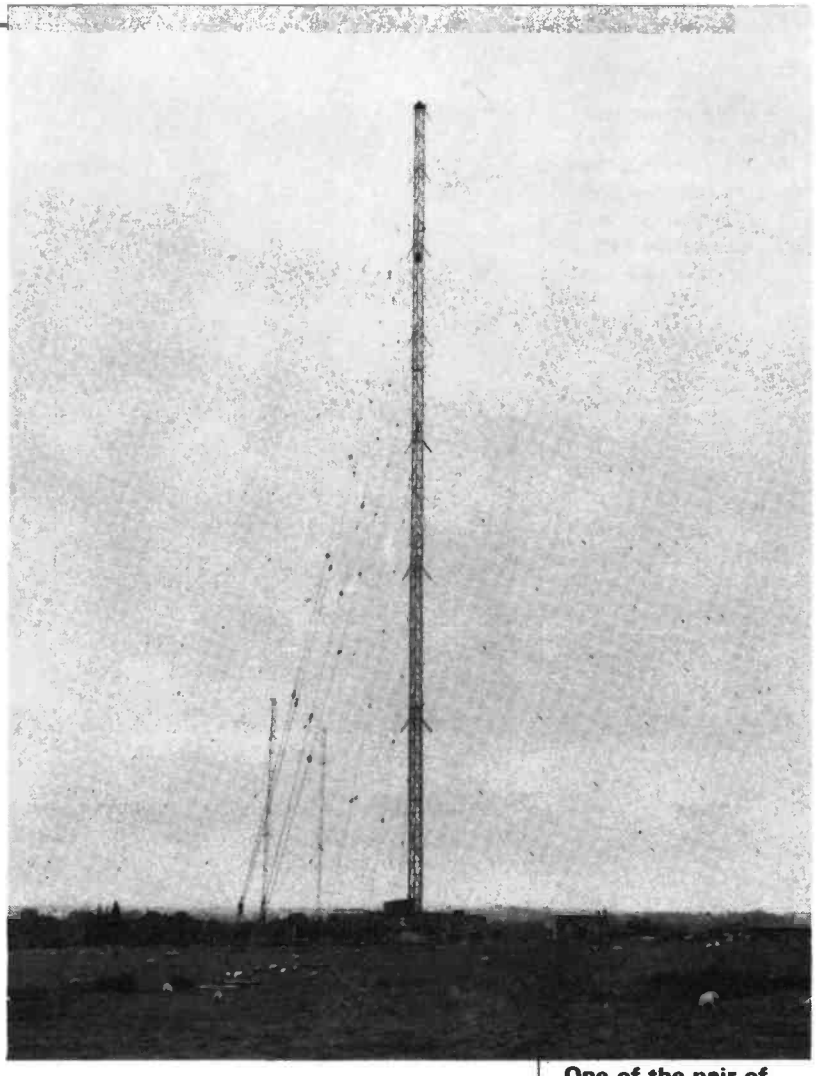
How the BBC, with valuable help from the GPO Dollis Hill laboratories in London, overcame this problem along with the wartime precautions and preparations, make very interesting reading. For those wishing to learn more on this fascinating aspect of radio broadcasting history I recommend Edward Pawley's book *BBC Engineering 1922-72*. Although long out of print, most reference libraries will be able to locate a copy of the book for those interested.

Unfortunately, the Air Ministry would not allow the Droitwich long wave high power transmitter, with its nationwide coverage, to work in wartime. The lack of other high power long wave transmitters elsewhere in the UK to act as 'spoilers', to stop the station from being used as a radio beacon by enemy aircraft, brought this situation about. It was accepted, however, that the transmitter could be used exceptionally for the radiation of urgent navigational warnings issued by the Admiralty.

Wartime Role

Droitwich did not fall silent during the war years, but ended up being converted to medium wave service for the duration and played an important role for the rest of the war.

At the beginning of hostilities, the term Overseas Service had replaced Empire Service and the Overseas and European together constituted the External Services. When the plans for wartime broadcasting were put into effect, the frequency of 1149kHz was used during the hours of darkness for the European Service transmissions.



One of the pair of 215m stayed-latice masts, the shelter at the base houses the lift mechanism

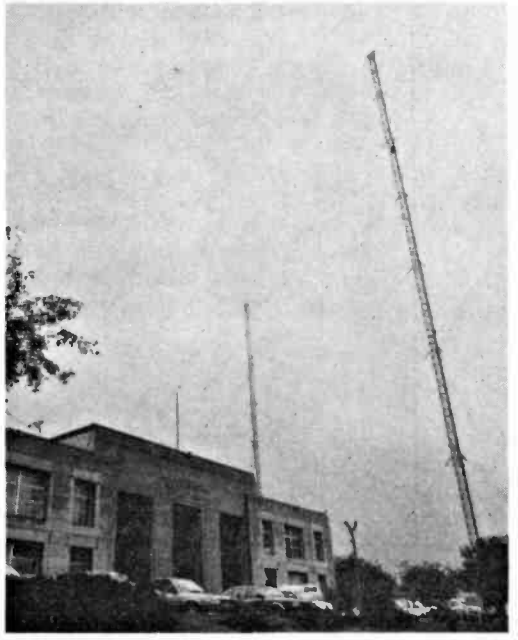
BBC Photograph

At first, three 50kW regional transmitters - located at Brookmans Park, Moorside Edge and Westerglen - were synchronised on this frequency, but on October 7 the Droitwich transmitter (converted from long waves) with its power output increased to 200kW joined the group. Another regional transmitter, located at Washford, joined this network on 5 November 1939.

Successful experiments with horizontal polarisation at the BBC's Start Point transmitter in Devon, led to the erection of a horizonatal dipole antenna at Droitwich for the 1149kHz transmissions. This antenna was brought into service on 17 February 1940, and during the hours of darkness the 1149kHz transmitter at Droitwich radiated alone.

When France fell in June 1940, there was an urgent need to increase the power of the existing European service transmissions and to carry them on more frequencies to reduce the chance of enemy jamming. The most ambitious project associated with this requirement was the installation of a transmitter at Droitwich with, for those days, the exceptionally high output power of 400kW on medium wave.

There was neither the time or manpower available to design a single transmitter of this advanced type. It was decided to install two 150kW transmitters then under construction by the Marconi Company and attempt to operate them in parallel. For the Droitwich application their output power was increased to 200kW, with a slight increase in distortion. Operating transmitters in this way was an innovation which was to have far-reaching effects in later years. The new high power transmitters were installed on the main site in an austere, separate two-storey building, and became known as HPMW.



The impressive facade of Droitwich Transmitter Station dwarfed by the twin 215m masts and dramatised by a wide-angle lens
BBC Photograph

Peace Returns

With peace in Europe once again, Droitwich was again playing its important role in the national and external services of the BBC. The station radiated the Light Programme until 1978, when the old names were replaced with the now familiar Radio 1, 2, 3 and 4. Radio 4 was then transmitted on long wave as the new all-UK service. Three transmitters provided national coverage on 200kHz, with Westerglen in Central Scotland and Burghead near Inverness in the Scottish Highlands providing coverage for the northern part of Britain.

Synchronisation of the carrier frequencies for the three transmitters was operated for some years, following the introduction of the UK-wide Radio 4 service. The engineering department of the BBC arranged that the nulls caused by the cancellation of the carrier waves from the separate transmitters were located in the region of Hadrian's Wall in Northumberland! The nearest large centres of population, Carlisle and Newcastle, being provided with medium wave relay stations to fill any gap in the service.

Today, although Radio 4 is not a 24-hour service, the modern 500kW Droitwich transmitter is on-air around the clock. For insomniacs, and the many listeners abroad, the BBC World Service from the Droitwich transmitter is on 198kHz from around 0045 to 0545UTC. It moved to this frequency from 200kHz in accordance with the WARC long wave bandplan changes in February 1988.

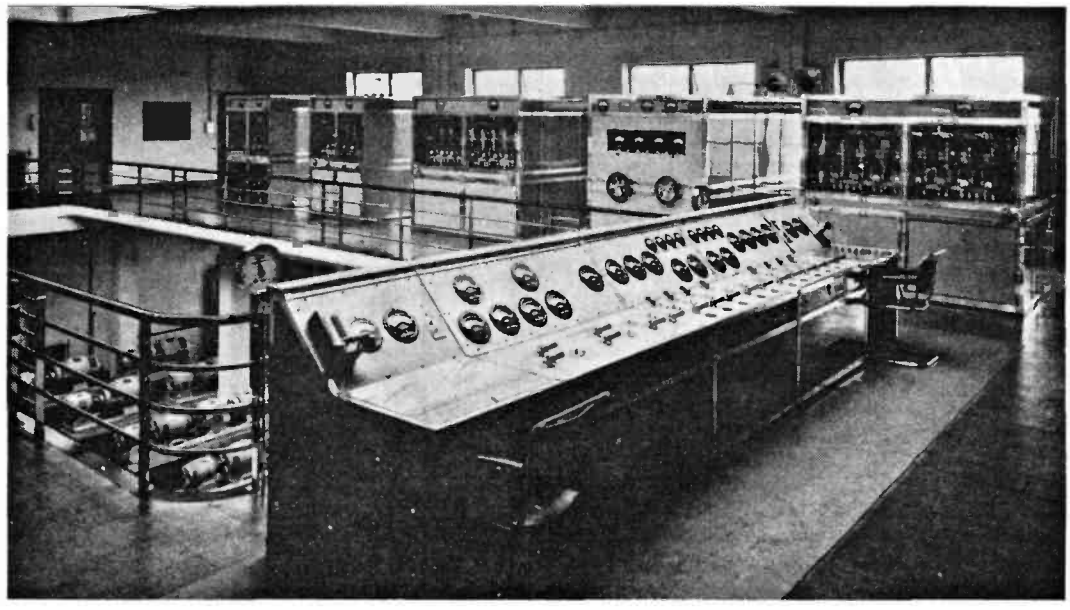
Celebrations

On 6 September 1984, the BBC commemorated the 50th anniversary of the start of broadcasts from Droitwich by holding a special dinner in the transmitter hall. Derek East, the BBC's Chief Engineer Transmission, who presided at the dinner with Engineer in Charge Arthur Morris, invited the Mayor and Mayoress Droitwich as the guests of honour.

Derek East summed up the feelings of many during the dinner by saying, "In the 30s Droitwich was a name on the listener's radio dials. They knew the name Droitwich for its radio service as well for its spa. Numbers like Radios 1, 2, 3 and 4 do not have the same personality, but Droitwich continues as an honoured name in the transmitter world". He went on to say, "This anniversary is especially appropriate at this time when we are installing only the second replacement transmitter since 1934. All three transmitters have been supplied by Marconi, indicating the long term association the BBC has had with British industry. Technology has not stood still and this latest transmitter will use a new modulation system and has a conversion efficiency of some 70 per cent. This compares with the 30 per cent for the old transmitter...a significant saving in power costs".

Such was the situation in 1984. But what lies in the future for long-wave broadcasting? Will the advent of the newly commissioned commercial long wave service, jointly operated by RTE and Radio Luxembourg in the Irish Republic, bring new life to an old service? Time only will tell, but for l.f. broadcasting enthusiasts and those who travel abroad, a quote from the BBC Engineering Information Service will be of some comfort.

"Regarding the future of long wave broadcasting, because of the absence of interference from other transmitters and the nationwide coverage possible with just three transmitters, its future in the BBC is assured." Hopefully Droitwich will always be engraved on the dial and liquid crystal displays of the future! **PW**



Droitwich Control Room in February 1935 showing motor-generators and split-level building
BBC Photograph

TESTING! TESTING! TESTING!

PROFESSIONAL EQUIPMENT AT AMATEUR PRICES

INCREDIBLE VALUE AT JUST £174.95 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 £349.95 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 absorbtion 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 £49.95 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 £7.95 CCS50

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 .....

Address .....

..... Post Code .....

If order below £9.25 add 75p, if between £9.25 and £10 make up to £10

Add Carriage 75p

Total

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

TS-950S. This is DX-clusive

Rumours have abounded for some months that Kenwood were once again about to take the HF transceiver market by the throat, and with the announcement of the TS-950S those predictions have proved to be true. It is an undisputed fact that Kenwood HF transceivers have always led the way, and it seemed almost impossible for their design team to make significant advances on the success of the TS-940S,— but they have.

We don't have to tell you that the receiver performance is outstanding; a noise floor of −140 dBm will do that. Nor do we have to mention the ease of use; Kenwood has an enviable reputation in this area. What we must give a few hints about are some of the new operating aids which Kenwood have included, such as a dual receiver which allows you to listen up to 500 kHz away from your operating frequency — even during transmitting; such as the revolutionary digital signal processing option which gives improvements of up to 10 dB in carrier and unwanted sideband suppression; variable transmit bandwidth; adjustable rise time of the CW envelope; and much more.

The photograph and this brief text can only give a hint of what the TS-950S can deliver — the full story can only be told by a visit to your Kenwood approved dealer or a browse through some detailed literature, but take it from me that once again, Kenwood have shown the way forward in HF transceiver design.

TS950SD	Includes DSP-10, SO-2, YG455C1, YG455CN-1, YG455S-1 and YK88C-1, (with integral Auto ATU).	**£3199.00**
TS950S	Transceiver with integral Auto ATU.	**£2499.00**
DSP-10	Digital signal processor unit	**£399.00**
SM230	Station monitor with Pan Display	**£773.00**
SO-2	High stability TCXO	**£99.00**
SP950	External speaker	**£87.55**
YG455S-1	Extra SSB filter	**£112.57**

LOWE ELECTRONICS LTD.

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

Sole Appointed UK Distributor for KENWOOD Amateur Radio

KENWOOD

More of everything - except cost

The new series of FM mobiles from Kenwood really do have more of everything; more power (50W on 2 metres), with three power levels (50W, 10W, 5W); more usable sensitivity (better than 0.16 microvolts for 12dB SINAD); more channel spacings (5, 10, 12.5, 15, 20, 25 kHz); more flexibility using the RC-20 controller and IF-20 interface (up to 4 transceivers from one controller); more memories (20 multi function); and even more bands, because the full range consists of the TM-231E for 2 metres, the TM-431E for 70 centimetres, the TM-531E for 23 centimetres, and finally the TM-701E for dual band 2/70 FM.

Every function that you could ever want is included in the specification - there is even an optional digital speech store which will store received or transmitted messages of up to 32 seconds, allowing the operator to quickly check or return any call. Even the microphone has been designed to give you full control of the transceiver from one hand, with tone burst, memory recall, VFO recall, and UP/DOWN functions provided; but the UP/DOWN is not just operating frequency but memory channel number and even the frequency of the built in sub-audible tone encoder.

There is even a fourth button on the microphone which can be user programmed to select MHz steps, or repeater shift, or reverse repeater, or digital record selection, or low power; all as you wish. Extremely comprehensive and easy to use in the Kenwood manner.

This exciting new range of FM mobiles from Kenwood is now available at your approved Kenwood dealer. Try them out; you will not be disappointed, particularly with the prices. As I said "More of everything, except cost".

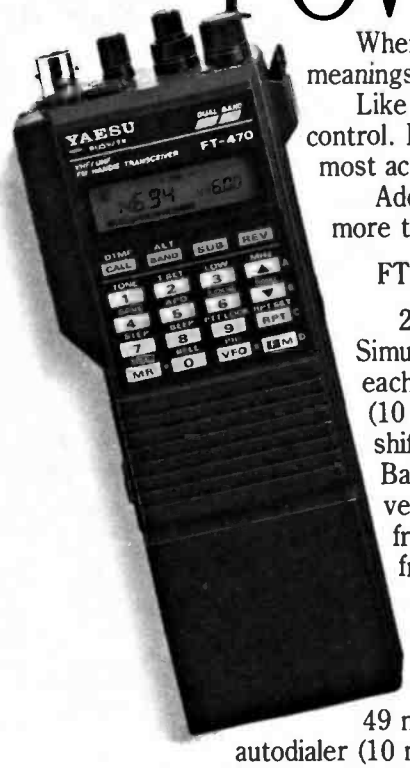
TM-231E	(2m)	**£289**
TM-431E	(70cm)	**£318**
TM-531E	(23cm)	**£385**
TM-701E	(2/70)	**£469**

LOWE ELECTRONICS LTD.

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

Sole Appointed UK Distributor for KENWOOD Amateur Radio

OUR COMPLETE LINE OF PORTABLE POWER TOOLS.



When you're talking Yaesu handhelds, power takes on many meanings.

Like maximum RF output. Sophisticated microprocessor control. Deceptively simple operation. Even cost savings—as most accessories are interchangeable throughout the line.

Added up, it's no wonder amateurs choose Yaesu HTs more than any others.

FT-470. DUAL-BAND OPERATION PERFECTED.

2 metre and 430-440 MHz 42 memories. Simultaneous receive of both bands. Dual VFOs each band. Paging feature. DTMF autodialer (10 memories, 15 digits each). Auto repeater shift. Scanning features. Auto power-off. Battery saver. Audible command verification. Keypad and rotary-dial frequency entry. Battery packs available from 2.3 to 5 watts. More.

FT-411 SERIES. MAXIMUM SINGLEBAND PERFORMANCE.

2 metre FT-411 and 430 MHz FT-811. 49 memories. Dual VFOs DTMF autodialer (10 memories, 15 digits each). Auto repeater shift. Scanning features. Auto power-off. Battery saver. Audible command verification. Key-pad and rotary-dial frequency entry. Many battery packs available, from 2.3 to 5 watts. More.

FT-23R SERIES. SMALL, SMART, RUGGED.

2 metre FT-23R, and 430 MHz FT-73R. 10 memories (7 store odd splits). Memory scan at 2 frequencies per second. High/low power switch. LCD power output and "S"-meter display. Auto-battery saver. Alluminium-alloy case. Water-resistant seals. Many battery packs available, from 2 to 5 watts. More.

Want more information? Call **(0703) 255111**
Or call into your local authorised Yaesu dealer and ask about the FT-470, FT-411 and FT-23R Series handhelds. The power in handheld performance.

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 SMCOMMG.

YAESU

Prices and specifications subject to change without notice.

PW 49'er In-car Short Wave Converter

The 49 metre band (6MHz) has long been a favourite with expatriate British and short wave listeners the world over. It's the band where you can be sure to hear the comforting strains of the BBC World Service, propagation permitting. Now, with the aid of this compact short wave converter from Brian Robertson G4POL, you can listen to this band in the comfort of your own car.

The car radio has for too long been overlooked as a useful piece of equipment for the radio constructor. However, by virtue of the fact that they are designed to work in an environment filled with electrical interference, most receivers of this type are built in a well screened case. This makes them ideal for use as a tuneable i.f. for use with receive converters. All the hard work is done for you, the radio alignment, audio amplifier, etc. All you need to supply is a 12V d.c. power source and a loudspeaker. This project is designed primarily to make additional use of the car radio and provide a very useful facility, that of being able to receive one of the most popular short wave broadcast bands.

The '49'er' will prove to be of great value to anyone touring abroad by car, as the BBC World Service in English can be heard all over Europe on the 6MHz band. Additionally, the English service of Radio Netherlands from Hilversum provides an excellent range of programmes for the listener.

When the reception of short wave broadcasts is not required, a built-in switch restores reception of medium waves again and also disconnects the internal 9V supply to the unit.

How it Works

A block diagram of the converter, which is designed around the ubiquitous SBL1 double-balanced mixer, is shown in Fig. 1 and the circuit diagram for the unit is displayed in Fig. 2. Signals picked up by the car antenna appear at the input of the unit via SK1. You will also note that the signal path is fed via S1c to one contact on S1a, this is to provide a by-pass route for the antenna when the converter is not in use. The other set of contacts on S1b are used to remove the supply from the converter when it is being by-passed. Thus, with the converter switched off, the car radio antenna is connected as usual directly to the radio for normal l.w., m.w. and f.m. reception, if your set is so equipped.

With the converter switched on, L1 tunes the car antenna electrically to resonance on the 6MHz band. The signals are then coupled to TR1 via T1 where they are amplified approximately 10dB by a single gate f.e.t configured in common gate mode. From this stage, the signals are matched by T2 in to the 50Ω port of an SBL1 double-balanced mixer assembly (X1).

The local oscillator signal is provided by a crystal oscillator operating at 5MHz. The oscillator is trimmed into resonance by C5 and L2. The output of the oscillator is matched to X1 via L3 which provides the necessary low impedance to drive X1.

A signal in the 49 metre band (fs) minus the local oscillator frequency (fo) produces two intermediate frequency (fs + fo) and (fs - fo). The latter falls in the passband of the car radio when it is switched to medium wave reception.

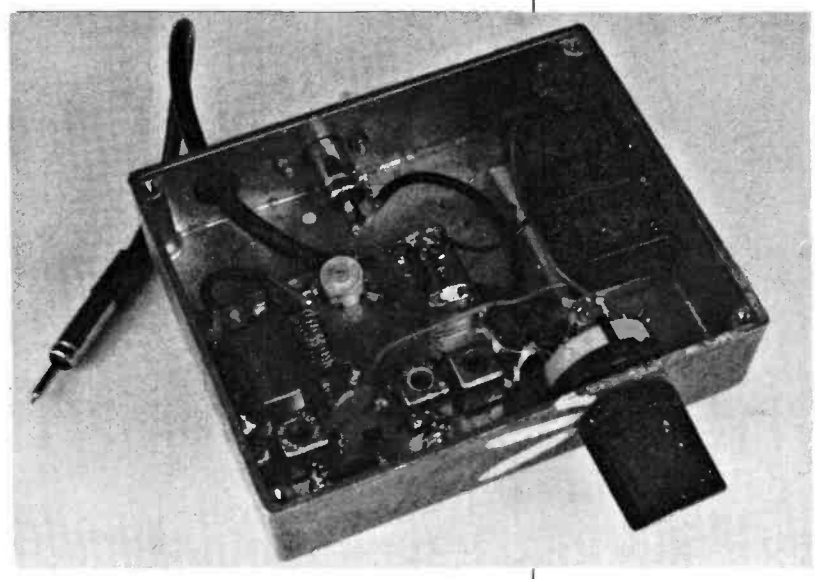
Construction

The component layout and double sided track patterns of the p.c.b. are shown in Fig. 3. The board is made from copper clad, glass fibre material. The upper surface is used as a ground plane. All holes, other than those used for earthing pins 2, 5, 6 and 7 of mixer X1, crystal XL1 and some pins T1 and T2, should be cleared to prevent a short circuit when the components are mounted on the board. This may be done by using a drill bit to countersink the upper copper surface.

When the board has been prepared, first solder in the resistors, followed by the capacitors. Note that C2, C3 and C4 have one lead bent to facilitate soldering to the ground-plane. Care should be taken to bend the leads by using fine nosed pliers.

Next, the coils L1, T1 and T2 should be inserted, followed by L2/L3, C6, Mixer X1 and finally the two semiconductors TR1 and TR2. Three Veropins are used to provide easy connections to the board when fitted inside the die-cast box which houses the converter. Inductor L2 is wound around the circumference of the toroid leaving a small gap to accommodate the winding of L3.

Finally, check for any solder bridges and mount the unit in the die-cast box. I used an input socket as



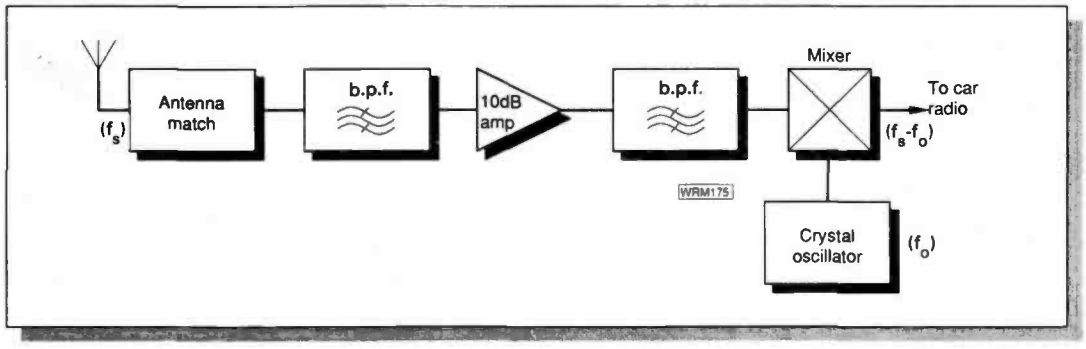


Fig. 1

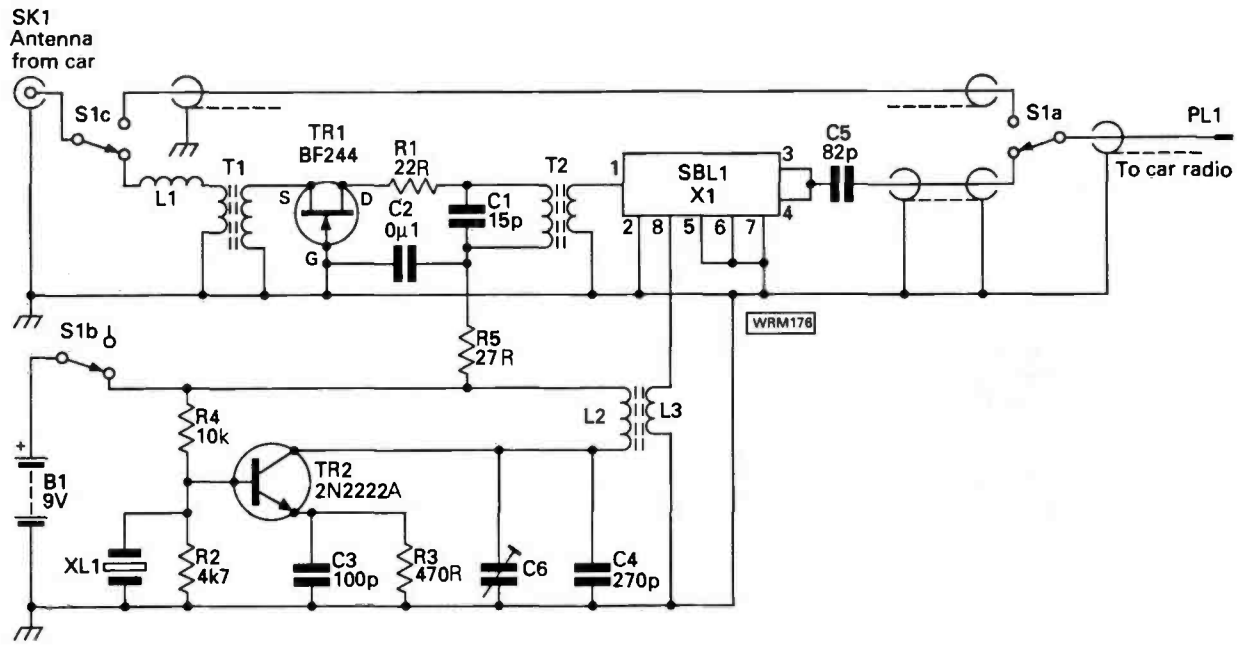


Fig. 2

Shopping List

Resistors
0.25W 5% Carbon film

22Ω	1	R1
27Ω	1	R5
470Ω	1	R3
4.7kΩ	1	R2
10kΩ	1	R4

Capacitors
Miniature ceramic plate

15pF	1	C1
82pF	1	C5
100pF	1	C3
270pF	1	C4

Monolithic ceramic

0.1µF	1	C2

Miniature foil trimmer

2-36pF	1	C6

Inductors
L1 Toko KANK 3333R
L2 25 turns 24 s.w.g.(e.c.w.)
L3 3 turns 24 s.w.g (e.c.w.)
L2 and L3 wound on a single T50-2 toroidal core

Transformer
T1 Toko KANK 3334R
T2 Toko KANK 3333R

Semiconductors

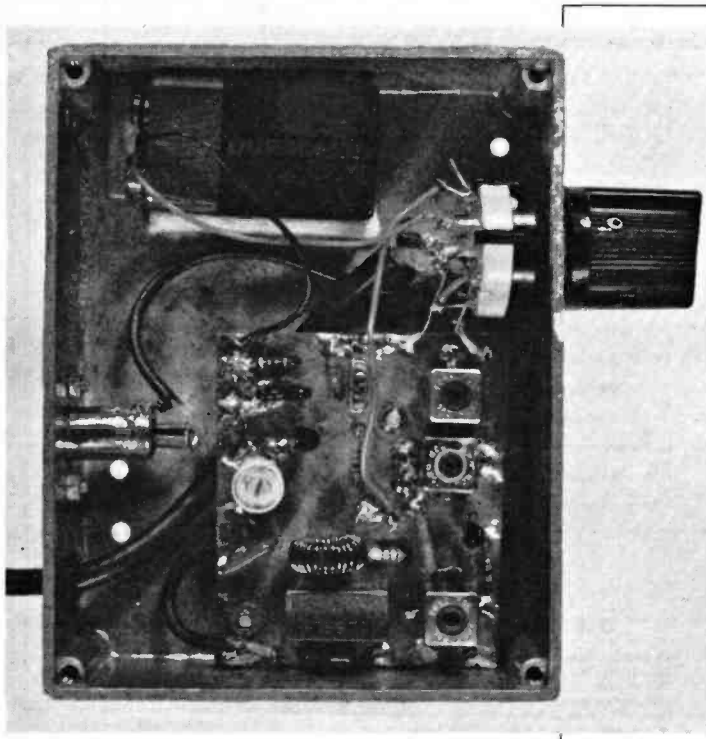
BF244	1	TR1
2N2222A	1	TR2

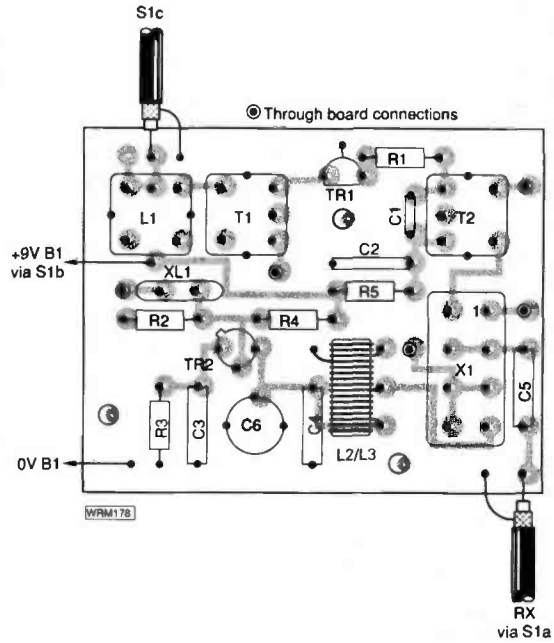
Miscellaneous
X1 SBL1 block mixer; PL1 car radio type coaxial plug; SK1 chassis mounted socket to match PL1; die-cast box approx. 120 x 95 x 38mm; PP3 Battery clip; S1 3-pole 2-way slide switch (or 4-pole 2-way); rubber grommet; 500mm of low-loss 75Ω coaxial cable; p.c.b.; 4 off 6BA countersunk machine screws; 2 off 0.25in brass spacers; 4 off 6BA nuts; 2 off 6BA solder tags; connecting wire; XL1 5MHz HC-18/U crystal.

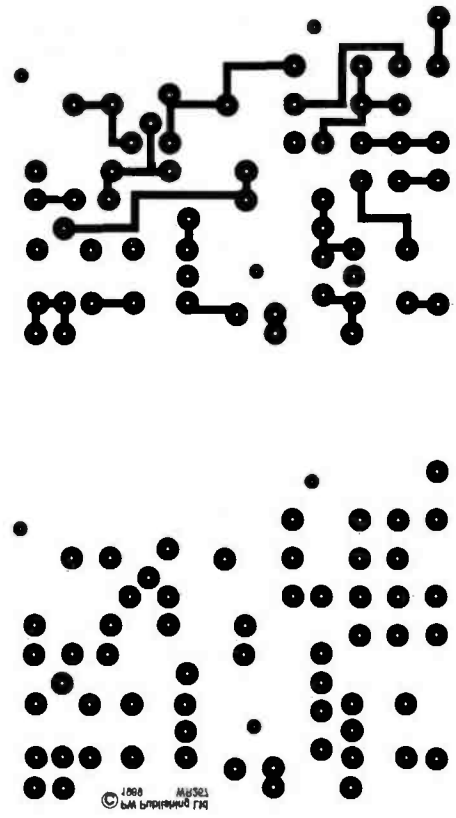
Inductors & mixer are available from:
Cirkit Distribution Limited.
Park Lane,
Broxbourne,
Herts EN10 7NQ.
Tel: (0992) 441306.

Car radio coaxial connectors are available from:
Maplin Electronic Supplies Ltd.
PO Box 3,
Rayleigh,
Essex SS6 8LR.
Tel: (0702) 552911.

Crystal XL1 is available from:
Cricklewood Electronics Ltd.
40 Cricklewood Broadway,
London NW2 3ET.
Tel: 01-452 0161







normally found on car radios. Similarly, PL1 on the flying lead that connects the converter to the car radio is of a matching patten. Connectors of this type can be obtained from scrap car antennas or from sources such as Maplin Electronics or car accessory shops.

All r.f. routes within the box should be made in miniature coaxial cable. A solder tag clamped by one of the screws holding S1 can be used as an earth come anchor point for the screen of the flying lead which connects the converter to the car radio. The converter draws approximately 15mA from an internal PP3 battery (B1), which in the prototype was secured to the die-cast box by a small piece of double-sided sticky tape. This method of mounting also prevents vibration between the case and the battery when the converter is used in the vehicle.

Alignment

Once the converter has been installed in the enclosure and the connections to the board have been made, disconnect the antenna lead from the car radio and insert it into SK1 on the converter. Then you should connect the output lead of the converter with its plug PL1 directly into the car radio antenna socket. Switch the car radio on and the converter off. The radio should function normally. If it does not, then there is a wiring fault on S1. If all is well, you should then tune the car radio to 1089kHz (Radio 1 to the less initiated...!). If all is well, switch on the converter. If nothing is heard, set T1 and T2 so that their cores are 2 to 3mm below the tops of the screening can. Now adjust C6 until a signal is heard. This signal should be Radio Luxembourg on 6090kHz which is audible almost continuously through the day and night. Once you have the signal, peak L1 for the loudest setting, then find a weaker station by tuning the car radio and peak L1, T1 and T2 for maximum strength. That completes the alignment, all you have to do now is to screw on the lid and find a suitable mounting location for the converter in the car. Happy listening you lucky Fortyniners! **PW**

Fig. 3

HOW MUCH ?
£ 21.00
HOW DIFFICULT
Intermediate

Feature

The Father of Amateur Wireless

Since the early 1900s, Guglielmo Marconi has been deservedly referred to as the 'Father of Wireless' and his name has been carried forward, in the field of electrical communications, to this day. The name of Hugo Gernsback is less well known, but in the beginning of the twentieth century he was generally regarded by his followers as the 'Father of Amateur Wireless'. Stan Crabtree G3OXC tells the story

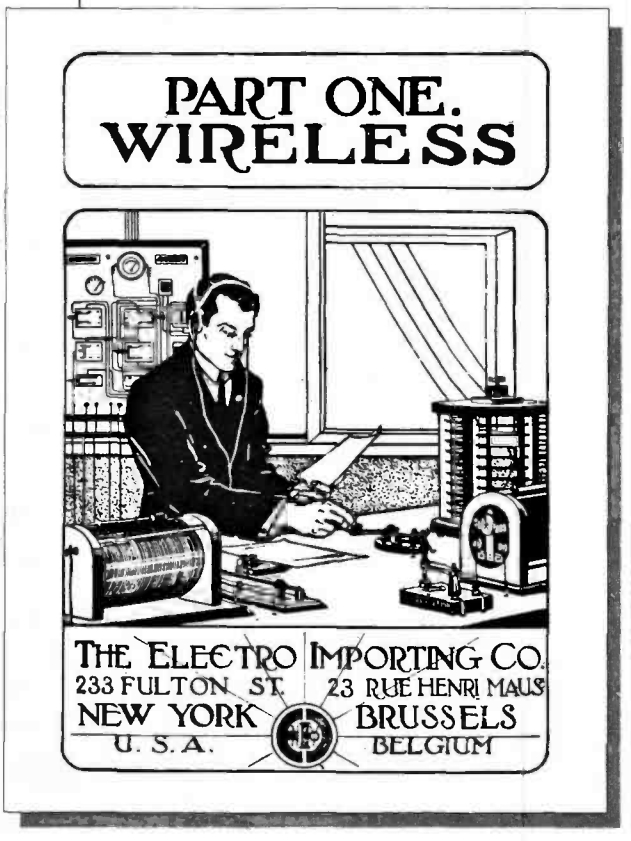
Hugo Gernsback was born in Luxembourg on 16 August 1884 and received his technical education at the Ecole Industrielle in Luxembourg and later at Bingen Technikum in Germany. His field was electrical engineering. Like many of his European contempories the 'New World' beckoned and, in his case, it seemed the ideal place to market an improved design of dry battery he had invented. He arrived in New York in 1904 at the age of 20.

Wireless telegraphy had by this time established itself as the new medium of communication. Marconi had already spanned the Atlantic, the great passenger liners on this route were now able to communicate with a land station throughout their passage and the number of wireless telegraphy stations in the United States was increasing dramatically. There were no licencing restrictions and little demarcation between Government, commercial and the few stations that were operated for pleasure.

Company Established

The entrepreneurial spirit of Gernsback was aroused. He saw a demand for the marketing of wireless expertise and components and set about making plans to meet it. Within the year the Electric Importing Co. was established in an office three metres square at 32 Park Place, New York; the first firm in America to sell only experimental electrical goods.

From the start, Gernsback earned the reputation of giving a 'square deal'. He was one of the first businessmen to take advantage of mail order and he built up a sizable list of agents and customers throughout the United States. Business flourished and in 1905 he took over larger premises at 87 Warren Street, which provided better manufacturing facilities. In the November 1905 edition of the *Scientific American* he advertised what was to become the "first complete home radio ever offered to the American public". The kit consisted of a miniature spark transmitter with a one inch coil, coherer and all other necessary components including batteries. A guaranteed range of one mile was claimed.



Expansion

Early in 1908 the company moved once more to buildings at 80-86 West Broadway which provided six times as much floor space as the Warren Street premises. Expansion continued and in 1909 a large retail store was opened 69 West Broadway. It was a unique store in New York and became the 'Mecca' for all local wireless enthusiasts. By 1910 the offices and factory had again reached saturation level and the company purchased its own five storey building at 233 Fulton Street. The premises next door were acquired in 1912 thereby doubling the Company's total available floor area to 2 500 square metres.

At this time the Electric Importing Co. were receiving 900 letters a day and shipping out on average 300 orders. Business was conducted with wireless enthusiasts all over the world. A European office was opened at 23 Rue Henri Maus, Brussels. EICO were the largest manufacturers of this type of equipment; raw material was purchased by the ton or car load. The company also controlled more patents on experimental and wireless apparatus than any other organisation in the US.

Hugo Gernsback had the knack of knowing just what this new breed of wireless devotees wanted. He was in fact one of them and spent much time in experimenting and testing new devices which his company subsequently marketed. The Electric Importing Co's catalogue was a wealth of information for anyone new to the art. Part One: 'Wireless', contained more than 200 pages and was beautifully illustrated with engravings of the various items on offer.

Services Offered

Gernsback offered a service that would be impossible to supply in this day and age. For a 2c stamp to cover postage, his engineering staff would "cheerfully answer free of charge any and all technical questions relating to our goods". Questions on 'hook ups' etc., not bearing a direct relation to the goods sold cost 10c. Also for 10c, the Company's drafting department would provide diagrams and connection data. The catalogue included one sales aid that would not seem out of place in today's marketing scene: A FREE Wireless Course. The book contained 20 coupons (numbered 1 to 20) each representing a lesson. Lessons ranged from 'Principles of Magnetism' to 'New Transmitting Systems' and 'Aerials' etc. By enclosing a coupon with each 1$ order spent on components, the corresponding lesson would be forwarded. For a $20 order the complete course was sent in a cloth binder. This was remarkably good value as most textbooks on wireless, and especially the ones that were written in a language the layman could understand, were neither numerous or cheap.

Wireless Association Of America Formed

As a follow up to the Company's catalogue, Gernsback founded *Modern Electrics* in 1908, the first magazine which eventually devoted itself almost entirely to wireless telegraphy. The circulation increased rapidly and through the journal's readership, Gernsback formed the Wireless Association of America, the first national amateur wireless organisation, in 1909. This was five years prior to the incorporation of the American Radio Relay League (ARRL). The WAA published the *Wireless Blue Book* which appeared yearly and contained a list of all US Government, Commercial and Amateur wireless stations in alphabetical order with callsigns and locations. It also included a three colour wall chart of the USA showing Government Stations. This for an annual sum of 15c. By 1910 the circulation of *Modern Electrics* had reached 30000.

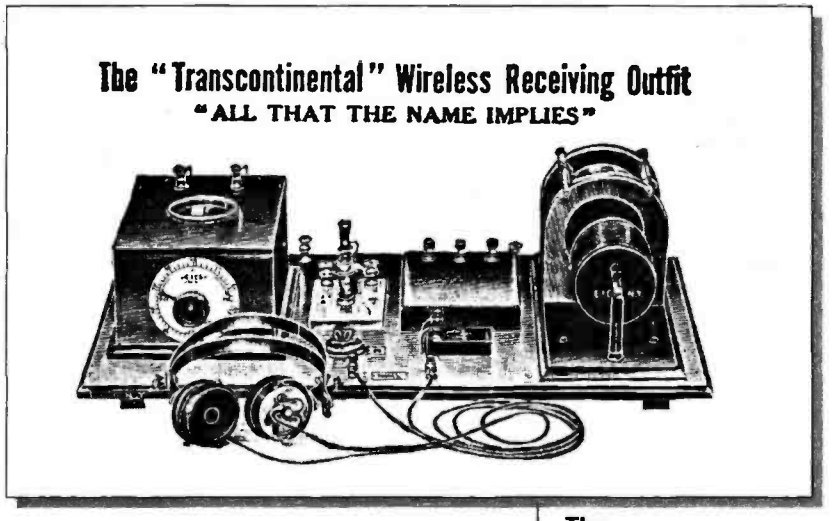
In the early years of the Century there was no legislation or restriction on the use of wireless apparatus on the North American Continent. This contrasted starkly with the situation in the UK where up to and including WWI the authorities apparently did everything possible to hinder layman wireless experimenters. Inevitably, a free for all on the air waves developed and continued until chaos reigned. Interference was caused due to interaction and mistuning of the now thousands of stations that were active on the medium and long wave band. Much of it was due to obsolete equipment, often in operation at Government stations. Wireless Legislation introduced in 1912 brought some semblance of order to the radio spectrum in use at the time. During the years running up to this legislation, Hugo Gernsback endeared himself to the American Ham operators by outspokenly challenging the authorities in their attempts to curtail amateur wireless operations.

The Roberts Bill

The first attempt at silencing the amateur fraternity (who were unequivocally labelled the villains) was in the Roberts Bill. Gernsback, at first single handedly, fought the Bill tooth and nail. Through a stirring editorial in the January 1910 issue of *Modern Electrics* he inspired 8000 wireless amateurs to lobby their congressmen in Washington by letter and telegram. Hundreds of newspapers picked up Gernsback's editorial and all endorsed and applauded his views. The public as a whole turned against the Roberts Bill and it was eventually abandoned.

The Burke Bill and the Depew Wireless Bill appeared shortly afterwards and suffered a similar fate. Due to opposition instigated by Gernsback through the columns of *Modern Electrics* neither were seriously considered as legislation.

In December 1911 the Alexander Bill was put forward and although it met many of the amateurs' pleas, Gernsback felt it was not acceptable in its original draft. In the editorial columns of his publication he put forth what was to become an historical recommendation. That the amateur should be allowed an input power of 1kW and that operation should be permitted on wavelengths below 200 metres. These regulations are still in force today.

