

Practical

JANUARY 1988 £1.20

ISSN 0141-0857

Wireless

The Radio Magazine

**EXPEDITION
to the pole**



BATTLE of the beams

BUILD the pw'otter' 50MHz receiver

REVIEW of the 'revex' wave monitor

Yaesu's FT-736R. Because you never know who's listening.

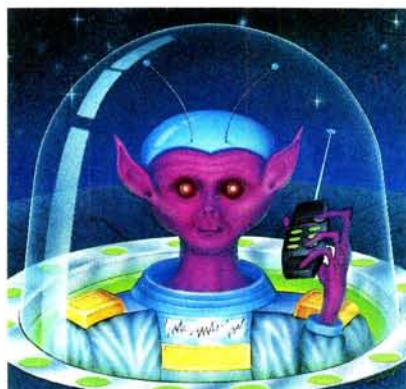
Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm, with two additional slots for optional 50-MHz or 1.2-GHz modules (220-MHz North America only).

Crossband full duplex capability is built into every FT-736R for satellite work. And the satel-



lite tracking function (normal and reverse modes) keeps you on target through a transponder.

The FT-736R delivers 25 watts RF output on 2 meters, 220-MHz, and 70 cm. And 10 watts on 6 meters and 1.2-GHz. Store frequency, mode and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. *CW Narrow Optional and FM wide/narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating

your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

YAESU

*CW narrow optional



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

Prices and specifications subject to change without notice. FT-736R shown with 220-MHz option installed.

Practical Wireless

The Radio Magazine

JANUARY 1988 (ON SALE 10 DECEMBER 1987)

VOL. 64 NO. 1 ISSUE 970

NEXT MONTH

Beginning
PW "Orwell"
High-performance
m.w. receiver

Directivity Gain
in
Transmitting
antennas

The ICOM IC-761
Reviewed

plus

All the usual
features

Don't miss
it—place
your order with
your
newsagent now!

On sale
January 14

Contents subject to last-minute revision

- 23 Dipoles Apart**
R. H. Pearson G4FHU
- 24 PW "Otter" 50MHz Receiver**
Mike Rowe G8JVE
- 30 Understanding Smith Charts—2**
Capt. C. A. King
- 33 Errors and Updates**
Semiconductor Tester, Dec. 1987
- 34 Whence Came Shack?**
Stan Crabtree G3OXC
- 36 Practically Yours**
Glen Ross G8MWR
- 37 Computing Corner**
Paul Newman
- 43 Battle of the Beams—1**
D. V. Pritchard G4GVO
- 48 IC of the Month**
Hitachi HA-1397 Audio Amplifier
Brian Dance
- 50 PW Review**
Revex Wave Monitor Scope
Mike Richards G4WNC
- 52 Making Waves—a Guide to
Propagation—2**
A. J. Harwood G4HHZ
- 54 Expedition to the Pole**
Laurence Howell GM4DMA
- 61 This is Thames Coastguard**
J. D. Harris G3LWM

Regular Features

79 Advert Index	16 News Desk	38 Short Wave
33 Binders	64 On the Air	Magazine
56 Book Service	47 PCB Service	58 Subscriptions
12 Comment	14 PW Services	12 Write On

Editorial and Advertisement Offices:

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

Advertisement Manager
Roger Hall G4TNT ☎ 01-731 6222

Editor Geoff Arnold T.Eng FSERT G3GSR
Assistant Editor Dick Ganderton C.Eng. MIERE G8VFB
Art Editor Steve Hunt
Technical Features Editor Elaine Richards G4LFM
Technical Projects Sub-Editor Richard Ayley G6AKG
Editorial Assistant Sharon George
Technical Artist Rob Mackie
Administration Manager Kathy Etheridge
Clerical Assistant Claire Horton
Accounts Annette Martin



South Midlands C

SCHOOL CLOSE, CHANDLERS FORD IND. EST., EAST

★ UNREPEATABLE SPECIAL OFFER ★

FT726R(2)

£699 inc. VAT



430/726 70 cms UNIT £199
50/726 6m UNIT £249

SAT/726 SAT UNIT £59
21/24/28 HF UNIT £269

COMPARE THE COMPETITION!

The FT726R 2m base station, at only £699, is £240 cheaper than its nearest rival. Add 70cms at £199, you now have 2m & 70cms capability for less than the oppositions 2m bases.

WITH 12 MONTH WARRANTY AND FREE FINANCE AVAILABLE

BEST VALUE ON 2M, 70CMS & 23CMS

NEW FT2311R
£499.00 inc.

- ★ 45(35)*(10)¹/5(4)*(1 or 5)¹ WRF Output
- ★ Easy 'one touch' push button operation
- ★ Reversible sloped front panel
- ★ Large green easy to read LCD
- ★ Ten memories (independent Tx & Rx)
- ★ Switchable 12.5/25kHz steps
- ★ Priority channel monitoring
- ★ C/w Hand mic and mobile mounting bracket

OPTIONAL ACCESSORIES

SP55	External Speaker	£19.55
YH1	Headset (C/W Mic)	£19.99
SB10	PTT Switch Unit	£22.00
MH 10F8	Speaker/Mic	£25.00
MH 14A8	Speaker/Mic (C/W Tone Burst)	£23.00
MF 1A3B	Boom Mic (Via SB10)	£25.00

THE **FT211RH**,
THE **FT711RH**
and the NEW **FT2311R**



* FT711RH † FT2311R

FT211RH
and FT711RH
£349.00 inc.

SMALL ON SIZE – LARGE ON FEATURES



FT23R & FT73R

- ★ 144-146 or 430-440MHz
- ★ Diecast solid chassis
- ★ 5W O/P (With Opt. FNB11)
- ★ 10 Memory channels
- ★ 6 Digit LCD display
- ★ One touch operation

FT23R From £249

FT73R From £269

FT727R

- ★ 144-146 & 430-440MHz
- ★ 5W O/P on 2m & 70cms
- ★ 10 Memory channels
- ★ Large clear LCD display
- ★ One touch operation
- ★ Computer capability

FT727R £425



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

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

BUCKLEY
SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Clwyd
Buckley (0244) 549563
10-5 Tues, Weds, Fri
10-4 Sat

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

N. IRELAND
SMC N. Ireland
10 Ward Avenue
Bangor
County Down
0247 271875

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
9-5.30 Tues-Sat



Southampton Showroom open 9.00-5.00 Monday to Friday, 9.00-1.00 Saturday Service Dept open Mon-Fri 9.00-5.00.
AGENTS: JOHN DOYLE, TRANSWORLD COMMS, NEATH (0639) 52374 DAY (0639) 2942 EVE

DAVID STENNING, G4JA, LOUTH 0507 604967



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

INTRODUCING THE **FT736R** FROM YAESU



THE VERY LATEST IN VHF/UHF BASE STATIONS FROM YAESU.

2m & 70cms AS STANDARD (25W O/P).

6m & 23cms OPTIONAL (10W O/P).

100 MEMORIES & FULL DUPLEX AS STANDARD.

EXPECTED PRICE AROUND £1500 C/W 2m & 70cms.

A SELECTION FROM OUR CATALOGUE

SPECIAL OFFERS

**ONLY AVAILABLE
WHILST STOCKS LAST**

FT203R(3,4)*	2m Thumbwheel Handheld c/w NICAD	£189.00 N
FT209R(3)*	2m Keyboard Handheld c/w NICAD	£199.00 N
FT209RH(3,4)*	2m Keyboard 5.0W Handheld c/w NICAD	£199.00 N
FT709R(4)	70cms Keyboard Handheld c/w FNB4	£199.00 N
FT703R(4)	70cms Thumbwheel Handheld c/w FNB4	£189.00 N
FT270R*	2m FM Mobile 25W output	£229.00 E/D
FT270RH*	2m FM Mobile 45W output	£249.00 E/D
FT770RH*	70cms FM Mobile	£279.00 N
FT290R mk1	2m Multimode 2.5W output	£349.00 N
FT790R mk1	70cms Multimode 1W output	£349.00 N
MMB11	Mobile mounting bracket for FT290R/790R mk1	£29.00 N
FL2010	10W linear for FT290R1	£39.00 N
YD844	Yaesu desk mic 600/50K	£19.95 N
430 TV	70cms Transverter module FTV series	£199.00 N
KDK FM240*	2m FM mobile 25W output	£199.00 N
KDK FM740*	70cms FM mobile 10W output	£199.00 N
78B	7/8 wave Ball mount mobile antenna	£15.00 N
GP23	Mechanically improved 3 x 5/8 colinear	£49.00 N
JD110	SWR Meter 1.5 - 150MHz 10/100W	£12.99 N

*All these items have a 3 month warranty.

All other items have a 12 month warranty.

N = New E/D = Ex Demo

Please add postage & packing as below
Accessories £2.50. Radios and Antennas £3.50.

NEW NEW NEW



**FT747GX
160-10mHF
ALL MODE
LOW COST
TRANSCIEVER
MORE DETAILS
AVAILABLE SOON**

NEW PSU's



A range of 12VDC power supplies to suit all needs. Specially manufactured to the highest quality using only the best in components and materials. With a choice of either 4, 8 or 25A continuous output (6, 10 & 35A surge handling) these P.S.U.'s are built to stand the rigours of everyday operation. Both the 8 and 25A units are fitted with overvoltage protection. All the above power supplies are keenly priced and are available from all leading retail outlets.

3A	only	£19.95 inc VAT
8A	only	£59.95 inc VAT
25A	only	£175.00 inc VAT

Prices subject to fluctuation.

FREE FINANCE . . .

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

FREE S.M.C. SERVICE INTERLINK DELIVERY . . .

Free interlink delivery on major equipment.
Small items, Plugs, Sockets, etc. by post £1.75. Antennas, Cables, Wire & larger items. Roadline up to £5.00.
Interlink delivery available, upon request, for items other than radios, from £7.30 depending on weight.
Same day despatch whenever possible.

GUARANTEE

Importer warranty on Yaesu Musen products.
Aby staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty-five years of professional experience.

● 2 years warranty on regular prices Yaesu products.

Reg Ward & Co. Ltd. 1 Western Parade, West Street, Axminster, Devon, EX13 5NY. Telephone: Axminster (0297) 34918



Yaesu	
FT767	HF Transceiver
FE767(2)	2m Module (767)
FE767(70)	70cm Module (767)
FE767(16)	6m Module (767)
SP767	Speaker
FT290	MkII New Super 290
FT290	2m M-Mode Port/Transceiver
MMB11	Mobile Bracket
NC11	Charger
CSC1	Carrying Case
YHA15	2m Helical
YHA44D	70cm 1/2wave
YMA9	Speaker Mic
MMB15	Mobile Bracket
FT23	2m Mini HH
FT73	70cm Mini HH
FN89	Spare Battery Pack (23/73)
FN810	Spare Battery Pack (23/73)
FN811	Spare Battery Pack (23/73)
NC18C	Charger (23/73)
NC28	Charger (23/73)
NC29	Base Charger (23/73)
PA0	Car Adapter/Charger (23/73)
MM12A28	Speaker Mic
FT727	2m/70cm HH
FN83	Spare Battery Pack
FN84	Spare Battery Pack
FN85	Empty Cell Case
FRG9600M	NEW 60-950MHz Scanning RX
MMB10	Mobile Bracket
NC3C	Charger
PA3	Car Adapter/Charger
FN28A	Spare Battery Pack
YMT24A	Speaker Mic
FT26R	2m Base Station
430726	70cm Module for above
FRG8800	HF Receiver
FRV8800	Converter 118-175 for above
FR7700RX	A.T.U.
MM1B8	Hand 600 Spin mic
MD1B8	Desk 600 Spin mic
MF1A3B	Boom mobile mic
YH77	Lightweight phones
YH55	Padded phones
YH1	Ultralight Mobile H'set-Boom mic
SB1	PTT Switch Box 290/708
SB2	PTT Switch Box 290/708
SB10	PTT Switch Box 270/2700
FF501DX	Low Pass Filter

Icom Products	
IC761	New Super HF Transceiver
IC751A	HF Transceiver
IC735	New HF Transceiver
AT100	100W ATU (751/745)
AT150	150W ATU (735)
PS55	Ext PSU (735)
IC505	50MHz multi-mode portable
IC290D	2m 25w M-Mode
IC28E	2m 45W FM
IC28H	2m New Mini HH
IC Micro	2m The Original HH
IC2E	2m HH
IC20E	New 2m 25 Base Stn
IC735E	70cm HH
IC4E	70cm HH FM Mobile
IC48E	70cm 25W FM Mobile
IC480	70cm 10W M-Mode
IC3200	2m/70 Dual Band FM Mobile
IC12E	23cm HH
ICR71	Gen Cov RX
IC7000	VHF/UHF Scanner
AH7000	25-1300MHz Discone
SP3	Ext Speaker
KC70	DC Cable (R70/R71)
E-X257	FM Board (R70/R71)
GC5	World Clock
AQ2	Waterproof Bag all Icom HH
BC35	Desk Charger
BP3	Battery Pack 8.4V (2/4E/02/04E)
BP4	Empty Battery Case (2/4E/02/04E)
BP5	Battery Pack 10.8V
BP7	Battery Pack 13.2V (02/04E only)
BP8	Battery Pack 8.4V
CP1	12v Charge Lead BP3/7/8
DC1	DC/DC converter operate from 12v
FA2	2m Helical BNC
FA3	70cm Flexible 1/4" Antenna (BNC)
HM9	Speaker/Mic
HS10	Head set Boom Mic
HS10A	Vox Unit HS10 (02/04E only)
HS10SB	PTT SW Box HS10
LC1	Leatherette Case 2E/4E + BP5
LC3	Leatherette Case 2E/4E + BP5
LC11	Leatherette Case 02E/04E + BP3
LC14	Leatherette Case 02E/04E + BP5/7/8
SS1	Shoulder Strap
SM6	600ohm 8P Base Mic
SM8	1.3K600G 8P Base Mic
SM10	Comp/Graphic Mike

P.O.A.	
1465.00	(—)
315.00	(—)
949.00	(—)
365.00	(3.50)
185.00	(3.00)
459.00	(—)
542.00	(—)
359.00	(—)
399.00	(3.00)
239.00	(3.00)
225.00	(3.00)
269.00	(3.00)
1039.00	(—)
285.00	(3.00)
299.00	(3.00)
449.00	(3.00)
617.00	(—)
556.00	(—)
428.00	(3.00)
525.00	(—)
967.00	(—)
82.00	(2.50)
70.00	(2.00)
41.00	(2.00)
43.00	(2.00)
14.30	(1.50)
70.15	(2.00)
29.90	(1.50)
9.20	(1.50)
60.95	(2.00)
74.79	(2.00)
71.30	(2.00)
6.90	(1.50)
17.25	(1.50)
9.20	(1.50)
9.20	(1.50)
21.85	(2.00)
20.70	(1.50)
25.30	(1.50)
20.70	(1.50)
6.90	(1.50)
6.90	(1.50)
9.20	(1.50)
9.20	(1.50)
10.35	(1.50)
46.00	(2.00)
82.00	(2.00)
116.00	(2.50)

BENCHER	
BY1	Squeeze Key, Black base
BY2	Squeeze Key, Chrome base

Kenwood	
TS940S	9 Band TX General Cov RX
AT940	Auto/ATU
SP940	Ext Speaker
TS930S	9 Band TX General Cov RX
AT930	Auto/ATU
SP930	Ext Speaker
TS440	NEW 9 Band TX General Cov RX
AT440	Auto/ATU
PS50	Hduty PSU
TS430S	160-10m Transceiver 9 Bands
AT230	All Band ATU/Power Meter
SP230	External Speaker Unit
LSS30SP	160m-10m Transceiver
TS430S	160m-10m Transceiver
PS430	Matching Power Supply
SP430	Matching Speaker
MB430	Mobile Mounting Bracket
FM430	FM Board for TS430
SM220	Station Monitor
BS8	Band Scope Unit (830/940)
TL922	10/160 2K Linear
TH41	2M Mini HH
TH41	70cm Mini HH
TH205	2M HH
TH215	2M HH Keyboard
TH215	2M 25W M/M Mobile
TS711	2M 25W Base Stn
TS811	70cm 25W Base Stn
R2000	Gen Coverage HF/RX
R5000	118-174MHz Converter (R2000)
VC20	NEW General Coverage HF/RX
VC20	118-174MHz Converter (R5000)
BT2	Empty Battery Case TH2141
DC21	DC Power Supply TH2141
EB2	Ext. Battery Case TH2141
HMC1	Headset with Vox TH2141
PB21	Nicad Pack TH2141
BC5	Desk Charger TH2141
SC8	Soft Case TH2141
SMC30	Speaker/Mic TH2141/2600
MC50	4P Desk Mic
MC60A	8P Desk Mic
MC80	Electric Desk Mic
MC85	Desk Mic Audio Level Comp
MC43	8P Fist Mic
MC35	Mobile Mic (6br 8p)
LF30	HF Low Pass Filter
KX3	Receiver ATU (Mizuho)
HS5	Lightweight Hiphones
SW100A	SWR/Power Meter 1.8-150MHz
SW100B	SWR/Power Meter 140-450MHz
SW200A	SWR/Power Meter 1.8-150MHz
SW200B	SWR/Power Meter 140-450MHz
SW2000	SWR/Power Meter 1.8-54MHz 2K
SWT1	2m ATU

67.42	(2.50)
76.97	(2.50)
1995.00	(—)
244.88	(2.50)
87.55	(2.50)
1695.00	(—)
206.03	(2.50)
90.94	(2.50)
1138.81	(—)
144.82	(2.50)
222.48	(2.50)
1098.00	(—)
208.67	(2.50)
66.45	(2.50)
Special	(—)
173.78	(3.50)
40.81	(2.50)
15.80	(2.50)
48.05	(2.50)
343.62	(3.50)
77.00	(2.00)
1495.00	(7.00)
189.00	(2.50)
218.00	(7.00)
215.26	(3.00)
252.13	(3.00)
99.00	(—)
940.00	(—)
1094.05	(—)
599.00	(—)
115.00	(2.00)
875.00	(—)
167.21	(2.00)
11.86	(1.50)
25.00	(1.50)
6.77	(1.50)
32.91	(1.50)
24.36	(1.50)
99.00	(2.00)
11.86	(1.50)
28.31	(1.50)
46.08	(1.50)
88.22	(2.50)
53.98	(2.50)
99.00	(2.50)
21.72	(1.50)
52.67	(2.50)
32.26	(2.00)
67.28	(2.50)
24.36	(2.00)
37.54	(2.00)
49.50	(2.00)
52.76	(2.00)
107.95	(2.50)
107.95	(2.50)
117.17	(2.50)
38.18	(2.00)

Datong Products	
PC1	Gen. Cov. Con.
VLF	Very low frequency conv.
FL2	Multi-mode audio filter
FL3	Audio filter for receivers
ASP/B	r.f. speech clipper for Trio
ASP/A	r.f. speech clipper for Yaesu
ASP	As above with 8 pin conn
OTS	Manual RF speech clipper
O70	Morse Tutor
RFA	RF switched pre-amp
AD270-MPU	Active dipole with mains p.s.u.
AD370-MPU	Active dipole with mains p.s.u.
DC144/28	2m converter
ANF	Automatic notch filter
SR82	Auto Woodpecker blanker

Miscellaneous	
SMCS 2U	2N 50239 Switch
SMCS 2N	2 way 'n' Shts Switch
Welz	2 way 50239 Switch
Welz	2 way 'n' Shts Switch
Drae	3 way 50239 Switch
Drae	3 way 'n' Shts Switch
Kenpro KP21N	2 way Switch
DRAE	Wavemeter
T30	30W Dummy load

18.95	(2.00)
23.50	(2.00)
29.95	(2.00)
49.00	(2.00)
16.96	(2.00)
21.91	(2.00)
27.00	(2.00)
30.25	(2.00)
10.29	(2.00)

SWR/PWR Meters	
SP10X	1.8-150MHz PWR/SWR
SP122	1.8-60MHz PWR/SWR/PEP
SP220	1.8-200MHz PWR/SWR/PEP
SP225	1.8-200MHz PWR/SWR/PEP
SP420	140-525MHz PWR/SWR/PEP
SP425	140-525MHz PWR/SWR/PEP
SP825	1.8-200-430-800-1240MHz

37.00	(2.50)
79.95	(2.50)
67.95	(2.50)
99.95	(2.50)
59.95	(2.50)
119.95	(2.50)
169.95	(2.50)

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

STOCK ITEMS USUALLY
DESPATCHED WITHIN 48 HRS.
OPEN TUES-SAT. 9.00-5.30
(CLOSED MONDAYS)

DELIVERY/INSURANCE PRICES
IN BRACKETS

WE WISH ALL OUR CUSTOMERS
A VERY HAPPY CHRISTMAS
PLEASE NOTE WE ARE CLOSED 25-30 DECEMBER

GUIDE TO UTILITY STATIONS 1988

by J. Klingenfuss
THE NEW 1988 EDITION NOW AVAILABLE
Guide to Utility Stations 1988 is the most comprehensive and accurate book on Utility Stations, covering airlines, commercial, military, Met, shipping, etc. Thousands of stations are listed with their frequencies, call sign, station name, location, transmission mode, etc. This massive frequency list from 0 to 30 MHz includes RTTY, CW, SSB, AMTOR, FAX, SITOR, VFT, etc. That's not all! There are chapters on Q-Codes, Z-Codes, SIMPO reporting, Met stations, maps and much more. Unlike other books the stations listed have been monitored.
Price £19.95 + £1.65 post and packing in UK
Overseas postage £2.45 by sea £1.25 airmail

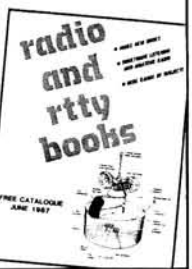
PASSPORT TO WORLD BAND RADIO

RADIO DATABASE INTERNATIONAL
All new articles... completely revised listings... 400 pages for 1988.
NEW LARGER 1988 EDITION IN STOCK

Everything you need to explore and enjoy the exciting realms of shortwave radio. The first part, **How to Tune in the World**, looks at a few countries and subjects available. Part two, **1988 Buyer's Guide to World Band Radio**, reports "hand-on" and laboratory tests of the latest models and comparative ratings of just about every major portable or tabletop receiver. Finally, **Worldscan** runs through all the frequencies of the world and spectrum and shows who's broadcasting from where, at what times, and in which languages.
Price £14.50 plus £1 postage in UK.
Overseas £6 airmail or £2 sea mail worldwide, Europe and Eire.

Other titles include:
Worldwide Weather Broadcasts, **GCHQ**, **Air & Metro Code Manual**, **Secrets of QSL'ing**, **Utility Address Book**, and more.
Ask for our New Free Catalogue giving details of all books and prices.

INTERBOOKS
PW188 STANLEY
PERTH PH1 4QQ, SCOTLAND
Tel: Stanley (0738) 828575 (24 hrs)
Almondbank (073883) 708



MET HIGH QUALITY BRITISH

ANTENNAS		COST inc.		P&P	
AERIALS CODE	MODEL	GAIN	VAT	rate	
70cms					
432-5B	5 Ele	9.2dBd	£19.49	B	
432-19T	19 Ele	14.2dBd	£40.94	A	
432-17X	17 Ele Crossed	13.4dBd	£56.55	A	
432-17T	17 Ele Long	15.0dBd	£45.08	A	
2M					
144-5	5 Ele	9.2dBd	£22.48	A	
144-7T	7 Ele	10.0dBd	£27.77	A	
144-8T	8 Ele Long	11.0dBd	£35.95	A	
144-14T	14 Ele	13.0dBd	£53.72	A	
144-19T	19 Ele	14.2dBd	£64.26	A	
144-6X	6 Ele Crossed	10.2dBd	£45.71	A	
144-GP	Ground Plane	Unity	£16.57	B	
4M					
70-3	3 Ele	7.1dBd	£34.64	C	
70-5	5 Ele	9.2dBd	£52.60	C	
6M					
50-2	2 Ele	4.7dBd	£32.00	A	
50-3	3 Ele	7.1dBd	£39.95	A	
50-5	5 Ele	9.2dBd	£59.90	A	
CK50	50/2-50/3 Conversion kit		£11.50	B	

POWER SPLITTERS			
70cm	2 Way	£23.46	B
	4 Way	£27.60	B
2M	2 Way	£30.60	B
	4 Way	£34.50	B
SF4/432	Stacking/Frame	£29.75	B
NON-METALLIC MAST			
RPM 1.5M (1½" dia)	With Fixing Clamp	£19.75	B
RPM 3.0M (1½" dia)	With Joiner and Resin	£39.50	B
RPM 1.5M (2" dia)	With Fixing Clamp	£22.25	B
RPM 3.0M (2" dia)	With Joiner and Resin	£44.50	A
P&P rates: A = £3.50: B = £1.95: C = £6.50			

NON-METALLIC MAST
RPM 1.5M (1 1/2" dia) With Fixing Clamp £19.75 B
RPM 3.0M (1 1/2" dia) With Joiner and Resin £39.50 B
RPM 1.5M (2" dia) With Fixing Clamp £22.25 B
RPM 3.0M (2" dia) With Joiner and Resin £44.50 A
P&P rates: A = £3.50; B = £1.95; C = £6.50

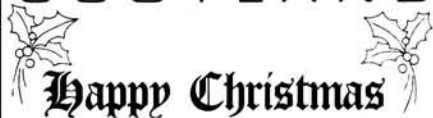
We now stock:
DRAE, BNOS, PW Publications, RSGB Publications, Microwave Modules, SEM, Star Masterkeys, and a full range of quality secondhand equipment.

Alan Kelly Communications Ltd.
3 Stoke Road, Aston Fields, Bromsgrove.
Tel: 0527 71165 24hr answerphone.



CREDIT FACILITIES
for all licenced UK
amateurs

TENNAMAST SCOTLAND



**Happy Christmas
Gaid New Year**

TENNAMAST ARE FAST BECOMING THE NAME FOR WIND-UP TILT-OVER MASTS. THEY ARE: EASY TO OPERATE - SAFE TO USE - SLIM AND ELEGANT - SUITABLE FOR HF & VHF. DESIGNED AND BUILT PROFESSIONALLY BY ENTHUSIASTS FOR ENTHUSIASTS. WRITE OR TELEPHONE FOR MORE DETAILS. DESPATCHED NORMALLY WITHIN 7 DAYS.

81 MAINS ROAD BEITH Ayrshire KA15 2HT.
TEL: (05055) 3824 GM60AL. GM4VHZ.

T
O
TENNAMAST
24 HOUR
ANSWER SERVICE

LAKE ELECTRONICS QRP KITS AT QRP PRICES

Our full kits include PCB and all essential parts. There are NO "accessories" or "extras" like cases, mains transformers or knobs to find up unless, of course, you prefer to "build in" to another piece of equipment in which case we shall be very pleased to supply the PCB and board components alone.

Comprehensive instructions supplied with each kit include circuit diagrams, lay-outs, alignment details (where necessary) and trouble shooting hints.

The range includes the "CARLTON" DIRECT CONVERSION RECEIVER which covers three popular Amateur Bands, 20m, 40m, 80m - SSB and CW. Originally produced as a very successful educational project, it can be accompanied by the TU1 TUNER - in it's simplest form a neat and effective Aerial Tuner for the SWL.

It has full coverage, Top Band to 10 metres. A more comprehensive tuner is the TU2 - with it's built-in SWR bridge you have a QRP ATU capable of handling up to 20 Watts. The addition of the AF2 AUDIO FILTER, an outboard Active Filter, - enables headphone reception of CW with a 3dB bandwidth of just 200Hz. The PCB can, if you prefer, be built in to a receiver.

An example of our Test Gear is the CM1 CAPACITANCE METER - a self contained and accurate meter with a linear scale which help you to identify those unknown capacities from a few pF to 1µF. For full details of these and the rest of our range, including QRP transmitters and test gear, send a large SAE to:

LAKE ELECTRONICS, 7 MIDDLETON CLOSE, NUTHALL, NOTTINGHAM NG16 1BX.
or ring Alan, G4DVW on (0602) 382509

WIN

A 600MHz FREQUENCY COUNTER!

IN THE NEW STYLE
WINTER 1987/88
Cirkit CATALOGUE

- Oscilloscope Digital Storage Unit
- Temperature Controlled Irons
- 5 and 50W RF Power Heads
- £££s of Discount Vouchers
- Easy to Enter Competition
- Quantity Price Discounts
- PCB Prototyping System
- 2 new HF Receiver kits
- 24 hour order line
- Component Packs
- 12 new books
- Special Offers



PACKED WITH NEW LINES

Available from your local newsagent or direct from Cirkit at

Cirkit the address shown below



Cirkit Distribution Ltd.

Park Lane, Broxbourne, Herts EN10 7NQ
Telephone (0992) 444111 Telex: 22478



"The Oldest Name In Amateur Radio"

NEW

BRASS RACER IAMBIC



£54.59



The newest addition to the Vibroplex family - the Brass Racer Iambic - A distinctive new design of Iambic paddle crafted from solid brass and mounted on a base of polished hardwood. No springs to fly off the middle of a contact. Superior Vibroplex quality. Always worth the difference and now a new Vibroplex look.

BRASS RACER EK-1

NEW

An even more exciting step is the new Brass Racer EK-1, an electronic keyer built into the base of our new Brass Racer Iambic paddle. Using the Curtis 8044 chip, this self-contained keyer and paddle is fully Iambic with dot/dash insertion and adjustable speed control. Use on either tube or solid state rigs. The perfect unit for mobile, DXpedition, or just plain fun.



£99.00



Presentation £115.00
Deluxe £ 78.09
Standard £ 66.33

THE IAMBIC

The distinctive look and quality of the Vibroplex Original is fashioned into the finest Iambic paddle anywhere. The dual paddles allows the operator to utilize automatic dot/dash insertion and other unique features of the modern electronic keyer. Vibroplex distinction for the modern operator.



Deluxe £78.09
Standard £63.98

THE VIBROKEYER

The Vibrokeyer is designed for "Bug" operators who want to move to electronic keyers without relearning keying. The single lever paddle initiates the automatic dots and dashes of the electronic keyer with the same motion used to operate the "Bug". For those who want to combine traditional skill with modern electronics.



Presentation £129.62
Deluxe £ 82.74
Standard £ 70.54

THE ORIGINAL

In 1890 Horace Martin searched for relief from the "glass arm" telegraph operators were getting from pounding the straight keys. His answer, the Vibroplex Original was an instant success. The vibrating lever bar automatically produces dots while dashes are made manually. Still popular today, the distinctive sound of the "Bug" can still be heard. It is the signature of the true C.W. expert.

All of our keys are available in Standard and Deluxe models. The Original and the Iambic are also available in the Presentation models.

Standard Model: All Standard models come with a neat, crisp, textured, painted base with polished and chromed top parts. Attention to detail in the finishing process gives Vibroplex an unexcelled quality appearance. Highly conductive large coin-silver contacts provide a clear, sharp signal, and non-skid rubber feet keep the keyer in its place.

Deluxe Model: All Deluxe models feature a chromed base, buffed and polished to a mirror finish. As in fine watches and other precision instruments, their jeweled movement serves to prolong life, maintain smoother, easier operation and prevent binding.

Presentation Model: The Presentation model is the top of the line at the top. Available in the Original and Iambic, the Presentation features 24 carat gold-plated base top, engraved with name and call and makes a truly personal gift. The Original has the adjustable super speed control main spring for a wider range of sending speeds.

**DEWSBURY ELECTRONICS, 176 LOWER HIGH STREET,
Stourbridge, West Midlands, DY8 1TG
Tel: Stourbridge (0384) 390063/371228**

dressler

**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



dressler - ara 30 -
active antenna
50 kHz . . . 40 MHz
WITH LIMITED PERFORMANCE UP TO
100MHz

Professional electronic circuitry with very wide
dynamic range. Meets professional demands both
in electronics and mechanical ruggedness. 1.2m
long glass fibre rod. Circuit is built into waterproof
2.5 mm thick aluminium tube. Ideal for commer-
cial and swl-receiving systems. £129.
See Review in August 1985 Issue p.35

NEW

**DRESSLER
ARA 900
ACTIVE ANTENNA**
50MHz to 1300MHz
Gain 17dB Typical
TECHNICAL SPECIFICATIONS
FOR ARA 900

Gain 17dB Typical (14-17dB)
Frequency Range 50-1300MHz
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

Intercept Point 3rd Order +180dBm at Input
Post £3.00 or Securoc £7.00 extra

£139.00

Both antennas come complete with 7 metres of cable, interface, power supply and brackets.

SWEDISH BRASS MORSE KEY



£65

ICOM IC-735

**£854
SPECIAL OFFER**



ICOM MICRO 2
HANDHELD



**£239 inc. NiCad
Charger & Case**

YAESU FT23/73



POA

**BUY A
R71 FOR £825
& RECEIVE AN ARA 30
FREE
WORTH £129**

ICOM R7000 25MHz-2000MHz
SPECIAL OFFER!!



**FREE
ARA 900.
ACTIVE ANTENNA
WORTH £139.00
£969**

ALL SONY PRODUCTS UK SUPPLIED

SONY AIR 7

PORTABLE-AM-FM

144-174MHz

108-136MHz

150KHz-2194KHz

£249



SONY ICF 2001D

76-108 MHz

116-136 AIRBAND

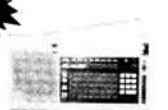
153kHz-29.995MHz

FM - AM - SSB 32 MEMORIES

INC PSU, CARRY STRAP

& EARPHONE

£325



SONY ICF 7600D
76-108MHz

76-108MHz

153kHz-29.995MHz

Complete with case,

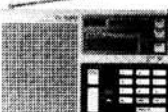
mains power supply,

earphone and

frequency list.

£169

ICF 7600 DS
Now available



SONY PRO-80

150kHz-108MHz

115.15MHz-223MHz

AM + FM + SSB

40 MEMORIES

£329

Sony Antennas

AN1 £55

AN3 £53



R.A.S. (Nottingham)

G6XBH
G1RAS
G8UUS

Radio Amateur Supplies
Tel: 0602 280267



Visit your Local Emporium

Large selection of New/Used Equipment on Show

AGENTS FOR:

F.D.K.

AZDEN

ICOM

YAESU

ALINCO

KEMPRO

ACCESSORIES:

Welz Range

Microwave Modules

Adonis Mics

Mutek Pre-Amps

Barenco Mast Supports

DRAE Products

BNOS Linears & P.S.U.'s

AGENTS FOR CELLNET and VODAFONE RADIOS

AERIALS, Tonna, Halbar, New Diamond Range of Mobile Whips, Jaybeam

BRING YOUR S/H EQUIPMENT IN FOR SALE

JUST GIVE US A RING

Monday: CLOSED Tuesday-Saturday: 10.00am to 5.00pm

3 Farndon Green, Wollaton Park, Nottingham NG8 1OU

Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)

VALVES

*High Quality

**Very High Quality

Prices correct as at 20/8/1987
but may fluctuate 15% VAT incl.

A1065	1.40	EF89	0.80	EF91	1.45	PFL200	1.10	UBF89	0.70
A2293	7.00	EC52	0.65	EF91	1.60	PFL200*	2.80	UCB84	0.85
A2900	12.75	EC91	4.40	EF91	1.60	PL36	1.10	UCB85	0.70
AR6	1.15	EC92	1.65	EF92	2.15	PL81	0.85	UCB86	2.50
ARP3	1.15	EC93	0.95	EF92	2.15	PL82	0.70	UCB87	0.75
ARP35	0.70	EC94	0.95	EF93	0.60	PL83	0.60	UCB88	1.60
ATP4	0.90	EC95	0.95	EF94	0.75	PL84	0.90	UF41	1.85
B12H	6.30	EC96	0.50	EF94	0.75	PL85	1.25	UF80	1.80
CY31	1.40	EC97	0.75	EF95	0.75	PL86	2.00	UF85	1.20
DA70	1.75	EC98	1.10	EF96	1.85	PL87	5.65	UL84	0.95
DA796	0.90	EC99	0.95	EF97	0.85	PL88	5.85	UM80	0.90
DE722	32.80	EC99A	0.65	EF98	0.85	PL89	3.45	UM80*	1.60
DF92	0.65	EC99B	0.95	EF99	2.60	PL90	0.70	UM84	0.70
DF96	0.85	EC99C	0.95	EF99	5.15	PL91	15.50	UY82	0.70
DH76	0.75	EC99D	1.80	EF99	0.70	PL92	14.00	UY85	0.85
DL52	1.85	EC99E	1.20	EF99	0.95	PL93	17.00	UY86	1.45
DY96/87	0.65	EC99F	0.70	EF99	0.95	PL94	25.00	VR105/30	1.80
E108C	0.70	EC99G	0.80	EF99	1.75	PL95	3.20	VR150/30	1.80
E108C	2.80	EC99H	0.65	EF99	1.25	PL96	3.20	VR150/30*	7.50
E108C	11.50	EC99I	0.75	EF99	6.50	PL97	29.50	VR150/30*	0.75
E108C	0.50	EC99J	0.75	EF99	2.20	PL98	9.50	VR150/30*	19.80
E108C	1.60	EC99K	0.90	EF99	5.85	PL99	0.70	VR150/30*	45.50
E108C	0.70	EC99L	3.50	EF99	7.70	PL99	0.80	VR150/30*	3.75
E108C	0.80	EC99M	1.20	EF99	8.45	PL99	0.95	VR150/30*	21.15
E108C	1.85	EC99N	1.10	EF99	9.85	PL99	0.95	VR150/30*	2.45
E108C	0.90	EC99O	0.65	EF99	4.50	PL99	0.80	VR150/30*	37.50
E108C	0.90	EC99P	0.30	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99Q	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99R	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99S	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99T	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99U	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99V	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99W	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99X	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99Y	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75
E108C	0.95	EC99Z	0.50	EF99	0.80	PL99	0.95	VR150/30*	0.75

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc. Retail 749 3934, trade and export 743 0899.

POSTAGE: £1-£3 55p; £3-£5 65p; £5-£10 85p; £10-£15 115p; £15-£20 145p. Minimum order £1.00. Delivery by return.

COLOMOR (ELECTRONICS LTD.) 170 Goldhawk Rd, London W12

Tel: 01-743 0899 or 01-749 3934. Open Monday to Friday 9 a.m.-5.30 p.m.

USED AMATEUR EQUIPMENT?

I Buy, Sell & Exchange!

Whether SELLING or BUYING, if you're talking
TOP QUALITY USED AMATEUR EQUIPMENT.

Phone G4TNY for the BEST deals around !!

Phone Dave on 04024 57722 or 0836 201530, 9am to 7pm, Mon to Sat

Ask about our new 'RIGSEARCH' services.

Send SAE for lists.

Personal callers by appointment, please.

G4TNY AMATEUR RADIO

132, Albany Road, Hornchurch, Essex RM12 4AQ

PART EXCHANGE

MAIL ORDER



Attention FT757, FT77 and FT707 owners . . .

**A RECOMMENDATION
FROM G3LLL**



Modern solid state rigs designed to have a **CLEAN** output can not be 'flat topped' by screaming into the mic. But a vast increase in average output can be obtained without objectionable distortion by using the **DATONG AUTOMATIC RF SPEECH PROCESSOR** — gives push button selection of up to 30db of clipping. **CALL IN AND LISTEN TO THE TAPE WE MADE WITH 2 FT757s and S1 signals** — certainly with my voice the Datong is more effective than any legal linear. Datong auto RF speech processor, £82.80 p.p. Ready wired for **FT757, FT707 or FT77**. With connecting lead — (no mic plug to solder!).

HEAR THE TAPE. (OR BUY THE PROCESSOR) AT:

HOLDINGS AMATEUR ELECTRONICS

45 Johnston St. Blackburn BB2 1EF

(15 mins junction 31 M6)

Tel: (0254) 59595

Closed Thursday



Access/Barclaycard

SCOPES. Solartron CD1400 general purpose DC to 15 Megs at 100 Mill/V Cm Dual Beam, timebase 0.5 US to 200 Mill/Sec Cm, 5" flat tube with 4Kv size 13x7x17" tested with book £95. Also Scopex type 4D-10 general purpose DC to 10 Megs at 10 Mill/V Cm dual trace, timebase 1 Us/Cm to 100 Ms/Cm lightweight transis size 6x12x14" tested with book £125. **A.F. OSC** Services type CT439 sinewave freq 10c/s to 100Kc in 4 ranges O/P var by fine and coarse atten up to 3v into 600 ohm fitted O/P voltmeter, neat unit in case size 8x10x8" with cover for use on mains or int battery, transis unit with high resolution scale tested £65. **AERIAL SWITCH** long wire aerial selector swt type J part off TL154/R1155 equip good cond £16.50. **PHILIPS PM5508** colour TV pattern geny UHF/VHF/IF provides 10 test signals tested with book £85. **METER** Services type CT471 Elec multimeter AC/DC volts, AC/DC current, 5 ranges of ohms, RF probes to 1 Gz at 40 Mill/V FSD in case size 9x8x8" reqs 3x HP2 batt tested with book £75. **VARIAC** for panel mounting 240v I/P O/P 0 to 270v at 2 amps as 1/4" shaft £18.50. **SPEAKER UNIT** Army AFV spk in metal case size 5 1/2" dia 3 1/2" deep semi weatherproof int spk 3 ohm new £8.50. **DISH AERIALS** Airborne radar X band 32" dia 5" deep dural some perforations new boxed £28.50. **H.F. PRE SELECTORS** made for Army by Marconi these tune 2/29 Mc/s in 4 bands with direct cal with 10.1 slow motion dial each band as two tuned circs with high Q coils, as 75 ohm I/P & O/P connections mounted on 19" Chassis ass size 19x7x14", well made unit useful for use with older type Rx.s to remove Image/second channel signals £28.50. **PANEL METERS.** Mixed all M.C. types new 2 1/3" dia 6 for £7.50. **GATE UNIT** special purpose unit sold for parts contains tuning cap twin gang 135pf per section, small 1" dia — 30 to +60°C, 2x large Vinkors, meter 50-0-50 Ua, Rot swt, transis, diodes, trans, push swt, 2x pairs 25 way connec, in metal case size 13x9x5" supplied in fitted carrying case £18.50. **PILOTS HUDS.** Aircraft Head up Displays, projects image from CRT onto glass screen (similar to old proj T.V.) reqs ext EHT supply as 45" mirror & FO.97 lense unit also motor driven carriage to move glass screen using 24v DC motor supplied in fitted case £35. **PHOTO FLASH CAPS** Sprague rapid discharge type 215 uf at 2.5 Kv Pk size 8x4x10" £17. **SIG GENs** American services type USM-44 equiv to Hewlett Packard 608 series high grade unit covering 10/420 Mc/s in 5 bands, as int AM mod at 400 & 1000 c/s with low spurious F.M. O/P var & metered int crystal check at 5 megas supplied in transit container £135. Also small stock of TS419 & TS403 L & S Band Sig Gen. **TEST SET PRM-10** American services Grid Dip Osc covers 2/400 Mc/s with 7 plug in coils as 4 functions GDO, Osc Det, Absorption W.M. & Sig Gen, as direct freq cal & meter indication supplied in metal stowage box size 11x9x5" this holds head unit & coils supplied tested with book, for 115v about 25 watts £65. **POWER UNITS** for 230v provide two DC smoothed O/P of nom 50v at 3 amps each as twin C Core mains trans on 19" panel connected as 50v + & 50v — supplies fused, well under rated unit £45. **TEST METERS.** AVO Model 8 Mk3/5 general purpose 20k ohm per/V test meter supplied tested but less leads & batteries £48. **TRANS.** All 230/240v C core Sec 50/60v at 5 amps. £14.50 E core Sec 21v at 10 amps (can be tapped down to 16v) £14.50 Mains Isol 240/240 at 500 watts £17.50. **HAND GENY** Army type output 13.8v adjustable 12/14 stabilised at 1 amp £24.50 quantity available. **ARENOLD CAPSULE** Smiths 2 1/2" dia connected by small bore pipe to 1/2" threaded union, new. £3.50.

Above prices include Carr/Post & VAT. Goods ex equipment unless stated new. SAE with enquiry or 2x18p stamps for List 41. Open to callers 10.30 till 5pm, closed Mon/Thurs. Phone if wishing to collect tested items.

A.H. SUPPLIES

Unit 12, Bankside Works, Darnall Road, Sheffield S9 5HA
Phone: 444278 (0742)

UNBEATABLE PRINTERS...



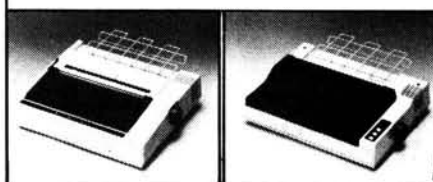
UNREPEATABLE PRICES!

A special bulk purchase from Japan enables us to offer high quality current manufacture Copal printers at around half the price of equivalent units.

		Price	Carriage
SC-1200	120 cps 80 column	£129.95	£8.50
SC-1500	180 cps 80 column	£179.95	£8.50
SC-5500	180 cps 136 column	£199.95	£8.50

VAT must be added at 15%.

These units are parallel interface, Epson compatible, and the SC-1500 and SC-5500 have NLQ print mode. Complete with forms tractors. Prices include paper separator and one ribbon. 12 months parts and labour warranty.



**ORDER
TODAY!**
Don't miss this
once only
opportunity!

ICS

ICS Electronics Ltd.
PO BOX 2
Arundel
W. Sussex BN18 0NX

12 Months Parts and Labour Warranty on all products sold
Visitors by appointment only. Send large SAE for further details.



Phone: 024 365 590
Facsimile: 024 365 575



S.E.M. UNIT P, UNION MILLS, ISLE OF MAN Tel: MAROWN (0624) 851277

NEW. S.E.M. V.H.F. to H.F. CONVERTER. Gives you 118-146MHz on your H.F. receiver. Connects in your aerial lead and reconnects your H.F. aerial when switched off. Tune your receiver from 2 to 30MHz. £49.50.

S.E.M. H.F. to V.H.F. Converter. Gives you 100KHz to 60MHz on your V.H.F. scanner. It converts up to 100MHz to 160MHz (e.g. to receive 20MHz tune to 120MHz). Connects in your aerial lead and switches between V.H.F./U.H.F. and L.F./M.F./H.F. as you require (no plugs to change over). £49.50 Ex-stock.

S.E.M. QRM ELIMINATOR. This unique accessory can solve the problem of your local noise as it has for many others. Some are back on the air who had been unable to operate at all. Any sort of interference, it can be next to your receiver (your computer?) or several miles away, any freq. 1.5-30MHz. Connects in your aerial lead and removes the interference before it gets to your receiver, and you can transmit through it. £85 Ex-stock.

If you don't believe its true, try one for 10 days, if it doesn't solve your problem, we'll refund, less £5 to cover costs. We have many delighted owners now, who can't speak too highly of performance. With comments such as "I can operate for the first time for years" or "you have got a winner".

S.E.M. Dummy load, 100W with dummy load/through switch. So you leave it plugged in line. £24.00 Ex-stock.

S.E.M. TRANZMATCH Mk III. Now has a switch to select DIRECT to aerial, BALANCED or UNBALANCED or DUMMY LOAD. The matching unit retains its tremendous versatility capable of matching virtually any aerial to 50 ohms at up to 1KW, balanced or unbalanced. The link coupled output isolates the aerial from the rig, which can cure TVI both ways. Their robust construction is proved by the ones in daily use for 15 years. 1.8-30MHz £110. Ezitune built in £39.50 (see below). Built in dummy load £8.90 Ex-stock.

S.E.M. 2 metre Transmatch, match your V.H.F. aerial, 1KW max. £32.00 Ex-stock.

S.E.M. EZITUNE. Do you use an antenna matcher? You need our Ezitune to tune it to your frequency without transmitting. Listen to the S9+ noise on your receiver and adjust your aerial tuner for a dip in the noise and you are matched up to 50 ohms (1:1 SWR). Protect your radio and stop tuning QRM. £45 boxed, or p.c.b. + fixing bits and instructions to fit in any A.T.U. £39.50. Ex-stock.



VERY WIDE BAND PRE-AMPLIFIERS

They cover from 3-500MHz with a noise figure of 1.5dB and an unprec. edented +30dB 3rd order IP at the INPUT. Gain is 9dB.

We make three types. Straight pre-amp, this has a signal loss if you switch it off, £32.00. One which switches to "straight through" when switched off, can be used for transmitting through (100W) if supplied with 12V on receive and 0 on TX, costs £37.00. All Ex-stock.

We are continuing to make our highly acclaimed dedicated 2 Metre pre-amps with adjustable 0-20dB gain and 1dB N.F. Receive only £25.00. R.F. switched £34.00.

R.F. NOISE BRIDGE. If you are experimenting with aeriels you need one of these units. Tells you the resonant frequency and impedance of your aeriels and also invaluable for measuring 1/4, 1/2, etc., wavelength of feeders, etc. £45.00. Ex-stock.

WAVEMETER. A pretty little absorption wavemeter, to satisfy the licence conditions. 1.5-30MHz with a meter indication. £39.50. Ex-stock.

IAMBIC KEYS. We use the world famous CURTIS chip which eliminates the little idiosyncracies common in other keys. Opto-isolators from the chip ensure that R.F. can't get in. Compatible with any TX. £45.00. An excellent twin paddle key often mistaken for ones costing several times more at £20.00. Ex-stock.

2 METRE LINEAR POWER AMP/PRE-AMP. People are constantly telling us that comparing different makes our Pre-amp is best. (See Pre-amps for spec.) Three models. Sentinel 40 14x power gain e.g. 3W IN-40W OUT. Ideal for FT290 £85.00. Sentinel 60, 10W IN-60W OUT £95.00. Sentinel 100 10W IN-100W OUT £135.00. All Ex-stock.

AUDIO MULTIFILTER. Has fully adjustable BAND PASS, HIGH PASS, LOW PASS and 2 NOTCH filters. From 2.5kHz to 20Hz. Making the most versatile filter available. £75.00. Ex-stock.

T.V.I. Our Braid Breaker/High Pass Filter cures T.V.I. by plugging into the TV aerial socket. £7.50. Ex-stock.

S.E.M. SWITCH. 3 way ant. switch + 4th position to earth. 1kW. S0239S D.C.-150MHz. £23.00. Ex-stock.

12 MONTHS COMPLETE GUARANTEE INCLUDING ALL TRANSISTORS.

Prices include VAT and delivery. C.W.O. or phone your CREDITCARD No. Ring or write for further data. Orders or information requests can be put on our Ansaphone at cheap rate times.

COMMUNICATION CENTRE OF THE NORTH

The largest range of communications equipment available in the North. Full range of receivers, transceivers, antennas, power supplies, meters. Ali tubing - wall brackets - rotators - insulators.

We are the original amateur radio suppliers in the North West with 20 years experience in all types of equipment. Wide range of Base, Mobile, Antennas for all applications. Full range of equipment on display. Guaranteed after sales service. Official Kenwood stockist for North.

Also stockists for Tonna, Welz, G.Whips, Jaybeam, RSGB Publications, Diawa, Microwave Modules, Capco Antenna Tuners, Butternut Antennas, Cushcraft Antennas, MJF Accessories.

RECEIVERS

Full range of receivers for all modes and frequencies.

KENWOOD R5000 General Coverage Receiver	£875.00
VC20 VHF Converter for R5000	£167.00
KENWOOD R2000 General Coverage Receiver	£595.00
VC10 VHF Converter for R2000	£161.00
JRC NRD 525 General Coverage Receiver	£1,195.00
CMK165 VHF/UHF Converter for NRD525	£391.35
HF125 General Coverage Receiver	£375.00
AR2002 Wide Band Scanning Receiver	£487.00
R535 VHF/UHF Airband Receiver	£249.00
R537S Hand Held Airband Receiver	£69.50
AT1000 SWL Antenna Tuner	£69.00

Please send SAE for full information and up-to-date prices as these fluctuate to change in sterling rates.

For the caller a wide range of Aluminium Tubing, Clamps, etc. at competitive prices, i.e. 12' x 2" Ali Tubing £10.95.

Full range of RSGB and ARRL publications in stock.

Part Exchanges welcome. Second hand lists daily.

Send S.A.E. for details of any equipment.

HP terms. Access/Barclaycard facilities.

Open 6 days a week. 24 Hour Mail Order Service.

Goods normally despatched by return of post.

Phone 0942-676790.

STEPHENS JAMES LTD.
47 WARRINGTON ROAD, LEIGH, LANCs. WN7 3EA.

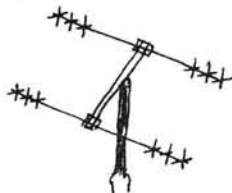
PRACTICAL WIRELESS KITS



Semiconductor Tester		Dec 87	13.40	COMPONENTS	
RTTY Tuning Indicator		Nov 87	23.90	DIODES	
PW Blenheim v.h.f. to h.f. receive converter		Sept 87	26.60	2N3904	14
Downton. Freq. to Voltage Converter		June 87	19.70	2N3906	14
Side Tone Oscillator		June 87	9.60	2N4124	35
PW AXE Signal Tracer		May 87	49.00	1N914	05
Itchen. LCR Bridge		April 87	27.90	1N916	16
Woodstock Short Wave Converter		March 87	26.50	1N4001	64
Masthead Preamp For 144MHz		Feb 87	39.30	1N4002	05
Westbury Basic Wobbulator		Jan 87	16.50	1N4005	07
High Z Musket Voltmeter		Dec 86	25.30	1N4148	03
Taw. VLF Converter		Nov 86	14.20	0A47	14
Active Antenna		Nov 86	17.80	0A91	10
Automatic Nicad Charger		Oct 86	18.20	W005	26
Simple 50MHz Converter		Sept 86	21.50	LM358	43
Arun Parametric Filter		May 86	49.30	LM566	128
Meon 2. 50MHz Transverter (144MHz IF)		April 86	43.30	MC1458	48
Rtty/Morse Modern (No Case)		Jan 86	31.85	MC1496	140
Two Tone Oscillator		Dec 85	23.30	IC109C	17
Meon. 50MHz Transverter (28MHz IF)		Oct 85	43.30	IC148	14
Capacitance Meter		Oct 85	21.30	SL1621	790
Fet Dip Oscillator		Oct 85	19.90	IC178	20
Add On BFO (Inc. C804 + Optional Comps.)		Aug 85	12.95	IC212L	14
Triambic Keyer		Feb 85	18.45	SL6440	465
Morse Sending Trainer		July 84	12.00	IC213	14
Auto Notch Filter		June 84	25.90	IC214	14
Morse Practice Oscillator		Jan 82	9.20	IC217	14
				IC218	14
				IC219	14
				IC220	14
				IC221	14
				IC222	14
				IC223	14
				IC224	14
				IC225	14
				IC226	14
				IC227	14
				IC228	14
				IC229	14
				IC230	14
				IC231	14
				IC232	14
				IC233	14
				IC234	14
				IC235	14
				IC236	14
				IC237	14
				IC238	14
				IC239	14
				IC240	14
				IC241	14
				IC242	14
				IC243	14
				IC244	14
				IC245	14
				IC246	14
				IC247	14
				IC248	14
				IC249	14
				IC250	14
				IC251	14
				IC252	14
				IC253	14
				IC254	14
				IC255	14
				IC256	14
				IC257	14
				IC258	14
				IC259	14
				IC260	14
				IC261	14
				IC262	14
				IC263	14
				IC264	14
				IC265	14
				IC266	14
				IC267	14
				IC268	14
				IC269	14
				IC270	14
				IC271	14
				IC272	14
				IC273	14
				IC274	14
				IC275	14
				IC276	14
				IC277	14
				IC278	14
				IC279	14
				IC280	14
				IC281	14
				IC282	14
				IC283	14
				IC284	14
				IC285	14
				IC286	14
				IC287	14
				IC288	14
				IC289	14
				IC290	14
				IC291	14
				IC292	14
				IC293	14
				IC294	14
				IC295	14
				IC296	14
				IC297	14
				IC298	14
				IC299	14
				IC300	14
				IC301	14
				IC302	14
				IC303	14
				IC304	14
				IC305	14
				IC306	14
				IC307	14
				IC308	14
				IC309	14
				IC310	14
				IC311	14
				IC312	14
				IC313	14
				IC314	14
				IC315	14
				IC316	14
				IC317	14
				IC318	14
				IC319	14
				IC320	14
				IC321	14
				IC322	14
				IC323	14
				IC324	14
				IC325	14
				IC326	14
				IC327	14
				IC328	14
				IC329	14
				IC330	14
				IC331	14
				IC332	14
				IC333	14
				IC334	14
				IC335	14
				IC336	14
				IC337	14
				IC338	14
				IC339	14
				IC340	14
				IC341	14
				IC342	14
				IC343	14
				IC344	14
				IC345	14

J & M (Amateur Radio) G4GKU

36, WESTGATE, ELLAND,
W. YORKS HX5 0BB.
PHONE: (0422) 78485
Ask for John G4GKU



NOW 10m, 15m, 20m

A TRI-BAND MINI BEAM

AT A SENSIBLE PRICE £69.95
(TRADE ENQUIRIES WELCOME)

We are the original designers of the popular G4MH mini beam, and have manufactured this aerial for the past ten years.

We can now offer our own version of this mini beam. **Direct from the manufacturer** at a money saving **£69.95** complete. Or in kit form or as spare parts. Ask for a quote.