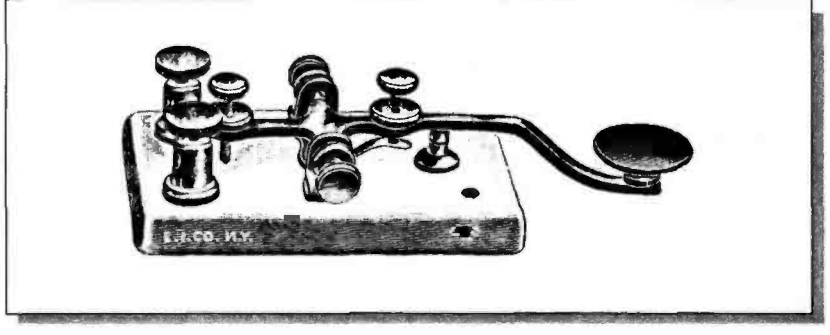


The 'Transcontinental' was the top of the range receiver in 1913. It featured a 0.1μF condenser (left) and a detector with finely balanced swivel ball handle for use with any mineral substance. Using a 70', four-wire antenna on top of their New York building, the manufacturers claimed to have regularly copied Colon in the Panama Canal - a distance of 2200 miles. Complete with the headphones, the cost was $24.00

Unfair Legislation

In March 1912 Gernsback once again put pen to paper and in a letter to the *New York Times*, protested against unfair legislation, outlining the shortcomings of the Alexander Bill. The writer realised, perhaps more than anyone else, that this Bill, in some form or other, would eventually become law. He therefore felt it was his last chance to champion the rights of the wireless amateur. His concentrated efforts produced results and Alexander and his advisers subsequently acceded to the overwhelming pressure. It is significant that the relevant section of the Bill followed Gernsback's recommendations, as set out in the February 1912 issue of *Modern Electrics*, word for word. The Alexander Bill, now amended, passed the United States Senate on 7 May 1912 and transferred to the House of Representatives the following day. On 13 August 1912 it was signed by President Taft and became law.

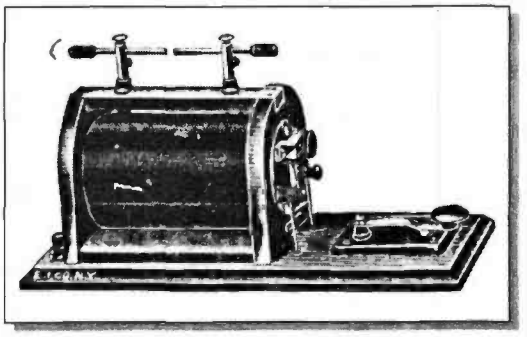
In the United States in 1913 a licence was not needed provided the sender's wireless signals did not cross the State border. This was ideal for amateurs in the centre of Texas but restrictive for enthusiasts in New York City. The Gernsback catalogue went to great pains to list the type of equipment which would reach a certain distance. There were still untuned spark transmitters in use and the range could be calculated by the size of the spark coil. A three inch coil would supply a signal for a distance of 24 miles; a one inch spark coil was limited to eight miles. With tuned apparatus using open core transformers the input wattage was used as a guideline. A distance of one mile could be achieved with every five watts in the primary circuit. By knowing the distance from a home location to the nearest border of the next state, it was possible to calculate the maximum power used before a licence was needed. The only other restriction was that no more than 500 watts could be run if the location was within five miles of a Government Wireless

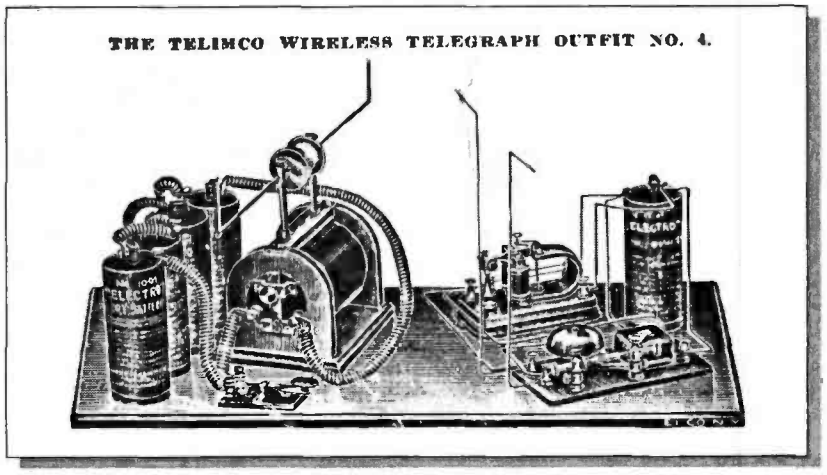


Mounted on an opal glass base, this key could be used for signalling with up to 12in spark coils and up to 30A. It followed a style that had been used by telegraphists on land line circuits before the turn of the century. The design was still in use until a few years ago. Price $1.75

Advertisement appearing in *Scientific American* in November 1905. It was the first radio kit ever to be offered to American wireless amateurs

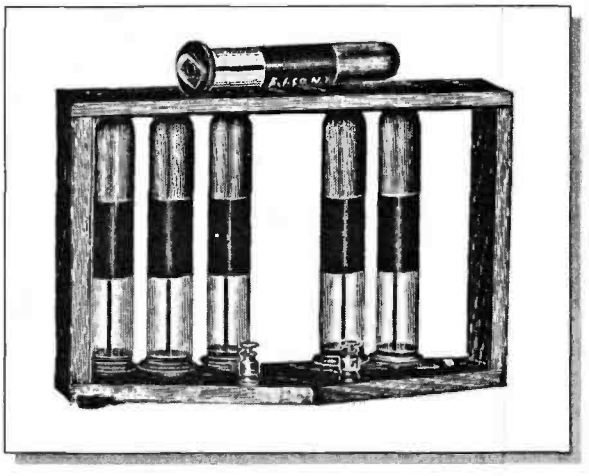
The 'Intercity' sending outfit. This was ready assembled and needed only a 4-wire antenna, 25 feet above ground. A 1in spark coil was used with 2in spark gap. With the supplied five dry batteries, a rage of up to five miles was claimed. The price, $8.45





With the 'built-in' antennas shown, this set had a range of 50 feet. With a good antenna, up to three miles could be achieved. Its design goes back to very early wireless and was used for experiement and instruction. It used a precision decoherer which, with a 50Ω relay, would ring a bell. The cost with dry cells was $5.25

"Adjustable Condenser'. The complete condenser comprises the stand and six Leyden jar condensers. Each jar had a spring clip at the top and small round metal knobs on the bottom. The jar could be snapped into position in seconds. Price $2.50



Station. In 1913 there were over 700 000 amateur stations in the USA.

Licence Encouraged

Gernsback encouraged all to take out a licence. He pointed out it was a great honour to hold one. The licence was free and not too difficult to obtain. If you lived any distance from a radio inspector you took an oath before a notary public that you were conversant with the law and that you could transmit a wireless message.

The Gernsback organisation produced components as well as complete transmitting and receiving outfits. They even supplied the materials to make the component. One novelty, patented in 1910 was an 'adjustable condenser' consisting of six leyden jars fitted in clips held in a frame of 'well seasoned oak'. From two to six jars could be used to obtain the correct capacity. Use of the Leyden jar considerably increased the duration of the spark and subsequently the range of the transmitter. The foresight of Gernsback in many areas is remarkable. One example is his reference to selenium which he sold in metal sticks at $1.50 an ounce.

"This peculiar substance is a conductor of electricity while exposed to light rays. An insulator in the dark it will close a relay when a match is lighted near cell. SELENIUM WILL SOLVE MANY PROBLEMS DURING THIS CENTURY".

New Publication

In June 1913 a new publication appeared from the Gernsback stable. *The Electrical Experimenter* was devoted entirely to publishing experiments on electricity and wireless. The magazine appeared monthly and a year's subscription was 50c. It was an immediate success and the following year incorporated an updated "Experimental Electricity Course" in 20 lessons. (Gernsback's pioneering *Modern Electrics* had now been incorporated into *Popular Science*).

Hugo Gernsback apparently played no part in the formation of the ARRL in January 1914. However, this is not surprising as the organisation at this time was confined to members of the Hartford Radio Club, Connecticut. It was some years before the League was to become known to every radio amateur throughout the world.

First Science Fiction Novel

Gernsback continued with his writing but now changed course to produce fiction. In 1911 he had written what is often regarded as the very first Science Fiction novel *Ralph 124C41+*. The title apparently translated his visions of the future: "One to foresee for one". In it he described and even illustrated a mechanism that could be likened to modern day radar. In 1926 he began publishing *Amazing Stories*, one of the first magazines to carry science fiction writing as its main theme. But he still maintained a keen interest in wireless. He founded WRNY Radio New York and conducted television experimental broadcasts in 1928. Gernsback also continued his association with the newcomer to wireless. *Radio Amateur News* was initiated in August 1919 and what was to become perhaps his most well known wireless book *Radio for All*, was published in 1922. He died in 1967 in New York City.

Not only in America, but amateurs throughout the world, owe much to Hugo Gernsback, the 'Father of Amateur Wireless'. **PW**

Construction

A Tuned Active Antenna

The modern home tends to have a smaller garden which is insufficiently large to put up a good wire antenna for the lower h.f. bands. This could be a disadvantage to anyone living in these circumstances, but now this very effective tuneable active antenna from Adrian Knott G6KSN changes all that. It should prove more than adequate for even the tiniest of flats, and choice of frequencies covered would also prove very useful at holidays locations.

Whilst many of us possess communications receivers and listen to the h.f. bands, be it amateur, commercial, or broadcast stations, unfortunately we do not all have sufficient space to string up a nest of dipoles cut to our favourite bands, particularly if these happen to include Top Band or some of the lower marine or aeronautical allocations. Thus, it seemed to be a good idea to me that an antenna of small physical size, but with the performance comparable of the full sized dipole could be constructed.

Initial experiments using a short whip feeding into a source follower, then into a one or two transistor amplifier, were disappointing on the lower frequency ranges. This was especially true on topband where swamping and cross modulation from m.w. broadcast stations masked all but the strongest signals. Subsequent investigation revealed that non-linearity in the front-end f.e.t., was the major cause of the problem. Tuning the input stage removed these problems at a stroke. Navigation beacons on topband became audible during the afternoon, suggesting a very respectable sensitivity. A further improvement is achieved by mounting the antenna remotely and feeding the receiver via a coaxial line. It was for these reasons that a remote tuning system was developed along with an indoor power supply and switchable attenuator unit.

Mast-head Unit

The circuit diagram of the remote head unit is shown in Fig. 1. This remote unit may be constructed to cover various portions of the h.f. band, and L1 should be chosen from the range of approximate values shown in Table 1 later in the project, to resonate with Varicap diode D5 over the required band. A short whip antenna is fed to the gate of the f.e.t. TR1., which has protection diodes D1-D4 between the gate and the 0V line. Coil L1, in conjunction with Varicap D5 form the input tuning circuit. The tuning voltage for D5 is filtered by the CR network C3, R2 and C2, then passed via the isolating resistor R1 to the cathode of D5.

The decoupling of source resistor R3 by capacitor C4 provides a degree of gain with TR1, the output of which is fed through blocking capacitor C5 to the wide band amplifier made up of TR2 and TR3. This amplifier has a gain which remains substantially constant over the whole h.f. band and provides a good match to the coaxial line conveying the signal to the indoor unit. The 15V power supply line is filtered and decoupled by capacitors C7 and 8 to reduce noise and power lead pick-up. These capacitors may be omitted if the whole system is built in one metal box, but must be included if the antenna is remote to the power supply unit.

Construction and Technique

On the prototype boards, components were mounted on the copper side of the board, as shown in Fig. 4a and 4b. The isolated areas for items were produced by cutting the copper away to form 'islands' in the correct places. This, by the way, was an early form of surface mounting practiced by many home constructors.

Indoor Unit

Shown in Fig. 2 is the mains p.s.u. and tuning control unit. Transformer T1 is a small 15V 100mA double insulated type with the secondary output going to the diode bridge made up of diodes D6 -D9. Entry of r.f. interference at this point is minimised by paralleling each diode with a capacitor (C9-C12). An l.e.d. D10 and its limiting resistor R9 give a visual indication that the unit is switched on. After filtering by C13 the output voltage is stabilised using a single low power 15V regulator i.c. IC1. An occasional problem with these i.c.s is a tendency to oscillate at a low v.h.f. frequency. These tendencies are counteracted by capacitors C14 and 15, which should be mounted as close as possible to the i.c., preferably using the minimum lead length. Capacitor C16 provides further hum and noise reduction. Tuning control R10 picks off a portion of the 15V rail and passes this to the remote unit tuning voltage filter mentioned earlier.

At times a degree of signal attenuation will improve reception quality, and so two switched attenuator pads have been implemented as shown in Fig. 3a. Switch S1 controls a combination of resistors R11 to 13 which form a 10dB pad whilst maintaining a constant impedance close to 50Ω. Similarly S2 and its associated resistors form a 20dB attenuator pad. These attenuators are not to be taken as exact, but have been calculated and the nearest preferred resistor values been used. The layout of the attenuator switches, which should be mounted as close together as

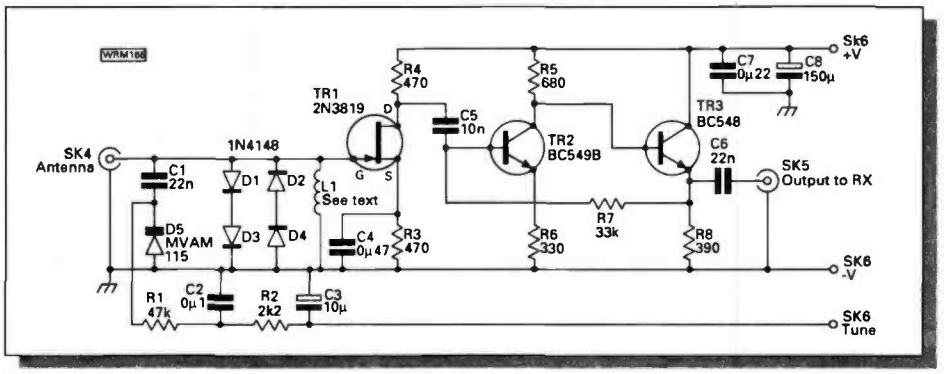


Fig.1

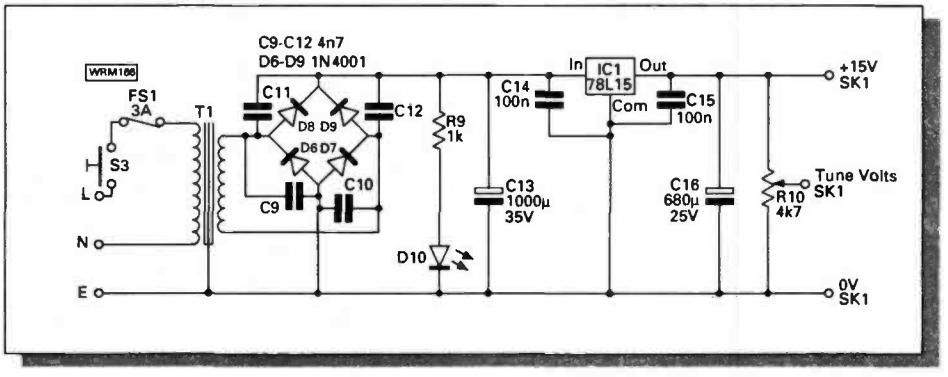
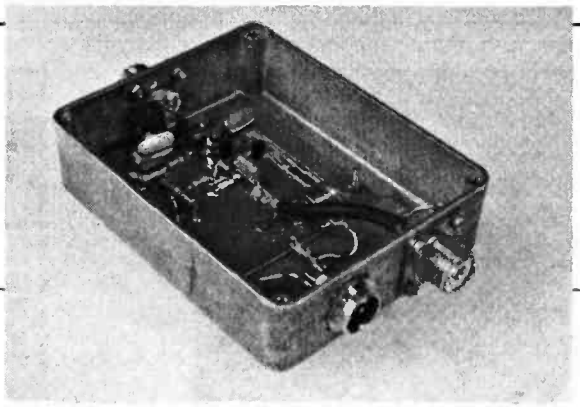


Fig.2



The mast-head unit mounted in its die-cast box

possible using screened coaxial lead for input and output connections, is shown in Fig. 3b.

Testing

Construct the p.s.u. board of the indoor unit and assemble the rest of the unit, but do not connect the output lines at this point. Check that the mains fuse is no greater than 3A, and that the mains connections are safely connected and insulated where appropriate. Finally check that all components are in their correct position and orientation. Switch the unit on and with a multimeter set to read 25V d.c. full scale, measure the voltage across C13. This should be in the region of 20 - 23V, and the l.e.d. D10 should illuminate. Transferring the leads of the meter across C16 to measure the voltage, should result in a reading of 14.5V to 15.5V. If this is the case then measure the voltage available on the slider of R10. It should be possible to obtain a voltage which may be varied between 0V and the voltage across C16.

When all is well, connect the negative side of the power supply to one of the pins of the output socket SK1 and the positive connection to another of the pins. The tune voltage is connected to a third pin. Matching the pins used, solder the control cable conductors to the plug. As the connections are made take note of the colour of the wires and what voltages they carry, this will be needed later.

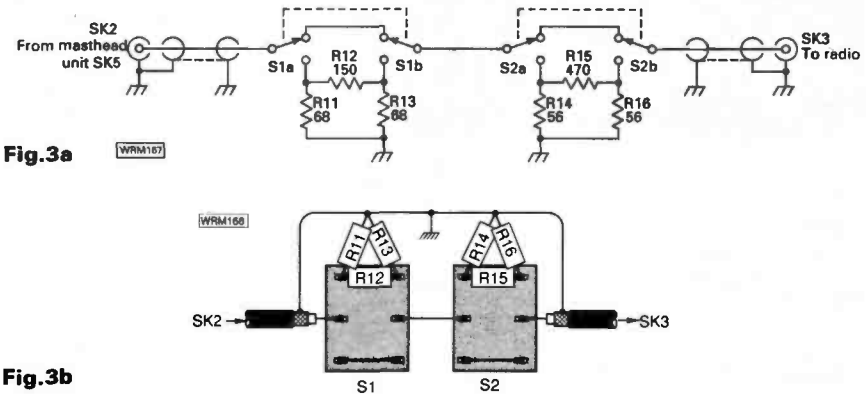


Fig.3a

Fig.3b

Construct the remote mast-head unit, taking care to use the correct islands and to orientate the components correctly. At this point the working position of this remote unit must be decided, as the positioning of the various sockets depends on this. In the prototype the antenna was at one end, with the output, SK5, and control,SK6, sockets at the opposite end to exit vertically downwards in normal use. Drill the box and mount the sockets in the correct positions. Using the colour scheme noted when wiring the indoor unit, solder the remote end plug to the control cable, and make note of the pins used at this end. From the

Shopping list

Resistors

0.25W 5% Carbon film

56Ω	2	R14,16
68Ω	2	R11,13
150Ω	1	R12
330Ω	1	R6
390Ω	1	R8
470Ω	3	R3,4,15
680Ω	1	R5
1kΩ	1	R9
2.2kΩ	1	R2
33kΩ	1	R7
47kΩ	1	R1

Potentiometer lin. rotary

4.7kΩ	1	R10

(5kΩ more usual in catalogues)

Capacitors

Disc ceramic

4.7nF	4	C9-12
10nF	1	C5
22nF	2	C1,6
100nF	3	C2,14,15

Miniature polyester 100V

220nF	1	C7
470nF	1	C4

Electrolytic axial leads 25v working

10µF	1	C3
150µF	1	C8
680µF	1	C16

Electrolytic axial leads 35V working

1000µF	1	C13

Inductors see text and Table 1.

Semiconductors

Transistors

BC548	1	TR3
BC549B	1	TR2
2N3819	1	TR1

Integrated Circuits

78L15	1	IC1. (low power 15V regulator i.c.)

Diodes

l.e.d	1	D10 (colour of choice)
MVAM115	1	D5 (27-560pF Varicap)
1N4001	4	D6-9
1N4148	4	D1-4

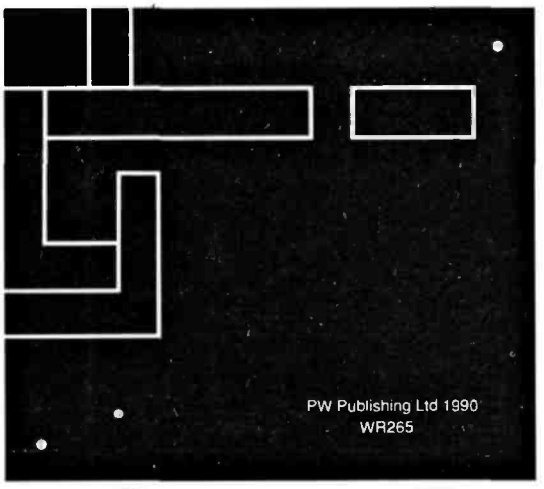
Miscellaneous

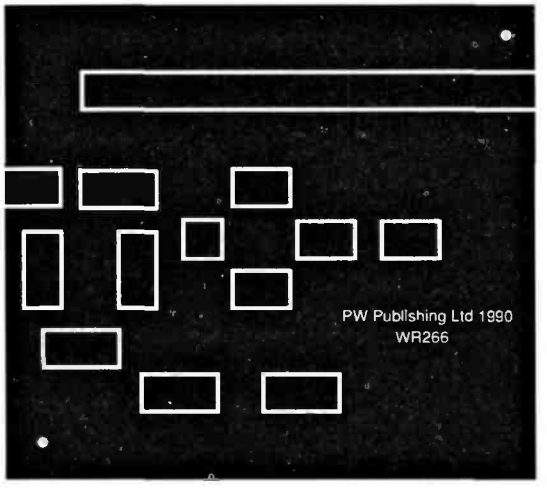
15V 100mA transformer; 3A fuse and chassis mounted fuse holder; low power three core mains cable; Mains on/off switch; 2 x 2 pole miniature change over switches; Diecast aluminium box 121 x 95 x 29mm for the remote head unit; Suitable aluminium box, approximately 150 x 120 x 50mm, for the main indoor unit; Coaxial plugs and sockets plus coaxial cable; two pairs of plugs & sockets, plus lightweight 3 core control cable; Single strand connecting wire of various colours; Suitable knob for the tuning control.

Inductance	f minimum (MHz)	f maximum (MHz)
1.0µH	7.12	30.63
1.2µH	6.50	27.96
1.5µH	5.81	25.01
1.8µH	5.31	22.83
2.2µH	4.80	20.65
2.7µH	4.33	18.64
3.3µH	3.92	16.86
3.9µH	3.60	15.51
4.7µH	3.28	14.13
5.6µH	3.01	12.94
6.8µH	2.73	11.75
8.2µH	2.49	10.70
10.0µH	2.25	9.69
12.0µH	2.05	8.84
15.0µH	1.84	7.91
18.0µH	1.68	7.22
22.0µH	1.52	6.53
27.0µH	1.37	5.89
33.0µH	1.24	5.33
39.0µH	1.14	4.90
47.0µH	1.04	4.47

Table 1.

HOW MUCH ?
£ 35.00
HOW DIFFICULT
Intermediate





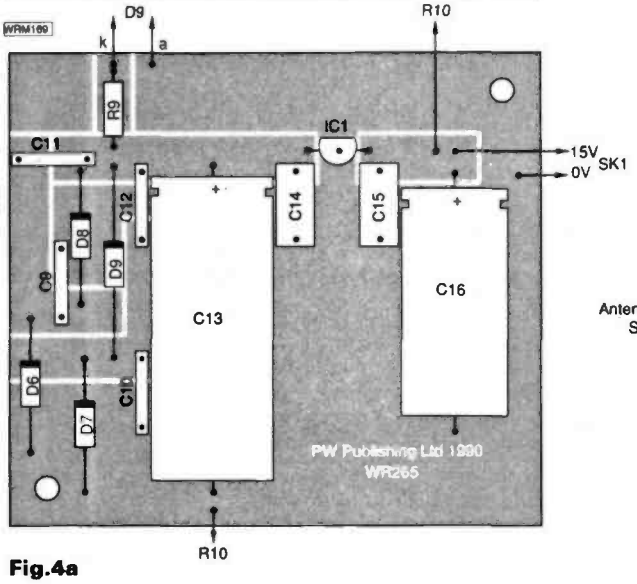


Fig.4a

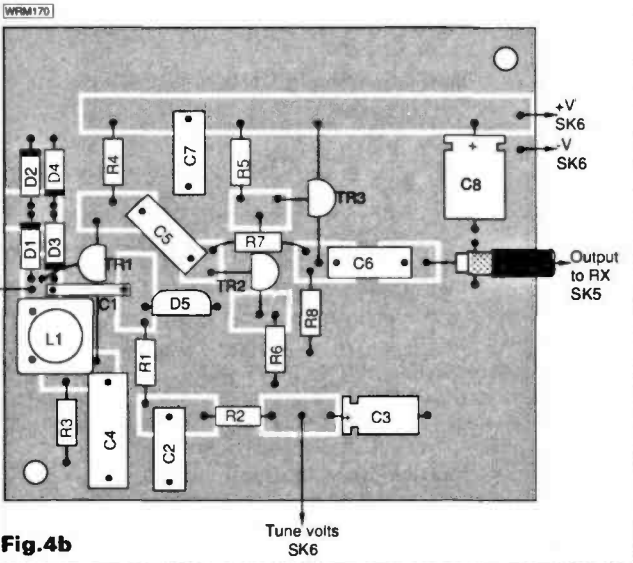


Fig.4b

corresponding pins of the socket, connect the 0V line to area marked -V in Fig. 4b and the 15V line to the land marked +V in the same diagram. Finally connect the tune volts line to the land on the positive side of C3.

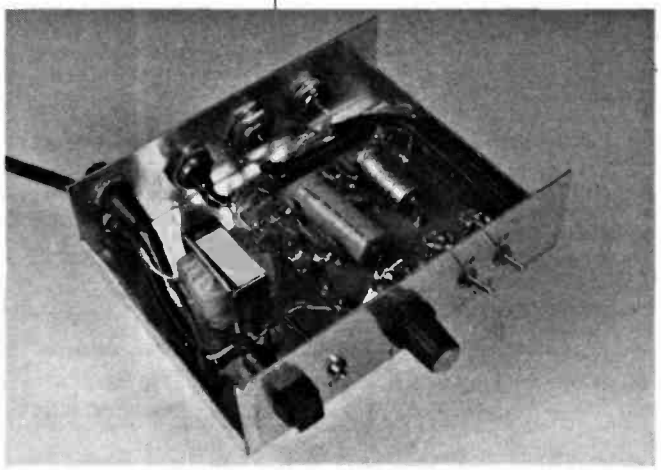
Carefully check all connections, components and orientations, and, if all is as it should be, connect the remote masthead unit to the indoor unit using the control cable. Monitor the voltage across C3 in the remote unit, it should be the same as the output voltage from the p.s.u. Also check the tune volts line in the remote unit, this should slowly follow the movement of the wiper of R10, and be variable between both supply rail limits. If this is not the case switch off and recheck all the connections.

Assuming that all is well then connect the short antenna to socket SK4 and the remote unit to the input of the attenuator pads via a suitable length of coaxial cable. The output from the attenuators should be connected, via a second piece of coaxial cable, to a communications receiver. Tune the receiver to the low end of the band of interest and set the tune volts to minimum. Noting the level of noise on the receiver, slowly rotate R10 to increase the tune voltage. The level of noise should peak and then decrease as the remote unit is tuned towards the higher frequencies. Retune the receiver to about twice its original frequency setting and retune the remote unit to peak the noise or signal level again.

At this point check the operation of the attenuators. Tune to a fairly strong constant signal, and operate both switches individually. If the receiver has a signal strength meter, an indication of their action should be obvious. However if no meter is fitted, a slight change in audio output may be the only indication of the attenuators coming into circuit.

Retune both the receiver and the remote unit to discover the upper and lower limits of coverage of the system. The frequencies at the both ends will vary with temperature, so if the band of interest is to be found at an extreme end, the next inductance value up or down should be chosen to place the required frequency towards the centre of tuning.

The combined indoor power and remote tuning unit

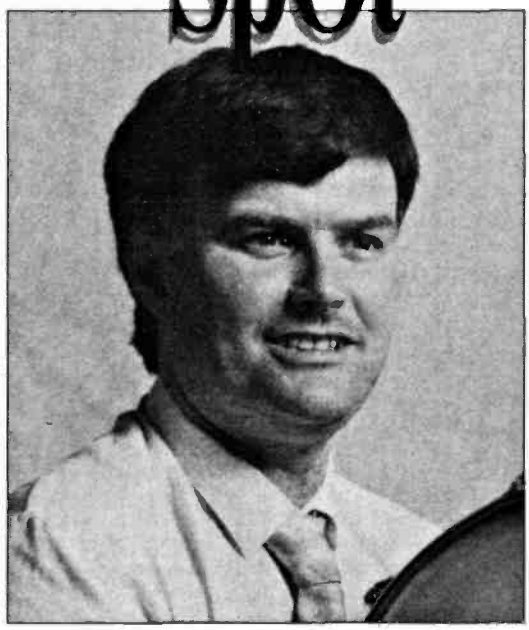


In Use

In use the antenna has been found to give impressive results on very weak stations, but at the same time copes very well with the end-stopping signals of the 6MHz band without signs of overload or cross modulation. This antenna has proved invaluable to the author and it is hoped that it may be of interest to others where space is at a premium. **PW**

Ten SpOt

Ten metres, or the 28MHz band, is a mystery band. It's at the top of the h.f. spectrum, dead most of the time but is rumoured to possess mystical powers every eleven years or so. In this monthly column, John Petters G3YPZ aims to explain matters and point the finger in the right direction of an exciting part of amateur radio.



John Petters was born in London in 1953. He discovered amateur radio in 1966, when his uncle bought him a CR300 receiver. He sat the RAE in May 1969 and was licensed as G3YPZ in August that year.

By 1970, he was equipped with an old KW Viceroy and lapping up the DX on the 14MHz band. One winter's afternoon he happened to tune his old home-brew receiver onto 28MHz and was staggered to hear the sounds of Stateside on a.m. - just like he was hearing the BBC. Running re-inserted carrier s.s.b., he was able to fake an a.m. signal and worked these stations on about 50 watts into a long wire. To his amazement he was getting 5/9 reports back.

Single sideband also proved fun, while c.w. on 28MHz to Stateside was 'a doddle'. No QRM like 14MHz, plenty of space, simple low power gear and, to him, the true spirit of amateur radio.

Since then, he's never looked back.

The secret of getting good results on the 28MHz band (10m) is mainly dependent on two things, a good sensitive receiver and a good dedicated antenna.

The Receiver

Historically, multi-band transceivers have suffered badly from a lack of sensitivity on the band. Unfortunately, 28MHz seems to have been almost an after-thought - after all it is dead most of the time - and when it is open the DX is so strong anyway!

This line of thinking has for years masked the true capabilities of this unique part of our spectrum. Current state-of-the-art rigs seem to be quite reasonable, but if you are using an FT-101, or even older, a KW-2000 then you will need to improve the front-end.

A simple m.o.s.f.e.t. pre-amplifier, as shown in Fig. 1, will put more than a bit of life into any of the older receivers.

The component values are as follows:

TR1 3SK88, BF960, 961 or 981
R1 68kΩ
R2 22kΩ
R3 100Ω
C1-3 10nF monolithic chip capacitors
C4 10nF (not critical as to type)
C5-6 5-65pF trimmers
L1-2 8 turns, 22 gauge wire close wound on 0.25in former tapped at 2 turns from the earthy end.

The pre-amplifier should be constructed on double-sided p.c.b.

The use of monolithic chip capacitors is recommended for decoupling as this will reduce the risk of instability. A ferrite bead can also be inserted in the drain of the m.o.s.f.e.t. if problems persist.

It may also be necessary to screen the input and output coils from each other.

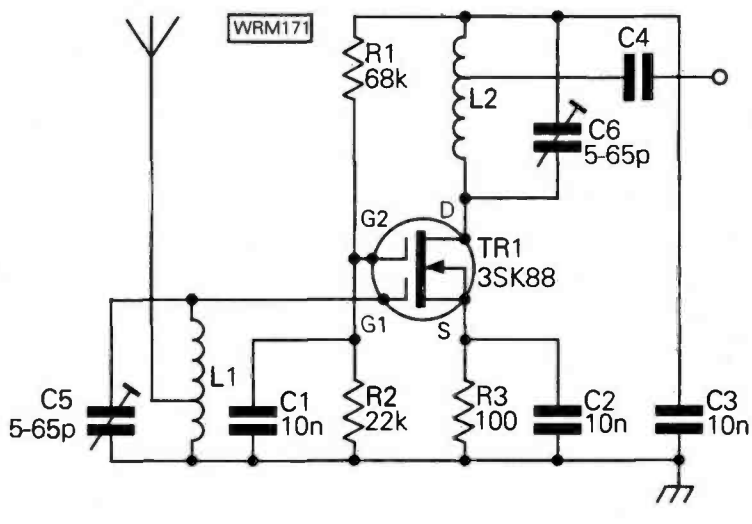
Of course, some form of switching would need to be used if operation is intended for a transceiver, I personally would advise a relay, powered from the p.t.t. line, as opposed to an r.f. sensed switch, in the interest of preserving the m.o.s.f.e.t. All components are readily available from suppliers such as Cirkit plc at Broxbourne and Maplin Electronics. Cirkit also do a range of Toko coils which include r.f. coils for 28MHz. These can be used in place of the home-brew types described previously.

The pre-amp should give something in the region of 20dB gain and should reveal a lot of weak, but workable signals especially on inter-G contacts and satellite working.

For those using converted CB rigs on f.m., there are numerous mods to improve the RX performance. The Icom 1050, LCL JWR and DNT rigs all benefit from changing the front-end m.o.s.f.e.t. to one of the types already mentioned, as well as replacing the ceramic i.f. filter with the 10.695MHz crystal filter available from Cirkit plc. It is just a matter of the filter change and terminating the input side with a 1.8kΩ resistor down to ground.

These mods alone will substantially improve results. There are further mods to mixers, etc., that can also be tackled.

For those using rigs with bipolar front-ends the easiest way to improve matters is to use the external pre-amp. **PW**



28 MHz Pre-amplifier

Next month we will look at 28MHz antennas, mobile operation and your reports.

REVIEW

The Yaesu FT-1000 HF Transceiver

At the 1989 Leicester Exhibition, Yaesu's brand new 'flagship', the FT-1000 HF DX transceiver, was proudly displayed. Chris Lorek BSc (Hons) AMIEE G4HCL put this rig through its paces.

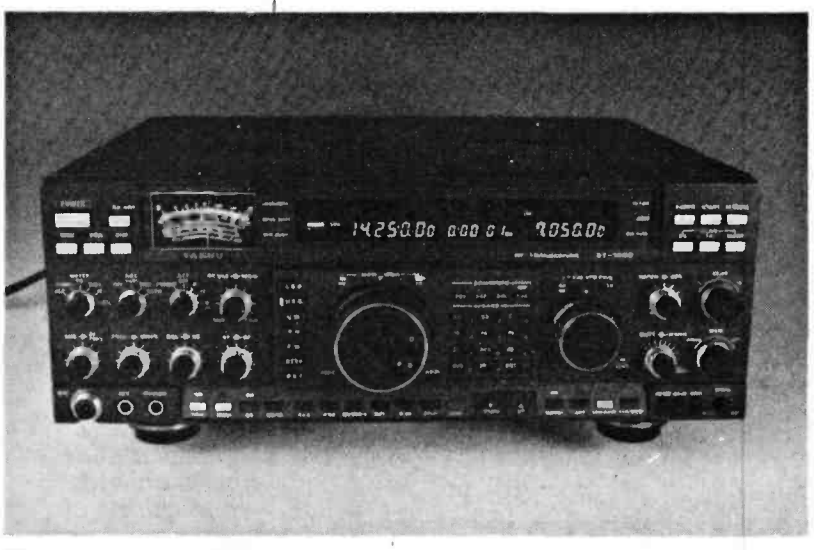
Digital Signal Generation

For the first time in their transceivers, Yaesu have used a direct digital synthesis (d.d.s.) method of local oscillator generation, the FT-1000 having two 10-bit d.d.s. together with three further 8-bit d.d.s. all controlled by their relevant microprocessors. No voltage controlled oscillators with their phase noise problems, but instead a handful of digital i.c.s providing the required signals. Twin internal receivers each with their own v.f.o.s together with an optional digital received audio storage facility whetted my DX chasing appetite, I was pleased to have the first UK review model.

Main Features

Priced at £2995, the set covers every WARC h.f. amateur band on transceive, together with a general receive coverage facility over 100kHz to 30MHz. In line with the ever-increasing trend of efficient digital modes of communications, dedicated 'packet' and 'RTTY' modes of operation are fitted alongside the traditional l.s.b., u.s.b., a.m., f.m. and c.w., a switching time of around 18ms being provided for fast c.w. break-in as well as rapid data transmit/receive switching.

The transmitter gives a controllable output of up to 200W, with p.t.t., VOX, MOX, c.w. break-in and automatic TNC-controlled transmit switching methods provided. A c.w. keyer is also built-in with variable speed and weight controls. Switching, a.l.c. and frequency band information sockets are provided on the rear panel to allow automatic control of an external linear amplifier.



Two Internal Receivers

Twin receivers are provided which can each be used on different operation modes and receiver bandwidths if needed. They normally use the same antenna socket and front end filters, but a plug-in bandpass unit at £69 is available to provide reception capabilities over any frequency split. Two separate v.f.o. knobs control the individual receivers, the set having a stereo output socket together with a panel mounted balance control to feed the received audio to 'left' and 'right' channels if required, giving you a new experience when you plug stereo headphones in! An additional antenna socket is also fitted to the rear panel for receive-only use, for 1.8MHz band DX chasing for example, this may be used either with or without the bandpass unit and is switched from the front panel.

Receiver Circuitry

A quadruple conversion system is used on receive, with a high first i.f. of 73.62MHz being followed by further i.f.s of 8.215MHz, 455kHz, and 100kHz, the final i.f. not being used on f.m.. Four crystal filters are provided as standard in the 8.215MHz i.f. and a further two filters in the 455kHz i.f., providing main receiver bandwidths of 250Hz, 500Hz, 2.0kHz, 2.4kHz and 6.0kHz. As well as this, the sub receiver comes with 2.4kHz filters in both its second i.f. of 7.68MHz and its third i.f. of 455kHz, and additional filters may be fitted in either receiver for more selectivity.

Fourteen 5-pole main channel front-end bandpass filters are automatically switched in, depending upon the band selected (together with another eleven in the sub-receiver filter if fitted). Following these, a cascode dual j.f.e.t. r.f. amplifier may be switched in or out of the receiver front-end, the receiver itself claiming a massive 108dB two-tone dynamic range (with +32dBm 3rd order intercept point) to alleviate problems from the many high-powered h.f. signals to be found. Switching in the preamp gives a noise floor of -138dB to make sure weak signals on 10m and the like are able to overcome the noise. A double balanced mixer ring using four high Idss j.f.e.t. comes next, and a front panel control lets you select either direct mixer feed, in-line pre-amp, or three steps of attenuation according to band conditions. No more problems with the chap down the road wiping your receiver out when the rare DX appears, providing the neighbouring transmitter is 'clean' of course!

Digital Communications

For those amateurs who like to communicate using their computers helping them, dedicated sockets are provided for connection of both a packet TNC and a RTTY/AMTOR terminal unit, with corresponding front panel mode selector buttons switching these in. A built-in microprocessor controls the audio frequency shift keying tones for RTTY and AMTOR, these can be set to either the standard 1275Hz mark tone or to the alternate 2125Hz tone as used with some American terminal units, and together with these, either 170Hz, 425Hz and 850Hz shifts may be used.

A significant and very useful point is that the narrow i.f. filters can be switched in for data use as needed, with the receiver passband being automatically centred onto the signal frequencies. The receiver frequency display then showing the actual centre of the two transmitted tones. This allows you to make the best use of the narrow filters rather than having to put up with s.s.b. bandwidths with resultant QRM problems on busy bands.

Computer Control

In common with Yaesu's other base-station transceivers, many of the set's functions can be controlled via. a c.a.t. (Computer Aided Transceiver) serial data socket on the rear panel, using standard RS-232 data through an interface unit. Existing software that works with the FT-747 may also be used with the FT-1000 with suitable modifications as required for the extra filters provided. With the UK licence now allowing remote control of our main station through a radio link, this provision should find more and more uses in days to come, and it is interesting to note that a Greek amateur already runs a h.f. packet BBS with c.a.t. auto-QSY control from off-air users commands!

CW Use

As individual amateurs have their own preferences, the FT-1000 lets you select a b.f.o. offset of 700, 600, 500 or 400Hz, and together with the narrow i.f. filters a variable audio peak filter gives a further amount of selectivity. For those who like a tuning aid, a phase-lock loop 'spotting' l.e.d. lights when you've correctly netted onto a c.w. signal, flashing in synchronism with the received c.w. However for the real DX chaser, a c.w. 'netting' oscillator can be used so you can put your c.w. signal exactly where you want it in relation to the DX station's signal, or indeed, in relation to all the others calling him! Full break-in switching is provided, and an internal c.w. keyer is fitted with which you can vary the weight ratio in 15 steps, from 1:3 to 1:4.5 dot/dash ratio.

Received Audio Storage

A novel optional fitment is the DVS-2 digital recording option, being a small unit around the size of a TV remote control which plugs into the set via a lead. This unit stores the received audio continuously, and pressing the 'STOP' button on the control saves the last 16 seconds of audio into its digital memory. This can them be played back through the FT-1000's speaker or earphone socket, as many times as you like. Great for when the DX station you've been calling for hours has just given you your report and a 73, then gone on to the next station just as your doorbell rang obliterating the details!

In transmit mode, either two 8-second calls or four 4-second calls can be stored to give your throat a rest during DX calling or contest working, these can be played back on air as many times as you like (Roger, your report is 5-9, 1-4, 73.....CQ Contest, CQ Contest, this is.....)!

Internal ATU

To let you get on with working stations rather than tuning antenna matchers, an automatic a.t.u. is internally fitted as standard. This has a matching range of 3:1 s.w.r., i.e. it can tune out the impedance mismatch from some off-resonance antenna but may not, of course, match long

More controls available on the back panel for setting personal preferences

wire or G5RV antennas. As well as an automatic adjustment being started when required, 39 a.t.u. memories are fitted for quick recall of previously used settings depending on which band and which part of the band you happen to be operating on at any time. If that isn't enough, then the a.t.u. setting controls are also accessible, through the transceiver's c.a.t. socket by an external computer.

The Front Panel

Looking at the front panel of the set, at first is quite bewildering , but a quick 'tour around' the controls nicely describes the set's other facilities. At the top left, next to the usual Power, VOX and MOX controls, are buttons to select the external receive antenna, and a 'DIM' facility to dim the set's display for all-night DX chasing sessions. Below these, rotary controls let you switch the meter functions to read either a.l.c. level, compression, power out, s.w.r., p.a. collector current or p.a. collector coltage on transmit, and to set the receiver a.g.c. to either slow, medium, fast or completely off. Next in line is the pre-amp switch controlling the f.e.t. r.f. pre-amp on quiet bands, or alternatively introduce 6, 12, or 18dB of attenuation in line when needed, every 6dB corresponding to one S point. An RX MIX control acts as a 'balance' knob to vary the relative audio levels from the two receivers, and a 'MONI' provides an off-air final frequency r.f. monitor of your transmitted signal through the set's speaker or headphone socket to let you hear what you really sound like. Below these are further rotary controls to let you adjust the mic gain, TX power from 20-200W, r.f. processing level, TX drive, receiver squelch and noise blanker threshold, together with the usual receiver audio and r.f. gain controls.

Along the bottom of the panel are a row of buttons switching in the r.f. speech processor, the TX monitor facility, and the two noise blankers, one with a narrow pulse width for ignition interference and the like, the other being wider for over-the-horizon radar pulse interference. Memory selectors and v.f.o. let you chop and change frequencies to your heart's content, with the 'RPT' button switching in a 100kHz repeater shift for 28MHz f.m. use. An 'M CK' button lets you see what you've stored in the set's 99 tunable memories to save you keeping a channel list to hand. The 'SPLIT' function lets you operate split-v.f.o. transmit/receive, and the 'DUAL' button switches between single and twin internal receiver operation. Finally, the 'NOTCH' and 'APF' buttons switch in the receiver i.f. notch and the tunable audio peak filter when the QRM gets a bit too much.

Towards the bottom right are the c.w. keyer controls and a 'SPOT' button for accurate netting, the adjacent 'SPEED' control setting the internal keyer speed. Above these are concentric controls to let you further narrow the receiver i.f. width and shift the centre position as needed to finally eradicate the 5-9++ station tuning up next to you. Above this is the i.f. notch control to use when the interfering heterodyne is on your frequency. The APF variable allows you to tune the audio peak filter centre frequency to wherever you prefer, and on the extreme right are large controls for the receiver clarifier and memory channel selection. Above these are the clarifier

DEWSBURY ELECTRONICS

G4CLX

POCOM
SWISS MADE BY POLY-ELECTRONIC

Communication decoders

AFR-1000 Automatic CW-RTTY Decoder

The microprocessor-controlled POCOM AFR-1000 CW-RTTY Decoder automatically processes radio teletype signals in accordance with **Baudot No. 1 and No. 2, ASCII, ARQ/FEC (SITOR/SPECTOR/AMTOR) and CW (Morse telegraphy)** standards and corresponds to the latest state of the art. The AFR-1000 Automatic Decoder is remarkable for its value for money. Its moderate price makes it particularly suitable for the cost-conscious RTTY beginner. Unlike the other models in the AFR series, however, it cannot be upgraded for special codes.

FEATURES

- *Fully automatic recognition of CW, ARQ-FEC and BAUDOT No. 1 and No. 2 teletype signals with automatic decoding, independently of the shift position.*
- *Baud rate analysis in the range from approx. 30 to 250 bauds.*
- *Extremely fast phasing of ARQ-FEC signals (Typical: 1-5 seconds).*
- *Special narrow-band quadrature discriminator for all usual LF shifts of 50-1000 Hz and CW Morse telegraphy.*
- *Swiss technology and quality — 1-year guarantee.*

The **POCOM AFR-1000** is extremely easy to use and very simple to operate. The **AFR-1000** is simply connected to the loudspeaker outlet on the shortwave receiver. Operation is confined merely to choosing the mode required. No tiresome testing of the baud rate and shift position. Two LED's indicate the active operation states in each case.

The baud modulation rate measurement facility is a complete new innovation in a unit in this price range. Knowledge of the baud rate permits reference to special codes, specific radio services, etc., and makes it possible to shed light upon a radio teletype signal. The display is provided on the screen or printer linked to it to 1/1000 baud (e.g. 96.245 bauds) with quartz accuracy and within a measuring range of approx. 30 to 250 bauds.

STOP PRESS

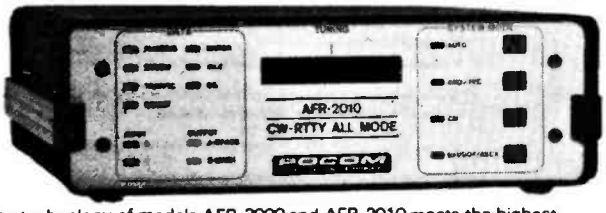
HF-VHF PACKET RADIO DECODER

available **NOW!!**

— does not require computer

S.A.E. for details of this and other products

AFR-2010 All Mode CW/RTTY Decoder



The technology of models AFR-2000 and AFR-2010 meets the highest demands. Their exceptional value for money will not be so easy to obtain in the near future. By choosing one of these units, you will be deciding in favour of the latest receiver on the market — enabling you to receive more and do less setting! Teletype reception has never been so easy!

The SW-reception system of the future on professional level for the serious DX-er!

POCOM® PFC-100

Intelligent Frequency-Controller for ICOM R-70/JRC NRD-515

PFC-100 FEATURES:

Nonvolatile memory for 100 complete operation settings — all functions can be programmed from the keyboard — versatile timer functions (on/off); 6 outputs can be switched separately — automatic memory channel and frequency scan modes with freely definable parameters — frequency offset mode for converter usage — alphanumeric liquid crystal display — intelligent selftest functions — 6KByte user ram, 16KByte operating program — low power consumption 8 Bit CMOS CPU — easy software adaption for future modifications — developed and manufactured in Switzerland by Poly-Electronic.

The efficient monitoring of the complete SW-range calls for the use of modern receivers which should offer a large amount of operating comfort. Recently good receivers such as the popular ICOM R-70 and the JRC NRD-515 have become available on the market, but they lack the optimal microprocessor-supported operating possibilities. These requirements are fulfilled by the intelligent programmable frequency controller POCOM PFC-100 from Poly-Electronic.

The use of up-to-date circuit technology contributes to the class of this innovation which meets the highest demands of all active SW-listeners. Together with one of the two receivers (ICOM/JRC) the PFC-100 permits an unsurpassed degree of operational ease due to the consequent use of a microprocessor and comfortable software.

Large S.A.E. for details *Price to be announced*

Dewsbury Electronics offer a full range of **Kenwood Equipment** always in stock.

WE ARE STOCKISTS OF POCOM — JRC — TAR — DIAWA — MICROWAVE MODULES — BNOS — LOWE — STAR MASTERKEY — WAVECOM

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG
Telephone: Stourbridge (0384 390063/371228
Fax: (0384) 371228

VISA Access

Instant finance available subject to status. Written details on request.

DEWSBURY ELECTRONICS

G4CLX

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.

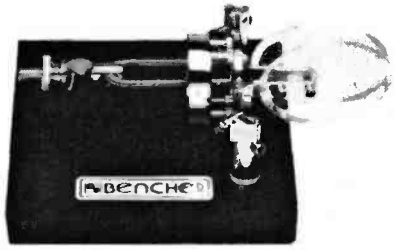
Indication of operating mode on leds. Sidetone and relay output for all types of transmitter.

Full QWERTY keyboard with real keys.

Metal cased for RF immunity.

APPROVED KENWOOD DEALER

STAR MASTERKEY
CMOS MEMORY KEYER
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 KEYERS £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.
Telephone: Stourbridge (0384) 390063/371228
Fax: (0384) 371228

Instant finance available subject to status. Written details on request.

VISA

Access

switches for use on either receive and/or transmit, together with a 'CLEAR' button to zero the clarifier. Above these are the automatic a.t.u. controls to switch the tuner in or out, together with a 'START' button to commence tuning for a match. At the top right is the M.SCAN button which starts the set hunting through all its memory channels for those who like to know everything that's going on around the spectrum.

To the left of the main tuning knob are the single-press mode buttons, to the right is the band-change keypad, this doubles as a direct frequency entry keypad, above which are the single-press buttons for altering the receiver i.f. filter selection. The smaller sub-v.f.o. knob controls just that facility, and either v.f.o. knob may be locked to prevent accidental change.

On The Air

After the required 'tour round' the controls to familiarise myself with its operation (i.e. 'Where's the On/Off switch?'), in went the antenna and power leads and a pleasant time was had by having a good listen around using a variety of antennas.

The first thing I noticed was that all the bands seemed quieter than usual, but comparing the set with my normal receiver showed that all the signals were there, but what was missing was all the background 'mush' due to internal mixing products. Switching in the front-end pre-amp brought the level of signals up, but the result was still a nice 'clean' band, even 7MHz (40m) in the evening! Tuning through the strong broadcast station 'intruders' on 7MHz didn't bring up the usual hacksaw-rasp type noise from the set's synthesiser at all, but instead strong tuned signals just came in cleanly, and went away similarly cleanly. Mind you, listening to European 14MHz (20m) signals at the weekend was certainly an eye opener - I could quickly find the stations who were using the 'alternative' method of speech compression, i.e. turning their drive level up to maximum and shouting down the microphone!

As a critical test of the set's capabilities under demanding conditions, I tried a little 'DX Chasing' during a recent h.f. contest, where stations galore were crammed into the bands, all trying to work each other. Within a few hours just using the set's 200W on s.s.b., I had worked over 50 DX stations including HR (Honduras), V4 (St. Kitts Nevis), OH0 (Aarland Is), FS (French St. Martin), VP2E (Anguilla), PJ8 (Netherlands St. Maarten), P4 (Netherlands Antilles), VP9 (Bermuda), HI (Dominican Republic) and VP5 (Turk Is). I was most impressed! The secret was in being able to receive the often very weak DX stations in the presence of much stronger interfering signals, coupled with use of the set's filters, notch, and shift controls which really did have a positive effect. The various controls often fell into place with my fingers easily, but I must say I was most annoyed when I accidentally touched the 'M SCAN' button at the corner of the set and lost the DX station I was just about to call, with no record of what the frequency was! A band change and very careful re-tune was then needed, with me quietly cursing to myself.

Changing bands by pressing the appropriate 'BAND' button, always placed the set on the last-used frequency in that band, this was very useful as it saved a re-tune each time. Likewise the last-used mode and filter bandwidth on that band was always recalled, which was a nice touch! With this facility fitted, I found I rarely used the v.f.o. memories for amateur band frequencies, slowly filling them up instead with various broadcast and interesting 'utility' frequencies for easy selection, when I wanted a change from amateur radio.

During longer 'ragchew' QSO sessions on the l.f. bands using an essentially non-directional antenna, I often found that I could copy other stations better than they could copy me, even though with 200W I was usually running more power than they were. Reports of "You're strength nine but the continental QRM is proving a problem" were typical, again showing the set's QRM rejection capabilities. In the clear, reports of my transmitted audio were very good, even with the r.f. processor turned up which one would normally expect to degrade the signal quality even if the weak-signal readability was improved.

On 28MHz (10m) f.m., again I received good reports on my transmission but I sometimes found quite a bit of distortion on received speech due to the 6kHz filter used on f.m. With the odd station running around ±4kHz to 5kHz deviation this filter was unfortunately too narrow, but this problem really lies with the stations running too much deviation for 10kHz channel spacing use. However, I feel a 12kHz filter would have been useful here, even if only for transverting up to v.h.f. or u.h.f., but then the set wasn't really designed for transverter use I suppose. Selecting f.m. mode speeded up the tuning rate of the v.f.o., from 10Hz steps to 100Hz steps which made tuning easy. A minor criticism is that I found the repeater button was hidden from normal view by the v.f.o. knob, and I had to be careful to bend my head down to check I was pressing the right button!

Using the set on h.f. packet was an absolute pleasure, pressing the 'PACKET' mode button the mode started cycling between s.s.b. with 200Hz shift for 300 baud use, and f.m. with 1000Hz shift for 1200 baud use, automatically switched in the connections to my external TNC plugged into the rear panel. Listening around the 14.099MHz area with the narrow filter selected showed good results, with screens full of data being displayed on my computer.

In all, I was very pleased indeed with the on-air performance, with the only 'moans' of the odd awkward button position being fairly minor as the vast majority of the set's multitude of functions were extremely easy to operate. My logbook certainly looked a lot more healthy after the review period!

Technical Results

The transmitter delivered in excess of the specified power on all amateur bands, and measuring the two-tone s.s.b. inter-modulation distortion, i.e. the amount of 'spreading' of the signal, showed the transmitter p.a. to be very linear indeed, no doubt due to 30V supply used to feed the MRF422 output p.a. transistors. Even with the processor in, the signal was very narrow, although when cranking the level up to 20dB the inner products came up in level.

On receive, the performance was often beyond the limit of the latest professional measuring equipment, with no measurable trace whatsoever of synthesiser phase noise. This noise often causes many expensive transceivers to fail in their rejection of closely-spaced interfering signals (look at the spate of 'add-on' phase noise reduction p.c.b.s in the past!). Several days worth of r.f. testing in the lab just confirmed the good performance found on air, what more can be said? **PW**

Yaesu's latest 'Flagship' transceiver clearly lives up to its name, and much thought must have gone into its design, it certainly is a departure from their traditional type of equipment. The set was extremely easy to use due to the simple one-touch controls, with many of the various knobs and buttons being sensibly placed for easy location. The twin receive facility was very useful when chasing DX, very akin to the use of separate transmitter/receiver combinations as favoured by the top DXers of the amateur world, the addition of the auxiliary receiver bandpass add-on giving unlimited frequency split operation. The set does not, I feel, lend itself to use as a do-everything v.h.f./u.h.f. transceiver as well as a h.f. DX machine, due to it's limitations with transverter provisions.

It was a pity to have to return the unit following review, even when it left me for one day for photography I started having withdrawal symptoms! Maybe I'll have to have a word with the bank manager.....

My thanks go to **South Midlands Communications Ltd, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY. Tel: 255111** for the loan of the review model.

Chris Lorek is Head of Research and Development at SMC

Lab Results

Receiver
Sensitivity: Input level in µV p.d. required to give 10dB S/N, 0dB attenuation;

Freq MHz	CW 250Hz/500Hz	LSB 2.0kHz/2.4kHz	AM 30% Mod	FM 1.5kHz dev
1.9	0.70µV/0.70µV	1.10µV/1.30µV	4.7µV	1.13µV
3.7	0.70µV/0.65µV	0.80µV/0.85µV	3.8µV	0.90µV
7.1	0.60µV/0.60µV	1.00µV/1.00µV	4.0µV	0.90µV
10.1	0.50µV/0.50µV	0.68µV/0.77µV	3.5µV	0.75µV
14.1	0.57µV/0.64µV	0.82µV/0.90µV	3.2µV	0.90µV
18.1	0.70µV/0.71µV	0.90µV/1.00µV	4.3µV	0.98µV
21.1	0.60µV/0.60µV	0.80µV/0.90µV	3.3µV	0.78µV
24.6	0.50µV/0.50µV	0.70µV/0.85µV	3.3µV	0.70µV
28.1	0.60µV/0.60µV	1.20µV/1.25µV	3.0µV	0.80µV
29.6	0.60µV/0.70µV	0.95µV/1.00µV	4.0µV	0.90µV

AM Sensitivity, pre-amp on;
Input level required to give 10dB S/N;

Freq	Level
1.5MHz	4.3µV p.d.
5.0MHz	1.7µV p.d.
10.0MHz	1.8µV p.d.
15.0MHz	3.1µV p.d.
20.0MHz	1.7µV p.d.
25.0MHz	1.7µV p.d.

Blocking;
Increase over 10dB S/N level of blocking signal degrading S/N by 6dB; measured at 10.7MHz and 21.4MHz, c,w, 500Hz bandwidth 0dB attenuation;

+/-50kHz	>110dB
+/-100kHz	>110dB
+/-1MHz	>110dB

3rd Order Intermodulation Rejection;
Increase over 10dB S/N level of signals spaced by 50kHz giving identical 10dB S/N 3rd order IMD signal; measured at 14MHz, c.w. 500Hz bandwidth. 0dB attenuation.;
> 95dB

IF Rejection;
Difference in level of relative signals at the 73.62MHz first intermediate Frequency and 14MHz, giving S9 signal level; u.s.b. 2.4kHz filter, 0dB attenuation.
85.3dB

IF Notch Rejection
Rejection of 1kHz beat signal; 14MHz u.s.b. 2.4kHz filter 0dB attenuation;
27.0dB

S-Meter Linearity;
14MHz, u.s.b., 2.4kHz filter, 0dB attenuation.

Indication	Sig. Level	Level (dBµV)	dB Change
S1	0	-	-
S2	6.50µV p.d.	16.4dBµV	Ref.
S3	7.60µV p.d.	17.6dBµV	+1.2dB
S4	9.40µV p.d.	19.5dBµV	+1.9dB
S5	11.7µV p.d.	21.4dBµV	+1.9dB
S6	18.1µV p.d.	25.2dBµV	+3.8dB
S7	30.6µV p.d.	29.7dBµV	+4.5dB
S8	54.3µV p.d.	34.7dBµV	+5.0dB
S9	104µV p.d.	40.4dBµV	+5.7dB
S9+10dB	280µV p.d.	49.0dBµV	+8.6dB
S9+20dB	821µV p.d.	58.3dBµV	+9.3dB
S9+30dB	3.08mV p.d.	69.8dBµV	+11.5dB
S9+40dB	12.3mV p.d.	81.8dBµV	+12.0dB
S9+50dB	48.9mV p.d.	93.8dBµV	+12.0dB
S9+60dB	911mV p.d.	119.2dBµV	+25.4dB

RX Effective Bandwidth:
Measured single signal effective bandwidth, 14MHz u.s.b. 2.0kHz bandwidth

-3dB	1.64kHz
-6dB	1.90kHz
-10dB	2.02kHz
-20dB	2.21kHz
-40dB	2.55kHz
-60dB	3.53kHz

Transmitter

TX Power;

Freq MHz	Power SSB (p.e.p.)	CW / FM
1.9	212W	202W
3.7	220W	208W
7.1	222W	211W
10.1	222W	212W
14.1	224W	213W
18.1	223W	213W
21.1	223W	213W
24.6	221W	214W
28.6	220W	213W
29.6	220W	213W

TX Harmonics;

Freq.MHz	2nd	3rd
1.9	-72dBc	-70dBc
3.6	-84dBc	-70dBc
7.1	-83dBc	-81dBc
10.1	-91dBc	-82dBc
14.1	-85dBc	-75dBc
18.1	-89dBc	-70dBc
21.1	-85dBc	-83dBc
24.6	<-90dBc	-85dBc
29.1	<-90dBc	-65dBc

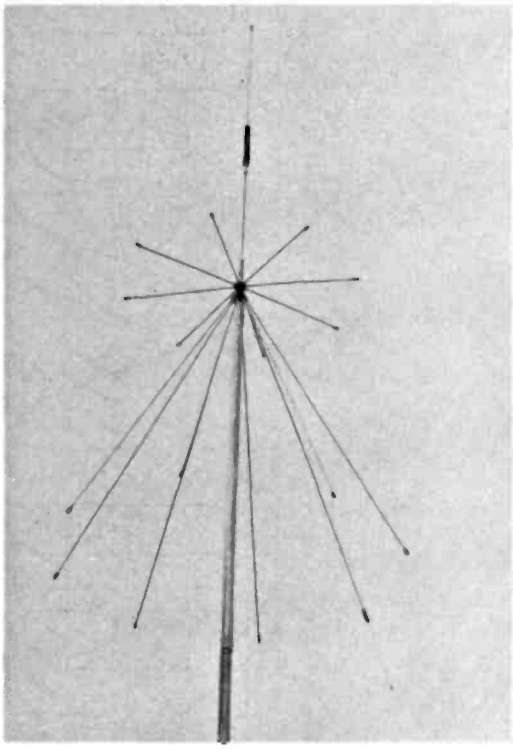
SSB TX Two-Tone inter-modulation distortion;
Measured on 14MHz with 1200Hz and 1800Hz tones, at onset of a.l.c., shown as dB below p.e.p. level.

	3rd	5th	7th	9th	11th
Processor Off;	-33dB	-36dB	-46dB	-49dB	53dB
10dB Processing	-32dB	-41dB	-43dB	-49dB	53dB
20dB Processing	-16dB	-41dB	-42dB	-43dB	44dB

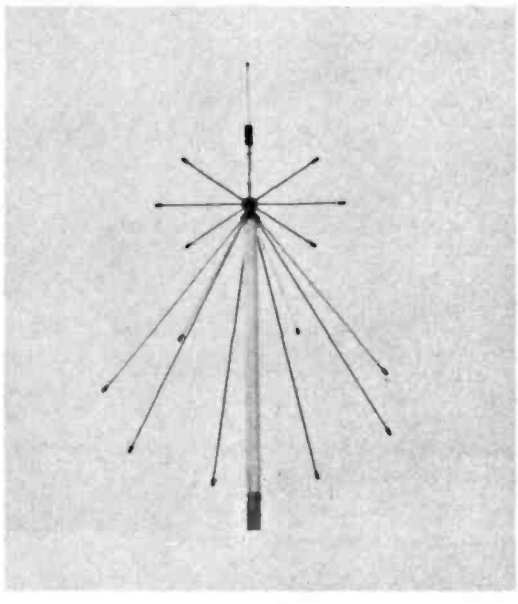
Special Offer

Special Offer! Discone Discount!

PW offers you a choice of two splendid Discone Antennas, both at a special price. Start a new decade with a new Discone.



Type 1 covers 25MHz to 1300MHz. Transmit or listen on 4m, 2m, 70cm and 23cm amateur bands, all with only one antenna. (You may listen on 50MHz, but as it is vertically polarised, you may not transmit on it). Optimised for 144MHz band use, with the resonating whip giving a measured gain of 2dBd.



Type 2 covers 40MHz to 2GHz. Smaller than type 1, so better if space is limited. Transmit or listen on 4m, 2m, 70cm, 23cm amateur bands all with only the one antenna. (As with type 1 you may listen on 50MHz only). Again optimised for 144MHz band use, the whip giving a measured gain of 2dBd.

Costing £47.00 for either type inclusive of postage, the antennas will be supplied direct from Sandpiper Communications. Each comes with a short mounting mast, clamps and 'N' type plug for the cable end.
Make it. - Mount it. - Use it, as easy as that!

How to order:

Complete both coupons in ink, giving your name and address clearly in block capitals. Coupon 2 will be used as the address label to despatch your s.w.r. meter to you. Send your coupons with your cheque to : *Practical Wireless*, Discone Offer (January), Freepost, Enefco House, The Quay, Poole, Dorset BH15 1PP. If you wish to pay by credit card (Access, Mastercard, Eurocard, or Visa only), please fill in your card details and sign the coupon where indicated. Available only to readers of *PW* in England, Scotland, Wales, N. Ireland, the Channel Islands and Isle of Man. Orders are normally despatched within 28 days, but please allow time for carriage. The closing date for this offer is 15 January 1990.

(1)

To: PRACTICAL WIRELESS, Discone Offer (January), FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP

Please send me.....Discone Antennas @ £47.00 each (inc. Post & VAT)
❑ **TYPE 1** ❑ **TYPE 2** (read above for specifications)

Name.....

Address.....

.....

.....Postcode.....

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

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

Card No. | | | | | | | | | | | | | | | | |

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

Signature.....Tel:.....

(2)

Name.....

Address.....

.....

.....

.....Post Code.....

Discone Offer Jan 1990

If you do not wish to cut your copy of *PW* you must send this flash with full details and remittance.
PW Publishing Ltd., Poole, Dorset (Reg. No. 1980539, England)

PW JANUARY 1990 DISCONE OFFER

MICRONTA®

High Technology Test Equipment

30-Range Digital Multimeter

£69.95

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 μF capacitance and transistor gain. Requires 9v battery . **22-194**

Probe Style Autoranging Multimeter

£29.95

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

£59.95

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.

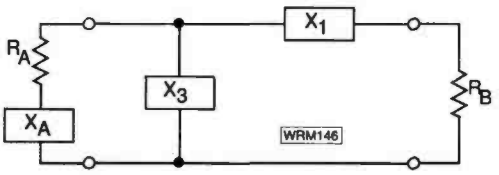
InterTAN U.K. Ltd., Tandy Centre, Leamore Lane, Walsall, West Midlands, WS2 7PS. Tel: 0922 710000

Reading & Understanding Circuit Diagrams

(with a bit of theory thrown in)

In Part 21 of this series, Ray Fautley G3ASG continues looking at the next four different types of impedance matching. Now it's the more complex circuits.

We continue with Type 3, where one impedance is purely resistive and the other comprises resistance and reactance in series. The resistive part of the complex impedance being a higher value than the pure resistance.
The circuit of the matching network is shown in **Fig. 21.1.**



(i) Let the higher value of the resistive part of the complex impedance be designated R_A and the lower value of the pure resistance R_B, regardless of which is source or load.
(ii) Change R_A and X_A to their parallel equivalents, R_A' and X_A'
(iii) Let $p = R_A'/R_B$
(iv) Let $q = \sqrt{(p - 1)}$
(v) Determine $X_1 = +(R_B \times q)$
(vi) Determine $X_2 = -(R_A'/q)$
(vii) Determine

$$X_3 = \frac{(-X_A')\,X_2}{X_2 - X_A'}$$

For our worked example, we'll match a pure resistance of 50Ω to an impedance of 250Ω in series with a reactance of -10Ω.

(i) $R_A = 250$ and $R_B = 50$

(ii) $$R_A' = \frac{250^2 + (-10)^2}{250} = 250.4$$

$$X_A' = \frac{250^2 + (-10)^2}{-10} = -6260$$

(iii) $$p = \frac{250.4}{50} = 5.008$$

(iv) $$q = \sqrt{(5.008 - 1)} = 2.002$$

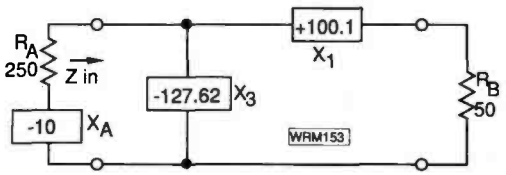
(v) $$X_1 = +(50 \times 2.002) = +100.1$$

(vi) $$X_2 = \frac{-250.4}{2.002} = -125.1$$

(vii) $$X_3 = \frac{(+6260)(-125.1)}{(-125.1) - (-6260)}$$

$$= -127.65$$

The resulting network is shown in **Fig. 21.2**



Checking the arithmetic, Z_{in} (in Fig. 21.2) should work out to be 250Ω in series with a reactance of +10Ω, to resonate with $X_A = -10\Omega$.

(i) Find parallel equivalent of R_B and X_1

$$R' = \frac{50^2 + 100.1^2}{50} = 250.4$$

$$X' = \frac{50^2 + 100.1^2}{+100.1} = +125.08$$

(ii) X' in parallel with X_3 is :

$$\frac{(+125.08)(-127.65)}{(+125.08) + (-127.65)} = +6212.6$$

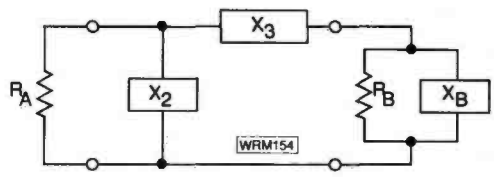
(iii) Finally, the series equivalent to 250.4Ω in parallel with a reactance of +6212.6Ω is :

$$R' = \frac{250.4\,(+6212.6^2)}{(250.4^2) + (+6212.6^2)} = 250$$

$$X' = \frac{(250.4^2)(+6212.6)}{(250.4^2) + (+6212.6^2)} = +10.08$$

So the check gives 250Ω in series with +10.08Ω, which near enough resonates with X_A (-10Ω) to give 250Ω.

Type 4
Where one impedance is purely resistive, the other comprising resistance and reactance in parallel. The pure resistance being a higher value than the resistive part of the complex impedance.
The circuit of the matching network is shown in **Fig. 21.3.**



(i) Let the higher value of the pure resistance be designated R_A and the lower value of the resistive part of the complex impedance R_B, regardless of which is source or load.

Take care when doing the worked examples, make sure you have the right component values

All the maths may look daunting but it's quite simple to follow

(ii) Change R_B and X_B to their series equivalents R_B' and X_B'.
(iii) Let $p = R_A/R_B'$
(iv) Let $q = \sqrt{(p-1)}$
(v) Determine $X_1 = +(R_B' \times q)$
(vi) Determine $X_2 = -(R_A/q)$
(vii) Determine $X_3 = X_1 + (-X_B')$

This example will be to match a pure resistance of 100Ω to a complex impedance of 65Ω in parallel with a reactance of +50Ω.

(i) $R_A = 110$ and $R_B = 65$

(ii) $$R_B' = \frac{65\,(+50^2)}{65^2 + (+50^2)} = 24.16$$

$$X_B' = \frac{(65^2)(+50)}{65^2 + (+50^2)} = +31.41$$

(iii) $$p = \frac{110}{24.16} = 4.553$$

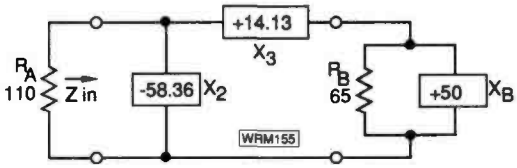
(iv) $$q = \sqrt{(4.553 - 1)} = 1.885$$

(v) $X_1 = +24.16 \times 1.885 = +45.54$

(vi) $$X_2 = -\frac{110}{1.885} = -58.36$$

(vii) $X_3 = +45.54 + (-31.41)$
$= +14.13$

Resulting in the values in **Fig. 21.4.**



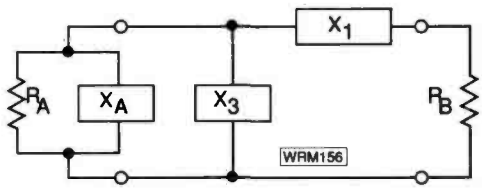
Checking the arithmetic:
(i) Using the series equivalents of R_B and X_B (R_B' and X_B') add X_3 to X_B':
+14.13 + (+31.41) = +45.54
(ii) Find parallel equivalent of 24.16Ω resistance in series with +45.54Ω

$$R' = \frac{24.16^2 + (+45.54)^2}{24.16} = 110$$

$$X' = \frac{24.16^2 + (+45.54)^2}{+45.54} = +58.36$$

So we have +58.36 in parallel with X_2 (-58.36) which is a parallel tuned circuit. This in turn is in parallel with 110Ω which results in a resistance of 100Ω. It worked again!

Type 5
One impedance purely resistive, the other comprising resistance and reactance in parallel. The resistive part of the complex impedance being a higher value than the pure resistance.
The circuit of the matching network is shown in **Fig. 21.5.**



(i) Let the higher value of the resistive part of the complex impedance be designated R_A and the lower value of the pure resistance R_B, regardless of which is source or load.
(ii) Let $p = R_A/R_B$
(iii) Let $q = \sqrt{(p-1)}$
(iv) Determine $X_1 = +(R_B \times q)$
(v) Determine $X_2 = -(R_A/q)$
(vi)

$$\text{Determine } X_3 = \frac{(-X_A)\,X_2}{X_2 - X_A}$$

As an example, let's match a complex impedance of 230Ω resistance in parallel with a reactance of -80Ω to a pure resistance of 75Ω.

(i) $R_A = 230$ and $R_B = 75$

(ii) $$p = \frac{230}{75} = 3.067$$

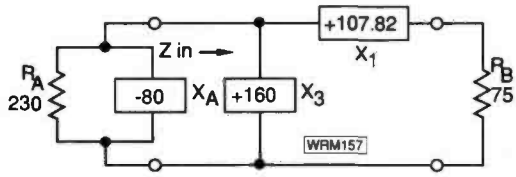
(iii) $$q = \sqrt{(3.067 - 1)} = 1.4376$$

(iv) $X_1 = +(75 \times 1.4376) = +107.82$

(v) $$X_2 = -\frac{230}{1.4376} = -160$$

(vi) $$X_3 = \frac{(+80)(-160)}{(-160) - (-80)} = +160$$

See **Fig. 21.6**



Arithmetical check:
(i)

Change R_B and X_1 to parallel form

$$R' = \frac{75^2 + (+107.82)^2}{75} = 230$$

$$X' = \frac{75^2 + (+107.82)^2}{+107.82} = +160$$

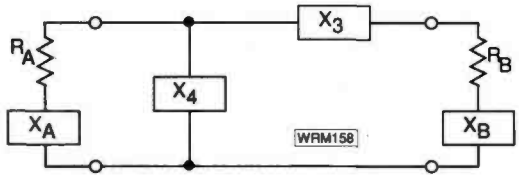
(ii) We have a reactance of +160 in parallel with X_3 (+160)

$$\text{i.e. } \frac{160 \times 160}{160 + 160} = +80$$

and this is in parallel with 230Ω

So Z_{in} in Fig. 21.6 is 230Ω resistance in parallel with +80Ω reactance, just the right value to cancel the -80Ω X_A, leaving the 230Ω required.

Type 6
Both impedances complex comprising resistance and reactance in series.
The circuit of the matching network is shown in **Fig. 21.7.**



(i) Let the higher value of reistance be designated R_A and the lower value R_B regardless of which is source or load.
(ii) Change R_A and X_A to parallel form R_A' and X_A'
(iii) Let $p = R_A'/R_B$
(iv) Let $q = \sqrt{(p-1)}$
(v) Determine $X_1 = +(R_B \times q)$
(vi) Determine $X_2 = -(R_A'/q)$
(vii) Determine $X_3 = (-X_B) + X1$
(viii)

$$\text{Determine } X_4 = \frac{(-X_A')\,X_2}{X_2 - X_A'}$$

For a Type 6 example, we'll match a complex impedance of 400Ω resistance and -60Ω reactance in series, to another complex impedance of 50Ω resistance and +100Ω reactance, also in series.

(i) $R_A = 400\Omega$ and $R_B = 50\Omega$

(ii) $$R_A' = \frac{400^2 + (-60^2)}{400} = 409$$

$$X_A' = \frac{400^2 + (-60^2)}{-60} = -2726.7$$

(iii) $$p = \frac{409}{50} = 8.18$$

(iv) $$q = \sqrt{(8.18 - 1)} = 2.6796$$

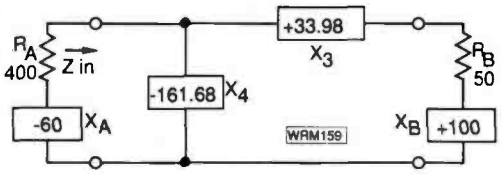
(v) $$X_1 = +(50 \times 2.6796) = +133.98$$

(vi) $$X_2 = -\frac{409}{2.6796} = -152.63$$

(vii) $$X_3 = -(+100) + (+133.98)$$
$$= +33.98$$

(viii) $$X_4 = \frac{-(-2726.7)(-152.63)}{(-152.63) - (-2726.7)}$$
$$= -161.68$$

The drawing **Fig. 21.8.** at the top of the next column, shows diagramatically, these values determined above. The arithmetic then follows on underneath from there.



(i) Add X_3 to X_b :

$(+33.98) + (+100) = +133.98$

(ii) Find parallel equivalent of 50Ω resistance in series with +133.98Ω reactance :

$$R' = \frac{(50^2) + (+133.98^2)}{50} = 409$$

$$X' = \frac{(50^2) + (+133.98^2)}{+133.98} = +152.64$$

(iii) Find the value of the effective reactance of X_4 in parallel with X' :

$$\frac{(-161.68)(+152.64)}{(-161.68) + (+152.64)}$$
$$= \frac{(-161.68)(+152.64)}{(-9.04)} = +2730$$

(iv) So this gives us R' = 490Ω and X' = +2730Ω in parallel

(v) Convert the 490Ω resistance and +2730Ω reactance in parallel to their series equivalents :

$$R = \frac{409(+2730^2)}{409^2 + 2730^2} = 400$$

$$X = \frac{409^2(+2730)}{409^2 + 2730^2} = +59.93$$

(vi) So Z_{in} in Fig. 21.8 is 400Ω resistance in series with +59.93 reactance which is near enough to tune out the reactance of X_a and provides the required match.

Next month we continue looking at the more complex impedance matching circuits

Wanna Swap!

FREE READERS' ADS

Have late 1920s 1-V-2 "portable" receiver, Burgoyne, built-in frame antenna and balanced armature speaker, working well. Would exchange for h.f. TRX. Mann. Tel: Cambridge 860150.

Have Realistic hand-held PRO-32 v.h.f. Hi/Lo aircraft u.h.f. 200 channel direct entry scanner, also v.h.f./u.h.f. discone antenna, all new this year. Would exchange for remote control video or good quality binoculars/scope suitable for bird watching. Alan. Tel: Cambridge 412236.

Have Corvett 20 h.f. marine transmitter, b.f.o. needs repair. Would exchange for marine scanner or h.f. airband scanner. D.W. Mackenzie. Tel: Stornoway (0851) 4726.

Have Wayne-Kerr Universal Bridge, B221, Airmec valve voltmeter type 712, Marconi universal bridge, Marconi standard signal generator 85Hz-25MHz. Would like communications receiver or v.h.f. transmitter or similar. Roger King. Tel: Totnes 866310.

Have Bell & Howell Filmosound projector 16mm model 652. Would exchange for a scanner 29-950MHz. S. Sharp. Tel: Bideford 4785959.

Have Zenith E SLR camera, new Mullard c.r.t. DH711, ETEL c.r.t. 4BP1 + shield, Cossor 1049 oscilloscope spares or repair. Would exchange for *PW* October 1980 or *PW* software tapes for spectrum, ZX81 or e.p.r.o.m. board. D.L. Smith. Tel: 01-695 6651. Faxed copy.

Have Drake 2B receiver, matching speaker, 2AC calibrator, includes manual and spare valves. Would exchange for a BBC B micro. Mr J. Wilkes. Tel: Crediton 4577.

Have FT-290R with muTek front-end, also mobile mount, soft case and Ni-Cads. Would exchange for an h.f. transceiver of similar value (FT-560, FT-200, etc.) to go with my new 'A' licence. Colin GW0MKS. Tel: Holyhead 59307.

Wanted Pye Westminster or Europa high band f.m. transceiver suitable for packet radio. Must be in good order electronically. Would exchange for computer gear. e.g. floppy drives, IBM cards, IBM or Atari ST RAM upgrade, hard disk controller, etc. D. Graham. Tel: Harrogate 872045 evenings.

Have Yaesu FR-50B receiver in perfect working condition. Would exchange for a large homebase CB 40 channel f.m. tranceiver. D. Jones. Tel: Porthcawl 5749.

Have Pentax MX 35mm SLR camera, semi-auto/manual, with f1.7 SMC standard lens, f2.8 135mm telephoto, electronic flash and holdall in A1 condition. Would exchange for a 2m rig, would add 60mm twin lens reflex for better rig. Henry Barber 330 Bradford Road, Otley, LS21 3LT. Tel: Blubberhouses (0943) 466493.

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 adapter	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
DR510E	2m/70cm mobile	549.00
ALX2E	2m micro handy	169.00
EBP3N	NiCad 450 mAh7.2V	28.95
EBP2N	NiCad 160 mAh7.2V	23.00
EDH10	DC to DC ALX2E	16.95
ESC5	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/REVEX

L20	15-50w load PL259	15.95
L20N	15-50w load "N"	22.95
SX100	Vswr 1.6-60 MHz	95.00
SX200	Vswr 1.8-200 MHz	65.00
SX400	Vswr 140-525 MHz	79.00
SX600	Vswr 1.8-525 MHz	119.00
SX1000	Vswr 1.8-1300 MHz	159.00
P300	30 Amp psu	149.00
W510	Vswr 1.6-30 MHz	79.00
W520	Vswr 1.8-200 MHz	59.95
W540	Vswr 140-525 MHz	63.00
W544	Vswr 140-460 MHz	119.00
W570	Vswr 1.8-1300	119.00
S20	Switch 1kW SO239	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
SRod7	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-7	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 (TV1/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

SWLCFL	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
SCAN1	Scanners 1	7.95
SCAN2	Scanners 2	9.95
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 trevr. + ATU	2499.00
TS950SD	HF tevr. + +	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
AT230	9 band ATU etc.	208.50
SM220	Station scope	343.50
TL922	9 band 2kW linear	1495.00
LF30A	HF Low pass filter	32.25
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

F1747GX	HF Transceiver	659.00
	FM board	40.00
F1757GX2	HF Transceiver	969.00
FP700	20 Amp power supply	219.00
FC757AT	Automatic atu	349.00
FP757HD	Heavy duty psu	259.00
MMB20	Mobile mount	25.00
FC700	Manual antenna tuner	149.00
FT767GX	HF transceiver	1599.00
SP767	External speaker	69.95

YAESU VHF

FT4700RH	2m/70cm mobile 50W	675.00
FT470R	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
FBAS	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

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

YAESU RECEIVERS

FRG8800	HF receiver	649.00
FRV8800	Conv. 118-175MHz	100.00
FRV/WFM	Module WBFM	20.00
FRA7700	Active antenna	49.00
FRT7700	Antenna tuner	59.00
FRG9600M	60-950 MHz scanner	499.00
PA4C	PSU for FRG9600	25.00
FC965DX	Conv. 0.15-30 MHz	89.00

YAESU ACCESSORIES

Most mics and filters from stock.
Please phone or write.

ICOM HF

IC781	HF Tevr. + ATU, CRT	4500.00
IC765	HF transceiver	2499.00
IC751A	HF transceiver	1500.00
IC726	Compact HF tcvr.	989.00
IC735	HF transceiver	979.00
IC725	HF transceiver	759.00

ICOM RECEIVERS

ICR71E	100 KHz-30 MHz Rx	855.00
R7000	Rx. 25 MHz-2 GHz	989.00

ICOM VHF

IC575H	50 MHz base 100W	1199.00
IC2GE	2m FM handheld	265.00
IC2SE	2m handportable	275.00
IC2SET	2M handy	
IC2E	2m FM handy 1.5w/BP3	235.00
ICO2E	+ keypad 3w/BP3	249.00
IC228E	2m FM mobile 25w	365.00
IC228H	2m FM mobile 45w	385.00
IC290D	2m multimode mobile	559.00
IC275E	2m multimode base AC	1069.00
IC4SE	70cms FM handy	310.00
IC4SET	70cms FM handy DTMP	310.00
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

ICPS15	Ext. 20 amp psu	165.00
ICPS45	Ext. psu 8 Amp	129.00
ICPS55	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	9.20

Most cases in stock! Phone.

GC5	World clock	43.00

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 tocked. 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.

JAYBEAM

MM3	Min 3 element HF	359.00
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!

TONNA

20505	6m 5 element beam	49.95
20808	2m 4 element beam	37.50
20809	2m 9 element beam	33.00
20818	2m 9 el. crossed	63.00

Most other models also from stock!

AERIAL ROTATORS

G-400	HF type 6 core	139.00
G-400RC	Round control type	169.00
G-600RC	Heavy duty 6 core	219.00
GC038	Lower mast clamps	16.95
GS065	Alignment bearing	29.95
G-500S	Elevation type 6 core	149.95
AR200XL	Light weight 3 core	49.95

HF ANTENNAS

C4	6-20m Mini. vert	79.00
CP5	5 band vert. complete	189.00
CP4	4 band vert. complete	149.00
MM3	Min 3 element	359.00
TB3MK3	10-20 3 element 2kW	345.00
TB2MK3	10-20 2 element 2kW	234.00
TB1MK3	10-20 1 element 2kW	117.00
VR3	10-20 vertical 1kW	81.00

SEM

ZMATCH	160-10m 100W	145.00
ZMATCH	Fitted EZITUNE	189.00
QRM	QRM eliminator	79.50

MONITORS

WIN 108	Handheld airband VHF	175.00
AIR-7	108-174 MHz AM/FM	227.00
PR0SO	150KHz to 225 MHz	299.00
SAB9EP	Steepletone airband	21.95
R537S	Tunable airband rx	69.50
Xtals	R537/R528 - 10 days	6.00
RB537S	Helical for R537S	4.95
PS9	Mains adaptor for R537S	8.95
R535	VHF/UHF Air	249.00
RB535	Rubber helical BNC	7.50
A2	Icom Airband 5W tx	399.00
A20	With VOR beacon	449.00
MTV5000	Jupiter 11 25-1300MHz	299.00
MTV6000	Base 25-1300MHz	379.00
IC-R7000	ICOM 25MHz-2GHz	989.00
AOR2002	25-1300 MHz	475.00
FRG9600M	60 - 950 MHz 12V	499.00
AR950	Base VHF/UHF	249.00
AR800	Handheld VHF/UHF	169.00
LC800	Soft case for AR800	3.50
AOR900	VHF/part UHF	199.00
RZ1	500kl-lz-950MHz	435.00
AX700	Standard Scanner	575.00

BEARCAT

BJ200MK3	Handheld	199.00
55XL	Handheld	99.00
100XL	Handheld	169.00
100XLT	Handheld	199.00
200XLT	Handheld	229.00
800XLT	Base station	229.00

WATERS & STANTON

RETAIL ONLY:- 12 North Street, Hornchurch, Essex RM11 1QX Tel: (04024) 44765
Early Closing Wednesday

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 dimunutive size (5.5' × 2.5' × 6.75') makes for easy installation in the modern car. Other features include up/down mic., 3 way scanning, 1750Hz tone-burst, reverse imput, 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!