PART EXCHANGE
BARCLAYCARD VISA



TX - 3

RTTY/CW/ASCII TRANSCEIVE

The high performance, low cost system

Split-screen, type-ahead operation, receive screen unwrap, 24 large memories, clock, review store, call sign capture, RTTY auto CR/LF, CW software filtering and much more. Needs interface or T.U. **BBC-B/Master** and **CBM64** tape £20, disc £22. **SPECTRUM** tape £35 inc. adapter board.

See reviews in December and January PW.

For **VIC20** we have our RTTY/CW transceive program. Tape £20.

RX - 4

RTTY/CW/SSTV/AMTOR RECEIVE

This is still a best-selling program and it's easy to see why. Superb performance on 4 modes, switch modes at a keypress to catch all the action. Text and picture store with dump to screen, printer or tape/disc. An essential piece of software for trawling the bands. Needs interface. **BBC-B/Master**, **CBM64** tape £25, disc £27. **VIC20** tape £25. **SPECTRUM** tape £40 inc. adapter board. The **SPECTRUM** software-only version (input to EAR socket) is still available £25.

TIF1 INTERFACE Perfect for TX3 and RX4, it has 2-stage RTTY and CW filters and computer noise reduction for excellent reception. Transmit outputs for MIC, PTT and KEY. Kit £15 (assembled PCB + cables, connectors) or ready-made £25, boxed with all connections. Extra MIC leads for extra rigs £3 each. State rig(s).

WORLD AND UK/EUROPE MAP LOCATOR Maps, great circles, distances, bearings, contest scores. Lat/long, locators, NGR, hundreds of placenames. **BBC-B/Master**, **ELECTRON** ONLY. Tape £10.

LOCATOR Distances, bearings, contest scores. Lat/long, locators. **SPECTRUM**, **CBM64**, **VIC20** tape £7.

And for **BBC-B/Master**, **SPECTRUM**, **ELECTRON**, **CBM64**, **VIC20**.

MORSE TUTOR 1-40 wpm. Learn by ear, practise using random letters, figures, punctuation, words. 40 plain language texts supplied or type your own. With learning guide, tape £6.

LOGBOOK Date, band, mode, call and remarks. Instant callsearch. Log printout. Tape £8.

RAE MATHS Unlimited practice and testing for the exam calculations. Tape £9.

All **BBC** and **CBM64** programs are available on **DISC** at £2 extra.

Prices include VAT and p&p, 1st Class inland, airmail overseas, normally by return. Eire, C.I., BFPO deduct 13%.



technical software (P.W.)

Fron, Upper Llandwrog, Caernarfon LL54 7RF.
Tel. 0286 881886

CRICKLEWOOD ELECTRONICS LTD

It's no secret!



that there is a real difference at Cricklewood Electronics. That's why you should never be without the **FREE CRICKLEWOOD ELECTRONICS COMPONENTS CATALOGUE**, for sheer variety, competitive prices and service from the U.K.'s number one 100% component shop. No gimmicks, no gadgets or computers, just components, millions of them, all easily available by mail order, calling or credit card telephone orders. Just pick up the phone (or a pen) to get your **FREE** copy now (no SAE required). You have nothing to lose.

CRICKLEWOOD ELECTRONICS LTD.
40 Cricklewood Broadway NW7 3ET
01-450 0995 & 01-452 0161
ALL MAJOR CREDIT CARDS ACCEPTED
Telex 914977 Phone or write today



TONNA F9FT THE VHF/UHF ANTENNA SPECIALIST

50MHz			435MHz		
20505 5 element	£41.69(a)		20909N 9 element	£28.62(a)	
			20919N 19 element	£34.35(a)	
144MHz			20438 19 element crossed	£39.66(a)	
20804N 4 element	£27.60(a)		20921N 21 element 432MHz	£44.57(a)	
20808N 4 element crossed	£34.96(a)		20922N 21 element ATV	£44.57(a)	
20809N 9 element fixed	£30.87(a)		1296MHz		
20809N 9 element portable	£33.12(a)		20623 23 element	£30.36(b)	
20818N 9 element crossed	£57.86(a)		20696 4 x 23 element - power	£160.00(a)	
20813N 13 element portable	£46.00(a)		splitter - stacking frame		
20817N 17 element	£61.54(a)		20655 55 element	£46.20(a)	
144/435MHz			20666 4 x 55 element - power	£230.00(a)	
20899N 9 & 19 element Oscar	£57.86(a)		splitter - stacking frame		

All prices include VAT. Please add carriage (a) £5.00, (b) £2.20.
ACCESS or VISA cardholders telephone your order - immediate despatch.
Callers welcome but by telephone appointment only please.
SEND 50p FOR OUR CATALOGUE WHICH CONTAINS FULL SPECIFICATION OF ALL OUR ANTENNAS, POWER SPLITTERS, STACKING FRAMES, COAXIAL CABLES ETC.

SOLE UK DISTRIBUTOR
RANDAM ELECTRONICS (P)

12 Conduit Road, Abingdon,
Oxon. OX14 1DB
Tel: (0235) 23080 (24 hours)

GAREX THE SCANNER SPECIALISTS

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

NEW REVCO MODEL

AM-NFM

★ 50 MEMORIES ★



? ASK ?
FOR ?
DETAILS

£ under 200

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

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

REGENCY HX-850E

THE SMALLER HANDY-SCANNER



- Covers: 75-106MHz or 60-90MHz plus 118-175MHz, 406-496MHz
- AM & NFM programmable on all bands
- Full scan & search functions are available
- 20 memories
- Measures only 2.5" x 5.5" x 2"
- Nicads, charger & BNC whip antenna included in the price

£279

DON'T FORGET THE ANTENNA!

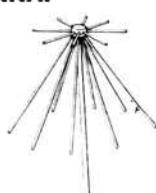
All receivers need a good antenna and the BRITISH-MADE REVCON is used throughout the world by discerning scanner owners. Covers 50-500MHz, extremely well made & excellent value at.....£31.95

For those who will appreciate extra performance we offer the REVCO RADAC dipole nest with transmitting capability from 25-500MHz.....£69.95

BROADBAND PREAMPLIFIERS

REVCO PA3 inline masthead model, with special mains psu. DC-1GHz min. 13dB gain.....£49.95

PA3I instrument or back-of-set version for 12V DC operation, BNC connectors (SO239 or N-type options).....£35.50



GAREX ELECTRONICS

Extensive range of PYE radiotelephone spares — S.A.E. for list.

HARROW HOUSE, AKEMAN STREET, TRING HP23 6AA.
Phone Tring (044282) 8580 & Cheddington (0296) 668684. Callers by appointment only.

Ask for our secondhand scanner bargain list.

AUDIO FILTERS MODELS FL2, FL3, FL2/A

Model FL3 represents the ultimate in audio filters for SSB and CW. Connected in series with the loudspeaker, it gives variable extra selectivity better than a whole bank of expensive crystal filters. In addition it contains an automatic notch filter which can remove a "tuner-upper" all by itself. Model FL2 is exactly the same but without the auto-notch. Any existing or new FL2 can be up-graded to an FL3 by adding Model FL2/A conversion kit, which is a stand-alone auto-notch unit. Datong filters frequently allow continued copy when otherwise a QSO would have to be abandoned.

Prices: FL2 £89.70, FL3 £129.37, FL2/A £39.67



ACTIVE RECEIVING ANTENNAS

Datong active antennas are ideal for modern broadband communications receiver — especially where space is limited.

- highly sensitive (comparable to full-size dipoles).
- Broadband coverage (below 200 kHz to over 30 MHz).
- needs no tuning, matching or other adjustments.
- two versions AD270 for indoor mounting or AD370 (illustrated) for outdoor use
- very compact, only 3 metres overall length. • professional performance standards.

Prices: Model AD270 (indoor use only) £51.75 Both prices include mains power unit. Model AD370 (for outdoor use) £69.00



MORSE TUTOR

The uniquely effective method of improving and maintaining Morse Code proficiency. Effectiveness proven by thousands of users world-wide.

- Practise anywhere, anytime at your convenience.
- Generates a random stream of perfect Morse in five character groups.
- D70's unique "DELAY" control allows you to learn each character with its correct high speed sound. Start with a long delay between each character and as you improve reduce the delay. The speed within each character always remains as set on the independent "SPEED" control.
- Features: long life battery operation, compact size, built-in loudspeaker plus personal earpiece.

Price: £56.35



Our full catalogue plus further details of any product are available free on request. All prices include VAT and postage and packing. Goods normally despatched within 3 days subject to availability.



DATONG
ELECTRONICS
LIMITED

write to dept. P.W.
Clayton Wood Close
LEEDS LS16 6QE
Tel: (0532) 744822 (2 lines)

RST

MAIL ORDER CO.
Langrex Supplies Ltd.,
Climax House,
159 Fallsbrook Road,
Streatham, SW16 6ED.

SPECIAL EXPRESS MAIL ORDER SERVICE

AZ31	2.75	EM81	2.50	PL519	6.00	6AK5	5.99	6KD6	8.00
CL33	4.00	EM87	2.50	PL802	6.00	6AL5	1.50	6L6G	5.00
DY867	1.50	EN91	6.50	PY33	2.50	6AM6	6.02	6L6GC	5.75
DY802	1.50	EY51	2.75	PY81	1.50	6AN5	4.75	6L7	2.50
E88CC	10.33	EY86	1.75	PY82	1.50	6AN8A	3.50	6L6	7.50
E180F	12.05	EY88	1.75	PY83	1.25	6AQ5	3.25	6Q7	3.75
E810F	35.48	EY500A	3.00	PY88	2.00	6AR5	25.00	6RH8/6KN8	
EAB8C80	1.25	EZ80	1.50	PY88A	4.00	6AS6	8.66		
EB91	1.50	EZ81	1.50	PY900A	1.50	6AS7G	8.75	6SA7	3.00
EBF80	1.50	EY501	3.00	PY800	1.50	6AT6	1.25	6SC7	2.75
EBF89	1.50	EZ32	4.00	PY801	1.50	6AUSGT	5.00	6SL7	3.25
EC91	8.00	GZ33	4.75	QV02-6	38.00	6AU6	2.50	6SK7	3.50
FCC33	4.50	GZ34	4.00	QV03-10	26.25	6AW8A	3.75	6SL7GT	3.00
ECC35	4.50	GZ37	4.75	QV03-20A		6B7	3.25	6SN7GT	3.00
ECC81	1.75	KT61	5.00	QV06-40A	48.38	6B8	3.25	6SS7	2.75
ECC82	1.75	KT66	15.00			6BA6	1.50	6SS7M	2.50
ECC83	1.75	KT77 Gold Lion	46.00			6BA7	5.00	6UBA	2.25
ECC85	1.75			QV03-12	6.80	6BE6	1.50	6V6GT	4.25
ECC88	3.50	KT88	15.00	R18	3.00	6BH6	2.50	6X4	3.00
ECC91	8.93	N78	15.00	R19	9.24	6BU6	2.25	6X5GT	1.75
ECF80	1.50	OA2	3.25	SP41	6.00	6BN6	2.00	12AX7	1.75
ECH35	3.00	OB2	4.35	SP61	4.00	6BQ7A	3.50	12BA6	2.50
ECH42	3.50	OC3	2.50	U19	13.75	6BR7	6.00	12BE6	2.50
ECH81	3.00	OD3	2.50	U25	2.50	6BR8A	3.50	12BY7A	3.00
ECL80	1.50	PC86	2.50	U26	2.50	6BS7	6.00	12E1	20.00
ECL82	1.50	PC88	2.50	U37	12.00	6BW6	6.00	12HG7	4.50
ECL83	3.00	PC92	1.75	UABC80	1.25	6BW7	1.50	30FL1/2	1.38
ECL96	1.75	PC97	1.75	UBF89	1.50	6BZ6	2.75	30P4	2.50
EF37A	5.00	PC900	1.75	UCH42	2.50	6C4	1.25	30P19	2.50
EF39	2.75	PCF80	2.00	UCH81	2.50	6C6	3.50	30PL13	1.80
EF41	3.50	PCF82	1.50	UCL82	1.75	6CB6A	2.50	30PL14	1.80
EF42	4.50	PCF86	2.50	UCL83	2.75	6CD6GA	5.00	57Z8	65.00
EF50	2.50	PCF801	2.50	UF89	2.00	6CL6	3.75	805	45.00
EF54	5.00	PCF802	2.50	UL41	5.00	6CH6	13.00	907	3.75
EF55	3.50	PCF805	1.70	UL84	1.75	6CIV4	8.00	811A	18.33
EF80	1.75	PCF808	1.70	UY41	4.00	6D6	3.50	812A	47.50
EF86	3.50	PCH200	3.00	UY85	2.25	6DO5	7.50	813	65.00
EF91	2.95	PLC82	2.00	VR105/30	2.50	6DQ6B	4.75	866A	35.00
EF92	6.37	PLC83	3.00	VR150/30	2.50	6EA8	3.00	872A	20.00
EF183	2.00	PL84	2.00	Z759	25.00	6EHS	1.95	931A	18.50
EF184	2.00	PL85	2.50	Z803U	25.00	6F6	3.00	2050	7.50
EH90	1.75	PL86	2.50	2D21	3.25	6G6K	2.75	5763	4.50
EL32	2.50	PL805	2.50	3B28	50.00	6H6	3.00	5814A	4.00
EL33	4.00	PD500	6.00	4CX250B	58.00	6HS6	3.77	5842	12.00
EL34	4.00	PL200	2.50	5R4GY	5.50	6J5	4.50	6080	14.00
EL36	2.50	PL36	2.50	5U4G	3.00	6J6	8.53	6146A	12.00
EL80	25.00	PL81	1.75	5V4G	2.50	6J7	4.75	6146B	12.00
EL81	5.25	PL82	1.50	5Y3GT	2.50	6JB6A	6.50	6550	10.00
EL84	2.25	PL83	2.50	5Z3	4.00	6JE6C	7.50	6883B	12.50
EL86	2.75	PL84	2.00	5Z4GT	2.50	6J56C	7.50	6873	7.50
EL91	7.39	PL504	2.50	630L2	1.75	6K6GT	2.75	7025	4.50
EL95	2.00	PL508	5.50	6AB7	3.00	6K7	3.00	7027A	7.50
EL360	18.50	PL509	6.00	6AH6	5.00	6K8	3.00	7360	10.00
								7586	15.00
								7587	22.00

Open daily to callers: Mon-Fri 9 a.m.-5 p.m.
Valves, Tubes and Transistors — Closed Saturday
Terms C.W.O. only, allow 7 days for delivery. Tel. 01-677 2424/7.
Prices excluding VAT add 15%
Quotations for any types not listed S.A.E.
Post and packing £1.00 per order

Telex
946708

Prices correct
when going
to press

Amcomm Christmas Bonanza!

Terrific savings on virtually all List Prices.

Where service and courtesy comes naturally . . .

HF EQUIPMENT

Before you decide . . . phone Amcomm — find out about our H.F. Xmas deal.

HF LINEAR AMPLIFIERS

Put some power behind your signal! High Freq. amps at low, low prices!

HANDHELD TRANSCEIVERS

Put a handy in your pocket — without burning a hole in it. Telephone for complete range!

UHF MOBILE

Get the gen. on our latest range — Terrific savings! Phone now . . .

UHF BASE STATIONS

Save, Save, Save — ring for Amcomm's Xmas prices!

RECEIVERS

Sit back and enjoy listening to the world this Xmas — enjoy your saving too!

RTTY/CW

Special Xmas prices for the enthusiast — find out why Amcomm are first in Radcom.



FT 757



IC 761



IC 735



AL 84



AR 2002

VHF BASE STATIONS

Ring Amcomm first and get the 'low-down' on our VHF prices!

VHF MOBILE TRANSCEIVERS

Your No. 1 mail order selection — Ring for prices. 1st in Ham radio — 1st in Radcom.

VHF LINEAR AMPLIFIERS

Tokyo, B.N.O.S., M.M. — Super selection — Super prices!

ANTENNA COUPLERS

Tailor made precision equipment — to maintain your signal and bank balance.

HEIL ACCESSORIES

Audio Equipment to make all the difference. Our prices will too!

POWER SUPPLIES

Can you really get a better Xmas deal? Buy yourself a gift this year!

HI-MOUND MORSE KEYS

C.W. with a difference. Tidy up your C.W. in '88 — Enormous range!

SUPER H.P. TERMS AND TRADE-IN SERVICE

CASH IN NOW, ON OUR HUGE BUYING POWER! ENORMOUS STOCKS WHERE A GOOD DEAL MORE COSTS A GOOD DEAL LESS!

373 Uxbridge Road, London W3 9RN, Tel: 01-992 5765.

Showroom and Shop opening hours 9.30-5.00pm — Closed Mondays

The Staff of Amcomm wish you a Happy Christmas and Prosperous New Year

TLX: 24263

Amcomm
of London





Novice Licence?

I note from the letters page of October *PW* that there is some discontent with the Radio Amateurs Examination system. I recently "caught the bug" and am writing in support of correspondent Brian Smith, who mentioned Novice licensing. I assume by this that he means a separate class of operator who would, presumably, not have to take the full RAE.

I am all in favour of a proper test of operating procedures and the use of the appropriate instruments and so on to prevent interference, but I am afraid

that I cannot really see the point of everyone having to learn basic electrics and electronics and how the insides of transceivers work. After all, it is possible to pass a Driving Test without having the slightest knowledge of what happens under the bonnet when you turn the ignition key.

I feel that the present examination system is inappropriate in this respect, given that sets no longer need to be constructed at home from bits and pieces.

I am sure that the sheer delay that must occur between people taking an interest and finally obtaining a licence must put a lot of people off—but perhaps that is the real object of the exercise?

Chris Charles, Cheadle

Wow! I think we're likely to need some fireproof paper to print the answers to this letter—Ed.

The RAE—Good . . .

In October's *PW* you asked for comment from candidates who had sat the Radio Amateurs Examination recently.

I started the course at Scarborough Technical College in September 1986, but was unfortunate in having to have a major operation in January. I rejoined the course at the end of February and sat the exam in May.

I consider that the questions asked were wholly representative of what was taught from the manual. We also had an excellent course tutor in Peter Tipper G3JBR, whose enthusiasm for amateur radio rubbed off on the students.

As I was on holiday when the results came out, I had to sweat it out for three

weeks until I got home. I had passed, and was awarded callsign G1ZGD. To all the sour grapes, I can only say: "You didn't try hard enough!"

**Bob Lees
Scarborough**

We learn from a cutting from the Scarborough Evening News that 63-year-old Bob continued his studies whilst in hospital and during his convalescence, by listening to tape recordings of the two-hour weekly lectures, made for him by a nephew. Congratulations on your perseverance, Bob—Ed.

I recently sat and passed the May 1987 RAE. Bearing in mind the stressful situation one finds oneself in during the exam, I found the questions clear and concise (though somewhat easier than I had anticipated), and I cannot recall any question which had several correct

PW COMMENT

Crisis Point

AS WE ENTER 1988, the 75th Anniversary Year of the Radio Society of Great Britain, it is my feeling that amateur radio has reached a crisis point in its development.

The RSGB itself has come in for a lot of stick lately. Much of that criticism has been very definitely "over the top", with genuine grievances being seized upon and manipulated by a vocal few, as is the way of the world. I know that *Practical Wireless*, too, has been criticised in some quarters, in this case for daring to print letters attacking the Society. The views which we have published have been selected as being the more constructive, from among a postbag which also contains some quite unprintable personal attacks on RSGB members and staff.

It is unfortunate that, despite a statement to the contrary, letters critical of the Society still do not appear to be encouraged in the pages of *Radio Communication*, and its discussion feature "I don't agree . . . but do you?" sank without trace after just one airing at the beginning of 1987.

There is an old saying that "the cobbler's children go worst shod", and it is certainly ironic that the RSGB, a communications-based organisation producing a monthly magazine, a weekly news broadcast, Prestel and telephone headline news services, and a Databox, seems to have such difficulties in keeping members informed about what is going on.

Did you know, for example, that a large proportion of headquarters staff with experience in dealing with members' queries, left the Society's employ during the early part of 1987? Or that a major restructuring of the organisation at Potters Bar had been going on during the year? Had this been announced in *RadCom*, with a message along the lines of: "Sorry, this means that there are likely to be delays in dealing with anything other than run-of-the-mill enquiries until everything settles down", members would, I am sure, have felt a great deal more understanding if their letters went unanswered. Which would have helped to promote a very much more positive attitude towards the Society.

The crisis which I see affecting our hobby is more widespread than this, though. There are two questions to be considered: where are we now, and where should we be heading? At present, amateur radio is becoming more and more a means of talking to other people, using "black boxes",

rather than a means of experimenting in radio techniques, using at least partly home-built equipment. Whilst talking to other people can undoubtedly make a major contribution to world understanding, is that going to be a good enough reason for holding onto our bands in the face of ever-growing pressure for spectrum space from other users?

Home construction and experimentation, which typified the original concept of amateur radio, requires two things: availability of components, and designs or ideas for putting them to use (plus, of course, the skill to do so). Though there are a few firms dealing in radio components, either by mail order or at radio rallies, it is by no means always easy to lay hands on all the bits and pieces required to complete a project. As for the availability of designs, it is pretty obvious to me, as an avid reader of all the UK radio hobby magazines, that there is a general and growing shortage of useful, well-engineered and interesting constructional articles. I personally find the trend quite frightening—where is the hobby going?

Certainly, whether amateur radio is for communicating or for experimenting, or for a healthy mix of the two, we do need more new blood coming into the hobby. Although I know that there are those who disagree, my feeling is that the RSGB deserves whole-hearted support in its proposal for a "student" or "novice" licence. The idea of a simplified licence giving access to limited power, with limited modes on limited bands, using a home-built transmitter and targeted especially at youngsters of school age, has great possibilities.

One other idea, mentioned to me recently by Richard Marris G2BZQ, is for a segment of a band such as 7MHz to be allotted to d.s.b. phone operation with limited power. His argument is that it would bring back the possibility that the casual listener with a short wave receiver, unable to read Morse and without a clue as to how to tune in those "Donald Duck" amateur s.s.b. signals, might experience the thrill of discovering amateur radio.

Dare I suggest, now the band up to 7.1MHz seems at last to have been vacated by the broadcasters, that the segment 7.05-7.10MHz be set aside for d.s.b. amateur transmissions only? Any s.w. broadcast listener will have access to it within his receiver's 41 metre band. With the increasing popularity of short-wave broadcast listening, it could give a very real boost to the fortunes of amateur radio.

Geoff Arnold

answers or indeed had no correct answer. A few questions in the second paper did require some consideration, as two of the possible four answers were partially correct. Mind you, at the time, I thought this was intentional in order to determine what path one would choose when offered alternatives.

I think it was a fair test, designed only to confirm that the candidate had a reasonable idea of what amateur radio was all about.

**Ron Greig GM1YSL
Kirkcaldy, Fife**

... Or Bad?

Having read the comments in the October issue of *PW*, concerning the current standard of the RAE, I would like to add my impressions as a successful entrant in the May 1987 exam.

As a secondary school teacher of more years standing than I care to recall, and past examiner for various examination boards at both O-Level and A-Level standard, I regard myself as being well-qualified to judge the standard and efficacy of the Radio Amateurs Examination.

Having spent several months studying the syllabi, and tested myself on the specimen papers in the excellent RSGB publication *Radio Amateur Examination Manual* (which I quite wrongly assumed to be actual past papers), I felt quite confident to attempt the exam.

My first impression of the papers was that I had entered the wrong examination room! The questions bore little or no resemblance to the clear,

well-written ones in the RSGB publications. Many of the questions were badly written, grammatically incorrect and ambiguous to say the least. A fair proportion were what I would describe as "trick" questions which gave me the distinct impression that the examiners were trying to cheat me out of a mark which I might easily have gained on a better-written paper.

Surely the purpose of the RAE is to test prospective licensees' understanding of the principles involved in the safe, interference-free operation of an amateur radio station, and not to test his or her pedantic knowledge of trivial data which can easily be gleaned from a reference book when required. Also, without reducing the academic level of the questions, a good examination should attempt to get the best out of its candidates rather than make success as difficult as possible.

The compilation of effective multiple-choice examinations is a well-documented scientific and statistical process requiring the thorough testing of each question beforehand, and it was evident to me that this process had not been carried out on May's examination.

Perhaps the CGLI indulge in the most unusual practice of forbidding the removal of question papers from the examination room in order to avoid the informed criticism which is so desperately needed to bring about an improvement in standards.

**Ian James G1ZEH
Birmingham**

Service!

As a newcomer to the world of amateur radio, I have progressed via the tortuous route of "home-brew" into the temptation of owning a black box inclusive of bells and whistles.

Having acquired a secondhand FT-102, my DX-hunting was brought to an abrupt end by Murphy's Law. Not wishing to delve into the black box myself, I set about finding an appropriate specialist

through the advertisement pages of *PW*.

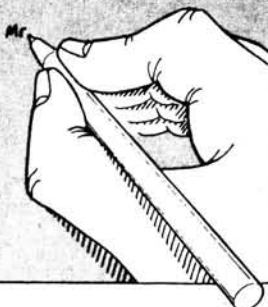
A telephone call and a two-hour car journey later, I was in the engineer's workshop describing the symptoms of the fault, which was quickly diagnosed.

The nature of the repair and the availability of the necessary component meant I had to leave my FT-102 for an unspecified period. It felt as if I was losing a friend!

Just a couple of days

Send your letter 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 other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestal Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.



Playnet?

I was very interested to read the replies from David Whiteman and Jeff Goodley (October *PW*) to Mr Taylor's original letter, and must agree with much of what they write.

Some background to the events which RAYNET members undertake for the User Services might be of help to licensees or s.w.l.s who are not familiar with RAYNET's work, and have not yet contacted their local group to find out more.

RAYNET has some 5000 members throughout the UK, and in 1986 they undertook approximately 66000 man-hours of duties on some 650 events where they provided much needed communications facilities for the Authorised User Services. In addition to this, they assisted with many live emergencies, and undertook training on-air, first aid training, map reading exercises, etc.

Just two examples of more newsworthy activity during 1987 have been the ferrying of drugs and supplies to isolated communities in Strathclyde and Norfolk in the winter snows, and the provision of cross-channel links with the Belgians for the Kent County Constabulary immediately after the Zeebrugge disaster.

All these skills and

disciplines are only useful if they are constantly rehearsed in team operations. There is no earthly use in saying: "I will be there when you need me", because no-one is going to have time to train you in the event of a real emergency.

So, the marathons and fun-runs of which Mr Taylor was so scornful do serve a vitally useful purpose. They provide situations where RAYNET members have to provide reliable communications in often difficult circumstances. It is difficult to imagine how else group members could regularly experience the high noise levels, low power levels, pressures of traffic density, and operator fatigue after long duty spells which form an inescapable part of disaster relief operations.

The User Services do from time to time involve RAYNET Groups with major disaster exercises, but in some cases unfortunately not as often as we would like. Usually a closer relationship grows from service given following a live emergency. As an example may I quote the County of Suffolk where the Police Computer operator and the RAYNET operator sit side by side at County Police HQ during an operation.

So, far from playing at it, I believe that RAYNET offers the community a very professional service. I will be quite content if they never realise it, because that means that the need has not yet arisen... but it will one day!

Will you be ready?

**Geoff Griffiths G3STG
Chairman, RSGB RAYNET
Committee**

Written before the devastating storms which hit the UK in mid-October, this letter was indeed prophetic in its final statement. RAYNET groups gave great assistance to the

later, I was invited to collect my equipment, which had been restored to life. The bill was most modest, the service and customer treatment of a standard rarely found in this day and age, especially in the hectic field of electronics.

I would like to commend that specialist, R. Withers Communications, and to thank Mr Ray Withers and his staff.

**John S. Baker G0HQQ
Peterborough**

► *User Services over a prolonged period whilst electric power and telephone services were being restored, and many lessons were learned. We hope to have a report on the RAYNET involvement in our next issue.*

Readers interested in finding out how they can play a part in RAYNET may contact either The Senior Membership Officer (RAYNET) at RSGB Headquarters, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE, or Trevor Emery G3KWU, Public Relations Officer, RAYNET Committee, 75 Haig Road, Eastleigh, Hants SO5 6JF—Ed.

RSGB Membership

In November *PW*, Peter Chadwick G3RZP notes that my letter in the September issue made him laugh! That is sad. Had he read my letter more carefully perhaps he would have taken it that much more seriously. Particularly the first two-thirds which he ignores.

My comments on the

state of the RSGB offices were based on memory, not fiction. I have indeed been there. If his remarks concerning the current state are to be believed then surely this is supportive proof of lack of good management?

Yes, mine was indeed a divisive letter, but it was written only after many years of waiting for the RSGB to act for its members, not itself. I said as much in my opening paragraphs, and if my postbag is to be believed there are others who agree with me.

If there is small print in the IARU Charter making the RSGB the only body in the UK allowed to run a QSL bureau, then one has to

doubt its validity for what must be rather obvious reasons.

One has the feeling that compulsory membership and a joint membership/licence fee might be hovering just in the future. Nice and tidy, simple and very profitable for someone. But would it be what we want? It seems that we might be better served by some form of choice free of official encumbrance.

I repeat my offer to act as a focus for sensible activity, should others of like mind care to contact me.

R. D. Railton GW6RXA
Glas-coed
Rhydargaeau
Carmarthen
Dyfed SA32 7JT



Morse

I read with interest the recent letters from G3BJG and G3ZNF concerning the abbreviation "ES" for "and" in Morse code. In fact this is not an abbreviation at all, but the original American Morse code (i.e. Real Morse!) for an ampersand (&), which was one dot followed by three dots, and has been carried over into the International Morse code we use today.

The source of the above information was the magazine *Morsum Magnificat* to which *all* Morse enthusiasts should subscribe!

Stan Barr G0CLV
Moreton, Wirral

I recently came across a somewhat ancient engineers reference book, containing a page on "Radio Signalling Codes" which considers "&" to be the 27th letter of the alphabet in "USA Morse", and gives its code equivalent "ditdi-di-dit". Other listings of American Morse I have seen do not mention it. It's nice to have a mystery solved once in a while—Ed.

OUR SERVICES

QUERIES

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

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the Editor, "*Practical Wireless*", Enefco House, The Quay, Poole, Dorset BH15 1PP, giving a clear description of your problem.
5. Only one project per letter, please.

COMPONENTS, KITS AND PCBS

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics**, and from **FJP Kits** (see advertisements). The **printed circuit boards** are available from our **PCB SERVICE** (see page 1 of this issue).

CONSTRUCTION RATING

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

Beginner

A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate

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

Advanced

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

BACK NUMBERS AND BINDERS

Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.30 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW*, are available price £3.95 to UK addresses, or overseas, including post and packing. Please state the year and volume number for which the binder is required. Prices include VAT where appropriate.

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News**, "*Practical Wireless*", Enefco House, The Quay, Poole, Dorset BH15 1PP, stating the county or counties you're interested in.

ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREE-POST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP**, with details of your credit card or a cheque or postal order payable to *PW Publishing Ltd.* Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £14 per annum to UK addresses and £18.50 overseas. For further details, see the announcement on page 36 of this issue. Airmail rates for overseas subscriptions can be quoted on request.

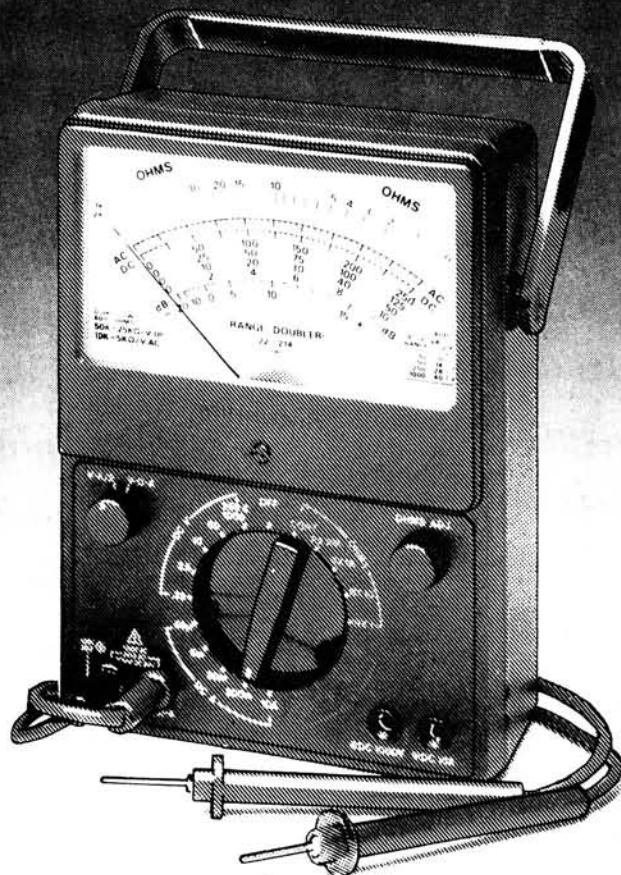
MICRONTA®

NEW PRECISION MULTITESTERS



A £34⁹⁵

A 28-Range FET VOM. Perfect for electronics testing! 10 megohms per volt DC sensitivity. Measures: 1000 volts DC in seven ranges and 1000 volts AC in five ranges. DC current to 10 amps, resistance to 100 megohms. Decibels: -20 to +62 dB. Fuse protected. Requires one 9v and one "C" battery. Measures: $7\frac{1}{16} \times 5\frac{1}{2} \times 2\frac{3}{4}$ ".
22-220 £34.95



B £29⁹⁵

B 43-Range Multimeter. 50,000 ohms per volt DC sensitivity. Fuse and overload protected. Measures to 1000 volts DC in 12 ranges and 1000 volts AC in 8 ranges. DC current to 10 amps, resistance to 20 megohms. Decibels: -20 to +62 dB. Requires one 9v and one "AA" battery. Measures: $6\frac{1}{16} \times 4\frac{7}{8} \times 2\frac{3}{8}$ ".
22-214 £29.95

Tandy®

For The Best In High Quality Electronics

Over 300 Tandy Stores And Dealerships Nationwide.
See Yellow Pages For Address Of Store Nearest You

Tandy UK, Tandy Centre, Leamore Lane, Bloxwich, Walsall, West Midlands. WS2 7PS

Catalogues

Five new catalogues have reached us this month: Cirkit, Greenweld, IQD, Maplin and STC.

Cirkit have a competition in their new release, the prize being a 600MHz frequency counter. As always there are plenty of new products, such as a 14MHz direct conversion receiver kit complete with case and a Seno Workstation for p.c.b. prototyping without the mess. The new catalogue costs £1.20 and contains discount vouchers for their products.

Cirkit Distribution Ltd.,
Park Lane,
Brockbourne,
Herts EN10 7NQ.

Greenweld have their 1988 electronics component and equipment catalogue out now. They accept a wide range of payment, too: Cheques and Access, but for small amounts, stamps, postal orders, money orders, cash including foreign currency banknotes or book tokens. So I think everyone should be able to find a suitable method of payment. The catalogue costs £1 inc. postage from: **Greenweld,**
443B Millbrook Road,
Southampton SO1 0HX.

The 1988 Maplin catalogue seems heavier than ever. There is a new section on radio control and they have extended the section on

communications. The catalogue is again available from W. H. Smith and Maplin Electronic Supplies Ltd. for £1.60
Maplin Electronic Supplies Ltd.,
PO Box 3,
Rayleigh,
Essex SS6 8LR.

IQD have just published the 200-page 1987/88 edition of their crystal catalogue.

Nearly half the pages are dedicated to new products and there is a much larger range of surface mount and MIL specification products.

The application and technical notes, which have been expanded, feature detailed copy and diagrams on the use of crystals,

miniature quartz resonators, oscillators and SAW filters in electronic circuits.

IQD Ltd.,
North Street,
Crewkerne,
Somerset TA18 7AR.

We don't normally mention catalogues for companies such as STC, but there are some very interesting pieces of equipment available this year. You can order quite easily from them these days, too, with a credit card, using their order telephone number. You can find out more about the catalogue from:

STC Instrument Services,
Dewar House,
Central Road,
Harlow,
Essex CM20 2TA.

Desk-Top Chargers

Ray Withers Communications Ltd have a range of cost-effective replacement NiCad battery packs, empty cell cases and desk-top chargers for the Icom, Kenpro and CTE range of handheld transceivers.

The new Raycom NC580 desk-top charger has been



designed to charge all Icom type NiCad packs over 400mAh capacity. It has

two switchable charging rates available as standard.

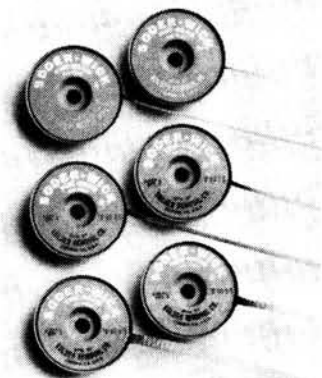
The empty cell cases have a capacity of up to ten AA/HP7 size cells.

Due to business expansion, Ray Withers Communications Ltd is moving to larger premises at **International House, 963 Wolverhampton Street, Oldbury, Warley, West Midlands B69 4RL.** Their

new telephone number has six lines and is 021-544 6767.

The company will be amalgamated with Raycom Ltd and will be trading under that name. The new location is a few hundred metres from Junction 2 of the M5 on the main Birmingham to Wolverhampton road. There is ample parking for up to 50 cars too.

Anti-Static Braid



Adcola have now got anti-static de-soldering braid in their range of products. The anti-static reels supply the braid in handy lengths of 1500mm or 30m on standard reels.

The range of sizes is from 1.5 to 2.8mm width.
Adcola Products Ltd.,
Adcola House,
Gauden Road,
London SW4 6LH.

The FT-712RH

This rig arrived fresh from Japan when it accompanied two Japanese gentlemen who visited the Leicester show to see SMC.

It has the serial number of 00001—so you can see it was quite new! They brought the 430MHz version to the show, but apparently the 144MHz version (the FT-212RH) will be available later.

It's a small rig, approximately the size of an IC-28E, but it has this huge heatsink on the back of the set. That's needed, too, as the rig has an output of 45W. It has all the usual features, plus some very

unusual ones too. There is an in-built voice memory, and that's not a speech synthesiser. This stores your voice in up to four of its memory channels. There are four sampling rates, the slowest of which provides three minutes of recording times — eat your heart out CQ loops!

The recording facility can also be used to record incoming signals too. Anyone with a d.t.m.f. mic can call your "selcal" number and leave a message of up to three minutes in their own voice on your rig—just like an answering machine.

You can always get more details about this rig from: **South Midlands Comms Ltd.,**
SM House,
School Close,
Chandler's Ford Ind. Est.,
Eastleigh,
Hants SO5 3BY.



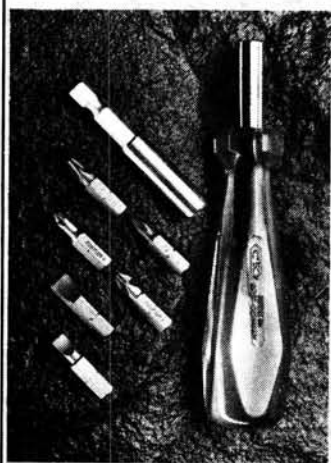
Screwdrivers

Ceka have a "pocket-sized" screwdriver that could be very useful when you don't want to have a heavy tool box with you.

There is a common holder which accepts a selection of magnetic slotted, recessed and Supa/Posidriv bits. Apparently they only take a matter of seconds to change over, too.

All the bits have a $\frac{1}{4}$ in hexagon shaft and are manufactured from hardened steel. A Bits Box, which holds six bits together with the adaptor, is also available.

The Magnetic holder drivers cost £6.60, the Bits Box £8.25 and the blister packed pair of bits £2.26. These should be available from hardware stores.



Welsh Awards

Since mentioning the Carmarthen Clubs award, which was assumed to be the first covering all of Wales, we have heard from the TOPS CW Club. They started issuing their "Worked All Welsh Counties" award in 1956 to celebrate their 10th Anniversary.

For this award you need one contact in each of the 13 old Welsh counties. Claims can be all phone or all c.w. but not mixed. Since only 13 contacts are necessary, QSL proof is deemed not unreasonable.

Many thanks to J. P. Evans GW8WJ, the Hon Sec of the TOPS CW Club, for bringing this to our attention.

The certificate shown is a copy of the one issued to the late David Butler G13JEX.



PSUs

South Midlands Communications have introduced three new models to their range of 13.8V d.c. power supplies. The p.s.u.s have line regulation of less than 1 per cent and r.m.s. ripple of just 2mV.

The smallest unit, the RU120406, is designed for a constant 4A, but will provide a surge to 6A. The

RS120810 is suitable for up to 8A constant and 10A surge. It also has over-voltage protection—very useful when you have expensive equipment on the end of it.

The SS122535 is 25A constant and 35A surge. This unit not only has over-voltage protection but also has a pair of terminals for remote voltage sensing. This allows the power

supply to adjust and maintain the constant voltage at load.

More details are available from:

SMC Ltd.,
SM House,
School Close,
Chandler's Ford Ind. Est.,
Eastleigh,
Hants SO5 3BY.
Tel: 0703 255111.

THE 91ST LEICESTER SCOUTS A.R.C.

AWARDED to _____ for _____ confirmed contacts/reports
with UK Special Event Stations, dated _____

150	200	250	300	350	400	450	500
-----	-----	-----	-----	-----	-----	-----	-----

The GB Award

This award is available to licensed amateurs, clubs and s.w.l.s. (on a heard basis). It is for confirmed contacts/s.w.l. reports with UK Special Event Stations GB prefixes (including GE, GV and GK prefixes).

Extracts from the log, signed by two local amateurs or a club official need only be submitted, but all contacts must be confirmed.

A fee of £1.50, \$3US or eight IRCs complete with the log extract should be sent to:

91st Leicester Scouts
ARC.,
c/o M.J. Harriman G4SJJ,
PO Box 49,
Leicester,
England.

The basic award is for 100 confirmed contacts/s.w.l. reports with UK special event stations. There are no band or mode restrictions.

Further stickers are available for quantity endorsements:
150/200/250/300/350/
400/450 and 500 at a cost of 50p per request, not sticker (maximum of three stickers per 50p).

Clamp-On Tester

TMK have introduced a second clip-on ammeter to their range. The SK-8100 has a 0–1000A current measuring capability with large 52mm jaws.

Other features are rotary current, voltage and ohms scales. There is also a pointer lock facility so you can lock the needle before moving the meter to see the reading more clearly.

The SK-8100 is priced at £75.75 plus VAT. For more details:

Harris Electronics (London)
Ltd.,
138 Grays Inn Road,
London WC1X 8AX.



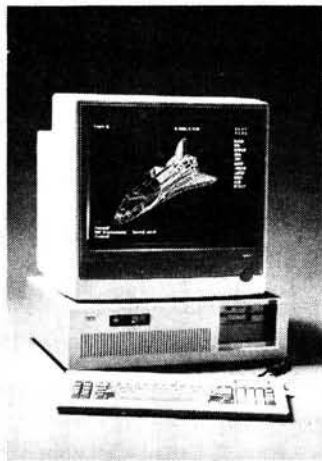
19in Colour Monitor

Northamber have added the Aydin Controls "Enhancer", a 19in colour monitor, to their range of products.

It is a self-adjusting monitor and is fitted with a high contrast, anti-reflect screen.

The photograph shows the Aydin Enhancer in use with an IBM PC AT running Autocad.

**Northamber plc.,
Lion Park Avenue,
Chessington,
Surrey KT9 1ST.**



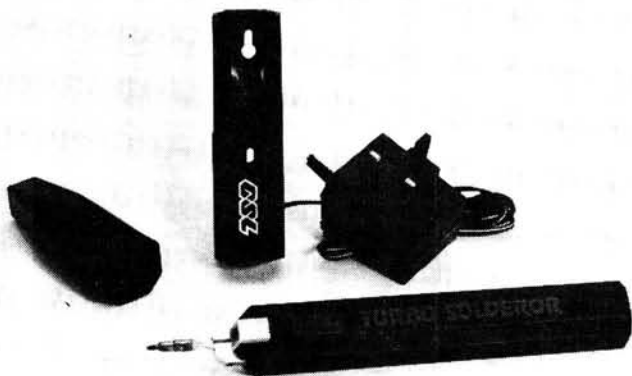
Rechargeable Iron

Cirkit have a rechargeable soldering iron which is ideal for soldering c.m.o.s. and other static sensitive devices and for site work where no mains supply is available.

Rated at 12W with fast warm-up and small 2mm diameter tip, the unit comes

complete with wall mounted mains charger and a 12V car charging lead which is connected via a vehicle's cigarette lighter. Up to 200 standard joints can be made from one charge of 12 hours.

**Cirkit Holdings PLC,
Park Lane,
Boxbourne,
Herts EN10 7NQ.**



Can You Help?

A reader has acquired a TR-2100 made by the Totsuko Corporation. It is a 144MHz s.s.b. and c.w. rig. Does anyone have an instruction booklet for this rig? If so, please contact: J.M. Jaffrey GM1VVV, 3 East Lodge Cottages, Ladykirk, Nr Berwick-upon-Tweed, Berwickshire TD15 1SU.

Does anyone have circuit diagrams or other literature for the Yaesu FR-100B receiver and FT-200B transmitter units? This is wanted by the Pembrokeshire Radio Society. If you can help, contact Brian GW0IER on (06462) 2825.

Mike Drew has recently obtained an FT-75B, crystal controlled h.f. transceiver. Has anyone got any information on the v.f.o. unit? He thinks it originally came as an optional extra for the unit. If you can help then ring him on (097888) 621.

Another recent purchase is an Ex-Admiralty receiver made by Murphy, type 62B,

it looks like the B40, but this one has suffered much abuse. Can anyone suggest where a valve layout plan and a circuit diagram may be found for this receiver? If you can help, write to R.H. Forsted, "Iona", Gelt Road, Brampton, Cumbria CA8 1QH.

Is there anyone who has or who has had a Trio 9R59DS communications receiver? A reader is trying to find the valve number for the rectifier. Any other data on this receiver would also be welcomed. If you can help, write to: Alexander Wilkinson, 7E Melvaig Place, Wyndford, Glasgow G20 8EY.

We've had a camping club contact us, they have a disco unit that is in need of repair, but can't find a service sheet for it. It's a Saxon Centaur Integrated Stereo Roadshow, Centaur Mk3 1552 D8821. If you can help, contact A.F. Mortimer, 72 Raynham Road, Bury St Edmunds, Suffolk IP32 6ED.

Southern 10m FM Group

I've received another multi-coloured newsletter from the group. They are enthusiastic users of the 28MHz band with particular interest in mobile, portable and fixed station operation on f.m.

The main objective of the group is to keep the band in use during sunspot minimum by publishing a newsletter to act as a focus for

information about 10m.

Activity on f.m. centres around 29.6MHz, the international calling frequency, with channelised 10kHz steps between 29.550 and 29.690MHz.

Membership is £3 per year to cover postage and printing costs. Write to: **Southern 10m FM Group, B. Sharp G0DWZ, 9 Highlands Road, Portslade, Sussex BN4 2BN.**

Broadcasting Services

Following the recent seminar on broadcasting, the DTI and the Home Office announced that the Government have decided to commission feasibility studies into the technical and financial prospects for both multi-point video distribution system (MVDS) and a fifth terrestrial u.h.f. television channel.

The Government will not be reaching decisions without first considering carefully the possible impact on existing and prospective services, including the terrestrial broadcasters, DBS and cable.

Digital Timer

A clock and timer are always useful in the shack, amongst other places. Cobonic Ltd. have a very neat timer, the ECT-1, which incorporates a stopwatch, a countdown/alarm/countup timer and a clock.

The timer has a memory and does not need to be keyed in again for repetitive identical timer settings.

The clip on the back of the timer will fix it almost anywhere. It is magnetic, spring-loaded and can be used as a stand.

**Cobonic Ltd.,
32 Ludlow Road,
Guildford,
Surrey GU2 5NW.**



Kent Repeater Group

At the recent AGM, Kelvin Fay G0AMZ was elected as the new secretary. He says that the group was formed in 1974 and at present supports 7 repeaters: GB3KN and KS on 144MHz, GB3CK, EK, NK, SK and RE on 430MHz, and the latest repeater GB3RE.

The repeater (GB3RE) was commissioned early in July and covers the Medway Towns on RB11 from a site at Chattenden.

Kelvin also mentions that the group is happy to give lectures to local clubs. Anyone interested should contact Kelvin direct on 0634 376991.

PRACTICAL WIRELESS 144 MHz QRP CONTEST 1988

The date of this event has now been fixed, and is:
Sunday, 12th June 1988
0900-1700 GMT

Further details and full rules will appear in a future issue of *Practical Wireless*

Rally Calendar

January 31: The Northern Amateur Radio Societies Association are holding their Belle Vue/Norbreck Radio Rally at the Norbreck Castle Hotel Exhibition Centre, Queens Promenade, North Shore Blackpool. Doors open 11am. There will be plenty of traders, a bring and buy, RSGB Morse tests, free car parking, talk-in on S22 and SU8 and admission is £1 (OAPs 50p, under 14s free). More details from **Peter Denton G6CGF on 051-630 5790.**

March 13: The Bury Radio Society are holding their 1988 rally at a new, bigger and better venue. That will be the Castle Leisure Centre, Bolton Street, Bury. There will be the usual large number of stands, a large bring and buy, displays as well as talk-in on S22. There

IRTS AGM

The AGM of the Irish Radio Transmitters Society was held recently in the Limerick Inn Hotel, Co. Clare. In his report to members, the outgoing president, Mike Staunton EI3DY, has some good news for EI amateurs. The Irish Department of Communications have granted permission for B licensees to use c.w. and RTTY on the v.h.f. bands.

Further good news was that the Amateur Radio Emergency Network has

also been given full approval. The photograph shows the outgoing

president (left) and Willie Barron EI6BUB, the new president.



The MN21 Battery

Duracell Batteries Ltd., now have a compact, high voltage battery.

The MN21 has a nominal voltage of 12V and yet measures only 10mm in diameter and 28mm long. It weighs only 4.6g. The nominal service capacity to 7.2V is 28mAh.

The MN21 uses Alkaline Manganese Dioxide technology and has a shelf life in excess of 18 months.

For further information regarding Duracell products and the company's free Battery Advisory Service, please contact

**John Bellamy,
Duracell Technical
Division,
Duracell House,
Church Road,
Lowfield Heath,
Crawley,
West Sussex RH11 0PQ.**

is ample space for parking and refreshments will be available.

March 20: The Tiverton SW Radio Club are holding The Mid-Devon Rally at the Pannier Market, Tiverton. There is easy access from junction 27 of the M4 and excellent parking facilities on site. There will be two halls of trade stands, a bring and buy and a mobile snack bar. Talk-in will be on S22. More from G4TSW, Mid-Devon Rally, PO Box 3, Tiverton.

May 29: The Plymouth Radio Club's Mobile Rally will be held at Plymstock School, Church Road, Plymstock. Doors open 10am. There is a large free car park, refreshments, raffle, the usual trade stands, demonstrations and talk-in on S22. Full details from **Joe G1RXR on (0752) 662511.**

June 12: The Royal Naval

ARS have announced the date of their Mercury rally. The venue, as always, is HMS Mercury, near Petersfield, Hampshire. Gates are open between 1000 and 1700. More details from C. G. Harper G4UJR. Tel: 0703 557469.

July 15-17: The RSGB 75th Anniversary National Convention will take place at the National Exhibition Centre, Birmingham. RSGB HQ can give you more details.

July 28-31: The AMSAT-UK Colloquium will again be held in the University of Surrey, Guildford. Details from G3AAJ on 01-989 6741.

August 14: The 1988 Derby Mobile Rally will take place at the usual venue of Lower Bemrose School, St Albans Road, Derby. Doors open 11am. More details from G3KQF, QTHR.

144 to 50MHz

C. M. Howes have introduced a ready-made 144 to 50MHz transverter into their product range. It has a 10W r.f. output and will accept between 1 and 5W of drive as

standard—there is also a 5-10W option.

Other features include s.w.r. and reverse polarity protection circuits, p.t.t. and r.f. VOX change-over and very low harmonic and local oscillator radiation levels.

An operator's handbook

is supplied complete with block and circuit diagrams in addition to the operating and installation instructions.

The HC266 costs £179.90 including P&P and VAT.

For more details on this and other products, contact:

**C. M. Howes
Communications,
Eydon,
Daventry,
Northants
NN11 6PT.
Tel: (0327) 60178.
Note the new address
please.**



HF 125 SHORT WAVE RECEIVER

The HF-125 short wave receiver was conceived, designed and is "Made in Britain" for the DX enthusiast. Its ability to perform on a crowded band with strong adjacent stations was a major consideration in its design. The HF-125 is also easy to use, the controls being simple and sensible. Essential bandwidth filters which are often options on other equipment are fitted as standard. Unnecessary frills are not included and their omission is deliberate. The result is an affordable receiver.

The HF-125 has continuous coverage from 30 kHz to 30 MHz. Operating modes are AM, USB, LSB and CW. An optional board (D-125) adds FM and synchronous AM. Unlike other receivers, the HF-125 comes complete with a comprehensive range of bandwidths; a 2.5 kHz filter for SSB transmissions or for resolving an AM station using SSB mode and ECSS technique (exalted carrier, selectable side band), a 4 kHz, 7 kHz or 10 kHz filter for AM reception, the width chosen dependent on the signal and band conditions (10 kHz for BBC Radio 4, 7 kHz for Vatican Radio on 6185 kHz and 4 kHz to resolve a signal when conditions are not ideal). For the CW enthusiast a 400Hz audio filter is included as standard.

Operating the HF-125 is refreshingly simple. The controls are logical in use and a large back-lit liquid crystal clearly displays the operating frequency.

Two buttons, one marked up, the other down, select the correct megahertz and you tune to the required frequency using a large heavy knob with a thoughtfully provided finger recess. The tuning rates relate to a simple design concept of two stations per knob revolution on each mode. As well as providing the optimum tuning rate whilst you are carefully looking for a weak signal, the HF-125 automatically increases its stepping increment as the knob rotation speed increases. The result is an extra rapid frequency shift to a new part of the band. There is also an optional

keypad controller (K-125) for even quicker frequency selection.

To further enhance reception other facilities are included. A noise blanker is permanently in circuit to deal with vehicle ignition interference, 20 dB of attenuation can be switched in when required and an HF or LF cut tone control can be applied to the audio output.

Although memory facilities are not essential in a short wave receiver they are useful. The HF-125 has 30 memories which are available in two banks of fifteen.

The HF125 provides its owner with outstanding performance. Typical values for frequencies greater than 500 kHz are a sensitivity on SSB of 0.3 uV for 10 dB S/N and on AM, 0.7 uV for 10 dB S/N at 70% modulation. Dynamic range is greater than 90 dB at 50 kHz from the tuned frequency (both IMD and RM) and image and spurious responses have a greater than 80 dB rejection.

Connections are included for both 50 and 600 ohm impedance aerials (SO-239 and a terminal block). The receiver has a 6mm jack socket for headphones on the front panel and two 3.5mm sockets on the rear panel, one for an external loudspeaker and the other for tape recording.

The HF-125 operates from 12 volts DC and, as such, is suitable for use from an external battery whilst caravanning or boating. For home use an AC mains adapter is supplied with the receiver. For truly portable listening, in the garden or on a hilltop, an internal rechargeable battery, charger and active whip aerial option (P-125) is available as well as a tough protective carrying case with shoulder strap (C125). Operation on a fully charged Nicad pack is around 10 hours.

Compact and lightweight, the HF-125 is 255mm wide, 100mm high and 200mm deep, a portable high performance short wave receiver.

HF125	£375.00 inc VAT, carriage £8.00
D125	£59.80 inc VAT, carriage £1.00
K125	£59.80 inc VAT, carriage £1.00
P125	£69.81 inc VAT, carriage £2.50
C125	£23.85 inc VAT, carriage £2.50

1300HC frequency counter

Small enough to fit into a shirt pocket, the 1300HC frequency counter brings easy and accurate frequency measurement well within everyone's reach.

The 1300HC uses a full 8 digit display, and measures to 1300 MHz, thus being ideal for amateur as well as all mobile radio bands including cellular.

The unit contains its own rechargeable NiCd battery pack which is charged from an external supply. The frequency counter can also be powered from any 9 to 12 volt dc supply, which charges the batteries as well.

The 1300HC has excellent sensitivity, and when used with the optional telescopic whip, easily measures transmitter frequencies of mobile or handheld transceivers, even low powered "bug" devices. When used in conjunction with a simple "dip oscillator", the 1300HC makes checking tuned circuit or aerial resonance an easy task.

The high performance of the 1300HC frequency counter makes it an indispensable tool for every amateur, engineer or technician. Its small size makes it suitable for either shack or "on the move" use.