HF TRANSCEIVER DISCOUNTS!

Most transceivers are designed for 12 volts. The manufacturer's own PSUs are expensive. But our REVEX "BIG BERTHA" P300 is just as good and a lot, lot cheaper. Fully protected, large hunky transformer, and thermal fan cooled! Below is a list of autumn packages that we invite you to consider. Part exchange welcome. Credit? Most certainly. Just ask for quote.

Model Type	Mfr's PSU	REVEX PSU
Kenwood TS440S	**£1360.00**	**£1200.00**
Kenwood TS140S	**£1035.00**	**£959.00**
Kenwood TS680S	**£1158.00**	**£1080.00**
Yaesu FT747GX	**£918.00**	**£759.00**
Yaesu FT757GX2	**£1128.00**	**£1069.00**
Yaesu FT767GX	**£1858.00**	**£1699.00**
ICOM IC751A	**£1878.00**	**£1589.00**
ICOM IC735	**£1357.00**	**£1069.00**
ICOM IC725	**£1137.00**	**£859.00**

The above price comparisons use the manufacturer's nearest equivalent PSU to the P300. Each Revex is fully guaranteed for 12 months as is the matching HE transceiver. All mail orders against credit cards are despatched by 24 hour Securicor at our risk. If payment is made by cheque please allow an extra couple of days for clearance.

A "WORLD FIRST" in SCANNERS!

25-1300 MHz* Handheld JUPITER II

£299

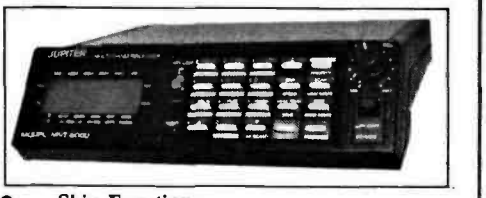
- **AM/FM**
- **Direct up/down tuning**
- **5, 10, 12.5, 25, 30 kHz steps**
- **100 memories**
- **10 programmable bands**
- **Step change frequency correction**
- **High speed scan 20 per sec.**
- **Carrier or audio scan**
- **Battery Saver**
- **Telescopic antenna (BNC)**
- **Fast memo load feature**
- **Individual memory unload**
- **Uses 4 × AA cells (Jupiter II)**
- **Size 7" × 2.5" × 1.5"**
- **700 MHz first IF**
- **Proper English Manual**
- **Superb sensitivity.**
- **Does not cover 550-800Mhz.**

No other similar receivers offer the same features at anywhere near the price! And inside the construction is a Joy! Lots of space, nicely laid out boards all linked with quick connect plugs. Not a "Taiwanese Rat's Nest!"

- **Direct up/down control.**
No need to punch anything into memories. Just enter frequency and use up/down buttons for manual or electronic tuning.
- **AF Scan.**
No more annoying blank carriers for the receiver to lock on to. Simply tell it to ignore carriers not containing audio and it will!
- **One Button Memo Read.**
A single button takes you directly into the memory bank. Up/down or scan will quickly move you around or use direct access for a particular channel number.
- **Battery Saver.**
For long term single channel monitoring this feature will reduce battery consumption by 70%.

25-1300 MHz* Mini-mobile/base JUPITER 6000 inc. P.S.U.

£379



- **Skip Function.**
Whether you want to bypass a single memory channel or an entire bank, this control provides the answer.
- **High Speed Scan.**
Select high speed scan or search and you will whiz through the range at a healthy 20 steps per second! That means you can scan 100 memories in 5 seconds or 1 MHz of space (25kHz steps) in 2 seconds. It really works!
- **Fast Memo Write.**
Enables you to quickly write into the memories, no need to select a number, the receiver will use the next empty memory.
- **User Friendly Search Programme.**
You can search in either direction and change direction at the press of a button. Total agility with a speed to match.
- **Unique Multiband Programme.**
No less than 10 separate band segments can be stored in the receiver's memory.
- **Total Flexibility.**
The basis upon which the receiver has been designed. It means you tailor the receiver to do exactly what you want it to do, almost like having a receiver that was designed for your own personal needs. No other receiver can match it, feature for feature and the good news is the cost!

World demand is tremendous. We are getting only small quantities so pick up the phone now and you could be lucky!

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 × 39H × 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 G5RV aerial system completely free of charge! Limited offer so act now!

SPECIAL OFFER THIS MONTH

SONY OFFER

Here is a once and only offer on Sony.
Brand new stock and limited to a few only of each model!

7600DS Portable HF with AC supply and aerial etc.	145.00
200ID Portable HF with air band, etc.	275.00
Air-7 Airband plus broadcast receiver.	215.00
SW1E Micro pocket HF plus active antenna.	219.00
SW1 As above but less active antenna kit etc.	139.00
PRO80 VHF/UHF Receiver plus broadcast.	259.00

RETAIL & MAIL ORDER:- 18-20 Main Road, Hockley, Essex SS5 4QS Tel: (0702) 206835, 204965
Visa and Access by telephone. 24hr Answerphone.

WATERS & STANTON

REVIEW

The Morse Machine MM-3

Advanced Electronics Applications Inc., recently brought out their MM-3 Morse Machine. Being a bit of a c.w. man, Ron Stone GW3YDX reviewed this piece of equipment for us.

The MM-3 is contained in a neat package, 51x196x120mm with input/output sockets on the rear face of the unit. The photograph shows the control keypad on the right and a panel displaying abbreviated commands on the left. It takes up the minimum of space, and being equipped with rubber feet, it sits firmly on the operating table while the controls are used.

The main features of the Morse Machine are:

(1) Electronic keyer with speeds variable from 2 to 99 w.p.m.
(2) 8000 character total memory capacity in up to 20 separate memories.
(3) Morse trainer
(4) Automatic serial number insertion and incrementing for contests
(5) QSO simulator
(6) Serial interface for personal contacts
(7) Beacon mode facility

Electronic Keyer

The unit has a lot more going for it than others on the market. One frequent criticism of Morse sent by electronic keyers is that it sounds impersonal, too perfect, and soulless. Furthermore, in most keyers there is no provision for semi-automatic 'bug' operation or for the connection of a straight key. With the MM-3 one has an impressively wide range of options.

The MM-3 will allow those who use a bug key to have the benefit of having the MM-3 generate the dots electronically and the dashes manually in the old way. The dot speed is set by the 'speed' control or input via the keyboard. Furthermore (and this has not been possible in other units) the same style of keying can be loaded into the memories.

The more usual modern style of paddle keying is via a single or dual lever paddle. The convention being that the dot contact is activated by the thumb and the dash by the index finger. This is the right handed convention and I, being left handed, was delighted to see that AEA had catered for me by allowing the paddle contacts to be changed around with a software command rather than by turning the paddle upside down. What attention to detail!

I use 'iambic' keying, where pressing the contacts at the same time produces an alternate stream of dots and dashes. It means that letters such as 'C' can be produced with the minimum of finger movement. Other operators prefer not to use iambic and make a 'C' by pushing the paddle lever to and fro. The MM-3 can be put into any of these modes by a software command. Needless to say, AEA have recognised that once the operators preferences are loaded, the operator will want them there every time the unit is switched on, so data is held in battery backed RAM.

Going back to the original comment about the anonymous sound of electronic c.w., the operator can not only vary the ratio of dots and dashes to make the dots longer or shorter than they should be, but can also decide if there is to be automatic spacing in between characters or to have the spaces dictated directly by the movement of the paddle. The big benefit of the MM-3 is that you can customise your code in every conceivable way. There is no other keyer on the market with such a wide range of user set options.

Other features that you would expect, such as selectable sidetone volume, etc., are there. Other nice touches such as being able to vary the sidetone frequency via the keyboard. Oh yes, the keyer sounds great on the air too!

Memories

A total of 8000 characters can be inserted into memory either from the paddle in the conventional way, or downloaded from a PC via the serial port. Although 8000 characters is more than one would normally ever need, there is a 'big chip' option available to take the memory up to 32K if required. The memory contents can be sent to 20 memory addresses in the battery backed RAM which can be recalled from the keypad. This can be useful for storing an entire contact including name, QTH, etc., or for storing and sending a long 'CQ DX'. AEA have not yet found a way of stopping the UB5s from replying!

Morse Trainer

The trainer mode sends randomly generated Morse characters for a predetermined duration, but in user selectable ways. You can select increasing, decreasing or constant speeds as required. There is also the option to send the characters in 'Farnsworth' mode where if the practice is at 12 w.p.m., the individual letters will be sent faster than that, but the spaces between the exaggerated - the overall speed being 12 w.p.m. Many people find it easier to learn code by the Farnsworth method and convert to conventional spacing later.

The default setting for the trainer contains the character set used for the USA FCC code test. The content goes beyond the UK test as punctuation is included. In addition letters, numbers and

punctuation signs are all mixed into the practice generated. For the 'experts' there are two more advanced character sets containing such gems as the Swedish 'A', the Spanish 'N' and the dollar signs (the Morse is ...-..-, etc. Just the job for a wet evening when the bands are awful).

Via the serial port, the MM-3 can be used to echo the practice Morse the trainer sends, or to reproduce your own sending practice on screen. The unit is extremely versatile, catering for the full range of needs between the beginner and the c.w. expert who wishes to check his receiving speed capability.

Contest Keyer

In most c.w. contests the contest exchange consists of the RST plus serial number, zone number, etc., or a combination of all three. Part of being a successful c.w. contester is down to finding time in between the contacts to check on the multipliers worked, write up the log and check for duplicates whilst running the pile ups at maybe 200 QSOs per hour. To do so without the aid of an electronic keyer is just about impossible.

The designers at AEA are obviously real live contesters, as they have allowed the format of the serial number to be tailored to the operators preference. In case readers think that much is being made of a small point here, the issue of what constitutes the best format of the contest exchange always causes lively debate among the contest fraternity, but they all agree that they would like a means of tailoring the exchange to their exacting needs. The MMM-3 makes this possible.

QSO Simulator

Amateurs who pass the Morse test often have every intention of using the code on the air, but then find out:

(a) that letters and numbers are all jumbled up together confusingly and that other amateurs are using weird abbreviations like 'BCNU' instead of "I'll be seeing you" and so on.

(b) that instead of a nice clear signal coming across from a practice oscillator, there is terrible QRM and ARN and it is a problem to copy anything.

(c) What's the point as everything else is going far too fast anyway.

In the circumstances many give up, and are lost forever in the world of telephony, never to discover the delights of the code.

The MM-3 has all the answers! As well as the trainer containing a mix of letters and numbers, and there being an excellent user handbook containing a glossary of amateur abbreviations, there is an amazing user mode where you can conduct simulated QSOs at your preferred speed, without ever going on the air.

Putting the Morse Master into user mode, you are invited to either listen to simulated contacts, to call CQ or answer other calls.

Not quite believing it, I programmed the MM-3 to send replies to me at a maximum speed of 30 w.p.m.

This is what happened:

YDX - CQ CQ CQ DE GW3YDX GW3YDX PSE K

MM-3 - GW3YDX DE W5YSA W5YSA AR

YDX - W5YSA DE GW3YDX BT GM OM BT TNX FER CLG BT HR NAME IS RON BT BACK TO YOU BT W5YSA DE GW3YDX K

MM-3 - GW3YDX DE W5YSA BT SRI RON MISSED SOME OF THAT BT DIDNT GET MY RST OR UR QTH BT UR RST 589 589 ES QTH PORT ARTHUR, TEX BT NAMME IS NORM NORM BT SO HW? GW3YDX DE W5YSA K

YDX - W5YSA DE GW3YDX BT PSE UR NAMME AGN? W5YSA DE GW3YDX K

MM-3 - GW3YDX DE W5YSA BT SRI RON HAD QRMM BT ISSED QTH AND RST BT HR NAME IS NOR NORM, RIG IS TEN-TEC ARGOSY.....

Aside from the absence of QRM it is all very real-sounding. As well as being the ultimate answer to all TVI problems, the QSO simulator allows you to practice at your own speed and to become familiar with the abbreviations in the 48-page handbook which will allow the novice to learn the all as they are sent in the QSO simulator module.

All the calls in the simulator are from the USA. In two weeks of testing, I did not find any repeated callsigns and nearly worked all states without switching the rig on!

Serial Interface

The principal use of the serial interface will normally be to echo practice characters on the screen. However, it can also be used to control the keyer and the memories from a home computer keyboard.

The serial ports can also be connected to a packet TNC, so that the ASCII which would normally go to the computer, is converted into c.w. It was very strange to hear packet signals coming from the local BBS converted into c.w. and slowed down to a speed one can copy. This facility offers blind operators the possibility of copying packet transmissions without an expensive ASCII to speech converter, although the Morse Machine is not the total answer, as v.h.f. 1200 baud packet will result in very fast c.w. - indeed if it is converted directly to c.w! The converted ASCII is of necessity only what is translated within the MM-3 buffer.

Beacon Mode

In some areas of communication, such as meteor scatter or moonbounce, it is desirable to send for a fixed period and then receive for a fixed period. The MM-3 incorporates an internal timer to allow the user to do this.

I thought that would be jolly useful for contests when there is a dead period - usually in the middle of the night - where one calls CQ with very few replies. Unfortunately, to return to normal memory mode it is necessary to press several buttons to get it back there and, after sending a serial number with the auto incrementor you have to press several buttons to get back into beacon mode. Using the beacon in a contest to call CQs every 15 seconds for instance is unfortunately not of benefit for that reason. Nevertheless, the beacon mode is useful for some special modes as detailed previously, and indeed for beacons. **PW**

REVIEW

Overall Verdict

The Morse Machine is a well conceived, easy-to-operate and user friendly piece of computer wizardry. It is not cheap at £169.95, but one has to compare it against other equipment on the market and see what it has to offer. There is nothing currently available which has all the MM-3 has, and even the outline of its facilities given here is far from exhaustive. Given the superb contest facilities and the big memory capacity, the unit is strongly recommended for those reasons alone. For the new amateur who is learning the code and who intends to stick with it, the Morse Machine is a very good buy.

The Morse Machine is available from ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD. Tel: (0903) 731101.

PW PCB SERVICE

Access VISA

0202 665524

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 £
WR266	TUNED ACTIVE ANTENNA	JAN 90	TBA
WR265	TUNED ACTIVE ANTENNA (psu)	JAN 90	TBA
WR264	IRWELL (relay)	JAN 90	TBA
WR263	IRWELL (vfo)	JAN 90	TBA
WR261	AM TX FOR 1.8MHz	NOV 89	TBA
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	APRL 87	
WR227	" "	"	9.70
WR226	" "	"	
WR298	"ITCHEN" LCR BRIDGE	APRL 87	3.40
WR225	"WOODSTOCK" SW CONVERTER	MAR 87	4.10
WR219	MASTHEAD PRE-AMP PSU	FEB 87	2.50
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 OSCILATOR	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 KEYER	FEB 85	7.10
WA002	"TEME" (RECEIVER)	JAN 85	4.30
WA001	"TEME" (VFO/DOUBLER)	DEC 84	2.80
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	TRANSCEIVER 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 KEYER	MAR 82	6.50
WR126	"EXE" 10GHz TRANSCEIVER	AUG 81	7.70
WR095	TRANSCEIVER POWER SUPPLY	SEP 80	3.85
WR068	AF SPEECH PROCESSOR	JAN 80	5.20

A high-performance HF rig . . . with a great receiver and full-power transmitter. Light in weight and low in price.

This is Yaesu's FT-747GX.

Whether you're a beginner or a veteran, it's a great way to start. And a great way to go.

DX ready. The 747 packs a full 100-watt RF punch on 160 to 10 meters, with continuous receive from 100 kHz to 30MHz.

And its control panel is refreshingly simple. So you can hop around the band *fast* to nail those DX stations. While other guys are warming up their amplifiers, you can be working the DX!

Multimode versatility. The FT-747GX is ready to go on LSB, USB, CW, and AM. With provision for the FM-747 FM unit.

You get 20 memories to store frequency and mode. Dual VFOs with split frequency operation for DX-pedition work. And manual band scan plus auto-resume memory scan via the microphone up/down buttons.

Great receiver. Utilizing a directly-driven mixer, the FT-747GX receiver features superb overload protection. You also get factory-installed narrow CW *and* AM filters. A one-touch noise blanker. All-mode squelch. RIT. And a 20-dB attenuator for local QSOs.

Lightweight construction. Housed in a metallized high-impact plastic case, the FT-747GX weighs in at about 7¼ pounds! With the loud-speaker mounted on the front panel for maximum audio transfer. And internal heatsinking for the transmitter, rated at full power for FM, packet, RTTY, SSTV, and AMTOR when used with a heavy-duty power supply.

Available options. FC-1000 or FC-757AT Automatic Antenna Tuners. FL-7000 500-watt Automatic, Solid-State Linear Amplifier. TCXO-747 Temperature-Compensated Crystal Oscillator. FAS 1 4R Remote Antenna Selector. FRB-757 Amplifier Relay Box. FP-700 Standard Power Supply. FP-757HD Heavy-Duty Power Supply. MMB-38 Mobile Mounting Bracket. MH-1B8 & MD-1B8 Microphones.

Discover the price/performance leader. Check out Yaesu's low-cost FT-747GX at your Yaesu dealer today. Because now, Yaesu puts priceless DX into *your* price range.

South Midlands Communications Ltd
S.M. House, School Close,
Chandlers Ford Industrial Estate,
Eastleigh, Hants SO5 3BY
Tel: (0703) 255111
UK Sole Distributor

YAESU

Fill your logbook. Without emptying your pocket.

Special Offer

Save £9.00 on the Revex W160 Power Meter

(1)

To: PRACTICAL WIRELESS, SWR Meter Offer (January), FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP

Please send me.....Power Meters @ £45.95 each (Add £1.00 p&p)

Name.....

Address.....

.....

.....Post code.....

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

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

Card No. | | | | | | | | | | | | | | | | |

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

Signature.....**Tel:**.....

(2)

Name.....

Address.....

.....

.....

.....Post Code.....

SWR Meter Jan 1990

Special Offer! *PW* exclusive purchase saves you money!

Normally £54.95

Now, to PW Readers At Only £45.95
(Plus £1.00 Insured Post & Packing)

- ✔ Palm-size precision engineering offering you a full-facility s.w.r. meter mounted in a sturdy die-cast casing.
- ✔ Tiny and very handy. You can take it wherever you want in your shirt pocket to check antenna, antenna base, coaxial cables, etc.
- ✔ Features: Simple switch operations allowing you to read s.w.r. directly, or transmit (forward) power.
- ✔ Simple, yet precision-made linear meter.
- ✔ Easy-to-read enlarged s.w.r. reading (s.w.r.= 5 at f.s.d.)
- ✔ Reflected power indicated by percentage scale.
- ✔ Combined use of two measuring scales make it possible to monitor either s.w.r. or power.

PW exclusive offer! The W160 will not be on general sale in the UK until the spring, save £9.00 on the retail price by buying yours now...through *PW*!

How to order:

Complete both coupons in ink, giving your name and address clearly in block capitals. Coupon 2 will be used as the address label to despatch your s.w.r. meter to you. Send your coupons with your cheque to: *Practical Wireless*, SWR Meter Offer (January), Freepost, Enefco House, The Quay, Poole, Dorset BH15 1PP. If you wish to pay by credit card (Access, Mastercard, Eurocard, or Visa only), please fill in your card details and sign the coupon where indicated. available only to readers of *PW* in England, Scotland, Wales, N. Ireland, the Channel Islands and Isle of Man. Orders are normally despatched within 28 days, but please allow time for carriage. The closing date for this offer is 11 January 1990.

If you do not wish to cut your copy of *PW* you must send this flash with full details and remittance.
PW Publishing Ltd., Poole, Dorset (Reg. No. 1980539, England)

PW JANUARY 1990
POWER METER OFFER

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

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-Lo). ★ 20 memories (20 banks of 10). ★ Power requirements 5.5-16V dc. ★ Superb sensitivity – less than 0.16V (12dB 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 × 55m W × 31mm D.

£230.00

C500

★ Full Duplex. ★ Frequency coverage 144-146 & 430-440MHz (extended Rx capability 130-169.995 & 410-470MHz). ★ 2.5/5W 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 × 60mm W × 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 panadaptor! 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 to show signal strength and the horizontal 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 that is heard and the display will shift to place it 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 panadaptor can do for you!

As for the rest of the scanner, it covers 50 to 904.995MHz with AM and FM (wide & narrow), it is powered by 13.8V dc and it measures just 180mm W × 180mm D × 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.

Norman G4THJ

£575.00 (PSU EXTRA)

C5200

This new generation dual band mobile transceiver is virtually two radios in one box. 70cms 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 or 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 70cms.

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

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

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

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

VISA Access

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

leetronics

NORMAN G4THJ

The HEMT - A very high performance microwave device

Feature

There is a great need for very low noise amplifying devices which can operate at microwave frequencies in satellite receivers, military equipment and in various other applications. So Brian Dance takes a look at the high electron mobility transistor - or h.e.m.t.

In many cases it is important that these very low noise amplifying devices used should be able to provide a low noise performance in room temperature operation so as to avoid the need for a supply of liquid nitrogen or even liquid helium. The microwave m.e.s.f.e.t. (metal semiconductor f.e.t.) in gallium arsenide has met such needs for some years, as it provides excellent characteristics for low noise amplification at frequencies up to about 20GHz or even more.

HEMT/MESFET Comparison

After the introduction of a special type of f.e.t. known as the h.e.m.t. (high electron mobility transistor) in 1979, the microwave world has found this device to be an increasingly attractive competitor to the m.e.s.f.e.t. The h.e.m.t. is especially useful at frequencies of the order of some tens of GHz where the limitations of the m.e.s.f.e.t. became more apparent.

The structure of the h.e.m.t. is basically similar to a m.e.s.f.e.t. in which an improved performance is obtained by specially formed layers of more than one type of semiconductor material. Thus h.e.m.t.s are more expensive to produce than m.e.s.f.e.t.s and are therefore unlikely to displace them at frequencies of a few GHz or less unless noise considerations are exceptionally critical.

One of the most important parameters affecting the performance of both m.e.s.f.e.t. and h.e.m.t. devices is the gate length (typically a fraction of a micron). It is very difficult and costly to fabricate devices with the extremely short gate lengths required for optimum low noise performance at the highest frequencies. The cost of such high frequency devices is increased further because the proportion of short gate length devices in each batch which have to be rejected is greater than in the case of devices with longer gates for lower frequencies. At the present time, state-of-the-art gates 0.25µm in length can be produced by electron beam lithography; this involves the use of an expensive machine which takes time to write each individual device pattern. The price for h.e.m.t.s are currently of the order of a few tens of pounds per device.

The more expensive devices are therefore reserved for applications where very low noise performance is required at the highest frequencies. In general the performance of a h.e.m.t. with a 0.5µm gate length is comparable with that of a gallium arsenide m.e.s.f.e.t. of half the gate length.

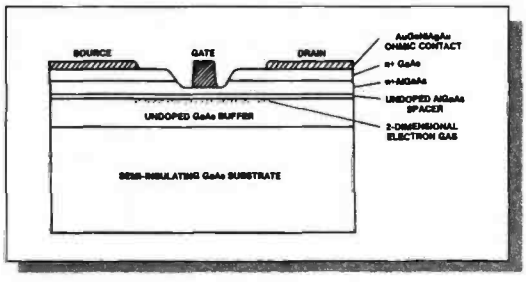


Fig. 1: The construction of a typical h.e.m.t. device

A further advantage of the h.e.m.t. over the m.e.s.f.e.t. is its lower power dissipation which can be of considerable importance in some satellite communications applications.

HEMT devices are now available commercially, especially from various Japanese manufacturers. Fujitsu of Tokyo originally developed the h.e.m.t. and owns the name 'h.e.m.t.' in Japan, but some others have marketed the devices as 'hetero-junction f.e.t.s'. Other names for the h.e.m.t. include the m.o.d.f.e.t. (MOdulation doped f.e.t.), the t.e.g.f.e.t. (Two dimensional Electron GaAsf.e.t.), the h.i.f.e.t. (Hetero-Interface f.e.t.) and the s.d.h.t. (Selectively Doped Heterostructure Transistor).

Construction

The h.e.m.t. structure is basically similar to that of a m.e.s.f.e.t. and involves a source, a drain and a Schottky gate. Although the gate potential regulates the current flow between the source and the drain as in a m.e.s.f.e.t.. It is the difference in the layers of the underlying semiconductor materials which distinguish the h.e.m.t. from the m.e.s.f.e.t. and which provides its improved performance.

The construction of a typical h.e.m.t. device is shown in Fig. 1. It contains a lattice-matched hetero-junction between two compound semiconductors (often gallium arsenide and gallium aluminium arsenide). The crystal lattice must be closely matched to minimise lattice strain, aluminium gallium arsenide having a lattice spacing within 0.1% of that of gallium arsenide. extremely abrupt hetero-junctions can be grown by such techniques as molecular beam epitaxy (m.b.e.).

Electrons from the donor silicon atoms in the aluminium gallium arsenide layer can move through the crystal until they fall into the lowest available energy states. In the h.e.m.t. device these energy states are in the gallium arsenide close to the hetero-junction interface.

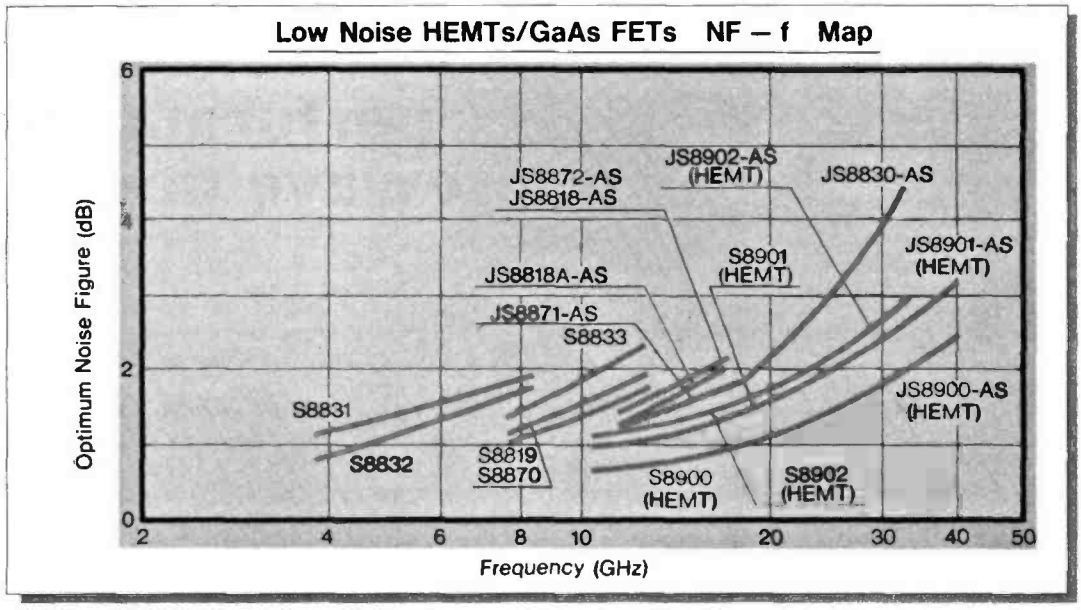
This results in the accumulation of electrons in an extremely thin layer which has a thickness of less than 10nm. The electrons are said to form a two dimensional electron gas. Thus the h.e.m.t. is a quantum semiconductor device. There are no donor atoms intentionally present in the undoped gallium arsenide layer, so the electrons in the two dimensional electron gas do not undergo impurity scattering.

High Mobility

Therefore they have a greater mobility than electrons in a piece of bulk gallium arsenide, namely about 6500cm^2/V-s at 300K, corresponding to a velocity of about 2 x 10^{7}cm/s. This is about twice the mobility of electrons in a m.e.s.f.e.t. (Mobility is the speed at which they move under a given electric field). In a h.e.m.t. cooled in liquid nitrogen, the mobility increases to some 80 000cm^2/V-s (depending on the epitaxial structure).

The gas forms because of the greater affinity of

F ig. 2: The noise figures of Toshiba h.e.m.t. devices



the electrons for the positive undoped gallium arsenide layer. The two dimensional gas forms the carrier channel between the transistor source and the drain. The low noise of the h.e.m.t. relative to a m.e.s.f.e.t. of similar gate length is believed to be due to the two degrees of freedom of the electron in a h.e.m.t. as compared with three degrees of freedom in the m.e.s.f.e.t. Thus there is less random motion of the electron flow in a h.e.m.t. and this leads to less noise.

The mobility of the electrons may be further increased by employing a thin layer of undoped aluminium gallium arsenide adjacent to the hetero-junction interface. This layer provides more separation between the electron gas and the ionised centres which scatter the electrons and therefore reduce their mobility.

The structure of the h.e.m.t. produces not only higher electron mobility, but also a higher sheet carrier density (of the order of 1 x 10^{12} per cm^2) and a higher saturation velocity. These factors result in the h.e.m.t. having a higher transconductance and a lower noise figure than gallium arsenide m.e.s.f.e.t.s with comparable gate lengths.

The Gate

A Schottky barrier gate, implanted on top of the doped layer, is used to control the number of electrons in the two dimensional channel via depletion or enhancement. A bias applied to the Schottky barrier gate can be used to modulate the number of electrons in the channel and hence can control the conductivity of the device.

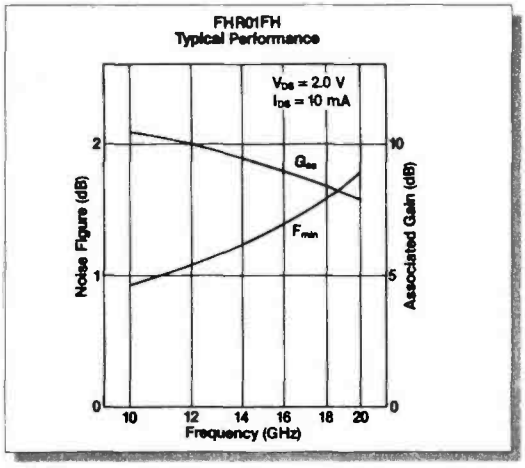
In contrast to the operation of the normal f.e.t., the width of the channel remains fairly constant in a h.e.m.t., but the number of carriers present is modulated. Hence the alternative name of m.o.d.f.e.t. for the h.e.m.t. Electrons in a h.e.m.t. move in the very thin layer, travelling parallel with the hetero-junction interface.

It is possible to manufacture both enhancement and depletion mode h.e.m.t. devices by suitable gate metallisation, layer thicknesses and doping levels. A feature which renders h.e.m.t.s particularly attractive for the future is their planar structure, which should enable them to be easily made by conventional silicon v.l.s.i. processing methods.

As in other high frequency f.e.t. devices, it is essential to employ a very short gate length to obtain low noise at high microwave frequencies.

One might expect a still better performance from h.e.m.t.s at low temperatures, since the two dimensional electron gas mobility at 77K is about 60 000cm^2/V-s. Unfortunately, low temperature h.e.m.t. performance is affected by deep electron traps.

Fig. 3: Noise and gain figures



Performance

The noise figures of h.e.m.t. devices manufactured by Toshiba are compared with some of the company's m.e.s.f.e.t. in Fig. 2. It can be seen that the h.e.m.t. devices generally offers a lower noise figure than m.e.s.f.e.t. devices at the same frequency. The S8902 and the S8901 have gate lengths of 0.3µm and the S8900 is 0.25µm.

Although the h.e.m.t. devices will operate at higher frequencies with lower noise than the corresponding m.e.s.f.e.t. devices, h.e.m.t.s are more costly and their short gate length necessitates a reduced power handling capability. Toshiba is hoping to develop indium gallium arsenide h.e.m.t.s with noise levels about 0.6dB at 12GHz, but they are not expected to be available until later this year.

Type Examples

The Fujitsu FHR01FH 'ultra low-noise' h.e.m.t. device uses a 0.5μm gate length to obtain noise figures comparable with those of m.e.s.f.e.t.s which have 0.25μm gate lengths. The FHR01FH has a maximum noise figure of 2dB (typical 1.8dB) at 20GHz with a typical associated gain of 8dB. An FH package developed for the device allows it to operate at up to 22GHz without parasitic resonances. Noise figure and gain are shown in Fig. 3. At a temperature of 50K, the noise figure is typically 0.7dB at 20GHz. Maximum drain-source voltage rating is 3.5V. The transconductance is typically 20mS with a drain-source voltage of 2V and a 10mA drain current. An output of 660mW with 3.2dB gain has been obtained at 20GHz and 210mW with 2.0dB gain at 30GHz.

Tests of such h.e.m.t. devices in high performance, low-noise, amplifiers for use in earth stations for 30GHz uplink/20GHz downlink satellite communications showed that gains of 33dB could be obtained. Residual noise was reduced to 1.71dB (about half of that of conventional amplifiers using m.e.s.f.e.t. devices). Fujitsu plans to produce h.e.m.t.s for amplifying signals at frequencies of up to 50GHz.

An H503 h.e.m.t. from Gould is designed for a maximum operating frequency of 18GHz. This device is fabricated with a 0.5μm gate length by a m.b.e. process. The H503 is intended for satellite communications, radar and electronic warfare applications.

Sony, another Japanese company, produces 200μm wide 2SK676 and 300μm wide 2SK677 aluminium gallium arsenide on gallium arsenide h.e.m.t. devices (also known as h.i.f.e.t.s) by metal organic chemical vapour deposition (m.o.c.v.d.). Each device is available in three grades, with maximum noise figures of 0.1dB, 1.2dB and 1.4dB at 12GHz. Sony claims these devices are optimal for a wide range of front-end amplifier applications, including satellite reception and other communications systems from C band to Ka band and above.

Sony claims that the m.o.c.v.d. processing instead of normal liquid phase epitaxy (l.p.e.) or m.b.e. is the main factor in achieving ultra-low noise performance; it allows thin semiconductor layers to be built up with very precise thickness. The gate, the source and the drain are added later by conventional photolithographical techniques.

Sony's h.i.f.e.t.s are aimed not only at commercial applications such as 4 and 12GHz satellite signal reception, but also at communications and other applications at Ka band and above. The two models are available in both chip and packaged form.

The Californian Eastern Laboratories of the Nippon Electron Co. (NEC) offers an NE202 h.e.m.t. with a typical noise figure of 1dB at 12GHz with an associated gain of 12dB. At 2GHz the device offers a 0.3dB noise figure and 20.5dB gain, but h.e.m.t.s are usually too costly for use at 2GHz. Very high reliability can be difficult to obtain in new devices, but a protective passivation layer of silicon nitride is applied to each NE202 i.c. to avoid contamination. This device is more or less interchangeable with standard m.e.s.f.e.t. products, offering an immediate improvement in the noise figure and gain performance.

The very low noise h.e.m.t. produced by TRW Electronic System Group of California uses a 0.2μm T-shaped gate. A noise figure of 0.61dB at 12GHz has been measured with an associated gain of 12.58dB. This is claimed to be the lowest noise figure ever reported for a h.e.m.t. at this frequency.

T-gate Process

TRW reduced the noise figure in three ways. The T-gate process they developed increases the cross-sectional gate area and reduces the gate resistance.

A deep alloying technique is employed to reduce the ohmic and source resistance. The gate length has been reduced from 0.25μm to 0.2μm to minimise the gate-source capacitance and increase the transconductance.

The US General Electric Company of Syracuse, New York, developed a h.e.m.t. for millimetre wave allocation in phased array radars and satellite communications. It has a noise figure of 2.1dB at 40GHz with an associated gain of 7.0dB; these figures were said to be better than the best available m.e.s.f.e.t. at 40GHz at the time. A maximum available gain of 5.7dB was measured at 60GHz for this device whose cut-off frequency is about 80GHz. A noise figure of only 0.05dB was found at 3.3GHz in a cooled device.

The General Electric Company in collaboration with the University of Illinois has developed a gallium arsenide h.e.m.t. with a calculated clock speed of 230GHz. At present there is no equipment available which is fast enough to check the switching speed of the device. The 230GHz maximum frequency of operation, (where the gain is unity), was determined by extrapolating the measured gain at 60GHz (11.5dB), assuming the normal 6dB/octave roll off.

This device was developed for the Jet Propulsion Laboratory (JPL), Pasadena, California for use in radio telescope detectors, where extremely low noise figures are required to discriminate between very low-level space signals and background noise. This h.e.m.t. can replace the much bulkier extremely expensive maser amplifiers for signal detection.

The device was fabricated by depositing indium gallium arsenide on a gallium arsenide surface. The indium gallium arsenide forms the two dimensional electron gas channel instead of gallium arsenide. The indium gallium arsenide layer is unnaturally compressed, leading to the name pseudomorphic h.e.m.t. for this type of device. The gate length is 0.25μm. Such devices have produced gains of 11.7dB at 60GHz and 6.7dB at 94GHz. Applications for extremely fast signal processing are expected.

Integration

The very high performance of discrete h.e.m.t. devices will eventually be incorporated into economical microwave modules, hybrid devices and monolithic microwave integrated circuits (m.m.i.c.s). As long ago as 1983, Fujitsu announced the integration of a few h.e.m.t.s into a single device and in early 1984 produced a 4K static RAM with access times only a small fraction of those of other gallium arsenide or silicon devices. In January 1986, a 256 bit Fujitsu h.e.m.t. memory containing 2072 h.e.m.t. devices became the first digital h.e.m.t. i.c. to be marketed; it is designed for operation at -196°C, but has a 1.5ns access time. In 1985 this manufacturer announced that a four-stage 19GHz h.e.m.t. amplifier was operating at liquid nitrogen

temperature in a Japanese satellite as part of a communications link.

The Japanese have had a national plan which aimed to produce a scientific super-computer based on h.e.m.t. devices by 1989. It was predicted that it would out-perform even the projected Cray computers.

Monolithic Microwave i.c. (m.m.i.c.) devices using h.e.m.t.s are still in the laboratory stage, but progress is currently being reported on such devices as traveling wave m.m.i.c. amplifiers, especially for military applications. Workers at Varian in Santa Clara, USA report an improvement in microwave amplifier noise figures of about 1dB when h.e.m.t.s are used instead of m.e.s.f.e.t.s in m.m.i.c.s for the upper microwave frequency range of 12 to 20GHz with smaller improvements down to 2GHz. The greater gain available from h.e.m.t. devices also contributes to the overall performance of these m.m.i.c.s.

It has been suggested that the availability of the h.e.m.t. with switching times of less than 10 picoseconds has been largely responsible for the winding down of intensive research on superconducting computers using Josephson junctions. HEMT switching speeds at the temperature of liquid nitrogen can be greater than that of Josephson superconducting junctions at liquid helium temperatures. However, the new high temperature superconducting materials may eventually change this position.

PW

Conclusion

The availability of h.e.m.t.s has enabled a comparable performance to be obtained at millimetre wavelengths to that previously obtainable at much lower GHz frequencies. Although Japanese and a few US companies have been prominent in the h.e.m.t. market, it seems the number of manufacturers of these specialised products will be quite small unless the market takes off in some unexpected way.

Only large companies, with extensive research facilities, and advanced semiconductor processing equipment can sensibly enter h.e.m.t. manufacture. The h.e.m.t. manufacturing technology can also be employed for creating lasers on an i.c. High frequency quantum-well devices which depend on tunnelling through thin barriers are expected to provide a challenge to the h.e.m.t..

Integration of HEMTS

HEMT devices are attractive for integration into m.m.i.c. devices (monolithic microwave i.c.s), since the resulting m.m.i.c.s may have reduced i.c. size, improved receiver performance and an extended frequency of operation even into the mm wave region. It has been estimated that the advance of h.e.m.t. integration into operational systems is increasing by a factor of four each year. A number of monolithic circuits incorporating h.e.m.t. devices have been developed in the past few years which provide excellent gain and noise figure performance (see Table 1).

HEMTs are being used in military equipment (both hybrid and monolithic products). They are very suitable for electronic warfare application in the 2 to 40GHz frequency range, for phased array X-band radar applications, for 35GHz smart munitions, and also for the US Milstar military satellite programme using a 20.7GHz downlink and a 44.5GHz uplink with a 60GHz satellite cross-link band.

There is intense interest in the development of more advanced m.m.i.c.s utilising h.e.m.t. devices. Improvement in the materials and in the process technologies (leading to shorter gate lengths and mushroom gate profiles) are resulting in work on the development of monolithic h.e.m.t. low noise amplifiers for frequencies up to 100GHz. Various manufacturers are also developing power i.c.s using h.e.m.t.s for the mm wave region of the spectrum; advanced material structures such as a pulse-doped h.e.m.t. device or multi-channelled h.e.m.t.s can be used in such products.

Digital applications are expected to greatly intensify the importance of h.e.m.t.s during the 1990s. Details of the first digital h.e.m.t. i.c. became available in January 1986 when Fujitsu released details of its 256-bit h.e.m.t. memory. It includes 2072 h.e.m.t. devices and provides an access time of 1.5nano seconds at -196°C. The same company developed the fastest 1Kbit static RAM with an access time of 0.9nanosecond at -196°C (1.5 times faster than any silicon i.c. on the market).

It has been forecast that h.e.m.t. technology will gain most attraction from large digital systems, such as mainframes and supercomputer manufacturers. Another area for development is that of telecommunications where h.e.m.t.s may play a very important role in the future. The technology used for h.e.m.t. fabrication can be used to create lasers on the same i.c. Instead of installing more optical filters in fibre optic systems, lasers emitting different wavelengths could be fabricated on i.c.s to increase the number of circuits which can be carried by a fibre optic pair.

Table 1: Monolithic i.c.s containing h.e.m.t. devices

Manufacturer	Frequency (GHz)	Noise Figure (dB)	Gain (dB)	IC Area (mm)
Gen. Electric	7.5 - 12	2.4	12 - 18	1.7 x 2.54
Thomsom-CSF	9.5	-	5	0.85 x 1.8
TRW	43 - 45	5	5.5	1.25 x 1
Varian	2 - 21	3	12	2.3 x 1.7
Varian	20 - 40	5	6	2.2 x 1.1
Varian	3 - 40	4	6	2.4 x 0.9
Varian	23 - 25	-	10	2.0 x 1.1

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.

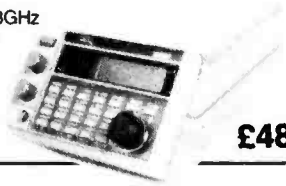
LATEST MODELS

Contact us for details.

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

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 800E

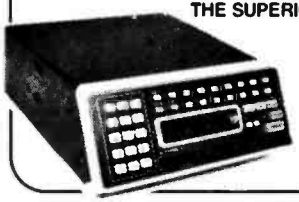
THE SMALLER HANDY-SCANNER

- 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

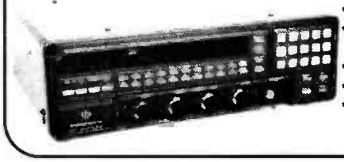


- The choice of the professionals
- Proven reliability
- Covers: 26-88MHz, 108-180MHz, 380-514MHz
- AM & NFM on all bands
- Positive action keyboard
- 16 memories
- 12V dc & 240V ac

£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

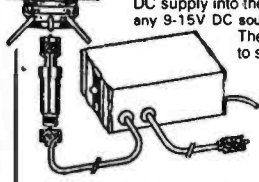
THE FAVOURITE HAND SCANNER

- UK version — full service backup.
- Covers 108-180MHz, 220-280MHz, 300-380NHz, 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

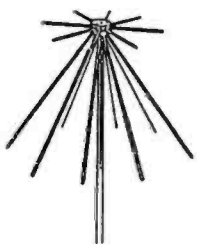
The problem with omni-directional wide-band antennas is their lack of gain.
The REVCO PA3 range of wide-band pre-amplifiers complement the antennas and compensate for their short-comings.
The basic specification of the products is similar: coverage 20MHz-1GHz, at 1GHz: minimum gain 13dB, noise factor 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!