SPECIFICATION

Range	1-1300 MHz
Resolution	100 Hz at 2.5 sec gate 1 kHz at 250 mS gate
Display	8 digit 0.3 LED MHz decimal point Leading zero blanking
Gate times	Fast: 250 mS Slow: 2.5 S
Sensitivity (typical)	1-10 MHz: 10-150 mV rms 10-1000 MHz: 3-50 mV rms 1-13 GHz: 10-150 mV rms
Accuracy (typical)	±1 ppm, ±1 count LSD
Aging	0.1 ppm/month (typical)
Gate indication	Red LED during sampling
Input connector	BNC
Input power	9-12 Vdc at 150 mA
Power connector	Concentric Centre positive
Case	Brushed anodised aluminium
Size	3.9H x 3.5W x 1D (inches)
Weight	255 g
Power supply	Internal NiCd pack (supplied) or external dc source (option)

1300HC... Handheld frequency counter
£135.00 inc VAT, carriage £2.00

OPTIONS

PS12... AC mains power supply	£6.50 inc VAT, carriage £2.00
ENC... Telescopic whip	£7.46 inc VAT, carriage £0.50
CC12... Padded carrying case	£9.90 inc VAT, carriage £1.00



Kantronics packet radio

When I first heard of packet radio, I said "What?", and that is the reaction of many radio amateurs. However, I never expected it to be so much fun, and judging by the demand and the queue to get at our demonstration station here at Matlock, a lot of other people are also finding it truly fascinating.

There are several companies offering ready made packet systems, and the descriptions are usually full of terms you don't understand (including some of our own ads in the past). What for example is "enhanced generic command structure"? Sounds very much like something taught at Sandhurst or West Point.

From the equipment available, we chose to represent Kantronics, because their units are sheer delight to see, to use, and to enjoy. For full information on this most interesting aspect of our hobby, just send a couple of first class stamps and ask for "Kantronics".

Prices range from £159 to £298, and I know I haven't told you what packet radio will do - send for the info...



Glasgow: 4/5 Queen Margaret Road.

Tel. 041-945 2626.

Cardiff: c/o South Wales Carpets, Clifton Street.

Tel. 0222 464154.

Darlington: 56 North Road.

Tel. 0325 486121.

London: 223/225 Field End Road, Eastcote, Middlesex.

Tel. 01-429 3256.

Cambridge: 162 High Street, Chesterton.

Tel. 0223 311230.

Bournemouth: 27 Gillam Road, Northbourne.

Tel. 0202 577760.

Note. All our shops open Tuesday to Saturday inclusive.



The TS140S from Kenwood

Every once in a while, something comes along which marks a true turning point in amateur radio equipment. Such was the case when **Trio-Kenwood** introduced the **TS120 series**; the first of the small solid state transceivers to appear.

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

Study of recent reviews of equipment which has been introduced to try to match **Kenwood's TS940S** reveals just how far behind some manufacturers have fallen: I am reminded of some lines from Kipling which run (more or less): "They stole everything I had, but they couldn't steal my mind, So I left them sweating and stealing. A year and a half behind."

Well, the chaps at Kenwood have not been asleep, and they have come up with a new transceiver which I believe will mark another turning point in HF equipment. This is the **TS140S**, and I can tell you that from a short "hands-on" session which I was given in Germany recently, I am certain that the **TS140S** will satisfy many many users.

The new **TS140S** is about the same size as the **TS430** or **TS440**, and on the face of it is similar (yawn) to other transceivers of the genre in that it gives you 100 Watts of RF on all the amateur bands, in

all modes including FM; has a general coverage receiver covering 500 kHz to 30 MHz; and has loads of facilities that you might expect – BUT – Kenwood have studied what the radio amateur has been saying and have refined and simplified the operation of the **TS140S** to make it a real dream to use.

Not only that, they have given the user a receiver section with real performance which matches today's expectations, and remember that Kenwood have consistently set the standards for the last few years.

Obviously it is impossible to describe all the features and facilities of the TS140S in a few paragraphs, so why not drop us a line and ask for complete information. What's that? Oh, the price. Not yet finally determined, but quite a bit less than £950 but not quite as low as the £750 we have been asking for the TS530S and TS430S in recent weeks.

In my opinion, the **TS140S** in combining performance with simplicity at an attractive cost will give real satisfaction to the radio amateur who wants to enjoy his hobby of communicating, rather than counting the buttons on the front panel. And who am I to make this pronouncement? Well, I'm John Wilson and I am one of the original gang of three which became Lowe Electronics Ltd. I haven't written for the magazines for many years, but the **TS140S** really attracted me so I thought I should tell you about it rather than bore you with a specification. Hope you like it too.

73, G3PCY/SN2AAC

LOWE ELECTRONICS LTD.

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



YOUR ONE SOURCE FOR RADIO

ARROW

THE NAME YOU CAN TRUST FOR PRICE & AFTER SALES SERVICE

**ELECTRONICS
LIMITED**
5, The Street,
Hatfield Peverel,
Chelmsford, Essex

FOR IMMEDIATE DESPATCH
phone with your Access, Eurocard,
Mastercharge or Visa number to
0245 (Chelmsford) 381673 or 381626
Telex 995801 (ref. A5)

ALL THE
TOP BRANDS
AT
UNBEATABLE
PRICES

IT WILL
PAY YOU
TO PAY
US A
VISIT!



YAESU MUSEN



Now available with PLL Modification (filter) at £1449.00

Special package deal bargain - FT23R + Nicad FNB10 + Charger + Case + Belt Clip only £249.00

New model FT736R 2 metre base station with 70cms & 23cms options. Send SAE for details - delivery December.



All discounted prices are cash & carry only - phone for credit/HP quote.

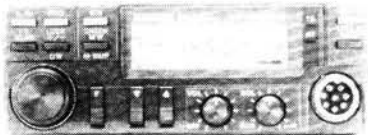


CASH PRICES??
This Advert. is prepared two months before you read it. If anybody else is selling cheaper - just give ARROW a ring (any branch) for our LATEST price!!!

ICOM



R7000 The world's finest scanner - £849.00. Available also complete range of active antennas & discones.



IC-3200 Icom Dual Banders for 2M & 70cm. Built-in duplexer complete package deal with MMB & dual band aerial £515.00.



Icom's famous min H.F. Transceiver package deal with butternut HF6V 6 band vertical rec. Retail value £1108.95.

For only £999.00!!!!

KENWOOD



New mini H.F. Transceiver - Details on request. Send SAE please.



TM221ES new 45 Watt 2M Mobile. "A really lovely radio." Will accept new handset RC10 (now in stock) £307.00 (RC10 extra).



NEW EASY-USE KENWOODS

TH205 £215.26

TH215 £252.13

with free extended range mod. if required (140-150MHz).

COMPLETE RANGES STOCKED OF ALL MAJOR BRANDS

PLEASE SEND S.A.E.
WITH ALL ENQUIRIES

CA-1243E Base Ant. Dual Band 70cm + 23cm £39.83
CA-2X4FX Fiberglass Base Ant. 2M + 70cm £52.50
CA-2X4SUP Dual Band Base 2M + 70 Hi gain £69.00
CA-2X4WX Dual Band Extra High gain 2M + 70 £74.00
CA-2X4Z 2M + 70 Ultra Hi gain Fiberglass Base Ant. £91.90
CA412NN Duplexer 23cm/70 £31.74
CA-ABC21 2M 5/8 Mobile Ant. £24.50
CA-ABC22A Base Ant. 2M 2 x 5/8 Colinear £36.00
CA-ABC23 Base Ant. 2M 3 x 5/8 Colinear £59.50
CA-ABC72 Base Antenna 70cms 2 x 5/8 Colinear £33.00
AC-MS58 Magnetic Mount £18.20
CA-SUS22 Stainless Steel Collin 2M 2 x 5/8 Base £52.50

CA-2X4MINI Miniature Mobile Dual Bander 2 + 70 £15.89
CA-CRD58M Book Mount S/S £14.79
CA-RS2 De-Luxe Gutter Mount £10.65
Full Comet range available, send SAE for price list/Cat.

DAIWA RANGE

MR750E Multitorque Rotator £245.00
MR750PE ditto + preset cont. £278.00
MR300E High Speed VHF rotator £243.00
LMC Lower Mast Clamps £18.00
MR750U Motor unit £75.00
MR300U Fast motor unit £75.00
KS065 Mast Bearing £35.00

(Meters are Crossed needle type)
CN410M 3.5-150Mhz SWR/PWR £58.00
CN460M 140-450Mhz SWR/PWR £62.00
NS448 900-1300Mhz SWR/PWR £86.00
MS660PA 1.8-150Mhz SWR/PEP + RMS & Averaging meter £115.00
30/300/3 kW UN6VN 140-525Mhz (NS660P) £55.00
CNW727 Dual Band Aerial Tuner & SWR/PWR Meter £110.00
PS310M 30 Amp PSU Var. Volts £199.00
PS120XM 3.15v Var 12 Amp PSU £99.00
CL680 Antenna Tuner £99.95
CS401 4 way Antenna Switch £59.50
CS201 2 way Antenna Switch £21.90
CS201G 2 Way Antenna "N" Switch £35.00
CS4 4 Way Ant. Sw. BNC £30.00

BUTTERNUT (USA) ANTENNAS
HF2V 80M + 40M Vertical £139.95
HF6V 6 Band Vertical £154.65
TBR160 Top Band Coil £55.24
STR2 Radial Kit £45.00

SAGANT

SA450 2 way Antenna Switch £210.05
SO-239 Super Rod 2 for 2M BNC £12.95
Super Rod for FT290R £12.95
Super Rod 7 70cms BNC £12.95
BL40X HF Balun £19.50

WELZ - DIAMOND

SP225 HF-6M-2M PWR/SWR Meter £99.95
PEP-Avg £99.95
SP425 2M + 70cm ditto £119.95
SP620 HF + 6M-2M+70cm ditto £109.95
SP825 HF to 1200Mhz with Auto SWR £169.95
RS3050 30 Amp PS 3-15v £159.00
CP5 10-80M vertical with radial kit £195.00
D130N Discone 26-1.3Ghz "N" socket + lead £82.25

ADONIS

AM303G Desk Mic £53.00
AM503G Super directional w.s.p. proc £69.00
FX8 Super directional mobile mic £69.00

ALINCO

ELH230D(II) 2M Linear 3 in 30 outw. pre-amp £89.95
ELH260D 1-5w in up to 60W out with pre-amp £109.00

KENPRO

KR250 VHF Rotator £78.00
KR400 Meter cont +/- 180 deg. £139.00
KR400RC Round Meter 360 deg. £169.00
KR500 Elevation rotator £149.95
KR600RC 360 deg HD rot. £219.00
KP100 Electronic Keyer £109.00

CUT PRICE TONNAS

Complete range is over 125 antennas & accessories. Price list + new Catalogue (Send SAE please)

2 Metre Beams

"N" sockets

9 E1. Yagi £29.75

9 E1. Crossed £54.25

17 E1. Yagi £58.00

70cms Beams

"N" Sockets

9 E1. Yagi £27.00

19 E1. Yagi £32.00

19 E1. Crossed - not "N"

Socket £38.00

21 E1. Yagi £42.00

21 E1. (ATV) £42.50

2M + 70cm £38.00

Combi Yagi

27/28 Mhz

3 E1. Beam £90.00

934 Mhz Beam

13 Element "N" £20.00

Splitters, Couplers, Multi-stacking frames available to order.

SATELLITE TELEVISION

We are one of the UK's most experienced suppliers & installers. Systems from £459.00 to £3500 or more. We can deliver & install throughout UK or Continent. (Other countries subject to special arrangement) SPECIAL EXPORT PRICES MONTHLY DELIVERIES TO E.E.C.

INTEREST FREE FINANCE

Many major items at Recommended Retail Price + carriage, are available on our FREE credit scheme: 20% down Balance over 6 months 1/3rd down Balance over 9 months 50% down Balance over 12 months Competitive Finance available with 10% deposit/Part exchange as deposit - balance over up to four years. Written details on request.

EXPORT?? WHY PAY FULL PRICE IN LONDON?

Special prices AND Tax-free for foreign visitors with free delivery to your London Hotel by our Courier service. (Also Harwich/Felixstowe). Please Telephone 0245 381673 (or 0836 294230 after hours)



ALL MAIL ORDERS TO
CHELMSFORD
OFFICE

Our normal despatch is one or two days (as thousands of satisfied customers will tell you). Subject to manufacturers supplies being available. CARRIAGE FREE on all orders of £300 value and over (UK Mainland only) Access and Barclaycard accepted. Save time-phone over your order with your Access or Barclaycard number.



Only a few showrooms in the U.K. can offer ALL MAJOR BRANDS as FRANCHISED DEALERS. Our main showrooms are only 10 minutes from the M25 Outer London Motorway (Take the A12 dual carriageway - just past Chelmsford) (British Rail Hatfield Peverel 3 mins.) Free car parking Monday to Saturday 9 - 5pm. Closed all day Thursday.

Scottish customers please note our Glasgow branch is moving - you will be advised new address as soon as possible. Meanwhile contact Chelmsford office.

North West Agent - Jim Cook (Wigan) 0942 214969

Leicester Agent Alan Faint (Market Harborough) 0858 62827

North Wales Agent John Lewis (Anglesey) 0248 714657

Dipoles Apart

An interplanetary tale with a down-to-earth message, by R. H. Pearson G4FHU

The oddest thing of all, while they watched the spacecraft land, was that it looked so *ordinary*. In all the hullabaloo of the previous few days since contact was first made by radio, no one had got any inkling of what the craft itself looked like. The TV and press had concentrated entirely on the occupants and were at first rather hoping for spherical green monsters with purple eyes, or something equally newsworthy.

Thus it came as something of a disappointment to learn that the visitors from Mars would be so similar in appearance to ourselves. Yet no one had made the obvious guess that the spacecraft might also look quite conventional to earthbound eyes.

All except for Frank that is, the radio amateur who had first made contact with the Martian ship a week before. Despite, or perhaps because of, the great upheaval in his life—the interminable TV and radio interviews and the clamouring reporters at his front door—he had given the whole matter a great deal of thought (there's nothing that concentrates the mind so keenly as having to answer questions from people who take you seriously!).

So, in his place of honour on the dais at the edge of the airfield runway, Frank had all his faculties sensitively tuned for the landing and was as alert as anyone among the thousands of spectators there and the hundreds of millions watching it on satellite TV.

Nothing seemed particularly remarkable about the spaceship as it came into view. It had familiar aerodynamic shapes suitable for the atmospheric phases of interplanetary flight, and experts in such matters no doubt speculated about the compromises needed for the two very different atmospheres on Mars and Earth. But most saw nothing very surprising; even the rocket motors appeared similar to those on Earth developed from WWII weapons and used on spacecraft ever since.

Frank, though, was especially interested to see what radio antennas were visible, since he himself had experimented with such things for over 30 years. He had already mentioned his enthusiasm over the air to the Martian communications expert on board, Diluna, who was herself a radio amateur.

So he already knew that the skin of the craft concealed both fixed slot antennas and, behind the plastic domes, a couple of quite large parabolics. Overcoming part of the language difficulty (achieved mainly by the makeshift English that the Martians had managed to learn) he had found

out that a few "dipoles" on the outside of the craft were used for specific purposes, but were retracted during entry into an atmosphere until the speed was subsonic. As they appeared, Frank was the only spectator to realise what they were, and many anxiously thought they might be weapons.

He was intrigued by their shapes. Some were very much like the biconical wideband dipoles seen on military installations; others were quite reminiscent of those quaint brass ball-ended affairs that Hertz used in the first radio experiments here. The largest one, mounted at the front, looked like the horns of a dreadful demon or the optical antennae of some fantastic insect.

It was weeks later, when all the fuss was over and the news value had subsided to the occasional and boring chat show appearance, that Frank had his first real chance to talk seriously with Diluna. The conversation went something like this:

Frank: I'm interested to know why all your dipole antennas seem to be thicker at the extremities than at the centre feedpoint (or at least have some kind of what we would call "end loading"). Are they *all* broadband antennas?

Diluna: Well, I've read some of your textbooks and looked at many of your "aerials" (as some of your old folk call them!) and I'm equally puzzled that you rely so much on purely wire or rod elements—in some cases even with the vital outside ends bent **downwards**, towards the earth. Back home on Mars, when we are short of space, we bend

simple wire dipoles **up** at the ends, not down!

Frank: But surely I don't have to tell an expert like you that the main radiation comes from the high current part of the dipole, i.e. near the centre; all our textbooks confirm this—and anyway it's common sense.

Diluna: Earth texts, yes! But on Mars our books emphasise the importance of the high voltage outer ends of the dipole. Surely it's common sense that most of the radiation will take place there.

We can laugh now at this odd chapter of technical radio history, because of course the whole thing was sorted out at the important 1999 conference sponsored by the RSGB, the ARRL and the RSAM (Radio Society of All Mars). There it was realised how a bit of half-understood or misapplied mathematics can cause so much confusion. It so happens that on earth we have good mathematics to deal with a short line of electric current and to sum (integrate) the effects over the whole length of an antenna. Because it offered the simplest mathematical approach our attention had become overconcerned with that aspect. On Mars, however, mathematics developed differently and is simplest when an analysis starts in terms of potential difference rather than current.

On each planet the mathematical tail was wagging the practical dog, so that earthlings regarded the high voltage ends as unimportant and Martians viewed the high current middle as just a nuisance needed only to separate the essential high voltage ends! Everyone knew that an electromagnetic field is not at all biased in its electric and magnetic components—they each husband the same energy and each supports the other—but such thoughts were usually put aside because of the mathematical details which obscured the wood for the trees.

At first the conclusion of the conference were widely misquoted or misunderstood (in some cases deliberately, for commercial and military reasons). On earth, the expensive amateur radio emporia sold "Mardipoles" like hot cakes, and on Mars "Terrapins" were all the rage.

But in the end, as all technically experienced readers will know, sense prevailed and the jointly designed "Emtenna" became the standard for the whole solar system. It's beautiful shape, seen on every roof, is now so familiar to absolutely everyone that there is of course no need to describe it here!



... Seen on every roof

The PW "Otter" 50MHz Receiver

This little receiver, designed by Mike Rowe G8JVE, is capable of excellent results; during the last Sporadic-E season it yielded signals from LA, VE, W, and all at good signal strength.

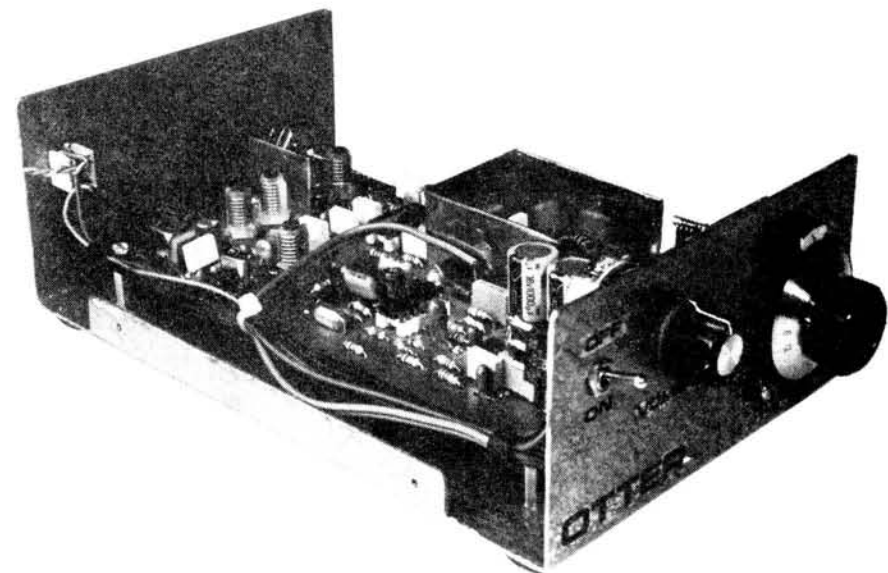
The design of this receiver is slightly unorthodox and is best described as a 50MHz crystal controlled converter feeding a 10.7MHz direct conversion receiver. Thus it has all the convenience of a simple receiver with regard to alignment, combined with the sensitivity and performance of a more complex design.

The entire receiver is constructed on one double-sided p.c.b. with only the tuning capacitor, volume control and on/off switch mounted off the board, on the chassis. The receiver may be mounted in any screened enclosure, the prototype was housed in a home-made, two-part aluminium box.

Circuit Description

Transistors Tr1 and Tr2 are both dual gate m.o.s.f.e.t.s type 3N201. Transistor Tr1 is configured as a 50MHz amplifier, and Tr2 as a mixer. Signals from the antenna socket are matched to Tr1 via a single turn of insulated wire, loosely wound on top of L2, a standard S18 Toko inductor. The output of Tr1 is coupled to the mixer stage Tr2, by a band-pass filter arrangement constructed around a further two pre-wound S18 inductors. The signal frequency is fed in on gate 1 of Tr2, while its second gate is used to set the d.c. condition of the mixer, in addition to being the local oscillator injection port. The mixer output is coupled to the next section of the receiver via T1, a 10.7MHz i.f. transformer.

The receiver's first local oscillator frequency is 39.8MHz. This is provided by Tr6 and its associated circuitry. Together they form a third overtone crystal oscillator, the output of which is capacitively coupled to the second gate of mixer Tr2. This choice of local oscillator frequency will provide an i.f. output in the range 10.2 to 11.2MHz, with the receiver covering 50–51MHz. Unfortunately, the bandwidth of a standard 10.7MHz i.f. transformer is far too narrow to accept frequencies in the range of 10.2 to 11.2MHz, so in order to modify the bandwidth of T1, the *Q* must be reduced. This is achieved by connecting a 10k Ω resistor across its primary winding, having the effect of broadening the response and



giving the receiver optimum performance around the six metre calling frequency 50.2MHz, where most of the activity takes place.

The second section of the receiver takes the less familiar form of a direct conversion receiver with IC1 as its mixer. The oscillator feeding the mixer is a Vackar type and was chosen for its good stability. It consists of Tr5 and its associated components. Transistors Tr4 and Tr3 form a buffer amplifier which isolates the oscillator from the mixer. The oscillator runs from 10.2MHz to approximately 11.2MHz. This signal beats with the incoming signal from T1 and the resultant audio signal is extracted from Pin 12 of IC1. Here any residual r.f. is filtered by C14, R29 and C27.

The audio signal is then fed through the first of the two volume controls which are ganged together. The reason for using a double-ganged volume control is two-fold. First it prevents strong signals from overloading IC2a, as would be the case if the gain were only controlled by R30b. The second reason for this arrangement is that it improves the signal to noise performance of the receiver. If the gain were to be controlled by R30a alone, the noise in the succeeding stages would be present all the time making strong signals as noisy as weak ones.

Operational amplifier IC2a acts as a

linear amplifier whilst IC2b and IC2c are configured as low-pass filters with a cut-off frequency of approximately 2kHz. The last operational amplifier IC2d is again used as a linear amplifier but with the addition of D2 and D3 connected in anti-parallel across its feedback resistor. This has the effect of clipping the signal to a set level, helping to reduce the car ignition noise which is prevalent on 50MHz. Integrated circuit IC3 provides further amplification to loudspeaker level.

Construction

First, wind inductor L5 which consists of 36 turns of 24 s.w.g. enamelled copper wire, closely wound in a single layer on a T50-6 ferrite ring. After winding the coil, tin the two ends and space them sufficiently to fit into the p.c.b.

Next, fit suitable i.c. sockets into the p.c.b. where IC1 and IC2 are to be located. Then fit Veropins for off-board connections as indicated in Fig. 2. Following this, insert wire links into the through-board earth-plane connection points. All through-board connections are shown as encircled crosses. After inserting the wire links solder them both sides and crop any surplus wire close to the p.c.b.

There are some points on the p.c.b. that use component legs to gain

Practical Wireless, January 1988

through-board earth connections; these are pins 3-5, 7, 10-12 of IC3 and one leg of C7.

Now insert and solder all the resistors and capacitors with the exception of the electrolytic and tantalum capacitors. Next fit all the diodes taking care over their polarity. Following this fit IC3, observing its orientation, remembering that pins 3-5, 7, 10-12 are also soldered to the earth plane. Next insert all the electrolytic and tantalum capacitors, again observing their polarity. Note that many of the components have one leg soldered to the upper "earthy" side of the p.c.b. Before insertion into the board, care should be taken to bend these component leads outwards using fine-nosed pliers, in order to avoid component damage.

Now fit inductor L2 and wind a single turn of insulated wire around its circumference to form L1. Following on, insert L3, L4, L5, L6 and then T1. Note the screening can pins of T1 are soldered both sides of the p.c.b. Finally solder in all the transistors again taking care over their orientation, while making sure that FB1 and FB2 are fitted to the correct leads of Tr1 and Tr2.

Insert IC1 and IC2 into their sockets and then fit the two screens shown in Fig. 2. These can be fabricated from scraps of double-sided p.c.b. material or tinfoil salvaged from used food cans. Prepare and fit a short length of miniature coaxial cable where indicated on the underside of the p.c.b. Solder the screen of this cable to the pads provided, as these are through-board earthing points.

This now completes the construction of the p.c.b. Finally check the p.c.b. thoroughly for any dry joints or short circuits.

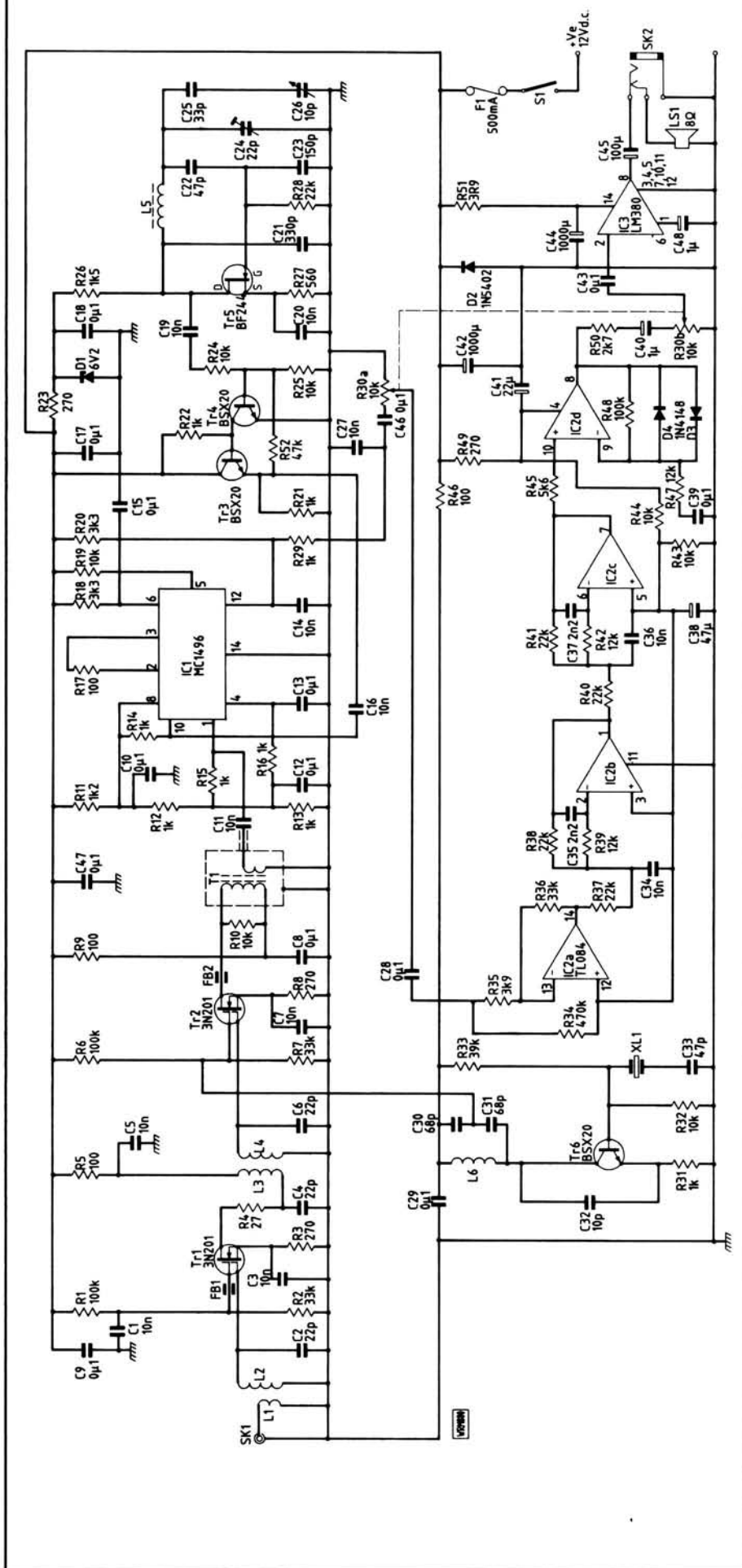
Case Layout

The aluminium case suggested for this project (Maplin AB15) is fabricated in two parts, rather like the one used for the prototype receiver. The bottom half of the case has two panels, one of these should be drilled to accommodate the vernier tuning mechanism, the volume control and the on/off switch. The other end of the case must be drilled to take the 50Ω coaxial socket, power leads, fuse holder and extension speaker socket.

The location of these components and the p.c.b. are shown in the photographs of the prototype. The exact dimensions are not critical, although it should be noted that the p.c.b. is mounted on 12mm 6BA threaded metallic pillars. Once all the components have been fitted to the case, all off-board connections from the p.c.b. can be made. When wiring R30a/b the rear section may be connected using ordinary pvc covered wire, as only short leads are required. The front section, however, must be wired in miniature screened cable because of the relatively long cable run.

Practical Wireless, January 1988

Fig. 1: Circuit diagram of receiver



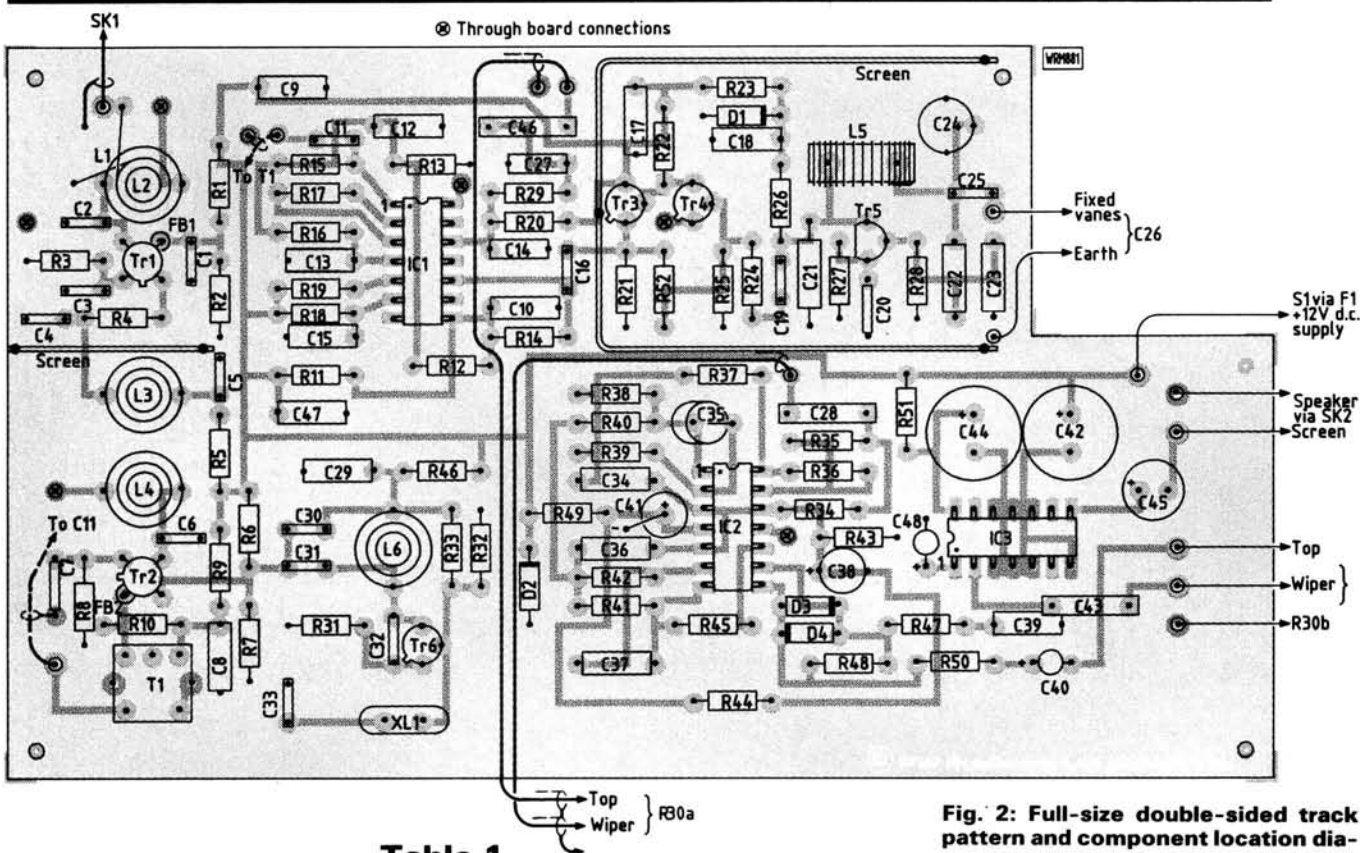
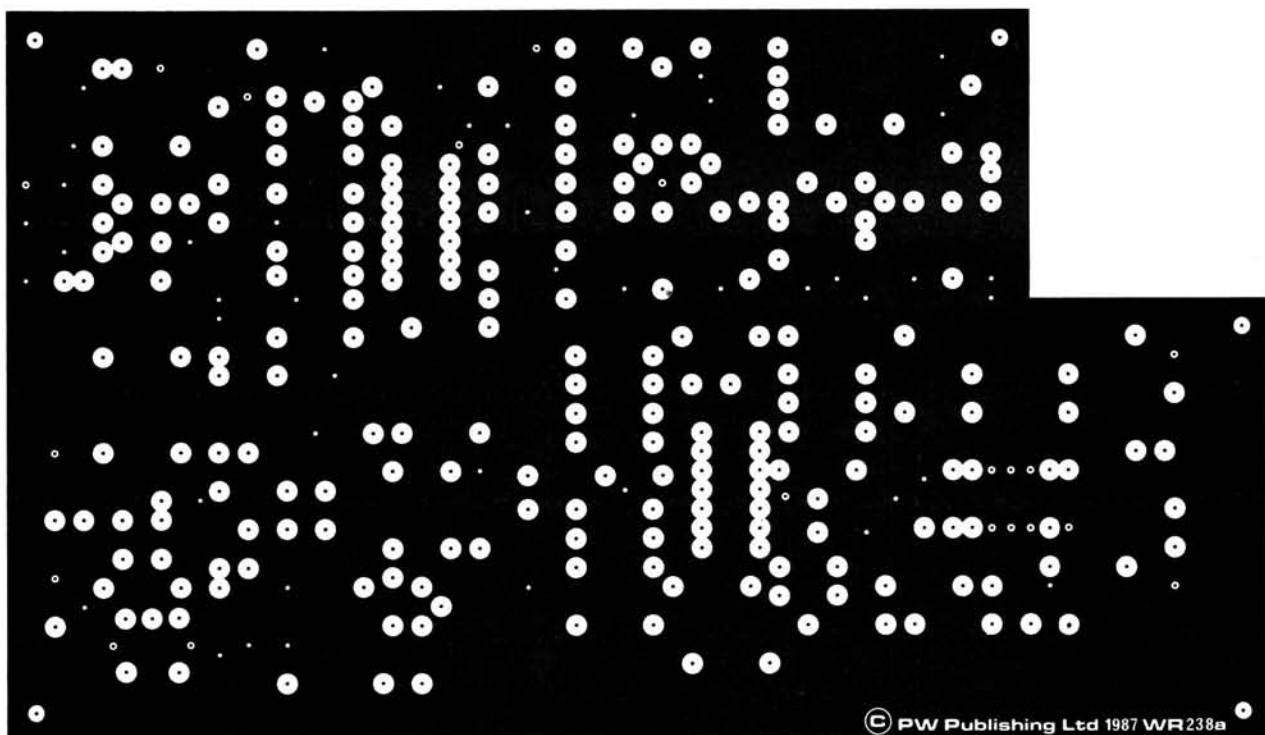


Fig. 2: Full-size double-sided track pattern and component location diagram of receiver

Table 1

Device	Drain	Gate1	Gate2	Source
Tr1	11.5	0	2.9	1
Tr2	11.7	0	2.9	0.9
	Emitter	Base	Collector	
Tr3	2.1	2.8	11.9	
Tr4	6.4	7	12	
Tr6	0	0.7	6.4	
	Drain	Gate	Source	
Tr5	3.6	0	1	

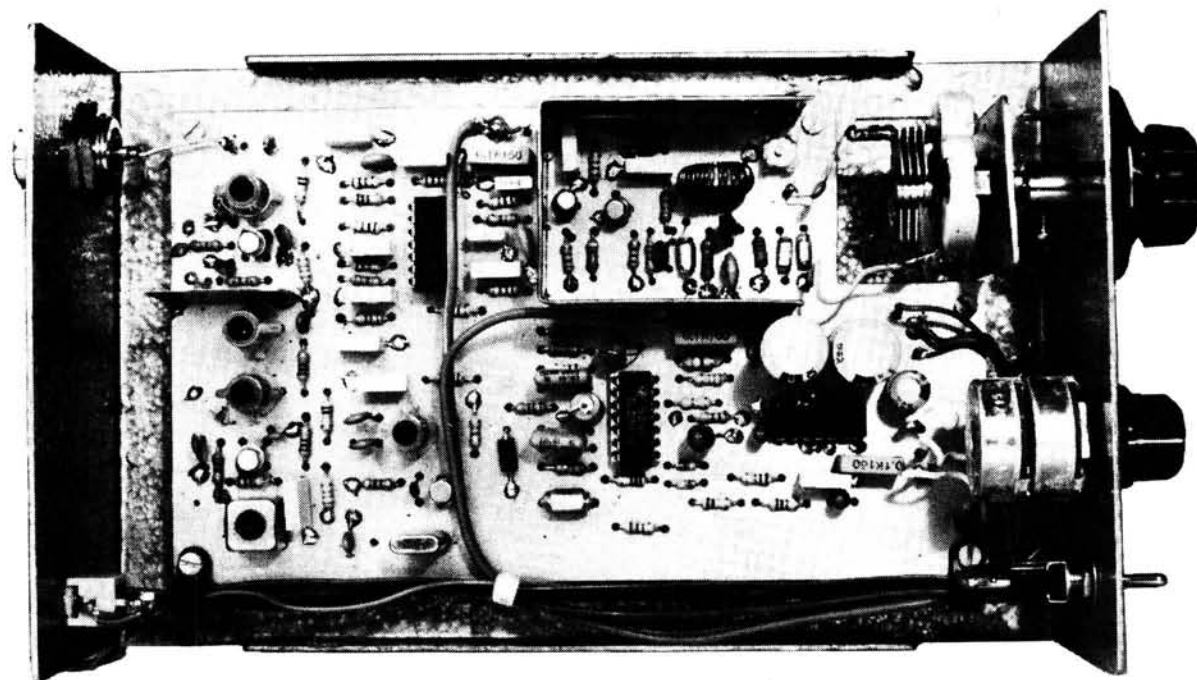
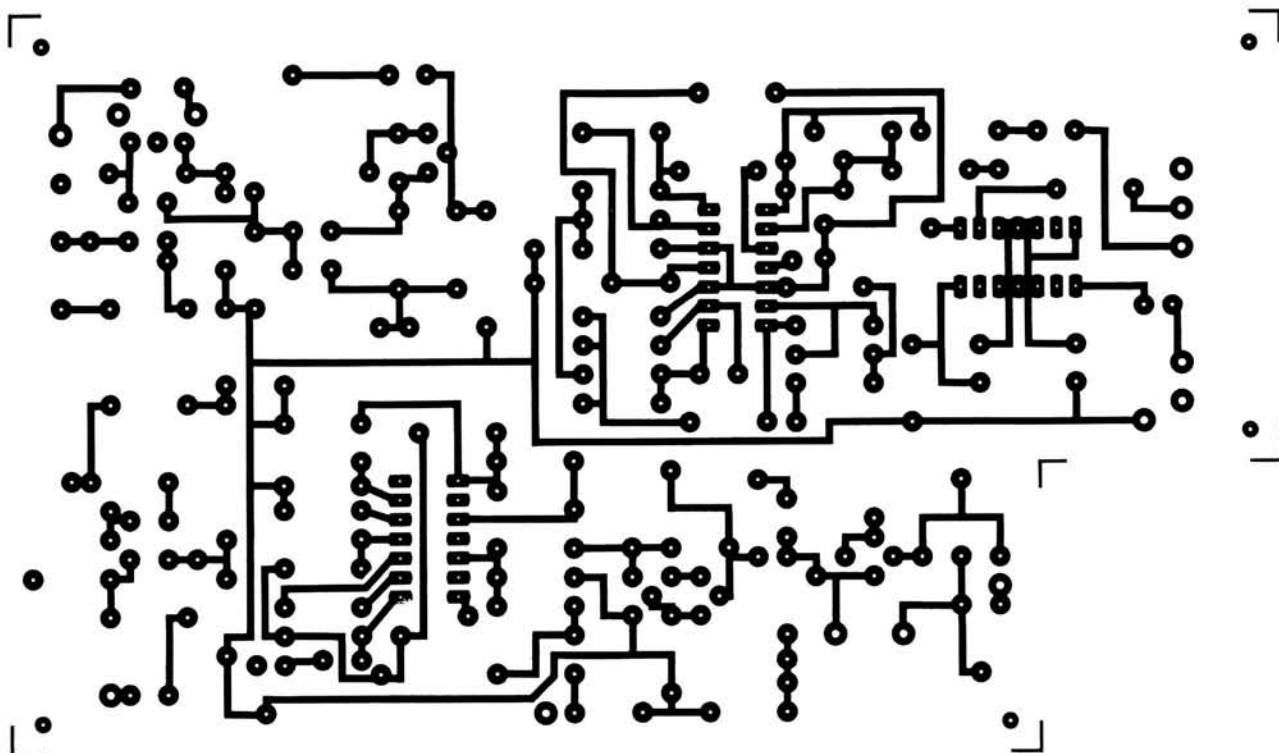
All measurements displayed are in volts

Note that pins 3-5, 7, 10-12 of IC3 and one leg of C7 (coaxial screen connection), are soldered both sides of the p.c.b.

Table 2

Pins	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC1	3.8	3	3	3.8	1.3	8.8	0	7.5	0	7.5	0	8.5	0	0
IC2	4.8	4.8	4.8	9.6	4.8	4.8	4.8	4.8	4.8	4.8	0	4.8	4.8	4.8
IC3	6.2	0	0	0	0	0	0	5.9	0	0	0	0	0	11.9

All measurements displayed are in volts



Internal view of prototype receiver

Alignment

First of all set the volume control to half rotation and the tuning to 70 on the 0-100 dial. Next, unscrew the cores of L2, L3, L4 and L6 so that the tops of their cores are about 2mm above the top of their plastics formers. Leave the core of T1 alone as this is normally preset by the manufacturers.

Apply 12 volts d.c. to the receiver from a well smoothed power supply, switch on, and if all is well a rushing sound should be heard in the loud-speaker. If not, switch off and investigate; if F1 is blown check the set for either a wiring fault or a short circuit on the p.c.b. After the initial switch-on procedure connect a high impedance voltmeter across R32 and adjust L6 for maximum voltage.

Practical Wireless, January 1988

Next connect a frequency counter between pin 10 of IC1 and ground, then adjust C24 to give a counter reading of 10.7MHz.

If a counter is not available hold a domestic v.h.f./f.m. receiver in close proximity to L5 and adjust C24 until the oscillator is heard as a quieting signal. At this point the hiss normally heard on a v.h.f./f.m. receiver when not tuned to a station will disappear. Finally peak L2, L3, L4 and T1 for maximum receiver noise; note the tuning of T1 is fairly flat due to the damping effect of R10.

Operation

Connect a suitable 50MHz antenna to the receiver and signals should now

be heard. Dimensions for a 50MHz antenna can be found on page 41, August 1986 issue of *PW*. Due to the band occupancy of 50MHz in some locations the only reliable source of signals will be beacons, a list of these appear in the front of the latest *RSGB Amateur Radio Call Book*.

Some practice will be needed in tuning the receiver to speech signals, as both sidebands can be tuned through. In effect when tuning through an s.s.b. transmission, two signal peaks will be heard very close together, one will be unintelligible while the other can be resolved to intelligent speech. All that is required is for you to tune to the correct sideband. Due to the fact that the numbers displayed on the vernier

dial are arbitrary, a general rule of thumb can be employed, 0–100 represent 50–50.8MHz.

It is suggested that if an accurate signal source is available, constructors should produce a calibration chart

Trouble Shooting

So far two prototypes have been

built and both worked without any problems. Should you have any difficulties, the voltages shown in Tables 1 and 2, measured using a high impedance voltmeter on the prototype, should assist in tracing the fault.

In the unlikely event of audio instability as there is a very high gain audio amplifier, reduce the value of R36.

Acknowledgement

The author would like to thank Messrs S.T.S. Communications for the use of test equipment in checking the prototype.

PW

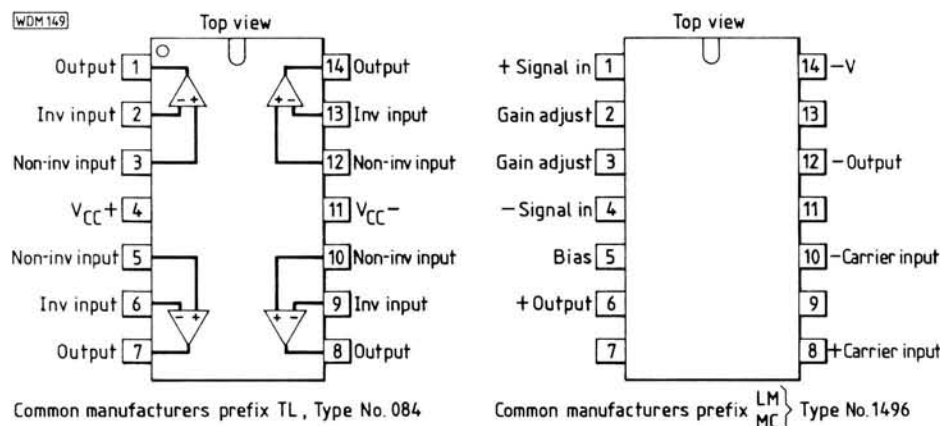


Fig. 3: IC pin-out data

SHOPPING LIST

Resistors

0.25W 2% Metal film

3.9Ω	1	R51
27Ω	1	R4
100Ω	4	R5,9,17,46
270Ω	4	R3,8,23,49
560Ω	1	R27
1kΩ	9	R12–R16,21,22,29,31
1.2kΩ	1	R11
1.5kΩ	1	R26
2.7kΩ	1	R50
3.3kΩ	2	R18,20
3.9kΩ	1	R35
5.6kΩ	1	R45
10kΩ	7	R10,19,24,25,32,43,44
12kΩ	3	R39,42,47
22kΩ	5	R28,37,38,40,41
33kΩ	3	R2,7,36
39kΩ	1	R33
47kΩ	1	R52
100kΩ	3	R1,6,48
470kΩ	1	R34

Potentiometer dual gang linear
10kΩ+10kΩ 1 R30

Capacitors

Sub-miniature ceramic plate

10pF	1	C32
22pF	3	C2,4,6
33pF	1	C25
47pF	1	C33
68pF	2	C30,31

Sub-miniature ceramic disc

10nF	8	C1,3,5,7,11,16,19,20
------	---	----------------------

Miniature polyester

10nF	4	C14,27,34,36
0.1μF	14	C8–10,12,13,15,17,18,28,29,39,43,46,47

Polystyrene

47pF	1	C22
150pF	1	C23
330pF	1	C21
2.2nF	2	C35,37

Foil trimmer

2–22pF	1	C24
--------	---	-----

Variable capacitor type C804A series

10pF	1	C26
------	---	-----

Electrolytic 16V single ended p.c.b. type

100μF	1	C45
1000μF	2	C42,44

Electrolytic 16V axial type

22μF	1	C41
------	---	-----

Tantalum bead 10V

47μF	1	C38
------	---	-----

Tantalum bead 35V

1μF	2	C40,48
-----	---	--------

Semiconductors

Diodes

BZY88C6V2	1	D1
1N4148	2	D3,4
1N5402	1	D2

Transistors

BF244	1	Tr5
BSX20	3	Tr3,4,6
3N201	2	Tr1,2

Integrated circuits

LM380	1	IC3
MC1496	1	IC1
TL084	1	IC2

Miscellaneous

T1 Toko KACS1506A 10.7MHz i.f.t.⁽¹⁾; L2–4,6 Toko S18 0.45μH⁽¹⁾; T50–6 toroid (for L5)⁽¹⁾; 0.5m 24 s.w.g. enamelled copper wire; Double sided p.c.b. material; HC18/U 39.8MHz 3rd overtone crystal⁽³⁾; 14-pin d.i.l. sockets (2); Miniature toggle switch s.p.s.t.; SO239 chassis socket (1); 3.5mm mono chassis socket with break contact; 768 type 500mW 8Ω speaker LS1⁽²⁾; Vernier dial with slow motion drive; Miniature screened cable; Wire; Knob; Aluminium box AB15 type⁽²⁾; Small rubber grommet (1); Plastics cable clips (2); Self-adhesive cabinet feet; Anti-parasitic beads (2); 6BA mounting pillars × 12mm long, nuts, bolts, washers; 20mm panel mounted fuse holder; 1amp 20mm fuse.

(1) Cirkit Holdings plc, Park Lane, Broxbourne, Herts EN10 7NQ

(2) Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR

(3) Gollidge Electronics, Merriott, Somerset TA16 5NS

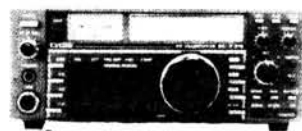


For Tomorrow's Radio Technology TODAY

BASE STATIONS

Good News for FT767 owners. Kenwood owners take note!
IMPROVED YAESU FT767 RWC/MK2 HF-UHF BASE STATION

FT767GX MK2/RWC



ICOM IC735

We are pleased to announce that we have now improved the synthesizer (see reviews) leading to better dynamic range by up to 20dB which now puts this transceiver in a class of its own! This modification is only available from RWC and is fitted FREE to all New units sold by us, or we will modify any existing unit for £59.50 inc. return carriage. Available at some Yeasu dealers

FT767 MK2/RWC COMPLETE TOP CLASS BASE STATION (EX VHF-UHF) £1499.00
 FT767 MK2/RWC COMPLETE TOP CLASS BASE STATION (EX VHF-UHF) WITH 2M FITTED £1599.00
 FT757 MK2 NEW IMPROVED HF TRANSCEIVER £895.00
 FT726R MULTIMODE BASE STATION WITH 2MTRS. (SPECIAL PRICE) £699.00
 ICOM IC735 SUPER MINI HF ALL BAND TRANSCEIVER £892.50
 ICOM IC275E 2MTR 25W BASE STATION, C/W AC PSU £349.00
 NEW ICOM IC575 6M 10W BASE STATION, 26-56 MHZ RECEIVER TX10 AND 6M £349.00



NEW

Many more Makes and Models in stock. Please enquire.

HANDHELDS

* = Extended RX coverage available, call for details.

YAESU FT272R 2.5W (5W) DUAL BANDER C/W CHGR £395.00
 YAESU FT237R/FNB10 2.5W (5W) 2MTRS C/W CHGR £249.00
 YAESU FT237R/FNB10 2.5W (5W) 70CM CHGR £259.00
 ICOM IC02E QUALITY 2.5W (5W) BP3 C/W CHGR £225.00
 ICOM MICRO 2E MINI 2.5W 2MTR C/W CHGR £209.00
 CTE1600 (V2 SIM IC2E) 2.5W 2MTR C/W CHGR £189.00
 KENPRO KT400EE 2.5W 70CM C/W CHGR £199.00
 KENPRO KT220EE 2.5W (5W) 2MTR LCD C/W CHGR £199.00
 KENWOOD/TRIO TH21E 2W 2MTRS. (WHILE STOCKS LAST) £139.00

PORTABLES

FT690R/MK2 2.5W MULTIMODE, JOIN IN THE FUN! £399.00
 FT690R/MK2 AS ABOVE C/W NICADS AND CHARGER £425.00
 FT290R/MK2 2.5W MULTIMODE, IMPROVED RECEIVER £395.00
 FT290R/MK2 AS ABOVE C/W NICADS AND CHARGER £429.00
 FT290R/MK1 2MTR MULTIMODE SPECIAL PRICE £329.00

MOBILES

YAESU FT211E 45W 2MTR NEW SUPER MOBILE FREE £299.00
 SUN 5/8 MOBILE ANTENNA C/W SO239 G/MOUNT £359.00
 ICOM IC28E 25W SUPER MINI MOBILE FREE SUN
 5/8 SO239 GUTTERMONT ASSY+EXT LOUDSPEAKER

NEW LICENCEES CALL FOR SPECIAL DEALS

INSURED P&P
£10

NEW

SCANNERS

YAESU FRG9600/RWC

FRG 9600

We supply the Yaesu FRG 9600 modified receiver to Government departments and professional users. We offer more options and facilities than any other company. We transform the basic unit by improving sensitivity and adding extra bands. No other scanner has this many options and modes available. Call now for much more information. Overseas dealer required for our kit.

Modified Yaesu receivers. NOBODY can tune 'em like WE can!

YAESU FRG9600 RWC/MK1 60-905MHZ IMPROVED RECEIVER £465.00
 YAESU FRG9600 RWC/MK2 60-905MHZ 'N' CONNECTOR £495.00
 YAESU FRG9600 RWC/MK3 100KHZ-950MHZ MULTIMODE £595.00

NEW YAESU FRG9600 RWC/MK5 100KHZ-950MHZ ACTIVE F/END £625.00 NEW

YAESU FRG9600 MK3/AH7000/G5RV/PA4C AC PSU, COMPLETE 100KHZ-950MHZ ALL BAND ALL MODE RECEIVING STATION £699.00
 ICOM ICR7000 25-2GHZ ALL MODE SUPER RECEIVER £857.00
 ICOM ICR7000/AH7000 ABOVE WITH MATCHING DISCONE £945.00
 UNIDEN-BEARCAT UBC100XL SUPER H/HELD C/W NCDS PSU £189.00
 UNIDEN-BEARCAT UBC175XL SUPER DESK-TOP C/W PSU £179.00
 NEW UNIDEN-BEARCAT UBC50XL NEW MINI SCANNER VHF/UHF £99.00
 REGENCY MX7000, SAME COVERAGE, SAME MAKE AS AOR2002 £399.00
 FDK AIR BAND HANDHELD THUMBWHEEL MINI C/W NCDS PSU £139.00
 FDK AS ABOVE COVERAGE 140-173.00MHZ FM BANDS £139.00
 MANY MORE MAKES AND MODELS IN STOCK, PLEASE CALL FOR DETAILS.
 INSURED P&P £10 ON SCANNERS.

SHORT WAVE RECEIVERS

YAESU FRG8800 SHORT WAVE ALL MODE 100KHZ-30MHZ £572.50
 YAESU FRG8800/FRV8800 AS ABOVE WITH VHF CONVERTER £659.00
 ICOM ICR711 100KHZ-30MHZ A TOP CLASS RECEIVER £738.00

NEW PRODUCTS

INTERNATIONAL MODEL 877R AIR-BAND RECEIVERS

This new tuneable receiver covers 52-174 Mhz as well as CB in three bands and is a cost-effective alternative to handheld scanners. The receiver is fitted with a Helical antenna and has good performance for a radio with this coverage. It is ideal for monitoring Air Band, the two-metre and PMR/Marine bands as well as Band 2 FM Broadcast. A squelch control is also provided. Two versions are currently available.

Model 877R, for use with Dry cells. £39.50
 Model 877R, c/w nicads and charger. £49.50

DEALERS CALL FOR TRADE PRICES

Sorry, not now available mail order. Please visit our new Show Rooms for a free demonstration.

FREE WITH PURCHASES OVER £1000



NEW

RAYCOM PRODUCTS

NEW ICOM TYPE COMPATIBLE NICAD PACKS, EMPTY CELL CASES AND DESK TOP CHARGER

A new range of professional Heavy Duty long life nicad packs, imported from the USA, available exclusively at RWC

10AF 10V 800 MAH LONG LIFE, ICOM EQUIV BP5/8 £55.00
 12AF 12V 600 MAH LONG LIFE, ICOM EQUIV BP7 £52.50

(Both above units for use in ICOM BC3060 OR RAYCOM NC580)

MT1 EMPTY Cell case for self assembly of up to 10x Nicads for a cost effective replacement for packs such as BP3 etc. there is ample room for a DC jack, c/w instructions £8.50. AA NICADS tagged 1.2V 500mA Nicad cells for above £1.60. NC580 Desk-top charger for all Icom type Nicads above 400mA, two charging positions 50mA & 80mA 14hr charge £39.50. Trade and Dealer enquiries welcome. Call for more details. P&P £2.50 per order.

Business radio users call now!



NEW

ANTENNAS & ACCESSORIES

ICOM AH7000 SUPER DISCONE 25-1300MHZ INC POST £79.00
 NEW RAYCOM AIR BAND DISCONE 118-170 MHZ 6 ELEMENTS £12.50
 RAYCOM DISCONE 60-600 MHZ 8 ELEMENTS SO239 SOCKET £27.50
 SUN MOBILE 5/8 SO239 C/W SO239 MOULDED LEAD/G/MOUNT £22.50
 G5RV 1/2 SIZE HF MULTIBAND HF ANTENNA (INC POST) £15.00
 G5RV FULL SIZE MULTIBAND HF ANTENNA (INC POST) £17.50
 G5KW/W3DZZ 7.1MHZ TRAP DIPOLE ASSY. SO239/COAX FED £23.50
 G5KW/W3DZZ 7.1MHZ MULTIBAND AS ABOVE, BALANCED FED £22.50
 G5KW/W3DZZ 7.1MHZ 2X TRAPS, FOR SELF ASSY. ANT £9.95

Hundreds of other types of base and mobile antennas in stock. JAYBEAM, TONNA, MET, SUN, HOXIN, POPULAR MODELS IN STOCK.

NEW RWC are now appointed dealers for the West Midlands for Butternut, Cushcraft and MFJ products. Please ask for details of the range currently available.

MOD KITS

RWC MOD KITS, ANNOUNCEMENT

We apologise to customers waiting for various mod kits, supplies of crystals and components are inconsistent and demand for kits varies, so there is occasionally a delay before we can send your kit of parts, please be patient. Rome was NOT built in a DAY! Kits still available

SANYO LC7137 SYNTHESIZER CB-10MTRS. £149.00
 LCLDNT CB-10MTRS. FT57GX MK1 FAST TUNING MOD. STORNO COM713 PMR-2MTR KIT. PYE A200 E-BAND 50MHZ KIT. call for technical details, prices and delivery

WANTED DEAD OR ALIVE

Your used equipment. We also offer a very comprehensive range of guaranteed used equipment, e.g. Amateur band transceivers, SW receivers, scanning receivers, PMR and accessories. As far as we are aware we are the only company in the UK to offer a bi-weekly computerized used equipment list and special offers list.

Send a large SAE for copies. ALL USED EQUIPMENT CARRIES 3 MONTH WARRANTY

RAY WITHERS COMMUNICATIONS LTD

Manufacturers, Importers and Suppliers of World Famous Communications Products

INTERNATIONAL HOUSE, 963, WOLVERHAMPTON ROAD, OLDBURY, WARLEY,

WEST MIDLANDS, B69 4RL. TEL: 021 544 6767 (PBX). VODAFONE: 0836 282228.

TELEX: 336483 G. FAX: 021 544 7124. PRESTEL MBX: 0214218216

Amateur Radio. Business Radio. Radio Telephones. Sales. Service Accessories and Antenna Systems.

Ordering Information: For fast delivery please order by Telephone, Telex or Fax, or send cash/cheques/drafts by post. All Credit/Charge cards accepted. £1000.00 Instant Credit available subject to status, we also offer our RWC Chargecard. Please call for further details and information. We do NOT advertise products that are not normal stock items. All prices correct at time of going to press. However, prices subject to change without prior notice. E&OE.

Most other products advertised in this magazine are available at RWC/RAYCOM.

STOP PRESS. . . PLEASE NOTE NEW ADDRESS

★ WE WILL MATCH OR IMPROVE ANY GENUINE ADVERTISED PRICE ★



The Smith Chart—A Practical Transmission Line Calculator

Part 2

This article, written by Captain C. A. King FSERT AMITE of the Royal School of Signals, first appeared in *The Journal of The Society of Electronic & Radio Technicians*. It has been reproduced here by kind permission.

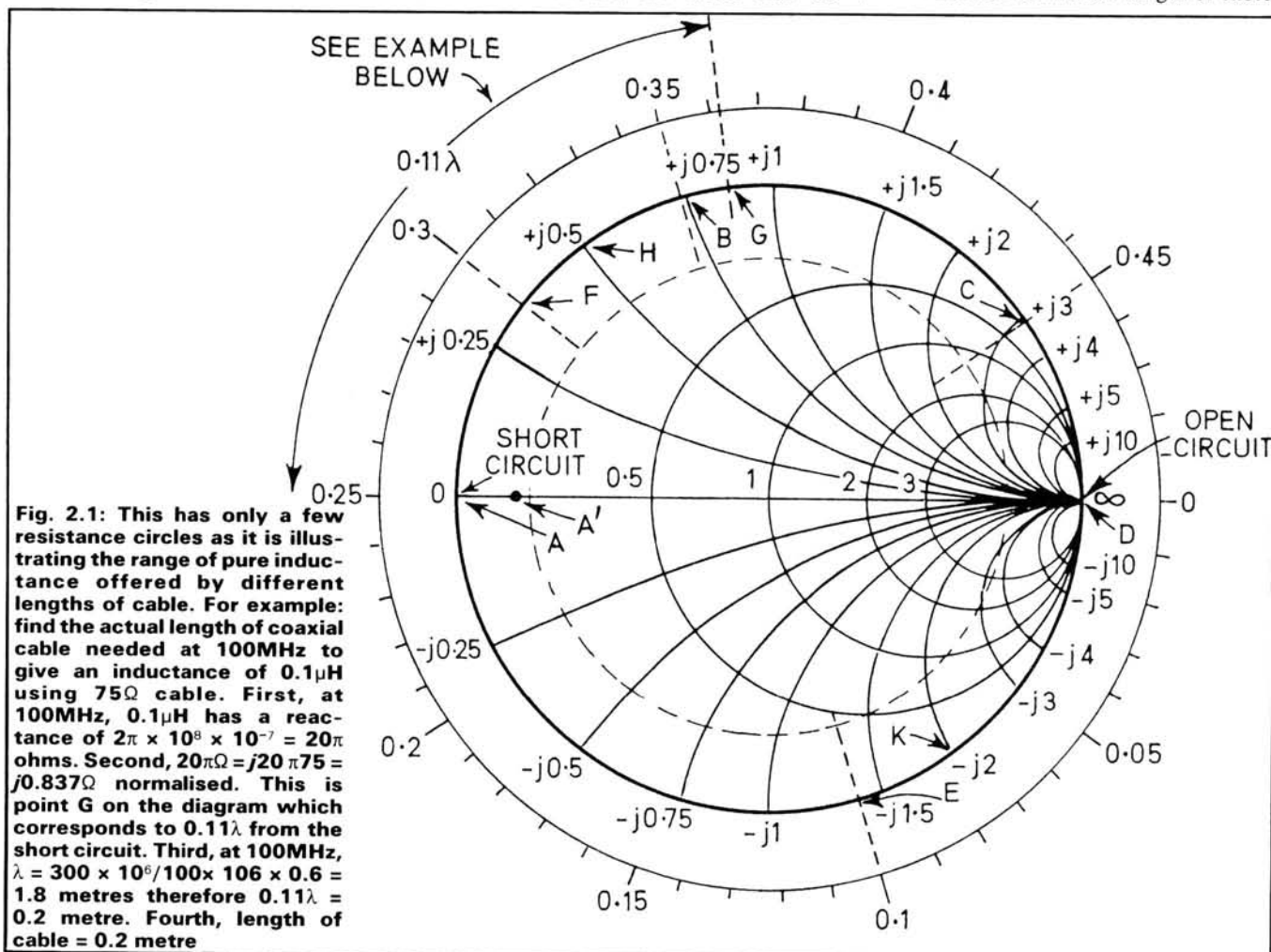
Using the Chart

Using Fig. 2.1, to study the reactance variations along a short circuit line, you should proceed as follows:

- Enter the chart at point A, a short circuit; $Z_L = 0 + j0$.
- Move clockwise round the outer circle 0.1λ to point B; use the "collar" as a guide to the distance to move, in this case from "0.25" to "0.35". The reactance at B is read off as $+j0.73\Omega$. Thus the impedance of this length of 100Ω cable is 73Ω

- inductive. The actual inductance could be found given the frequency.
- Move on another 0.1λ to point C. The reactance is now $+j3.1\Omega$.
- Move a further 0.05λ to point D. The total distance moved is now 0.25λ . At this point the impedance is very high, similar to a parallel tuned circuit at resonance.
- Move on to point E, a further 0.1λ . The reactance is now falling again and is capacitive of value $-j1.37$. If a length of line has an adjustable short circuit, the latter can be

- moved back and forth to find the exact 0.25λ point; this is equivalent to "tuning" the line. Such a system can replace a normal tuned circuit, at very high frequencies.
- After further movement, point A is reached after 0.5λ . Moving to point B again would give 0.73Ω . So a 0.1λ and a 0.6λ length of cable both have the same reactance. This is true for any difference of 0.5λ . Naturally the shortest length of cable is used.
- The reverse process to the above would be to find the length of cable



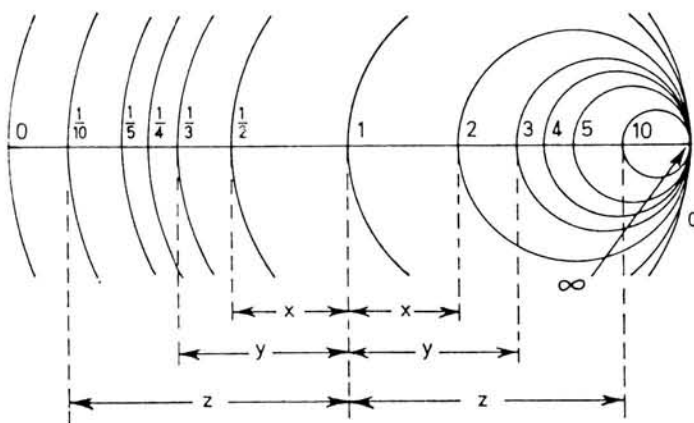


Fig. 2.2: Resistance to conductance conversion

needed for a given reactance. For example, find the length of 50Ω cable having an inductive reactance of 200Ω .

The normalised reactance is $+j4$ ohms. Starting from point A, the short circuit $+j4$ is found round the outer circle at 0.461λ . The actual distance moved is $0.461 - 0.25 = 0.211\lambda$, the required length.

In practice, line losses will prevent the reactance following precisely the previous route. The actual route will gradually cut into the diagram in a shallow spiral finishing at A'. It will not pass through, but slightly to the left of D. The impedance after 0.25λ will not be infinite but a high resistance. This is just what happens in a tuned circuit with finite Q. Similarly, after 0.5λ the impedance will not be zero, but a low resistance. Again similar to a resonant tuned circuit, this time a series resonant circuit.

Translating Impedance to Admittance

The reciprocal of resistance is conductance, $G = 1/R$ siemens (previously called mhos).

Conversion is simple on the chart. On the horizontal axis, resistance is as far to one side of the centre point or origin as the corresponding conductance is to the other. This is illustrated in Fig. 2.2, and can also be clearly seen in Fig. 1.5.

The reciprocal of reactance is susceptance, $B = 1/X$. Positive reactance gives negative susceptance and vice versa. In this case, corresponding values of B and X lie diametrically opposite each other on the outer circle. In Fig. 2.1, lay a ruler through $+j0.5$ (H) and through the centre of the circle. It will also cut the outer circle at $-j2$, point K. Thus an inductive reactance of 0.5Ω has a susceptance of -2 siemens; similarly, a capacitive reactance of -2Ω has a susceptance of $+0.5$ siemens.

Practical Wireless, January 1988

Either of the above conversions is quite simple without the chart. Impedance to admittance conversion is not quite so easy, involving the use of operator j , or messy algebra. Using the chart, the process takes little time.

Once again, corresponding impedance Z and admittance Y values are diametrically opposite each other; they may now occur anywhere inside the defining circle.

Using Fig. 1.5, consider point E. This is an impedance of $1-j1\Omega$. Diametrically opposite E on the same radius is point F. This is the admittance corresponding to $Z = 1-j1$. Its value is $0.5 + j0.5$ siemens. A practical way of doing this conversion is to draw a circle through Z, centred at the origin. A straight-edge will then locate Y opposite Z. Such circles are auxiliary to the main diagram, being constructions used for specific problems.

Here is another example, using Fig. 2.1. Consider $Z = 0.5 + j1.5$. The auxiliary circle is dotted in. The value of Y is about $0.2 - j0.58$ siemens. The exact value is $0.2 - j0.6$, which demonstrates the limitations of a small diagram.

Now try $Z = 3.2 + j2.4$; the answer is about $0.2 - j0.15$.

Conversions as before are an important step in using the chart for stub matching problems; these are the final use of the chart to be described.

Matching Cables to Varying Load Impedances

It is always desirable to match a cable such as an antenna feeder to its load. The main reason for this is economy of power. The other reason is that reflected power can cause damage to the transmitter output stage; the reflected power is also responsible for standing waves which can cause flash-over in high power systems.

In many situations the load is built on the spot. The most obvious example is a large antenna such as a rhombic.

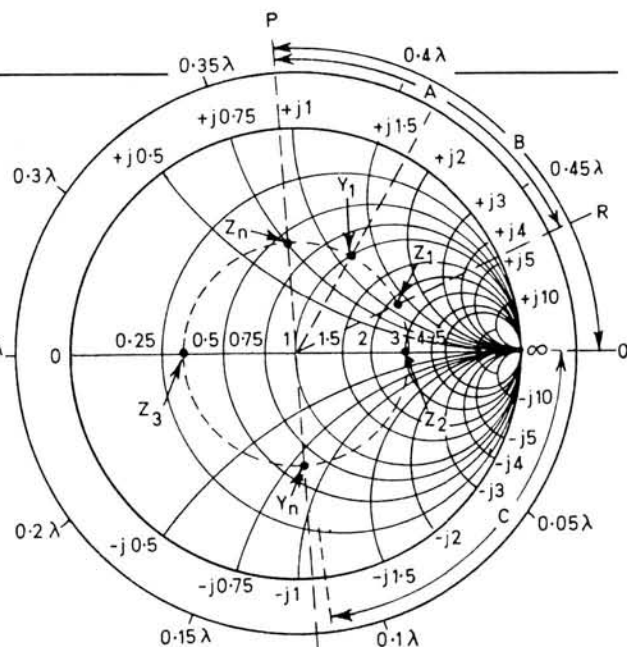


Fig. 2.3: Z_n is a normalised impedance of $0.6 + j0.75\Omega$. Y_n is the normalised admittance of Z_n . Z_1 is the impedance of a 0.1λ length of cable terminated in Z_n . Z_2 is the impedance at a voltage maximum. Z_2/Z_0 is also the s.w.r., 3 in this case. Z_3 is the impedance at a voltage minimum. Z_3/Z_0 is also the s.w.r. Y_1 is the first point along the line from the load Y_n that the conductance of the total admittance is 1. (Numerically equal to Z_0). The actual admittance is $1 + j1.12$. The susceptance at this point is cancelled, or tuned out by adding $j1.12$ in parallel using a length of short circuit line. Arc C shows the required length 0.113λ , measured from ∞ (infinite susceptance is equivalent to zero reactance, or a short circuit)

The exact impedance is difficult to predict. However, it is simple to measure. Readings along the feeder route locate the voltage maxima and minima and hence the standing wave ratio can be calculated. The distance of the first maximum from the load indicates the reactive nature of the load. These assessments are made simple by the use of the Smith chart.

Sometimes the load itself is adjusted to improve the s.w.r., other times the matching is done along the line. One such system is called stub matching. An example of stub matching will now be worked out in detail.

A 600Ω open wire line is terminated in a load of impedance $360 + j450\Omega$. A Smith chart can be used to match the load to the line by a stub.

This type of problem is worked out in admittance, rather than impedance. The reason for this is that an expression of admittance such as $3 + j2$ refers to a conductance in parallel with a susceptance. By adding a second susceptance in parallel, of opposite sign and same size ($-j2$ in this case) the total susceptance is zero. This is the same as saying that if a resistor is shunted by an inductance, the effect of the inductance can be tuned out by adding a

suitable capacitor in parallel with the other two components.

Stub matching relies on the fact that at some point down the line from the load, the admittance must be of the form $1 \pm jb$. By adding a suitable extra susceptance at the point in question the admittance becomes 1, which makes the impedance 1, or Z_0 . It will be shown that there is always some point in the line where $Z = 1 \pm jb$.

Stage 1: Normalise Z_L . This is $360/600 + j(450/600) = 0.6 + j0.75$.

Stage 2: Enter the chart. See Fig. 2.3. The normalised load is marked as Z_n .

Stage 3: Draw the auxiliary circle, shown dotted. This circle traces the impedance variations over a half wavelength. Arc A is a move of 0.1λ away from the load. At point R the line impedance reads $2.3 + j1.1$. And so on.

The point marked Z_2 is important. At this point the line impedance is

resistive and is 3Ω . The value 3 is also the standing wave ratio, another useful piece of stored information.

The admittance variation can also be easily traced. Locate the load admittance at Y_n . The same auxiliary circle is used to follow the admittance variations back along the line.

A little thought will show that it is impossible to draw any auxiliary circle that does not cut the 1Ω resistance/conductance circle. In the example, the auxiliary circle first cuts the 1 circle at the point marked Y_1 . This is the first point along the line at which the admittance is $1 \pm jb$. In this case, $Y_1 = 1 + j1.12$ siemens. Measurement on the outside scale shows that Y_1 is 0.295λ from Y_n . This is the distance from the load at which the extra reactance must be added to match the load to the line.

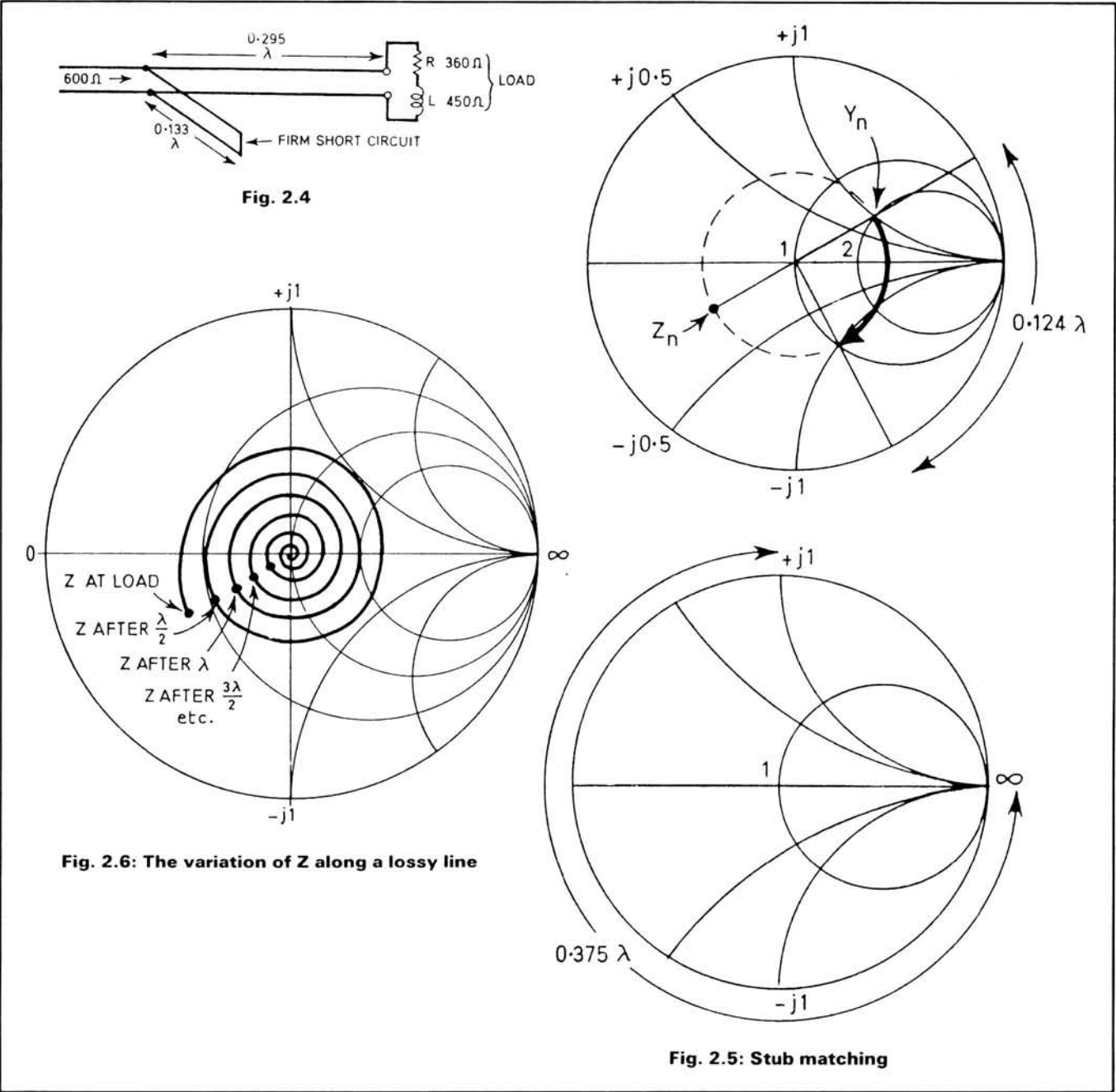
The required susceptance is $-j1.12$ siemens, equivalent to an inductive

reactance. Reactance can be constructed from a length of short-circuited line. On the diagram, arc C shows that a length of 0.113λ will provide the necessary susceptance of $-j1.12$ siemens. Measurement starts from the right hand side of the diagram because a short circuit has infinite susceptance. To check this, convert the susceptance to reactance, as described previously, and measure from the left hand side of the diagram. The result should be identical.

Stage 3 actually derives two cable lengths. One is the length needed to produce a given reactance, the other is the distance from the load at which the extra reactance is attached. The extra piece is the "stub".

Summary

1: Normalise the load impedance. Enter chart and draw auxiliary circle.



- 2: Locate load admittance. Move clockwise round auxiliary circle until it first cuts the $R = 1$ circle. Distance moved is distance from load to stub attachment point.
- 3: Read off susceptance at attachment point and reverse its sign.
- 4: From the short circuit point on the right hand side of the diagram, read off the distance to "reversed sign" susceptance. This is the stub length. Using Fig. 2.5 where $Z_0 = 300\Omega$, $Z_{load} = 120 - j60$
- 1: $Z_n = 0.4 - j0.2$
- 2: $Y_n = 2 + j1$
- 3: Distance to $R = 1$ circle is 0.124λ
- 4: At this point, $Y = 1 - j1$, so stub susceptance must be $+j1$

- 5: From the $B = \text{infinity}$ point, distance to $+j1$ is 0.375λ

Notes

- 1: The above method of matching is only suitable for fixed frequency and load. To change either would involve changing stub length and attachment point. A better matching method is to use two stubs at a fixed spacing from the load and each other. By careful selection of stub spacing, and by varying the length of both stubs, most load values can be matched. Readers may like to work out this system on a Smith chart, using a stub spacing of 0.375λ .
- 2: The effect of line loss has been mentioned previously. If load values

are plotted over several wavelengths for a "lossy" line, the auxiliary circle is replaced by a spiral working towards the centre of the chart. This effect is shown in Fig. 2.6. Note that the spiral tends towards the $R = 1$ circle. This supports the idea that in a long line, the impedance seen by the source tends to Z_0 irrespective of the actual load mismatch.

Conclusion

The construction and a few uses of the Smith chart have been described. No mathematical proof of the construction has been given. Printed pads of Smith charts are available for those wishing to construct their own.

ERRORS & UPDATES

Semiconductor Tester December 1987

Capacitors used in this project can be any type providing they have a tolerance of better than 10% and their d.c. working voltage is greater than 60.



"... So signing clear with you and turning the beam north ..."

Tidy up your shack for Christmas

NEW STYLE PW BINDERS

Only £3.95 each (Including Post, Packing and VAT)

Are you tired of sifting through cardboard boxes and carrier bags to find that useful item in PW?

Our **smart new style** binders, covered in blue plastics, are a must for your library, keeping your radio magazines in good condition and easily accessible.


An Ideal Christmas present at only **£3.95** (including Post, Packing and VAT).

Order Immediately and we will do our best to get your binders to you before Christmas.

HOW TO ORDER

PW Binders are £3.95 each (including Post, Packing and VAT). Send a postal order, cheque or international money order with your order, stating number required to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP**. Payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 678558. Normally despatched by return of post but please allow 28 days for delivery.



0202 678558   **(24 hour Answer Service)**

Whence Came Shack?

The term "Shack" is commonly used to refer to the amateur radio operational area. The derivation of this description can only have one source. Stan Crabtree tells us about the wireless cabin of the first British ship to be equipped with the new invention—a shack.

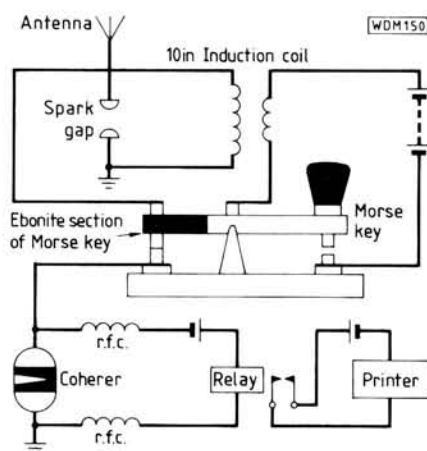
The Beaver Line's *Lake Champlain* was the vessel in question, sailing from Liverpool on 21 May 1901 for Halifax. It was over a year earlier that the first Merchant Ship had been fitted with wireless. The Norddeutscher Lloyd liner *Kaiser Wilhelm de Grosse* had since made many North Atlantic crossings and her wireless apparatus had been put to good use when in range of Southern Ireland, England and the North German Coast. The wireless room on the *Kaiser Wilhelm* was within the accommodation and the raucous note of the spark transmitter could be heard in the nearby 1st class cabins. It may have been the rumours of complaints from passengers that made the Beaver Line management decide to install the *Lake Champlain's* wireless in an external location.

The term "shack" is perhaps not an apt description. Cupboard would be more appropriate. The structure was made of matchboarding, enclosing an area of length 1.83m and width 1.22m, one end being formed by the iron bulkhead of the upper deck. To a casual passer by it might well have been taken as a small vegetable locker. There were no windows and to obtain sufficient light the door had to be left open. Probably because there was no budget provision for this additional ship's structure the construction cost is recorded as £5.

Mr F. S. Stacey, who was to sail with the ship, assembled the equipment at the Marconi premises established at Hall Street, Chelmsford and proceeded by train to Liverpool with his excess baggage. He also assisted in the installation.

Power supply

The power supply consisted of four sets of 6 volt batteries, two being in use whilst the other two were being charged. Charging arrangements were basic, the mains voltage being dropped by six carbon filament lamps. The lamps, which were screwed to the wall, served a double purpose in dimly illuminating the enclosed area. The transmitter was the then usual 254mm induction coil. Although the "jigger"



The *Lake Champlain's* transmitter/receiver set-up

coil, providing a certain amount of tuning, had been invented (and patented) by Marconi two years earlier for some reason it was not included in the equipment. The antenna was connected to one side of the spark gap, the other side carrying a cable to the ship's structure (earth). The spark producing components were balls of 15mm diameter with an adjustable gap.

The receiving apparatus consisted of two coherer detectors working a Morse inker via a relay. At this time headphones were not in use and for receiving purposes, the Morse signals were reproduced on paper tape in long and short dashes. A burst of atmospherics would ruin the intelligibility of a received message as at this time the human ear was not given the chance to differentiate between the two types of sound.

At the turn of the century the range of communication attainable was almost entirely dependent upon the antenna installation. On the *Lake Champlain*, two wires were supported vertically, 30.5m above the water line by a sprit of some 3.66m in length. This was hauled up the main mast in much the same way as rigging a sail. The wire used was electric lighting cable, kept apart by 1.83m spreaders.

Perhaps the most novel feature for the time was the send receive switch formed by the transmitting key. An ebonite extension was used to isolate

the section holding the key contacts and a further two contacts were used to connect the aerial to the coherer when the key was "up". Upon keying, the receiver input was open.

The £5 capital cost expended did not extend to the operator's seating and for this Mr Stacey was obliged to use the two coil boxes, one on top of the other. The box of the coil in use served as a cupboard for other spares. The equipment was arranged on a shelf running across the width of the cabin. Some attempt at furnishing was made by using a piece of green baize as the table cover.

Set Sail

The *Lake Champlain* sailed from Alexandra Dock with some 1200 passengers on board.

Contact was first established with the coast station at Holyhead and subsequently with Rosslare. Messages were exchanged for the length of time the vessel was in range. Operating speeds were confined to 10w.p.m. as above this the coherer device did not respond. The size of the Morse key gap also limited high-speed signalling.

Once clear of the St George's channel, operations closed down. There were no further stations to contact. Stacey spent the rest of the sea voyage demonstrating the equipment to passengers and crew and found this much harder work than operating? Only two spectators at a time could be accommodated in the wireless cabin.

Arrival of the ship in Halifax, Nova Scotia, gave the opportunity once again of demonstrating the new means of communication. Newspaper reporters descended on the vessel and Stacey was obliged to describe in some detail just what happened. Public interest increased even more when the ship arrived at Montreal. The scene was much the same as a year earlier when the *Kaiser Wilhelm de Grosse* had arrived in New York with the newly fitted apparatus. Scientific Societies and the staff of technical colleges visited the ship. The Government Inspector of Telegraphs travelled from Ottawa and was much impressed with the

MAIL ORDER
IS OUR
SPECIALITY

Kenwood

SPECIAL OFFERS WHILE STOCKS LAST

			P&P
TS430S	160-10m, with general coverage receiver	748.00	(10.00)
TS530SP	160-10m, amateur band transceiver	748.00	(10.00)
TR3600E	70cms Handheld with DCS	275.00	(4.00)

TS440S	NEW Amateur band transceiver		
	General coverage RX	1138.81	(7.00)
PS50	Heavy Duty PSU for TS440S	222.49	(5.00)
AT440	Auto ATU for TS440S	144.82	(3.00)
TS940S	9 Band TX General Cov RX	1995.00	(7.00)
AT940	Auto ATU for TS940S	244.88	(4.00)
TS930S	9 Band TX General Cov RX	1695.00	(7.00)
TS830S	160-10m Transceiver 9 Bands	1098.00	(7.00)
AT230	All Band ATU/Power Meter	208.67	(5.00)
SP230	External Speaker Unit	66.49	(5.00)
PS430	Matching Power Supply	173.78	(5.00)
SP430	Matching Speaker	40.81	(3.00)
MB430	Mobile Mounting Bracket	15.80	(2.50)
FM430	FM Board for TS430	48.05	(1.50)
LF30A	HF Low Pass Filter 1KW	32.26	(2.50)
YK88A	6KHz AM filter for TS430S/440S	49.37	(1.50)
YK88C	500Hz CW filter for TS430/440/830/530	46.08	(1.50)
YK88CN	270Hz CW filter for TS430/440/830/530	54.64	(1.50)
YK88SN	1.8KHz SSB filter for TS430/440/830/530	46.71	(1.50)
MC50	Dual Impedance Desk Microphone	46.08	(2.50)
MC35S	Fist Microphone 50K ohm IMP	21.72	(1.50)
MC85	Deluxe Desk Mic with Audio Compensator	107.59	(3.00)
MC43S	Up-Down Hand Mic 8-Pin 500 Ohm	22.22	(1.50)
MC40S	Up-Down Hand Mic 6-Pin 500 Ohm	19.07	(1.50)
MC60A	Desk Mic with built-in Pre-amp	88.22	(3.00)
MC55	Mobile Microphone with control box (up/down etc.) 6 or 8 pin	52.67	(2.50)
TR751E	2M Multimode (mobile)	599.00	(5.00)
MU1	DCL option for TR751E	30.95	(1.00)
TS711E	2M Base Stations	940.00	(7.00)
HS5	Deluxe Headphones	37.54	(2.50)
SP40	Mobile External Speaker	21.06	(2.00)

NEW

TS140S	Amateur Band Transceiver/General coverage	P.O.A.	(4.00)
TH205E	2M Handheld Transceiver	215.26	(4.00)
TH215E	2M Handheld with Keypad Entry	252.13	(4.00)
PB1	Nicad Pack 12v 800mAh	57.27	(2.00)
PB2	Nicad Pack 8.4v 500mAh	34.22	(2.00)
PB3	Nicad Pack 7.2v 800mAh	38.82	(2.00)
PB4	Nicad Pack 7.2v 1600mAh	63.19	(2.00)
BT5	Dry Battery Case	11.86	(1.50)
BC7	Rapid Charger	97.42	(3.00)
SC12	Case for (PB2/3)	13.82	(1.50)
SC13	Case for (PB1/4)	14.49	(1.50)
PG2V	DC Power Cable for TH205E/215E	3.96	(1.50)
SMC30	Speaker Mic for TH21E/41E/2600/3600E	28.31	(2.00)
HMC1	Headset Unit with VOX for TH21E/41E/2600/3600E	32.91	(2.00)
RA2	Rubber Flexible Antenna for TR2400/2500/2600E	9.87	(1.50)
RA3	Telescopic Whip Antenna for TR2400/2500/2600E	13.74	(1.50)
TM221E	2M FM Mobile Transceiver 45W	317.30	(5.00)
TM421E	70cms FM Mobile Transceiver 35W	372.08	(5.00)
RC10	Remote Controller Handset for TM221/421	169.00	(4.00)
TH405E	70cms Handheld Transceiver	273.00	(4.00)
TH415E	70cms Handheld with Keypad Entry	298.85	(4.00)
TR851E	70cms All Mode Transceiver	699.00	(5.00)
TW4100E	VHF/UHF FM Mobile Transceiver	699.00	(5.00)

Yaesu

FT709R	70cm H/Held	275.00	(—)
MMB10	Mobile Bracket FT209/709	10.00	(1.50)
NC9C	Charger	11.50	(1.50)
PA3	Car Adaptor/Charger	21.85	(2.00)
MH1B8	Hand 600 8pin mic	21.00	(1.50)
MD1B8	Desk 600 8pin mic	79.00	(3.00)
MF1A3B	Boom mobile mic	25.00	(2.00)
YH77	Lighthweight phones	19.99	(2.00)
YH55	Padded phones	19.99	(2.00)
YH1	Lighthweight Mobile H/set-Boom mic	19.99	(1.50)
YH2	Lighthweight Mobile H/set-Boom mic	19.95	(1.50)
SB1	PTT Switch Box 208/708	22.00	(1.50)
SB2	PTT Switch Box 290/790	22.00	(1.50)
SB10	PTT Switch Box 270/2700	22.00	(1.50)

NEW

FT690RMKII	2.5W 6M multimode portable/mobile/base	399.00	(5.00)
FT211RH	2M 45W Mobile	309.00	(4.00)
FT767GX	HF Gen. Coverage trans. with optional VHF/UHF-6M modules	1550.00	(—)
FE7-767-2	2m module for FT767	169.00	(3.00)
FE7-767-7(B)	70cms module for FT767	215.00	(3.00)
FE7-767-6	6m module for FT767	169.00	(3.00)
FL7000	Solid State linear with built in auto ATU	1600.00	(—)
FT727R	Dual Band handheld transceiver 144-146MHz, 430-440MHz up to 5W on each band	425.00	(3.00)
FT290RMK II	2M multimode portable/mobile/base	429.00	(3.00)
FT233R/FNB10	2M mini handheld with LCD display 5W	249.00	(3.00)
FT733R/FNB10	70cms mini handheld with LCD display 5W	269.00	(3.00)

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

Royal Blue

Photo Acoustics have pleasure in presenting the ROYAL BLUE — a Short Wave Listeners folded dipole antenna that covers 2-30MHz. Its neat and compact design (just 6' tall) makes it ideal for unobtrusive outdoor or indoor use. It will work quite happily on your roof or stood in the corner of your shack. It is a truly versatile antenna that will pull in the DX and which works exceptionally well with modern receivers such as the Yaesu FRG8800, Icom R71, Trio R2000 and so on.

To buy this superb new antenna, just send us £25, plus £3 for postage and packing and we will rush one to you.

Receivers

Trio R2000 HF general coverage receiver	595.00	(7.00)
Trio VC10 VHF converter for R2000 118-174MHz	161.94	(3.00)
Trio R5000 NEW HF general coverage receiver	875.00	(7.00)
Trio VC20 VHF converter for R5000 108-174MHz	167.21	(3.00)
Yaesu FRG8800 HF general coverage receiver	639.00	(7.00)
Yaesu FRV8800 VHF converter for FRG8800 118-175MHz	100.00	(3.00)
Icom R71E HF general coverage receiver	825.00	(7.00)
Icom RC11 remote control unit for ICR71E	62.00	(2.00)
AR2002 VHF/UHF scanner 25-550MHz and 800-1300MHz	487.00	(5.00)
FRG9600 VHF/UHF scanner 25-950MHz	509.00	(5.00)
Icom R7000 VHF/UHF scanner, all modes 25-2000MHz	957.00	(7.00)
Icom RC12 remote control unit for R7000	62.00	(2.00)
New RS35 VHF/UHF airband receiver	249.00	(4.00)
RS37S Air band portable. Tunable 118-136MHz	69.51	(3.00)

NEW

Regency MX4200 Portable Scanner. Covers 60-89MHz, 118-136MHz, 144-174MHz, 380-495MHz and 800-950MHz ONLY	328.50	(5.00)
HF125 HF general coverage receiver 30KHz-30MHz (Made in Britain)	375.00	(5.00)

Icom

IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
PS15	P.S. Unit	158.00	(4.00)
PS30	Systems p.s.u. 25A	343.85	(—)
SM6	Base microphone for 751/745	46.00	(1.00)
IC2900	2m 25W M-Mode	542.00	(—)
IC505	10W/3W 6M multimode, portable/base	459.00	(5.00)
IC3200E	2m 70cms dual band mobile, with built in duplexer	556.00	(5.00)
IC02E	2m H/Held	269.00	(—)
IC04E	70cm handheld	299.00	(—)
BC35	Base Charger	70.15	(1.50)
HM9	Speaker mic	21.85	(1.50)
BP3	Std Battery Pack	29.90	(1.50)
BP4	Empty Battery Pack	9.20	(1.50)
BP5	High Power Battery Pack	60.95	(1.50)
CP1	Car Charging Lead	6.90	(1.50)
DC1	12v Adaptor	17.25	(1.50)
IC48E	10W 70cms FM mobile	449.00	(3.00)
IC28E	25W FM mobile (Tiny)	359.00	(3.00)
IC28H	45W FM mobile (Tiny)	399.00	(3.00)
IC-Micro	2 mini hand portable LCD display 1W	239.00	(3.00)

NEW

IC-275H	2M Multimode Base Station 100W	999.00	(7.00)
IC-475E	70cms Multimode Base Station inc. PSU 25W	1125.00	(7.00)
IC-475E	23cm FM Mobile, 10W output, style similar to 28E	559.00	(4.00)
ICOM 761	HF general coverage transceiver with internal PSU and auto ATU	2459.00	(7.00)
ICOM IC575	6 metre Base Station	999.00	(10.00)
IC-900	Multiband FM Transceiver. Requires optional Band Units	469.00	(5.00)
IC-UX19	28MHz Band Unit. 10W	P.O.A.	(5.00)
IC-UX59	50MHz Band Unit. 10W	239.00	(5.00)
IC-UX29	144MHz Band Unit. 25W	229.00	(5.00)
IC-UX29H	144MHz Band Unit. 45W	249.00	(5.00)
IC-UX49	430MHz Band Unit. 25W	269.00	(5.00)
IC-UX129	1296MHz Band Unit. 10W	P.O.A.	(5.00)

Power Supplies

DRAE			BNOS		
4 amp	48.30	(3.00)	6 amp	75.00	(3.00)
6 amp	71.53	(3.00)	12 amp	125.00	(3.00)
12 amp	95.16	(3.00)	25 amp	185.00	(4.00)
24 amp	137.54	(4.00)	40 amp	385.00	(4.00)

Aerial Rotators

DAIWA MR750E	Heavy Duty rotator. Can have up to 4 motors	254.10	(5.00)
KR400	Med/H Duty	139.00	(5.00)
KR500	6 core Elevation	149.95	(5.00)
KR400RC	5 core Medium Duty	169.00	(5.00)
KR600RC	6 core Heavy Duty	219.00	(5.00)
KC038	lower mast clamps	17.45	(2.00)
KS065	Rotary Bearing	29.95	(2.50)
AR1002	Lightweight VHF Rotator	52.95	(4.00)

Switches

Sigma	2 way S0239	20.20	(1.50)
Sigma	2 way 'n' Skts	22.95	(1.50)
Weiz CH20A	2 way S0239	30.75	(1.50)
Weiz CH20N	2 way 'n' Skts	54.00	(1.50)
Drae	3 way S0239	17.00	(1.50)
Drae	3 way 'n' Skts	21.95	(1.50)

CW/RTTY/Equipment

BENCHER			P&P
BY1	Squeeze Key, Black base	67.42	(3.00)
BY2	Squeeze Key, Chrome base	76.97	(3.00)

HI-MOUND MORSE KEYS

HK708	Straight Key	21.50	(2.50)
HK702	Deluxe version of above on Marble Base	42.50	(3.00)
HK706	Straight key	23.00	(2.50)
HK707	Straight key	22.25	(2.50)
MK704	Squeeze paddle	20.00	(2.50)
MK705	Squeeze paddle on Marble Base	32.20	(3.00)

NEW

RTTY-EQUIPMENT

PK-232	Packet, Amort, RTTY, CW, ASCII, FAX transceive in one unit. Works with any computer equipped with an RS232 interface. 12V operated	269.95	(4.00)
	NEW FAX option for existing PK232 users (includes new manual)	49.95	(2.50)
	NEW PK-87 1200 Baud Amateur Packet Radio TNC	169.50	(4.00)
	NEW PK-90 Commercial Packet Radio TNC	465.25	(4.00)

SOFTWARE PACKAGES

PK232/C64-128	Cartridge, overlays, cable, handbook	69.00	(1.50)
PK232/BBC-B & Master. E-PROM, overlay, cable, handbook		35.00	(1.50)
PK232/IBM-PC & Compatibles. Disc, handbook		39.00	(2.50)
PK2/C64-128	Cartridge, overlays, cable, handbook	69.00	(1.50)
PK87/BBC-B & Master. E-PROM, overlay, cable, handbook		35.00	(1.50)
NEW FAX-1	Radio Facsimile Weather Map demodulator with double screened printer cable. Includes mounting bracket and NEW RTTY receive facility.	279.95	(4.00)

CD660	Data Receiver for CW/RTTY/TOR/AMTOR/ASCII	264.97	(5.00)
CD670	As above but with built in LCD display	327.77	(5.00)

KEYERS & ACCESSORIES

Star Master Key	Electronic Keyer	54.70	(3.00)
NEW Star	Masterkey electronics CMOS memory keyer	95.00	(3.00)
TRX3	Morse Oscillator	13.65	(1.50)
Datong	D70 Morse Tutor	56.50	(2.50)

MFJ

MFJ 9898 3KW Delux ATU		368.16	(5.00)
MFJ 9628 1.5KW Versatuner		241.95	(5.00)
MFJ 949C 300W Delux Versatuner		157.75	(4.00)
MFJ 941D 300W Basic ATU		105.13	(4.00)
MFJ 901B 200W Versatuner		63.07	(3.00)
MFJ 16010 Random wire tuner		42.02	(3.00)
MFJ 1701 6 way antenna switch 2KW		30.72	(3.00)

Aerials

6M Dipole		6.50	(3.00)
6M HB9CV 2 ele beam		12.95	(4.00)
6M 3 ele Beam		22.00	(4.00)
6M 5 ele Beam		32.00	(12.00)
AH-7000	Wideband Discone Antenna. 25-2000 Mhz	82.00	(4.00)
Revcone	Wideband Discone Antenna. 25-550 Mhz	30.50	(4.00)
G5RV	Full size 102'	16.75	(2.50)
G5RV	Hall size 51'	14.25	(2.50)
HB9CV	2 metres	3.95	(3.00)
HB9CV	70cms	3.95	(2.00)
2 metre	Slim Jim	8.95	(3.00)
4-1	Baluns	9.50	(2.00)
3 7 and 7 1MHz	Traps (pair)	12.95	(2.00)
Dipole	Centrepieces	2.25	(0.50)
Copper wire	50M rolls hard drawn	7.95	(2.50)
3" Feeder spreaders in lots of 20		3.60	(1.50)
3" Ribbed end insulators (Polypropylene)		0.60	(0.75)
Limpet Mag Mounts		20.50	(3.00)
BOOKS	Confidential Frequency List (NEW Edition)	5.95	(1.00)
	Air Traffic Radio	2.25	(0.75)
	The Complete guide to VHF/UHF frequencies 25-2000MHz (NEW)	4.95	(1.00)
	The International VHF FM guide.	2.85	(0.75)
	GUIDE TO FACSIMILE STATIONS	9.95	(1.00)
	Towards the RAE (Questions and answers book)	4.25	(0.75)
	Logbooks	3.50	(1.00)

SPECIAL OFFER

Almco ALM-203E	2M Handheld C/W 30W Amplifier, Nicad. Charger	269.95	(4.00)
Almco ALD-24E	2M/70cms Mobile 25W Full duplex	449.00	(4.00)

PMR

We are agents for
Tait - Pye - Icom - Maxon

SPEND UP TO £1,200 INSTANTLY WITH A PHOTO ACOUSTICS LTD. CREDITCHARGE CARD — APPLY FOR DETAILS
PART EXCHANGE WELCOME, ASK FOR KERRY G6IZF OR ANDY G4YOW

RETAIL SHOWROOM OPEN TUESDAY-FRIDAY 9.30-5.30, SATURDAY 9.30-4.30

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



system displayed. He obviously had the ear of the Government as a few days later the Marconi Company received a cable from the Canadian Authorities ordering two complete stations. They were to be installed for signalling across the Straits of Belle Isle, a distance of 35km. It was thought this would provide more consistent communications than the currently installed telegraph cable which was susceptible to damage by icebergs.

The first part of the return voyage was uneventful and Stacey again spent most of his time showing passengers the contents of the wireless shack.

He had asked to be advised by the bridge of the ship's position and as the

Lake Champlain neared Southern Ireland he "fired up" the rig once again and set the spark gap to its optimum spacing. Checking the coherer he finally wound up the clockwork mechanism that powered the ink recorder. During his time away he knew that a new Marconi station should have been installed at Crookhaven and he expected to be the first vessel to establish contact. He gave a long call and settled back to await a response.

A minute later the receiving relay began to click and he leaned forward to look at the Morse characters endorsed on the paper tape. It was not Crookham replying but another ship asking for a signal report. A few minutes later

he was exchanging messages with the *Lucania*, outward bound from the UK and the first Cunarder to be fitted with wireless. At the conclusion of signals, Crookhaven was contacted and messages were exchanged with the owners and with Queenstown where the ship was to berth. After leaving the Irish port, Stacey contacted Rosslare and later Holyhead on his way to the ship's home port of Liverpool.

It was to be another six months before the first wireless signals were to span the Atlantic and a number of years before liners on the North Atlantic sea route were able to rely on continual wireless communication from both sides of the Atlantic. **PW**

Feature

Practically Yours

By Glen Ross G8MWR

This month we were going to have completed our investigation into s.w.r. problems but I have decided to hold that over to a future issue because I have received several letters from people who are looking for a simple way to increase the selectivity of receivers, especially when receiving c.w. transmissions.

The Problem

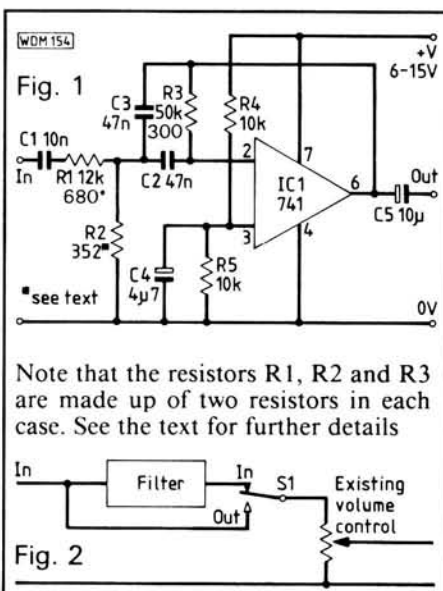
Any decent receiver manufactured in the last twenty years or so will have a selectivity curve suitable for reception of s.s.b. but very few have the 150 hertz or so bandwidth that is required to really dig out the weak ones at the c.w. end of the bands. Some may have the facility to fit an extra filter but these are usually rather expensive. At the other end of the scale are the people who are playing about with direct conversion receivers which are notorious for wide bandwidth.

The Answer

For the man who is prepared to "roll his own" there is a simple and cheap answer which is also easy for the newcomer to home construction to both build and fit. What is this modern miracle I hear you ask. The solution to the problem is the humble 741 integrated circuit used as an active band-pass filter.

The Circuit

The circuit of the complete filter is shown in Fig. 1. It is designed around the following criteria. The bandpass response of the filter is designed to be centred on 800Hz, which is the pitch at which most people listen to c.w. The gain of the circuit is two and the Q is 6;



this gives 3dB down points at 733 and 867Hz or approximately 150Hz bandwidth. The input impedance is high which means it can be connected to nearly any audio circuit and the output impedance is fairly low. In fact it is safest to keep the output load above about 250 ohms so as not to cause problems in the 741.

Fool the 741

This type of integrated circuit is designed to be run from positive and negative rails with respect to circuit earth, but these are not always conveniently found and so a neat little circuit trick is used. By fitting resistors R4 and R5, pin 3 is set at half supply rail volts and is fooled into thinking that this is the circuit earth line. Capacitor C4 is used to decouple this point and ensure that no audio signals appear on the "faked" centre rail.

Building the Circuit

There are no special precautions to be taken when building the unit. The simplest way is to use a piece of Veroboard and set the components up very much as they appear in the circuit diagram. To get the desired results it is imperative to use 5% tolerance components where shown in the parts list. The resistors R1, 2 and 3 are all made up of two resistors in series; R1 uses 12kΩ and 680Ω; R2 is made up of 330Ω and 22Ω and R3 uses 47kΩ and 3.3kΩ.

Installation

The installation circuit is shown in Fig. 2. The board is simply fitted at some convenient point in the case and the existing wire to the top end of the volume control is disconnected and taken to the input of the filter unit. Looking at the back of the volume control you will see three connections mounted in a group round the edge of the control. Looking at the back of the control the one you disconnect is the wire going to the most anticlockwise of the three contacts. S1 is fitted to allow you to switch the filter in or out of circuit. Obviously the zero volt line goes to the earth side of the equipment you are going to use the filter with and it should not be too hard to find a point where you can get a few positive volts; try the on/off switch assuming it's a transistorised receiver!

Components

IC1	741
R1-3	5% ¼ watt
R4-5	¼ watt
C2-3	5%
C4-5	15V electrolytic
S1	s.p.d.t.

Practical Wireless, January 1988

Computing Corner

We have a lot of ground to cover this time, so I shall start with small items of interest to specific users.

Commodore C64 and C128 users may like to enquire about the Colour Meteosat picture system launched by I2CAB and I2AED⁽¹⁾. This "interface-less" system claims excellent colour picture quality and I understand IBM PC and Olivetti M24 versions are available.

I am pleased to pass on information sent by Ken Easum, Capetown, South Africa concerning a C64 FAX decoder. Disk or tape versions are available⁽⁶⁾ at around 20 dollars.

The SpectrumWest Autotrack system for automatic satellite antenna tracking mentioned several issues ago attracted considerable interest. Des G8SBU forwarded further information for which I'm grateful. Neill Hill K7NH has left SpectrumWest taking rights to Autotrack. He has boards and software for C64 and Vic20, and software only for Amiga and IBM. If there is enough demand he can supply fresh boards for ZX81/Spectrum.

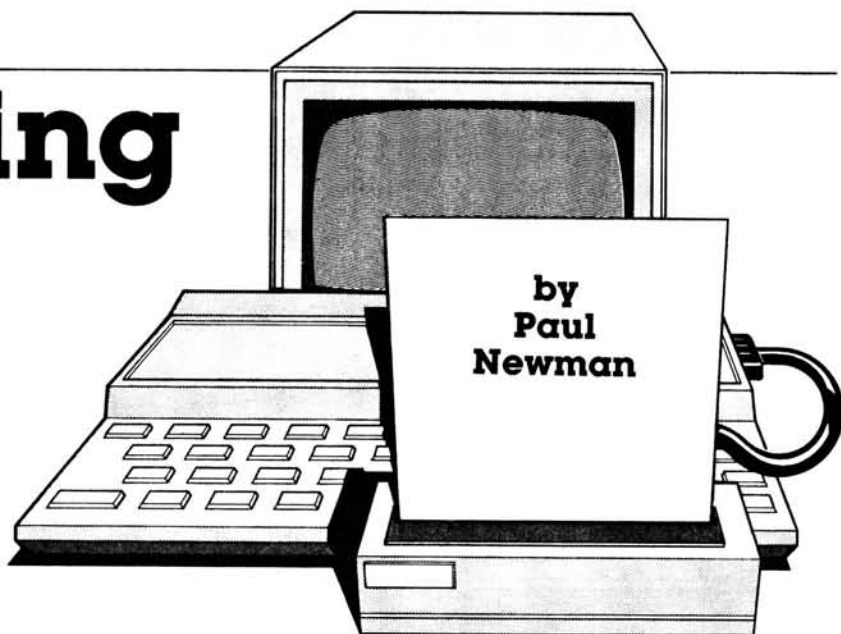
Neill has a new address⁽²⁾ so I suggest that you write to him direct. Why not blow the dust off that old ZX81 and use it as a dedicated satellite tracking computer—it's cheap enough?

JEP Electronics⁽³⁾ forwarded their current catalogue together with a copy of their Amstrad c.w. decoder program (which I'll review in a later issue). Morse-reader programs are available in Spectrum, BBC, MSX-1 Dragon, Vic20, ZX81, Atari 400-800XL and Amstrad 464 and 6128 versions. Sinclair versions operate through the "ear" socket though an odd-on is needed with the Plus-2 Spectrum. Other micros require a simple and cheap interface connected typically via the joystick port.

JEP market the "ear socket" adapter mentioned last time. In order to operate this with devices such as printers you need an expansion lead like that offered by Messrs Hawnt.⁽⁴⁾ A Morse tutor is available for the Spectrum or MSX micros together with RTTY, c.w. and SSTV transceive programs for the Spectrum. JEP tells me that further programs are in planning including Amstrad and MSX applications.

G4IDE Microsystems have ceased trading, and none of their products are now available though the G4IDE/G4INP UoSat decoder for Spectrum can still be obtained via myself. I wish Roger good luck and thank him for supplying some interesting items in the radio-computing field.

Practical Wireless, January 1988



The TX-3

There are now several transceive systems for single and multimode operation available on a number of micros so I was pleased to be offered the opportunity to review one of these—the Technical Software TX-3 for the Spectrum. The BBC-B version was viewed last month.

TX-3 is a program which uses either an interface or terminal-unit. The Spectrum version also needs an adaptor to supply the hardware which CBM and BBC have built-in. The TS interface is a high performance 2-stage device for c.w., AMTOR and narrow-shift RTTY. Transmit outputs for MIC, PTT and KEY are provided by very generous lead lengths with connectors for your specific rig. Audio input to the filter provides an external monitor-speaker output. Filter and interface are connected by a long ribbon-cable terminated with an IDC connector reducing the weak-points to the customary Spectrum edge-connector.

First, let's bear in mind that c.w. is usually hand-sent by operators each with his own "fist". Whilst most are easily read by an experienced operator, the imperfections can easily mislead a computer program no matter how good it is.

The TX-3 is clearly a complex system so any attempt at "live" operation straight away would almost certainly prove difficult and give a false impression. The TS instructions emphasise that you should understand the system and mode first and I strongly endorse this.

I set the system up using my cassette recorder as a source of pre-recorded c.w. and RTTY and, using the keyboard template and handy reminder-card provided, practised with the keys. Most selections are made using E or C-mode plus another key. The screen is the usual split-screen form. The lower type-ahead buffer area is used for memory and tape operations. Status lines are in the middle and bottom

screen. Live-typed, and memory text is scrolled across the central line as it is sent.

Practice with transmit was carried out, again using the cassette recorder. This cannot prepare you fully—only "live" conditions can do this, as you will shortly see.

Next, I set up the program options using the tape-saveable option file. With such a sophisticated system this is highly desirable since so many options are available and various combinations are required for different operating circumstances. Memories are saved in similar fashion as is the QSO-review store (27.5K long!). "Break" handling during tape operation is automatic, unlike many programs TX-3 won't crash here.

I now felt able to operate on h.f. and, having hooked everything up, set about finding readable stations on 14MHz c.w. My main problem was tuning technique—I was just too clumsy! Using the software 1300Hz filter together with the external filter in "RTTY" I succeeded in getting the program working well. Tuning is critical since correct operation depends on keeping the audio within the filter passband. Clearly, the filters are highly effective and the user should not be put-off by difficulties here.

I copied as many c.w. stations as I could find, gaining as much practice in this aspect as possible. The autotrack is very effective and on all but the noisiest, weakest signals sticks relentlessly to the Morse despite variations in sending speed. Several commercial Morse stations were copied faultlessly, in one case for over 45 minutes.