PA3 Masthead, with PSU		PA31/B	BNC	**£35.50**
PL259	**£49.95**	PA31/N	N-type	**£38.95**
N-type	**£53.95**	PA31/S	S0239	**£35.50**

REVCONE



The UK's favourite discone composed of traditional British quality engineering.
The REVCONE 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 S0239. N-types give a better UHF performance, but they cost a bit more. The choice is yours.
Because the REVCONE 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 (S0239 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 6AA.
Phone 0296 668684 or 044 282 8580. Callers by appointment only.

0202 665524 **VIDEO FILM MAKING** 0202 665524

by Keith Brooks

First published in 1985, this 176-page book describes how video film making is done and what you can do yourself. Practical step-by-step instructions are given for making your own films.

Originally £9.95 our bargain price is just **£2.95 including P&P.**

SATELLITE TV — A LAYMANS GUIDE

by Peter Pearson

This book, first published in 1987, explains all about setting up your own satellite TV terminal at home. Originally sold at £4.95 it can be yours for just **£1.50 including P&P.**

Send your orders to:

PW Publishing Ltd. FREEPOST, Enefco House, The Quay, Poole, Dorset B15 1PP

MERLIN

MERLIN WAY, BOWERHILL, MELKSHAM, WILTSHIRE SN12 6TJ.
Tel: 0225 706886. Fax: 0225 708594

SYSTEMS

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, 60000uf 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

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
68-88 MHz
12.5 kHz Cannel 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 DK 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

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—Gast rotary air/vacuum pump 20psi/29invac.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!

PACKET RADIO FROM THE SPECIALISTS!

Siskin Electronics have a policy of supplying the best range of packet radio equipment available for the radio enthusiast. We have examined the products of many manufacturers and are pleased to be able to offer what must be the widest range of equipment available from just one UK supplier. All prices include VAT and are valid at time of publication.

PACCOMM
TINY-2 with PMS..... £119.00
TNC-320 dual port *In Stock!*..... £179.00
PC-320 dual port PC card £189.00
MICROPOWER-2 ..... £149.00
HANDIPACKET *(Le TNC)*..... £199.00
9600 baud modem..... £ 95.00
REAL TIME CLOCK option..... £ 27.95
MICROSAT PSK MODEM *New!* £ POA

AEA
PK232 best selling multimode..... £289.95
AMT 3 AMTOR/RTTY *New!*..... £169.95
PK232+MAILBOX £319.95
PK232 MAILBOX upgrade..... £ POA

KANTRONICS
KPC2 HF/VHF with Wefax..... £165.00
KPC4 VHF/VHF dual port £242.00
KAM all mode with Wefax..... £285.00
DVR 2-2 two metre data radio..... £ POA
"Smartwatch" real time clock..... £ 27.95

UPDATES
The latest firmware revision with minimal fuss and expense! PHONE FOR DETAILS

PACKET ACCESSORIES
ATARI *Portfolio PC New!*..... £249.99
32K (62256) static ram..... £ 15.00
BBC MICRO RS423 lead..... £ 7.95
PC RS232 lead ..... £ 9.95
ATARI ST RS232 lead ..... £ 9.95
Custom made RS232 leads from..... £ 9.95
4 way RS232 switchbox ..... £ 24.95
SPECTRUM 48K TNC interface .. £ 14.95
AMSTRAD 464/664/6128 or PCW 8256/8512/9512 RS232 I/F.. £ 59.95
G3RUH 9600 baud modem..... £ 95.00

TRANSCEIVERS/RECEIVERS
HF-225 Gen. Coverage Receiver... £395.00
Navico AMR 1000 Transceiver..... £247.00
Navico AMR 1000S Transceiver... £299.00
All Navico radios supplied by us include TNC connecting lead.9600 version available, phone for details!

SOFTWARE (Packet & FAX only)
We supply suitable software for most computers FREE of charge with all TNC purchases.

NOTE: All prices plus carriage/P&P.
Normally same day despatch

Siskin Electronics Ltd
2 South Street,
Hythe, Southampton,
SO4 6EB.
FAX: 0703-847754

Tel: 0703-207155

VISA

RST

RST MAIL ORDER CO.
LANGREX SUPPLIES LTD,
1 MAYO ROAD,
CROYDON,
SURREY CR0 2QP.

SPECIAL EXPRESS MAIL ORDER SERVICE

	£p								
AZ31	4.00	EM81	2.50	PL519	6.00	6AK5	5.99	6KD6	12.00
CL33	6.50	EM87	2.50	PL802	6.00	6AL5	1.50	6L6G	7.50
DY86/7	1.50	EN91	6.50	PY33	2.50	6AM6	6.02	6L6GE 5YL	9.00
DY802	1.50	EY51	2.75	PY81	1.50	6AN5	4.75	6L6GC Siemens	4.50
E88CC	10.33	EY86	1.75	PY82	1.50	6AN8A	4.50	6L6GC GE	9.00
E180F	12.05	EY88	1.75	PY83	1.25	6AQ5	3.25	6L7	2.50
E810F	35.48	EY500A	3.00	PY88	2.00	6AR5	25.00	6LQ6	8.50
EABC80	1.25	EZ80	1.50	PY500A	4.00	6AS6	8.66	6Q7	3.75
EB91	1.50	EZ81	1.50	PY800	1.50	6AS7G	8.75	12AX7A	4.50
EBF80	1.50	GY501	3.00	PY801	1.50	6AT6	1.25	6RHH8/6KN8	10.00
EBF89	1.50	GZ32	4.00	QQV02-6	19.50	6AU5GT	5.00	6SA7	3.00
EC91	8.00	GZ33	4.75	QQV03-10	5.00	6AU6	2.50	6SC7	2.75
ECC33	4.50	GZ34 Mull/GE	7.50	QQV03-10 Mull	15.00	6AW8A	3.75	6SG7M	2.50
ECC35	4.50	GZ37	4.75	QQV03-20A	25.00	6B7	3.25	6SJ7	3.25
ECC81	1.75	KT61	7.50	QQV06-40A	27.50	6B8	3.25	6SK7	3.50
ECC82	1.75	KT66	15.00	QQV06-40A Mull	39.50	6BA6	1.50	6SL7GT	3.00
ECC83 Siemens	2.25	KT77 Gold Lion	12.00	QV03-12	6.80	6BA7	5.00	6SN7GT	3.00
ECC85	3.50	KT88	15.00	R18	3.00	6BE6	1.50	6SS7	2.75
ECC88	3.50	N78	15.00	R19	9.24	6BH6	2.50	6U8A	2.25
ECC91	8.93	OA2	3.25	SP41	6.00	6BJ6	2.25	6V6GT	4.25
ECF80	1.50	OB2	4.35	SP61	4.00	6BN6	2.00	6X4	3.00
ECH35	3.00	OC3	2.50	U19	13.75	6BQ7A	3.50	6X5GT	1.75
ECH42	3.50	OD3	2.50	U25	2.50	6BR7	8.00	12AX7A	4.50
ECH81	3.00	PC86	2.50	U26	2.50	6BR8A	3.50	12AX7	1.75
ECL80	1.50	PC88	2.50	U27	9.00	6BS7	6.00	12BA6	2.50
ECL82	1.50	PC92	1.75	UABC80	1.25	6BW6	6.00	12BE6	2.50
ECL83	3.00	PC97	1.75	UBF89	1.50	6BW7	1.50	12BY7A	3.00
ECL86	1.75	PC900	1.75	UCH42	4.00	6BZ6	2.75	12E1	17.00
EF37A	5.00	PCF80	2.00	UCH81	2.50	6C4	1.25	12HG7	4.50
EF39	2.75	PCF82	1.50	UCL82	1.75	6C6	3.50	30FL1/2	1.38
EF41	3.50	PCF86	2.50	UCL83	2.75	6CB6A	2.50	30P4	2.50
EF42	4.50	PCF801	2.50	UF89	2.00	6CD6GA	5.00	30P19	2.50
EF50	2.50	PCF802	2.50	UL41	10.00	6CL6	3.75	30PL13	1.80
EF54	5.00	PCF805	1.70	UL84	1.75	6CH6	13.00	30PL14	1.80
EF55	3.50	PCF808	1.70	UY41	4.00	6CW4	6.00	572B	65.00
EF80	1.75	PCH200	3.00	UY85	2.25	6D6	3.50	805	45.00
EF86	5.00	PCL82	2.00	VR105/30	2.50	6DQ5	8.50	807	3.75
EF91	2.95	PCL83	3.00	VR150/30	2.50	6DQ6B	4.75	811A	18.33
EF92	8.37	PCL84	2.00	Z759	25.00	6EA8	3.00	812A	52.50
EF183	2.00	PCL85	2.50	Z803U	25.00	6EH5	1.85	813	65.00
EF184	2.00	PCL86	2.50	2D21	3.25	6F6	3.00	866A	35.00
EH90	1.75	PCL805	2.50	3B28	50.00	6GK6	3.50	872A	20.00
EL32	2.50	PD500	6.00	4CX250B	61.00	6H6	3.00	931A	18.50
EL33	7.50	PFL200	2.50	5R4GY	5.50	6HS6	3.77	2050	7.50
EL34 Mullard	10.00	PL36	2.50	5U4G	4.50	6J5	4.50	5763	6.80
EL34 Siemens	4.50	PL81	1.75	5V4G	2.50	6J6	2.00	5814A	4.00
EL36	2.50	PL82	1.50	5Y3GT	3.50	6J7	4.75	5842	10.00
EL80	25.00	PL83	2.50	5Z3	4.00	6JB6A	10.00	6080	8.00
EL81	5.25	PL84	2.00	5Z4GT	2.50	6JE6C	8.50	6146B GE	15.00
EL84	2.25	PL504	2.50	6/30L2	1.75	6JS6C	9.00	6550A	12.50
EL86	2.75	PL508	5.50	6AB7	3.00	6K6GT	2.75	6883B	9.50
EL91	7.39	PL509	6.00	6AH6	5.00	6K7	3.00	6973	8.75
EL95	2.00					6K8	3.00	7025	4.50
EL360	18.50							7027A	11.00
								7586	15.00
								7587	23.00
								7868	8.50

Prices correct when going to press

Tel. 01-684 1166 Open daily to callers: Mon-Fri 9 a.m.-4p.m. **Fax: 01-684 3056**
Valves, Tubes and Transistors – Closed Saturday
Terms C.W.O. only, allow 7 days for delivery.
Quotations for any types not listed S.A.E.
Prices excluding Post and packing £1.00 per order + VAT **Telex 946708**
VAT add 15% VISA CARDS ACCEPTABLE OVER TELEPHONE

Packaged Radio

Feature

Packet - the Mode for the Nineties. Packet has been around for several years now, but there is always an influx of newcomers, sufficient to warrant another educational article. It seemed a suitable time, coincidental with the new format of Practical Wireless, *for Roger J. Cooke G3LDI to produce such an article.*

Imagine coming into the shack in the morning and checking the Private Mail Box of your packet station to find mail from friends in the USA, Australia, South Africa or even from just across town. Used properly, it can be the outlet to the world for lots of amateurs with antenna restrictions for example, or for an amateur constantly moving around on business, the complete packet station can be contained in a brief-case. How does all this work? What do I need? How much does it all cost? Read on and find out.

The packet station can be split into three parts. First you possibly already have the radio equipment, a transceiver, tuned to 144.650MHz, the most common v.h.f. packet frequency. You probably also have an antenna to go with the transceiver. Secondly, a TNC, that's a Terminal Node Controller. This is the packet equipment which provides packet assembly and disassembly, together with modulation and demodulation functions. Thirdly the terminal equipment, a computer being the most common, using a terminal emulator program.

The terminal equipment can be a dedicated terminal, such as a v.d.u., a Video Display Unit, with a keyboard and RS232 interface. If it is used solely as a display unit, with basic input and output functions it is known as a dumb terminal. If it has other support functions, it is known as an intelligent terminal. However, most amateurs use a computer these days, with a program enabling them to "emulate" a terminal. There are numerous micro-computers available to suit most pockets and there is usually a communications program available to enable it to be used on packet.

The TNC has seen lots of major advances since the days of the old TNC1 from TAPR (Tucson Amateur Packet Radio-corporation). There are TNCs that are designed for v.h.f. (1200 baud) working, such as the Tiny 2. This unit also has its own personal mailbox. There are TNCs with modems suitable for either v.h.f. 1200 baud or h.f. 300 baud operation, such as the TNC200. Then there is the sophisticated all-mode type of units such as the KAM and PK232 which besides being used on packet, can also be used on AMTOR, ASCII, c.w., RTTY, FAX and in the case of the KAM, can be used on packet on v.h.f. and h.f. simultaneously. Most of the modern TNCs have a c.w. ident (a requirement imposed by the DTI) a PMB, Personal Mailbox, and possibly a tuning indicator, a necessity for h.f. working.

The radio equipment depends on the requirements of the operator. Although the newer synthesised rigs have solid-state switching for changing from transmit to receive, some of them can present a problem in that the synthesiser requires a finite time to lock. The older switched-channel rigs do not suffer this problem, but do have relay switching, which can be another problem! However, the time taken going from transmit to receive can be compensated for by proper adjustment of the TNC parameters.

Inter-connections

In most cases the physical connections between the pieces of equipment are fairly straightforward. The audio output from the TNC is connected to the audio input of the transceiver with the p.t.t. line connecting to the p.t.t. connection, both are usually together on the microphone socket. The audio output of the transceiver is connected to the audio input of the TNC. Considerable care must be taken here. Some TNCs are very fussy about the audio level input, too much audio and swamping takes place, the result is no copy. Padding networks may be necessary in stubborn cases. The RS232 connection is normally described in the TNC handbook. You should check this carefully also because the RS232 standard is not always "standard". However, normally only five connections are needed, given in Fig. 1.

Switching On

Having connected the equipment together and double-checked the wiring, it's time to switch on. However, don't expect everything to be fine after that. There may be incompatibility between the TNC and the terminal or the TNC and the rig, or, at worst, all three! The first thing to check is the terminal. or serial port, baud rate. A data rate here of 4800 bauds is normal. The radio port baud rate is 1200 for v.h.f. and 300 for h.f. In the case of the TNC200, baud rates are selected by DIP switches. This MUST be done with the TNC switched OFF. If in doubt, always adopt the RTM technique (Read The Manual). Having set the baud rates correctly, you should have a sign-on message on the screen at switch-on. For example, the TNC2 sign-on message is in Fig. 2.

Parameters

Modern TNCs have well over 100 parameters, each of which has to be set correctly in order for the TNC to perform properly. Having said that, the default settings of a large percentage will be OK for a start. Parameters can be classified into several different groups:

Character commands. - These select the special alphanumeric characters used by the TNC for various functions.

Identification commands. - These determine how a packet radio station is identified.

Link commands. - These relate to functions and parameters used in communications with other stations.

Monitor commands. - These relate to the

Figs 1 & 2

Computer RS232 connections.

Pin 2 Transmit Data - This line is the serially transmitted data from the terminal to the TNC.

Pin 3 Receive Data - This line is the serially transmitted data from the TNC to the terminal.

Pin 4 Request To Send - This line tells the TNC that the terminal is ready to receive data. An ON level tells the TNC it may send data while an OFF level tells it to stop sending data.

Pin 5 Clear To Send - This line tells the terminal whether or not to send data to the TNC. An ON level tells the terminal it may send data while an OFF level tells it to stop sending data.

Pin 7 Ground connection.

Pin 8 Data Carrier Detect - This line is and output from the TNC indicating connect status of the unit.

The sign-on message from the TNC.

Tucson Amateur Packet Radio TNC 2.
AX.25 Level 2 Version 2.0.
Release 1.1.4 11/13/86 - 32K RAM.
Checksum $21
cmd:

monitoring of packets and also the status of the TNC.
Re-initialisation commands. - Exactly what it says.
Port commands. - These configure the port connected to your computer.
Timing commands. - These adjust the various TNC timing parameters.
An immediate command instructs the TNC to perform an immediate task, such as connecting, disconnecting etc.
A configuration command sets the TNC parameters. Configuration commands that have to be set from the start are as follows:
Mycall - An obvious one, to be set to your callsign.
Frack - This will have to be determined by experiment, normally between 1 and 4.
Maxframe - Set it to 1.
Paclen - On v.h.f., if you have a good link, set it to 0 (256). On h.f., if you have a good link, 150 is about the maximum, although the vagaries of h.f. propagation can so easily take their toll, so 60 is about average.
TXDelay - Depends on your rig, determine by experiment.
Retry - Normally about 10 to 15. Make sure you NEVER leave it on 0 as it could be embarrassing!
Echo - If you don't see what you type, set it to ON. If you see two of what you type, set it to OFF.
Monitor - There are several different levels of monitoring on most modern TNCs so read the manual to determine what suits you.

Fig. 3

A(BORT)	Send during long list to stop
B(YE)	Use to sign off from the BBS
D(OWNLOAD)	Download a file in the file directory, e.g. D USER.DOC. See W to get list of files
H(ELP)	A brief help file
I(NFORMATION)	Information on the mailbox
J	Lists recently connected stations
K(ILL)	Kills messages. For example: KM = Kill mine, K
XXXX =	Kill number XXXX
L(IST)	Lists messages. For example: LM = List mine;
LL XXX =	List last XXX messages; L<c/s = List from a callsign; L>c/s = List to a callsign; L! text = Searches all subject areas for text string; L = List all since last time; L XXXX XXXX = List from XXXX to XXXX
R(EAD)	Reads Messages. For example: RM = Read mine; R XXXX = Read message XXXX
S(END)	Send a message. For example: SP G4GBA = Send a personal message to G4GBA; SP G4GBA @ GB7MXM = Sends a message to G4GBA at GB7MXM BBS (works to all BBS worldwide!); SB ALL @ ENET $ = Send a bulletin to all BBS in Eastern Anglia; SB ALL @ GBR $ = Send a bulletin to every BBS in the UK; So use sparingly!
T(ALK)	Talk to the Operator
U(PLOAD)	Upload a file to the Files area
V(ERSION)	Gives version of BBS in use. If used with a message number gives read of all the headers e.g. V XXXX
W(HAT)	List directory of the file area
?	? followed by first letter gives a detailed help message of the command e.g. ?W Please remember: Advertisements or For Sale notices are against your licence and mine. They will be deleted if I catch them. You may see others using them, but don't be tempted.....

The setting of the other parameters can be obtained by asking somebody who is already using the same TNC. In fact, there are usually lists of TNC parameters kept in most local BBS (Bulletin Board Systems) so a look in there would probably help.

Operating

Having put the basic station together, with the transceiver on 144.650MHz, you should see packets appearing on the screen. One way of announcing your presence to the packet world is to put out a beacon. This is easily done by setting two more parameters. First the beacon text. All that is needed is something like "G9ZZZ, Fred in Anytown". Then set the beacon timing to something sensible. Refer to the manual again and make sure that you set the timing for AFTER 10 minutes, or whatever interval you choose. Less than 10 minutes is unnecessary and setting the beacon to EVERY instead of AFTER is unsociable. Using AFTER makes sure that the beacon is not transmitted until that interval has passed with no link activity. This ensures that no collisions take place.

BBS and Node Use.

Having connected the equipment successfully, watching the screen will identify your local BBS station. If there are several, pick the one that has the best signal and make that your "home BBS", the place where you pick up your mail. If you can connect direct, fine, if not you may have to use the local repeater, or node. To do this, simply issue a connect request to the repeater, C GB3XX, for example and then wait for the "Connected to GB3XX" message. Then issue another connect request, C GB7XXX, to connect to the BBS. You will then receive a sign-on message which will invite you to give your name, so that you will be recognised in the future. Just type N Fred to tell it your name. You will need to become familiar with the command structure of the BBS, the different types are mostly compatible, so try typing H to get some help. This will point you in the direction of a help file which can be down-loaded and printed out for reference. The complete documentation on BBS operation is about 28k long, so if you want this, make sure you download it in a quiet period! A help file is given in Fig. 3.

Some general rules to follow when using a BBS.

1: Always kill your mail after reading it, download it to your system if you wan to keep it.

2: Never send an advertisement of any kind. Most sysops will kill it on sight as they contravene our Notice of Variation (BBS licence).

3: Don't send frivolous, racist or contentious messages. They will likewise be killed.

4: Don't use the BBS system as a soap-box, exchange and mart, or comic strip. If you have a bone to pick with anybody, do it on the land-line. The BBS is NOT a gossip column. ALL such messages are killed on sight on my BBS.

In other words, please use the system thoughtfully. Sysops spend a lot of time editing and maintaining their systems for your benefit. They have also spent vast sums of money on the equipment needed to run a busy BBS so they will not take kindly to abuse of any kind. So, before you issue a message such as SB ALL @ GBR, which means that all the BBS systems in the UK will receive it, ask yourself if that address is right, could it have been @ Local, or just a private message? Having said that, most sysops will help in any way they can, so don't be afraid to ask if you are not sure how to address mail or use some of the many features of a BBS. There is a lot of information tucked away in the directories and the system exists for your enjoyment.

73 and happy packeting.

SPECIALISTS IN DRESSLER ACTIVE RECEIVE ANTENNAS

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 50-180MHz
	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 Securicor £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 ruggednes. 1.2m long glass fibre rod. Circuit is built into waterproof 2.5mm thick aluminium tube. Ideal for commercial and swl-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 8953609 LEXTON G
PHONE 01-558 0854 01-556 1415
FAX 01-558 1298

OPEN MON – SAT 9AM – 5.30PM
INTEREST FREE HP FACILITIES AVAILABLE
ON MANY ITEMS **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 5199, 0860 634526. Terry (Biggleswade, Beds.) 0767 316431.

SPECIAL OFFERS

IC–R9000

INCLUDING ARA 30 + ARA 900(N) £3,899

IC–R7000

INCLUDING ARA 900(N) £999

IC–R71

INCLUDING ARA 30 £855

KENWOOD R5000

INCLUDING ARA 30 £899

KENWOOD

NEW TS950 H.F. TRANSCEIVER £P.O.A.

Kenwood R5000 + ARA 30	£899
Kenwood R5000	£799
VC20 Converter	£160
TS680 HF + 6 Mtr inc. Microphone	£895
TS440 inc Auto ATU inc. Microphone	£1,150
TS940 inco Auto ATU	£2,000
TS790 2/70 + SAT	P.O.A.
TM701 Dual Band	£479
TM231 2m TX/RX	P.O.A.
NEW TM 731 New Mobile Dual Band	
TH 75 New 2/70 Dual band	P.O.A.

ICOM

IC781 H.F. TRANSCEIVER £P.O.A.

PHONE FOR BEST PRICE

ICOM IC32G	ICOM IC3210
ICOM IC2GE	ICOM IC761
ICOM IC228	ICOM IC781
IC 4S	ICOM IC735
IC 2S	IC 9000
IC 32 DUAL BAND	IN STOCK

SCANNERS

AOR 2002	£475
AR 900	£235
BC 2000XLT	£239
RZI KENWOOD	£440

Jupiter II INC. case, NICADS, belt clip, 12v car lead £299

STANDARD AX700
PANADAPTOR DeLuxe
£575.00

FRG 9600
50 – 950 MHz
£500.00

YAESU

FRG 8800

FRG 8800 **HF RECEIVER £585.00**

VHF CONVERTER £100.00

NEW FT1000 H.F. TRANSCEIVER £P.O.A.

FRG9600	£475	FT747GX	£599
FRG9600M	£500	FT757 MkII	£875
FRG8800	£585	FT23, 411, 4700, 767	
FRV8800	£100	+ All Yaesu available	

STANDARD

WE ARE STANDARD AUTHORISED DEALER

C500 DUAL BAND	£375
C150 2 MTR	£230
C528 DUAL BAND	£379

SONY

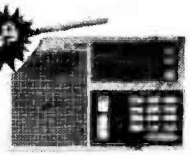
SONY ICF 2001D
76-108MHz
116-136 AIRBAND
153kHz-29.995MHz
FM - AM - SSB 32 MEMORIES
INC PSU, CARRY STRAP & EARPHONE

£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



Feature

Practically Yours

Glen Ross G8MWR

This month's offering is a simple speech processor circuit which can be built for a very modest sum. Why would you want to use one? There are two main reasons, the first type of use is to allow you to move away from the microphone and still keep maximum audio on the signal. The second usage is of particular interest to the s.s.b. operator. It is well known that for most of a transmission, the actual power output is probably no more than 10% of the maximum. This maximum is only available on speech peaks and, if you try to drive the output up on average levels, the peaks will be distorted and you will produce splatter over a wide part of the bands.

Simple Answer

What is needed is a system where the average levels are brought up more closely to the peak levels, and the peaks are held below the level at which overdriving would occur. One of the easiest ways to do this is by using a clipper circuit in which the audio peaks are literally cut down to size. The problem with this type of unit is that the resulting waveform tends to be a square wave and this itself needs further treatment before it can be used to modulate the signal.

RF Clipper

In an r.f. clipper system, the audio from your microphone is used to modulate a transmitter in the processor box and the peaks of this r.f. signal are then clipped. The dipped signal is then demodulated and the recovered audio is used to modulate your rig. This has several advantages over the audio clipper system in that there is little distortion involved and the clipping level can be set to as much as twenty or thirty decibels with reasonably acceptable results. The big problem from the home constructors point of view is that it is expensive to build and none too easy to set up correctly without a lot of test gear.

A Solution

Is there a way round these difficulties? The answer is yes. The third way of controlling your audio is to use a system of automatic gain control. In this type of unit, the gain of a pre-amp stage is controlled by a voltage which is derived from the incoming audio signal. The higher the audio level, the greater is the control voltage which is fed back to the pre-amp and reduces the circuit gain. By this means it is possible to get a sensibly constant output from a input signal which varies over a 60dB (1000 000:1) range.

Tailoring

As well as getting more effective modulation levels, it would also be nice if we could adjust the frequency response of the modulation system to improve readability. Most of the information in the human voice is contained in the range 300 to 3000Hz, yet most modulation systems have a much wider bandwidth than this. Because the lower frequencies tend to contain most of the power, your signal is being heavily modulated with unwanted voice frequencies which add nothing to the readability. It is also true that a signal which is top heavy tends to cut through the QRM and gives you more punch.

The Answer

Is there a simple way of putting all these things together in a simple circuit? Again, the answer is yes. Plessey produce an i.c. known as the SL6270 which will give all the facilities we need and what is more it is very cheap. Referring to Fig. 1, the resistor R1 is used to provide a reasonable impedance match for the average microphone, the single ended input of the i.c. being around 150Ω. Resistor R6 allows the input level to the i.c. to be adjusted. A certain amount of low frequency roll-off is provided by the capacitor C1, but most of the audio tailoring is done by C4 and 5.

Roll Off

Capacitor C4 is in parallel with an internal resistor and increasing its value will decrease the h.f. roll-off point. Capacitor C5 is a coupling capacitor between two sections of the i.c. and reducing its value will raise the frequency of the low frequency roll-over point. As listed the components give roll-over points at about 300 and 3000Hz, but these components can easily be altered to suit your own requirements. The gain of the system can be adjusted over a wide range using R7 and the resistor R3 must be included to maintain the minimum allowable resistance between pins 2 and 8. The attack time and the decay rate of the system are set by C3 and R2, connected to pin 1.

Response Times

As shown, the attack time of the circuit is fairly fast at 20ms and the a.g.c. decay is set at 20dB per second. These values avoid the bumping effect which is obtained if the attack and, more especially, the decay times are too short. The settings can be changed over a wide range by suitable choice of these components, but those used in the circuit should suit most requirements. The final variable setting is R8, which is used to control the output from the unit to the rig.

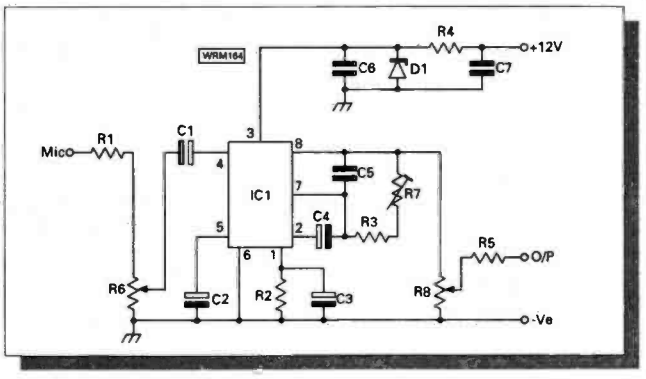
Construction

There is nothing special about the construction except that, to avoid hum pick-up, the unit needs to be well screened. Veroboard and a die-cast box would fit the bill pretty well. The actual component layout is very much as shown on the circuit diagram. The power supply requirements are only a few milliamps at 6V. This could be obtained from a built-in battery or, as shown in the circuit diagram, by using a dropper resistor and a Zener diode from the station's 12V supply.

Setting Up

The unit can be set up without the need for any test gear, you simply need someone to listen to your

Fig. 1



signal at a few kilometres distance. Insert the unit into the microphone line and set R6 and R8 to about mid position, with R7 set to the maximum resistance point. First, adjust R6 until high ambient noise is reported to have gone. Now, whilst speaking into the microphone at your normal speech level, adjust R8 until distortion just sets in. When this happens reduce the value of R8 slightly to clear the distortion and the job is done. If these adjustments cannot be accomplished, try altering the setting of R7 and run through the whole procedure again until the desired results are obtained. Now you come to the interesting bit! Having obtained a selection of 'on air' reports, you can decide if you want to modify the frequency response; just follow the points made earlier. The nice thing about this design is that it will keep you happily playing with it for hours until you get exactly what you want. **PW**

Shopping List

Resistors
0.25W 5% Carbon film

220Ω	1	R5
270Ω	1	R4
390Ω	1	R1
680Ω	1	R3
820Ω	1	R2

Pre-set Potentiometers

470Ω	1	R6
1kΩ	1	R8
5kΩ	1	R7

Capacitors
Disc ceramic

4.7nF	1	C5
10nF	1	C6
1nF	1	C7

12V Electrolytic

2.2µF	3	C1, 2, 4
68µF	1	C3

Semiconductors
Diodes

C6V2	1	D1 (6.2V zener)

Integrated Circuits

SL6270	1	IC1

What is Propagation?

Feature

Ron Ham takes a look into various aspects of propagation and how you can do experiments of your own.

Last time, I showed a 32 day, 160 hour, test of observing meteors by radio and recording the results on about 140m of pen recording chart. After this it was obvious, that another method of counting had to be found before my plan to run the system from 0800 to 2300 each day could be put into operation.

Electronic Counter

My problem was solved in August 1971, when I received a copy of RS Components' catalogue and found that they had added decade counter parts to their component range. These included the p.c.b., adder and driver chips and the Nixie tube, all ready to assemble. I immediately ordered enough parts to make 6 decade counters, a power unit and one of their metal cabinets to house the system. Total cost about £40 trade. Each p.c.b. was clearly marked for wiring, and component positions and arranged that the output of one was fed to the input of the next and so on until, in my case, the unit could total just one short of a million counts.

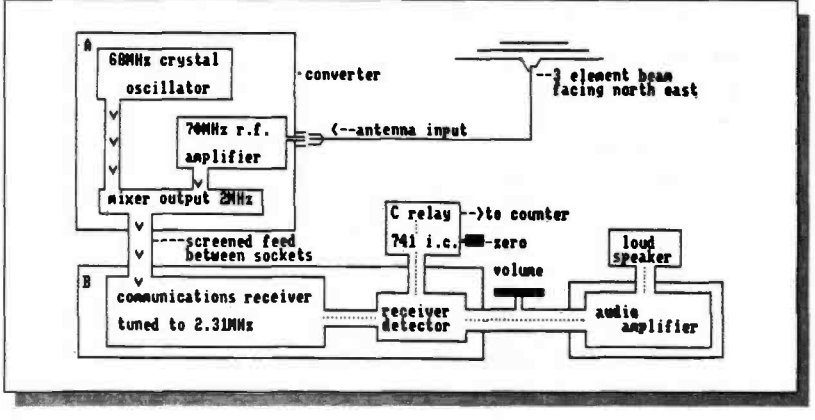
The counter worked a treat and the first real test was carried out on September 26, when 1072 meteor "pings" were counted between 0915 and 2300. So, the following day a major observation began, but, this meant that Joan or I had to read the counter every hour during each daily observation and although you may think us daft, we did it for about four years!

Receiver

Reference to Fig. 1, will show that meteor reflected signals from the Polish transmitter at Gdansk on 70.31MHz were collected on a 3-element beam and passed on a low-loss coaxial feeder to the 70MHz converter detailed in box A. The converter's output was fed by a short screened lead to the antenna socket of a communications receiver, box B, tuned to 2.31MHz. The rectified signal from the receiver's detector was tapped and sent to an integrated circuit (741) d.c. amplifier which in turn energised the coil of a sensitive relay which had a positive action and good quality contacts.

When the system was working, only the periodic 'pings' of speech or music from Gdansk could be heard above the fluctuating hiss of the receiver's background noise. The zero control on box C was adjusted so that each 'ping' operated the relay. However, before the input of my home-brew counter was connected to the system, it proved necessary to add a capacitor and resistor network across the relay contacts to prevent 'contact bounce'. In other words the electronic adder would total up the relay contact operations. Remember, this was 18 years ago, so different input techniques would be used today. Next time, I will tell you about the results. **PW**

Fig. 1



C.M.HOWES COMMUNICATIONS

VISA Access

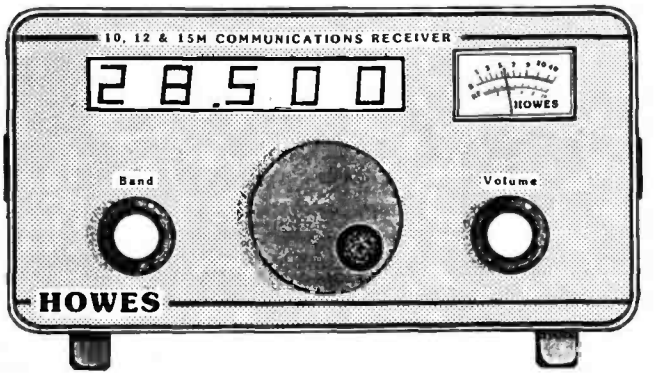
Mail order to: EYDON, DAVENTRY
NORTHANTS NN11 6PT
Tel: 0327 60178

Professional RF design, manufacture and consultancy.
HOWES KITS for the Novice and Radio Amateur

Building your own equipment is one of the most enjoyable aspects of amateur radio. Our range of kits is designed to enable you to enjoy this pleasure with the minimum of trouble. We have receiver kits to suit the beginner, and transmitters for the licenced amateur, plus a full range of accessories.

INTERLINKING MODULES

The important feature of our range is the way the kits can be linked together. If you are a newcomer to the hobby, you can start with a simple single band receiver, and later add any accessories you choose (digital readout, "S meter", extra filters, etc.) and then by adding a VFO kit and a transmitter, turn it into a full transceiver when you get your licence.



An illustration of one of our demonstration receivers.

The drawing shows the result of combining a few of our kits together and building them into one piece of equipment.

Kits used in the construction of this radio were **DXR10** (three band receiver), **DFD5** (Digital Readout), **DCS2** ("S Meter"), and **CBA2** (Buffer/Amplifier). Total cost of kits: **£78.50.** The performance is excellent, and with a little time, trouble and money spent on making a neat job of the construction, a receiver to be proud of. A little too ambitious a project for the beginner perhaps, but a DXR10 kit without the digital readout, meter, etc., will still hear as many stations, and is suitable for the less experienced constructor.

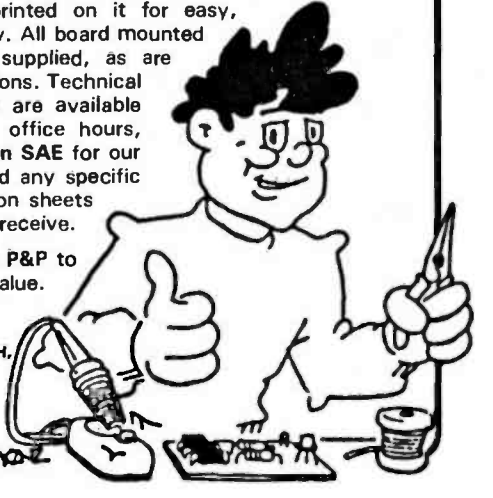
COMPLETE RECEIVER PACKAGES FROM £32.10

To make life easy for the newcomer we also stock "hardware" packages to go with our receiver kits. These include a case, dial, tuning capacitor(s), knobs, sockets, nuts and bolts, etc. — the mechanical bits and pieces to go with the basic kit (which contains the electronics). The total cost of a complete three band receiver package (DXR10 + hardware + P&P) comes to **£39.90.** Which is not bad for a radio that will receive almost as many stations on these bands as the most expensive set! A DcRx single band package works out at only £32.10.

		Kit Price	Assembled PCB Module
RECEIVERS			
DcRx20	20M Amateur Band SSB/CW Receiver	**£15.60**	**£21.50**
DcRx40	40M Amateur Band SSB/CW Receiver	**£15.60**	**£21.50**
DcRx54	5.4MHz HF Air Band Receiver	**£15.60**	**£21.50**
DcRx80	80M Amateur Band SSB/CW Receiver	**£15.60**	**£21.50**
DcRxl60	160M Amateur Band SSB/CW Receiver	**£15.60**	**£21.50**
DXR10	10, 12 &15M Ham Bands SSB/CW RX	**£24.90**	**£36.90**
M8RX	HF SSB/CW Marine Band RX	**£29.90**	**£44.90**
TRF3	SW Broadcast TRF Receiver	**£14.80**	**£20.20**
RECEIVER ACCESSORIES			
AA2	Active Antenna Amplifier	**£7.50**	**£11.50**
ASL5	External Dual B/W SSB & CW Filter	**£14.90**	**£22.50**
CBA2	Buffer/Pre-amp to feed DFD5	**£5.80**	**£8.90**
CSL4	Internal Dual B/W SSB & CW Filter	**£9.90**	**£15.90**
CTU30	HF bands +6M ATU for RX or 30W TX	**£27.90**	**£33.90**
DCS2	"S Meter" for our receiver kits	**£7.90**	**£11.90**
DFD5	Digital Frequency Counter/Display	**£39.90**	**£59.90**
XM1	Crystal Calibrator, VLF to UHF	**£16.80**	**£21.90**
TRANSMITTERS			
AT160	80 & 160M AM/DSB/CW 10W PEP TX	**£34.90**	**£53.90**
CTX40	40M 3W QRP CW Transmitter	**£13.80**	**£19.90**
CTX80	80M 5W QRP CW Transmitter	**£13.80**	**£19.90**
MTX20	20M 10W CW Transmitter	**£22.90**	**£29.90**
VARIABLE FREQUENCY OSCILLATORS (VFOs)			
CVF20	20M VFO for TX or Transcieve	**£10.40**	**£16.90**
CVF40	40M VFO for TX or Transcieve	**£10.40**	**£16.90**
CVF80	80M VFO for TX or Transcieve	**£10.40**	**£16.90**
VF160	80 + 160M VFO for TX/TCVR	**£19.90**	**£34.20**
CONVERTERS/TRANSVERTERS			
CV220	2M Converter for 20M Receiver	**£17.50**	**£23.90**
CV620	6M Converter for 20M Receiver	**£17.50**	**£23.90**
HC220	20M Transverter for 2M Rig	**£52.50**	**£83.50**
HC280	80M Transverter for 2M Rig	**£52.50**	**£83.50**
MICROPHONE AND STATION ACCESSORIES			
AP3	Automatic Speech Processor	**£15.90**	**£22.80**
CM2	Quality Mic with VOGAD	**£11.90**	**£15.90**
EM1	Electret Mic capsule to suit AP3	**£1.90**	—
MA4	Mic Filter/Pre-amp.	**£5.60**	**£9.90**
SWB30	SWR/Power Indicator/Load 30W	**£12.50**	**£17.30**
ST2	Side-tone/Practice Osc.	**£8.80**	**£13.50**

All **HOWES KITS** come with a good quality Printed Circuit Board which has its holes drilled, its tracks tinned, and the parts locations printed on it for easy, accurate assembly. All board mounted components are supplied, as are full, clear instructions. Technical advice, and sales are available by phone during office hours, but **please send an SAE** for our free catalogue and any specific product information sheets you would like to receive.

Please add £1.00 P&P to your total order value.



73 from Dave G4KQH,
Technical Manager.

Back-Scatter

HF Bands

Reports to
Paul Essery GW3KFE
287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

Lots of things to report this month, lots of letters, so we'd better get on with it! First though, it was nice to meet some of you, readers and contributors, when a last minute offer of a seat going to the Leicester exhibition came up. Particularly nice were the chats with G5KW and G2HKU.

Events

Thanks of course to DXNS, TDXB, the CARF *Canadian Amateur*, your letters, and a Mkl ear!

The period October 16-22 was notable for a series of proton flare events on the sun; and I won't need to tell keen DXers what that caused!

Andorra has suspended licensing for some unspecified period. Initially the news was that all licences had been so treated, but the latest word says it only affects visitors.

Variation on that theme; it is understood that there are no currently authorised stations in Benin; on the other hand there was a buzz regarding TY1DX from October 15 and said to be an Italian priest.

In the CQ WW SSB Contest weekend, several UK stations had a ball. SWL **D. A. Whitaker** logged 103 countries on 28MHz in just six hours, while **G4LJF** managed to work 119 countries in 35 Zones also on 28MHz. **GW4BLE** worked 100 countries on both 21 and 28MHz, while **G4SVB** worked 90 countries using his QRP set-up.

New Country!

At the end of this year, an area of land larger than Western Europe will change hands by gift; the 1.5 million square miles from Hudson Bay northwards to the Pole is being given to the Innuit Eskimos. A full regional government will be established under the name of Nunavut which means 'Our Land.' Now, who will set up a DXpedition to the new Nunavut?

Gripe!

G2HKU mentions in his letter that RTTY and packet have spread all over the c.w. end of the 14MHz band. This prompts me to wonder how it can be that a couple of computers talking to each other while their owners are at work can be regarded as amateur radio. To me amateur radio is an activity whereby two people communicate with each other, implying the presence of the operator in the shack when this occurs. Surely there is room now for a separate h.f. band on which computers can natter to each other without the QRM generated by real radio amateurs?

The 7MHz Band

Nice to have so many different 'fists' to interpret this month. Everyone's input is greatly welcomed.

G4CCB (New Ollerton) recently had his KW trapped dipole down for repairs of the mast, so about 24m of wire was hung up, tuned through a KW a.t.u. and driven from the station FT-277. On 7MHz, this impromptu antenna and a Morse key yielded NM2E, NJ1H, UA9KCN, UA9WZ, UA9FOR, OH2NQX/8 on QRP, F6AEG again QRP and SP8BFG. As Tony says, while the regular antenna may be more effective, he will never under-estimate the simple end-fed wire: another triumph for the KISS (Keep It Simple, Stupid!) technology.

One of the real dab hands is **GM3JDR** (Aukengill) who offers as his c.w. pickings on 7MHz the following: WL7E, UB5MAL/UA1O, FV9NDX, J52US, VK3OX, UA9AU, PY6BG, JX7DFA, JA1UQP, JA5RH, EK4AA, UA9CGL, JA4MRL, YC6JRV, VK3NC, VS6UO, VK2KM, RH8BQ, JA4XGC, W6s, W7s, V31BB, JT0DX, VK3MR, VE7DBI, ZL1AZE, KN0E/KH3 and KX6DC.

Over now to **ON7PQ** (Kortrijk), who offers his c.w. with JH2MAZ, JT0DX, ZL4KT, 5H3TW, V31BB, KJ7O, XE3LPV, HB9AHA/J6L, VE7WQ, PA0GAM/ST0, ZM1AIZ, VQ9SS and 4K0F.

G0HGA (Stevenage) was active with 10 to 20 watts of c.w., to an end-fed 18m wire; with thus she raised loads of Europeans, plus HB0/HB9NL, UA9SXT, VE1FKZ, KZ3O, K1DPB and K2GGN. Another one to stick to the key was G2HKU, although his activity was reduced by way of the KW Electronics move to Sandling on the one hand, and on t'other his attendance at Leicester. Nonetheless, he did manage to raise VK2BLX, K4NJQ, W2ERJ, UW9CYA and YU2WM who was on Palagruza Is.

G3BDQ (Guestling) was away for some of the period and when he got back found the bands none too good; however on 7MHz c.w. he made it across to VE7AHB, JA5RH and JH3RRA.

The 3.5MHz Band

Now here's a band you either love - or love to hate!!

Another new hand to write in is **G0KRT** (Welling) who uses a Lake DTR3 QRP rig at 1.5 watts output, plus a Howes direct-conversion receiver to a 22m end-fed wire loaded against a quarter-wave counterpoise. While this set-up produced mostly G stations, I notice that some thirteen contacts were two-way QRP. For the rest, the morning and evening operating stints yielded lots of Gs nicely covering the whole country, GM3TMK, DL1EFX, ON5AG, F6ZWF, but, alas, nary a GW!

Now to ON7PQ; Pat mentions his contacts on c.w. with HC8/WA7EGA, 9Q5DX, JT0DX, ZL4IE, 9Y4SD, ZL3GQ, UG6GAW, UF6FEI, UD6DDK, UL7PHB, UI8IAY/UI1C, HK1AMW and DK8FD/VP9.

Turning to G0HGA, we find Angie using just 20 watts c.w. to the 18m end-fed and raising a gaggle of Europeans on the band, including G2FDF, G3LD, G3JHF, G0HHL, G3XNG, G4KLQ, DL5VS, DL6ZBA, DH1LAO, ON4SK, PA3DDN, Y47MN, I2GZQ, SP5TKW, OZ1TKW and DL9EO.

G4CCB tried a couple of times on 3.5MHz and his improvised antenna, to raise VE1AGG and Y40DDR on s.s.b. plus YT3GP and UA3XEU on the key.

The 1.8MHz Band

I really do need some more news of this band than I am getting of late, so all you Top Band addicts please let me know what gives. Unfortunately, I am very deaf on this band because of the site constraints - hint, hint!

G2HKU (Minster) mentions s.s.b. contacts with Y25G and ON7BW, while YL2RG, F3AT, DJ3GR and RW9HYY were worked on the key.

G3BDQ (Hastings) had a little sniff round the band just to see it was still there, and as a result his log included c.w. with UT5UIR, PA63DWE/J, Y38I, Y25TG, OK1JJF, UP2BQS, W1ZE and K1ZM the last two at 2230Z. On s.s.b. contact was made with OZ9EDR, SP5INQ, SP9PEY, LZ2CJ, LX7A, YT2A, RQ7W, IM8A, LY2ZZ, IU3A, I2BJJ and IH9/IV3PRQ on Pantellaria Is which counts as Africa. All were raised on one of John's grounded vertical 'specials' worked against an earth mat.

The WaRC Bands

This is an area where the reports for some reason are thin on the ground. **G3NOF** (Yeovil) offers his s.s.b. analysis: North Americans heard between 0900 and 2000Z, VK/ZL around 0800. Two-way contacts were made with EA4AZ/6, EI9DP, LA0EP, RW3AH, UR2QD, ZL2APW, ZL2BFW, 6W1QB, 9H1VJ and 9K2KS.

Next we turn to GM3JDR who used c.w. for the most part, with two-way contacts booked against the calls of JA6MQI, JA9JFO, JA1ADN, JA6CNL, JA9DMD, JL1UJG, JL1ARF, JP3AZA, JA6DXS, JA6BIF, JA8AIP, JR6CSY, JR5JAQ, JA2DHG, JA2IVY, JA2FJP, JA5AHQ, JI2KXK, JH3DJX/2, JF3KTJ, JA4MRL, JA3DV/2, JM1JIV, JA5AJQ, JA1LFS, JA6PK, JA0BNX, JA3FYC, 9V0VB, 9V0VS, ZL1BEK, VK7FJ, VK3MJ, KH6CD, KL7CYL, W6GTI, WA7RAE, WA6VGI, VE7QU, W7EXR, K6DDO, PY6WT, YB0SQT, LU3EX, K7DX, NN7E, ZL1ST, VK2HW, ZL2ANT, SV9TJ, 4X4DK, VK6AKG, ZL4BF, ZL2FV, TA7/KU0J, SV5TS, VK3XB, LU2IP, PJ2AM and G4BUV/MM near VK6-land. On the sideband front JA5DQH and VK7CK were raised.

Now we look at the log of G2HKU who used c.w. on 10MHz for CO2VG and TF3FZ, the same mode on 18MHz for W7EXR, N5VV, JA4CSH, KC1CU, WA4GAX, W2GW; not to forget 24MHz on which **K2KIB** was netted.

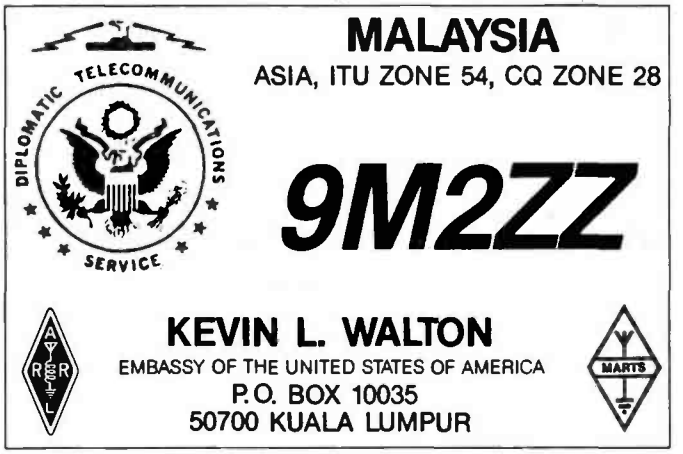
The 28MHz Band

Isn't it amazing? The band 'gives' like nobody's business until it senses my footsteps coming into the shack, at which time it promptly expires....just what have I done to deserve this?

Seriously though, the band has always had that 'unexpected' tendency; a CQ on an apparently dead band might scare up a reply from somewhere totally unexpected; when it is going to drop out, the s.w.l. will tend to notice that propagation is swinging round, but the licensed type, intent upon his particular morsel and shutting out

From l-r: Sharanjit (s.w.l.), Harris (9M6HF), Rashid (9M2RS), Zainal (9N2ZA) & Kevin (9M2ZZ).

Back-Scatter



Kevin's QSL card

the QRM is thus taken by surprise. Awkward, ain't it?

ON7PQ first. Pat found XX9SW, JT0DX for Mongolia, SM0OIG/YN3, TI4SU/5, 3DA00BK, PA0GAM/ST2, NL7GP, KN0E/KH3, ZY0FA, P40P, ZD8Z, TO100D, and CW0L, all with CW.

G0HGA varied power between 5 and 20 watts. The lower level was enough for JE1GTA, and UB5MVX; others on c.w. included SV/DK9CG, DK8FD/VP9, UL7CC, UB3ME, UA3PIP, RL7LAY, RI8BQ, UD8DWW, UZ3LWN, UC2LBF, RTU, UT9J, WD8MEV (YL Contest), K3GWA, W4NPX, K4YR and VE1CH.

Now we come to a first letter from **GM0DEQ** (Hurlford) who offers his c.w. contacts with K3SQO, 6W1QB, W2QUV, VE3PUA, OH5MMO who was using QRP, VE1WDR, plus s.s.b. contacts with NM2Y, RAAW, LZ1W, UT4UZ, N8CXX, W4/G4BHE, KJ0B, NC7K, YO4CVT and KD5FW.

GM4UQD (Livingston) next; Alistair has been relatively inactive for three years, so he decided to do something about it by way of a G-Whip, a used FT-7B and some /M operation, and a report to this column. Thus when working nights the tea-break could be taken by slipping out to the car for a few QSOs. During the month, this meant some 24 sessions, only two on 28MHz; the latter accounted for PJ2/OH6VY, RB5SA, DK8FD/VP9, ON/G2VH, N2JTV, 4X4HQ, and UG7GWB. Welcome aboard GM0DEQ and GM4UQD.

Nice to hear again from **G0JBA** (Sittingbourne), who has been six months QRT while moving house. The new place now boasts a 15m telescopic tower, surmounted by a Cushcraft A3 tribander, with a half-sized G5RV for other bands; Phil can also hang up an end-fed wire if needed. In general, the beam is noted as being 2-6 points up on the same signal on the G5RV. So, while trying it all out, G0JBA made it to AY6D, BY5RA, CE3TVN, DX1DBT, K3AQH, KZ5B, K4XS, LU1ICX, N5KEA, OD5SK, PP5ZYZ, PY5EG, SV8/DF4TD/P, UP1BZZ, VO1MQ, ZC4BS, ZP5CF, ZS6AOO, 4U1UN, 4X0WAE, 5B4ES, 9K2DR and 9K2KS.

Sideband all the way for G3BDQ, who raised J28TY, UL7ACI, UL7LC, P40R, HZ1AB, TR1C, 9H1EL, RB8M, IH9/IV3BMV (Pantelleria Is), OHXX/EA9 and UZ9SWR.

G3NOF, of course, stuck to s.s.b., with CY0SAB, FJ/DL7FT, HK3JJH, HL4SF, HL0Y, II7AMM, many JAs, JT0DX, K4PI/PJ7, KB7YS (Arizona), KP2A, NL7J, NP4CC, PJ2/W4JVN, PJ1B, TR2A, TT8GA, TU0A, TA3F, TI100D, UA0FF for Zone 19, V47K, VE7DTS, VE7GFS, WL7BQM, XE1L, YI1BGD, ZL2SQ, assorted W6s, 4U1VIC, 5J0DX, 6W1AAD, 8P9X, 9H3EH and 9I2XXV.

Turning northwards we head for GM3JDR; Don used s.s.b. to raise LU9VAB, BY8AC, VU2GHS, CQ0LN, FM5WD, CE2BMU, ZL3VN, and loads of W and JA stations; on c.w. these were VK6XA, dozens of JAs, RA9WJ, 5N0LT, VK5FE, VK6WT, UL7HB, G3GJQ/5N0, LU9CV, LU1HDC, PY2ACJ, CE3DNP, VK4XA, A92BE, BV2DA, LU2YE, TL8RM, CQ0LN, VK6DZF, VS6DL, HL1SX, LU2AFT, OY7ML, VK5OH, VK3EGN, HK3RO, ZP6XDW, 5J0DX and PY5AKW.

Finally for this band we note that G2HKU made a foray on c.w. to raise K9QVB and N3CEU.

The 14MHz Band

G2HKU stuck to his key on this band and managed to find KL7PJ, ZY0RC, K1EFI/VP9, RS3A, KN0E/KH3 (Johnston Is) and VK2BLX.

"Not greatly enamoured of it!" about sums up GM3JDR's view of this band, but he did key with ZL2AGN, UW6HZ/JW, SP8UFO/JW, VK7AAQ, RA9LZ, JA7AS and UA0MO.

G3NOF notes that he didn't spend much time on 14MHz since conditions were so good elsewhere; however he did have s.s.b. contacts with AH9AC, BZ4CH, G4DUW/DU1, TT8GA, XX9KA, YJ8AB, YK1AO, ZL2VS and 3B9FR.

Yet another one to comment "not my favourite band these days" is G3BDQ, who only worked JA7BE.

G0JBA introduces a new note in his report on the band; Phil worked SSTV with CT1AFN and DL1NCH, plus s.s.b. to VU2TTC, V47NXX, W1-2-3-4-8.

G0HGA managed N1CC, SP2AEL, UA1WAN, UA1ZEY, DL6ZBA and DL1BD.

Coming now to the list of ON7PQ, Pat spreads his activity out very evenly between the bands, and emphasises it by the very way he presents his lists. He mentions FO0MGZ, JT0DX, ZY0RC, ZK1CQ, OH4ML/H44, ZY0FA, CI0MDA, KX6DC, K7SS/PT1, VQ9VR, DK8FD/VP9, 4K0F and G4CNY/VP9.

The 21MHz Band

First, a very nice letter and photograph, sent in by **Kevin 9M2ZZ** (Kuala Lumpur); the pic shows Kevin with active locals s.w.l.s Sharanjit, Harris 9M6HF and son Alif from Saba, Rashid 9M2RS and Zainal 9M2ZA. Turning to his band activity, Kevin is mainly active on 21MHz, 1600-1800Z, into the UK; among the Gs worked by 9M2DZZ we note G3NKQ, G3WCY, G4WDW, G0KON, G0JHP, G4WTD, G0EYN, G3FPQ, EI5FA, G0LRJ, G0JNZ, GM4ORL, G4PDQ and others.

Now to GM0DEQ, who offers, on c.w., UA0ICC, UA0AMW, JA0AMN, RA9CEI, JA7CDO, VE2DXZ, W2EEH, JA6PA, JH8REZ, UA0JB, CM6XK, JA2GGX, VE2ANE, N4FJZ, EC1CVC, 5T5CK (QSL via DL2HH), UZ6AZS, YC3FFB, U3AJ, WJ9E, K1RH, KA1LIS, UA9MEX, J01TVE, JA9ELE, JA1AIB, JR0KSZ, BV2DA (QSL via DL7FT), UA9DM, UA9CQ, UV9WN, W2QUV, UA0CID, JE8, JR8JZJ, JS1CVR, JR1TUU, JA1HVS, 9H1GI, HL4CHH (Box 29 Yosu), VS6VC, NY9C, VS6UW, JA1YDJ, UI9ABA, N3JO, plus the usual smaller fry.

Pat at ON7PQ found ZD8VJ, ZD7KM, YE5R, LU1ZA in South Orkney, ZS3/SM0KV, JT0DX, OH4ML/H44, PY2TG/PY0T, FR9A, ZY0FA, HL5BDS and 5J0DX.

G0HGA used 10-20 watts most of the time and hooked 7X0A, VE1FLE, SP9DJP, UQ2GN, HA3OD, UP3BW, UA6NE, LY2WW, YU1FG; and in the contest on October 15, eight watts was used for K3ZO, W3ARK, N2KW, KZ3B, N4AR, N3JT, N4XR, K2SX/1, K4PQL, K5MM/7, K7ZA, VO8AW, ZD8SE, JA0EZ, UV9FB, RZ9UA, UA9FGJ, RV9GFP, UA0QGN, plus Europeans of course.

GM4UQD/M didn't say what band he used for his contacts, but I believe they were on 21MHz. Thus I note lots of Europeans, HB0/FF5SK, SV/DL6FM for an IOTA counter, YV5ANF, YV5VR, YV5KIN, UC1OWM/RB9M, 9M2HB for a Gotaway, VO1BL, WA4WTG, W3BRU, 4Z4ZW, 4X6RL, Y40DDR, U1LP, SV8/DF4TD/P, IF8PNJT0DX, LZ1EF/P, LY2WR for one of the new prefixes in Latvia and Estonia, 4N4Z, UA6EA, LY1BC, TH9A, UW1ZC/UA1O, PA63EPG, 4X4JU, 7X7ZA (QSL via F6FNU), JI2EMF, JA7OYF, NZ8H, CU3BI, N4RXT, NL7MF/W1, W8NJS, W1/P/CU3AO (New York), W4PTH, 9K2RA, K1UN (who had a 220MHz link back to his home 48km away!), VE8RCS, TF6JZ, A51AD (Bhutan), UF7FWR, SV0DR, TA4A, YV5ANF, PJ2/OH6VY and of course lots of smaller fry.

CI1YX was a special VE call says G0JBA, who also mentions JT0DX, VE3AGW, VE3KZ, W1-2-3-4-5 and W7, all on s.s.b..

At G3BDQ time seems to have been split between c.w. and s.s.b.; the former made it to FR9A (Reunion), HK0EHM (San Andreas), HK3RQ, KN7K in Idaho, UA0AMW, P40P, while s.s.b. did the trick with UW1ZC/UA1O (Franz Josef), SS0EJ for a funny prefix from Stockholm, PJ8T, UO5ONA, EL2CX, AP2SQ and XL3CPA from Canada.

Contacts using s.s.b. were made by G3NOF with A61AC, A61AD, BY4SZ, BY5HZ, FP/G3LMD, HC1OT, HB9AHA/J6L, HL5FMF, HL9HH, HL0F1B, HR1RMG, HV3SJ, J73DX, many JAs, JA8VKP/JD1 (Minami Torishima), JT0DX, KD7MX, LY2BQQ, N6QLQ/5N29, OX1O, P40V, TA3/DL5SCQ, VE3XN/VP9, VE6MV, VE7NKI/M/W6, VE8RCS, VKs, VP2EZ, VP9AD, VP9LR, VS6BT, VY9CC, W6s, 3D2AG, 4U1WB (The World Bank) 5W1KT, 5N29FEA, 8J2DEP, 8P6SH, 8P9X and 9Y4VU.

All his 21MHz contacts were c.w., says GM3JDR. Don notes in particular JT1CD/9, JT1BR/9, ZL2ALJ, U0CP, HL4CJJ, HS0YDY, RZ8T/UA4FDS, UW8T/UA4FBG, 9V0YC, 4L0X, HL2VQ, VS6VT, H27T, TJ/IK1JLL, FK/JA1CMS, UA0BB, BZ1OK, PY1NBP, HL5BDS, ZD8VJ, ZL1BMP and YV4DDT.

Lastly, G2HKU, who made it to PA0GAM/ST2, K2BZT, CI3AT, UZ9WUU, VK3CP, RA3AEC and VK2BLX.

Forthcoming Events

If you heard XW5PP under a king-sized pile-up, this was not Laos Slim but HA5PP who is trying yet again to get on from that country; at the time of writing the prediction looks like a start date of November 15, but nothing official has appeared as yet.

The word goes about that VU2JX will be in Bhutan, A5 in February, under the sponsorship of an Amateur Radio Branch of Rotary International; and a different source also says they have an operating permission.

On the other hand the news that the Yasme team - Lloyd and Iris Colvin are out and about again is quite firm. The first stop was to be Niger, XT, followed by a move to 5U in mid-November. Look out for 'KL' and 'QG' callsigns. Iris is often in the s.s.b. nets bumping up the DXCC score, while Lloyd tickles the keypaddle.

Mats SM7PKK is reported to have had to totally rearrange his schedule, as no seats were available for Rotuma within the planned time frame. At the time of writing, the word is that he is looking for a sea route there. 3D2XR will be the call on Rotuma, with more time, as a result of this upheaval being spent on Fiji as 3D2KK. Western Samoa 5W1HK, Tuvalu, T2, Western Kiribati T30, and South Cooks ZK1 are all on the agenda, but of course everything depends on the initial problem.

Turning now to the Bouvet DX-peditions, we hear that OH2BH has joined the *Saturday Evening Post* expedition team which now totals eighteen.

Looking for CQ Zone 23? RV0YF seems to like 21.010MHz as lots of people have noted.

The lot for this time. Thanks to all who report in and all who read the piece. Keep the news rolling in!

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

Solar Data for October 1989

During the last week of September there was a large scale decline in solar activity. A flare occurred on September 25, and although a flare alert was issued, nothing came of it. A large X-ray event, lasting for nearly 4 hours took place on September 29. On the same day there was a large flare of 2800 flux units which lasted for over 2 hours. This was followed by a proton event and a cosmic ray increase. During the first few weeks of October, up to the 15th, there was a considerable improvement in ionospheric conditions, with a continual increase in solar flux levels and some lessening in the geomagnetic activity. With solar flux levels averaging 220 units and the geomagnetic A index falling to zero on October 12, 13, & 14, the radio quality indices were well above normal, leading to extended propagation on the 50MHz band.

During the last two weeks of October, from the 16th to the 29th, there were a wide variety of solar features, such as proton outbursts, X-ray flares, proton flares, neutron events and other ionospheric disturbances. On October 18, there was a flare, followed by a sudden storm commencement. This was followed on October 19, by a massive proton flare event, believed to be the largest proton event ever recorded. On the 20th there was a much larger event, followed by a magnetic storm and aurora. The geomagnetic A index, recorded at Meudon, reached 110 units. The activity, in the sun's southern hemisphere, continued to produce many magnetic disturbances right up to the end of the month and by consequence, the radio quality indices collapsed to a very low level, giving much poorer conditions on the lower v.h.f. bands.

Aurora

Two major events in October occurred on the 20th and 21st, although other minor auroras were workable by stations, located mainly in the north of England, on other days throughout the month.

North of the border is always a good place to start with when reporting auroral activity. **Tom Astbury GM0GMD** discovered the aurora on October 20 at 1310UTC. On the 144MHz band he worked many stations in DL, F, G, GW, ON and PA. The best contacts were with Y22ME at 1920UTC and OK2KZR at 1927UTC. This auroral phase faded with Tom at 1940UTC. A brief phase was observed from 2220UTC but signals were weak and only GW was worked at this time. Auroral activity on Saturday 21st was first noticed at 1210UTC. No very long distance stations were heard, contacts being restricted to F, DL, G, ON and PA. Tom remarks that signals were loud and activity was very high enabling 32 locators to be worked. Signals faded at 1800UTC, returning later in the evening from 2100UTC for about 3 hours. This phase was much weaker and less productive with only EI, G, GM and PA being worked.

Annual c.w. ladder

Station	Band (MHz) 50	70	144	430	Points
G4ASR	83	7	344	1	435
G4OUT	-	19	183	-	202
G0HGA	-	—	192	-	192
G4XEN	7	—	144	9	160
GM4CXP	29	1	114	1	145
G0FYD	-	—	117	-	117
G4VOZ	-	46	—	8	54
G3FPK	-	—	32	-	32
G0FYD	-	—	31	-	31
G4AGQ	-	10	11	-	21
GD0ELY	1	—	14	-	15
GW4HBK	-	15	—	-	15
GW4VVX	-	—	9	-	9

Number of different stations worked since January 1 1989

In the aurora on September 26, **Ela Martyr G6HKM** (ESX) worked GI0GDP on 144MHz, but found activity very low. The event on October 20 was very much better subscribed and contacts were made with many stations including EI2BWB (IO52), EI3GE (IO63), OZ1IJL, OZ1KYM and OZ1QZD, all in JO45, also OZ1ANA (JO55). A number of German stations, including DC4OH (JO52) and DG6HB (JO53), were also worked. The auroral activity on the next day was almost missed, but Ela managed QSOs with OZ1GSA (JO46), OZ1LCQ (JO45) and OZ/DG7LAB/P (JO46). Switching to 50MHz, contacts were made with GI4OPH, GM0GEI, GM4WJA, PA3EWP, PE1CXZ and half a dozen G stations.

I first heard about the aurora on October 20 at 1345UTC, but work sometimes has to come before DX. Concentrating on 144MHz, my first contact was at 1540UTC. Activity was quite poor with only 20 c.w. contacts being made in the next 3 hours. A total 17 locator squares were worked in EI, DL, G, GM, HG, OK, ON, PA and SP. Best contacts were HG0HO (KN07) at 1802km, OL6BZR (JN89) and SP2HHX (JO94). The auroral session, on October 21, was very much better, both in terms of increased activity and in the number of DX contacts. Between 1130 to 1830UTC, 90 c.w. contacts were made in 15 countries and 41 locators. Over 50% of the contacts made were with West German operators. Some of the better contacts included RB5PA (KO21) at 1886km, HB9BZA (JN36), HB9CKM (JN47), HG1WD (JN97), OE3XUA (JN77), OK1ATQ (JO70), OK1DXS (JN69), OK1KQJ (JN69) and OK2TU (JN89). It was also interesting to note that some contacts were quite far south, FC1HGO in JN05, being one example. The tail end of an aurora on October 26 was caught at 1935UTC, but only 3 Scottish stations were worked.

Dale Harvey G3XBY (WKS) worked many 144MHz stations in the event on October 21. Among the more choice DX was LY2WR (KO24), HG1YA (JN87), OK1KQJ (JN69) and OK2BGQ (JN99).

With recent improvements to his station, **Ian McCabe G0FYD** (LNH) has seen a dramatic change in the amount of DX worked, especially via auroras. He is now running a TS-780 transceiver and 100 watts to a 15-element Cushcraft Boomer. On September 18, SP5EFO (KO02) was worked at 2315UTC. Most of the event on September 26 was missed apart from contacts with DK1KR and LA3WU. Pressure of work meant that the event on October 20 only produced contacts with SP6GZZ (JO81) and Y22ME (JO72) around 1715UTC. October 21 was much better with many stations being worked, especially in France and West Germany. Some of the DX worked included HB9QQ (JN47) and OK2TU (JN89).

Using a 9-element Yagi and 80 watts, **Jim Smith G1DWQ** (DOR) made the most of the auroras, despite missing much of the events by having to be at work. On October 20, GM0LIR and FD1GHP were both worked on c.w. Staying with this mode, Jim worked GM4BYF and GM4SIV in the opening on October 21. On 50MHz, just one QSO was completed at 1851UTC with PA3EUI.

After helping to run a local J.O.T.A. station, **Ian Wright GW1MVL** was pleased to come home early, on October 21, to discover the aurora in progress. On 144MHz, Ian worked GI7CNO (ATM), GM8XOC (IO97), EI9GO (IO62) and DG6JF/P (JO33).

A report of the events on October 20/21, as heard in Belgium, comes from **Johan Van De Velde ON1CAK**. Activity was reckoned to be poor on the 20th with only 20 stations being worked on 144MHz in a 2 hour session. Among the contacts were EI3GE (IO63), GI7CNO (IO64), GM4IPD (IO87), and SM7BHM (JO76). Similar results were obtained on the 21st with 20 stations being worked in 4 hours. Contacts included GI1JUS (IO74), GI7EEZ (IO74), GM0ERB (IO76), GM0LIR (IO85) and Y24QO (JO62).

A number of stations concentrated on the 50MHz band during the recent period of auroras.

Bill Biltcliffe G6NB (OFE) mentions that 6 new counties were worked in the event on October 21. Contacts were made with GI4OPH, GI8AYZ, GM0GEI and GM4JEJ plus many G stations. Signal strength of all signals was reported as very strong.

Paul Baker GW6VZW (GWT) participated in the aurora on October 20 between 1423 to 1515UTC, working many G stations. The event on October 21 was first detected at 1200UTC, Paul going on to work 48 stations in 32 counties and 7 countries. New counties and countries worked included G3JOC (NOR), G4IZH (TWR), G8BFL/P (YSN), G0JXY (LCN), GI4OPH (DWN), GI6GBK (LDR), GI8AYZ (ATM), GI8YDZ (ATM), GM0ECU (SCD), EI5FK (IO51), F6HRP (IN88) and PE1ILY (JO31).

The 50MHz Band

In marked contrast to the previous month, October provided a bonanza for the enthusiast. Propagation was available to every continent, enabling many operators to complete W.A.C. On many mornings the band was open to the far east, with stations in Australia, Japan, Philippines and Guam being worked. African openings were plentiful with Ascension Island, Botswana, Gabon, Liberia, Namibia, Nigeria, Reunion Island, South Africa and Zimbabwe available to the DXer. The Americas provided Barbados, Canada, Ecuador and USA. Not a bad start to the season - and it can only get better.

A letter from G6NB starts off by saying that there was not much activity in October to report and that conditions haven't been all that good. However, on October 13, Bill managed to work VK8GF and VK8ZLX, both in PG66. On the same day, JA1UIU, JA2NCK, JA4UIG and JF1UM were all heard with very weak signals. On October 15, VE1HD

Annual v.h.f./u.h.f. table January to December 1989

Station	50MHz Counties	50MHz Countries	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total
G1SWH	66	26	69	7	93	22	60	9	—	—	352
G6HKM	57	31	—	—	82	29	50	18	28	8	303
G8LHT	56	17	34	5	79	31	53	15	8	4	302
G0IMG	66	25	41	5	56	12	27	5	—	—	237
G4ZTR	19	11	49	8	59	27	23	7	13	3	219
G1DOX	30	6	48	6	64	16	27	3	13	2	215
G6NB	66	33	—	—	56	17	24	3	—	—	199
GW6VZW	64	25	—	—	75	21	—	—	—	—	185
G8PYP	35	24	—	—	59	26	25	11	—	—	180
G4XEN	21	9	13	2	63	21	33	9	—	—	171
G4LDR	43	10	—	—	44	14	37	9	—	—	157
GD4XTT	34	8	—	—	57	14	20	11	—	—	144
GM4CXP	28	11	4	1	61	19	4	2	—	—	130
GM1SZF	33	11	—	—	57	16	5	6	—	—	128
G0EHV	—	—	44	5	62	16	—	—	—	—	127
G8XTJ	40	14	—	—	54	13	—	—	—	—	121
G0FYD	—	—	—	—	88	23	4	2	—	—	117
G3EKP	25	15	27	8	25	7	5	4	—	—	114
G0EVT	23	19	—	—	33	26	8	8	—	—	113
G4VOZ	—	—	64	8	—	—	31	7	—	—	110
G1VJP	15	4	—	—	74	12	—	—	—	—	105
GW4HBK	—	—	61	7	—	—	21	3	—	—	92
GW1MVL	—	—	—	—	62	20	3	4	—	—	89
G1TCH	21	14	—	—	38	15	—	—	—	—	88
G7CLY	—	—	—	—	57	14	4	1	—	—	76
G3FPK	—	—	—	—	51	19	—	—	—	—	70
G7CFK	42	28	—	—	—	—	—	—	—	—	70
G1CEI	5	3	—	—	46	10	1	1	—	—	66
G1GEY	4	2	—	—	—	—	34	8	2	2	52
G0HGA	—	—	—	—	32	12	—	—	—	—	44
GM1ZVJ	3	3	—	—	23	15	—	—	—	—	44
G4AGQ	—	—	12	2	7	7	6	3	—	—	36
G6MXL	2	1	4	1	7	4	8	5	—	—	33
G0HOZ	—	—	—	—	25	4	—	—	—	—	29

Back-Scatter

QTH Locator Squares Table

Station	1296	430	144	Total
G3IMV	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
G1EZF	—	93	263	388
G4XEN	—	111	274	385
G6DER	78	110	183	371
G6HKM	46	109	215	370
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
ON1COQ	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
G4PCS	—	3	258	261
G1GEY	11	77	168	256
G3NAQ	—	80	175	255
G0EVT	—	57	197	254
G6STI	24	69	152	245
G6DZH	—	87	154	241
G4IGO	—	—	238	238
G3FPK	—	—	236	236
G0EHV	—	75	160	235
GM4CXP	—	31	198	229
EI5FK	—	56	172	228
G4MEJ	—	—	213	213
G8LFB	—	—	209	209
GW4FRX	—	—	204	204
G8MKD	—	49	150	199
GJ6TMM	—	48	151	199
G4YCO	—	—	197	197
G1SWH	—	53	140	193
G4DDL	—	—	186	186
GI1JUS	—	—	181	181
G4ZTR	30	47	95	172
G7ANV	—	—	153	153
G6MXL	16	45	91	152
GW6VZW	—	6	143	149
G4FVK	21	49	78	148
G4AGQ	1	42	104	147
G1OWQ	—	—	142	142
G0FYD	—	1	134	135
G8PYP	—	26	104	130
GW1MVL	—	22	105	127
G1WPF	—	29	97	126
G0FEH	—	24	101	125
G8XTJ	—	—	116	116
G1IMM	—	17	98	115
GM0HBK	—	—	107	107
GI4OWA	—	—	103	103
GM0GDL	—	22	81	103
G1TCH	—	6	95	101
G1SMQ	—	—	93	93
G6MEN	4	26	63	93
G1DDX	5	12	67	84
G4WHZ	7	—	76	83
G0ISW	—	17	59	76
G0HEE	—	—	73	73
G1CEI	—	1	72	73
GU4HUY	—	—	73	73
G0HDZ	—	—	64	64
G1NVB	—	—	58	58
GM0JOL	—	—	47	47
G2DHV	2	7	33	42
GM1ZVJ	—	—	41	41
G7CLY	—	—	38	38
G7AHQ	—	—	34	34

No satellite or repeater QSOs
Starting date 1 January 1975

144MHz QRB Table Distance in kilometres

Station	Tropo	Aurora	Meteors	Sporadic-E
G0CUZ	2943	1758	1996	2943
G0DAZ	1251	876	2026	2249
G0FYO	1315	1624	—	2019
G0ISW	1059	566	—	2057
G1DWQ	1454	1812	—	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	—	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	—	2372
G3FPK	1835	1686	—	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
G6LEU	2620	910	—	2430
G8HHI	1742	—	—	2058
G8JOX	2667	1368	—	2663
G8LHT	3070	1780	1868	2510
G8MFJ	1209	1210	1329	2168
G8PYP	1083	1451	—	2318
GD4XTT	3053	—	—	1700
GI1JUS	3067	1614	1507	2216
GI8YOZ	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

and VE1YX were heard at good strength.

Another station for whom Friday 13th was lucky, was G6HKM. Ela was among the many UK operators to work VK8GF and VK8ZLX, providing both a new country and more importantly a new continent.

Having noted the build up in conditions on previous days, I decided to remain at home on October 12, to see if the band would open up to the Far East during the morning. The wait was worth it with VK8ZLX, in Alice Springs, being worked at 0902UTC. Later in the day, between 1805 to 1835UTC, contact on c.w. was made with ZS6CE (KG34) and Z23JO (KH52). The band was in an even better state the next day, October 13. VK8ZLX was worked twice, the second time at 0903UTC, when he was 59+. In both instances he was heard calling CQ but getting no replies. At 0923UTC, VK8GF, also located in Alice Springs, was worked on s.s.b. In an African opening, on October 17, between 1740 to 1900UTC, contacts were made with ZS6BMS, ZS3KC and FD1NLQ/7X. On October 20, the conditions were quite interesting. By beaming north, you could participate in an aurora, and, by beaming south, you could work into Southern Africa. Contacts were quickly made with Arnold ZS6BMS, a fellow V.H.F. Manager, at 1513UTC, and with ZS6WB at 1524UTC. Later, in the evening, at 1910UTC, the Square Bashers, in the guise of 9H3LF, were worked via Auroral-Es. The lads were putting in a tremendous signal from the Island of Gozo (JM76).

The 70MHz Band

Without any Sporadic-E to liven up activity, the only event to draw operators onto the band were the auroras on October 20 & 21.

Dave Lewis GW4HBK (GWT) is one of the stalwarts of the 70MHz band. In the aurora on October 20, Dave worked EI9FK on two occasions, at 1920UTC and 2120UTC. Throughout the evening, only 4 other stations, all Gs were worked. The event on the 21st was somewhat better with 13 QSOs being clocked up. Contacts included GI8AYZ (ATM), GM3WYL (SCD) and GM0EWX (WIL).

From the Four Metre Newsletter, *QSB*, edited by **Roger Banks G4WND**, comes news of stations recently active on the band.

Bill Sterling GM4DGT has moved QTH, now returning to Central region once again after an absence of about a year. The new location, on top of a hill, should prove to be excellent for v.h.f. operating, far better than the old site in West Lothian.

Another station from north of the border is **Elvin Bailey GM8BBA**.

He is active from Strathclyde and asks that stations in the south should not forget that there are a number of permanent 70MHz operators located 'up north'. Elvin would welcome a beam pointing at them at times other than contests.

From the poorly activated county of West Sussex, a new voice should shortly be appearing. **John Chinn G8HSH** is currently converting some Pye p.m.r. equipment and hopes to be on the band in the near future.

The 144MHz Band

Tropospheric conditions were very good during the first week of October. The band was open, at some time during the week, from the Faroes, in the north, through central Europe, right round to Spain, in the south.

I start this month with a report from a new licensee, **Vince Shirley G7ENF**, located in Belper, Derbyshire. With the help of G8ROU and G0HMZ, Vince got his station on the air at the beginning of August. Running an IC-251E and 80 watts to a hand rotated 8-element Yagi, 54 squares and 14 countries were worked in the first 10 weeks since being licensed. The longest distances worked were during the tropo opening from September 30 through to October 3. Particularly pleasing were s.s.b. QSOs with OK1IBL (JO60) and OK1AXH (JO70). OZ1QZ and OZ5TG, both in JO45, were also worked for a new country. The best DX worked in a southerly direction was FC1GXX (IN95), contacted on October 2 at 1009UTC. Several EA stations were heard later in the day, but the pile up was too hard to crack. Future plans for the 144MHz system include replacing the old Jaybeam antenna with a 16-element F9FT Yagi and installing a rotator. Welcome to the bands, Vince. You've certainly got off to a good start.

From the far flung north, comes a report of tropo DX worked by **Colin Robertson GM0HBK**. Between 2246 to 2330UTC on October 1, many French stations, including FC1CDS (IN77), F6CGJ (IN78), F1DPX, F1FHI, FC1NHO, all in IN97, EA1TA and EA1ACD, both in IN53, were worked on s.s.b. Propagation was good to the south for the next two days with contacts being made with EA1CUU, EA1DKV, EA1ED, EA1QJ, all in IN53, EA1BCB (IN63), EA1DDU, EA1KC, EA1NU, all in IN73, and many stations in southern and central France. During good conditions on October 3, Colin swapped to f.m. mode, running just 3 watts, and worked EA1TA and EA1DKV. Later in the month, on October 14, Colin listened in to the e.m.e. contest taking place and was rewarded by hearing W5UN off the moon for his first reception of moonbounce signals. In addition to hearing W5UN between 0300 to 0500UTC, KB8RQ and N5BLZ were also copied. GM0HBK uses a single 19-element Yagi, GaAs-f.e.t. l.n.a. and an FT-726 transceiver. A transmitter fault stopped Colin from calling but he didn't think 100 watts would have been enough anyway. This is not particularly true. If conditions are right and polarisation shift is not too great, then stations running 100 watts into a single Yagi, of reasonable boom length, are able to work some of the larger e.m.e. stations quite easily.

John Hilton GM1ZVJ (LTH) reports that conditions were excellent to EI/GI on September 30. He managed to work GI4KSO (DWN) for a new county. On October 2, the Faroe Island club station, OY6FRA, was worked for a new country and locator square.

Mervyn Rodgers GM0GDL (CTR) confirms the good EI conditions as reported by GM1ZVJ. On September 30, he worked EI3GE (IO63), EI4DQ (IO51), EI6ARB/P (IO63) and GI1BIW (IO64). A few days later, on October 3, propagation was very good to the south, with EA1ACD, EA1BCB, EA1DKV and EA1QJ being worked.

Over on the Isle of Man, **Dave Brown GD4XTT** had a fair bit of fun despite running 7 watts output. First indication of the tropo opening, on September 30, came when Dave was trying to work G1RER (LDN) on 430MHz via 144MHz talkback. At 1640UTC, PE1MYD broke in to say that he was 59 in Holland on 144MHz. The test was quickly abandoned and the PA station was worked to provide a new country for 1989. Other stations worked included ON1CAK and FC1MOZ (JN29). DL1EJA was heard but Dave's 7 watts didn't quite make it. On October 1, a number of F, ON and PA stations were worked but nothing startling or new. Conditions took a turn for the better on the 2nd with F6ANQ (IN94), FC1GXX (IN95), FC1NZK (IN96), FA1MXE (JN05) and other stations in JN15, JN16 and JN17 being worked. At 1830UTC, EA1ACP (IN53) provided country No.14, followed by EA1BCB, EA1DDU, EA1DKW, EA1NU, EA1TA and EA1QJ.

Another station running low power, 10 watts in this case, is G6NB who made a number of interesting tropo contacts. On October 2, FC1ADT/P (JN15) and HB9DBM (JN47) were worked. Propagation had swung around to Scandinavia by October 4, giving contacts with SM7BOU and SM7SPG, both in locator JO66. Later in the month, s.s.b. QSOs were made with DL0GC (JO31) on the 24th and EI3GC (IO63) on the 25th.

Gerry Schoof G1SWH (MCH) is the only operator in England to report working into the Faroe Islands. OY6FRE (IP62) was worked on October 2 and OY9JD, in the same locator, was worked the very next day.

G6HKM had a field day during the period of extended propagation. On October 1, contacts on s.s.b. were made with HB9AOF (JN36), OK1IBL (JO60), Y23KO (JO62), FC1ADT/P (JN15) and many Dutch and German stations. Tropo conditions were still very good on the 2nd with EA1DDU, EA1BCB, F6ARQ (JN05) and FD1LRL (JN27) being worked with ease. By October 3, the best results were coming from a northerly direction. Among the contacts were GM4IPK (IO99) on Shetland, SK6AW (JO67) and SK6HD (JO68). Many Swedish stations were worked on October 4 in locators JO57, JO65 and JO66. Other contacts included LA2PGA (JO48), OZ1ANA (JO55) and OZ1HNM (JO57). Conditions were up again on October 16, best DX being into JO51 and JO52 squares.

Down on the south coast, **Steve**

Back-Scatter

Damon G8PYP (DOR) worked most of what was going in the 3 day period from October 1. Many French and German stations were worked. Highlights were EA1BCB, EA1DDU, EA1NU and HB9HFA/P (JN36). Unfortunately, Steve reports that the gales that swept the south coast on October 21/22 took their toll of the antenna system. The stub mast was bent over at an acute angle, breaking the rotator and wrapping the 50MHz antenna around the mast. Fortunately the 144MHz and 432MHz systems escaped without too much damage. At my QTH, I wasn't so lucky, with gale force winds on October 28, toppling a 2 tonne chimney through the roof of the cottage, demolishing the extension containing the radio room and losing the mast with the 70MHz and 430MHz antenna systems.

The 430MHz Band

Tropospheric conditions on this band were on a par with 144MHz but the lack of activity was very disappointing.

The band was in good shape during the evening of September 30/ October 1 for Ela G6HKM. Two new squares were added to the total when GM0GDL/P (IO76) and GM4LBV (IO75) were worked. Later in the day, on October 1, contacts were made with F6HYE (JN36), GD6DQO/P and EI5FK. Tropo conditions were still good later in the month with HB9MIN/P being worked on October 16 and GM4SIV (IO65) on the 24th. During the 430MHz cumulative contests, GJ4TAW and 7 counties for the *PW* tables were collected.

Newly licensed G7ENF (DYS) is active on 430MHz with 40 watts of s.s.b. from a Trio 9500 and a solid state amplifier. In the limited time since coming on the air, Vince has worked 11 squares in G, GW and PA. He wonders if anyone in GM ever uses 430MHz?

Colin GM0HBK, put his 24-element Parabeam back on the mast on October 2 especially to work some DX on the band and was pleased to make contact with EA1QJ (IN53), EI4CL (IO63), F1FHI and F6APE in IN97, GI4KSO and GI4OPH.

GD4XTT was very pleased to work seven new countries during the lift in conditions. Contacts included DL0UD, EA1NU, EI6AS, F6ETZ, HB9AMH/P, ON1ABO and PE1GHG. Dave says that if anyone wants GD on 430MHz, they should call him on 144MHz for a QSY.

Ian Harwood G8LHT (YSS) operates on all bands from 50MHz through to 1.3GHz. During the period of extended propagation he put his station to good use, particularly on 430MHz. On September 30, contacts were made with EI6AS (IO63), GM0GMD/P (IO76) and PA0FRE (JO21). A new square, IN78, was obtained by working F6CGJ on October 2. Later the same day, HB9AMH/P was also worked. Scandinavians were the order of the day, on the 4th, with SM7FMX and SM7SCJ, both in JO65, and OZ7LX (JO55), being worked on s.s.b.

I made mention in a previous 'VHF-up column' that **Philip Lancaster G0ISW** (LDN) runs an interesting antenna consisting of an array of 16 phased dipoles. Using 10 watts from an FT-767 contacts were made, in early October, with F6FLE (JO00), HB9AMH/P (JN37), ON4AQO (JO11), ON5NY (JO10) and PA3DZL (JO21), certainly proving the performance of this most unusual antenna.