Operation of autotrack and TX tone/RX filter frequency is by keys 1-7 in E-CAPS and E-SYMB modes respectively. I advise being familiar with these combinations as mix-ups in the narrow confines of the Spectrum Plus keyboard are easy (less so on other micros though, I imagine.)

Having mastered receive, I put out

The most complex aspect to me was E-CAPS and E-SYM and I thought it a pity that what are probably the most crucial control-key operations should be so similar. During the learning stages, they are easy to confuse. It's hard to see how TS could have done these differently though perhaps it

Reviewing TX-3 was highly enjoyable; it is practical, nicely designed and full of potential. I found the learning stages difficult but amply rewarded after care in acquiring the right technique with program and transceiver.

One last-minute final-final! Charles Crane G4YFN⁽⁷⁾ announces software for PC1512/1640 and IBM compatibles. Please contact him direct, with s.a.e.

- (1) G Cameroni I2CAB and G Morelato I2AED, via D Chiesa 26, 27029 Viegvano (PV) Italy.
- (2) Neill Hill K7NH, Neill Hill Enterprises, 22104 66th Avenue West, Mountlake Terrace, WA 98043 USA
- (3) JEP Electronics, New Road Complex, New Road, Kidderminster DY10 1AL Worcs.
- (4) Hawnt Electronics Ltd, Firswood Road, Garretts Green, Birmingham B33 0TQ
- (5) Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF
- (6) Gary Sargent WB8TPD, 4227 Willow Run Drive, Dayton OH 45430, USA. Enclose 2 valid IRCs for a reply.
- (7) Charles Crane Computing, 2 Pimento Drive, Earley, Reading RG6 2GZ



VHF/UHF FM Handportables

If you want a handheld with exceptional features, quality built to last, and a wide variety of interchangeable accessories, take a look at the ICOM range of FM transceivers, all ICOM handportables come with a nicad battery pack, AC wall charger, flexible antenna and wrist strap.

Micro 2E/4E

These new micro-sized 2 metre and 70 centimetre handportables give the performance and reliability you've come to expect from ICOM. Measuring only 148 x 50 x 30 the Micro fits in your pocket as easily as a cassette tape. The Micro 2E/4E features an up/down tuning system for quick frequency adjustments, 10 programmable memories, a top panel LCD readout, up to 2.5 watts of output (optional).

IC-2E 2 metre Thumbwheel Handportable

This popular handheld from ICOM is still available. For those amateurs who require a straightforward and effective FM transceiver the IC-2E takes some beating. Frequency selection is by means of thumbwheel switches (with 5KHz up switch) simplex or duplex facility. Power output is 1.5 watts or low 150 milliwatts (2.5 watts possible with BP5A battery pack).

IC-02E/04E 2 metre and 70cm Keypad Handportable

These direct entry CPU controlled handhelds utilise a 16 button keypad allowing easy access to frequencies, memories and scan functions. Ten memories store frequency and offset, these handhelds have an LCD readout and power output is 2.5 watts or low 0.5 watt. 5 watts is possible with the IC-BP7 battery pack or external 13.8v DC.

IC-12E 23cm Handportable

Similar in design and style to the 02E/04E this 1296Mhz handheld utilises ICOM's experience in GHZ technology, gained by the excellent IC-1271E base station. Power output is 1 watt from the standard BP3 nicad pack, external 13.8v DC powering is available to the top panel jack. With the growing number of repeaters on 23cm. The IC-12E makes it an ideal band for rag chew contacts.

ALSO AVAILABLE FOR ICOM HAND-PORTABLES ARE A LARGE RANGE OF OPTIONAL EXTRAS INCLUDING A VARIETY OF RECHARGEABLE NICAD POWER PACKS, DRY CELL BATTERY PACKS, DESK CHARGERS, HEADSET AND BOOM MIC, LEATHERETTE CASES AND MOBILE MOUNTING BRACKETS.



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.

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




ICOM

THE NEW F



IC-761, HF TRANSCEIVER with General coverage receiver.

The new ICOM IC-761 H.F. Transceiver has many features making it probably the best top of the line Amateur transceiver available today. This all mode transceiver features an internal tuning unit and A.C. power supply. The A.T.U. boasts a 3 second band selection and tune up with a VSWR matching of less than 1.3:1. For the serious operator the 100kHz-30MHz general coverage receiver and 105dB dynamic range make it ideal for DX chasing. Frequency selection is by the main VFO or via the front panel direct access keypad. And for when reception is difficult, pass band tuning, I.F. shift, notch filter, noise blanker, pre-amp and attenuator should enable you to copy even those weak DX stations whether amateur or broadcast. The C.W. operator will appreciate the electronic keyer, 500Hz filter and full break in (40wpm) other filter options are available. The IC-CR64 high stability crystal is standard as is the CI-V communications interface for computer control. Twin VFO's and split mode for cross band contacts, the IC-761 features program scanning, memory scan and mode select scan and the 32 memories can store frequency and mode. The transceivers operating system is held permanently in ROM and is not dependant upon the lithium battery. The cell is used for memory back up only. A new style meter gives P.O., A.L.C., IC, VC, COMP and SWR readings.

Icom (UK) Ltd.

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

Count on us!

FACE OF HF.

You can count on Icom HF Transceivers to give superior performance, take a close look at the Icom range and see for yourself. Authorised dealers throughout the U.K.



IC-751A.

Features:

- All mode.
- 100kHz-30MHz General Coverage Receiver.
- 100 watts.
- 105dB Dynamic Range.
- 12v Operation.
- 32 Memories.
- Electronic Keyer.
- Full Break In (40wpm).
- 500 Hz CW Filter.
- HM36 Microphone.



IC-735.

- Small Compact Size.
- 100kHz-30MHz General Coverage Receiver.
- 100 watts.
- 105dB Dynamic Range.
- FM Standard.
- 12v Operation
- Large LCD Readout.
- 12 Memories.
- CI-V Communications Interface
- HM12 Microphone.

STOP PRESS. Later in 1988 Icom are launching a terrific new HF transceiver, similar in size to the IC-735 but simpler to operate. This new HF rig is also realistically priced and aimed at a large section of Ham operators. The introduction of this new HF transceiver emphasises Icom's positive approach to market requirements.

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.

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





ICOM

Count on us!

IC-28E, 2m FM Mini-mobile.

This 2-metre band transceiver is just 140mm (W) x 50mm (H) x 133mm (D) and will fit nearly anywhere in your vehicle or shack. Power output is 25 watts or 5 watts low power and is supplied complete with an internal loud-speaker. The large front panel LCD readout is designed for wide angle viewing with an automatic dimmer circuit to control the back lighting of the display for day or night operation. The front layout is very simple, all the controls are easy to select making mobile operation safe. The IC-28E contains 21 memory channels with duplex and memory skip functions. All memories and frequencies can be scanned by using the HM-15 microphone provided. Also available is the IC-28H with the same features but with a 45 watt output power. Options include IC-PS45 13.8v 8A power supply, SP8 and SP10 external speakers, HS 15 flexible mobile microphone and PTT switchbox.



IC-3200E, Dual-band transceiver

If you are a newly licensed or just undecided about which band to first operate, then the ICOM IC-3200E is just the answer. This is a dual-band (144-146/430-440MHz) F.M. transceiver ideally suited for the mobile operator. The IC-3200E has a built in duplexer and can operate on one antenna for both VHF and UHF, and with 25 watts of output power on both bands (the low power

can be adjusted from 1 to 10 watts) you can never be far from a contact whether simplex or 2m/70cm repeater. The IC-3200E employs a function key for low priority operations to simplify the front panel and a new LCD display which is easy to read in bright sunlight, 10 memory channels will show operating frequencies simplex or duplex, and four scanning systems memory, band, program and priority scan.

IC-48E, 70cm. FM Mini-mobile.

This 70cm. band transceiver is so small that it will fit almost anywhere in your vehicle or shack. Power output is 25 watts or 5 watts low, the IC-48E is supplied complete with an internal loud-speaker. The large front panel LCD readout is designed for wide-angle viewing with an automatic dimmer circuit to control the back lighting of the display for day or night operating. The front panel of the IC-48E is straightforward to make mobile operation safe and easy. The IC-48E contains 21 memory channels with duplex and memory skip functions. All memories and frequencies can be scanned by using the HM 15 hand mic provided. IC-48E options include the PS45 13.8V. 8 amp power supply, SP8 and SP10 external loudspeakers, HS15/SB mobile flexible microphone and PTT switchbox. Why not try 70 cms as a serious alternative to the 2 metre band, you might be amazed at what can be achieved. For more information contact us or your local ICOM dealer.



Icom (UK) Ltd.

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

The Battle of the Beams—Part 1

1940 . . . Now, nearly 50 years on from those near-disastrous days, how many of us remember (or even know of) the debt of gratitude owed to one man who confounded the radio experts, overcame officialdom—to earn Churchill's praise as the man who "broke the bloody beams"—and went on to unravel the secrets of German radar and Hitler's "V-weapons": the V1 pilotless flying bomb (the "doodlebug") and the V2 rocket?

But for Professor Reginald Victor Jones our official language today might well be German. D. V. Pritchard Dip Ed G4GVO tells the story.

Born in London in 1911, R. V. Jones was educated at St. Jude's, Herne Hill, and later at the Elementary School in Sussex Road, Brixton, where he won a scholarship to Albyn's School, Dulwich. Awarded an Open Exhibition in 1929 to Wadham College, Oxford, he worked in the Clarendon Laboratory under the formidable Professor Lindemann (later Lord Cherwell and Winston Churchill's wartime Scientific Adviser), where he turned his talents to infra-red detection—an interest he was to pursue for the next 30 years.

Fortunately for us, in 1939 he was appointed Scientific Officer to the Military Intelligence Service (MI6) to find out what the Germans were doing in the way of applying science to warfare, and in early 1940 he came to believe that they had a radio-navigation system by which they hoped to bomb accurately at night.

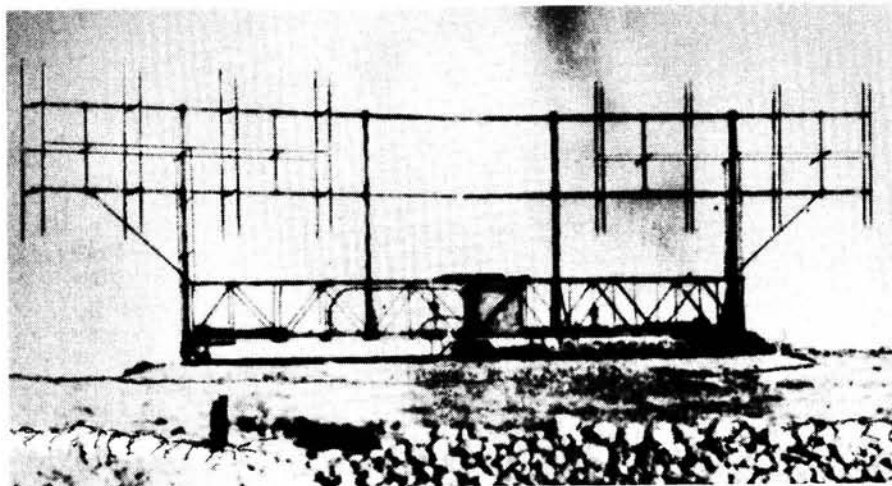
Knickebein—The Crooked Leg

From captured documents found in crashed German aircraft he came across the word *Knickebein*, or "crooked leg". The Germans were ridiculously informative with their code-names—it even sounded like a beam. But what kind was it?

Then two prisoners of war in conversation were heard to speak of something called *X-Gerat*, or "secret apparatus"; evidently it was something used in an aircraft and involved radio pulses. A thriller could hardly have a more intriguing title, but what was *X-Gerat*—and was it the same as *Knickebein*? Deeply interested, Jones pressed his Intelligence sources for more information and in March he was rewarded with the navigator's notes from a shot-down Heinkel: *Navigational Aid: Radio Beacons working on Beacon Plan "A". Additionally from 0600hr Beacon Dühren. Light Beacon after dark. Knickebein from 0600hr on 315°.*

Shortly afterwards a co-operative prisoner said that *Knickebein* was a beam so narrow and exact that two of them could pinpoint a target with an

Practical Wireless, January 1988



Front view of a small Knickebein array

accuracy of less than a kilometre. He also added that *Knickebein* was in some ways similar to *X-Gerat*, assuming that we were familiar with both systems!

From the wreck of another Heinkel a diary was rushed to Jones. It read: *March 5. Two-thirds of flight on leave. Afternoon training on Knickebein, collapsible boats, etc.*

By this time the cryptographers at Bletchley Park performed a near-miracle by breaking the German *Enigma* code. One of the intercepted messages from a German aircraft was sent to him: *Knickebein, Kleve, is confirmed at position 53°24' north and 1° west.* This meant that the aircraft had reported receiving the beam a few miles south of Retford in Lincolnshire, and Kleve (where Anne of Cleves came from) was on the nearest German soil to England.

But, clearly, there had to be two beams: one along which the bomber flew, and another one—a marker beam—to tell the pilot when he was approaching his target. Evidence of this second beam arrived a few days later in yet more salvaged papers from a crashed Heinkel: *Long-range Radio Beacon: Knickebein (Bredstedt) 54°39', 8°57', Knickebein (Kleve) 51°47'5", 6°6'.*

So Bredstedt in Schleswig-Holstein was the source of the second beam!

Amateurs and Experts . . .

Obviously beams less than a kilometre wide at well over 300km called for very high frequencies—possibly something in the centimetric region—and although this part of the spectrum was in some use at the time, the power generated by valves then available was very low. Certainly the German system suggested they had overcome the problem. (It was only later that we discovered that German radar had been operating on 50cm since about 1930!)

However, Rowley Scott-Farnie G5FI, then a signals officer in RAF Intelligence, showed Jones a report by T. L. Eckersley, the country's leading propagation expert, in which Eckersley had computed the possible range of a 20cm transmitter sited in the Hartz Mountains. If the calculations were correct the signals would bend round the earth and might well be heard by a bomber at 20 000 feet over England. This information, together with the evidence he had already collected, prompted Jones to alert Professor Lindemann to the possibility that the Germans had a narrow-beam system for bombing the country. Lindemann naturally countered with the objection that the frequencies they would have to

use could not possibly bend round the earth, but Jones produced Eckersley's calculations and told him that indeed they could.

But how were the Germans doing it? Inspection of captured aircraft revealed nothing unusual and the radio equipment seemed perfectly normal—certainly nothing in the way of centimetric receivers. He pressed for yet more information, especially from the prisoner-of-war interrogation centres. Did their aircraft carry special receivers for beam reception? Had we missed something?

Quite correctly the prisoners admitted nothing. But at one centre a prisoner was overheard to tell his friend that no matter how hard we looked for the equipment we would never find it. This startled Jones, for it implied that it was under our very noses and therefore we would never see it. Methodically he sifted through the captured equipment but the only item that fitted the bill was the receiver marked E BI 1 (Empfänger Blind 1)—Blind Landing Receiver Type 1—which was used by both the RAF and the Luftwaffe for blind landing on the Lorenz Beam System.

The Lorenz System, however, only had a range of about 8km at best, unless the Germans has somehow dramatically increased its range. Knowing that Farnborough had evaluated the equipment, he enquired if there was anything unusual about the receiver.

"No," came the reply. "But since you mention it, the receiver is many times more sensitive than they would ever need for blind landing."

Could that be it! Dr Jones spoke to Lindemann, who drafted a note to Churchill: "There seems some reason to suppose that the Germans have some type of radio device with which they hope to find their targets."

Churchill initialled the note and sent it to the Air Minister, adding: "This seems most intriguing and I hope you will have it thoroughly examined."

A committee of enquiry was formed and Squadron-Leader R. S. Blucke was put in charge of flying operations. Three Ansons were fitted with suitable receivers and flown by Lorenz-trained pilots. Rowley G5FI, told Jones that the German pre-set frequencies were likely to be 30, 31.5 and 33.3MHz, and sure enough a few days later a scrap of paper recovered from yet another crashed aircraft read: *Knickebein (Kleve) 31.5*.

On June 20 a Heinkel was shot down and the radio operator, who had baled out, had torn his notes into shreds and was actually burying them when he was captured. An Intelligence NCO unearthed them, gummied them together and sent them to London: VHF. *Knicke 54°38'7"N, 8°56'8"E, 51°0'30"N, Eqms., Stollberg 30mc/s. Kleve 51°47'N, 6°2'E, 55°N, 2°Eqms., 31.5mc/s.*

This seemed to confirm the existence of another Knickebein installa-

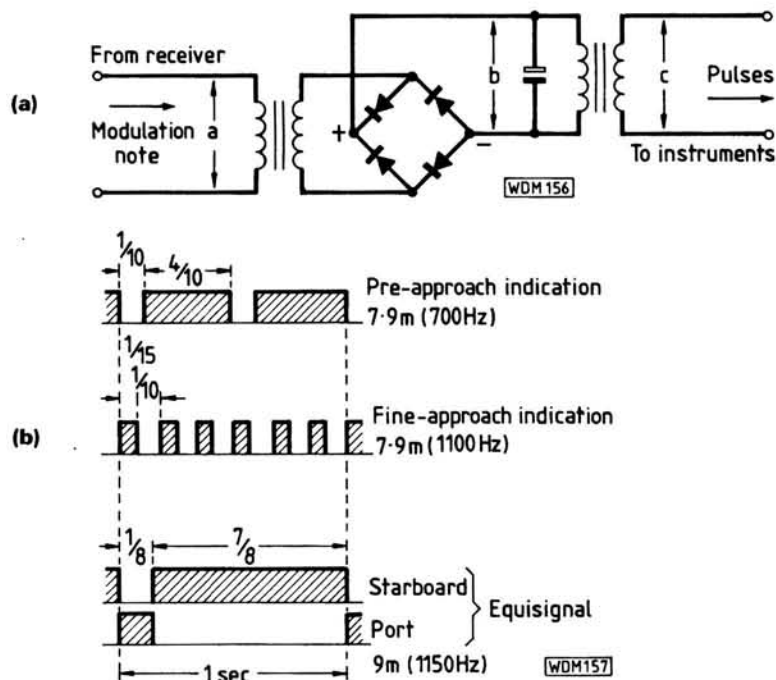
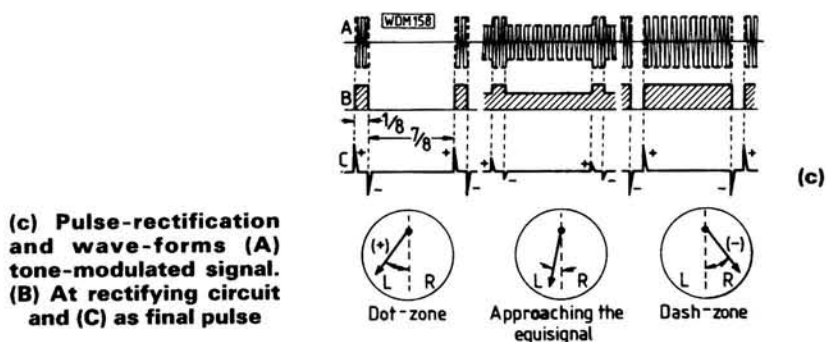


Fig. 1.1: The target-approach indication with the Knickebein system. (a) Pulse rectifying circuit. (b) Pulse-rate timing—distances in metres, tones in hertz (for approach on flightpath)



tion at Stollberg, also in Schleswig-Holstein, and also Scott-Farnie's guesses about the frequencies. Yet after two flights the Ansons failed to find the beams.

Was Jones wrong after all? Many thought so. Sir Henry Tizard was sceptical (and fell from Churchill's favour as a result); Air Chief Marshal Dowding was doubtful and Air Chief Marshal "Bomber" Harris was scathing. Other military and scientific brains looked askance at the young man who questioned established wisdom. Then suddenly on the same morning Jones was summoned to a meeting at Downing Street.

Thinking the message was one of Scott-Farnie's practical jokes, he arrived half an hour late to find the meeting already in progress. A galaxy of talent confronted him. Churchill sat on one side of the table flanked by Lindemann on his left and Beaverbrook on his right. Facing them was Sir Archibald Sinclair (the Air Minister), Sir Cyril Newall (Chief of the Air Staff), Sir Henry Tizard, Watson-Watt, and Portal and Dowding (Com-

manders-in-Chief of Bomber and Fighter Commands). Breathing his apologies to the Prime Minister, Jones took his place at the end of the table. An argument was taking place: did the beams exist or didn't they? Soon Jones realised that nobody in the room knew as much about the matter as he did. Suddenly Churchill snapped a question at him, and feeling he couldn't answer it out of context Jones said, "Would it help, sir, if I told you the story right from the start?" Churchill seemed somewhat taken aback but then replied, "Well yes, it would."

For the next 20 minutes Jones outlined his evidence. As he later recalled "... although I was not conscious of my calmness at the time, the very gravity of the situation somehow seemed to generate the steady nerve for which it called. Although I was only 28, and everyone else around the table much my senior in every conventional way, the threat of the beams was too serious for our response to be spoilt by nervousness on my part."

When he had finished an air of incredulity filled the room. Sir Henry

Tizard demanded to know why the Germans should use a beam anyway, assuming such a thing was possible—our own pilots found their targets very well by astro-navigation. (They didn't!—*Author.*) Others round the table seemed doubtful. But Churchill was convinced and asked Jones what should be done.

"I told him that the first thing was to confirm their existence by discovering and flying along the beams for ourselves, and that we could develop a variety of countermeasures ranging from putting a false cross-beam for making the Germans drop their bombs early, to using forms of jamming ranging from crude to subtle."

With a typical "Let this be done at once!" Churchill then turned round and tore a strip off the Air Ministry for their tardiness.

And Expert Amateurs . . .

Elated at having convinced the Prime Minister, Jones dashed away to attend a conference in the office of the Director of Signals, Air Commodore Nutting, to discuss the possibility that the Germans might exploit pulse techniques as navigational aids, and on which T. L. Eckersley was to give evidence. However, because Eckersley disagreed with Jones' findings, the subject reverted to Knickebein.

But what about those propagation calculations? Oh, those! Eckersley pooh-poohed them: he didn't believe them himself. He was only trying to demonstrate how far the signals *might* go under certain conditions. He thought he had been stretching theory too far, and doubted if signals in the 30MHz band would curve round the earth.

The Ansons had failed to detect the beams during their previous flights and another one was due that evening. In order to cancel it the Principal Deputy-Director of Signals, Group Captain O. G. Lywood, picked up the phone saying, "Well we have here the greatest expert on radio propagation in the country (*author's italics*) and he says the beam theory is all wrong. We've wasted a lot of time and let's not waste any more. This evening's flight should be cancelled!" But Dr Jones stood his ground. Pointing out that Eckersley's evidence had neutralised itself because he had said one thing a few months before and now said something quite different, and that enough evidence already existed to convince him, he demanded that Eckersley's statement should be ignored. He also told Lywood that if the flight was cancelled he would "jolly-well let the Prime Minister know who had countermanded his orders." Lywood backed down.

From the Chair, Air Commodore Nutting demanded: "And what do we do if we find the beams?" Quietly Jones whispered to Rowley Scott-Farnie, "Go out and get tight!"

Black Night and Bright Dawn

Dr Jones went home to spend one of the most miserable nights of his life. *"Had I, after all, made a fool of myself and misbehaved so spectacularly in front of the Prime Minister? Had I jumped to false conclusions? Had I fallen for a great hoax by the Germans? Above all, had I arrogantly wasted an hour of the Prime Minister's time when Britain was about to be invaded or obliterated from the air?"*

It was a beautiful summer's night—the shortest night of a terrible year for Britain—when Flight-Lieutenant Bufton and Corporal Mackie climbed aboard their Anson and flew over the area between Huntingdon and Lincoln. Neither had been told the Knickebein story, but merely to search for beams with Lorenz characteristics. Suddenly on the Hallicrafters receiver they heard signals on 31.5MHz. Dots!

The aircraft swung to the north. Still dots. Then—a continuous note, and later, as expected, a zone of dashes. When the dashes ceased Bufton and Mackie began intently to plot the beam. The following afternoon Bufton's report was on Jones' desk:

(1) *That there is a narrow beam (approximately 400–500yd wide) passing through a position 1 mile south of Spalding, having dots to the south and dashes to the north, on a bearing of 104° (284°T).*

(2) *That the carrier frequency of the transmissions on the night of 21/22 June was 31.5mc/s, modulated at 1150 cycles and similar to Lorenz characteristics.*

(3) *That there is a second beam having similar characteristics but with dots to the north and dashes to the south*

On the Equisignal, dots exactly fill the gaps between the dashes, so that the pilot hears a continuous note.

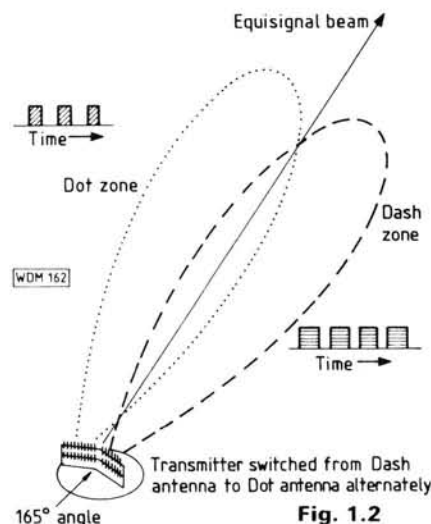


Fig. 1.2: The principle of the Lorenz (Knickebein) beam

Fig. 1.3: The principle of the operating reflectors

Fig. 1.4: The principle of the Lorenz beam system

synchronised with the southern beam, apparently passing through a point near Beeston on a bearing lying between 60°+ and less than 104°.

In other words the director beam was aimed at Derby where the Rolls-Royce factory produced engines for the RAF—as Jones had suspected. The impact of Bufton's report on the meeting that afternoon may well be imagined. Jubilation was in the air. Even "Daddy" Nutting was skipping round the room in delight. All doubts were now dispelled and countermeasures could go ahead urgently.

In the midst of the revelry Scott-Farnie button-holed Jones: "Remember what you said yesterday?"

So they bowled across to a pub to celebrate.

The Lorenz System

In 1932 a Dr E. Kramar of the German Lorenz Company began to develop a high-frequency blind-landing system on pre-set frequencies between 30 and 33.5MHz, continuous-wave modulated at 1150Hz. The beacon transmitter and its associated antenna system stood at the end of a runway and had a range of 3–5km (sometimes more depending on conditions) even though the transmitter developed 500 watts. The output was fed to a single dipole, to the left and right of which and at a $\frac{1}{4}$ -wave spacing, was a single reflector cut at its centre point. A relay was employed to alternately close and open the reflector, as shown in Fig. 1.3, whereupon a beam was generated at an angle left and right of the driven element composed of dots to one side and dashes to the other (Fig. 1.4). These alternating beams partially overlapped each other centrally to give a narrow zone of about 3° angle in which

Fig. 1.3

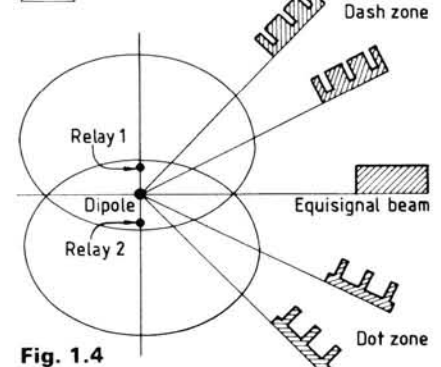
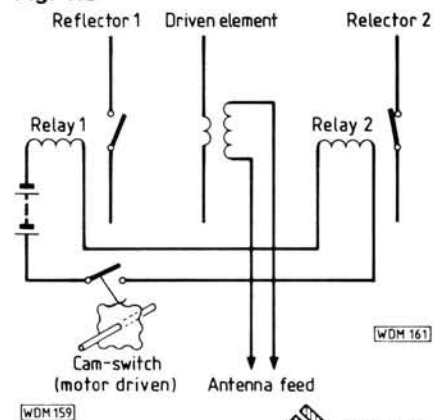


Fig. 1.4

the dots and dashes were heard as a single note, thus telling the pilot he was on the correct approach. A simple presentation unit was also provided in the cockpit which showed the course-deviation on a meter, and a form of range measurement was furnished by an S-meter arrangement.

Two additional transmitters were employed to aid landing (Fig. 1.5). At a point 3km before the runway was an early-approach system on 38MHz with a power of 5W, but having a slower keying rate and a lower modulation note. The second system comprised a transmitter at 300m before the runway, with a higher key-rate and modulation tone. Both these systems operated a lamp on the presentation unit to give further visual indication.

The accompanying aircraft receiver was known as the EB 1 (Blind Landing Receiver 1), which was developed from the earlier EBE receiver. The system was made available to Luft-hansa in 1934 and the aircraft were fitted with vertical rod antennas, usually $\frac{1}{4}$ -wave whips. Later, the Luftwaffe produced a specification for what was to be called the Blind Landing System FuB 1, and which required two separate receivers: the EB 1 for signals in the range 30–33.3MHz, and the EBL 2 for 38MHz. All multi-engined aircraft of the Luftwaffe were fitted with these up to 1941.

As war seemed inevitable, in 1938 Dr Lohmann of Telefunken developed a much larger system which was called the FuS An 721. This was an antenna array of metal girders 30m high and 90m long which revolved on a circular iron track; in the middle was a 50-watt transmitter for 30–33.3MHz. The framework supported 16 vertical wire dipoles and reflectors and was arranged at an angle of 165° (looking down on the array), so that 8 2-element antennas were in each leg of the framework. From this "broken neck" appearance, *geknickten* in German, came the code-name Knickebein.

Details of the transmitters and re-

ceivers used are, unfortunately, no longer in existence, but the antenna lobes were similar to those shown in Fig. 1.6, except that the narrow equisignal zone was $\pm 0.3^\circ$ wide and the keying of the dash-dot system had a ratio of 1:7. The improved receiver, another mark of the EB 1 known as the Fu Bl 1, could receive the beam at a range of 500km and a height of 6500m. The principle was that the main beam was directed at a target and the pilot knew he was on course when a continuous note appeared in the receiver; if he strayed to the left a preponderance of dots was heard, and a swerve to the right produced dashes.

By 1940, 10 smaller versions of Knickebein had been built which only required a circular track of 45m diameter, and each leg of the angled frame contained only 4 sets of vertical 2-element arrays which were broadbanded to tune between 30 and 33.3MHz by constructing them from wide-diameter tubing. The range was almost the same in practice as the large Knickebein, although the main beam width was wider at $\pm 0.6^\circ$.

As already mentioned, in use the main beam was directed at the target and at a pre-determined point some distance before it was reached it was overlapped by a second beam on a different frequency, thus telling the pilot he was so-many kilometres from his objective. Fig. 1.6 shows the method in more detail.

Although no details remain of the receivers employed, it is known that they were t.r.f. types and, as will be seen later, very susceptible to jamming. For this reason a Dr W. Klopfer of Lorenz developed a superhet, the EBL 3 H, which needed only slight preparation as it used the same p.s.u. as its predecessor and fitted the same cabinet. This was tunable over a number of channels from 1 to 34 in the spectrum 30–33.3MHz, and could receive the Knickebein transmissions at the same height and range of the earlier model.

Pulling the Crooked Leg

A special unit was set up to counter the beams (which were code-named *Headaches*) under the command of Wing Commander E. B. Addison of No. 80 Wing at Radlett. The technical design of the countermeasures was the responsibility of Dr Robert Cockburn of the Telecommunications Research Establishment at Worth Matravers. Both organisations were accorded the highest priority.

Receivers were placed on top of the masts of certain stations of the Chain Home RDF (radar) system, and the unlucky operators in these dizzy crows' nests were connected by telephone with Fighter Command Headquarters at Bentley Priory.

Professor Jones records how he, too, spent a night on top of one of these towers, listening to the signals which Eckersley had said could not be heard even by a bomber at 20 000 feet over England: "When about dusk the German beams were switched on, the men in the towers would be able to pick them up and let us know, for instance, if a beam was going between tower 'A' and tower 'B'. That would give us a clue to the beam's position, and one of our chaps would go up in an Anson and fly back and forth until he picked up the beam, which could then be plotted."

The first jammers were diathermy sets used by hospitals to cauterise wounds. These were requisitioned and tuned to the Knickebein frequencies, and although they only emitted a mush of signals it was thought that they had some effect on the beams. Installed mainly in police stations, they were switched on when ordered by No. 80 Wing.

Fortunately we had acquired the Lorenz licence before the war, so Lorenz transmitters were modified and strategically placed, as were "Meacons", or mock beacons. The Luftwaffe, with more than 80 radio beacons at their disposal in Germany and occupied Europe, began to find radio-navigation an ever-increasing problem. But it was Cockburn's jammers (code-named *Aspirins*) that were most effective. Immensely powerful, they flooded the beams with dashes and the German pilots, flying into their own dash-zones, would steer to find the equisignal only to find Cockburn's dashes. They would continue turning until they found a dot-zone (and Cockburn's dashes) which often synchronised into a false equisignal note. After they had found themselves flying round in circles during bombing raids for a few weeks, they came to realise that we had found and jammed their system. We had, in fact, "pulled the crooked leg". An additional bonus lay

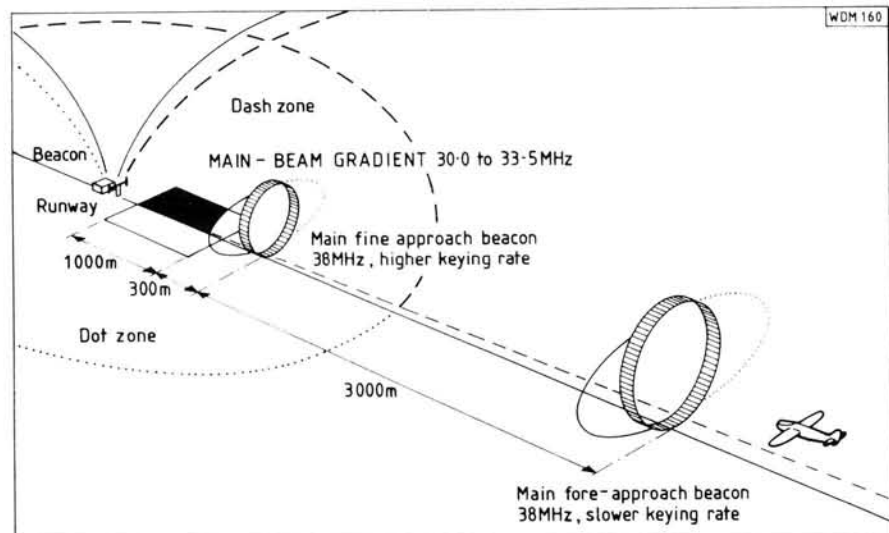


Fig. 1.5: The principle of the Lorenz blind-landing system

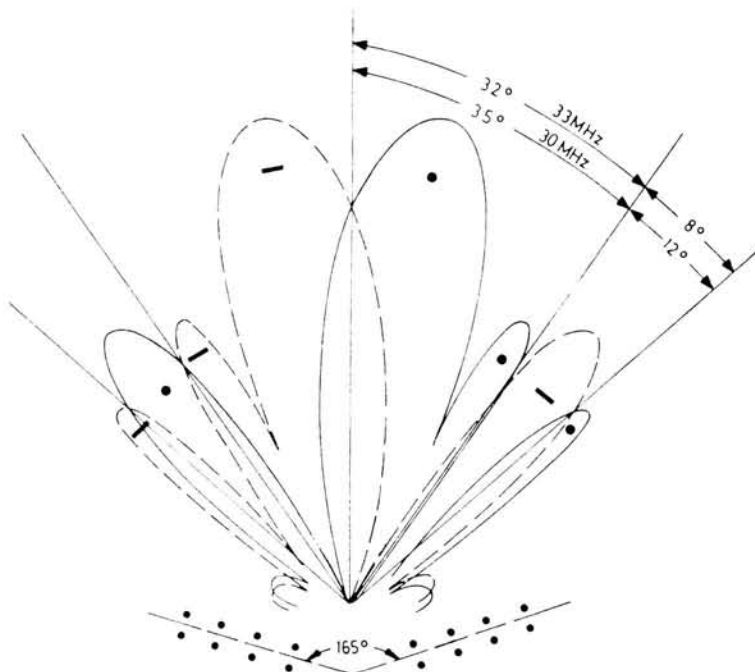


Fig. 1.6: The antenna pattern of the Knickebein array

in the fact that it was several months before the German pilots had the courage to tell Goëring that Knickebein was useless.

Had the system worked successfully a number of bombers could have put a bomb every 17 metres into a selected target. As it was our cities suffered a severe mauling from the Luftwaffe: how much worse the loss of life and property would have been but for the efforts of a young physicist who refused to believe the experts, and courageously challenged his superiors.

Today one wonders how many Londoners and citizens of our other major cities have heard of Professor R. V. Jones.

In Part 2 of his series, G4GVO describes how the X-Gerät mystery was unravelled.



0202 678558

Practical Wireless

0202 678558



PCB SERVICE

Printed circuit boards for recent *PW* constructional projects are now available from the **PW PCB SERVICE**. The boards are fabricated in 1.5mm glass-fibre, and are fully drilled and roller tinned. All prices include VAT and postage and packing for UK orders. Add £2.00 per order for despatch to overseas addresses.

Orders and remittances should be sent to: **PCB Service, Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP**. Cheques should be crossed and made payable to **Practical Wireless**.

When ordering, please state the Project Title and Issue Month as well as the Order Code. Please print your name and address clearly in block capitals, and do not send any other correspondence with your order. You may phone 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 earlier p.c.b.s.

PROJECT TITLE (Issue)	ORDER CODE	PRICE
PW Marchwood (7/83)	WR161	£3.32
Bug Key with Memory (10/84)	WR189/WR192	£10.35
PW Teme—TX (11/84)	WR196	£4.83
PW Teme—VFO/Doubler (12/84)	WA001	£3.76
PW Teme—RX (1/85)	WA002	£5.46
PW Triambic Keyer (2/85)	WAD280*	£4.26
FRG-7 BFO Mod (2/85)	WAD249	£4.00

SOME EARLIER BOARDS			
WR068	£6.90	WR177	£6.90
WR095	£4.98	WR178	£6.90
WR137	£6.04	Above 3	£17.25
WR143	£9.49	WR179	£8.63
WR144	£8.63	WR183	£8.63
WR156	£6.90	WR184	£8.63
WR160	£6.90	WR185	£8.63
WR165	£6.90	WR187	£6.04
WR166	£8.63	WR190	£6.04
WR168	£8.63	WR194	£6.04
WR169	£8.63	WR195ab	£3.54
Above 4	£19.84	WAD280	£9.49
WR167	£10.35	WAD246	£6.90
WR176	£6.90	WR126	£10.35

PW Colne (4/85)	A004	£4.14
PW Colne (5/85)	A005	£4.08
PW Colne (6/85)	WR198	£5.01
Battery Charge Control (6/85)	WR197	£4.97
Crystal Tester (7/85)	WAD302	£3.94
Add-on BFO (8/85)	WR200	£3.43
UHF Prescaler (9/85)	WR201	£3.42
PW Meon 50MHz	WR202	£4.76
Transverter (10/85)	WR199	£8.28
Capacitance Meter (10/85)	WR203	£3.74
WQ MW Loop (11/85)	WR204	£3.45
RTTY/Morse Modem (1/86)	WR205	£6.73
Crystal Calibrator (1/86)	WR206	£3.78
Simple Audio Oscillator (3/86)	WR207	£2.90
RF Speech Processor (3/86)	WR209	£5.50
PW Meon Filter (4/86)	WR208	£5.21
PW Arun Parametric Filter (5/86)	WR211	£4.04
FRG-7 CIO Mod (6/86)	WR210	£9.87
Simple 50MHz Converter (9/86)	WR213	£3.61
NiCad Charger (10/86)	WR215	£4.86
Active Antenna (11/86)	WR217	£3.30
PW Taw VLF Converter (11/86)	WR216	£3.24
High Impedance MOSFET	WR222	£3.82
Voltmeter (12/86)	WR223	£3.82
Modifying the SRX-30D (12/86)	WR214	£3.99
Basic Wobblulator (1/87)	WR224	£4.52
2m Mast-head Pre-amp (2/87)	WR218	£5.33
PW "Woodstock" (3/87)	WR219	£3.37
PW "Blandford" (4/87)	WR225	£5.28
	WR227a	£11.11
	WR226a	
	WR228	
PW "Itchen" (4/87)	WR298	£4.49
PW "Axe" (5/87)	WR230a	£5.07
	WR231	£4.24
	WR232	£3.82
PW "Downton" (6/87)	WR233	£5.04
Side-tone Oscillator (6/87)	WR234	£3.65
Mains On/Off for Battery Radio (9/87)	WR235	£3.97
PW "Blenheim" VHF to HF Converter (9/87)	WR236	£5.99
A High-stability VFO (10/87)	See article	—
RTTY Tuning Indicator	WR237	£6.95
PW "Otter" 50MHz Receiver	WR238a	£9.52

IC of the Month

There are a great many audio amplifier integrated circuits on the market which can be used with extremely simple circuits to build a power amplifier unit with a minimum of trouble; however, most of these devices provide only moderate audio output levels. Brian Dance tells us about the Hitachi HA-1397 which can supply up to 20W of audio power to a loudspeaker, considerably greater than most competitive devices.

Twenty watts is about the maximum power level obtainable from a single integrated circuit. The output power level of 20W can be obtained at frequencies over the range of 20Hz to 20kHz, with a total harmonic distortion of 1 per cent. Distortion is considerably less at lower output levels, typically 0.04 per cent at 2W output at 20kHz (maximum value for any HA-1397 is 0.2 per cent).

The HA-1397 Device

This unit is a single-in-line audio amplifier. That means it has a single line of connecting pins (12) instead of the more usual two lines employed in dual-in-line devices. It is backed by a small piece of metal with two holes for bolting the device to a suitable heatsink.

Its internal circuit in block form is shown in Fig. 1, together with a suitable external circuit. The main power supply lines are the positive line to pin 5 and the negative line to pin 12. The absolute maximum permissible values for these supplies are +30V and -30V respectively; higher voltages are likely to do permanent damage. It is strongly recommended that supplies of appreciably lower voltage than these limiting values be employed so as to allow a reasonable margin for supply voltage variation etc. A value of $\pm 22V$ is recommended and will allow the 20V output level to be achieved; the use of much lower supply voltages will cause a lower maximum output power to be obtained. These main power supply lines need not be regulated.

The quiescent power consumption from the main positive line is in the 20 to 120mA range, with 60mA being typical; maximum quiescent current to be supplied by the negative supply is 152mA. Both the

positive and negative supply currents greatly increase when a signal is applied to the device input.

Although large electrolytic capacitors will be used in the power supply unit from each power line to ground, the small non-electrolytic capacitor, C8, is connected between the two lines to prevent possible high-frequency instability. Electrolytic capacitors have a relatively high impedance at high frequencies and there may be unwanted coupling from the relatively long connections to the p.s.u. if C8 is omitted: C8 should be connected directly to the device pins using short leads.

The auxiliary positive supply, +V2, should be a regulated supply about 3 to 5V greater than the main positive supply when the device is delivering its rated output power. This second power supply line operates the internal muting circuit so that pop noise is minimised when the p.s.u. is switched on; the +V2 voltage should rise with a time constant of about two seconds. The absolute maximum value of this auxiliary positive voltage is 30V; under quiescent conditions the current from the auxiliary supply will not exceed 22mA.

The device's thermal resistance

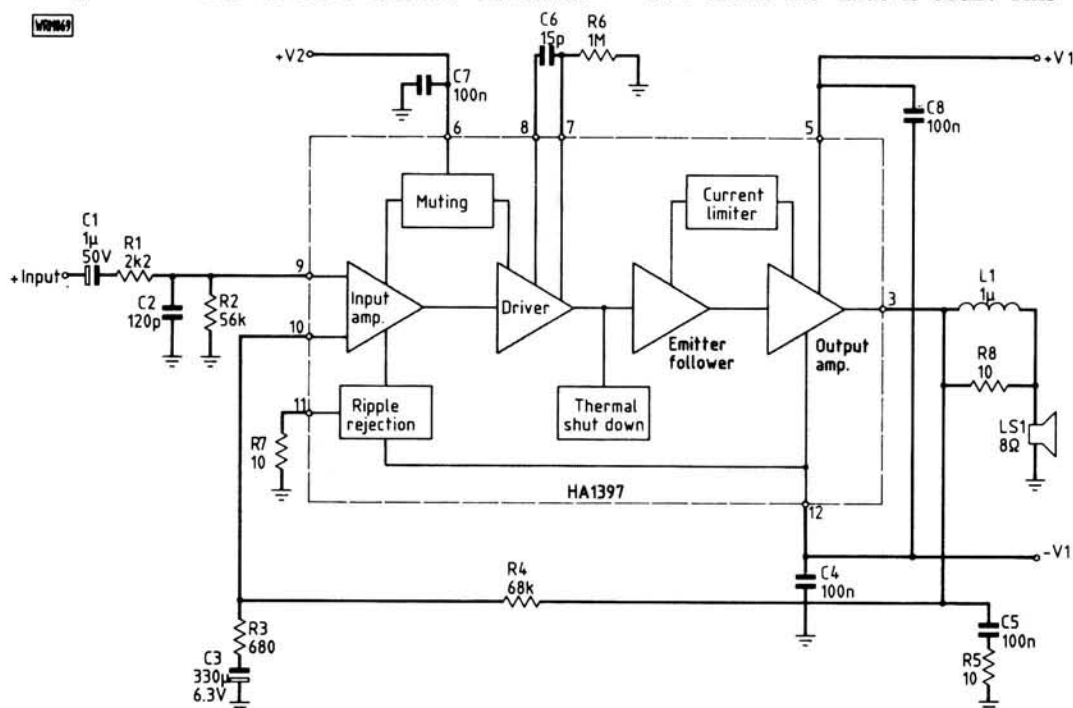
between the junction and the metal tab is 2.5°C/W . Absolute maximum device power dissipation is 30W for a 75°C tab temperature; this corresponds to a junction temperature of 150°C . The absolute maximum output current is 7.5A and maximum permissible input voltage is $\pm 10V$.

Thermal Shut-down

Incorporated into the HA-1397 device is a thermal shut-down circuit which prevents damage from occurring if the device becomes too hot. If the temperature of the i.c. exceeds about 150°C , the protection circuit will automatically reduce the output current.

The resistor, R7, between pin 11 and ground is used to prevent excessive transient current when the p.c.b. is tested with imperfect power supply ground on the assembly line; it is recommended that this resistor is used in all circuits.

A ripple-rejection circuit incorporated into the device provides a minimum of 52dB ripple rejection at a frequency of 100Hz when a $5.1\text{k}\Omega$ input resistance is employed. In a typical HA-1397 device the value is 60dB. This



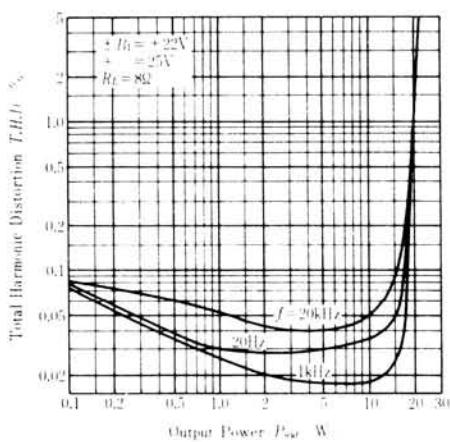


Fig. 2: Total harmonic distortion vs output power

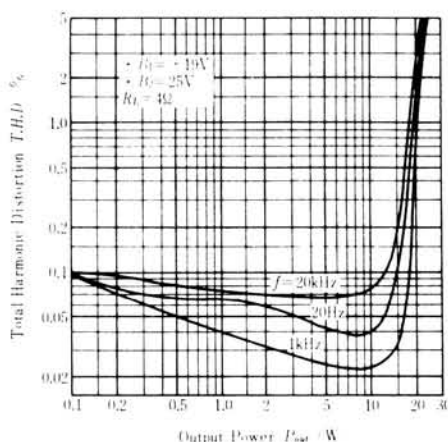


Fig. 3: Total harmonic distortion vs output power

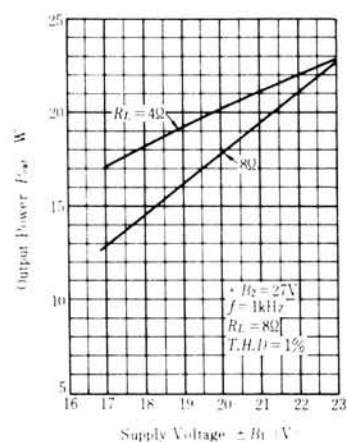


Fig. 4: Output power vs supply voltage

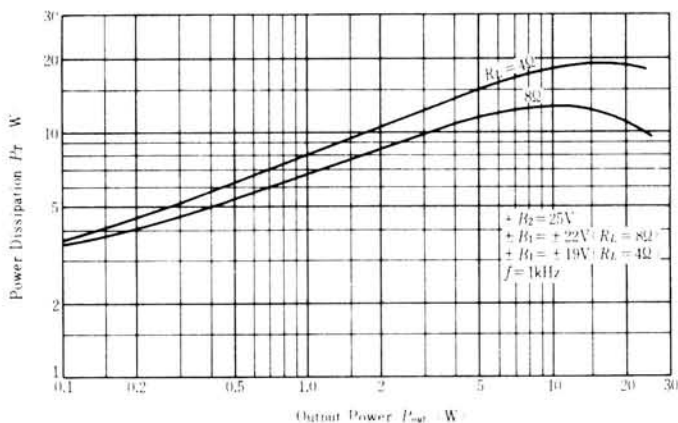


Fig. 5: Power dissipation vs output power

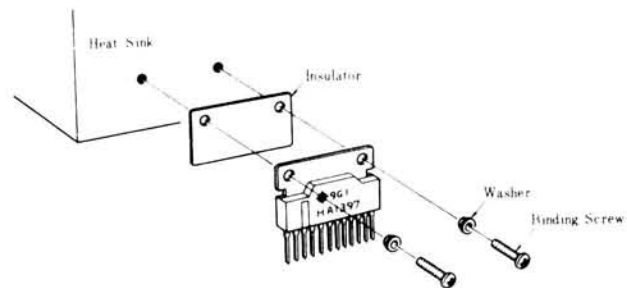


Fig. 6: How the tab of the device should be insulated

means that the ripple at the output pin is at least 52dB below that on the power supply lines to the device.

Gain

The voltage gain provided by the device is set by the ratio of R_4 and R_3 and is about 38dB with the values shown; reasonable changes in the values of these resistors can be made to alter the circuit gain if desired. The device open-loop gain without feedback ($R_3 = 0$) is typically 88dB.

As is the case with all power amplifiers, the total harmonic distortion at the output varies with the output power level, the supply voltage and the frequency, Fig. 2 shows its typical values for supplies of $\pm 22V$ $+V_2 = 25V$ and an 8Ω load. Similar curves for $\pm 19V$ supply lines with a 4Ω loudspeaker are shown in Fig. 3. It can be seen that there is a very rapid rise in the distortion level as the rated power output is reached when the Class-B amplifier circuit is driven to the point at which clipping of the peaks of the output waveform occurs.

The output power obtainable at various main power supply voltages is given by the graphs in Fig. 4 for 8Ω and 4Ω speakers. Power dissipation against the output power is shown in Fig. 5 for the same two values of load impedance. Care must be taken that the absolute maximum internal power dissipation of 30W is not even approached or one risks destroying the amplifier device.

Practical Wireless, January 1988

Mounting

The device manufacturer recommends that a torque of 4 to 8kg-cm is used on the screws which hold the device to its heatsink, and it is vital that excessive force is not used; on the other hand too little torque will increase the thermal resistance to the heatsink. Oval counter-sunk screws must not be used, since they can subject the HA-1397 to intense stress; if a tapping screw is employed it should have a diameter smaller than that of the holes in the HA-1397 mounting plate, and the torque recommendations for such screws should be observed. The heatsink screw holes should be spaced by $20 \pm 2mm$.

Care should be taken to ensure that the heatsink surface is quite flat, since a non-flat heatsink can result in greatly increased thermal resistance and subject the internal components of the HA-1397 to excessive stress; the heatsink surface should be flat to $\pm 0.1mm$ over the contact area. The holes should have burred material removed and the fixing hole size should not exceed 4mm diameter.

Thermal coupling grease should be used between the metal tab of the device and the heatsink, but avoiding an excessive amount of the compound. The HA-1397 should be fixed to the heatsink before the leads are soldered as this minimises strain on the connections, etc. If the heatsink is to be electrically connected to ground, the tab of the device should be insulated as shown in Fig. 6.

Radio Use

Hitachi recommend that certain precautions be taken when using the HA-1397 with an a.m. or f.m. radio tuner.

An adequate distance should be allowed between the ferrite antenna of an a.m. receiver and the HA-1397 so that high currents in the power supply lines, and in the output line, do not affect the ferrite; the antenna should be placed near the speaker leads.

The circuit in Fig. 1 provides for operation at frequencies of up to 100kHz or more. For use with a radio receiver it is suggested that the capacitor, C_6 , between pins 7 and 8 be increased to 22-47pF to reduce high frequency gain; this will improve stability at high frequencies.

The maximum signal from the tuner may produce clipping of the waveform and a harmonic signal return to an a.m. receiver antenna ferrite bar. Over-driving of the power output stage can be prevented by setting $V_2(+)$ at a value below 25V.

For high-sensitivity a.m. reception it is suggested that electrolytic capacitors of not less than $47\mu F$ (35V) be connected between pin 5 and ground, and between pin 12 and ground; alternatively, an additional capacitor of about 10pF may be connected between pins 7 and 10. Some trial-and-error experiments are clearly required if problems are experienced with unwanted coupling under such conditions.

Inductance L_1 may comprise 9 turns of 1.5mm dia. e.c.w. on a 15mm dia. former.

PW REVIEW



*A monitor 'scope can be very useful,
Mike Richards G4WNC reviews the Revex MS1.*

This rather neat unit from Revex combines the functions of a simple oscilloscope with a useful r.f. monitor-scope. As can be seen from the photographs, the MS1 is attractively styled and looks similar to a modern oscilloscope. An r.f. monitor-scope is a useful addition to the shack and enables many parameters of the transmitted signal to be checked at a glance.

Operation

Connecting up the MS1 is simplicity itself. The prime use is as a monitor-scope and to achieve this the MS1 is connected between the transmitter output and the antenna tuning unit or antenna. This connection is eased by the provision of two SO-239 sockets on the rear panel which are clearly marked ANT and TX. These rear mounted sockets are specified as suitable for use between 1.8MHz and 54MHz which is a very useful range.

The MS1 is mains powered and can be set for either 240 volt or 110 volt operation. The power is supplied via a 1.4m cable which comes complete with a moulded continental two pin plug for connection to the mains via a suitable fused adaptor.

The supplied manual comprised a single sheet of paper folded into four and printed on both sides so making eight A4 sides of text. Although the manual was obviously rather brief, it did cover the basic operation and was adequate for the user who is already familiar with the measurement principles.

My first problem after switch-on was to find the trace! It's surprising how difficult this can be on an unfamiliar piece of equipment. The problem was

finally solved by selecting SSB, setting the brilliance (intensity) to maximum and carefully adjusting the horizontal and vertical position controls until the trace appeared!

The MS1 is provided with three basic monitoring modes, each of which are selected by push-buttons on the front panel.

One of the most useful and consequently most used monitoring techniques is the trapezoidal pattern. This technique literally produces a trapezoidal pattern on the screen which, if perfectly proportioned, indicates a good transmission. The display is actually produced by feeding a small amount of r.f. signal to the vertical input and a sample of the audio signal to the horizontal input. The signal samples are derived within the MS1 thus requiring no additional connections which is a good point. The height of the displayed pattern can be adjusted with a stepped attenuator on the front panel, though the sensitivity is perhaps a little low if you are a keen QRP operator. When set to maximum vertical sensitivity I found that the review model required some 2.5 watts of r.f. to produce a vertical deflection of one division on the display. The width of the display is also adjustable by using the horizontal gain control which, incidentally, had a very wide range of operation. Finally the position of the trapezoid pattern on the display can be adjusted both horizontally and vertically by adjusting the appropriate position controls on the front panel.

These various adjustments meant that a good pattern could be obtained for any power level from about five watts up to the maximum of 1kW. One very useful feature when in trapezoid

mode is that the display is blanked in the absence of any r.f. hence preventing damage to the display tube through the long term display of a steady line.

The next monitor mode available is the SSB mode. When this mode is selected a sample of the transmitted r.f. is fed to the vertical deflection amplifier, whilst the horizontal deflection is controlled by the internal sweep oscillator. This monitoring technique produces a classic display of the modulation envelope. As with the trapezoid mode the position of the display is fully adjustable. There are however a few more adjustments required in order to achieve a satisfactory display. The main adjustment is to set the internal sweep oscillator frequency so that the audio modulating waveform is clearly displayed. I found that the sweep oscillator frequency range was more than adequate for the purpose and a clear display was quickly established. As well as monitoring the modulation envelope of audio signals the SSB mode can be used very effectively to check for key clicks when using c.w. The presence of key clicks is indicated by a very sharp leading or trailing edge on the displayed pulses of carrier.

If you are a RTTY operator then this next mode is likely to prove very useful. The RTTY mode allows the connection of the mark and space outputs of your terminal unit to the monitor-scope. This is of course only possible if your RTTY terminal unit is provided with external mark and space outputs! There is a choice of connecting the terminal unit outputs to either the front or rear BNC sockets on the MS1, the rear sockets being the norm. When all is connected up the display will show a cross pattern for a correctly

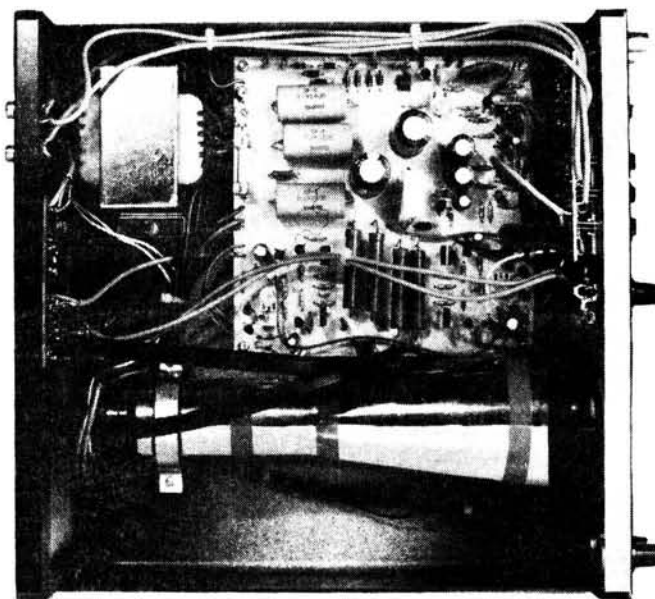
tuned signal and can be used as an effective tuning aid. In order to obtain a clear cross pattern both the vertical and horizontal gain and position controls have to be adjusted. One important point I did note was that the maximum input to both the vertical and horizontal inputs is 1 volt without the attenuator or 10 volts with the attenuator. This means that the terminal unit output voltage should be checked before being connected to the scope. If the input voltage limits are exceeded then the first effect is that the input waveforms are distorted making it impossible to obtain good monitor patterns. Obviously if the limits are greatly exceeded then the scope will probably be rather more permanently damaged.

One final and extremely useful facility is the ability to use the MS1 as a simple audio oscilloscope. To do this the MS1 is set to SSB mode and the signal to be viewed is connected to the vertical input via the BNC connector on the front panel. The internal sweep oscillator provides the horizontal movement of the trace and the sweep frequency is adjustable over a very wide range in three bands. The width of the display also has a very wide range of adjustment which can prove very useful. One point to watch is the input sensitivity of the vertical amplifier which, as described earlier, is limited to a maximum input of either one volt or 10 volts depending on the attenuator setting. This limitation needs to be carefully observed otherwise the displayed results will be meaningless. One other limitation of the vertical amplifier is the frequency response which only extends to about 40kHz making it suitable only for audio work. The input impedance of the vertical amplifier is $1M\Omega$ which is good as it means that standard oscilloscope probes can be used. As none of the controls had calibrate positions the MS1 could not be used as a measuring instrument in the same way as a conventional oscilloscope. Of course if an accurate signal was applied to the MS1 the various controls could be adjusted to give a temporary calibration to enable measurement over a limited range. In practice probably the most common use of an oscilloscope is as a signal tracer and for this use the MS1 is perfectly adequate. When used as an audio oscilloscope I found that I could easily obtain a steady display of frequencies between about 30Hz and 20kHz. Although higher frequencies could be displayed it was difficult to obtain a steady trace above about 20kHz.

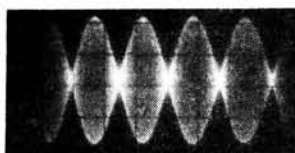
Performance

During the review period the MS1 has been in daily use in my shack and has been connected between my trusty Icom IC-720A h.f. transceiver and the a.t.u.

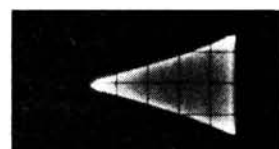
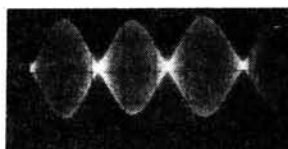
The 75mm cathode ray tube display had a very good range of brilliance
Practical Wireless, January 1988



The internal view of MS1



Two waveforms showing a typical modulation envelope



The trapezoidal waveform

adjustment and the focusing was very sharp giving a good clear image regardless of the ambient light conditions.

I found that the most used monitoring mode was the trapezoid facility as the display was easily interpreted whilst on the air. The other good point about this mode was that the display was blanked during reception. I also found that once initially set-up the trapezoid mode required no further adjustment unless the r.f. output was drastically changed. The facility to view the modulation envelope was particularly useful for checking non-speech transmissions, i.e. RTTY and Morse, etc.

Although the MS1 is specified for use up to 54MHz, the current UK power limitations on 50MHz combined with the MS1's sensitivity means that the monitor display on this band will be rather small.

I also noted that the MS1 introduces a certain amount of frequency dependent mismatch when using the antenna and transmitter connections on the rear panel. This mismatch gave a s.w.r. which ranged from 1.1:1 at 3.5MHz to 1.3:1 at 29MHz.

When used as a simple audio oscilloscope the MS1 performed well, but the input overloading mentioned earlier can easily catch you out if you're not careful.

The general control layout and mode selection was very well designed. I particularly liked the fact that the MS1 could be left permanently connected both to the antenna and the terminal unit, using the front panel switch to select the front or rear inputs for scope or RTTY use.

Overall I would sum-up the MS1 as a useful addition to the shack for the h.f. orientated amateur who requires a monitor scope and simple oscilloscope in one neat unit.

The MS1 monitor-scope is available from *Waters and Stanton, 18-20 Main Road, Hockley, Essex SS5 4QS* price £269 inc VAT plus £3 carriage. My thanks to them for the loan of the review model.

Specification

RF Section:

Frequency range: 1.8MHz to 54MHz
Maximum power: 1000 watts p.e.p.
Impedance: 50 to 75 Ω

Vertical Amplifier:

Input Impedance: $1M\Omega$
Frequency Response: 10Hz to 40kHz.

Horizontal Amplifier:

Input Impedance: $1M\Omega$
Frequency Response: 10Hz to 300kHz.

Sweep Generator:

Frequency range: 100Hz/1kHz/10kHz

CRT: 75mm round monitor.

Power requirements: 100-117V or 220-240V a.c. 30 watts

Dimensions: 270 x 116 x 305mm

Weight: Approx 4.2kg

In the first part of this series we saw how electrical energy was turned into an electromagnetic wave and radiated into space. What I would like to show now is how to extract some of the energy by reconvert it to an electrical signal, says A. J. Harwood C Eng MIERE G4HHZ.

Making Waves—A Guide to Propagation

Part 2—Are You Receiving Me?

To do this of course we need a receiving antenna and so in this month's article we'll look at some aspects of antennas. The easiest one to start with is our old friend the half wave length dipole.

If we can recap on Part 1, the important results were that the wave carries energy in the form of an electric field E and a magnetic field H and the energy flows at a rate of $E^2/120\pi$ watts per square metre. So what happens when we put our dipole into the wave; perhaps the first question to ask is how do we place it in relation to the wave? The answer is that we put it parallel to the electric field which also means it is at right angles to the magnetic field. With this orientation, the dipole intersects the magnetic and tries to "short-out" the electric field. It is these actions which induce a voltage in the dipole. The next question is how much voltage?

At first sight if the length of the dipole is $\lambda/2$ metres and the field strength is E volts per metre, we might expect the answer to be

$$E \times \lambda/2 \text{ volts}$$

However, it's a little more complicated than that, (but not much more). The voltage induced on the dipole is not evenly distributed along its length, but assumes the familiar sinusoidal (strictly speaking cosinusoidal) distribution

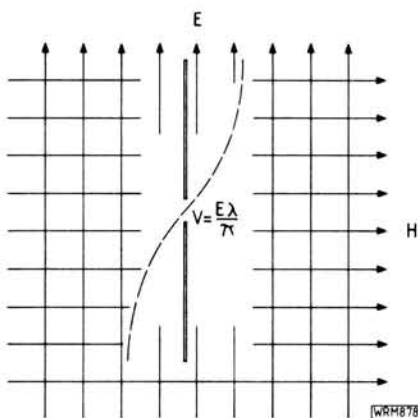


Fig. 2.1

being maximum at the ends and a minimum at the centre terminals and it is the average value of the voltage which in fact drives a receiver. Now the average value of something which has an overall distribution of a half sine wave is $2/\pi$ times the maximum. So if the voltage has a sinusoidal distribution with a peak value of $E \times \lambda/2$ then the voltage at its terminals, V volts, has an average of:

$(E \times \lambda/2) \times (2/\pi)$ so,
as shown in Fig. 2.1, we have

$$V = E \times \lambda/\pi$$

This isn't all the story though; if we want to make the received signal do something useful, such as drive the front end of a receiver, we need to consider the dipole as a generator and to know its internal impedance.

To find this, it is necessary to resort to a mathematical analysis which shows that it is 73.2 ohms. This is also known as the radiation resistance since, when the dipole is used as a transmitting antenna, the power radiated can be considered to be dissipated in a resistance of 73.2 ohms. Now, any generator delivers the maximum power possible to a load when the load is equal to the internal impedance of the generator; to get the most out of our dipole we must therefore connect it to 73.2 ohms. Under these conditions the voltage across the load is equal to half

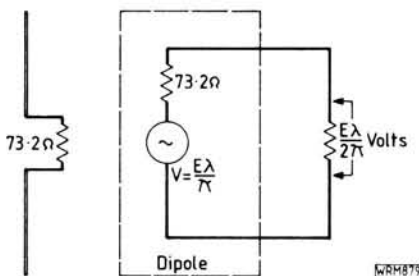


Fig. 2.2

the generator voltage. So to deliver the greatest possible signal power to the receiver, the input voltage is

$$E \times \lambda/2\pi \text{ across } 73.2 \text{ ohms.}$$

It is therefore possible to calculate the power into the receiver by means of the usual calculation, $P = V^2/R$, which gives

$$(E \times \lambda/2\pi)^2/73.2 \text{ watts}$$

Another way of looking at this is to say that a matched dipole can extract

$$(E \times \lambda/2\pi)^2/73.2 \text{ watts}$$

from a wavefront with a field strength of E volts per metre. This point is illustrated in Fig. 2.2.

This result also allows us to consider the dipole from another aspect, that of an aperture. Since the wavefront carries energy at a rate of

$$E^2/120\pi \text{ watts per square metre}$$

we can calculate how many square metres of wavefront must be intercepted to provide the power delivered by the dipole to the receiver simply by dividing this power by

$$E^2/120\pi$$

The answer we arrive at is an area, usually denoted by the letter A, given by:

$$A = \frac{\lambda^2}{4\pi} \times \frac{120 \text{ square metres}}{73.2}$$

and substituting for the numbers gives:

$$A = 0.13 \times \lambda^2 \text{ square metres.}$$

The matched dipole behaves in effect as an aperture or window of cross sectional area 0.13 square wavelengths and all the energy flowing through this aperture is passed to the receiver.

The more inquisitive reader, (assuming there still are some) may wonder why I've left the fraction to the right ($120/73.2$) on its own. Working

out its value shows it to be 1.46, which is a number we used in Part 1. It is the gain of a dipole over an isotropic source, the theoretical antenna which radiates equally well from all directions. As we shall see although we can't go out and buy one, the isotropic source is a very useful idea if only because it makes the sums easier.

Going back to the concept of aperture we can easily see that the aperture of an antenna is directly proportional to its gain. Perhaps we'd better remind ourselves just what we mean by an antenna's gain. In the transmitting case, if one antenna produces a given field strength E at a given location for an input power of one watt, whilst a second antenna requires an input of G watts to produce the same field strength then the first antenna has a gain of G times the second. In the receiving case, if an antenna receives G times the power of another when placed in a given field strength then it has a gain of G over the other. However we can also say that it is intercepting G times the area of wavefront and so its aperture is also G times greater. Note the gain is always quoted as a power gain, if we want to calculate the relevant voltage across the two antennas then they will be proportional to the square root of the gain of one compared to the other.

Considering the dipole and the isotropic source, if the dipole has a gain of 1.64 over the isotropic source then the aperture of the isotropic source must be $1/1.64$ times that of the dipole which is $\lambda^2/4\pi$.

We can also see that if we use our isotropic source as a reference, (even though we can't get hold of one), we can say that the aperture of any antenna whose gain is G with respect to the isotropic source is given by:

$$A = \frac{G \times \lambda^2}{4\pi} \quad \text{or} \quad G = \frac{A \times 4\pi}{\lambda^2}$$

Knowing an antenna's gain over an isotropic source we can easily calculate its aperture and the power (P_r) it delivers to a matched receiver is given by:

$$P_r = A \times E^2/120\pi \text{ watts}$$

One point worth noting is that the received voltage is proportional to the wavelength so the output voltages from a number of dipoles placed in a set of fields of different frequency, but all having the same field strength decrease as the frequency increases. Similarly, the received power decreases in a manner which is inversely proportional to the square of the frequency. This is one reason why, in general, we need higher gain antennas in order to communicate at higher frequencies. Many people believe that propagation is inherently worse at high frequencies. In fact, in free space it isn't, it's getting the signal out of the wavefront that is more difficult.

We now have two interrelated ways of measuring the energy taken out of the wavefront, we know how to calcu-

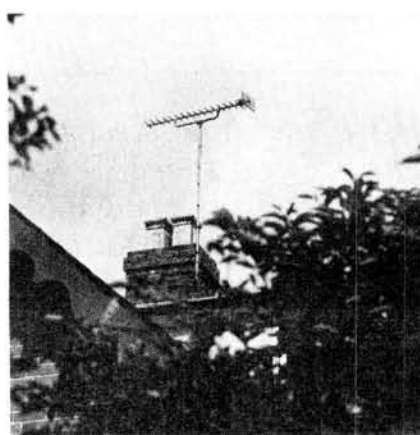


Fig. 2.3: A typical TV antenna

late the voltage at the input to a matched receiver and the power delivered to the receiver. Both are used in practice depending on the problem under consideration.

Let's just have a look at how we would use these two methods in practice. Most people have a television receiver, so let's start with that. (I know in the last episode I specified a system out in space to avoid the complication of effects arising from the proximity of the earth but I promise that in the case I'm about to consider there are no such effects. I'll deal properly with what happens in the real world in a later article).

An average receiver needs about a half a millivolt of signal at the input socket if it is to give a noise-free picture. At 600MHz, the lower end of Band V used for television broadcasting in the United Kingdom, the wavelength is a half a metre.

Well inside the service area of a transmitter, we would expect a field strength of 4 millivolts per metre, or as the broadcasters would be more likely to quote it 72dBµV/metre. If we were to put a dipole (correctly orientated of course) into this then we would get an output voltage (into a matched load) of:

$$\begin{aligned} V &= E \times \lambda/2\pi \\ &= 4.0 \times 0.5/2\pi \\ &= 0.32\text{mV} \end{aligned}$$

In practice, the attenuation of the feeder connecting the antenna to the television receiver would reduce the signal to about half this value or about 0.16mV at the receiver input. To get 0.5mV at the receiver we need $0.5/0.16$ times this voltage so we have to use an antenna which has a power gain of $(0.5/0.16)^2$ which is 9.77 times or about 10dB. It's important to note that this gain is that over a dipole and can be realised by a Yagi antenna with about ten to twelve elements of the type shown in Fig. 2.3.

At the microwave frequencies used for satellite transmission it is more usual to use the received power and aperture approach, so let's see how we go about a receiving problem in this case. The antenna is usually a dish



Fig. 2.4: A satellite TV dish

which is shaped so that it focuses the energy to a point where it can drive the receiver front-end. The power it intercepts is simply that carried by the wavefront in an area of the dish. Not all of this power is passed to the receiver, mainly due to an effect known as spillover, and in practice the dish will be something over 50 per cent efficient, that is at least half the energy arriving at its surface will be transferred to the receiver.

As an example I'll use the sort of receiving dish that is being thought of for the television direct broadcast satellite services which will be starting in two or three years time. They will operate at frequencies of about 12GHz with a wavelength of 2.5 centimetres or 0.025 metres. The plan that's allocating frequencies for this band assumed the use of dishes with an average diameter of about 0.9 metres, illustrated in Fig. 2.4, which means a cross sectional area of 0.64 square metres. Allowing for 50 per cent efficiency the effective aperture is 0.32 square metres. The gain of the antenna can thus be calculated and is:

$$\begin{aligned} G &= A \times 4\pi/\lambda^2 \\ &= 0.32 \times 4\pi/(0.025)^2 = 6434 \end{aligned}$$

This is equivalent to 38dB and it is the gain compared to an isotropic source.

The convention at microwaves is to quote power flux densities rather than field strengths and for a high power direct broadcast satellite this is planned to be at least 50 picowatts (0.000 000 000 05 watts!) per square metre (for the dB merchants—103dBW per square metre). Power delivered to the front end of a satellite receiver will be 0.32×50 or 16 picowatts. In practice dishes of 0.6 metres diameter having an effective aperture of 0.14 square metres and a gain of 2860 (38dB) will give good results delivering about 7 picowatts to the receiver.

Well, by now we should know a bit about receiving antennas and how they interact with an electromagnetic wave. In the next article we'll consider how the transmitting end, the propagation path and the receiving end can be considered as a system which we can design to give us the results we want for a communications link.

Expedition to the Pole

In late February, 1988, a small team will be returning to the Arctic region to undertake the Polar Universal Natural Science Expedition 1988 (PUNS). Among them will be Laurence Howell GM4DMA, who wrote this report of the last expedition in 1986.

In 1986, GM4DMA was active as G4DMA/P.VE8 from a canvas hut located on Ward Hunt Island, which is located at 83° 05'N 74° 06'W, just north of Ellesmere Island NWT. Tiny Ward Hunt Island is popular with explorers as a starting point for attempts on the Pole, being one of the closest points to the geographic North Pole.

From early March until early May 1986, amateur and commercial communications were radiated from ruggedly built Racal transceivers using QRP only. Power was obtained from a 24 volt battery system, charged by two 4 amp wind turbine generators. Temperatures varied from -20°C to a cool -52°C, with a winter low of -67°C. This caused no problems for the radio gear, despite it often being covered by a layer of frost, though the operator had to be fairly careful that moisture from his fingers did not freeze onto the controls, causing great pain when pulling them off!

Below about -45°C, interconnecting wiring such as coaxial cables takes on a new physical state. "Normal" cable such as RG8/UR67 becomes brittle, and even a slight breeze can snap and tear the insulation off an untethered length, rendering the cable useless. Special silicone-coated cables were employed for most of the antennas, and no problems were experienced, apart from the local Arctic fox and wolf populations taking a liking to the taste of the cable to supplement their meagre diet.

Wire antennas were employed for point to point links, "vee" beams being the most successful, but a vertical or two for the l.f. bands seemed very

effective, stations on Top Band from the UK being very strong from early on in the evening. The transition from being completely dark to twenty-four hour daylight takes only a few weeks, after which it becomes very difficult to judge the time of day without the aid of a 24-hour watch.

Being only some 300 miles to the north of the North Magnetic Pole, radio conditions tended to be very erratic, with rapid deteriorations in communication. This was mostly on transatlantic links back to the UK, though the large commercial arrays of British Telecom International's Portishead Radio kept in touch through very bad disturbances. Optimum working frequency charts for different point to point locations were provided by Racal Communications, which compared well with the actual values calculated at Ward Hunt Island. Daily communication was established with the Phillips Petroleum Maureen Alpha platform (GM4DMA's normal place of work), situated in the North Sea, and great pleasure was obtained from both ends keeping abreast of the state of play of the expedition.

Tests of the radio paths from Pole to Pole were also carried out with the British Antarctic Survey base at Halley Bay, Antarctica, links being established with just 10 watts p.e.p.

Scientific Tasks

The expedition had been given a number of scientific tasks to complete. Most of these were "earth science" based, such as drilling by hand a number of 10m holes into the ice shelf around the island. Each hole took two

days to complete. The core samples were returned to Ward Hunt for onward shipment by air for analysis. A detailed make-up of the ice shelf is being compiled, as large sections keep breaking up and floating either eastwards or westwards, possibly jeopardising oil drilling operations far to the south.

A full meteorological programme was also carried out, with twice-daily reports being sent by radio for inclusion in the world weather forecasting system. Snow and lichen samples were taken from "clean" areas in the locality, to be shipped away to a university for analysis. The results will show the level of industrial contamination present even in these remote areas.

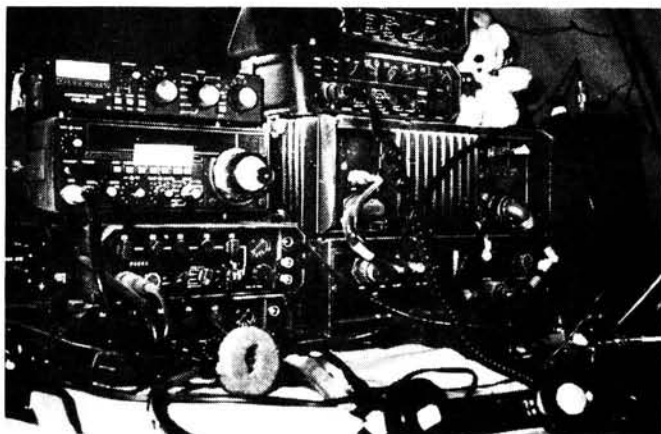
A study was also carried out of the problem of Arctic haze. The high pressure that tends to sit over the high Arctic in the winter causes air to sink, so that the pollution coming from heavy industrial areas far to the south gets compressed into a dirty smog, greatly reducing the visibility. Air sampling was carried out using evacuated flasks, far from the base and away from any local effects.

To the Pole!

In addition to the scientific programme, an expedition left from Ward Hunt to travel towards the Pole to try to beat the existing record for unsupported travel Polewards, that is, no air support nor any help from mechanical or animal means. The two men who left the base pulled their heavily laden sledges, weighing over 136kg, northwards towards the Pole over the very rough terrain of the ever-moving Arc-



Base-camp hut, Ward Hunt Island, 83N 74W, April 1986



Frost-covered radio equipment in hut operating at -52°C, March 1986



Hand-drilling ice-cores to 10m takes two days at -45°C , east of Ward Hunt Island



The author holds a smoke-flare giving navigational aid to a ski aircraft at Ward Hunt Island, March 1986

ic Ocean. Travel is not easy, for winds and currents cause the polar ocean ice to shift and break up, smashing large areas of ice together and making pressure ridges appear within minutes to a height of 10 metres. This compounds the difficulty of working physically very hard at these low temperatures, when stopping for a break allows perspiration to freeze within seconds, making movement extremely uncomfortable.

After travelling for over twelve hours a day, the "ice-group" made camp and used the 1 pint of fuel allowed per day to cook their dried rations and hopefully dry out their clothing. However, their sleeping bags gradually became more and more wet, increasing the weight to be carried and causing sleeping to become more uncomfortable night after night. Getting into a frozen sleeping bag after a hard day's pull is not the most pleasant feeling in the world. Averaging an astonishing 16km a day, the ice-group managed to break the record before returning to base camp.

Watchkeeping

For fourteen days, a continuous 24-hour radio watch was kept by GM4DMA for the ice-group. On the hour, every hour, a 10-minute watch

was mounted in case of difficulties, using just a dipole laid out on the polar ocean ice. The ice-group link back to base camp proved to be excellent, their lightweight Racal transceivers taking all the physical punishment, plus the extremes of temperature, and not failing once.

The only problem was static interference from charged particles as they passed over the respective antennas. Very good localised lightning displays were noted within the base hut, with huge blue and red flashes plus the associated bang. Tracking occurred down the side of the canvas hut adjacent to the antenna cables, causing some concern!

An Extra Dot!

The Ward Hunt radio station was the most northern land-based radio station in the world, and thus interest was quite high from radio amateurs. However, operating time was limited because of the scientific work to be carried out, plus the added problems of running a base camp single-handed. Sleep was very broken, being limited to 50 minutes between the hours. This could explain why the Morse from G4DMA/P.VE8 was augmented by the occasional extra dot—it wasn't his teeth chattering.

PUNS 1988

In February 1988, the same team will be going back north to continue the scientific work, and will have an attempt at reaching the pole without any support.

This time it is planned that three men will travel north, as it was decided that they can carry and distribute the weight far more easily than two. Sir Ranulph Fiennes, Oliver Shepard and Dr Mike Stroud will depart from the Ward Hunt area around the first week in March, this being the earliest that they can fly into Ward Hunt Island. The first day the sun rises over this area is around March 4. Base communications will be run again by Laurence Howell GM4DMA.

The duration of the expedition depends very much on the state of the ice towards the Pole, which varies from year to year. If everything goes according to plan, the three-man ice-group hope to reach the Pole within 90 days. G4DMA/P.VE8 should again be active throughout this period on all bands from 1.8 to 30MHz and possibly 144MHz too, that is if the polar bears, wolves and Arctic foxes leave his coaxial cables alone. Operation will take place from Ward Hunt Island (Locator FR23WB) and from Axel Heiberg Island (80°N 90°W —Locator ER50AA). **PW**

**PLEASE
MENTION
PRACTICAL WIRELESS
WHEN REPLYING
TO ADVERTISEMENTS**

J. BIRKETT

RADIO COMPONENT SUPPLIERS

EX-MILITARY COMMUNICATIONS RECEIVER

R210, Frequency 2 to 16MHz, in 7 Switched Bands.

AM, CW, SSB, FCO, Aerial Inputs, 80 ohm, Balanced

Line, Long Wire or Whip, CW Filter, BFO, Noise Limiter.

Complete with 240 volt AC Power Pack, Loudspeaker, Headphones Jack and a pair of Lightweight Headphones. Price **£79.80**. Carriage

£12.00, mainland only.

50 BC108 TYPE TRANSISTORS UNTESTED @ 75p, BC177 PNP Type 50 for 75p.

X BAND GUNN DIODES @ **£1.65**, X BAND DIODES Like 1N23 @ 45p, SIM2 @ 45p.

200 ASSORTED MINIATURE POLYESTER CAPACITORS for **£1.00**.

WIRE ENDED RF CHOKES 100ma 2.5mh, 5mh, 7.5mh, 10mh. All @ 70p each, 800uh @ 30p, 1

Amp TC Chokes @ 20p.

C804 TYPE VARIABLE CAPACITORS 5p.f. @ **£1.95**, 10p.f. @ **£1.95**, 25p.f. @ **£2.50**, 50p.f. @

£2.50, 75p.f. @ **£2.50** 100p.f. @ **£2.95**, 150p.f. @ **£2.95**.

MORSE OSCILLATOR KITS With Instructions @ **£1.95**.

VMO5 POWER TRANSISTORS VN1 0KN @ 50p, WM211 @ 40p, VN90AA @ 80p, VN1 0LM @

40p.

455KHz CERAMIC FILTERS MURATA BF8455 6 for **£1.00**.

VERNITRON CERAMIC FILTERS 10.7MHz 6 for **£1.00**.

TRANSMIT-RECEIVE PIN DIODES VHF 5 for 60p, UHF 5 for 75p.

VHF MONITOR RECEIVER KIT 120 to 150MHz Approx, consisting of Tuner Module, 10.7MHz IF

Module, AF Amplifier, Telescopic Aerial, Loudspeaker with Instructions @ **£15.95** (P.P. **£1.00**).

ITT CRYSTAL FILTER TYPE 0140G 10.7MHz BW 3.75KHz @ **£3.95**.

RECEIVER AERIAL TUNING UNIT 1 to 30MHz @ **£23.60** (P.P. **£1.50**).

MULLARD VHF TUNER LP1169 88 to 108MHz @ **£3.00**.

WOOD AND DOUGLAS KITS AND C.M. HOWES COMMUNICATIONS KITS AVAILABLE. ACCESS AND BARCLAY CARDS ACCEPTED, P.P. 60p UNDER £5, OVER FREE. EXCEPT WHERE STATED.

**25 The Strait
Lincoln, Tel. 20767**

(LN2 1JF)

Partners J.H.Birkett.

J.L.Birkett.

Complete with 240 volt AC Power Pack, Loudspeaker, Headphones Jack and a pair of Lightweight Headphones. Price **£79.80**. Carriage

£12.00, mainland only.

50 BC108 TYPE TRANSISTORS UNTESTED @ 75p, BC177 PNP Type 50 for 75p.

X BAND GUNN DIODES @ **£1.65**, X BAND DIODES Like 1N23 @ 45p, SIM2 @ 45p.

200 ASSORTED MINIATURE POLYESTER CAPACITORS for **£1.00**.

WIRE ENDED RF CHOKES 100ma 2.5mh, 5mh, 7.5mh, 10mh. All @ 70p each, 800uh @ 30p, 1

Amp TC Chokes @ 20p.

C804 TYPE VARIABLE CAPACITORS 5p.f. @ **£1.95**, 10p.f. @ **£1.95**, 25p.f. @ **£2.50**, 50p.f. @

£2.50, 75p.f. @ **£2.50** 100p.f. @ **£2.95**, 150p.f. @ **£2.95**.

MORSE OSCILLATOR KITS With Instructions @ **£1.95**.

VMO5 POWER TRANSISTORS VN1 0KN @ 50p, WM211 @ 40p, VN90AA @ 80p, VN1 0LM @

40p.

455KHz CERAMIC FILTERS MURATA BF8455 6 for **£1.00**.

VERNITRON CERAMIC FILTERS 10.7MHz 6 for **£1.00**.

TRANSMIT-RECEIVE PIN DIODES VHF 5 for 60p, UHF 5 for 75p.

VHF MONITOR RECEIVER KIT 120 to 150MHz Approx, consisting of Tuner Module, 10.7MHz IF

Module, AF Amplifier, Telescopic Aerial, Loudspeaker with Instructions @ **£15.95** (P.P. **£1.00**).

ITT CRYSTAL FILTER TYPE 0140G 10.7MHz BW 3.75KHz @ **£3.95**.

RECEIVER AERIAL TUNING UNIT 1 to 30MHz @ **£23.60** (P.P. **£1.50**).

MULLARD VHF TUNER LP1169 88 to 108MHz @ **£3.00**.

WOOD AND DOUGLAS KITS AND C.M. HOWES COMMUNICATIONS KITS AVAILABLE. ACCESS AND BARCLAY CARDS ACCEPTED, P.P. 60p UNDER £5, OVER FREE. EXCEPT WHERE STATED.



0202 678558

Practical Wireless

0202 678558 

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 American in origin.

HOW TO ORDER

Add 75p per order postage (overseas readers add £1.50 for surface mail postage) and send a postal order, cheque or international money order with your order (quoting book titles and quantities) to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP**. Payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 678558. Books normally despatched by return of post but please allow 28 days for delivery.

★ A recent addition to our Book Service. O/P = Out of print, O/S = Out of stock.

RADIO

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

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

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

BETTER RADIO/TV RECEPTION★

A. Nallawalla, A. T. Cushen and

B. D. Clark

An Australian publication giving guidance and advice both to listeners seeking reliable reception of some distant radio station, and to DX listening hobbyists. 134 pages £9.95

BETTER SHORTWAVE RECEPTION (USA)

W. S. Orr W6SAI and S. D. Cowan W2LX

Receivers, antennas, propagation, DX listening techniques for the short waves and v.h.f. 158 pages £5.50

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

FOUNDATIONS OF WIRELESS AND ELECTRONICS (10th Edition)

M. G. Scroggie and S. W. Amos

Covering d.c. and a.c. circuits, L, C, tuned circuits and selectivity, valves, semiconductors, transmission lines, antennas, radiation, oscillation, modulation, detection, amplification, superhet receivers, c.r.t.s, waveform generators and switches, computers and power supplies. 551 pages £8.95

GUIDE TO BROADCASTING STATIONS 19th Edition (1987/88)

Philip Darrington

Frequency and station data, receivers, antennas, Latin American DXing, reporting, computers in radio, etc. 240 pages £6.95

HF OCEANIC AIRBAND★ COMMUNICATIONS (2nd Edn.)

Bill Laver

Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. 24 pages £3.50

INTERFERENCE HANDBOOK (USA)

W. I. Orr W6SAI and S. D. Cowan W2LX

How to locate and cure r.f.i. for radio amateurs, CBers and TV and stereo owners. 253 pages £6.75

INTERNATIONAL RADIO STATIONS GUIDE (BP155)

Revised and updated in 1985, 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 £2.95

QUESTIONS & ANSWERS RADIO

Eugene Trundle

Basics of electrical theory, radio and semiconductors, receivers, amateur and CB radio, and test equipment. 110 pages £2.95

RECEIVING STATION LOGBOOK (RSGB)

Standard logbook for the s.w.l. in horizontal A4 format. 32 lines per page. 50 pages O/S

SATELLITE TELEVISION★

Peter S. Pearson

How satellite TV works, setting up your own TVRO terminal, the costs, the programmes available. 72 pages £4.95

SCANNERS★

Peter Rouse GU1DKD

A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating procedure. 177 pages £7.95

THE COMPLETE VHF/UHF FREQUENCY GUIDE

This book gives details of frequencies from 26–2250MHz with no gaps and who uses what. There are chapters on equipment requirements as well as antennas, etc. 60 pages £4.95

UK LISTENERS CONFIDENTIAL★

FREQUENCY LIST (4th Edn. 1987/88)

Bill Laver

Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz. 124 pages £5.95

VHF/UHF AIRBAND FREQUENCY GUIDE

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 (1987)

Country-by-country listings of long, medium and short wave broadcasters and TV stations. Receiver test reports. English language broadcasts. The s.w.l.'s "bible". 576 pages £17.95

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 £5.95

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 AND ELECTRONICS ENGINEER'S POCKET BOOK (17th Edition)

Keith Brindley

Useful data covering maths, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semiconductors, components, etc. 201 pages Hardback £6.95

OSCILLOSCOPES, HOW TO USE THEM, HOW THEY WORK (Revised 2nd Edition)

Ian Hickman

This book describes oscilloscopes ranging from basic to advanced models and the accessories to go with them. 133 pages £5.95

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 about 10 000 transistors, f.e.t.s, u.j.t.s, diodes, rectifiers, triacs and s.c.r.s. 175 pages £7.50

TRANSISTOR SELECTOR GUIDE (BP234)★

J. C. J. Van de Ven

This guide has the information on all kinds of transistors in useful categories (other than the usual alpha numeric sort) such as voltage and power properties making selection of replacements easier. 192 pages £4.95

PROJECT CONSTRUCTION

HOW TO BUILD ADVANCED SHORT WAVE RECEIVERS (BP226)

R. A. Penfold

Greater satisfaction can be gained from the hobby of shortwave listening when using home constructed equipment. This book gives full practical constructional details of a number of receivers as well as some add-on circuits like S-meters and noise limiters. 118 pages £2.95

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 £1.95

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

POWER SUPPLY PROJECTS BP76

R. A. Penfold

This book gives a number of power supply designs including simple unregulated types, fixed voltage regulated types and variable voltage stabilised designs. 91 pages £2.50

PRACTICAL POWER SUPPLIES Collected Articles from PW 1978-1985

Characteristics of batteries, transformers, rectifiers, fuses and heatsinks, plus designs for a variety of mains-driven power supplies, including the PW "Marchwood" giving a fully stabilised and protected 12V 30A d.c. 48 pages £1.25

PROJECTS IN AMATEUR RADIO AND SHORT-WAVE LISTENING

F. G. Rayer G3OGR

Full constructional details are given for all projects, including housing the unit in a suitable case. Such projects as an artificial antenna unit, direct conversion receivers and converters are all included. 90 pages £4.95

SOLID STATE SHORT WAVE RECEIVERS FOR BEGINNERS (BP222)

R. A. Penfold

There is a strange fascination in listening to a broadcast which has been transmitted over many thousands of kilometres. This is even more the case when you've built the receiver yourself. This book contains several designs that will give a fairly high level of performance. 93 pages £2.95

AMATEUR RADIO

A GUIDE TO AMATEUR RADIO (RSGB)

Amateur Radio—the hobby, the equipment, workshop practice, the licence, the RAE (including sample questions). 154 pages £3.62

AMATEUR RADIO CALL BOOK (RSGB)

Spring 1987 Edition

This useful work now incorporates a 48-page reference section of useful information for amateur radio enthusiasts. 310 pages 0/5

AMATEUR RADIO LOGBOOK

Standard logbook for the transmitting amateur in horizontal A4 format. 25 lines per page. 96 pages £2.30

AMATEUR RADIO OPERATING MANUAL (RSGB)

A mine of information on just about every aspect of amateur operating, including international call sign series holders, prefix lists, DXCC countries list, etc. 204 pages £6.16

HOW TO PASS THE RADIO AMATEURS' EXAMINATION (RSGB)

G. L. Benbow G3HB

The background to multiple choice exams and how to study for them with nine sample RAE papers for practice, plus maths revision. 91 pages £3.15

INTRODUCING MORSE

Collected Articles from PW 1982-1985

Ways of learning the Morse Code, followed by constructional details of a variety of keys including lambic, Triambic, and an Electronic Bug with a 528-bit memory. 48 pages £1.25

PASSPORT TO AMATEUR RADIO

Reprinted from PW 1981-1982

The famous series by GW3JGA, used by thousands of successful RAE candidates as an aid to their studies. Plus other useful articles for students of amateur radio. 96 pages £1.50

PROJECTS IN AMATEUR RADIO AND SHORT WAVE LISTENING

F. G. Rayer G3OGR

Full constructional details are given for all projects, including housing the units in a suitable case. All the projects are either on p.c.b. or matrix board. 90 pages £4.95

QUESTIONS & ANSWERS

AMATEUR RADIO

F. C. Judd G2BCX

What is amateur radio? The Radio Amateurs' Exam and Licence. The technology, equipment, antennas, operating procedure and codes used by amateurs. 122 pages £2.95

RADIO AMATEUR'S GUIDE 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

RADIO AMATEUR'S MAP OF NORTH AMERICA (USA)

Shows radio amateurs prefix boundaries, continental boundaries and zone boundaries. 760 x 636mm £2.25

THE COMPLETE DX'ER (USA)

Bob Locher W9KNI

Equipment and operating techniques for the DX chaser, from beginner to advanced. 187 pages 0/5

THE INTERNATIONAL VHF FM GUIDE 7th Edition

Julian Baldwin G3UHK & 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 SATELLITE EXPERIMENTER'S HANDBOOK (USA)

A guide to understanding and using amateur radio, weather and TV broadcast satellites. 207 pages. £9.25

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

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

ANTENNAS (AERIALS)

AERIAL PROJECTS (BP105)

R. A. Penfold

Practical designs including active, loop and ferrite aerials plus accessory units. 96 pages £1.95

ALL ABOUT CUBICAL QUAD ANTENNAS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Theory, design, construction, adjustment and operation of quads. Quads vs. Yagis. Gain figures. 109 pages £5.50

ALL ABOUT VERTICAL ANTENNAS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Theory, design, construction, operation, the secrets of making vertical work. 191 pages £7.50

AN INTRODUCTION TO ANTENNA THEORY (BP198)

H. C. Wright

This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved. 86 pages £2.95

BEAM ANTENNA HANDBOOK (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Design, construction, adjustment and installation of h.f. beam antennas. 198 pages £6.75

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 £6.17

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 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

THE ARRL ANTENNA BOOK

14th Edition (USA)

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. 327 pages £9.10

THE ARRL ANTENNA COMPENDIUM Volume 1 (USA)

This book makes fascinating reading of hitherto unpublished material. Among topics discussed are quads and loops, log periodic arrays, beam and multi-band antennas, verticals and reduced size antennas. 175 pages £9.25

THE RADIO AMATEUR ANTENNA HANDBOOK (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Yagi, quad, quagi, l-p, vertical, horizontal and 'sloper' antennas. Towers, grounds and rotators. 187 pages £6.75

TWO-METRE ANTENNA HANDBOOK

F. C. Judd wrote this book for radio amateurs new to the 144-146MHz band. The range of antennas described will cater for most situations, particularly those where space is a problem. £5.95

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

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

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

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

PRACTICAL HANDBOOK OF VALVE RADIO REPAIR

Chas E Miller

The definitive 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 £15.95

QUESTIONS & ANSWERS

RADIO REPAIR

Les Lawry-Johns

How to fault-find and repair valved and transistorised receivers, car radios and unit audio equipment. Suggested lists of tools and spare parts. 106 pages £2.95

SERVICING RADIO, HI-FI AND TV EQUIPMENT

Gordon J King

A very practical book looking at semiconductor characteristics, d.c. and signal tests, fault-finding techniques for audio, video, r.f. and oscillator stages and their application to transistor radios and hi-fi. 205 pages £8.95

TELEVISION INTERFERENCE MANUAL (RSGB)

B. Priestley

TV channels and systems, spurious-radiation TVI, strong-signal TVI, audio breakthrough, transmitter design. 78 pages £2.94

TEST EQUIPMENT FOR THE RADIO AMATEUR (RSGB)

H. L. Gibson G2BUP

Techniques and equipment for tests and measurements on devices, systems and antennas. 142 pages Hardback £7.88

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

COMPUTING

AMATEUR RADIO SOFTWARE (RSGB)

John Morris GM4ANB

Using a computer for c.w., RTTY, data, plus calculations for antennas, distance, bearing, locators, satellites, sun, moon and circuit design. 328 pages Hardback £9.41

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 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

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 £8.95

AUDIO FREQUENCIES

AUDIO (BP111)

(Elements of Electronics—Book 6)

F. A. Wilson

This book studies sound and hearing, and the operation of microphones, loudspeakers, amplifiers, oscillators, and both disc and magnetic recording. 320 pages £3.50

THEORY & CALCULATIONS

BEGINNER'S GUIDE TO ELECTRONICS

Owen Bishop

For youngsters thinking of a career in electronics; theory and applications in computers, radio, TV, recording, medical and industrial electronics. 240 pages £4.95

CARE AND FEEDING OF POWER GRID TUBES (USA)

This handbook analyses the operation of EIMAC power grid valves and provides design and application information to assist the user of these valves. 156 pages £6.75

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

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

THE SIMPLE ELECTRONIC CIRCUIT AND COMPONENTS Book 1 (BP62)

The aim of this book is to provide an inexpensive but comprehensive introduction to modern electronics. 209 pages £3.50

TAKE ADVANTAGE OF THIS GREAT SUBSCRIPTION OFFER

Introducing

Two and three-year subscriptions for *Practical Wireless* readers in the UK

You can save money and avoid the inevitable cover-price increases over the next two or three years!

One Year — £14.00
Two Years — £26.00
Three Years — £36.00

FREE BINDER . . . FREE BINDER . . . FREE BINDER . . . FREE BINDER . . .

There's More!

Christmas is almost upon us, and it's time to think about pressies. Wouldn't a subscription to PW be a good idea for your loved one? Get your order to us before 25 December 1987, and we'll book you in for 13 issues for the price of a 1-year sub, or 26 issues for 2 years. For a 3-year subscription, you get 39 issues plus, with our compliments, one of the smart new PW binders. Sorry, this offer is open to UK readers only.

FREE BINDER . . . FREE BINDER . . . FREE BINDER . . . FREE BINDER . . .

Wherever you live, a Postal Subscription will ensure that you receive your copies of PRACTICAL WIRELESS and/or SHORT WAVE MAGAZINE regularly, through your own letterbox, before it gets onto your newsagent's shelf. Order a Joint Subscription and you will qualify for the Special Discount.

Fill in the Order Form below and post it to: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP (no stamp required). Credit Card Orders taken on (0202) 678558.

Overseas subscriptions outside Europe are now despatched by Accelerated Surface Post for faster delivery.

Please indicate the type of subscription required:

Special Joint Subscription



- ☐ See above (UK) ☐ £17.00 (UK) ☐ £27.00 (UK)
☐ £18.50 (Overseas) ☐ £19.00 (Overseas) ☐ £30.00 (Overseas)

(Prices correct at November 1987)

To commence with issue dated

To: PW Publishing Ltd., FREEPOST, Subscriptions Dept., Enefco House, The Quay, Poole, Dorset BH15 1PP (no stamp required).

Name

Address.....

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

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

Card No.

☐ Valid from

Signature.....

£375



STANDARD.

C500

WE ARE PROUD TO ANNOUNCE THE NEW, TOP OF THE RANGE, STANDARD C500 HANDHELD 2m AND 70cms, FULL DUPLEX – DUAL BAND TRANSCEIVER AT THE UK RECOMMENDED RETAIL PRICE OF £375.00 (INC. VAT)

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

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

★ ★ ★ ★ ★ ★

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



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



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

NEAREST TUBE:
EDGWARE ROAD
PADDINGTON

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

ELEMENTARY MATHEMATICS!

The problem:

I want to operate 2m and 70cm mobile. I want full duplex facilities so that I can transmit on one band whilst listening on the other. What are my choices and what is the best solution?

2m FM transceiver	£300.00
70cm FM transceiver	£350.00
2m/70cm duplexer	£26.00
Total cost of above:	£686.00

The above are based on typical market prices.

The solution:

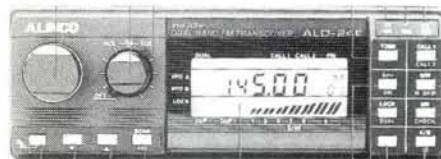
DUAL BANDER

- ★ 2M/70cms
- ★ 25 Watts
- ★ Full Duplex
- ★ Built-in Diplexer/Dual VFO
- ★ Small size/21 memories

£449!

This rig looks like starting a revolution in mobile FM. About the size of many 2m rigs (5.5" x 2" x 6.5") and represents a massive saving on separate 2m/70cm rigs. A host of features include large back-lighted LCD display, tuning by up/down mic. or conventional front panel knob, single RF socket with built-in duplexer, priority channels, programmable scanning, lockout, 12.5 or 25KHz steps, tone-burst, repeater off-set, mobile mounting bracket etc.

ALD-24E



ALR22E 2M FM MOBILE

Rx 138/175 MHz Mod. available



- ★ 25 Watts FM
- ★ 21 Memories

£249

The exciting new ALINCO mobile is superb value for money. Complete with up/down microphone; mobile mount and all hardware. Measures only 5.5" x 1.5" x 6.5". That's small! Full 12 months warranty etc.

2M MICRO HANDHELD

- ★ 3 Watts FM
- ★ Memory Channel
- ★ Battery Save
- ★ Smallest in World

£199!

ALX-2

The diminutive size of this transceiver and features will amaze you. Thumbwheel frequency selection, 600KHz repeater shift, toneburst etc. Supplied complete with battery pack AC mains charger, and whip aerial. And size? 2.3" x 0.9" x 4.7".



2M HAND-HELD

- ★ 3/5 Watts FM
- ★ 10 Memories
- ★ Battery Saver
- ★ 140-160MHz

£229!

ALM-203E

The new ALINCO handheld has a host of features. 150-160MHz Rx, Full program scan, Real S-meter, 12.5KHz steps, 100mW low pwr, Detachable batt. pack, AC mains charger, Flex antenna, Lithium back up, etc. Great value and great performance.



ALINCO 2m LINEARS

The new ALINCO amplifiers are great value. Compact, reliable and low priced. Now you can boost the power of your hand-held without boosting your overdraft!



ELH 230D₂
1-3 & 5w i/p 30w out
Gasfet pre-amp
Vot or PTT
Full protection
£75.00 inc vat

ELH260D
1-3w i/p 50w out
Switch pre-amp
Vox or PTT
Output meter
£119.00 inc vat

NEW REVEX METER

W570

- ★ 1.6-1300MHz
- ★ RMS/PEP
- ★ 0-200 watts

Here's a VSWR meter that covers every band from 160m-23cms! It also has remote sensor and "N" sockets. Highly accurate and automatic power readings. **PRICE £119.00 p&p £2.00.**



UK'S BEST FREQUENCY GUIDES

UK LISTENERS CONFIDENTIAL FREQUENCY LIST

Everything you have ever wanted to know about stations between 1.6 & 30MHz. Includes aviation, marine, military, press, broadcast and more. Not an import, but a proper UK written book of 130 pages. **Price £5.95 + 90p post.**

COMPLETE GUIDE TO VHF/UHF FREQUENCIES 26-1300MHz

Now you can learn exactly where all the main users of this spectrum are located. It includes all emergency services, aviation, civil & military, pmr, telephones, cellular, and many other services including duplex splits. **Price £4.95 + 90p post.**

VHF/UHF AIRBAND FREQUENCY GUIDE

A complete list of aviation frequencies of civil & military users. A proper manual with text and photos and free supplement of the latest changes. Don't waste money on cheap photo sheets, get the proper book at this bargain price. **Price £5.95 + 90p post.**

SONY COMMUNICATIONS



£169 FREE SECURICOR

ICF 7600DS

7600DS
2002D
AIR-7
PRO80
AN-1
AN-3
ACD-4
BP23
DCC-12A

AM/SSB Pocket size 150KHz-30MHz
AM/USB/LSB all band + Airband VHF
108-174MHz hand-held plus b'cast
HF/VHF AM/SSB handheld plus b'cast
Active antenna for 7600/2002
VHF antenna with 50ft coax
Mains AC adaptor Air7/PRO 80
Ni-cad battery pack
DC car adaptor all models

£169.00
£329.00
£247.00
£329.00
£49.00
£45.00
£16.95
£16.95
£16.95

FREE 24 HOUR DELIVERY ON SONY OVER £100

We are appointed UK stockists with Warranty facilities. **Not all dealers are!**

NEW BOOK

THE SECRET OF LEARNING MORSE

By Mark Francis

A no nonsense look at the problems of learning Morse Code with plenty of advice and tips that will help all students. Unlike any other book written before, it tells you how you can learn Morse code quickly and easily. Many of the myths and mysteries are exposed and there is masses of information including tests you can set yourself. **PRICE £4.95 post 90p**

WATERS & STANTON

RETAIL & MAIL ORDER:- 18-20, Main Road, Hockley, Essex SS5 4QS.

Tel: (0702) 206835, 204965

RETAIL ONLY:- 12, North Street, Hornchurch, Essex RM11 1QX.

Tel: (04024) 44765

Visa and Access by telephone. 24hr. Answerphone.

This is Thames Coastguard

This article, by J. D. Harris G3LWM, describes the specific operational requirements and equipments in use at Thames MRSC at Walton on the Naze.

"All stations, All Stations, All Stations—This is Thames Coastguard, Thames Coastguard, Thames Coastguard". That broadcast announcement often heard on channel 16 (v.h.f Marine Band) is, in many cases, made by a Coastguard Auxiliary. The author, a radio amateur of many years standing, as can be seen from his callsign, spotted a request in the local paper that the Coastguard at Walton were seeking to recruit further Auxiliaries into the service. After an initial meeting attended by 18 men and women from all walks of life and all age levels everyone elected to go on for the training programme.

Unlike other examinations we were only allowed to attempt the Auxiliary Coastguard Examination once, failure is FINAL and you are not allowed to have any further attempts! The final goal after training is the Department of Transport HM Coastguard Certificate of Qualification as a Radio Telephone Operator. It is pleasing to note that everyone passed and obtained their Radio Certificates. Whilst familiarity with radio from an amateur standpoint was useful, the use of specific procedures and terminology had to be learnt and put into practice. The operating disciplines are strict and bear little relationship to the generally relaxed conditions on amateur radio. Accurate log keeping and message handling are, of course, also of prime importance.

Like many other British organisations the HM Coastguard is a compromise between operational requirements and available budgets. Total regular staff are about 560 whilst the Auxiliary strength is over 8500. Auxiliaries perform many other functions as well as Operational Room Assistants, such as Mobile Shore Patrols, Rescue Companies and CG Boat Crews, etc.

Round the shores of the UK there are six MRCC's (Maritime Rescue Co-ordination Centres) and a further 18 MRSC's (Maritime Rescue Sub Centres) all dedicated to SAR work. As all these units are on a 24 hour watch at all times the requirement for the Auxiliary staff can be appreciated. Depending on the location of the MRSC or MRCC each area has unique responsibilities. For instance Dover MRCC is responsible for CNIS (Channel Navigation Information Service) and em-

plays both radar and aircraft to carry out this function. This article describes the specific operational requirements and equipments in use at Thames MRSC at Walton on the Naze. The Coastguard Service are the co-ordinators, their responsibilities can be summed as follows:

HM Coastguard is the authority for initiating and co-ordinating all Civil maritime search and rescue measures for vessels or persons in need of assistance in the United Kingdom Search and Rescue Region.

Naturally in the communications area radio plays an important and vital part. The great majority of radio traffic is conducted in the v.h.f. Marine Band although facilities exist for communications on m.f., v.h.f., a.m. (Aeronautical) and certain other frequencies to enable direct communication to be maintained with other services if required.

The following frequencies are utilised by HMCG:

Channel 0 (156.00MHz)	Primary Working channel only for use by HMCG or other organisations providing SAR (Search and Rescue) support to HMCG such as RNLI, etc.
--------------------------	--

Channel 6 (156.30MHz)	Primary Intership. SAR use for communication between vessels and helicopters at scene of search
--------------------------	---

Channel 10 (156.50MHz)	Intership frequency. Also used as counter pollution frequency.
---------------------------	--

Channel 16 (156.80MHz)	International Distress safety and calling frequency. Used for distress and urgency signals and traffic for safety signals.
---------------------------	--

Channel 67 (156.375MHz)	Intership frequency. Small vessel safety channel between HMCG and small vessels. Also used for safety and weather information after preliminary announcement on channel 16. Can also be used as first alternative to channel 0.
----------------------------	---

Channel 73 (156.675MHz)	Inter-ship frequency. Used by HMCG as a second alternative to channel 0 if that frequency becomes congested.
----------------------------	--



Thames Marine Radio Sub Centre, the lookout and antennas

It is the responsibility of the HMCg to guard the integrity of channel 16 throughout the 24 hours and a radio operator will be detailed for this purpose on each watch. Apart from audio recordings that are maintained a written Log is an important duty of the channel 16 operator.

At the Walton site of Thames MRSC there are four control desks. The general layout of these control units is identical as in fact are all the radio control desks through the Coastguard service. Some control positions are provided with certain unique functions such as v.h.f., d.f. and m.f. transmitter/receiving unit. In addition to radio, telephone lines are also connected to each desk and this enables 'split' (telephone/radio) working to be carried out if required.

In order to ensure full radio coverage of the area covered by Thames Coastguard antennas/transmitter-receiver units are located at various places on the coast. These units can be controlled in various ways by the radio operator at the Thames MRSC. At the control desks audio signals are all available and it is up to the operator to select the best depending on the location of the vessel and/or other radio conditions.

Two basic systems are in operation. Firstly there is the dedicated system where the equipment and antennas are only operational on one channel, and secondly multi-operation where the operator can select the required channel. Thames Coastguard covers the area from Southwold in the North to Reculvers on the North Kent coast. Radio/Antennas are installed as follows:

Bawdsey: Dedicated Ch. 0/16 Multi on 0,6,10,16,67,73

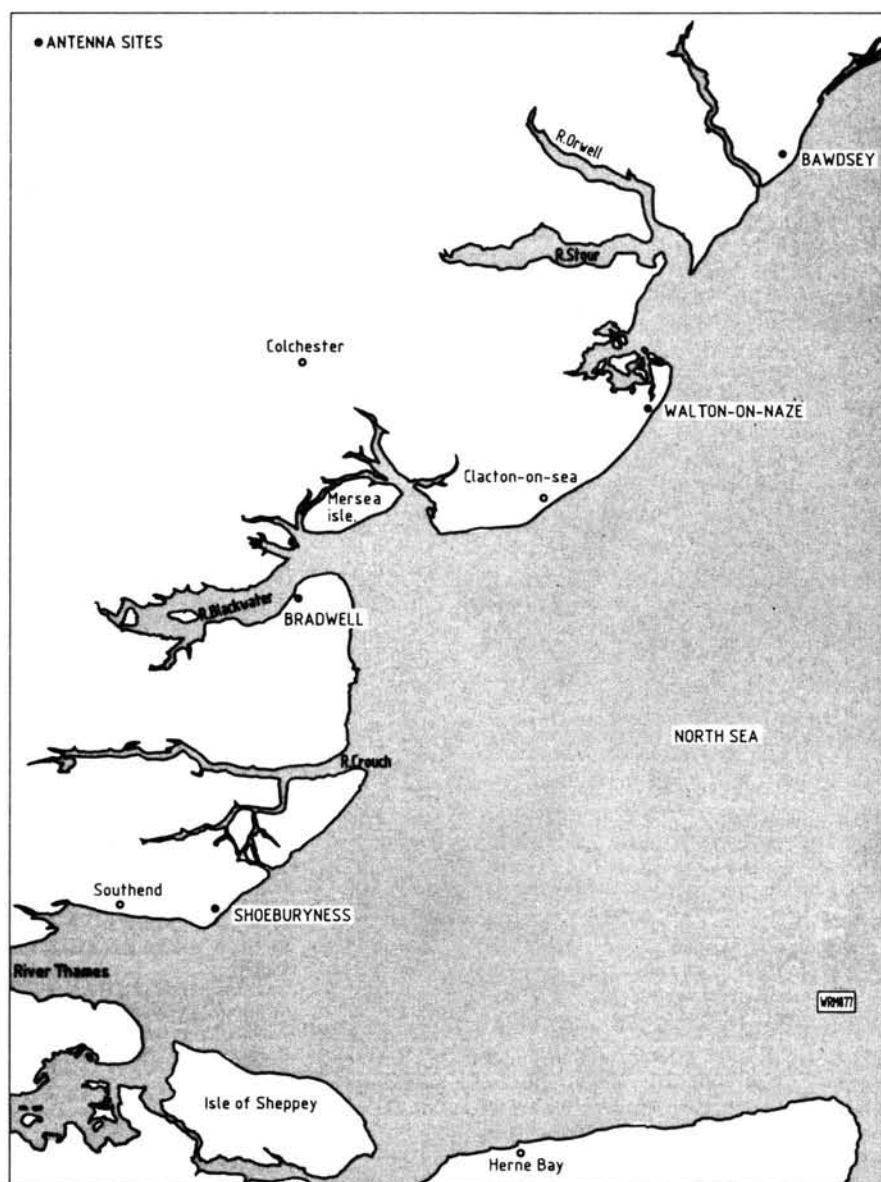
Walton on Naze: Dedicated Ch. 0/16 Multi on 0,6,10,16,67,73

Bradwell: Multi only on 0,6,10,16,67,73

Shoeburyness: Dedicated Ch. 0/16 Multi on 0,6,10,16,67,73

As can be expected all antennas have vertical polarisation with coverage tailored to meet the requirements of marine traffic.