Down in Wimborne, Steve G8PYP worked a number of DX stations during the lift on October 2. The best of the bunch were HB9AMH/P (JN37), F6BZA (JN05) and FC1ADT/P (JN15).

THE Microwave Bands

A report from **Bob Atkins KA1GT** (ex G8EKB) tells of a new world record on 5.7GHz. The contact, between XE2GXQ/N6XQ, located in Mexico (CM94) and N6CA/6 plus N6NSA/6, located in California (DL37), was over a path length of 987km. Equipment used at both ends was identical, consisting of 1.5dB noise figure receivers, 4W narrow band transmitters and 1.2m dishes. Contact was also made on 3.4GHz for a North American tropo record. Dedication was the order of the day. N6XQ drove for fourteen hours, over rough roads, to reach the first location in Mexico, and then made a six hour journey just to move 104km north to his final location. Liaison between the groups was a little difficult. With a path of nearly 1000km, the 144MHz talk-back was very marginal and a tortuous link was made by using 220MHz f.m. from N6CA to XE2UZL/W6UZL (350 km), 28MHz s.s.b. from XE2UZL to KH6HME in Hawaii and then on to XE2GXQ.

Keith Hewitt G6DER has been doing exceedingly well on the middle microwave bands. A total of 40 locator squares have now been worked on 2.3GHz, 10 on 3.4GHz and 3 on 5.7GHz. The furthest distance worked on 3.4GHz is 947km, whilst up on 5.7GHz, Keith's best contact stands at 702km.

Another old hand on the microwave bands is **Gordon Emmerson G8PNN** (NLD). New squares worked this year on 2.3GHz have included DG4BB (JO43), LA6LCA (JO59), OZ1JXY (JO46) and OZ/DK2UO/P (JO45), bringing Gordon's total on the band to 31 squares.

John Lemay G4ZTR (ESX) comments that he worked, on 1.3GHz, G6LEU (CNL) on October 16, and earlier in the month, on 432MHz, F6KSX/P in locator JN15.

In the early hours of October 1, G6HKM worked GM4LBV (IO75) on 1.3GHz, for a new square and her first GM of the year. The conditions during the 1.3GHz cumulatives were very poor, but despite this contacts were made into Shropshire and Buckinghamshire.

ON1CAK is now active on 1.3GHz with a 55-element Yagi and 10 watts from an SSB Electronics transverter. The antenna is at 27m above the ground, fed with 20mm diameter hardline.

VHF News

Prior to setting up the world record 5.7GHz contact, Jack Henry XE2GXQ/N6XQ also made record distance contacts on 144MHz, 220MHz, 432MHz and 2304MHz. In all instances, contact was made with Paul Lieb KH6HME on Hawaii, some 4150km away. This unusual tropo duct was so lossless that contact on 220MHz was accomplished by using f.m. handheld IC-37A transceivers and simple Yagi antennas.

Recent contacts, mainly via aurora, into the nearer Russian Republics, have shown that the callsign formats are changing.

The three Baltic states of Estonia (UR), Latvia (UQ) and Lithuania (UP) were independent before the commencement of World War Two, but became incorporated into the USSR during the war. However, with the recent 'deregulation', these three states are slowly receiving some autonomy. Recently the Amateur Radio Society of Lithuania obtained approval from Moscow to replace the UP prefix with LY. They also have their own QSL bureau operating independently from Box 88. You can now send cards to PO Box 1000, Vilnius 232001, Lithuania, USSR. In a similar vein, the Estonian authorities are changing from the UR prefix to the series ES1-ES0, with the country being divided into 10 call areas, similar to that which existed before WW2. Not to be outdone, Latvian amateurs will be changing from UQ to YL.

With the conditions on 50MHz now allowing world-wide communication, many operators have worked, or are very close to working, all six continents required for the W.A.C. award. Applicants are advised that the qsl cards should be sent to the RSGB HF Awards Manager **GW4BKG** and **NOT** to the VHF Awards Manager. Full details of the W.A.C. certificate and other awards can be found in the RSGB *Amateur Radio Call Book*.

Beacon and Repeater News

News has recently been received that the Channel Island beacon, **GB3IOJ** on 50.065MHz, will shortly be given permission to start transmissions. Of very great interest is the fact that the DTI has allowed the beacon to run 10 dBW e.r.p. with an antenna which is vertically polarised. This move may hopefully herald the introduction of mobile operation at a later stage in the UK.

A new beacon in Finland, **OH1SIX**, became active on September 23. Located in KP11QU, it runs 50 watts to stacked crossed dipoles on a frequency of 50.025MHz. Reports of reception, which will be answered, are welcomed by the beacon-keeper OH3BK. Send your information to the Radio Amateur Technical Society, P.O. Box 88, SF-02151 Espoo, Finland.

Stations in the UK will be pleased to hear that a new beacon is now operational on 70.040MHz. Using the callsign **GB3REB**, the beacon is located near Chatham, Kent, in locator JO01GK.

A new beacon, **PI7DIJ**, on 1296.820MHz, has recently become active. It is located at the QTH of Frank PA3DIJ, in locator JO33.

The microwave beacon, **GB3MHX** on 10368.83MHz, went off the air on October 20, following a catastrophic failure of the waveguide feeder. It will remain off until another 30 metre length can be procured. Contact Dave Robinson G4FRE if you can help.

The Bristol packet radio repeater, GB3FC, now has a port on 70.4875MHz. Contact G4WRW if you want more details.

The Sussex Coast 144MHz repeater GB3SR, located near Brighton, came into service during October. More information is available from Derek Stewart G4HSY.

A newly licensed Bedford 430MHz repeater, GB3BL, on channel RB7, was switched on at the end of September. The keeper, Roy Smith G6SNV, would welcome reports of its coverage. Also from G6SNV, comes news that the nearby beacon, GB3DD, on channel RB4 will be off the air for several months as a result of building work taking place at its site.

The new Coventry u.h.f. repeater GB3CV on channel RB9, came into service on November 6. The repeater is located at the GPT site at Stoke.

The Guildford u.h.f. repeater, GB3GF, was due to change channels, from RB13 to RB12, on October 17, to eliminate co-channel interference between GB3GF and GB3VH, located in Hitchin.

Following recent repairs to the transmitter, the Bracknell u.h.f. repeater, GB3BN, was recently returned to service. Another u.h.f. unit, GB3HR, is also back on the air following extensive rebuilding of the antennas and filters. G4KUJ would greatly appreciate reports of this Hertfordshire repeater.

European VHF/UHF/SHF Contest Calender

Operators interested in finding out what contests are running on any particular day during 1990, will be pleased to know that a publication by DH2NAF will give them such details. Now in its fifth year, the 120-page booklet gives information in three sections, on more than 450 contests, from all over Europe. The first section gives contests on a calendar basis, the second section is a listing by country, and the third section gives the contest rules and necessary addresses. In addition, there are various articles of interest to the v.h.f. enthusiast. The *1990 Contest Calendar* is written in both English and German and can be obtained by sending 4 IRCs or 3 US $ to Ham-Press Verlag, P.O. Box 1101, D-8078 Eichstatt, West Germany.

KEEP THE REPORTS COMING FOR YOUR ENTRY INTO THE TABLES

Back-Scatter

RTTY

Reports to
Mike Richards G4WNC
200 Christchurch Road,
Ringwood, Hants BH24 3AS

Interference

Regular readers will remember that I recently mentioned how Mr Innes solved his computer interference problems. One snag he had was difficulty trying to fit ferrite beads to leads with moulded plugs. Well help is at hand, thanks to a letter from **Mr K. Seddon** of Stockport. He has sent me details of a range of split ferrite beads specifically designed to overcome this problem. There are two sizes of bead available with either 0.25in or 0.5in centre holes. To fit the beads you simply place the beads around the cable and tape the two halves together with ordinary insulating tape. There are a wide range of potential uses for these beads and their ease of use make them ideal for curing difficult interference problems, as they can be fitted and moved so quickly.

For those who have a use for them, the beads are available from T.M.P. Electronic Supplies, Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd, N. Wales CH7 3PL. The 0.25in version is priced at £1.50 per pair whilst the 0.5in costs £3.00. Post and packing is £0.75 for any quantity and all prices are exclusive of VAT.

Don't forget, if you have any useful tips such as this drop me line with the details and I will pass it on via the column.

Packet Sked

I received an interesting letter from **Paul Thompson G6MEN** the other day. He recently had contact with a colleague, Gervase 7P8DR (Lesotho) who is ex-G4URJ. Gervase is a member of the UK Civil Service Amateur Radio Society and would like to make contact with other members or any UK amateurs via the DCE and packet. He is also very interested in RTTY and AMTOR skeds direct. So if you are interested, either look out for him on the h.f. bands or, if you have packet, the route is 7P8DR @ ZS6SAT for mailbox communications.

AMTOR Update

AMTOR is one of the most effective data modes for live typing QSOs and also the prime mode for automatic (mailbox) operation on h.f. From letters I have received it is clear that there are many newcomers to the data modes who are unfamiliar with the operation of this mode and the reasons for its effectiveness. I also have a suspicion that many newcomers are deterred by the unique operating procedure and the difficulty in identifying stations due to the infrequent use of callsigns.

So what's the difference between AMTOR and RTTY and why use it?

The major difference between the two modes is that AMTOR is error correcting, i.e. it can detect errors in the received signal and correct them, whereas RTTY has no such facility. The system has its origins in commercial radio teletype systems where an error correcting system has obvious advantages. The commercial system is known as TOR for Teleprinter Over Radio and is described in CCIR recommendation 476. One of the most common implementations is SITOR (SImplex Teleprinter Over Radio) and is used extensively for Telex communication to ships at sea - the main UK centre for this being BT International at Portishead. The amateur implementation of this system was devised some years ago by Peter Martinez G3PLX - the name AMTOR is simply an acronym of AMateur Teleprinter Over Radio.

Those of you who have yet to encounter error correcting systems are probably wondering how you can detect an error in the received signal when you don't have a copy of the original to check against. Although the AMTOR system is called error correcting, like many other error correcting systems, it can in fact only correct certain types of error. To help you understand this I'll describe just how the error correcting system works. But before I do that I ought to explain that the term AMTOR actually covers two transmission modes known as mode A and Mode B. Mode A is most commonly used for QSOs and refers to the automatic repeat request ARQ while Mode B is the FEC forward error correcting system which is used to start QSOs.

The heart of both systems is the code used to represent the transmitted characters. Those of you who are familiar with RTTY will know that that system uses a five unit code - the ITA No. 2 or Baudot code, to represent the characters. When using this code each character is represented by a combination of marks and spaces totalling five. The AMTOR system however uses a different seven unit code called the Moore code. The important point about the Moore code is that each character always contains four marks and three spaces - it's just the combination that changes. The first part of any error correction system is to detect the error and this is where the characteristics of the Moore code are used to the full. As every received character should contain four marks and three spaces, we can confidently declare any other patterns to be errors! So as you can see the error detection system is really quite straightforward and in practice is surprisingly effective. Of course, any errors which corrupt the signal but still leave four marks and three spaces will go undetected.

Having detected the error the next problem is to correct it. This is done in the same way as you or I would when in conversation, i.e. you ask for the corrupted information to be repeated. The AMTOR Mode A system does this automatically, hence the name Automatic Repeat reQuest or ARQ.

Let's now see how the AMTOR ARQ system works. Rather than transmit long messages and then try and sort out the errors, the AMTOR system splits the message into more manageable groups of three characters. Once three characters have been sent, the system waits for an acknowledgement from the distant end confirming that all was received OK. Once this acknowledgement has been received, a further three characters are sent and so the process continues. If the distant station encounters an error, instead of sending an acknowledgement a repeat request signal is sent whereupon the originating station re-transmits the last three characters.

The use of acknowledgement codes in AMTOR is rather ingenious so I will cover that next. Rather than have two separate exclusive codes, one for acknowledgement and one for repeats. The codes used are known as control 1 and control 2, CS1 and CS2 for short. The interpretation of the codes depends on when they are sent - let's try an example with an error free link. Once the first group of three characters has been successfully received a CS1 acknowledgement is sent, after the next group a CS2 is sent and so on alternating between CS1 and CS2. Now if an error is encountered the receiving station sends the last control code instead of alternating, this triggers the transmitting station to re-transmit the last group. This simple system covers all eventualities of data or control signals being corrupted.

This covers the basic operation of the AMTOR system with one exception, in our examples so far we have dealt with a transmitting and a receiving station but in our amateur transmissions we need to be able to reverse the process at the end of each over. This is achieved very easily and automatically by the sequence +? being typed in by the transmitting station. This is then acknowledged by the receiving station sending two special idle characters known as alpha and beta. Once this sequence has been successfully received the changeover takes place. So as you can see there is no transmit/receive switching in the conventional sense - it all being taken care of automatically.

One other very important part of mode A is the inclusion of SELCALs. A SELCAL is a four character alphabetic group which is exclusive to your station. The normal way of defining amateur SELCALs is to take the callsign and remove the number i.e. my callsign is G4WNC so my SELCAL is GWNC - simple isn't it! The use of SELCALs is an important aspect of AMTOR which I will cover later when describing the operating procedure. This just about covers the raw basics of Mode A operation, so let's take a quick look at Mode B or FEC.

Forward Error Correction FEC is quite different in operation to Mode A, though it still uses the same Moore code and error detection system. From the previous discussion it is clear that Mode A can only operate effectively between two stations that are locked together. Mode B was created as a broadcast mode from one central station to any number of listening stations. With this mode all the transmitted characters are sent twice, but the repeated set are delayed by three characters. These repeated characters are also interleaved with originals. The principle here is that if the original character is hit by a burst of interference there is a good chance that the repeated character will be ok. In practice this system is very effective. Although there is a commercial FEC system that uses SELCALs the AMTOR system does not.

So there we are, a very brief and by no means comprehensive insight into the operation of the AMTOR systems. But before you can rush out and start operating you will need to know the operating practices in use by amateurs.

Operating Practices

Assuming you have purchased your AMTOR system and are fully connected up ready to go, the first thing you will have to do is enter your own SELCAL, which as I described earlier, is normally just a case of removing the number from your callsign i.e. G4WNC = GWNC. Once this has been entered, you are ready for operation. I always feel that the first task with any new mode is to spend some time listening to QSOs, so that you are familiar with the operation of your equipment and the practices used by other amateurs. Probably the best band to try is 14MHz at around 14.075MHz. Having familiarised yourself with the mode try calling CQ, this is done using Mode B, FEC the broadcast mode - a typical message follows:

CQ CQ CQ CQ CQ
DE G4WNC (GWNC)
G4WNC (GWNC)
G4WNC (GWNC)
PSE K

NB: The text in brackets is the SELCAL.

One very important point to note when using Mode B is that the receiving station can only synchronise to your signal when you are sending idles, and this only occurs when you are not actually sending text. The technique I use is to first switch to transmit without entering the message, this causes a stream of idles to be sent allowing stations to tune in. This is similar to sending RYs in RTTY. I also tend to leave breaks during the message so that the system sends yet more idles. Once you have finished the CQ message all you have to do is sit and wait for you transceiver to burst into life! What actually happens is that a station hearing your CQ will note your SELCAL and enter it into his equipment as the station to be called. As soon as your CQ is complete he will then start calling you using

Back-Scatter

Mode A and if the path is good your equipment should respond to his call and his initial message will print out on your screen. The QSO is then under way and can be continued using the +? combination at the end of your over to change the direction of transmission. Of course as AMTOR is fully error correcting, there is no need whatsoever to repeat any information as the system does that for you. One plea I would make at this point is to include both callsigns at the end of each over. Unfortunately it seems to be common practice among many AMTOR operators to only send callsigns occasionally. This is very frustrating both for other amateurs and for short wave listeners as it can somtimes take ten minutes of listening before a station can be identified!

Let's now look at operation from the other point of view, i.e. after hearing a CQ call. The first thing to do is note the other stations SELCAL and enter it into your equipment as the station to be called. When he has finished his transmission, start a Mode A call to his SELCAL - if all is well your status indicators should show that you are idling in transmit mode. At this stage you can start the QSO using +? at the end of your over.

So that's the basics of AMTOR operation, but before I finish just a few do's and don'ts to promote better operating practices.

DO

Move away from the calling frequency as soon as possible.
Send both callsigns at the end of each over.

DON'T

Send RYs - it's totally pointless when using AMTOR.
Repeat text - the system makes sure the message gets through.

If you would like further information on the working and operating practices of AMTOR there are many sources e.g. BARTG or the *ARRL Operating Manual*

Back-Scatter

Amateur Satellites

Reports to
Pat Gowen G3IOR
17 Heath Crescent
Hellesdon, Norwich, Norfolk NR6 6DX

Mort d'Oscar-9

As predicted, OSCAR-9 (alias UoSAT-1) fell to earth in early October, after having been functioning in space for just over eight years despite it's three year design lifetime. OSCAR-9 was launched from Vandenburgh Air Force Base in California at 1127UTC on 6 October 1981, into a 554km, 95 minute, polar sun-synchronous circular orbit. It had its teething problems, as, soon after launch in April 1982, a software error resulted in both the 435.025MHz and 145.825MHz beacons being commanded on simultaneously. The net result was that as one or the other of these bands needed to be free to uplink control commands to turn one or the other beacon off, the desensitising of both command receivers made switching off the satellite almost impossible. It finally was overcome on 20 September 1982, when the 145.025MHz beacon was finally silenced by beaming up a 12 Megawatt command signal, so permitting faultless operation for the next seven years.

In the week prior to its demise, OSCAR-9 continued to transmit dependable telemetry, which has provided much insight into satellite decay, as this is the first known time that any satellite has continuously provided all parameters of data to the point of terminal decay. By using the element set based on an epoch of day 281.65058094 (8 October 1989, 1536:50), a mean motion of 16.12691500 orbits per day, and adjusting the increasing decay rate to give a precise to match actual AOS, TCA and LOS times, accurate tracking and orbital heights were able to be determined.

This is shown on the decay graph, Fig. 1. On October 6 the drag was 0.0061, two days later 0.01195, the following day 0.012203, and when last heard at 2202UTC on October 12, it had escalated to 0.02271.

By study of the battery temperature transmitted by channel 08, the 'Y' axis of our graph, the variable effects of frictional heating could be observed, strangely not the near exponential curve expected. The battery temperature in degrees Celsius was able to be determined by subtracting the three figures following the '08' channel indicator from 474, dividing this by 5, and multiplying by 1.01. As the spacecraft came into the high solar flux expanded strongly ionised F2 layer, the temperature had climbed from the normal just below zero to some plus 6 degrees Celsius. On October 10 it was down to +1, and the following day down to -6.3C. It then went up again as it went through the F1, peaking +5.8C on the morning passes of October 12, but dropped to +4 by that evening.

The findings, AOS, TCA, LOS, Doppler curves were compared with other observers G3CAG, G3CDK, G3ENY, G4CUO, G4LWM and LA4XC with 3.780MHz post pass nets each day prior to the fall-out. As far as is yet known, the 2201UTC October 12 TLM was the last recorded from the UK, although it was heard from 0343 to 0349UTC on October 13 by K9CIS who reported "..all TLM nominal..".

OSCAR-9 re-entered earth's atmosphere on orbit 44761 at 0750UTC on Friday October 13, at around 48 degrees south 220 degrees east (140W), a remote part of the earth more than one thousand kilometres south of VR6 Pitcairn Island, sadly out of range of any known monitoring station.

TLM of the last 9 hours is urgently required for study, as even in it's death throes, UoSAT-1 was still putting out all of its 60 channels valuable data, which has told us much about the predictability of terminal decay and re-entry place and time.

U-o-9 Re-entry Contest

The winner of our OSCAR-9 satellite re-entry competition for the handsome space book prize was **David Rowan G4CUO**, who was only seven hours early of the precise re-entry date and time. David modestly claims that he picked October 12 "..as it was my XYL Margaret's birthday..".(!) Reliable sources in fact state that David had put much study and effort into his findings, and that many graphs and equations had been meticulously prepared to permit the forecast to be so close. The majority of entries had predicted, as I did, between October 4 and 8, with some as early as August and some as late as January 1990. Frankly, all entries were possible contenders, as the variables posed were many!

The AMSAT-UK contest was won by **Geoff Roberts G3ENY**, who by a lots of study of decay graphs related to periodic solar flux expansion was also able to predict within a day. In all, both competitions attracted over 70 entries, though many arrived too late for the one month deadline required.

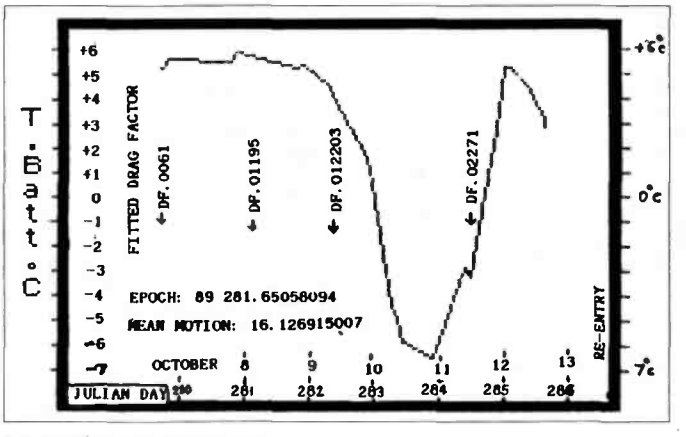


Fig. 1: OSCAR-9 decay graph

TLM

The need and use of the telemetry channel brought about by the OSCAR-9 findings brings us to the subject of the use of telemetry itself, as outlined in the AMSAT Journal in an editorial entitled *Telemetry - The Best Kept Secret* by Joe Kasser G3ZCZ. Joe points out how the TLM can tell us a story of what is happening to the spacecraft and it's environment, how valuable this is as a study, and yet how few seem to make use of it. He writes, "The number of individuals not associated with command stations who have decoded spacecraft telemetry and published their findings can be counted on the fingers of one hand. There's a lot of computing power out there that has the potential to process telemetry and find something new, but does not have access to the data. Perhaps the reason for the lack of use of the telemetry is that those who have the capability to receive it are not interested in it, and those that have the interest in it do not have the equipment to receive it".

Joe points out that the average school science class has a computer, but not a satellite ground station, and that an AMSAT repository is obviously needed that could distribute the data on disk to those who want it.

Back-Scatter

The question arises to the interested individual, who is far better able to contribute toward knowledge and education than merely making a few QSOs 'by satellite'. Have you contacted your local school, college or university to explore any need? You may know of them, but the chances are they do not know of you. The lack of TLM found when exploring for sources outside ones own horizons for OSCAR-9 re-entry data has highlighted the separation, as some very valuable information is fully available but apparently not utilised.

New Launches

To publish a confirmed launch date in this column is to automatically invite the incoming of a launch delay notice just after the stop press deadline! The problems encountered with the pyrotechnic initiators on the Ariane *V-34*, 35 and *36* launches have dictated a further postponement of the Spot-2 launch carrying UoSAT 'D' and 'E' and the four new microsats. Launch is currently set at 0130UTC on 19 January 1990, giving a breathing space welcome by the AMSAT builders and testers.

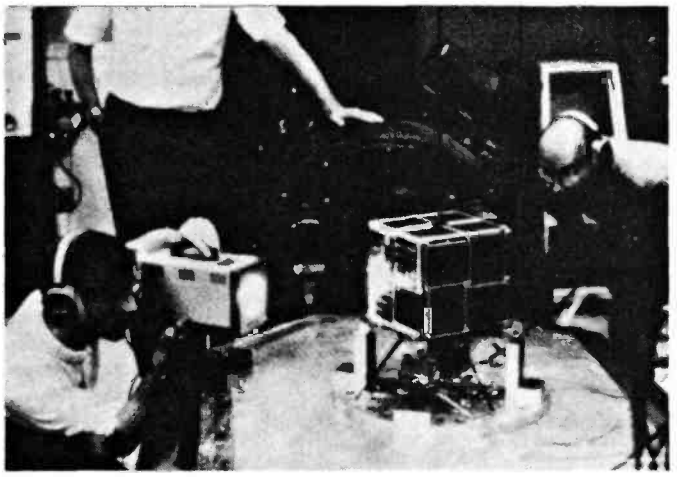
The 1 watt 'S' band beacons are now ready for two of the microsats, and all four have passed their shake and vibration ordeals. UoSAT-E has had it's solar simulation, tip mass balance and antenna pattern tests completed, and the c.c.c.d. camera has been shown to give excellent picture quality of scenes outside the laboratory window.

Launch and monitoring nets are already organised, with G3RWL/G0AUK planning to be on 3.780MHz from one hour prior to blast off. The ejected cluster of satellites will not be 'seen' in the UK until about 0900 the following morning, when a further informal 3.780MHz observer net will be activated to monitor progress. Each evening following orbital insertion will see 7pm update information nets on the same frequency.

JAS-1-b

Since December's news on the forthcoming JARL/JAMSAT satellite, progress and conformity testing with the coming JAS-1-b appears to be excellent. JARL report that full environmental testing has now taken place at the Yokohama factory of the NEC Corporation, and no defective equipment was found. The final and full tests, consisting of equipment adjustment, full electrical tests, thermal, vacuum, vibration, calibration, etc., was being completed in October, to ensure that no problems are encountered during the launch or later in orbit. The main differences as I have mentioned in previous issues between the new FUJI and its predecessor JAS-1 alias FUJI-OSCAR-12 are greater solar cell area and new antennas. These should prove to be a great improvement.

The launch time has not changed from that previously supplied, for example 23 January 1990, and past experience of Japanese planning and efficiency shows delay to be unlikely. Look out for nets covering the event and post launch capture which have yet to be arranged.



One of the microsats undergoing qualification tests - Jan King W3GEY

FUJI-OSCAR-12

The ailing OSCAR-12 continues to try to meet its JA pass time in-range minimal commitments despite a very meagre and restricted schedule due to power insufficiency. Planned transponder 'on' times are:-

November 18, from 0156 to 0349UTC on Mode JD digital.

November 25/26 from 2247 to 0049UTC, Mode JD digital.

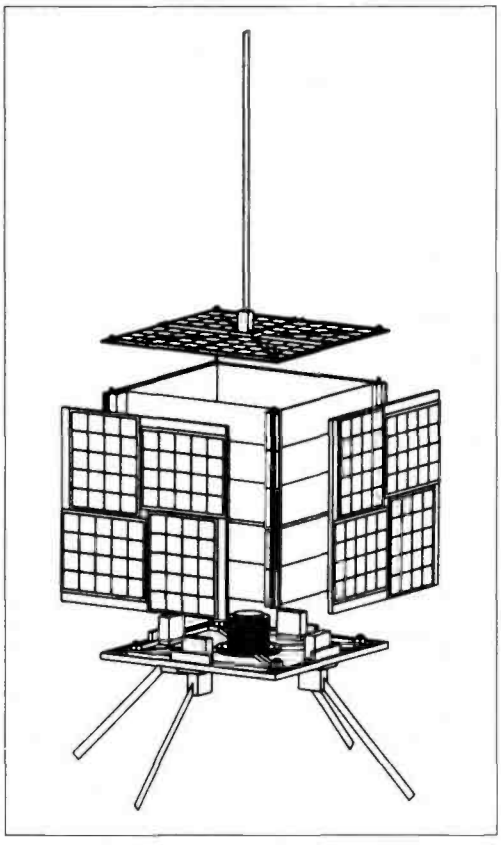
December 5, from 1951 to 2152UTC, also Mode JD digital. At all other times the transponder will be kept off in order to attempt to ensure continuity of battery supply.

OSCAR-10 and 13

While OSCAR-10 has been unusable since September 1 due to eclipses (though due to be back with us for transponder use from 1 December 1989), OSCAR-13 has had its problems too. On the morning of October 9, following a huge solar flare, the system was found to be stuck on the default Mode B transponder energising the omni antenna, and the normally expected 145.812MHz TLM was but a plain carrier. The entire memory had been wiped from the IHU, and the whole system had crashed. At first attempt the re-set and re-load of software failed, but sustained efforts by the command team eventually regained control. A similar event took place between 2145 and 2115 on October 28 between MA 245 and MA 109, and this further problem is currently being serviced. Whether these failures are due to solar proton entry to a vital part of the 32K memory, or Van Allan radiation belt damage (despite the specially hardened chips and dual layer protective shielding), has yet to be determined, but it certainly looks as if we can lay the blame on the present super-active sun. It is to be hoped that the satellite can be used again by the time you read this news, but do be sure to check the beacon messages and the AMSAT nets for schedule news before attempting to do so, as undoubtedly modifications to the transponder operation plan set from November 16 will be necessary.

The first unexpected drop out gave one advantageous finding, as suddenly, without any logical explanation, signs of life were seen for the first time from the RUDAK system, and partial 400 baud p.s.k. loading and output resulted! It is too premature to yet know if the RUDAK system can be fully used, similarly if any permanent memory damage has resulted to the spacecraft's IHU, but according to DB2OS ".. things appear good so far..". He is currently heavily engaged in reset and reload activities, and somewhat more optimistic now than when the initial 'crash' occurred.

A similar loss, probably for similar reasons, was experienced by *Voyager-1* now outward bound outside the plane of the solar system where the solar wind meets the cosmic wind, but it was able to be placed on again.



Mechanical make-up diagram of a typical microsat

ZRO Tests

Readers will now be familiar with the certificates being awarded by AMSAT for proven 145.840MHz downlink reception of ultra QRP uplinks to OSCAR-13. If a brochure outlining the background procedures is required, send a request with s.a.s.e. and/or IRCs to Andy MacAllister WA5ZIB, AMSAT Vice President for User Operations, 14714 Knightsway Drive, Houston, Texas 77083, USA.

The next series of Saturday tests commence on December 16 at 2000UTC, December 30 at 1600UTC, January 13 at 1200UTC and January 20, when the squint angle is most favourable for an optimised downlink. Not all of these are within range of the UK, but December 30 looks good for those who wish to have a try.

'RS' Satellites.

The daytime problems of 28MHz f.m., broadcast harmonics and severe attenuation persist, but RS-10 keeps on regardless. Sub-horizon has been excellent, and auroral tone

Back-Scatter

'A' returns are common from northern passes. The robot can prove at such times a little hard to access when multipath propagation effects delay elongation the accurate dot/dash ratio desired for entry into the system. **Gordon Cowey G3DDG** continues to experiment with the speeds acceptable under different path propagation conditions, and advises that on the proviso good spacing is provided between characters, call acceptance and QSOs are normally possible with persistence.

Vadil Donchenko UL7CR, is regularly active around a 29.463 - 470MHz downlink on passes to the UK north east, and has worked 80 countries on RS-10/11 to date. He needs QSOs with GW and GI if anyone out there can help by provision. At least five other UL7s are regularly active.

Ron Pearson G3CAG and **Dave Rowan G4CUO** are regular 'RS' users, and report steady QSOs, but with little new DX apparent. **Vin G4ULS** reports hearing a good signal from UA0QBR in Yakutsk, but sadly well sub-horizon, long after he had lost his uplink to the satellite.

One of the most active operators is shown in Fig. 4. It is a recent photograph of 67 years young **Janos HA5AM** (also HG5AM) in his satellite station. I have had many QSOs with Janos on OSCARs 6, 7, 8, 10, 12 and 13, and on RS-1, 2, 5, 6, 7, 8 and 10/11. He is a mainstay of the Technical University of Budapest, and with Bandi Gshwindt is operative in the design and building of many parts for past and future satellites.

RS-11 is being kept in mothballs as a standby for RS-10. The expected new RS-12/13 may well ascend with a new Cosmos Navsat in January, but confirmation or denial of this earlier voiced possibility is still awaited.

Shuttle

WA3NAN, the club station of the Goddard Space Flight Centre at Greenbelt, Maryland transmitted throughout the latest *Atlantis* mission to launch the *Galileo* probe to Jupiter. They will similarly retransmit future non-military missions, and are to be found on 3.860, 7.185, 14.295, 21.395 and 28.650MHz. Prior to Dellinger fade out and auroral activity, the latter frequency was excellent during daylight, and the 21 and 14MHz frequencies good propagation at night. As the astronauts are on Californian time, they will sleep between midnight and 0700 that time, when activity will be zero.

Ron Parise WA4SIR states that he will be active on auto-recording, SSTV, amateur wide band TV and packet radio during the nine day duration *Columbia STS-35* shuttle *Astro-1* mission launching 26 April 1990. The bad news is that the 300km high, 28.46 degree inclination planned will not place any passes above the UK horizons. The good news is that gateways to permit linking QSOs are currently being investigated.

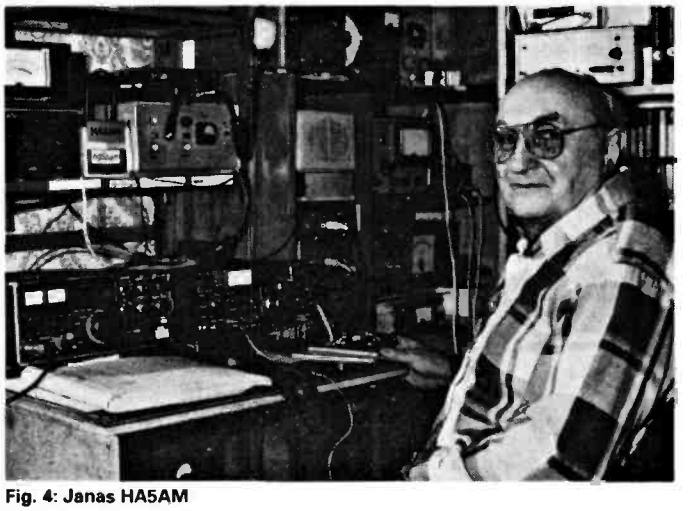


Fig. 4: Janas HA5AM

MIR 'Ham in Space'

More good news this month comes on the continuity of the earth-space QSOs with the Russian orbiting space station. As foretold in our earlier column, new amateur activity from the new crew of MIR which was manually docked by the new SOYUZ-TM-8 at 2220UTC on September 7 is now in operation, the first hearings being on Sunday September 17. After an initial ten day period of station refurbishment and initiation, the newly licensed MIR cosmonauts Alexander Viktorenko and Alexander Serebrov became intermittently active on 145MHz f.m. looking for QSOs as the Soviet manned space station orbited the world, mainly during their 'free' time at week-ends. It will be noted that due to last minute re-scheduling, the originally planned crew went aloft via the new SOYUZ-TM-8 as first intended, e.g., including Alexander Serebrov, the mission docking specialist.

The launch of the first of the two huge new modules going up to MIR via Proton taking the housing and docking 'D' module assembly to permit the use of the new 'space bikes' from the space station, has been further delayed due to a micro-chip failure in the guidance system, this was earlier evidenced by the matching problems that resulted in a manual TM-8 docking. The add-on module is currently due to be launched on November 28 to fly remote as a separate satellite for about one week before docking about one week later,and should present good visual sighting possibility if the skies are clear. A new Progress launch is due December 17. The delay has given a little more free time to the crew, and more amateur radio activity is thus expected.

The second 'T' module, also very large, should, if not delayed, launch via Proton on 30 January 1990 and fly free for a short while until it also docks to MIR in early February. This will give more room for the crew and experiments, and permit a better environment for both work and relaxation.

One of these, the planned amateur radio activity, will mainly employ split frequency operation, with one of the Alex pair transmitting on 145.550MHz (S22), and listening on either 145.525 or 145.575MHz (S21 or S23) for replies from earthbound amateurs. Remember, make short, sharp calls, using internationally recognisable phonetics, spend more time listening, and then the QSO rate will be far greater with everyone having a QSO opportunity. The Alex pair will be there for some 5 months total, returning to earth on February 19, thus giving everyone a reasonable chance to work them, until the new crew go aloft in the spring of 1990 for yet another change of callsigns.

For those who like to track the space station by listening just outside our two metre band to the previous 143.625MHz space to ground f.m. communications channel, please take note that they now appear to have a second onboard transmitter. This is moved down by some 4kHz from the original and is now centred on 143.621MHz. If you measure TCA, the time of closest approach by that when they are on the non-doppler shifted nominal frequency, your calculations will come unstuck if you do not correct for this alternative frequency change. MIR is firing the Progress motor to change its orbital parameter height every three weeks or so, thus updated Keplerian elements that give good tracking should be sought from the numerous AMSAT nets listed later so as to ensure continuing accuracy.

AMSAT Nets

Whilst this column prides itself in topicality, invariably being the first with the written news, at times of high launch activity such as is now upon us, the very latest information is needed on a daily basis. Here follows a listing of AMSAT nets from which you will glean the instant update details.

NetDesignation	Day/Time	Freq.MHz	Net Control
AMSAT-Europe	Sat 1000UTC	14.282	PA0DLO
AMSAT-USSR	Sat 1100	14.290	UA3CR
AMSAT-S.Pacific	Sat 2200	14.282	ZL1WN
AMSAT-S.Africa	Sun 0900	7.080	ZS6AKV
AMSAT-S.Africa	Sun 0900	14.280	ZS6AKV
AMSAT-S.Africa	Sun 0900	145.650	ZS6AKV
AMSAT-Australia	Sun 1000	3.685	VK5AGR
AMSAT-UK	Sun 1015 local	3.780	G0AUK
AMSAT-Argentina	Sun 1100 local	3.737	List
AMSAT-Internat	Sun 1900 UTC	14.282	WD0HHU
AMSAT-Internat	Sun 1900	21.280	W8GQW
AMSAT-Internat	Sun 1900	28.460	WB2YGA
AMSAT-S.Africa	Mon 1730	145.650	ZS6AKV
AMSAT-UK	Mon 1900 local	3.780	G0AUK
AMSAT-NA East	Tue 2000	3.840	K4EDU
AMSAT-NA Mid.	Tue 2100	3.840	W0RPK
AMSAT-NA West	Tue 2000	3.840	KI6QE
AMSAT-UK	Wed 1900	3.780	G0AUK

There are many more national nets on v.h.f., mainly 144MHz f.m. which will only be heard on a semi-local basis, but I will be pleased to publish these if requested. Those for the United Kingdom are as follows:

Bideford, Devon	Sun 1800 local	144.280	G0DLC
Brighton	Sun 1915 local	144.280	G6ZRU
Lancashire	Tue 2100 local	144.280	G0GJP
Birmingham	Thu 1900 local	144.280	G4ULS
Chichester	Thu 1900 local	145.275	G6CSX
Trent Valley	Daily 1900 local	145.575	G4CUO
Paisley, Scotland	Daily 0900 local	144.625	GM1SXX

Back-Scatter

Propagation

Reports to
Ron Ham
Farraday
Greyfriars, Storrington, West Sussex R20 4HE

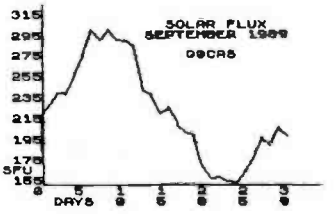


Fig. 1a

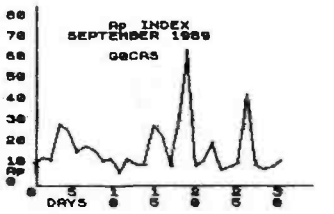


Fig. 1b

Solar

Ron Livesey (Edinburgh), using a 2.5in refractor and solar projecting system, identified 6 areas of activity on the sun on September 30, 7 on the 2nd and 18th, 8 on days 10, 16 and 17 and 10 on the 9th. From his observatory in Selsey, **Patrick Moore** sent the drawings that he made of the massive sunspot group on September 5, Fig. 3 and the smaller group and scattered spots on October 17, Fig. 4. **Ted Waring** (Bristol) counted 32 and 28 sunspots on October 3 and 22 respectively and in Plymouth, **Ern Warwick** heard variations in the background noise of his 28MHz receiver around 1615 on September 30 and October 1, midday on the 13th, 1650 on the 15th, around 0930 on the 17th, midday on the 18th and 0915 on the 20th.

Neil Clarke G0CAS (Ferrybridge) reports that the mean solar flux for September was 225 units and as usual provided the daily figures on his computer print out in Fig. 1a. **Cmdr Henry Hatfield** (Sevenoaks) using his spectroheliscope during the period September 29 to October 31 observed the sunspot groups, filaments and quiescent prominences listed in Fig. 5. Henry also recorded individual bursts of solar radio noise at 136MHz on September 29 and October 8, 10, 15 and 19 and on 1297MHz on September 29 and October 19, 27 and 28. His recording charts run side by side so that direct comparison can easily be made between solar bursts at these widely differing frequencies. This proved valuable on October 19, Fig. 2, when, having been out all day, he arrived home and found the longest period of bursting that he can remember on 1297MHz.

Auroral

Around 2100 on September 26, **Simon Hamer** (New Radnor) sighted aurora and described the colour as "predominantly orange with some white." This event was also reported to Ron Livesey, the auroral coordinator for the British Astronomical Association, by observers in North Dakota, Denmark and Scotland whose descriptions were "active, pulsating and flaming", "rayed arc and rayed band" and "all sky aurora" respectively. Another occurrence on the 18th was seen as "coronal rays overhead," from North Dakota, Great Lakes, Scotland and West Ireland and other UK observations like "ray bundles" were reported from North Wales on the 3rd and Moray Firth on the 15th, "coronal rays overhead" from West Ireland on the 17th and a "glow" from central Scotland on the 30th. Ron also received reports of various types of aurora from astonomers in North Dakota for September 4, 5, 7, 8, 9, 11, 13, 17, 21, 25 and 26.

The auroral effect on radio signals, known as tone-A, was heard by **Doug Smillie** (Wishaw) on the 50MHz band on the 15th and 16th and both the 50 and 144MHz bands on the 26th. **Vaclav Dosoudil** OK2PXJ (Kvasice) told me that "a white colour aurora" was visible from the high mountains in Czechoslovakia on October 20.

Magnetic

The Fluxgate magnetometers used by **Karl Lewis** (Saltash) and **David Pettitt** (Carlisle) and the "Jam-Jar" and Hall effect instruments operated by Ron Livesey and Doug Smillie respectively, between them indicated stormy conditions on September 2, 3, 4, 5, 6, 9, 10, 11, 12, 15, 16, 18, 19, 22, 25, 26, 27 and 30. "September was generally unsettled to active, but there were some quiet days and also some stormy days," said Neil Clarke who noted the Ap index peak at 64 on the 19th and recorded the daily levels for the month on his computer, Fig. 1a.

Sporadic-E and F2

Simon Hamer logged television pictures, via Sporadic-E, in Band I, from stations in Poland and the USSR on September 21, Finland and Scandinavia on the 22nd, Spain on the 23rd and Czechoslovakia, Hungary, Poland, Scandinavia and the USSR on October 7. In addition he identified smeary pictures, received via the F2 region of the Ionosphere on Ch. E2 (48.25MHz), from Dubai on October 8, Iran on the 9th and Zimbabwe on the 10th and I heard strong synchronising pulses and saw a jumble of unlockable pictures, typical F2, on Ch. R1 (49.75MHz) early on the 16th and on Chs. E2 and R1 between 0800 and 1100 on November 1.

28MHz

At midday on October 8, **Igor Khrustalev UA3QJC**, on holiday from Voronezh, operated from the Chalk Pits Museum (Amberley, Sussex) and soon contacted a pile-up of Russian stations including a friend of his who was in Africa at that time. "On the 18th Oct. at 1800UTC I picked up a signal from Melbourne, Florida- "WA4BIK/BCN TESTING FOR PROPAGATION FROM THE EXHAUST OF THE ROCKET"," wrote Ted Waring and this was also heard by **Mark Appleby G4XII** (Scarborough), **Greg Lovelock G3III** (Shipston on Stour) and Ern Warwick who also reports hearing echos on a number of signals around 1057 on the 2nd. Among the DX logged by **John Levesley G0HJL** (Bransgore) were signals from stations in Australia on September 30, Canada and/or the USA on the 30th and October 1, 2, 3, 4, 6, 14 and 15 and South America on days 1, 2 and 4.