Whilst the majority of traffic is with vessels at sea HMCg vehicles for rescue and patrol purposes are also equipped with the required v.h.f. channels. Handportables are also widely used by cliff and shore patrols. During



the summer months local lifeguards are equipped with handportables to enable them to rapidly summon assistance if required to a beach/shore casualty situation.

Certain other vessels and aircraft also have the facility of channel 0 such as SAR helicopters and police launches.

Although the majority of work carried out by the UK Coastguards is concerned with SAR activities in Coastal waters HMCg are also part of a Worldwide SAR activity and via MRCC Falmouth can be linked to INMARSAT (International Maritime

The map showing the location of the antennas and sites used by the Thames Coastguard, all remotely controlled from Walton on Naze

As a Radio Amateur who has operated on 160 (Top Band) it was of interest to learn the full significance of the following phrases often heard on marine radio.

MAYDAY: A vessel in distress will preface all Distress Calls with the spoken word "MAYDAY". This will be broadcast on Ch. 16 v.h.f. or 2182kHz.

MAYDAY RELAY: This is Mayday information rebroadcast by another

station giving specific details of a "Mayday" situation.

PAN PAN PAN: This is the urgency signal and is used where the transmission of the distress signal is not justified. It indicates a very urgent message concerning the safety of a vessel or a person.

SECURITY: This is the safety signal and indicates that the station is about to transmit a message containing an important navigational meteorological warning.



Typical operation position. The photograph shows Keith Purves, Coastguard Officer, Clyde DTI HMCg



Plotting table scene

DTI HMCG

Maritime VHF Radio

The allocation of frequencies and standard usage of the radio channels so allocated in the Maritime v.h.f. Band (156-174MHz) has been Internationally agreed.

Extensive fitting of v.h.f. radio telephone equipments operating within the band has proceeded among ships of most maritime nations.

Specific allocations are made for ship/ship, port operations and public correspondence use. As well as being available for these uses many port and harbour authorities now operate navigation or port operations service to advise shipping in the port or its approaches of docking programmes, movements, visibility, tidal data, radar assistance or other general information as required.

All Coastguard channels are single channel simplex but a number of other services within the Maritime v.h.f. Band use split frequency simplex working.

Originally the band had 50kHz channel spacing but as traffic increased this has now been reduced to 25kHz. At the moment the highest frequency in use is channel 88 157.425/162.025.

Satellite Organisation) that can provide instant communications from suitably equipped ships almost anywhere in the world.

Thames Coastguard at Walton covers a busy section of the UK coastal waters and every watch is full of interest. During the summer months as many as 10 incidents can be in progress at once and it takes little imagination to see the requirement for tight control and coordination of the available

rescue services.

Radio discipline by all users is most important and it is pleasing to note that in general this is well conducted. All users of marine radio have to obtain a licence from the Home Office and a short examination has to be taken even for small pleasure craft owners who fit v.h.f. radio. This exam gives the Restricted Certificate of Competence in Radiotelephony v.h.f. Only to successful candidates. This

Coastguard Rescue Centres

Regions and Districts	Address	Telephone number
MRCC ABERDEEN	Blair's Quay, Aberdeen	Aberdeen (0224) 592334
MRSC Shetland	Lerwick, Shetland	Lerwick (0595) 2976
MRSC Pentland	Kirkwall, Orkney	Kirkwall (0856) 3296
MRSC Moray	Peterhead, Aberdeenshire	Peterhead (0779) 74278
MRSC Forth	Fife Ness, Crail, Fife	Crail (0333) 50666
MRCC YARMOUTH	Great Yarmouth, Norfolk	Great Yarmouth (0493) 851338
MRSC Tyne Tees	Priddy Gardens, Tyne and Wear	North Shields (0632) 572691
MRSC Humber	Spurn Point, near Hull, North Humberside	Spurn Point (0964) 50351
MRCC DOVER	Langdon Battery, Swingeate, Dover, Kent	Dover (0304) 852515
MRSC Thames	Hall Lane, Walton-on-Naze, Essex	Frinton-on-Sea (02556) 5518
MRSC Shoreham	Shoreham-by-Sea, West Sussex	Shoreham (0791) 2226
MRCC FALMOUTH	Castle Drive, Falmouth, Cornwall	Falmouth (0326) 317575
MRSC Brixham	Brixham, Devon	Brixham (08045) 58292
MRSC Solent	Tottland Bay, Freshwater, Isle of Wight	Freshwater (0983) 752285
MRSC Portland	Grove Point, Portland, Dorset	Portland (0305) 820441
MRCC SWANSEA	Mumbles, Swansea, West Glamorgan	Swansea (0792) 66534
MRSC Hartland	Hartland, Bideford, Devon	Hartland (02374) 641
MRSC Milford Haven	Castle Way, Dale, Haverfordwest, Dyfed	Dale (06465) 218
MRSC Holyhead	Holyhead, Anglesey	Holyhead (0497) 2051
MRSC Liverpool	Crosby, Liverpool	Crosby (051) 531 3343
MRCC CLYDE	Navy Buildings, Eldon Street, Greenock, Renfrewshire	Greenock (0475) 29988
MRSC Ramsey	Ramsey, Isle of Man	Ramsey (0624) 813255
MRSC Belfast	Bangor, Co. Down	Donaghadee (0247) 852184
MRSC Oban	Boswell House, Argyll Square, Oban, Argyll	Oban (0631) 63720
MRSC Stornoway	Stornoway, Isle of Lewis	Stornoway (0851) 2013

MRCC Maritime Rescue Coordination Centre MRSC Maritime Rescue Sub Centre

In an emergency, for coastal or sea rescue, DIAL 999 AND ASK FOR THE COASTGUARD

Prepared by the Department of Transport and the Coastguard, published by the Department of Transport, HMSO, London, 1988.

List of Coastguard Rescue Centres

Note: Whilst you are welcome to visit all these stations please do telephone for an appointment before calling. If an emergency is in progress when you arrive it is unlikely that you will be allowed in the operations room until the emergency is over.

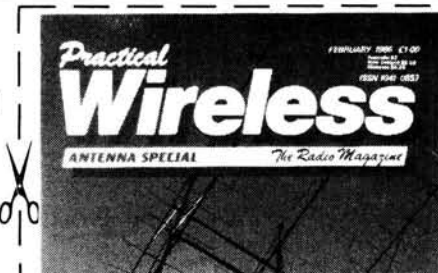
ensures that in an emergency communications are established and maintained in order that all rescue operations can proceed with the maximum efficiency. Emergencies at sea can happen with terrifying speed and in many cases seconds are vital to safety.

If any readers in Coastal Districts are interested in becoming Auxiliary Coastguards they should in the first instance contact their local Coastguard station. I can assure that if they do eventually 'join' they will be carrying out a useful and interesting function within the UK and Worldwide Search and Rescue organisations.

Finally my thanks are due to the District Staff Officer (Training) for his patience, to the regular Coastguard Officers for their forbearance and to the other Auxiliaries for their mutual assistance.

HAVING DIFFICULTY GETTING YOUR COPY OF PRACTICAL WIRELESS ?

Then place a regular order with your newsagent **NOW !**



Dear Newsagent, please reserve/deliver my monthly copy of PRACTICAL WIRELESS

Name _____ Address _____

Signed _____

Distributed by Comag

On The Air

On The HF Bands

Reports to Paul Essery G3KFE
Practical Wireless, Eneco House, The Quay, Poole, Dorset BH15 1PP.

Last time around I expressed doubts about the SORASD expedition; no sooner was the copy gone beyond recall when the expedition appeared on the bands, with Martti Laine OH2BH having taken the place of an operator who dropped out. OH2BH is a chap who likes things done properly; and so it was. The group were not operational 24 hours daily as they were very much into training locals, and already the training work has borne fruit with activity from the Director of Telecommunications who is to be issued the call SOIA and promises to be very active; he has fluent Arabic, French and Spanish and enough English to make a QSO.

Rhubarb Corner

On the other hand, I hear that one of the recent Mount Athos DXpedition has recently been openly saying on the air that there will be a charge of five US Dollars, without which Mount Athos QSLs will not be forthcoming. Against this blatant commercialism, it is clear that to require payment beyond the cost of return postage is against DXCC rules as indeed the DXCC desk itself has confirmed. My advice would be not to bother to QSL this one, at least until the question of payment for QSLs has been clarified—in any case their documentation has not reached ARRL HQ so it cannot be claimed for DXCC yet. My own feeling is that the DXCC rules should be amended to make one IRC the standard, with "green stamps" only allowable if the expedition can demonstrate an inability to encash IRCs, or where a DXer is in a country where IRCs cannot be obtained. The rules should then be enforced; if the requirement for ever-increasing numbers of dollars for a QSL during the contact goes on, one will require to be a millionaire to reach Honour Roll status!

The Andamans activity this time was a great success, although surprisingly enough they were to be heard on 3.5MHz calling CQ with no takers—until the gang rumbled the situation and came I.f.!

CQ Zones

Arising from the increasing amateur radio operation from China, *CQ Magazine* has announced an alteration of Zone boundaries to Zone 23 and 24. The new definitions are: Zone 23, Central zone of Asia comprising: Mongolia JT, Tannu Tuva UA0Y, Tibet, Peoples Republic of China BY3G-L (Inner Mongolia), BY9A-F (Ningsia or Ningxia), BY9G-L (Tsinghai or Qinghai), BY9T-Z (Kansu or Gansu), and all BY0. Zone 24, Eastern Zone of Asia, BV, XX9, VS6, BY1, BY2, BY3A-F (Tianjin or Tientsin), BY3M-S (Hebei or Hopeh), BY3T-Z (Shanxi or Shansi), BY4, BY5, BY6, BY7, BY8, BY9M-S (Shanxi or Shansi).

Talking of *CQ Magazine*, the CQ WW SSB contest produced the usual crop of amusements from the non-contesters. For example, the chap in the middle of a pile-up yelling for the DX's "name, for my log!" or the hopeful innocent heard giving out, from Zone 14, an exchange of "RS5953".

The Bands

The autumnal lift in conditions this time was marred to an extent by the seemingly

over-frequent days of below normal or disturbed conditions; but on the other hand there were several good days too. No doubt at all, though that the rising band conditions are notable as compared with this time last year.

I worked VK2AU and in a later letter he told of his antenna set-up. He has a VK2ABQ beam part way up the tower which is 21m tall. He says he spent two weeks getting the matching right—no wonder he is such a good signal on the band!

GOCNO wrote from Radlett. After a summer in USA, Michael came home with an Icom IC-735 and SB201; he reckons the pair cost him around £700, even after paying VAT on them after returning home. He runs a Butternut HF4B at 15m. However, now we come to the bitter bit. The tower went up, bolted to the side of the house with no guys, on October 15—readers may recall there was a spot of wind that night... The 3.5MHz dipole was shredded, and six trees on the plot came down; the greenhouse took off and landed three gardens away, and the borrowed TH2 came down suffering a bent boom. However, the tower and the beam stayed up—but needless to say, after such an experience, the tower is now guyed securely!

New Bands

G4ZAU (Oswestry) mentions some interesting QSOs on 10MHz; Dudley uses a TS-930S at 50 watts input, to a dipole. Earlier c.w. QSOs included K8XF/MM in the Gulf; K5HK/MM in the Caribbean, near 20N 85W, KP4DJ Rio Pedras, Puerto Rico, and UA0AG. During the current period under review Dudley rang the bell with LZ1KX, OE5NKL, OE5WLL, OF3ES, OF8NKQ, OH1XX, OH2BEJ, OH2BT, OH2BY, OH7OI, OK1DAV, OK2PGG, OZ1JKL, OZ5DX, SM4BQI, SM7CEH, VE1BB, VK6AKG, EA2CIN, lots of Fs, FG5XC, several Gs including GM3SWK, Stornoway, HB9s, Italians including IQ5MR (QSL via I5KYC), K4BX, K4CNZ, KB4UGI, WA2RCA, W1FNY, W1FZY, W1UN, W3GG, W3PEI, W4BW, W8MTC, and KA8VLW, LA5LBA, LA6XEA, LA8HF, three East Germans, a brace of YUs, 18 West Germans, and from USSR, UA3AOE, UA6UF, UH8DC, UA9CQ, UB4KWA, UB5BAZ, UW3WZ, UY5GM, UY5UZ, UZ4HVV, EA2FD, UV9UWW; leaving just PA0VG/EA3 and JA1IFP to be mentioned. Now that for a month's crop, on a band where people complain of lack of stuff to work, is a pretty persuasive argument to the contrary!

GWOIER tried the band for the first time on September 16, between 1500-1600Z; the result was a contact with successively DL8SBV, F6IJL and HB9LO.

**Reports in by
Dec 23, Jan 27,
March 2**

The 1.8MHz Band

The long wires which are required for this band are particularly vulnerable to high winds, so the gales have probably "seen off" a high percentage. On October 13 and 15, GWOIER made his debut on the band, with his 60m of wire fed by a "T" match; to the time of his letter the activity had netted him OK1FDY, RB5BE, DL7AA, Y27QH and GM3PPJ for the first five towards a Top Band DXCC.

The 3.5MHz Band

Since his last report, says G4CFS (Doncaster), he has continued to run three watts of home-brew into a G5RV; 166 UK stations were worked, of which 80 were two-way QRP, plus DK6ZZ, DF3DR, DJ3TS, DL0RSF, DL8EAH, DL8VK, DK6KW, DJ4ST, DL5CYI (two-way QRP), DH1OAD, ON6JW, ON4OA, ON4AGJ, EI9K, OZ1LGB (two-way QRP), F5ZW, EA1JO, PA3DUS, UQ2GRP, IS0JMJ and Y31ZB/P. Glyn notes that he has been to visit G3NOF to see the new tower and beam, which impressed him mightily, and in spare time is preparing for some activity on 10 and 14MHz.

GWOIER reports from Milford Haven, and wonders whether there is a conspiracy against his 50 watts... on the evening of September 27, he worked on c.w. some half-dozen stations, and it turned out ALL were using QRP between two and five watts!

G0HGA (Stevenage) is still QRP, and on 3.5MHz she has managed to hook ON4PS, DJ3TS, GM3TMK, LA3X, GM3HBT, and UQ2GR.

Leighton Smart listens to most bands, and on 3.5MHz he noted OX3SGA, VK3DZM, VO1FG, KA4DOD5RH, H25JE, VO1SA, OH3VV/CT3, W1QUW, OD5VT and VO1FB.

The 7MHz Band

GWOIER started his amateur career on this band, and the liking has never diminished. Most evenings after 2300Z some W and VE stations are worked around 7.020-7.030MHz on c.w. The highlight was the night of October 16, when between midnight and 0344Z, some 17 were worked in a string as they queued up for the chance! So, neglecting that, other contacts included VE1BN, KW2P, N2MM, K3QIA, KE4Y, KA5YCM, UZ1AWO, UP2BF and UB5DAL.

Leighton Smart seems to have just one look at the band, at 2259 on September 25, when he heard H8IH.

The 14MHz Band

Where it all happens—or so they tell me! For me, the indoor array continues to "do its thing" and also to maintain its stubborn refusal to net decent reports from the west, although it is undoubtedly radiating the r.f. in the required directions. However, on c.w., QSOs were completed with various eastern and middle-west Ws, UA9 and UA0. On a different tack, I recently went to visit the SMC (TMP) establishment at Buckley—a pleasant day out, albeit somewhat hard on the wallet. However,

Practical Wireless, January 1988

while there I managed to obtain most of the raw materials for the next outside Secret Weapon—I will have an RS59 report from a W at this QTH if I bust in the attempt!

GOCNO (Radlett) had a basinful in JOTA, under the GB8TE call; on 14MHz, they raised W1, W2, W3, W7, W8, W9, W0, VO1, VE1, VE2, VE3, VE6, VE7, VK1, VK2 both on long path, ZB2IP, 4X4, mainly of course s.s.b. but a few c.w. stations, not to mention Gotaways ZL, ZK2JB, VK0LH and WP4JQ. On a totally different tack, Michael comments on the difference the extra height has made to the strength of incoming signals—going from 9m to 16m has made some 10dB or so of difference.

GOHGA (Stevenage) is still QRP and found time for contacts with UB4XWA, I6ANZ and UA3LAY.

Leighton Smart (Trelewis) says he is being pressed by his locals to take RAE since he joined the local club—and why not? Leighton uses a Grundig 1400SL Professional, a home-brew a.t.u. and some thirty metres of wire, end fed. On September 29 at 2220Z, Leighton heard J79MD, followed a few moments later by

ZD8RP and then 8P6FX; and on October 11 4X1KT was noted, followed by W4PSN/MM in Region 1.

The 21MHz Band

GOCNO exercised the GB8TE call on Sunday October 18 to the tune of: JR3BOT, JH2MQT, UA9CRF, W4MGX, EA7GGM, KM3T, 9K2DT, UI8CAJ, W1NG, W8AH, 9H3TGG, KT2V, ZS6UW, KI4EZ, KD0JL and KJ4OM. All were on s.s.b.

Leighton Smart listened to the band several times, and his log notes 5N9SRC, N4EXR/TA2, ZS6ADM, 5N0GAA, TA3C, UB4MXR and VP2EZ.

GOHGA seems to do far better on 21MHz; the log from her QRP this month shows IK3DNX, RA4CLY, UB5MTN, RW3WO, UA1OLL, UB4MOF, U3DR for a nice prefix, UA3DUS, RA3RND, UA3SDY, UO5OCI, OI7AX for another nice prefix addition, UA1ZEN, RB5ZB, UZ6AXF, UA3LHA and UB4QHA.

The 28MHz Band

GOCNO says that from the GB8TE efforts arose contacts with ZS6WRS,

4X77BSA, LU4DM, LU7DID, PY, YV, and Europeans. Michael notes, with an element of surprise that the 4X77BSA was for the Boy Scouts of AMERICA!—tricky negotiations on callsigns involved there I reckon!

Odd Points

VK2AU notes that he is always to be found on the long path, and sometimes on the short path, looking for Gs. From the end of December to the end of January, John will be operating from Western Samoa 5W1 and American Samoa KH8, using 3.5-28MHz for sure, and maybe 1.8MHz if time permits.

As an aside in her letter, GOHGA mentions a c.w. club called FISTS, for all the c.w. addicts; details can be obtained from G3ZQS who is QTHR.

Final Thoughts

An amusing letter from G4YDO notes in passing that SW2MO was on from Mount Olympus, QSLs via SV2AEN. Another genuine one was FF1BSR. As to why the latter prefix, Bren suggests maybe old friend from years ago, MO1FFI might have some aids for such cases . . .

VHF Up

A smaller than usual postbag this month, no doubt due in part to the uninspiring tropo conditions but more likely to the after effects of the phenomenal hurricane which struck the south eastern corner of England on October 16. On the positive side there have been a few Auroras and the first 50MHz contacts between the British Isles and Botswana have occurred.

The Hurricane

Barometer watchers knew that some dirty weather was likely in the late evening of October 15. At 2220 at my QTH the pressure (QNH) was 973 millibars with the wind from the south at about five knots and a temperature of 12°C. An hour later the figures were 971, 20 and 17 respectively.

In my profession we adopt a basic wind speed for London of 85m.p.h., this being the maximum velocity of a three seconds gust occurring once in fifty years. The London Weather Centre reported 94m.p.h.; such a gust, according to statis-

tics, could be expected once in 200 years. I have no doubt that gusts in excess of 100m.p.h. occurred in the London area and these would happen once in 500 years.

It certainly was a testing time for antenna installations. Although my v.h.f. and h.f. ones were unscathed, many were not so lucky. Ironically some readers' antennas were wrecked by trees falling on them rather than by their own failure. Probably the weakest links were rotators, though.

By contrast, some were very fortunate, like Ken Miles G8GGK who has a rather exposed QTH in Selsdon similar to my own. He left his tower fully extended at over 18m with the 144 and 430MHz Yagis and the installation survived intact.

It would seem that most household insurance policies cover the cost of replacing collapsed antennas attached to the house. Whether separate tower type installations are covered, other than for third party risks, will depend on the proverbial small print in the policy.

Awards News

Congratulations to Swiss reader Yves Margot HB9AOF from Lully (DG61f) who is the 82nd member of the 144MHz QTH Squares Century Club. His application was processed on Oct 24 and he has 114 confirmed out of 141 worked.

He was first licensed in Aug 1969 at the age of 20 years and has always operated on 144MHz, never using more than 120W to a single Yagi antenna. Yves has used m.s. mode on s.s.b. since 1986 to increase his score but finds it difficult to get some of the QSLs. In particular he cites G8BBG (ZM) and G5KW (WJ). He is also QRV on 430 and 1296MHz and enters the Squares table.

99 squares were worked on s.s.b., the rest on c.w. 90 QSOs were on tropo mode, 16 via Es, seven on m.s. and one by f.a.i. I had to reject three cards, two of which were for contacts prior to 1/1/1975, the other being for a mobile QSO.

That champion of 70MHz John Jennings G4VOZ from Ullesthorpe in Leices-

tershire was elected to membership of the v.h.f. Century Club on Oct 30. His certificate number is 16. All contacts prior to March 1987 were made with a rotatable dipole antenna, the station comprising a Yaesu FT-480, Microwave Modules transverter and 80W solid state amplifier.

G4VOZ has also achieved the first Worked All Britain Basic Award for 70MHz which is for contacting 400 areas, and the Class 2 Counties Award which requires working 55 counties. This news was passed along by John Fitzgerald G8XTJ who handles publicity matters for the WAB group.

Any reader wanting information on PW v.h.f./u.h.f. awards should send an s.a.e. to Practical Wireless, Enefco House, The Quay, Poole, Dorset, BH15 1PP marking the envelope "Awards" in the top left corner.

About the tables, a list of the county abbreviation codes with other information is available from Poole on request, but please send an s.a.e.

A letter from new contributor Jason Bowen G1YOY (ESX) raises the perennial queries as to what you can count. He asked about the Squares Table and yes, Jason, you can count NFD stations, club stations, special event stations worked from home. However, you cannot claim for your own station anything worked while you were operating any such station from a different QTH.

The tables are for achievements from one fixed QTH, almost universally the home QTH. However, if you are lucky enough to have two fixed QTHs you can submit an entry for each, separately. Incidentally, there is no need to send in a complete list of everything worked if you wish to enter the tables; if you claim you have worked 50 counties, 12 countries and 78 squares on 144MHz, that is all I need to know.

Beacon News

The Cornish beacons GB3CTC are back on again, albeit temporary installations, on 70.03 and 144.915MHz. The 430MHz one is not operational pending the install-

Annual c.w. ladder

Station	Band (MHz)				Points
	70	144	430	µWave	
G4ZEC	—	601	—	—	601
G4XEN	—	300	15	—	315
G4NZU	2	243	4	—	249
G4ZVS	—	166	—	—	166
G4QUT	—	151	—	—	151
G4WHZ	—	139	—	—	139
GOHGA	—	128	—	—	128
G4VOZ	102	—	23	—	125
G4ZNI	—	112	—	—	112
G4YIR	—	105	—	—	105
G0GKN	—	84	—	—	84
G0DJA	—	83	—	—	83
EI5FK	—	29	35	—	64
G4YTR	—	56	—	—	56
G4AGQ	15	21	14	1	51
GM4CXP	—	51	—	—	51
G2DHY	15	28	1	—	44
GU4HUY	—	31	—	—	31
GW4HBK	27	—	—	—	27
G0HDZ	—	9	—	—	9

Number of different stations worked since January 1.

Practical Wireless, January 1988

tion of a new TX. Thanks to the Mid-Cornwall Beacon and Repeater Group for restoring this very useful service, which is well received in London again.

The Irish beacon EI2WRB on 144.920MHz continues to provide a very consistent signal at G3FPK and proves that this 500km path should be workable by 50W single Yagi stations in flat conditions, provided they are in reasonable locations. With increasing activity from EI it is worthwhile putting out CQ calls in that direction. After all, there is no sense in everyone just listening all the time on the calling frequencies; somebody has to start the ball rolling.

Contest Notes

Reminders that the last session of the 432MHz Cumulatives is on Dec 11, and the 1.3/2.3GHz Cumulatives on Dec 19, both 2030–2300. The 70MHz c.w. contest is on Dec 13 but it seems that the RSGB wants to keep us all in the dark. As of Nov 1, I can find no details of this one. Last year it started at 0900.

By contrast, the Derby and District ARS is not so reticent, its Contest Sub-committee secretary G1DHQ having already forwarded details of its National 144MHz Contest on March 13, 1300–1700. For the complete rules send an s.a.e. to the society at 119 Green Lane, Derby, DE1 1RZ. Last year saw the first DADARS 144MHz event and it was very successful.

Meteor Shower Information

Last month I covered the Geminids shower which should provide good opportunities for m.s. QSOs in the period Dec 12–14. Another very useful shower in December is the Ursids on the 22nd. It lasts about 12 hours and, with a declination of +76°, is above our horizon all day. The Right Ascension is 217°.

The Ursids are particularly good for east/west contacts with an efficiency of about 70 per cent or more. The peak time for NE/SW is centred on 1500 and for NW/SE on 0200, but both these are very broad peaks. The N/S path is the least effective, dropping out at about 0900 and 2100. Best times would be 0300 and 1400 when the efficiency is about 40 per cent.

The Quadrantids shower has the highest number of reflexions per hour of any of the normal showers and should be very useful on Jan 3/4. Its Dec/RA are +48° and 230° respectively and it does not set in the UK. Prime times would be: NE/SW 1400 with a lesser peak around 0600; E/W 1400–0300 at an average of 50 per cent efficiency; NW/SE 0300 and N/S 0400 and 1300 when the efficiency is around 90 per cent.

Times to avoid are: NE/SW 0100 and 0900; E/W 0600 and 1100; NW/SE 0800 and 1600 and N/S 0900 and 2100. All the above times are for the centre of mainland Britain and are local times, i.e. UTC. This information was derived from my computer program based on one by DL5MCG which was published in edition 1/86 of Dubus Magazine, by the way.

DXpedition Report

In spite of very heavy seas and poor radio conditions, the OZ1EVA/MM team did operate across the North Sea as planned during the period Oct 8–10. The ship was the DFDS Dana Anglia ferry of 14 500 tonnes on the Harwich/Esbjerg route.

The equipment consisted of an Icom IC-271E with MuTek board, 100W to a 4-ele Tonna Yagi on 144MHz, and an IC-475, 25W to a 10-ele Tonna Yagi on 430MHz. A 5m antenna mast was attached to a railing on the top deck 24m a.s.l. and substantially guyed. The team were afforded the luxury of a large boardroom immediately under the mast but even so, there was a long feeder and rotator cable run.

Unfortunately the rotator jammed at the beginning. The antenna was obscured by a very large funnel which blocked signals from the NE on the outward trip and to the SW on the return leg. The ship's position was followed using an Admiralty Chart with frequent updates from the bridge. They marked the locator squares on the chart.

Some 700 contacts were made on 144MHz and 60 on 430MHz from squares BM, BN, CN, CO, DO and DP. On 144MHz only one GW was worked, from BM, the rest being either Gs or continentals. 18, 22 and five respectively Gs were worked from CO, DO and DP. Best DX on this band were DK3TT at 913km and DJ0XR/P at 622km from DP, and SM6CMU at 516km from CO.

On 430MHz 9 Gs were worked from BM and one from BN. Best DX were OZ1GMP at 343km from CO and DL2KBB at 307km from BN. Flemming G4MJC/OZ1EVA and Jan G4XNL are ex-Merchant Navy so coped well with the heavy seas and gales but they report that sea sickness was a problem for the other two operators G4MDZ and G6VYH.

They wish to thank all those many stations who stayed on the bands with them throughout the nights and report that operating procedures were generally excellent and disciplined, enabling them to work most in the inevitable pile-ups. Total time ashore in Esbjerg was only four hours. A similar trip on another route is likely later this year as they are keen to do it again.

The 50MHz Band

The most important news this month is the first 50MHz QSOs between Britain and Botswana which took place on Oct 22. The DX station was A22KZ in Maun and the first to work him was Eric Parvin G2ADR (YSN) in IO93KX who told me he made the contact at 1537. They also worked cross-band 50/28 and 28/50MHz. I understand A22KZ is in KG19RX which makes the true ellipsoidal QRB 8530km.

When first heard A22KZ was T7 but later T9 on c.w. He was using 75W to a 5-ele Tonna Yagi at 9m but G2ADR was only running 9W to a dipole at 8m and it was not ideally aimed either. The most likely propagation mode was Es to the Mediterranean latitude, thence t.e.p. or trans-equatorial to the uninitiates, to Botswana.

Subsequently G3CCH (HBS), G4GAI (LNH), G4HBA (YSW) and GM4DGT (CTR) contacted the A2 station, and the QRB to GM4DGT (IO86CD) is 8221km. Stations south of about latitude 53.7° north listened to the aforementioned working A22KZ but heard absolutely nothing of him.

The short contest on Oct 18 was favoured by some Es propagation. Robert Stennett G0HFN (BRK) heard the beacon CTOWW at S7 at 0915 so put out a CQ call on 50.110MHz to be answered by CT4KQ (IN60BP). G0HFN uses a Yaesu FT-690 Mk 2 with 15W amplifier to a 2-ele Sandpiper antenna in the loft facing west.

Geoff Brown GJ4ICD made 60 QSOs in

QTH Locator Squares Table

Station	Band (MHz)			Total
	1296	430	144	
G3JXN	82	129	175	386
G3XDY	81	137	185	403
G6DER	70	105	182	357
G4NQC	63	99	250	412
G3UVR	63	113	217	393
G4FRE	63	136	84	283
GJ4ICD	59	119	253	431
G4NBS	59	99	92	250
G8PNN	58	94	128	280
HB9AOF	55	80	141	276
G6MGL	50	89	135	274
G3COJ	44	102	186	332
G4DEZ	44	38	246	328
G8ATK	42	89	138	269
G4RGK	36	94	251	381
G1EZL	32	86	234	352
G6YLO	32	104	128	264
G8GXP	30	140	307	477
G1DOX	28	34	53	115
G1KDF	27	86	144	257
G4MUT	24	88	144	256
G6HKM	22	101	172	295
G6XVV	20	64	194	278
G8XVJ	18	88	236	342
G3IMV	17	116	405	538
G4FVK	17	43	71	131
G4ZTR	17	15	37	69
G6MXL	10	36	66	112
G6AJE	5	57	95	157
G8LHT	2	31	81	114
G4AGO	1	41	102	144
G2DHF	1	4	27	32
G4KUX	—	80	345	425
G4XEN	—	102	250	352
DL8FBD	—	69	274	343
G4DHF	—	—	307	307
G4SWX	—	—	293	293
G4TIF	—	106	184	290
G0DAZ	—	91	183	274
I4YNO	—	—	270	270
G4SSO	—	67	190	257
G6DZH	—	82	143	225
G1LSB	—	118	106	224
G4IGO	—	—	223	223
G3FPK	—	—	222	222
G4SFY	—	—	222	222
G4MJC	—	33	184	217
GM4CXP	—	30	182	212
G3NAQ	—	68	143	211
G4MEJ	—	—	211	211
G1EGC	—	44	166	210
GW8UCQ	—	81	128	209
G8LFB	—	—	200	200
G4HGT	—	52	142	194
G4YCD	—	36	155	191
G1GEY	—	48	139	187
G8MKD	—	49	133	182
G4XEK	—	—	178	178
GM0BPY	—	54	123	177
G4YUZ	—	—	177	177
EI5FK	—	35	137	172
G8ZDS	—	43	129	172
G4DOL	—	—	172	172
GJ6TMM	—	31	128	159
ON1CAK	—	—	154	154
G4CQM	—	52	100	152
GW8VHI	—	48	102	150
GW4FRX	—	—	126	126
G6XRK	—	1	117	118
G4TGK	—	—	113	113
GW6VZW	—	6	98	104
G8XTJ	—	—	104	104
PA3EUS	—	17	56	73
G0FEH	—	—	65	65
GM0GDL	—	13	48	61
G1CRH	—	—	59	59
G0HDZ	—	—	55	55
GU4HUY	—	—	54	54
G1NVB	—	—	49	49
G8PYP	—	—	47	47
G1VTR	—	23	6	29

Starting date 1 January 1975.
No satellite or repeater QSOs.
"Band of the month" 1296MHz.

the contest and confirms Es propagation throughout the period with S9 signals from CT0WW. He heard no EA or CT stations though but best DX was GM0FRT (IO87) at 871km via Es. TV timebase QRM made things very difficult on reception.

Paul Thompson G6MEN (SPE) runs 25W to a dipole and reports Es cross-band QSOs with EA4CN at 1305 on Oct 24 and EA3ADW at 1214 and EA3DLV at 1240 the next day, the EAs being on 28.885MHz.

Derrick Dance GM4CXP (BDS) has found several Ar events these past few months. On Oct 3 he worked GM0HNX, GM3JIJ, GM3ZBE, LA3EQ, G4HBA and G4CMT. The event was still in progress, weakly, at 2138 when he closed down.

Simon Lloyd Hughes GW8NVN (GNS) wrote about the operation from Flatholm Island in the period Aug 28-31 using the callsign GB2FI. On 50MHz the group used an Icom IC-290ES, MM 50/144MHz transverter and 5-ele Tonna Yagi. They had a continuous pile-up and notable contacts included G1HYD (HWR) using one watt, G3RSX (WMD) running 0.5W and GW3JXN/A (DFD) with one watt, each using dipoles. The trip was to celebrate the 90th anniversary of Marconi's tests from the island and had BBC radio coverage including the World Service.

The 70MHz Band

After a four years' absence **Paul Turner G4IJE** (ESX) is back on the band. Next to **Dave Meadows G4TGB** (NOT) who has worked eight new stations on s.s.b. and six on f.m. since his last report. But he reckons there are still not many B licensees QRV yet. He was on for two hours in the contest on Oct 25 and worked 26 stations in 18 counties. He would like to try some RTTY on the band but would rather avoid 70.3MHz as he transverts from 144MHz so there could be breakthrough as it is the calling frequency. He is QTHR if anyone would like to arrange tests. Dave mentioned that the Rolls-Royce Club in Hucknall (NOT) is QRV on 70 and 50MHz but did not know the club call.

John Jennings G4VOZ (LEC) used c.w. in the contest and has now boosted his ladder total to 102. All the regulars answered on c.w. but the "visitors"—those who only seem to appear in contests—nearly all came back on 'phone. Usual excuses were no key or they were a Class B licensee apparently using a "callsign of convenience".

G4VOZ operates mobile a lot using f.m. simplex and often gets asked how to get going on the band. His usual response is that all you need to do is plug in a soldering iron, but that induces a "shock, horror" comment it seems.

GW8NVN and his friends had 70MHz equipment during their GB2FI trip but, although it had survived a week-long soak test the previous week, it became faulty on Flatholm leaving many addicts very disappointed.

The 144MHz Band

Johan Van De Velde's ON1CAK letter was written in mid-October and lists some good DX worked from Liedekerke in September including GWs in XL and XM and EIs in WN, plus G4XBF/P (XJ) on the 23rd. In an Ar event on Oct 3 he contacted GM3TSL (YR) and heard other GMs and GIs. He contacted OZ1EVA/MM in BM, BN, CO and DO squares in the Oct 8/9 period and on the 10th Y35O and Y23KO in GM and Y32CL (GL). Johan is now up to 154 squares worked.

Annual v.h.f./u.h.f. table
January to December 1987

Station	70MHz Counties Countries		144MHz Counties Countries		430MHz Counties Countries		1296MHz Counties Countries		Total Points
G1KDF	—	—	98	16	70	12	28	8	232
G4NBS	54	7	68	17	53	18	42	10	217
G6HKM	—	—	74	26	54	13	27	7	201
G1LSB	—	—	75	25	62	22	—	—	184
G1SWH	—	—	97	12	58	11	—	—	178
G1GEY	—	—	74	26	47	12	—	—	159
G6XVV	—	—	70	13	50	8	12	2	155
G1EHJ	—	—	58	12	53	9	—	—	132
G8LHT	—	—	66	22	29	10	3	1	131
G6AJE	—	—	54	17	40	8	7	2	128
G4SEU	58	6	43	16	3	1	—	—	127
G4DEZ	—	—	34	10	42	11	13	5	115
G4ZTR	36	5	32	11	24	6	21	6	114
G4MUT	26	1	45	14	19	3	7	2	108
G4VOZ	61	6	—	—	34	7	—	—	108
G6MXL	22	5	42	11	18	7	8	3	105
GW4FRX	—	—	77	27	—	—	—	—	104
GW6VZW	—	—	68	24	9	2	—	—	103
ON1CAK	—	—	72	31	—	—	—	—	103
G3FPK	—	—	76	21	—	—	—	—	97
G4WJR	—	—	78	10	—	—	—	—	88
G4TCK	—	—	66	19	—	—	—	—	85
G8XTJ	—	—	65	16	—	—	—	—	81
G4AGQ	15	1	31	12	13	4	7	7	76
G4YIR	—	—	60	15	—	—	—	—	75
G1CRH	—	—	64	11	—	—	—	—	75
G6OKU	—	—	53	9	1	1	—	—	64
G0HDZ	—	—	53	11	—	—	—	—	64
G6MGL	—	—	25	6	25	2	1	3	62
GM4CXP	2	2	32	13	3	3	—	—	55
GW4HBK	48	7	—	—	—	—	—	—	55
G0HGA	—	—	43	9	—	—	—	—	52
G1VTR	—	—	16	2	22	5	—	—	45
G2DHY	11	2	21	5	3	1	—	—	43
G3EKP	13	3	12	3	7	3	—	—	41
G4WND	25	4	—	—	—	—	—	—	29
GU4HUY	—	—	21	6	—	—	—	—	27
G6XRK	—	—	8	6	—	—	—	—	14

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

Before the hurricane, **Antony Wayland G1HJW** (ESX) worked OZ1EVA/MM in BM, BN, DO and DP squares but his antennas got blown away a week later. However, he has already replaced them and hopes the new ones work as well as the old ones did.

Maurice Williams G1NVB (LCN) wrote to update his squares table figure listing the new ones worked in the summer. He finds his signals are swamped out by those using much greater e.r.p. though. However, he has worked into LA and HB with OE heard.

John Quarmby G3XDY (SFK) reports that all his antennas survived the hurricane but that there is not much to report as tropo conditions have been poor this autumn. He did get a couple of new squares, CO and DO, from the OZ1EVA/MM voyage.

Ian Cornes G4OUT (SFD) always sends in a very neat computer-printed log of the c.w. stations worked, now at 151 for this year. His work shift pattern was due to change on Nov 1 which should have enabled him to take part in the 24 hours c.w. contest on Nov 7/8. Ian is one who has only had temporary planning permission for his antenna mast so hopes that this time he will get full permission.

John Palfrey G4XEN (NHM) caught the Ar event on Sept 25, 1710-1830, and tried very hard to work GM0EWX (WR) on c.w. He did contact LA2AB near Oslo at a beam heading (QTE) of 350° with the LA's QTE being 300°. Square number 250 was worked on Oct 10, OZ1EVA/MM in BM and the next day, in another Ar, John worked LA6VBA, GM4ILS and G4CJG/A but no SM or UQ stations heard in Wellingborough.

He was in Ibiza from Oct 2-9 and met EA6FB and his wife, and husband and wife team EA6QB and EB6MC. With José EA6FB he had visited the site of the beacon EA6VHF (AY07j) at 458m a.s.l.

from which the view was superb. It is also the v.h.f./u.h.f. contest site. The beacon QRG is 144.918MHz.

Ela Martyr G6HKM is now minus the 18m tower which supported her 144MHz Yagi and her husband's tri-band h.f. beam. On its way down in the hurricane it smashed the 430MHz beam. The only antenna to survive was the 42-ele 1.3GHz one on the small Altron mast. Prior to the disaster, BM and BN squares were added to her total.

Mervyn Rodgers GM0GDL (CTR) has written after a long time to update his squares totals. During this period he has worked into F, GU and I and has put up two 10-ele Yagis. He mentions several recent Auroras but these tend to be non-events in Alva due to there being 763m of granite just 200 yards to the north.

GM4CXP cheerfully admits that Auroras are certain to bring him out of hiding, so Derrick has been pleased to discover several recently. He reports events on Aug 3 and 31 and on Sept 22 when GB3LER was copied weakly at about 1700. On Sept 25 OH2NQ (KP22GE) was heard at 1614 and RQ2GAG (KO26AW) six minutes later. He worked LA9BM (JP40CM) at 1629 at RST55A each way.

On Oct 3 another one was detected at 1327 and Derrick contacted two PAs, four Gs, two DLs, OZ1FGP, UQ2GMD, SM1MUT, EI5FK and GM4AWA. On Oct 11 GB3LER was auroral at 1502 and he worked two GMs, OZ4VV and LA9FY before the event faded away at 1846.

The GB2FI team's trip to Flatholm Island coincided with a period of excellent tropo and GW8NVN reports that many continentals were worked including OK1FM/P, OZ1FTU and HB9STY/P in spite of inadequate RX facilities. This was in the Aug 28-31 period.

At G3FPK the only tropo contacts worth reporting were with OZ1EVA/MM in BN and DO squares, neither new, though. On

the Ar scene, **John Eden GMOEXN** (HLD) telephoned at 1535 to report an Ar in the north of Scotland and I also found it audible in ZL60j and worked GM4ILS (I087IP) on c.w. at 1556 and heard John at RST51A shortly afterwards; this on Oct 11.

My notes are ambiguous but I believe there was an Ar in Scotland on Oct 27 as I have a note in the log for that day that GM4IPK worked 20 stations. **John Nelson GW4FRX** (PWS) telephoned at 1415 on Oct 28 to report reception of SK4MPI (HU46d) on 144.960MHz and GB3LER, albeit very weakly. GMOEXN advised me at 1620 that he was copying GB3VHF aurorally but I heard no Ar signals through the computer noises—it was half term and the local schoolchildren were apparently playing computer games all day long.

My thanks to **Derek Turner G4SWY** (HFD) who sent me a tape of "Various Auroras" received from GMOEXN. The reason he got it was because the latter copied a c.w. signal from G4SWY but it was actually G4SWX sending a duff X. I have played the tape through and it makes me very envious since only rarely do we hear so many strong Ar signals in the southerly latitudes.

One sound piece of advice from GMOEXN is that on c.w. stations spread out well away from the 144.050MHz region which gets very cluttered. While we may only be copying a few of the stronger stations in the south, up in Scotland they will probably be receiving lots of the more modest signals from SM, etc. So a weak G signal will almost certainly be covered up.

John suggests to go above 144.075MHz in five kilohertz steps as they tend to search those frequencies. It would make sense to call CQ in the higher parts of the c.w. section, even up to and above 144.150MHz, he reckons. Another factor to consider is the Doppler shift whereby the Ar signal will not be on the same frequency as the actual transmission. This is of great importance if you are using a narrow c.w. filter, of course.

On occasions when I have been able to copy the direct tropo signals from distant stations as well as the Ar ones, I have measured shifts of up to 2kHz, sometimes i.f., at other times h.f. So you really do need to use the r.i.t. control in case someone is calling you zero-beat to your Ar signal.

To put some figures to Doppler shift, if you observe a shift of 1.2kHz, this implies that the auroral curtain is moving at a velocity of about 2.5km/sec or 5600 m.p.h. Since signals are being reflected from many different parts of the curtain, or curtains, your signals will be coming back at umpteen different frequencies. This is because an Ar is not a static thing but in violent motion as anyone who witnesses these events will know. The net result is a great spread of the received signal.

The 430MHz Band

Paul Brockett G1LSB (LCN) reports below average conditions in October but he did work G4YPC/P (XJ) on the 2nd. In

the u.h.f. contest on the 3rd he worked DK0VKG/P (DL), DK1KN (DK) and PI4EME (DN). The following day brought ON1KBV (CK), DFOAP (DJ), DL8PC (EK), F1GTR (ZH) and F1ARR (ZI). Paul did not hear OZ1EVA/MM in the Oct 8–10 period, though.

Phillip Stanley G3BSN (LDN) lists overseas stations heard/worked as DG2BRW, DJ9DL, DK0VS, DK0VPG, F6CTT, F6HMG, FF6KDG, ON1BLY, ON4FI, PA0GUS, PE1CJW, PE0MAR and PI4KML. In the UK, G1LGG (WMD), G3GIM, G8STY and G6YLV (KNT), G1GVA and G3IMV (BKS), G1JGS/P (IOW), G4APA (CHS), G3FVA (DYS), G6WZA (SOM) and G8HDS (LNH). All those on s.s.b with G4DZU (YSW) on c.w. G4XBF and G4YPC operating portable from the Lizard (CNL) were also mentioned.

Phillip's antennas were brought down in the hurricane but the 430MHz ones only suffered minor, bent element, damage. He plans to replace the array with a box of four with AZ/EL facility as he has found that, in good tropo conditions, signals can be improved by up to 12dB with some elevation.

G3XDY added OZ1EVA/MM on Oct 8 when they were in BM and BN squares, both new, but John did not hear them from CO. G6HKM had added a BNOS 100W amplifier to her station and used it for the first time in the Oct 8 leg of the Cumulatives making 47 QSOs. One new 1987 county, GNM, came out of it.

GMOGDL should have finished a 4CX250B amplifier for the band by now and planned to erect two 23-ele Yagis which ought to make him a good signal from the rather rare Central Region.

The Microwave Bands

On 1.3GHz G3BSN lists as heard/worked PE1CJW (JO32FI), GW4IGF/P (I083JA) and, from England, G3GIM and G8XIR (KNT), G3IMV (BKS), G8CHW (HFD) and G8OHH (WMD). Phillip's antennas suffered badly in the hurricane. The problem with the Tonna product being the plastics stand-off insulators which hold the elements in place. He suggests these should be re-designed.

G3XDY reports average conditions in the contest on October 3 and he made 13 contacts on 2.3GHz including one in AK square, which was new. John now has 25 on this band. In the contest, **John Tye G4BYV** (NOR) worked two stations on 3.4GHz (9cm) in AL and AN squares. On 2.3GHz a new one was XK square, making it 53 on the band. He made about 60 QSOs in the contest and only gave the European

QTH locator. He says that those calling CQ were giving their E-QTH too. He heard G4BRK/P (XK) working PE1GHG (CL) on 2.3GHz in the contest.

For G6HKM, the only new one for the Annual Table was G8OHH/P (OFE) in one leg of the Cumulatives bringing Ela's counties total to 27 this year on 1.3GHz. GW8NVN, referring to the GB2FI operation, mentions an unsuccessful 10GHz test with GW3PPF because, "... a seagull did not like the equipment and dive-bombed it, knocking it off the roof."

Interference Problems

Tony Collett's G4NBS (CBE) has been having continual trouble with one neighbour with TVI or rather a defective audio circuit in the set which causes break-through when he is on 430MHz. Only channel 21 is affected it seems.

The RIS is involved and he writes, "... this time I have been threatened that I must not cause any interference to the main TV, or else!" Therefore, he is limited to a mere 10W when beaming in the direction of the affected set.

Now in cases where the RIS engineers have proved conclusively that interference is only due to r.f. being rectified in audio circuits—i.e. no interference to the u.h.f. or i.f. ones—I think we should politely, but firmly, tell the RIS folk that we will not accept this QRP solution. By all means offer to restrict the power for a week or two while the complainant gets his set fixed, as a gesture of goodwill, but we must make it quite clear that we refuse to accept power limitation as the final solution.

One of our licence conditions is that we must not cause any undue interference to other wireless telegraphy. Quite right. But surely it is stretching the matter a long way to regard purely a.f. circuits as wireless telegraphy?

Tony's 70MHz transmissions have caused genuine TVI in the past and he has found the cause. In the output circuit of the PA there is a little diode to rectify a whiff of r.f. to drive a meter to indicate relative power output. Said diode, since removed, was generating harmonics in Bands IV and V which were being radiated directly, even though he has a low-pass filter between TX and antenna.

This is nothing new, of course. GW4FRX had a similar problem years ago from an "el cheapo" so-called s.w.r. bridge. Replacing the germanium diodes with Schottky ones cured the problem and also improved the linearity of the device.

Sign Off

Please note the next deadline and make sure you get your final annual table scores to me as near the year end as possible. Meantime, a Very Merry Christmas to all readers and contributors. Thank you all for your support and I look forward to an even better 1988.

**Reports by
Dec 23, Jan 27,
and March 2**

RTTY

This month has been quite a good one for RTTY and I have logged a few new prefixes, which are always welcome.

The first was ZL1AHA (New Zealand) on 14MHz at about 1000UTC on October 9. Although New Zealand is hardly rare, it's

the first I have logged on RTTY. When I first heard ZL1AHA he was working OF1WF, which is another unusual prefix: this turned out to be OH1WF using a special call to celebrate the Republic of Finland Independence Day, so that was

rather a unique QSO. The next interesting burst of activity was on October 14 and 15 when I logged 9Q5BG (Senegal) on 14MHz and 21MHz; at the same time there were a lot of South American stations coming in with very strong signals. One final notable

Practical Wireless, January 1988

NEW FROM YOKO MODEL F6/I VHF/UHF SYSTEM B/G/I/L Operation £95.00



Yes, the ubiquitous Yoko 5" black & white TV for reliable VHF/UHF TV/DXing is back — but in an improved version. Model F6 incorporates not only **SYSTEM I** (6MHz sound for UK/Eire/South Africa) but **SYSTEM B/G** (5.5MHz sound for Europe, Middle East, Australasia and other parts) **AND SYSTEM L FRENCH** standard (6.5MHz sound). The 5.5/6MHz sound switching is automatic within the receiver, the 6.5MHz and positive/negative video switch is situated at the rear of the television.

It's restyled too, featuring a sleek black monitor look and with rotary drum continuous band tuning. A telescopic whip antenna is situated at the rear, together with a 75 ohm coaxial input socket.

Versatile 3 way powering for AC Mains, internal batteries or an external 12V DC source (lead supplied), its ideal for the home, mobile, camping/caravanning or that 'DX-pedition' to the local mountain (and we'll supply the aerials if needed!) Completely compatible for use in the UK and throughout the Continent (including **FRANCE**). It's just the answer for a compact — 4.7(H) x 5.5(W) x 8.6(Deep) inches — high gain and comprehensive TV-DX installation and at a reasonable price.

Stocks of this new receiver have just arrived from the Far East, so don't delay, order today and maximise your loggings.

YOKO model F6 multistandard VHF/UHF 5" screen TV (System B/G/I/L) £95.00. Carriage UK £4.95; elsewhere POA.

Aerial Techniques, the company that knows the TV-DXing hobby carry a comprehensive range of aerial equipment for every type of installation — and with a huge range of filters, amplifiers, cables, rotators, masts and supporting hardware. Send for our illustrated **Catalogue at 75p**, if it doesn't list what you want, then we can obtain it quickly.

STOPPRESS — New Triax style Notch Filter, covers whole of the UHF Band, 470-860MHz completely tunable. Notch depth up to 26dB..... **£6.95** (includes postage)

All prices inclusive of VAT

Delivery normally 7-10 days.

ACCESS & VISA Mail and Telephone orders welcome.



AERIAL TECHNIQUES (PW)
11, Kent Road, Parkstone,
Poole, Dorset, BH12 2EH. Tel: 0202 738232.



South Midlands Communications



HF ANTENNAS

South Midlands Communications has the largest stocks and range in Europe — your one stop source for antennas, rotators, cable etc.

TB2

MM3 THE NEW JAYBEAM MINIMAX. At last a professionally manufactured minibeam built to Rolls Royce standards.
MINIMAX 10.15-20M, gain (pk) 6dbd F/B 12db typical
LE 16.1ft. Boom 9.8ft. wt 15kgs

		£327.75	£4.50
12AVQ	Vertical 10-15-20M	78.95	p&p 3.75
14AVQ	Vertical 10-15-20-40M	106.00	3.75
105BA	5 Ele. Yagi 10 metres	220.00	3.95
153BA	3 Ele. Yagi 15 metres	135.00	3.95
203BA	3 Ele. Yagi 20 metres	259.00	4.90
205BA	5 Ele. Yagi 20 metres	499.00	9.40
DB10-15A	3 Ele. Yagi 10-15M	209.00	4.80
TH3JNR	3 Ele. Yagi 10-15-20M	299.00	4.50
TH2MK3	2 Ele. Yagi 10-15-20M	279.00	4.50
EX14	5 Ele. 10-15-20M 'Explorer'	499.00	7.50
TH5MK2	5 Ele. 10-15-20M 'Thunderbird'	649.00	7.70
TH7DXX	7 Ele. 10-15-20M 'Thunderbird'	755.00	9.75
VR3 MK3	Vertical 10-15-20M	70.15	2.90
TB3 MK3	3 Ele. Yagi 10-15-20M	299.00	5.90
TB2 MK3	2 Ele. Yagi 10-15-20M	202.40	4.90
TB1 MK3	Rotary Dipole 10-15-20M	101.20	3.35
TB3/SSKIT	Converts TB3 MK2 to TB3 MK3	59.80	2.50
HQ1	Mini 'Quad' 6-10-15-20M	199.00	4.00
G4MH	Mini Beam 10-15-20M	98.00	4.50
TD-HP	Trapped Dipole 10-20-40-80M 1000W PEP	49.00	2.65
G5RV	H.F. Dipole	16.68	2.65
HF3VNB	Vert. 12-17-30M 1000 PEP	73.15	3.00

MOBILE ANTENNAS

TRIBANDER 86	Antenna Two Sections 10-15-20M Slide Switch	36.34	2.20
GWBASESTND	Base Standard	8.45	1.00
LFCOILS	Loading Coil 30M/40M/80M/160M	8.45	1.00
FLWHIP	Telescopic Whip	5.87	1.00
FLEXIWHIP	Antenna Mast + Telescopic Whip (10M Basic)	27.54	2.20
LFCOILS	Loading Coil 15M/20M/40M/80M/160M	8.45	1.00
FLEXI 10	Mobile 80-40-30-20-17-12-10-2 Coils	61.53	2.35
PL SERIES	PL259 Mount 20M/40M/80M/160M	From 18.34	2.35

**SCHOOL CLOSE, CHANDLERS FORD IND. ESTATE
EASTLEIGH SO5 3BY. Tel: 0703 255111
AND ALL BRANCHES**



ALTRON COMMUNICATION EQUIPMENT

**ALWAYS CHOSEN BY
PROFESSIONALS AND DISCERNING
RADIO AMATEURS.**

COMPACT LATTICE TOWERS SLIMLINE TUBULAR MASTS

Telescopic—Tiltover, Fixed—Mobile from 3M to 60M. Over 50 Models, suitable for a wide range of civil and military applications such as:

- Radio Communications
- Amateur Radio
- CCTV and Surveillance
- Meteorological Monitoring
- Aero & Marine Nav Aids
- Flood Lighting etc.

Purpose designed using 4.5m and 3m section modules for low retracted heights and cost effective shipping. Engineered to B.S.I. standards and hot dip galvanised to BS729 for protection. Wind loads are based on BS CP3 CHAP V PT 2 1972 for wind speeds up to 100mph/160kph.

**AQ6-20 SPACE SAVER THE
COMPACT 4 BANDER THAT IS
DIFFERENT 2, 3 OR 4
ELEMENTS 6, 10, 15 AND 20M.
Unique Fully Sealed Coils.**

**Hi'Q'—Close
Coupled capacity
hat loaded Yagi with
optimized
performance. Ideal
for small spaces.
Send now for full
Spec. sheet. NOW!**

QUALITY —
RELIABILITY —
KNOW HOW

WE DESIGN—WE MAKE—WE SELL—DIRECT.
At manufacturers prices—you get best value.