Propagation Beacons

First, my thanks to Mark Appleby, **Chris van den Berg** (The Hague), Vaclav Dosoudil, Henry Hatfield, John Levesley, Greg Lovelock, **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), Ted Waring and Ern Warwick for their beacon logs from which I extracted the detailed information to compile this month's, longer than ever, 28MHz beacon chart, Fig. 7.

Vaclav Dosoudil received strong signals from the Spanish beacons EA3JA and EA6RCM on his portable receiver while walking with his family on October 21. He also heard the UK beacon GB3RAL (28.215MHz) on October 7 and 16 and WD8T/B and W8UR/B, for the first time, on October 18 and reports that OK1FL logged WA4BIK/B on 28.256MHz. Greg Lovelock heard KW7Y/B on 28.225MHz with 4 watts from Washington, LU1DZ -Box 9, Wilde Baires, Argentina, on 28.215MHz and WT8D/B on 28.247MHz.

In addition to his 28MHz report, Ern Warwick also copied, on most days, IK6BAK (24.915) and PY2AMI (24.931) on 24MHz, LU4AA, OH2B, ZS6DN/B and 4X6TU/B on 14.1MHz and DK0WCY on 10.144MHz and less often PY2AMI on 18.100MHz and JA2IGY and 4U1UN/B on 14.100MHz.

Tropospheric

The slightly rounded atmospheric pressure readings indicated in Fig. 6 were taken at noon and midnight from the barograph installed at my home in Sussex. It is interesting to compare with the timing of the tropospheric openings which occurred during the period. Although Simon Hamer found too much Band II DX to itemise on September 20 and 21, he simply listed the countries that he heard, which included Benelux, Eire, France, East and West Germany and Scandinavia. This opening, like the one on October 3, extended to Bands III, IV and V when he logged television captions, test cards and programmes from Austria, Belgium, Czechoslovakia, France, East and West Germany, Holland, Ireland, Luxembourg, Poland, Scandinavia and Switzerland. I found at least 10 active very strong continentals throughout Band II at 0845 on October 16 and early on the 17th and while travelling between

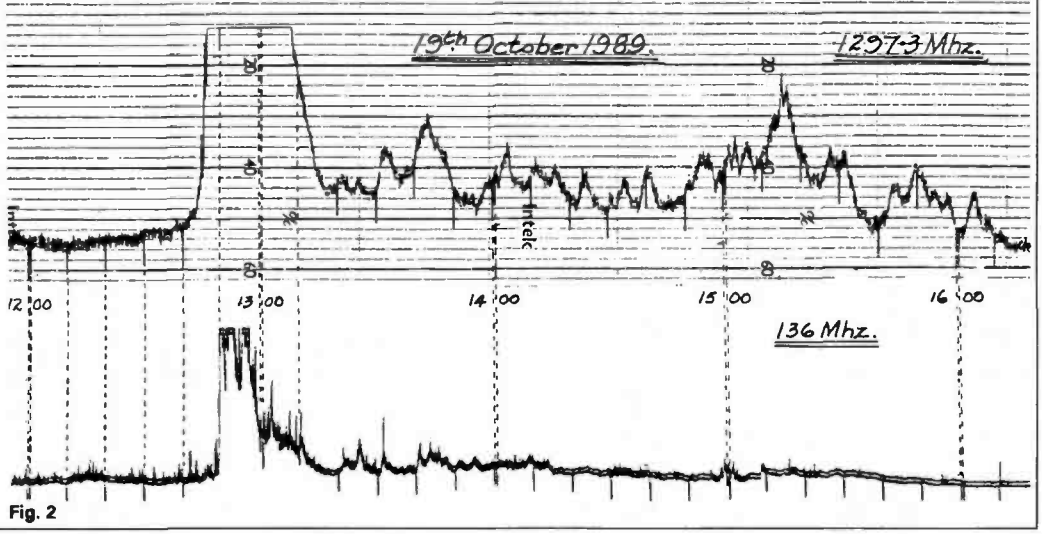


Fig. 2

Back-Scatter

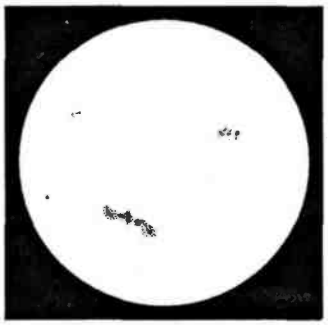


Fig. 3

Date	Groups	Filaments	Quiescent Prominences	Remarks
29.09.89	2	13		an eruptive arched filament with a bandwidth of about 3 Angstroms
05.10.89	4			
09.10.89	3			cloudy
10.10.89	3*	29	7	* = doubles
12.10.89	2	31	14	
14.10.89	4	29	9	
15.10.89	5	25	10	two sub-flares
17.10.89	3	25	12	
20.10.89	2	26	11	
24.10.89	3	22	12	
30.10.89	1	16	6	observations hampered by high cloud
31.10.89	1	33	12	

Fig. 5

Fig. 4

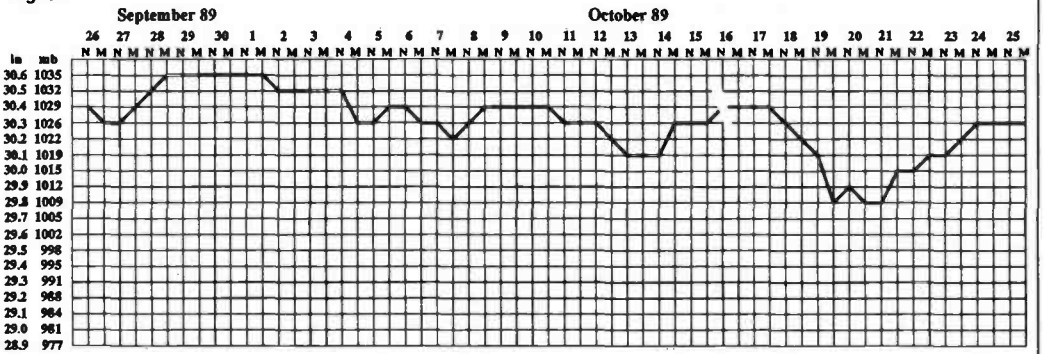


Fig. 6

Winchester and Poole at 0640 on the 17th, Editor, **Rob Mannion G3XFD** heard French, Italian and one Spanish station in Band II on his Panasonic car radio.

Although my Plustron TVR5D, with its own rod antenna, was on the back seat of my car and under trees, in East Sussex, I heard several foreign voices as Band II was gradually opening up around 1600 on October 24. When I checked from home at 0930 on the 25th, with my ex-military R216 fed by a dipole, I counted at least 18, mainly German, foreign stations between 87.5 and 102MHz plus BBC Radio Oxford which is unusual for me. In addition, between 0900 and 1030, I received pictures in Band III from Belgium, France and West Germany and similar conditions prevailed at 0900 on the 27th.

934MHz.

"Favourable tropospheric conditions were enjoyed during the evening of October 17 through to the morning of the 18th," wrote **Terry Wyatt UK-845** (Walton on Thames) and adds, "Stations made contact from and between Leicestershire down to Devon in the west and Essex in the east." Although conditions were not so good for the UK club contest on the 15th, competitors enjoyed the event over a 80km radius and John Levesley UK-627 worked stations in the Channel Islands, around 160km, during the good conditions on September 27 and 30 and October 2. Also on the 2nd he heard a station in Bridgend at 135km.

	September													October																
Beacon	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											
DF0AAB	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
DJ9CG																								X						
EA3JA																					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
IY4M							X	X	X	X	X	X	X	X	X	X				X								X		X
KB2BBW																				X										
KB4UPI					X							X	X		X	X	X			X	X		X			X		X		
KC4DPC			X	X	X		X	X	X	X	X	X	X	X	X	X	X	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
KE2DI/B				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
KI4PJ													X																	
KJ4X/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	
KW7Y/B										X	X						X	X	X	X										
LA5TEN										X		X	X	X	X	X	X	X	X	X	X		X							
LU1DZ																	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
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
N8KHE																	X	X	X	X	X				X					
OK0EG												X	X	X				X	X											
OH2TEN	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
PI7ETE												X																		
PT7AAC							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	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
PY2GOB															X	X	X	X	X	X	X	X	X	X	X					
SK5TEN											X	X	X	X		X	X	X	X	X	X									
VE1MUF										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
VE3TEN			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
VE6YF											X		X					X												
VK2RSY	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
VK5WI	X			X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X		X
VK6RWA	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X		X	
VP8ADE																			X											
VS6TEN					X		X		X	X	X			X	X	X	X	X	X	X	X		X	X						
WA4BIK												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
WC8E																X	X	X	X	X	X	X	X	X						
WT8D/B																						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
W7JPI/B										X			X	X		X		X		X	X	X								
W8FKL/4						X		X	X	X																				
W8TD/B																						X	X		X					
W8VR							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
W9UXO						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X		
YO2KHP					X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
ZD8HF	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
ZL2MHF				X		X			X	X	X	X		X	X	X	X	X	X	X	X		X		X					
ZS1LA		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
ZS5VHF	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
ZS6PW	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
Z21ANB	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
4N3ZHK					X				X			X		X		X		X	X		X	X	X		X		X			
5B4CY	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

Fig. 7

Back-Scatter

Broadcast Round-up

Reports to Peter Shore

Radio Free Europe and Radio Liberty are expanding contacts with their Eastern Bloc target countries. The head of the organisation recently visited the Hungarian news agency MTI and other visitors to the station's headquarters in Munich have included a delegation of Soviet officials in recent weeks. The Public Affairs Director of RFE/RL, Robert Redlich, told me in late October that changes were taking place which just over two years ago would have been unthinkable, including the establishment of news bureau in Warsaw and Hungary, and correspondents in other major Eastern Bloc capitals. Improved transmission facilities would enable the station to improve coverage of the Soviet Asiatic Republics and already audience figures are on the increase.

In a continuing trend amongst Soviet Republics, Radio Minsk and Latvian Radio have both introduced new services for expatriates. Details are given in the European news section.

Radio Australia will have a new General Manager, Richard Broinowski, from the new year. In a recent review of the station, its aims and potential has shown that short wave broadcasting will be important in the Asia-Pacific region until well into the 21st Century, and that Radio Australia should be playing its part. A new programme schedule is to be introduced in December which will represent the station's target priorities of the south and southwest Pacific and Asia. The Japanese short wave service may be a candidate for closure, but the station is examining ways of establishing a transcription based service for Japan. As for transmitters, the station would like to be responsible for its own transmitting sites instead of relying on Telecom Australia. Full details of all the Radio Australia schedule changes will be carried in this column next month.

Swiss Radio International's aim in the future will be "to provide direct information to Swiss people through out the world...in addition to promoting the image of Switzerland abroad". The station also hopes to make more use of other means of communication such as satellites and cable networks, according to a report by SRI's management on Switzerland's media in the future. It makes one wonder if anyone will use short wave in a few years time.

All India Radio continues to upgrade its domestic and overseas short wave facilities.Tests of new equipment have been noted in recent weeks, and regular transmissions are now underway at some sites. Full details of current frequencies may be found in the Asia and Pacific section. Two 150kW medium wave senders are to be installed in the Tamil Nadu town of Tuticorin, beaming programmes to Sri Lanka. The antenna tower is already complete, and the transmitters are expected to be operational from February.

A French company, Media Connection International, is planning to build a transmitting station on Cape Verde Island, just off the West African coast.There will be three 500kW senders which will be leased to stations such as RFI, VoA and Radio Japan. It is expected that the station will be up and running in 1991.

European Stations

All times UTC (=GMT)

Radio Albania's English service has been noted on 9.50MHz at 1530 with broadcasts to Europe, with a closing announcement giving a current schedule of:

0630 on 9.50 & 7.205MHz
1830 on 9.48, 7.12 & 1.395MHz
2200 on 9.48, 7.215 & 1.395MHz and to North America
2300 on 11.825, 9.76 & 6.12MHz
0230 on 11.825 & 9.76MHz
0330 on 11.825 & 9.76MHz

Czechoslovakia's long wave transmitter for the Hvezda programme moved from 272 to 270kHz on October 1. The station was due to move under the IFRB l.f. band plan on 1 February 1990.

Radio Finland has introduced weekly five minute news round-ups in Classical Latin. These are included in most of the English language broadcasts between 0930 on Sundays and 1300 on Mondays, towards the end of the block. Radio Finland believes that it is the only news programme in Classical Latin in the world. Current English transmissions to Europe are heard:

0730 on 11.755, 9.56 & 6.12MHz
1505 on 15.185, 11.85 & 9.64MHz
1930 on 11.755, 9.53 & 6.12MHz
2200 on 11.755, 6.12MHz, 963, 558 & 254kHz

Deutsche Welle does not broadcast in English to Europe, but the station's English services to other parts of the world are audible here. At the present, they are:

0100 on 11.865, 9.735, 9.565, 6.145, 6.085 & 6.04MHz
0200 on 15.325, 11.945, 11.835, 9.69, 9.615, 7.285 & 6.035MHz
0300 on 11.81, 9.605, 9.545, 6.13 & 6.085MHz
0400 on 15.265, 11.765, 9.765, 9.565, 7.225 & 7.15MHz
0500 on 9.70, 9.67, 6.12 & 5.96MHz
0600 o 17.875, 15.185, 13.79 & 11.765MHz
0900 on 21.68, 21.65, 17.78, 17.765, 11.945, 6.16 & to Africa on 21.60, 15.41 & 9.65MHz
1100 on 21.6, 17.8, 17.765 & 15.41MHz
1500 on 21.60, 17.765, 11.965 & 9.735MHz
1600 on 21.68, 17.825, 15.595, 15.105, 7.225 & 6.17MHz
1900 on 17.81, 15.39, 13.79, 11.81, 11.785MHz
2100 on 15.435, 11.785, 9.765 & 9.67MHz

Radio Free Europe in Romania may be heard on an s.s.b. feeder at 1955 until 2255 on 5.125 & 5.295MHz.

Radio Netherlands is heard well at the following times:

0730 on 15.56 & 9.63MHz (both from Bonaire)
0830 on 21.485 & 17.575MHz (both from Madagascar)
1130 on 21.615, 21.48, 17.575, 9.715 & 5.955MHz
1430 on 17.605, 15.575, 15.150, 13.77 & 5.955MHz
1830 on 21.685, 17.605, 15.56 & 6.02MHz
2030 on 15.56, 13.70 & 9.86MHz

The winter schedule for Radio Norway's Sunday English service includes European transmissions at:

0600 on 5.98MHz
1300 on 9.59MHz
1900 on 15.22MHz

Transmissions to other areas are at:

0600 & 0800 on 15.165MHz
0900 on 17.74MHz
1200 on 15.165MHz
1400 on 21.71MHz
1600 on 21.705 & 17.84MHz
1700 on 21.705 & 15.305MHz
1800 on 15.265MHz
2200 on 15.225MHz
2300 on 9.605MHz
0000 on 9.595MHz (Mondays)

Radio Minsk has a new Byelorussian service for listeners in North America at 2330 for 30 minutes each day on 17.69, 15.18, 11.675 & 9.61MHz.

Latvian Radio in Riga has a new Latvian service for West Europe at 1730, also for thirty minutes, on the medium wave channel of 1.143MHz. The transmitter which carries Radio Moscow at other times is thought to be in Kaliningrad and be 500kW.

Radio Vilnius in Lithuania has English transmissions to Europe at 0930 on 6.10MHz and 666kHz, and from 1000 also on 15.455, 13.645, 11.79 & 7.40MHz.

North American listeners can tune in at 2300 on 17.69, 17.665, 15.18, 11.675 & 9.61MHz.

Radio Vilnius has also started a Russian language DX programme called *Hello DXers*. It is heard on Saturday at around 1320 on 6.01 and 9.71MHz short wave, and is reputedly broadcast on the medium wave channels of 1.557MHz and 666kHz.

Feeders for Moscow home services and World Service are audible at several times of the day. Try between 1700 and 2000 for RMWS on 8.122, 9.21 & 16.25MHz. The Moscow Second *Mayak* programme can be heard on 18.87, 18.46, 18.195 & 9.25MHz. Other services heard include one time-shifted version of Moscow third programme on 14.437MHz, and other variations of home services are on 9.145,10.995 & 16.02MHz. All transmissions are in s.s.b.

African & Middle Eastern Stations

Radio Kuwait is using an additional channel of 21.675MHz for English at 1830, in parallel with 11.665MHz.

Radio Omdurman relays its general programme on 11.625MHz between 0355 and 0600, and 1055 and 1900. Arabic language programming is heard, except at 1530 when a thirty minute English news, press and music programme is broadcast.

Asian & Pacific Stations

Radio Bangladesh at 1815 is now using the frequency 17.714MHz.

Trans World Radio in Guam broadcasts in English to Africa at 1600 on 11.91MHz.

The other Guam religious broadcaster, Adventist World Radio, airs a DX programme on Saturday at 1630 on 11.98MHz and again at 2330 on 15.125MHz. On Sunday the show is at 0230 on 11.70MHz and Monday at 1030 on 13.72MHz.

Lots of details of All India Radio's use of short wave for domestic services: Radio Kashmir uses a new 10kW transmitter daily 1130-1630 on 4.76MHz, and at 0120-0300 on 3.33MHz.

At Port Blair, AIR uses another 10kW sender 0700-0850 on 7.18, 1030-1630 on 4.76MHz.

Shillong, in the north-east of the country, has a 50kW transmitter which is heard 0125-0220 and 1225-1720 on 3.255MHz, and on 7.19MHz at 0225-1215. This channel is likely to be replaced by 4.79MHz before too long.

Tests for the new 500kW transmitters at Bangladore have been on 17.85 and 15.295MHz between 1330 and 1430. All India Radio plans to use both transmitters in tandem to radiate signals of 1000kW. All India Radio at 1330-1500 on 15.335, 11.81 & 9.56MHz in English.

Radio Japan at 2100 in English uses 11.765MHz, a move from 11.80MHz, whilst at 0100 the frequency is 17.775MHz replacing 17.825MHz.

Radio Enga, a provincial Papua New Guinea station, is back on the air using its old frequency of 2.41MHz with a new Japanese 10kW transmitter.

The Sri Lanka Broadcasting Corporation has English transmissions:

0300-0430 & 1230-1730 on 15.42 & 9.72MHz
1030-1130 on 17.85, 15.12 & 11.835MHz

Radio Thailand uses 9.655MHz between 1200 and 1230 daily.

North, Central & South American Stations

Radio Canada is using 13.65MHz for broadcasts beamed to West Europe from 2000.

Radio Lira International from Costa Rica opens at 1100 on 11.87 and 9.725MHz. Try the 9MHz channel between 2030 and 0100, too.

Radio Cultural in Guatemala has been heard in Europe on 3.30MHz from 0330 with gospel programming. Union Radio uses 5.98 from 0000 until 0200.

Radio Havana Cuba currently transmits English to Europe:

1900-2100 on 15.34MHz
2000-2100 on 17.875MHz
2200-2300 on 11.705 or 9.685MHz

WHSB at 2000 uses new 15.225MHz, replacing 15.39MHz for its European and North American service. To Australia at 0800, new frequency 13.760MHz is used.

MERRY CHRISTMAS AND KEEP THOSE REPORTS COMING IN DURING THE NEW YEAR TO THE NEW "BACKSCATTER" COLUMNS. WE HOPE YOU LIKE THE NEW FORMAT.

Back-Scatter

ATV

Reports to
Andy Emmerson G8PTH
71 Falcutt Way
Northampton NN28PH

I had a shock recently - strong winds had had 'an adverse effect' on one of the trees in the garden and the trunk almost snapped. As soon as I saw this I knew it was time to check the antenna system ... you know, make sure it's still there, all sealed joints are still waterproof and any guy wires are taut.

One TVer I know (no need to mention the callsign really) did this last winter and decided to lower his wind-up (or is it wind-down?) tower. Bang! It came down a bit faster then he had reckoned with, and it was lucky he could jump so fast! The steel cable had rusted through and if nothing else, this is a word to the wise for those lucky(?) individuals with towers - check the cable regularly! It may look firm but how can you tell? I must admit I don't know but I can tell you that it helps to keep it really well greased.

Grease! Who wants to get that stuff on their hands? Well, it's not as bad as it sounds and if you use gloves you won't get any on your hands anyway. You can buy a monster tube of it at your local filling station for a small sum and it will last ages. It's great stuff. Smear it over all ironwork in the antenna system, clamps, bolts and so on. If you dip nuts and bolts in the grease before you assemble mast-clamps, they will always come undone easily afterwards, even several years later. On the other hand, there's nothing worse than struggling with rusted bolts at the top of a ladder in biting wind. You don't have a spanner of the correct size, so you use an adjustable one, it slips and digs into your hand, you curse and drop it 10 metres, then you wonder why you took up such a stupid hobby. So do grease those bolts!

Also, remember that BNCs and UHF connectors cannot make waterproof joints, only N-types can. Water always gets into unsealed joints so tape up all connectors with self-amalgamating tape. It is expensive but it does the job, also you can often buy it cheaper at rallies. Don't forget Coax-Seal, my favourite "goop on a reel", which you can buy at your local Tandy store. It is a kind of waterproof Plasticene, very pliable and absolutely ideal for sealing up outside joints: not cheap, but ideal! No doubt you find all this pretty obvious, but there are some people who only learn the hard way, which is a shame.

New ATV Magazine

Have you seen the new American ham TV magazine yet? It's called *ATV Quarterly* and issue 4 has just appeared. Articles include colour-keying using the Tandy effects generator, a new phase-lock loop transmitter for 24cm and more on balloon TV. *Amateur Television Quarterly* is a high-quality, technically orientated, journal for TV amateurs, with 48-pages and colour cover. Like *CQ-TV*, it contains virtually no editorial, just build-it projects, equipment reviews, theory articles and operating news.

Subscriptions cost $25 a year by air mail and the UK agent is Mike Wooding G6IQM, 5 Ware Orchard, Barby, Rugby, Warks CV23 8UF.

What are SATV and NBTV?

Slow-scan TV is familiar to most ATVers but some folk are a little hazy when it comes to SATV and NBTV. SATV is rather dated now but its day may come once more. It is a German concept and is (was?) used only in Germany. The S stands for schmalband or narrowband and relates to normal fast-scan operation on 70cm and 23cm. The idea was to reduce the transmitted bandwidth to 1MHz, giving two advantages. Together with the use of matching narrow-band receivers it gave a considerable boost or 'punch' to signals, enabling them to be seen where 'normal' ATV would not get through (as TV DXers know - reducing the bandwidth of the TV receiver appears to sharpen up the picture no end). Interference to other band users is also reduced. Depending on circumstances, we might see a comeback for SATV one day!

NBTV or Narrow Band television is generally taken to mean (intentionally) low-definition television, of the kind Baird and others were experimenting with 60 years ago. There is a speciality interest group for NB people, called the Narrow Bandwidth Television Association. It was founded in 1975 and exists to promote the 'development, study and widespread use of low definition and mechanical television'. Membership is open to all persons with an interest in its aims at a modest annual subscription, and rather like the G-QRP club it has a faithful following and high reputation in its field.

The association holds an annual exhibition and conference in April or May, and members receive quarterly newsletters of about 12-pages containing technical articles, details of constructional projects and so on. There are also some special services for members. Activities include the building of experimental cameras, monitors, also closed circuit demonstrations, tape correspondence (using audio tape recorders) and transmissions on the amateur wavebands, the 28 and 144MHz bands being favoured.

NBTV is genuine television, along the lines of the BBC/Baird transmissions of the early 1930s, though with improved techniques: the system gives moving half-tone pictures within a bandwidth of some 7kHz. It must not be confused with slow-scan TV, which provides only still pictures, though with higher definition. Technical standards are well established, with 32 lines, vertical (upward) scanning and 12.5 pictures per second with a 3:2 ratio.

Membership enquiries should be addressed to N Reynolds G8YXL, 6A Collingbourne Road, London W12 0JQ. For information on amateur band NBTV contact D J Sumner G3PVH, 20 Woodlands Way, Southwater, Horsham, Sussex RH13 7HZ, and about other technical matters write to D B Pitt, 1 Burnwood Drive, Wollaton, Nottingham NG8 2DJ.

Shop Window

If you have built the Cirkit/Cropredy TV test pattern generator you should know that the Worthing TV Repeater Group have expanded their range of accessories to suit this handy unit. The latest add-on is a carousel or auto board which displays one screen after another automatically. They also have a module which will enable the device to produce colour pictures and a variety of EPROMs. As well as these, they also supply a one watt transmitter for 24cm television. An s.a.e. will bring details: write to R. Stephens, GB3VR Treasurer, Toftwood, Mill Lane, High Salvington, Worthing, Sussex BN13 3DF.

The End of Amateur Video?

Yes, it's a trick headline to catch your attention. But I would suggest that the biggest difference between amateur video and professional productions has been in picture quality. Until now, the kind of video cameras and recorders used by hobbyists were no match for those of the broadcasters, and only rarely would tape shot by amateurs be accepted for use by the major TV stations. Now things are changing. Video-8 and even more so, Super VHS (S-VHS) have altered this: Video-8 gives very acceptable pictures and S-VHS can match the quality of U-Matic. As a result, local TV stations and some of the major networks in the USA are now accepting material shot on consumer video formats for use on air.

Notwithstanding their price - and they are becoming more affordable every month - the new S-VHS camcorders really make all existing home video equipment look like toys. "If you take an image shot with a high-quality, professional camera on S-VHS, I don't think you'd be able to tell the difference between that picture and one shot with a comparable quality camera on 3/4in", claimed Ardell Hill, director of operations and engineering for WXFL-TV, a local station in Tampa, Florida (quoted in World Broadcast News). Of course, this does not mean that the BBC and the ITV companies are now going to ditch their 3/4in and 1in equipment overnight, but the new technology will enable good pictures to be taken in emergency situations such as plane crashes and natural disasters, when regular news crews with full-blown equipment cannot be on the scene. It will also mean that viewers will have a better chance of selling material they have shot on their own equipment to the big stations. You may recall that a British doctor on holiday in Moscow happened to be standing in Red Square when the young German Rust landed his plane there. The doctor had been shooting home movies on his VHS camcorder and his footage was purchased by NBC and flashed to the world by satellite.

Another area in which amateurs and professionals are now on an equal footing is captioning. Many TV programmes - for instance some independent productions for Channel Four and Cable News Network - are using titles and credits made on the Amiga home computer. If you have the equipment you can create exactly the same results in your own home - fascinating isn't it?

The Future of ATV

What does the next decade hold for amateur television? The technology will become cheaper in real terms, and I suspect results will be restricted only by our own competence and expertise. There will be more ATV repeaters, probably on 10GHz, with interlinking and amazing user facilities hardly dreamed of.

This sounds great, but I suspect we may have problems in store on the air. If the trends in continental Europe are matched in Britain, we may run the risk of increased QRM to ATV from packet radio operators (the only growth area in ham radio). So far this is not a problem in Britain, though I hear it is in Germany and the Netherlands. This can only get worse, because the interest in packet radio is growing all the time and some packet radio operators display little radio knowledge. This minority may be expert in data matters but many of them have no awareness of (or interest in) bandplans and reserved frequencies, nor do they listen on a channel before transmitting. By no means all packet radio people are like this, but sufficient are to cause a threat to ATV. (Apologies to all you good guys!). Anyway, it is up to us ATVers to seek a happy and equable solution.

We must educate all radio amateurs of the importance of sharing our valuable resource thoughtfully. We must make more people aware that ATV is fun and the most fully rewarding branch of our radio hobby. This won't happen by itself - we must make ATV more interesting to others, explain what we are doing and encourage them to join in our particular hobby. More repeaters with more user facilities are the most dramatic way of demonstrating this. I hope you can think of ideas too. As for avoiding packet radio QRM, I fear the only solution is to 'move to higher bands' - this may not please everyone but it may be the only way to escape PR!

I know I can expect you to come up with other practical ideas, and I look forward to receiving them!

Please mention Practical Wireless when replying to Advertisements

PW BOOK SERVICE

The books listed have been selected as being of special interest to our readers. They are supplied from our editorial address direct to your door. Some titles are overseas in origin.

VISA

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.

VISA

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. Nallewalla, A. T. Cushen 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 end v.h.f. *158 pages.* **£5.50**

PASSPORT TO WORLD BAND RADIO 1989
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.* **O/P**

SCANNERS (Third Edition)
Peter Rouse GU1DKD
A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating prodedures. *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 charecteristics 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.* **£6.95**

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.* **£5.95**

GUIDE TO WORLD-WIDE TELEVISION TEST CARDS
Edition 3
Keith Hamer & Gerry 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. *60pages.* **£4.95**

SATELLITE TELEVISION INSTALLATION GUIDE
2nd Edition
John Breeds
A practical guide to satellite television. Detailed guidlines on installing and aligning dishes based on practical experience. *56pages.* **£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. *244pages.* **£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. *260pages.* **£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. *104pages.* **£4.00**

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, callsign, name of the station, ITU country/geographical aymbol, 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 callsign 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. *62pages.* **£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. *288pages.* **£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.* **£17.95**

INTERFERENCE

INTERFERENCE HANDBOOK (USA)
William R. Nelson WA6FQG
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 callsign 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. *152pages.* **£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 1989 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 **O/S**

***THE ARRL OPERATING MANUAL**
Another very useful book from the ARRL. Although writen 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 asd 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
The 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 is 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. Indispensible 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 callsign 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, gramaphones, 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 Van
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 seletion 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 primarliy 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 capabilites 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 oscilletor 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 G3RJV 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 unstabilised 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 QRPer. 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 besic 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 metworks 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/S**

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 ZL 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**

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. **£2.95**

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 mateur 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**

NEVADA

introduce

The CT1600 VHF Hand Held

New!

DOCKING BOOSTER

Boost the output of your handheld to 25 Watts

BS25 - for Icom/Kenpro/CTE

BS23 - for Yaesu models

INTRODUCTORY PRICE **£59.95**

The CT1600 is a small light-weight transceiver covering the 2 metre Amateur Band. Its rugged construction and sensitive receiver make it excellent value for money.

SPECIFICATIONS:

- Fully synthesised resolution 10KHz/5KHz
- **UK Model** 144 - 146MHz
- **Export Model** 142 - 149MHz
- Repeater Shift (plus or minus 600KHz)
- Tone Burst
- 1½/½ Watt output
- Complete with Ni-Cad charger

INTRODUCTORY OFFER £169

NEVADA

Available from your Local Dealer or direct from the UK Distributors:-
Nevada Communications 189 London Road North End Portsmouth Tel: (0705) 662145 Fax: (0705) 690626

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.90 per single column centimetre (minimum 2.5cms). Please add 15% VAT to the total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent by registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP. Telephone (0202) 676033.

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

Receivers

SAVE £40.00! New realistic Pro 2005 Scanner 25MHz-520MHz & 760MHz-1300MHz, 400 channels. Price now £299.95 (was £339.95). P&P Free!! LINK ELECTRONICS, 228 Lincoln Road, Peterborough. PE1 2NE. Mail order hot line Tel: (0733) 45731 (Visa, Access or American Express accepted).

SCANNERS & CBs in Cumbria. Realistic, Bearcat, Midland. ACE ELECTRONICS. 73 Highgate, Kendal, Cumbria (0539) 725728.

B.F.O. KITS, resolves single-side band on almost any radio, £11.95. Also Steepletone FM/AIR/MW £9.95. CORRIGAN RADIOWATCH, 7 York Street, Ayr KA8 8AR.

RECEIVER R209 Ex MoD 1-20MHz with manual lead £50.00 & £5 P&P. COLLECTORS PARADISE LTD. Wolverhampton 20315.

150MHz SPECTRUM ANALYSERS
Connect this unit to convert almost any oscilloscope into RF Spectrum Analyser. 400kHz to 150MHz. 70dB range. **£120**. SAE for details.
WATERBEACH ELECTRONICS
34 Providence Way, Waterbeach, Cambridge CB5 9QJ

Components

QUARTZ CRYSTALS and FILTERS
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.
GOLLEDGE ELECTRONICS
Merriott, Somerset, TA16 5NS
Tel: (0460) 73718

JAPANESE TRANSMITTING Tubes and transistors for broadcasting, communication and industrial use. Please make enquiry by facsimile 816-338-3381. Tsutom Yoshihara, 1-105, Deguchi-cho 34, Suita-shi, OSAKA 564, JAPAN.

Service Sheets

ACCESS MASTERCARD **TECHNICAL INFORMATION SERVICES (PW)** VISA EUROCARD
76 Church St., Larkhall, Lanarkshire ML9 1HE
Immediate quotes - Phone (0698) 884585 Mon-Fri 9-5, (0698) 883334 any other time
IMMEDIATE DESPATCH OF ALL Phone Orders by ACCESS, VISA etc. or to Listed Customers

WORLD'S LARGEST COLLECTION OF SERVICE MANUALS ... from £3.50 to £50 ... Most unobtainable elsewhere
Every issued FULL SIZE ERVICE SHEET in stock; CTVs or Combinations £3.50/Singles £2.50; Plus: SAE
LSAE for any Quotation, plus huge FREE Catalogue, STREE Review, Pricelists, etc.
For £3 ... Comprehensive Sercie Manuals & Sheets Catalogues PLUS 1989 Chassis Guide & £4 Vouchers
Spectrum Repair & Service Guide **£5.00**. Video Recorders Service Gude 3rd Ed **£20.00**
Giant Collection of 10 Huge Binders covering all main CTVs to end 1989, (FREE Updating) £265

Veteran & Vintage

THE VINTAGE WIRELESS BOOK LISTING Published regularly containing 100s of out of print, old and collectable wireless and TV books, magazines etc. Send 2 x 19p stamps. WANTED Pre 1960 wireless books magazines and associated printed items. CHEVET BOOKS. 34 Park Lodge Lane, Wakefield, Yorkshire Tel. (0924) 381857.

VINTAGE WIRELESS EQUIPMENT FOR SALE. A selection of transforms, coils, tuning condensers valves and other components. Also a 1928 Marconiphone Wireless Set, Bush radio, Cossor radio and other equipment. Phone (0533) 402145 for further details (evenings or weekends) - offers invited.

Educational

NORTH ATLANTIC SEA STATION - Anyone interested in spending a 5 week holiday on board a vessel on station in the mid-Atlantic departing from and returning to a UK port is invited to contact, Curnow Shipping Limited, The Shipyard, Porthleven, Helston, Cornwall TR13 9JA.

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.

WORKSHOP SERVICE MANUALS.
VIDEO RECORDERS - £12.50
Most colour TV, Audio, Test, Vintage, Amateur etc. - £6.00
Please state make/model type with order.
FREE Catalogue Unique Repair and Data Guides with all orders or SAE for your copy.
MAURITRON (PW), 8 CHERRY TREE ROAD, CHINNOR, OXON, OX9 4QY

TECHNICAL MANUALS, AR88, CR100, R210, HR0, £4 each. Circuits only 150 pence, plus LSAAE, lists thousands. BENTLEY, 27 De Vere Gardens, Ilford, Essex IG1 3EB. Phone 01-554 6631.

Kits

KITS AND PLANS. Microtransmitters, telephone/bleeper transmitters, recording switches, voice scrambler, 6kV from 9V, Radio Alarm etc. SAE list. ACE (PW). 99 Greenheath, Hednesford, Staffordshire.

VISA **KANGA PRODUCTS**
KITS FOR THE AMATEUR
BUDDING AMATEUR OR THE LISTENER
NEW - NEW - NEW - NEW
PROJECT ONE
A direct conversion receiver designed for the first-time builder.
Ideal for children of 10 years plus.
SOLD COMPLETE @ £19.95 (+ £1 p&p)
Send large SAE (20p stamp) for full catalogue
KANGA PRODUCTS, 3 LIMES ROAD, FOLKSTONE CT19 4AU

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 £.....(inc. 15% VAT). Rates and Postal Address at top of page.
(Cheques and Postal Orders should be made payable to Practical Wireless).

CATEGORY HEADING.....

Name .....

Address .....

.....

.....

.....

.....

For Sale

COLLINS RECEIVER 1.5-12MHz complete £20. Collins Transmitter 1.5-12MHz complete. XTALS, 35, CW sections, 80, 40 and 30 £20. (0634) 253056 Evenings.

B2 SPY SET. Original tools, etc., complete, water tight cases mint. R206 MKII. Mint. Offers. Medway 253056 evenings only please.

ICOM RC7000 Less than 10 hours use. Save yourself pounds £600. (0202) 823245.

6809 USER THE DRAGON MAGAZINE £1.25 sample copy or subscription £7.00 six editions. Sunnydale Publishing, PO Box 13, Ilfracombe, N. Devon EX34 8PB.

BADGES/LABELS CALLSIGN, NAME Two line engraving. Silver Gold Coloured badges. £2.00 Including postage Jay Graphics, Unit 5, Thomas Street, Congleton, Cheshire Tel. (0260) 275127.

OLD MAGAZINES, PRACTICAL WIRELESS 1948-72. Practical Television 53-65. Wireless World 43-54. R.S.G.B. 47-51. Others. (0935) 851 348.

CALLSIGN BASEBALL CAPS - Blue, Red or Black. Send £3.90 including P&P. M.J. Hilton, 3 Highfields, Wirral, L60 7TF.

USED SCOPES, Sig. Gens. Power Meters, PSUs DVMs etc. Barclaycard & Access accepted for payment. COOKE INTERNATIONAL (0243) 545111.

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.

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.

£39 Incl. VAT + Post £2
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

Computers

EEC LTD. - 230 VAC POWER SUPPLIES
12 High St. Watlington Oxon OX95 5PS
Tel. 049 161 3294
Sinclair £9.95
48K 9VDC 1.4amp. - 128k 2.1amp.
BROTHER PRINTERS Etc. £12.95
TYPE 'C' 6VDC 2amp. TYPE 'D' 8.5VDC 1amp.
OBERON £14.95
Regulated 12VDC 1amp.
VISA
PRICES INC. VAT. PLSE. ADD £2 P&P

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.

MS-DOS MORSE TUTOR. 3 1/2" 720K diskette £6. 5 1/4" diskette £5. MIKE GATHERGOOD, G4KFK, 24 New Road, Datchet, Berkshire, SL3 9JB.

COMMODOR 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).

RMS3 - RTTY, MORSE & SSTV
The Program :- Decode, RTTY, Morse & SSTV with one program for your Spectrum. Menu driven, this program is the most 'User Friendly' on the market today.
All Sections of the program will operate without filter or interface, though a suitable filter will improve decoding on the noisy HF bands.
The Filter:- Specially designed for use with this program, the filter switches easily between the three modes. Each of the three filters incorporated in the unit are designed for optimum performance, and AGC is incorporated as standard. (Please state programme source).
The System :- We are able to offer a saving to customers purchasing the program and filter at the same time.
The Program **£17.50**, the filter **£35.00**, both **£47.50**.
Please send **large** S.A.E. for full details of all our products.
J.B.P. ELECTRONICS LTD.
Unit 45, Meadowmill Estate, Kidderminster
DY10 1HH Tel: (0562)753893
VISA

Miscellaneous

G2YF 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 SWLs. AND LONG AND MEDIUM WAVE BANDS FOR BCLs.** Loops 21 inches square or triangle. No special skills required. Circuits, Parts Lists with sources of supply assembly/data. **HIGH FROQUENCY LOOP** 80 to 10 Metres **£5. LONG AND MEDIUM WAVE LOOP** for BCLs **£3. LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP** 1500 to 10 Metres **FOR THE BCL AND SWL £8. 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 G2YF HF** Loop or ATU **£4.** SAE details. All projects DIY. Metal Detector £2. Photo Copy HRO 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.

Wanted

EX - R.A.F. GEE Mk3 (A.R.I. 5816) Indicator etc. also Rebecca Mk 4 Indicator etc. to complete static display of Canberra aircraft. Please can anyone help? Frank Walker (0228) - 24848 (Home) (0228) - 21440 (Work).

19 SET AND ACCESSORIES. 1155 A4D power supply. WD sets carriage arranged (0326) 240781.

CALL MARCIA BROGAN ON (0202) 676033 FOR ALL YOUR ADVERTISING QUERIES

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS IN THIS MAGAZINE

INDEX TO ADVERTISERS

YOUR LOCAL DEALERS

SOUTH WALES

ELECTRO MART

Equipment, Components, Howes Kits, Eldy Kits, AR Gear and much more.

TAILLWYD ROAD
(off Main Road)
Neath Abbey, Neath
Tel: 0639 644111

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 – TELEPHONES KITS AND CABLES

125 LANGWITH ROAD
HILLSTOWN
CHESTERFIELD S44 9SP
PHONE 0246 826578

CLOSED WEDNESDAY

HERNE BAY

ICOM

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, Nethernall 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., Oxton, Birkenhead L43 2HZ
051 653 3437

Unit 5, Miton St., Waterloo Ind. Est., 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 UST

PLEASE MENTION PRACTICAL WIRELESS WHEN REPLYING TO ADVERTISEMENTS

WEST SUSSEX MAIL ORDER RETAIL

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

GREAT NAMES FROM RADIO SHACK

The latest one is YUPITERU! – for the MVT-5000 Jupiter II hand held scanner. By Yiminy Crickets this little unit covers 25-550 MHz AM/NFM and 800-1, 300 MHz NFM with 100 memories and 10 search ranges for only £299. This one from a manufacturer who is not as well known as THE BIG THREE. Amazing isn't it!

Economise with the 16 channel Bearcat BC-200FB scanner that includes search facility for £99.95 and the 200 channel BC-200XLT handheld at £249. From AOR the AR-800 at £199, AR-900 at £235 and the AR-2002 for £487. Hand held 200 channel PRO-34 for £249.95 with Ni-cads and charger and the 400 channel PRO-2005 for £329.95 we should also have the latest in this series the PRO-2024 at £179.95 by the time you read this. Do not forget we sell the IC-R7000 in original, unmutilated, factory spec., for only £??? and the IC-R9000 for only £????.

Transmit on 2 with the new IC-2SET £295 and the latest goodies from ICOM. Kenwood's mystry package will be unveiled shortly and we will be happy to send you the details. Yaesu as well, we will quote for whatever you fancy. We have brand new Rockwell-Collins KWM-380 HF transceivers cheap. Used Drake equipment in stock. Drake owners get on to our list for useful items etc., that turn up.

We are clearing out ancient and modern treasures, from WW2 manuals to present day computers, including antennas, my God, the antennas, come and save a few bob on Jaybeam, Hustler, Hygain and the Avanti 10m Dual Diversity 2 edlement Quad for £89.95 to name but a few! Do you want to save more? (or spend less, depending on how you look at it!). If you are serious we can do you a money saving deal on Computers, Dot Matrix or Laser Printers, the list never ends but goes on and on . . . Give us a call or look us up when in London, export not a problem but a speciality.

73s – Terry G3STS

COME AND GET A BARGAIN!

Access

RADIO SHACK LTD

188 BROADHURST GARDENS, LONDON NW6 3AY

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 *Fax: 01-328 5066* Telephone: 01-624 7174

VISA

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.

VISA MasterCard

ORDER YOUR COPY OF THE NEW MAPLIN CATALOGUE ON SALE NOW

Pick up a copy from any W.H. Smith for just £2.25 or post this coupon now to receive your copy for just £2.25 + 50p p & p. If you live outside the U.K. send £4 or 17 International Reply Coupons. I enclose £2.75.

Name .....

Address .....

.....

Post Code .....

Send to Maplin Electronics, P.O. Box 3, Rayleigh, Essex SS6 8LR.

AVAILABLE FROM 10th NOVEMBER 1989 IN ALL W.H. SMITH STORES PW 90

OVER 580 PAGES WITH HUNDREDS OF NEW PRODUCTS AT SUPER LOW PRICES

THE NEW MAPLIN CATALOGUE – WORLDS APART!

1990 BUYER'S GUIDE TO ELECTRONIC COMPONENTS SEND FOR YOUR COPY TODAY