**SEND S.A.E. FOR FULL DETAILS
AND PRICES OF ALTRON PRODUCTS.**

H.P. TERMS

**ALLWELD
ENGINEERING**

Factory 6, 232 Selsdon Road,
South Croydon, Surrey, CR2 6PL.
Tel: 01-680 2995 (24 hr) 01-681 6734



call was YO4AVR/MM; this Romanian station was maritime mobile off the South East coast of Brazil and was putting out a very good signal.

My biggest problem this month has been a severe lack of reports from readers. Just a few notes or a photo-copy of your log is all that's required and would help to make this column more representative. If you have any comments on the development of the column then please write and let me know, as my objective is to please you!

FAX

How many of you worked or heard some interesting DX during the FAX contest on the weekend of October 31/November 1? Unfortunately I was away at the Computercations Rally so I missed most of the action. This rally was the first where I have tried to set up a live FAX demonstration so quite a lot of experimentation was required.

I took along my trusty Icom IC-720A transceiver, Epson RX-80 printer, power supply and the ICS FAX-1. The antenna comprised a coaxial feeder from the rig to the roof of the building, which was connected to a long wire antenna about 30m long. I was hoping to be able to receive some good amateur FAX from the contest that was running on November 1. After sorting out the earthing problems all seemed to be working well and I managed to receive signals from DJ4SR, which was a good sign. Then the trouble started. First I found that the h.f. demo station was overloading the front end of the Icom and causing splatter all over the h.f. bands; this is not surprising as they were running at least 100W and their antenna was less than 30m from my long wire! My next problem was more QRM from all the computers which were running on site. So unfortunately I had to give up amateur FAX and revert to weather broadcasts on v.l.f. Despite the problems I think the whole experiment was worth doing as mine was the only live demo running and did seem to attract a lot of interest.

My activities at Computercations meant that I missed the FAX activity night on November 2, so how did it go? Your reports would be very welcome.

Packet

As can be seen from this month's chart, I have spent a fair amount of time monitoring h.f. packet on 14MHz. The level of activity is really quite amazing. Whilst listening on October 24 I logged Senegal for the first time when I heard 6W1FJ at 0854UTC on 14MHz. The operator's name was Malick and the QTH is Dakar, so I should watch out for that one.

On the equipment front I have just received some hot news from Siskin of a new TNC-2 clone. It is called the Siskin TINY II and is about half the size of the earlier TNC-220 (that's small!). There's only one port (v.h.f.) but h.f. can be obtained by plugging in a header. It is to be fully TNC-2 software compatible and will

be supplied built and tested with a 12 month guarantee. The cost, £99.95, which sounds pretty reasonable.

I also have news that the AMRAC TNC driver r.o.m. v 3.01 for the BBC B is now available from AMRAC. I have only had time for a quick play with it but it looks good. The program has now been produced as a Public Domain package and as such is unlikely to be updated. The software is normally supplied as a r.o.m. image on disk, so contact AMRAC for supply details.

The latest addition to the packet operator's armoury is NET/ROM which adds a much needed additional layer to the AX-25 packet protocol. The main benefit offered is greatly improved throughput of information when using paths with one or more intermediate stations.

The existing technique for operating via intermediate stations is known as digipeating. This technique is fine providing all the radio links used are free from noise and congestion, a rare occurrence these days. The use of digipeaters can be a great help, especially if you have a QTH like mine which is in a valley at sea level! Anyone who has tried to work through more than one digipeater on today's crowded bands will, I'm sure, have found the link to be very slow and very often failing miserably. In order to understand why the link fails a basic knowledge of the AX-25 protocol is required.

To help newcomers the following is a simplified account of the error correction system used in packet radio.

The characters typed at your keyboard are assembled into packets by the TNC (Terminal Node Controller) and then transmitted. These packets comprise the actual characters that you typed plus some extra information added by the TNC for routing and error correction purposes. The TNC will then wait for an acknowledgement from the distant station to confirm that the packet was received error free. Once the acknowledgement has been received the next packet can be transmitted and so the QSO continues.

If for some reason the packet arrives at the distant station corrupted, then instead of sending a simple acknowledgement the distant station will ask for a repeat of the packet. Another possibility is that the acknowledgement from the distant station is either corrupt or missing entirely. In this case the originating TNC automatically re-sends the packet after waiting a pre-set time. If a packet still fails after ten of these re-trials then the TNC will normally abandon the connection.

As can be seen from this description, the error correction system is pretty fool-proof and ensures that the original message either arrives at the distant station complete or not at all!

When using this system via a digipeater the result is often failure as the digipeater merely repeats the packet or acknowledgement and does not have an error correcting system between it and the stations using it. Even on a simple route with just one digipeater, corruption of any part of the link will force the originating TNC to re-

Prefix (Country)	Band (MHz)				
	3-5	7	10	14	21
A, K, W (USA)		P		APR	
CT (Portugal)				P	
CX (Uruguay)				R	
DA, F, J, K, L, (W. Germany)	R	R		APR	
D4 (Cape Verde)				R	
EA, C (Spain)		P		R	R
EA8 (Canary Is.)				A	
F (France)		P		APR	
G (England)	AR	R	A	APR	
GI (N. Ireland)				P	
GM (Scotland)	R			P	
GW (Wales)	R			PR	
HA (Hungary)			A	PR	R
HB (Switzerland)				P	
I (Italy)		P		PR	
JA, G (Japan)				PR	
KX6 (Marshall Is.)			P	PR	R
LA, B (Norway)	R			PR	P
LU (Argentina)				R	R
LX (Luxembourg)					
LZ (Bulgaria)				R	
OE (Austria)				R	
OH (Finland)				PR	
ON (Belgium)	R			R	
OZ (Denmark)				R	
PA (Netherlands)				R	
PP, Y (Brazil)				R	R
SG, K, L, M (Sweden)				APR	
SO, P (Poland)				R	
SV (Greece)				P	
SV5 (Rhodes)				R	
SV9 (Crete)				P	
UT (Ukraine)				R	R
VE (Canada)				P	
YB (Indonesia)				R	
YO (Romania)				R	
YU (Yugoslavia)				R	
Y2 (East Germany)	R				
ZL (New Zealand)				R	
4K1 (Antarctica)				R	
4X (Israel)				P	
6W (Senegal)				P	
9H (Malta)				P	
9Q5 (Zaire)				R	R

send the whole packet. Obviously if you extend this to a route with more digipeaters the result is a very slow and virtually unusable link.

What is needed to correct this situation is complete error correction on each part of a route so that in the event of corruption only the link suffering the corruption has to resend the data. This is where NET/ROM comes in as, if this facility is available on the digipeaters, then all parts of the link can be made error correcting.

The procedure is to first connect with the local NET/ROM digipeater. Once this connection is established you then issue another connect instruction to the NET/ROM digipeater within range of the station you want to contact. The route between the two NET/ROM digipeaters is then automatically set up. When the route is complete the originating station receives a message saying that connection with the final NET/ROM digipeater has been established. All that is required now is to issue a final connect command to the destination

An amateur FAX picture



station and the QSO can begin. This may sound rather complicated but in practice it's really very simple.

Any TNC-2 or clone can have the NET/ROM fitted, though for best results the TNC may need to have the clock speed increased and the memory expanded. For more information I would recommend that you contact your TNC supplier.

Free Software

Are any of you using IBM PC compatible computers or machines that use the CP/M operating system? If so, you ought to

know about the **Public Domain Software Library**⁽¹⁾. I originally joined the library whilst looking for a source of software for the Amstrad PCW computer and have since been delighted by the software and service offered by the library. The software isn't actually completely free as there is a small copying fee, postage and V.A.T. An alternative is to download software from the bulletin board.

To give you an idea of the amount of software available, the library currently holds more than 2000 disks each containing about 360K of software! Within this vast range of software there are quite a

few which are of particular interest to the radio amateur. I have contacted the library and will shortly be reviewing some of these programs in this column. If you can't wait or would like to find out more, then you can contact the library direct, enclosing a s.a.e. for the reply.

Don't forget I need those reports either direct to the address at the head of the column or to my **Prestel mailbox: 425470071**.

(1) Public Domain Software Library, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL.

Amateur Satellites

Reports to Pat Gowen G3IOR
17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

RS-1

Radio-Sport-1, launched over ten years ago, was the forerunner of the RS series of satellites. The very fact that it prematurely lost its battery capacity means that now it is the longest surviving audible amateur-radio satellite. A cell of the rechargeable battery supply went open circuit, allowing the beacon to operate whenever a sufficiency of voltage resulted from the illuminated solar cells.

Many letter and telephone reports result due to the rather sporadic appearance of the beacon on 29.401MHz, with most observers excitedly reporting what is believed to be a new satellite sending numbers. The original telemetry, which sent the callsign "RS" followed by a series of letter prefixed numbers indicating housekeeping values, has become corrupted with each letter sent as a figure "5", so that now we hear "55 5015 5015 5015 55" in a run. This has been heard with regularity by those looking for the RS-10 upper beacon on 29.403MHz, but occasional reports also came in of a strange "ticking" on the same frequency.

A little calculation of the old RS-1 orbit, and the close following of a number of passes, resulted in discovering that the "ticks" were the dots and dashes of RS-1 itself, with the tiny power capacity as it approached a low sun angle near solar

eclipse causing power exhaustion so severe that a full duration dash or dot could not be sustained, only permitting the tick of the make of the character before the power fell. The space between the pulses permitted enough charge to accumulate before the next "tick".

An interesting experiment is evidenced here, as although we understand (to the best of our knowledge) that RS-1 is never on in darkness, it is not always on when calculated to be fully illuminated by sunlight. A possible explanation results from the awareness that solar illumination is not just a matter of "on" and "off", as earth's atmosphere content gives considerable scatter and light attenuation, particularly in the blue end of the visible spectrum. Pollution can give very red sunrises and sunsets. It could prove valuable as a research project to observe the beacon of RS-1, as it is obviously very sensitive to changes of light intensity, in order to attempt to relate this to terrestrial and ionospheric events.

The figures in Fig. 1, from the GM4IHJ "eqxer" computer program, give the acquisition times of RS-1 for the Sundays of December 13 and 27, when the satellite first comes into our range. The printouts (i), (ii), (iii), (iv), (v) and (vi) (Fig. 2) are from the GM4IHJ "SATSOL" program which graphically shows the passage of an orbit of the satellite in shadow or in sunlight, the

RS1 ON 13/12/87

AOS 0031	AZ 193
AOS 0235	AZ 242
AOS 0444	AZ 295
AOS 0652	AZ 331
AOS 0855	AZ 344
AOS 1057	AZ 347
AOS 1259	AZ 346
AOS 1502	AZ 339
AOS 2042	AZ 91
AOS 2236	AZ 148

RS1 ON 27/12/87

AOS 0141	AZ 256
AOS 0351	AZ 307
AOS 0558	AZ 336
AOS 0801	AZ 345
AOS 1002	AZ 347
AOS 1204	AZ 346
AOS 1944	AZ 108
AOS 2140	AZ 161
AOS 2341	AZ 210

Fig. 1

main black area indicating the period of an orbit when not eclipsed by earth's shadow. If we look at Fig. 2 (i), the first pass for December 13, commencing at 0031, we find the satellite in eclipse, having been so for some fourteen minutes, and not coming back into sunlight until after we lose the pass. The beacon is thus most unlikely to be heard.

POTENTIAL SOLAR POWER Eff%
RS 1 on 13/12/87 begins 0031
Note . Satellite random attitude
Average Eff = 72%

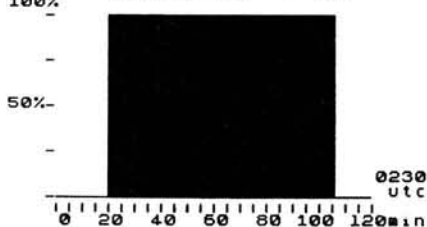


Fig. 2(i)

POTENTIAL SOLAR POWER Eff%
RS 1 on 13/12/87 begins 0444
Note . Satellite random attitude
Average Eff = 71%

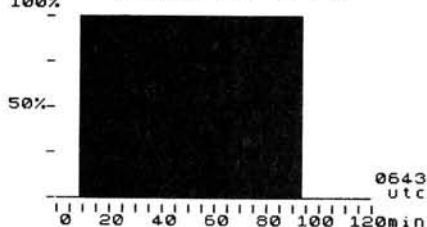


Fig. 2(ii)

POTENTIAL SOLAR POWER Eff%
RS 1 on 13/12/87 begins 0652
Note . Satellite random attitude
Average Eff = 72%

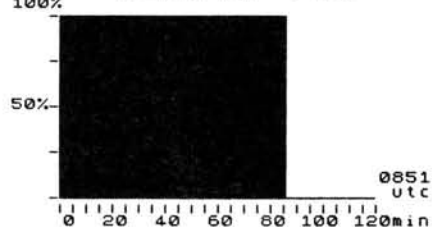


Fig. 2(iii)

POTENTIAL SOLAR POWER Eff%
RS 1 on 13/12/87 begins 1057
Note . Satellite random attitude
Average Eff = 72%

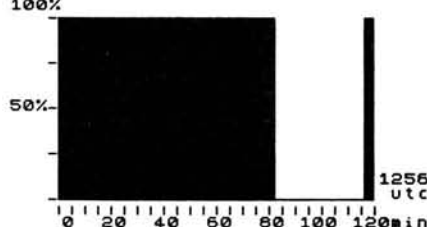


Fig. 2(iv)

POTENTIAL SOLAR POWER Eff%
RS 1 on 13/12/87 begins 1502
Note . Satellite random attitude
Average Eff = 71%

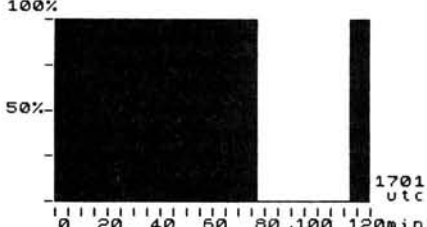


Fig. 2(v)

POTENTIAL SOLAR POWER Eff%
RS 1 on 13/12/87 begins 2042
Note . Satellite random attitude
Average Eff = 71%



Fig. 2(vi)

If we now jump to the pass commencing at 0444UTC, Fig. 2 (ii) shows that the satellite comes into the sun four minutes into the pass, and we may hear it start to tick, and later send its full content. At 0652UTC Fig. 2 (iii) puts the satellite into the sun from the moment it comes into range, giving an ever greater chance of hearing the beacon commence. On Fig. 2 (iv), at 1057UTC, we first have AOS after RS-1 has been out of solar eclipse for four minutes, whilst with the AOS at 1502UTC on Fig. 2 (v) it has been in the sun for eight minutes, each stage increasing the opportunity of actuating the beacon. Finally, at 2042UTC, on Fig. 2 (vi) the solar cells have seen no sun for some 22 minutes, again giving little likelihood of operation. Unfortunately, in this particular period, we have no passes in range of the UK where it enters eclipse after sustained solar illumination, though these will result later. If readers wish to follow up this interesting project and need precise long term tracking and insolation values, both of the programs are available from SARUG (G4INP QTHR) and run on the Spectrum computer.

Encore OSCAR-10

Recent observation of OSCAR-10 shows that the battery charge is slowly increasing, and that the transponder is still functional, although current indications suggest that the beam-antennas have probably not automatically switched in during the power-off period as hoped. Nevertheless, W6WNH performed a transponder test, and found strong signals resulting.

Peter Guezlow DB2OS, in consultation with fellow command stations VK5AGR and ZL1AOX, indicates his delight at the discovered recovery. He believes that use of the transponder might now be possible from November 20 onwards on the proviso that the lowest possible power required for communication is employed and that the eclipse period following perigee is kept free of all use. For November 16, the solar eclipse is from 0657 to 0824UTC, so use from Mean Anomaly 74 to 106 must be avoided at all costs. The periods recommended for transponder employment are from Mean Anomaly 0 to 059, and from 131 to 255 for November 16 to 23, and from MA 0 to 69 and 141 to 255 for November 24 to 30. Later periods, and the confirmation to commence transponder operations will be given out on the AMSAT nets to ensure topicality.

Recognising that we are in holiday time, and the dark days and long nights are very conducive to being in the shack, we offer some passes for you to try, in the confident hope that full operation will re-commence. The print-out of the AMSAT AMS-81 program is shown in Fig. 3 and gives a listing of OSCAR-10 signal acquisition and loss of signal times for the period December 12 to January 6 inclusive for Britain. The final columns give the time of maximum DX (normally apogee), the maximum distance (DX) possible, and the azimuth at which this occurs. Note that the use is dependent upon the time of the mean anomaly determining the use schedule, and not merely over-the-horizon satellite presence.

The apogee of OSCAR-10 is at its most northerly point again on January 7, so it is not surprising to find that we can "see" the tops of both apogees each day, giving a coverage of all of the northern hemisphere, and most of the south as well (only

that area immediately proximate to New Zealand has no mutual access for the UK). The elliptical orbit and the earth rotation give passes that seem rather unexpected to the circular satellite observer, resulting in two passes per day from Christmas Day to December 29 inclusive, and even three separate signal acquisitions as the satellite appears over our horizon on December 27.

The print-out, Fig. 4, from the GM4IHJ OSCAR-10 calendar program called "CAL", gives us on-the-hour azimuth and elevation positions for central UK for the holiday days of December 28 and 29. Under the callsign headings, e.g. KH for Hawaii, W6 for California, etc, an indication is given by an asterisk if OSCAR-10 has mutual access.

It can be seen that all areas except ZL are workable, and although ZS is not marked, it will be available on other days when the satellite apogee is closer. On December 29, we can work Hawaii (KH) by both "short path" to the west in the morning and on "long path" in the afternoon!

AMSAT-UK Services

The requirements of satellite enthusiasts are somewhat wider and different from the radio amateur and short wave listener that keeps to terrestrial communications, and aids for the space specialist are not always easy to come by. AMSAT-UK run a membership service organisation that is available to all satellite fans, and to members at 10 per cent discount rates. Profits from sales have resulted in funding for the satellites themselves, as needed finance toward OSCAR-10, the UoSAT spacecraft, and to the next Phase III satellite planned for launch soon.

Among the many reasonably priced items are "Oscalator" trackers for RS-5, 7, and 10/11, FO-12, the UoSAT pair OSCAR-9 and 11, and the NOAA-9 and 10 Weather Satellites, as well as frequency translation cards to help translate uplinks to downlinks. Printed circuit boards with specific components are available for pre-amplifiers at 29MHz (RS satellites) and 145MHz (OSCAR-10, RS-10/11, Phase III-c) with pre-amplifiers fully built and aligned for 145MHz and the 137MHz Weather Satellites.

Circuits and p.c.b.s for Phase IIIb and c demodulators, demodulators for UoSAT 1 and 2 and FO-12 can be supplied, as well as a host of books covering the needs of satellite operation, technical handbooks, data books on the various satellites. Align-

28/12/87	UTC	AZ	EL	KWJPGZ9VJZ	H62Y	SMKAL
0000	269	8	.....	.....	.....	.....
0100	271	17	.....	.....	.....	.....
0200	274	19	.....	.....	.....	.....
0300	278	19	.....	.....	.....	.....
0400	281	17	.....	.....	.....	.....
0500	284	14	.....	.....	.....	.....
0600	285	10	.....	.....	.....	.....
0700	284	6	.....	.....	.....	.....
0800	276	0	.....	.....	.....	.....
OUT OF RANGE						
1300	59	-4	.....	.....	.....	.....
1400	59	0	.....	.....	.....	.....
1500	62	3	.....	.....	.....	.....
1600	65	6	.....	.....	.....	.....
1700	68	7	.....	.....	.....	.....
1800	71	6	.....	.....	.....	.....
1900	73	1	.....	.....	.....	.....
OUT OF RANGE						
2300	261	8	.....	.....	.....	.....

29/12/87	UTC	AZ	EL	KWJPGZ9VJZ	H62Y	SMKAL
0000	262	21	.....	.....	.....	.....
0100	266	25	.....	.....	.....	.....
0200	269	25	.....	.....	.....	.....
0300	273	23	.....	.....	.....	.....
0400	276	20	.....	.....	.....	.....
0500	278	17	.....	.....	.....	.....
0600	278	13	.....	.....	.....	.....
0700	272	8	.....	.....	.....	.....
0800	251	-1	.....	.....	.....	.....
OUT OF RANGE						
1400	54	-2	.....	.....	.....	.....
1500	57	0	.....	.....	.....	.....
1600	60	2	.....	.....	.....	.....
1700	63	1	.....	.....	.....	.....
1800	65	-2	.....	.....	.....	.....
OUT OF RANGE						
2200	254	6	.....	.....	.....	.....
2300	253	25	.....	.....	.....	.....

Fig. 4

ment tapes and even satellite QSL cards with your own callsign are among the stocks held. Add to this software programs for the Apple, Amstrad, BBC and BBC (B), and Commodore C-64 computers, and most needs can be covered.

Readers interested should send a 9 x 6in self-addressed envelope with 20p in stamps to Ron Broadbent G3AAJ, Secretary AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12 5EQ. In return, by request, they will receive a list of all accessories available, a copy of *Oscar News*, an AMSAT-UK information sheet, a latest "hot line" news sheet, and a membership form.

Keplerian Elements

You are reminded that some of the satellite computer programs do not auto-

Fig. 3

DAY	AOS	LOS	MAX	DX	EL	AZ
12DEC	2137	0748	0229	14597	254	254
13DEC	2051	0707	0148	13997	245	245
14DEC	2005	0626	0107	13424	233	233
15DEC	1920	0545	0025	12925	219	219
16DEC	1835	0502	2344	12561	203	203
17DEC	1751	0418	2303	12394	184	184
18DEC	1708	0335	2222	12464	165	165
19DEC	1626	0251	2141	12753	147	147
20DEC	1544	0206	2100	13203	132	132
21DEC	1503	0120	2019	13750	120	120
22DEC	1424	0034	1938	14343	109	109
23DEC	1347	2345	1856	14945	100	100
24DEC	1318	2257	1815	15532	092	092
25DEC	0304	0605	0555	18006	302	302
26DEC	1301	2206	1734	16090	085	085
27DEC	0137	0717	0514	17531	296	296
28DEC	1303	2112	1653	16610	078	078
29DEC	0034	0741	0433	17069	289	289
30DEC	1323	2015	1612	17095	071	071
31DEC	2334	0758	0351	16582	282	282
01JAN	1346	1910	1531	17555	064	064
02JAN	2239	0759	0310	16059	275	275
03JAN	1434	1747	1420	18033	067	067
04JAN	2049	0735	0229	15499	267	267
05JAN	2059	0701	0148	14909	259	259
06JAN	2012	0623	0107	14306	250	250
07JAN	1925	0544	0026	13713	240	240
08JAN	1839	0503	2345	13168	227	227
09JAN	1755	0421	2304	12722	212	212
10JAN	1711	0337	2223	12443	194	194
11JAN	1627	0255	2141	12385	175	175
12JAN	1544	0211	2100	12563	156	156

ALLSATS	EQX	ON	13/12/87	UTC	Brg	Next	Orbit	Next	Day
SAT	EQX	W	+min	+inc	+min	+deg			
F12	0034	254	115.7	29.2	64.3	20			
R55	0039	260	119.4	30	113.4	30			
R57	0149	305	119.1	30.9	108.7	29			
Mir	0040	137	91.1	203.1	19.1	11			
Sal	0029	335	94	203.8	64.6	22			
R51	0026	8	120.3	203.0	3.9	3			
U01	0033	85	94.1	203.5	37.9	16			
U02	0032	45	98.4	203.6	37.2	9			
N09	0021	132	102	205.5	90.2	23			
N10	0141	91	101.2	205.3	78.4	20			
M13	0039	152	104	206.1	16.6	6			
M14	0055	130	104	206.1	16.9	6			
M1	0019	180	109.3	207.4	90.8	25			
R10	0016	159	104.9	206.3	29.5	25			
ERS	0032	345	89.5	206.6	38.4	11			
M15	0039	204	105.6	206.5	38.4	11			
Aji	0047	258	115.7	209.2	64.3	20			

ALLSATS	EQX	ON	27/12/87	UTC	Brg	Next	Orbit	Next	Day
SAT	EQX	W	+min	+inc	+min	+deg			
F12	0154	330	115.7	29.2	64.3	20			
R57	0124	312	119.4	30	113.4	30			
R55	0139	323	119.1	30.9	108.7	29			
Mir	0021	218	91.1	203.1	19.1	11			
Sal	0115	67	94	203.8	64.6	22			
R51	0131	46	120.3	203.0	3.9	3			
U01	0049	83	94.1	203.5	37.9	16			
U02	0133	55	98.4	203.6	37.2	9			
N09	0112	145	102	205.5	90.2	23			
N10	0137	90	101.2	205.3	78.4	20			
M13	0116	186	104	206.1	16.6	6			
M14	0135	165	104	206.1	16.9	6			
M1	0139	223	109.3	207.4	90.8	25			
R10	0020	184	104.9	206.3	29.5	25			
ERS	0034	38	89.5	206.6	38.4	11			
M15	0031	234	105.6	206.5	38.4	11			
Aji	0011	305	115.7	209.2	64.3	20			

Fig. 5

SPECTRUM COMMUNICATIONS

MANUFACTURERS OF RADIO EQUIPMENT AND KITS

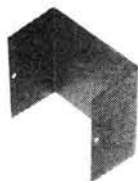
FM BOARD FOR YAESU'S AND KENWOOD'S (TRIO'S)

£81.00

SEND FOR DETAILS NOW!

RECEIVE PREAMPS

2, 4, 6, or 10 metres RF switched and DC sensing, 100W transmit handling power, gain 0-20dB adjustable by panel control, NF 1dB on 2M, 2dB on 4 & 6M, 3.5dB on 10M, 13.5V negative ground operation. Excellent performance at a reasonable price. Well made attractive boxed unit 77x70x39mm, an asset to any Ham shack. Types RP2S, RP4S, RP6S, & RP10S. PCB KIT £12, PCB BUILT £16.75, BOXED KIT £20.25, BOXED BUILT & TESTED £27.



4 and 6m EQUIPMENT

RECEIVE CONVERTERS 4 or 6m antenna input, 10 or 2m i.f., variable gain 0-26dB, n.f. less than 3.5dB. Buffered local oscillator output, types RC4-10, RC4-2, RC6-10 and RC6-2. PCB kit £17.25, PCB built and tested £24.50, boxed kit £29.25, boxed, built and tested £41.00.

TRANSMIT CONVERTERS 4 or 6m variable power 80mW to 2.5W, 2m or 10m drive 10mW to 100mW. Local oscillator input matches receive converters. Types TC4-10H, TC4-2H, TC6-10H, TC6-2H. PCB kit £27.50, PCB built and tested £37.75, boxed kit £39.50, boxed built and tested £53.00.

TRANSCIVE CONVERTERS Single board version of receive converter and 500mW transmit converter. 10m drive 25mW to 500mW. Types TRC4-10 and TRC6-10. PCB kit £39.00, PCB built and tested £54.00, boxed kit £54.00, boxed, built and tested £83.25.

TRANSCIVE CONVERTERS Separate receive converter and 2.5W transmit converter in a single boxed unit, 2m or 10m drive 10mW to 100mW only, requires r.f. sensing switch and attenuator for use with 2.5W 2m rigs. Types TRX4-10H, TRX4-2H, TRX6-10H and TRX6-2H. Boxed kit £60.00, boxed and built £99.50.

TRANSCIVE CONVERTERS As above but including an interface providing RF sensing attenuation and PTT switching. 1/2W-5W 2M drive. Types TRX4-2I and TRX6-2I. Boxed kit £67.00, boxed and built £115.00.

CB to 10m

CB TO 10 FM CONVERSION BOARDS - THE FIRST COMMERCIALY AVAILABLE, suits all UK FM CB rigs to give 29.31 to 29.70MHz. Size only 63x40x13mm. Built and aligned board SC29 £15. Or send your rig and we'll fit it. £28 inc. return P&P for mobiles. £31 inc. for base rigs.

MULTIMODE CB CONVERSIONS, send your 120 channel rig and we'll convert it to give 28.01 to 29.70MHz in straight sequences without gaps. Colt 1200DX, Cobra 148, Hy Gain 5, Multimode 2, Major M360, Tristar 747 & 777, Super Star 360, Concorde, etc., £62 inc. return P&P. Jumbo or Colt Excalibur 1200, £65. 80 Channel rigs such as Stalker 9 or Major M588 are modified to give 28.31 to 29.70MHz in straight sequence without gaps, £55.00 inc. return P&P. 200 Channel in 4 bands of 50 are converted to give 28.00 to 30.00MHz or 28.00 to 29.70MHz as required. Super Hy Gain 5, Lafayette 1800, Super Star 2000, £45.50 inc. return P&P. Nato 2000 £52.50, Super Star 2000-5x40CH £70. Colt 1600, 4x40CH, £65.50.

VAT & P&P INC PRICES Delivery within 14 days subject to availability. 24 hr answering.

UNIT B6, MARABOUT INDUSTRIAL ESTATE, DORCHESTER, DORSET. TEL: 0305 62250



AMELEC LIMITED

PRODUCT

DIODES

IN 4001	0.04	IN 5401	0.11
IN 4002	0.04	IN 5402	0.13
IN 4003	0.04	IN 5403	0.11
IN 4004	0.05	IN 5406	0.12
IN 4005	0.05	IN 5407	0.15
IN 4006	0.06	IN 5408	0.15
IN 4007	0.06	OA 47	0.14
IN 4148	0.02	OA 90	0.09

ZENER DIODES

BZY88 SERIES	0.08
--------------	------

TRANSISTORS

BC 107	0.10	BFY 90	0.70
BC 108	0.09	TIP 41A	0.40
BC 109	0.09	2N 3055	0.49

ALL GOODS NEW AND TO MANUFACTURERS SPECIFICATION. PRICES DO NOT INCLUDE VAT.

Payment Example:— PRODUCT COST + P & P £0.60 x 15%

ALL CHEQUES AND POSTAL ORDERS PAYABLE TO:— AMELEC LIMITED

AMELEC LIMITED, ELECTRONIC COMPONENT DESPATCHER

5-7 UPPER BROOK STREET, RUGELEY, STAFFORDSHIRE WS15 2DP

Tel. 0894 79797 Tlx. 36373 Amelec G

SEMI

555	0.20	MRF 450A	13.80
741	0.18	MRF454	21.00
747	0.18	MRF 455	16.00
CA 3140E	0.40	MRF478	3.75
CA 3240E	1.00		

REGULATORS

7805	0.40	78L05	0.25
7812	0.40	78L09	0.50
7815	0.40	78L12	0.25
7824	0.40	78L15	0.25

CARBON FILM

1/4W 5%	0.005	1/2W 5%	0.01
1W 5%	0.05		

THERMISTOR

VA1104	0.80	5 PIN DIN	0.16
--------	------	-----------	------

CONNECTORS

PRICE = PER UNIT	PRICE = PER UNIT
------------------	------------------

MAKE YOUR INTERESTS PAY!

More than 8 million students throughout the world have found it worth their while! An ICS home-study course can help you get a better job, make more money and have more fun out of life! ICS has over 90 years experience in home-study courses and is the largest correspondence school in the world. You learn at your own pace, when and where you want under the guidance of expert 'personal' tutors. Find out how we can help YOU. Post or phone today for your FREE INFORMATION PACK on the course of your choice. (Tick one box only!)

Electronics	<input type="checkbox"/>	Radio, Audio and TV Servicing	<input type="checkbox"/>
Basic Electronic Engineering (City & Guilds)	<input type="checkbox"/>	Radio Amateur Licence Exam (City & Guilds)	<input type="checkbox"/>
Electrical Engineering	<input type="checkbox"/>	Car Mechanics	<input type="checkbox"/>
Electrical Contracting/Installation	<input type="checkbox"/>	Computer Programming	<input type="checkbox"/>
GCE over 40 'O' and 'A' level subjects		<input type="checkbox"/>	

ICS Name _____ P. Code _____

Address _____

International Correspondence Schools Dept EES 18, 312/314 High St., Sutton, Surrey SM1 1PR. Tel: 01-643 9568 or 041-221 2926 (24hrs).

now, better than ever, the **NEW** TRIO TR751E

2 metre multimode!

£599.00 inc. VAT, Carriage £8.00



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

matically update for the new year, so some of you may have incorrect tracking information until the sidereal to solar time corrections are made. If you hit trouble, then you may call January 1 1988, December 32 1987 until your program is updated, but better to update the sidereal time, under "G2" (e.g. LET G2 = 0.2753606) in your programs. These are as follows:

1987 — 0.2753606
1988 — 0.27469296
1989 — 0.27676777

Apologies to the pair of erratic apogees and perigees that slipped by in our October listing. We gave the figures for FO-12 as 2479.774 and 2459.757 respectively, when of course we know the mean orbital height to be some 1500km. RS-10/11 was given as 488.0103 and 473.894, at which it would have been a spectacular meteor! It orbits in fact at some 1000km.

The latest fortnightly equator crossings for all satellites appears as Fig. 5. NOAA-11 is not included, as at writing time we are awaiting launch, originally set for October 29.

RS-10

Our latest system pair continues well, alternating between RS-10 and RS-11 on around a six week basis, mainly on mode "KA" whilst the 150MHz COSMOS NAVSAT remains quiet.

Bill Kelly of Belfast sends in a long list of regulars, and has been getting equator crossings directly from the onboard Codestore transmitted memory at the lower end of the passband. The format taken is "... RS10 (or 11) ... WSEM de RS3A — OPORTNYE ORBITY DLA RS10 — 24 Okt NR 1684 0114UT 89 ZAP — 31 OKT NR 1780 0117 UT 102 ZAP ..." and so on for many equator crossings ahead. The orbit date leads, followed by the orbit number, then the EQX in UTC time, followed by "ZAP" (I) which is degrees west.

Gordon Cowey G3DDG of Peterlee, Durham, has been testing the ROBOT, and finds that even at meteor scatter speeds close to 100w.p.m. the ROBOT can still copy his c.w., and come back almost as fast! The lower range seems to be around 6w.p.m., both extremes being very effective on the proviso that perfect c.w. is sent.

OSCAR-9

UoSAT-1 alias OSCAR-9 was six years old on October 6, and despite early calculations showing it would fall to earth in 1986/7, due to the low solar flux and lack of drag over the past few years, it still goes strong. Although its original 550km orbit is now down to 483km, it is expected to be with us until 1991/2.

The reason for the concern expressed over it being off the air from October 14 to 19 were not due to age, nor to a birthday celebration hangover, but because of damage to the UoS command antennas from the severe hurricane that swept across southern and eastern England, destroying thousands of amateurs' antenna systems!

Moscow Meeting

To celebrate the 30th anniversary of the launch of Sputnik-1 on October 4, a "Space Future Forum" convened by the Soviet Academy of Space Research was held in Moscow from 2 to 4 October 1987. Over 180 scientists attended, and AMSAT was represented by President Vern Riportella WA2LQQ. Other amateurs in the US contingent included Dr. Owen Garriott W5LFL, Dr. Ken Kellerman K2AOE, and Dr. Richard Moore W0GYS. Leonid Labutin UA3CR was among the Soviet attendees.

**Reports in by
Dec 23, Jan 27,
and March 2**

The forum included many topics on the peaceful use of space, with talks by Karl Sagan, Dr. Bernard Lown on the medical uses of space, including AMSAT's PACSAT project, and many other notable figures.

Project "HAART"

Even before the days of satellites, many amateur groups in the USA, Germany, France and South Africa launched balloon-borne transponders to give skills in tracking and extended v.h.f. and u.h.f. communications. It was by balloon testing that AMSAT-Italy developed the separate AGC passband split to help overcome the QRO "Alligator" problems. Most of these projects have been flown to high altitude on their own or on unmanned research and weather balloons.

Now G3RWL and G3AAJ have got together to provide project HAART, an AMSAT-UK experiment (standing for High Altitude Amateur Radio Transponder). Already the system is working on the bench, and a licence for flight testing is awaited. It consists of a 435.040–435.050MHz uplink receiver, with a non-inverting 145.840–145.850MHz downlink transmitter, with a beacon on 145.852MHz transmitting at 10w.p.m. c.w. the callsign plus an ascending serial number from 000 to 255 sent every 80 seconds. The beacon will run 60mW, and the transponder transmitter 300mW e.r.p. The antennas will be vertically polarised, as they will dangle below the balloon, and the batteries should last for longer than 10 hours.

The intention is to fly the package with Danielle Bridge, a brave young lady out to break the ladies' balloon ascent record, just as soon as the licence and some good weather arrives. It is confidently expected that she will ascend to an altitude of greater than 30 000 feet, which will give a considerable range between the transponder users.

Propagation

Reports to Ron Ham
Faraday, Greyfriars, Storrington, West Sussex R20 4HE

From his observatory in Bristol, **Ted Waring** counted 9 sunspots on October 6, a dozen on the 12th, 22 on the 17th and 7 on the 22nd. In Sevenoaks, **Cmdr Henry Hatfield** recorded bursts of solar radio noise, at 136MHz, on October 5, 6, 8, 14, 15 and 23.

"Sunspots continue to be seen and the geomagnetic field has been more disturbed," wrote **Ron Livesey** (Edinburgh) on October 10. Ron is the auroral co-ordinator for the British Astronomical Association. He reports that the magnetometer used by Karl Lewis (Saltash) was unsettled to very unsettled from September 24 to 30. Magnetic storm-aurora was reported from northern-America on the 24th and such reports as "active auroral storm", "active rayed arc", "active light", "active storm" and "quiet arc" came from auroral observers in Belfast, Birr Castle, Culbokie and Edinburgh for the period September 22 to 30. Ron also pointed out that the AP indices reached 32, 54 and 37 on days 22, 25 and 29, respectively.

Henry Hatfield, using his spectrohelioscope, located the results as shown in Table 1.

I see in the October issue of *Solar News*, the journal of the London Solar Society, that they are selling kits, for £6.50, to make a Jam-Jar Magnetometer which looks interesting. More details about this

product and society membership are available by sending an s.a.e. to the Editor at "Brindles", Mill Lane, Hooe, Battle, East Sussex TN33 9HT.

The 28MHz Band

Although **Bill Kelly** (Belfast) logged an Italian station at 1040 on October 10, he found the band generally quiet. In Storrington, **Fred Pallant G3RNM** found a good path between South America and the USSR at 1813 on October 3. He reports that the Brazilian beacon (PY2AMI) was RS59 at 1009 on the 11th but was gone by 1015.

Dave Lingard G0CLH (Soham) logged signals from CX, KB4, TU and W9 on October 9; AL7, HK, KA2, W1 and 5 and 6W6 on the 12th; FM5, KP4, W4, YB0 and 6W7 on the 13th; FR4, W0, 1, 2 and 5 and ZS on the 19th and CX, K3 and VE1 on

Table 1.

Date	Time	Flares	Filaments
Oct 1	1000	0	10
Oct 3	1036	0	12
Oct 4	1347	1	13
Oct 6	1447	0	10
Oct 8	1135	0	7
Oct 11	1035	0	14
Oct 12	1100	0	10
Oct 22	0932	0	16
Oct 25	1130	0	16

the 22nd. "A very good Sporadic-E opening on the 21st with a lot of short hop stations including G1, GM and plenty of big signals from Europe plus A92, H25 (special call from Cyprus) and 8P9," said Dave.

John Levesley G0HJL (Bransgore) logged CT, CU, DJ, EA, I, JY4, LU, LZ, PT, UA, UT, YC and 3B1 on the 10th; CT, DJ, EA, EA8, FY, I, NP4, OD, SV, UA, VO, ZS, 4X5 and 9J2 on the 11th; HG on the 12th and CX, EA, EA8, F, HB9, I, OE, OD, SV, SV5, UA, WD4, ZS, ZY and 5B4 on the 18th, which is a good haul.

The 21MHz Band

It is well known that **Gerry G3WMU** and **Margaret Brownlow G4LCU** are the licence custodians and the prime operators at the amateur station GB2CPM. That is installed in the wireless exhibition building at the Chalk Pits Museum, Amberley, Sussex. Their voices are usually heard, on Sundays during the season, on the upper h.f. bands.

Around midday on September 20, 21MHz was open to the Far East and Margaret, Fig. 1, worked four Tokyo stations in succession, much to the delight of a Japanese lady who saw the log when she visited the museum later that afternoon. "They were giving me RS59," said Margaret.

Practical Wireless, January 1988



Fig. 1

Propagation Beacons

First, my thanks are due to **Chris van den Berg** (The Hague), **Henry Hatfield**, **Don Hodgkinson G0EZL** (Hanworth), **Bill Kelly**, **Dave Lingard**, **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant** and **Ted Waring** for their 28MHz logs from which I compiled the chart of international beacon signals, heard in Holland and the UK between September 26 and October 25, Fig. 2.

Most observers heard a good number of South African beacons, Chris and Don logged the Bermuda beacon **VP9BA** on October 12 and 13. Don also found **KD4EC** on the 13th and **WA4DJS** on the 3rd and 11th. Fred heard **WB8UPN** on the 9th and 10th and **WA4DJS** on the 11th.

"I heard 14 beacons on October 12," wrote Don but added sadly, "unfortunately my beams were blown down during the storm on the 16th, when my barometer bottomed out, so I'm back to listening on the vertical ground plane which remained unharmed". My chimney mounted Revcone survived as well Don.

Tropospheric

The atmospheric pressure readings taken at noon and midnight during the period September 26 to October 25, Fig. 3, shows how my barograph fluctuated from a peak of 30.4in at the end of September to a low of 29.1in on October 7 and a very low of 28.8in, Fig. 4, while the hurricane swept through southern England in the small hours of October 16. Similar barometer plots showing this dramatic pressure change came from **Ted Owen** and **John Raleigh**.

I understand that weird things happen to v.h.f. radio signals during such extraordinary conditions, but unfortunately I could not check the bands because the power lines in my area were severely damaged by the wind and I was without electricity from about 0200 on the 16th to 1115 on the 27th.

Life without electricity is not easy and my thanks are due to the Brownlows for

Fig. 2

	September 1987															October 1987										WMR87				
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
QF0AAB																														
QK0TEN																														
QLO1GI																														
EA3JA																														
EAGRCM																														
LY4M																														
LUIUG																														
PY2AMI																														
PY2G08																														
VP8ADE																														
VP9BA																														
ZS1LA																														
ZS6PW																														
Z21ANR																														
3B8MS																														
4N3ZHK																														
5RACY																														

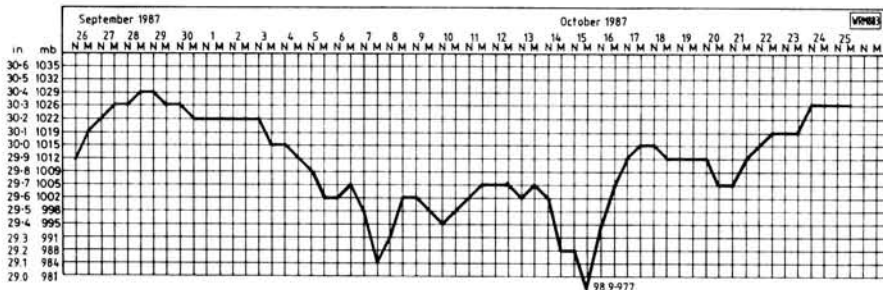


Fig. 3

the loan of a large 12V battery and a couple of fluorescent fittings and to the engineers from the SWEB (Bristol) who restored my supply. We are also grateful to the "army" of electricity and telephone engineers who immediately came south, from many parts of the UK, to help our local engineers repair the extensive damage to these systems.

934MHz

Between September 20 and 26, **Les Jenkins GB-37** (Godalming), operating from his holiday QTH in Deal, made contact with 20 stations, on 934MHz, located in Broadstairs, Canvey Island, Detling, Felixstowe, Gillingham, Hockley (near Rayleigh), Hungerford, Ipswich, Margate, Rochford, Thanet and Southend. Les used a Nevada Delta-One transceiver, a Crest-byte pre-amplifier for the receiver and a PA7 collinear antenna, mounted some 3m a.g.l. He was back in Deal for a while after October 17 and made 21 new contacts including a maritime mobile on the *MV Pepita* at Shoeburyness on the Thames Estuary.

"At 2330 on September 18, Fred Mills TL-01 worked two stations on The Wash, some 96km from his home in Kempston," wrote **John Raleigh DW-04** (Bedford). He noted a slight fall in atmospheric pressure at the time. John is secretary of The Four County 32cm Club and reports that at

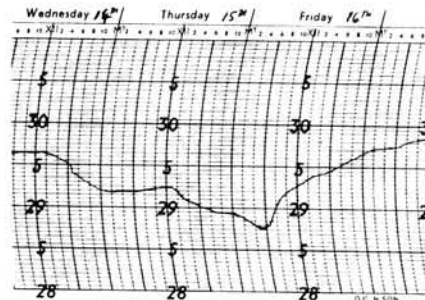


Fig. 4

2000 on the 21st, **Bill Ellis WE-641** (Houghton-Regis) worked into London during another slight fall in pressure.

"On September 27, I went to the UK-934 Club rally, on Butser Hill, organised by the Portsmouth area group," wrote **John Levesley UK-627**. He met many old and some new friends among the 50 or so stations that attended. During the Club's national contest on October 18, he had QSOs with stations in Dorset, Hampshire, IOW and West Sussex from his mobile location at Stoney Cross in the New Forest. John is the Club's national contest manager and Dorset area representative and is expecting a lower number of logs this time due to the hurricane and power failures of the 16th.

Broadcast Round-up

Peter Shore

The time change in the UK heralded the start of the medium wave DX season as winter conditions took over. It is now possible to scan the band even during the day and hear stations from quite far away. Radio Sweden on 1.179MHz comes in well even in southern parts of the country during daylight hours. VoA Europe can be heard in the early morning and late afternoon with its programming on 1.197MHz from Munich, too. The BBC 648 service coverage area has increased too, with excellent reception well south of Paris during the mid-afternoon. However, the transmitter at Orfordness went on to just

50kW on Friday October 16, the day the hurricanes hit southern England, as both the 11 and 33kW lines were damaged. The station went up to 250kW by the end of the weekend, but it was still some days before the full 500kW service was operational.

New transmitters continue to come into operation. Radio Monte Carlo is using a new 1000kW transmitter for its m.f. transmissions on 702 and 1467kHz. The comprehensive antenna array at Roumoules, 100km west of Monaco, has a five tower system. That has four main directional beams possible, including a

320 degree north-westerly beam for transmissions to northern Europe in French, English, Dutch and so on.

Meanwhile, Radio Moscow is considering starting a Russian language World Wide Service for Russian speakers and students around the world. It will be interesting to see how, if the plan actually succeeds, this will affect Moscow's usage of the h.f. bands. More Soviet usage perhaps...?

Finally, an over-the-horizon radar station is to be built in Alaska by the US military. It is hoped that this will not cause any interference to the h.f. bands, as there is

apparently already a site in the eastern USA operating without complaint.

Europe

Note: all times are UTC (GMT)

The English broadcasts from radio Austria International can be heard at:

0630 on 15.41, 6.155 & 6MHz
0830 on 15.41, 11.915 & 6.155MHz
1230 on 15.32, 11.915, 9.685 & 6.155MHz
1400 on 11.915, 9.665 & 6.155MHz
1530 on 11.915, 9.61 & 6.155MHz
1830 on 12.015, 11.825, 6.155 & 5.945MHz
2100 on 9.655, 7.205, 6.155 & 5.945MHz

The Austrian Shortwave Panorama programme is now heard on Sundays at 0200, 0815, 1230, 1430 and 1805.

Radio Prague's English service has introduced a weekly programme heard in the 1900 transmission on 7.345 and 5.930MHz called *The Voice of Believers in Czechoslovakia*. This programme is introduced as "Christian comment from Czechoslovakia" and perhaps reflects a new openness towards religious beliefs in the Eastern Bloc countries.

Once again it shows that international radio often gives remarkable insights into what is happening in different parts of the world.

Radio Finland's transmissions continue to be dogged by problems. Certain frequencies have been cut for periods whilst maintenance work is undertaken at the new Pori site. There has also been trouble with the link between the Helsinki studios and the transmitter site. However, the 963kHz medium wave channel puts in a reasonable signal in the UK, with interference from the Radio Monique transmitters.

Voice of Greece English transmissions have been heard at 1920 on 11.645, 9.425 and 7.430MHz.

Radio Netherlands dropped its additional feeder channels for its Madagascar relay in early November once work at the satellite ground station was completed. Channels used included 13.7 and 13.77MHz and my information is that the station may well use a 13MHz frequency for its services before too long. *Media Network* during December will have a Christmas Preview on December 17, including an interview with Dutch electronics specialist Willem Bos who has been looking at active antennas for the 1988 *WRTH*. On December 24, there's a special Christmas Party with a look back at the year from a propagational viewpoint, whilst the last edition of the year—on December 31—promises a "Burst of the Worst" with more mistakes from the world of radio broadcasting.

Two frequency changes for Radio Netherlands: at 0400, 9.895MHz is replaced by 9.85 and at 1830, 9.54 is replaced by 15.18MHz.

Radio Exterior de Espana is heard to Europe:

1830–1930 & 2030–2130 on 7.275 & 9.765MHz.

Additional frequencies for the Middle East and Africa at 1830 are 11.840 and 15.375MHz.

The Spanish service can be heard in Europe as per:

0600–0700 on 7.45 & 6.02MHz
1030–1630 on 12.035 & 9.875MHz
1630–2230 on 7.45 & 6.02MHz

Radio Sweden International's first transmission of the day is now at 1400, instead of 1230 as during the summer months. Radio Sweden's current English schedule is:

0930 On 9.63MHz

1100 on 6.065 & 9.63MHz (not Sat or Sun)

1600 on 6.065 & 1.179MHz

2100 on 6.065 & 1.179MHz

2300 on 1.179MHz

The European Service of Swiss Radio International can be heard with English at 0830, 1400 and 1900 on 3.985, 6.165, 9.535 and 12.03MHz with an additional placing at 2330 on 6.16MHz. Relays of radio Suisse Romande can be heard at 0900 Monday to Friday and 1000 Sunday on all four day-time frequencies, and music programmes are on the air at 1200, 1800 (Mon–Sat) and 1830 (Sun) again on the day-time channels.

The relay agreement between Swiss Radio and Radio Beijing is now in operation, with Radio Beijing's programmes carried from SRI transmitters at Lenk and Saarnen on 3.985 and 6.165MHz. The 3.985MHz frequency carries German at 2100, French at 2130, Italian at 2200 and English at 2230, whilst 6.165MHz has Chinese, Serbo-Croat, Spanish and Portuguese. It seems that this signal cannot be heard in most parts of Europe, though, as Radio Havana Cuba uses the same channel!

A mystery surrounds a further relay of China on 9.77MHz from 0000 to 0300. This channel carries English and Chinese and reports suggest that the relay transmitter is located either in North America or Portugal. Further details soon.

Radio Tallin in Estonia has resumed programming in Esperanto on two Sundays a month at 0925 and on two Thursdays at 2225 on 6.085 and 1.035MHz.

Middle East

Radio Cairo has started test transmissions between 1730 and 1800 on 9.90MHz for a new service in Albanian, due to start on November 4. Reports on reception were requested to PO Box 566, Cairo, Arab Republic of Egypt.

Egypt's Domestic Arabic service can be heard from:

0330–0800 on 11.905, 11.88 & 9.77MHz
0800–1400 on 15.285 & 11.98MHz
1400–1800 on 15.285MHz
1800–1900 on 15.285, 11.785 & 9.77MHz
1900–0030 on 11.785, 11.665 & 9.77MHz

Kol Israel's programmes have been off the air since October 7 following a strike by journalists. Frequency changes took place on November 1, although no programming is carried, and it has therefore been impossible to verify the schedule.

The Voice of Turkey in English at 2300 on 7.12, 7.135, 9.445 and 17.76MHz. At 0400, 9.56 is also replaced by 9.445MHz.

Africa

RTM in Morocco uses 9.685 between around 0200 until 0500. Radio RSA has made some frequency changes:

0300 on 11.9, 9.58, 7.295 & 4.99MHz
0400 on 11.9, 9.58, 9.295 & 4.99MHz
0630 on 17.825, 17.79, 15.125 & 7.295MHz
1500 on 17.81, 15.125 & 9.75MHz

Asia

A new 1000kW transmitter has been opened by Radio Afghanistan's *First Programme* on 1.107MHz. The transmitter, which is on the air between 0130 and 1930, has reportedly been logged in

northern Europe. Radio Bangladesh announces that the English broadcast at 1230 will be carried on 15.525 and 11.75MHz, with the 11MHz channel possibly replacing the long established 12.03MHz frequency.

Radio Pyongyang in English to Europe at 1300 on 9.345 and 9.325MHz with the programmes at 1500 and 1700 on 7.29 and 9.325MHz. In addition, transmitters beamed to Africa and the Middle East at 1500, 1700 and 2000 have frequencies of 9.64 and 9.977MHz.

The Voice of Vietnam in English to Africa at 1600 has new frequency 12.019 to replace 15.01MHz, in parallel with 9.84MHz.

Australasia

Radio Australia now has a listener *Open Line* for comment, questions and so on—dial 010 61 3 2352360.

Australia is also bugged by industrial action, with some bulletins of Australian news not broadcast by the station at the beginning of November. Budget cuts have also meant a rationalisation and re-organisation of some programmes. Australian News is no longer broadcast for ten minutes at the half hour, but appears as a three minute segment at the end of international news every two hours, and *International Report* is extended from 20 to 25 minutes. This means that many features aired after the international news and Australian news bulletins, which now last for thirteen minutes, will be three minutes shorter. This includes the regular Sunday media programme, *Talkback*.

The BBC World Service programmes were carried on 15.11MHz via the Shepparton transmitter site at 2200–0030 from October 5 following the second coup in Fiji.

North America

Radio Canada International now has a transmitter exchange agreement with Radio Japan whereby its programmes are relayed from Yamata, and Radio Japan uses Sackville to reach North America. For Europe, programmes in English are as follows:

Mon–Fri
0615–0630 on 6.05, 6.14, 7.155 & 9.76MHz
0645–0700 on 6.05, 6.14, 7.155 & 9.76MHz
1930–2000 on 5.995, 7.325, 11.945, 15.325 & 17.875MHz
2100–2130 on 5.995, 7.13, 11.945 & 15.325MHz
2200–2300 on 9.76 & 11.945MHz
Sat–Sun
2100–2200 on 5.995, 7.13, 11.945 & 15.325MHz

A new station from Salt Lake City, Utah called KUSW is due to go on the air from December 1 with a schedule of:

0000–0300 on 11.68MHz
0300–0600 on 9.755MHz
0600–1100 on 6.135MHz
1100–1600 on 9.85MHz
1600–1900 on 15.225 MHz
1900–2200 on 17.715MHz
2200–0000 on 15.58MHz

WCNS has made some frequency changes with the 2000 programme on 9.495 and at 2200 the station is on 9.85MHz.

The latest WRNO schedule is:

1600–2200 on 15.42MHz
2200–2400 on 9.495MHz
0000–0400 on 7.355MHz
0400–0600 on 6.185MHz

Books for radio amateurs

FDK

ELLIOTT ELECTRONICS

for the Radio Enthusiast

MICROWAVE MODULES

INSTANT HP AVAILABLE

OSY OLD MAN TO

THE 'HAM SHACK'

JAYBEAM AMATEUR ANTENNAS

AERIAL ACCESSORIES AND MASTS

APPOINTED DISTRIBUTOR

RIGS, ANTENNAS, SWR BRIDGES, POWER SUPPLIES, TEST GEAR, COMPONENTS, MORSE KEYS, COAXIAL CABLES, ROTATORS, MICS, PLUGS AND SOCKETS, SWITCHES

Call us on (0533) 553293

OR COME AND LOOK AROUND AT

26/28 Braunstone Gate, Leicester

RADIO AMATEURS EXAM? PASS FIRST TIME!

Before you enrol check the benefits of
RRC'S unique Home Tuition Service

RRC has helped thousands of students to success in their examinations with this unique system of postal tuition, one which guides you, step-by-step, to qualify in the shortest possible time. Only The Rapid Results College offers you all these advantages:

- | | |
|---|--|
| <input type="checkbox"/> A qualified personal tutor | <input type="checkbox"/> Free advice before you enrol |
| <input type="checkbox"/> Study material prepared by specialists | <input type="checkbox"/> Telephone Helpline |
| <input type="checkbox"/> Completely self-contained courses | <input type="checkbox"/> Free 'How to Study' Guide |
| <input type="checkbox"/> Handy pocket-sized booklets | <input type="checkbox"/> Instalment Plan |
| <input type="checkbox"/> Personal study programme | <input type="checkbox"/> Free Postage on course material |
| <input type="checkbox"/> Regular marked tests | <input type="checkbox"/> Worldwide Airmail Service |
| <input type="checkbox"/> Courses regularly updated | <input type="checkbox"/> Extra tuition free if you don't pass first time |
| <input type="checkbox"/> 48 hour despatch | |

POST COUPON TODAY FOR FREE RADIO AMATEURS PROSPECTUS
Please send me my prospectus as quickly as possible.

Mr/Mrs/Miss/Ms _____

Address _____

Postcode _____

RRC The Rapid Results College

Dept. JX24, Tuition House, London SW19 4DS. FREE ADVICE: 01-947 7272 (9am-5pm)
PROSPECTUS: 01-946 1102 (24 hour Recordcall Service quoting Dept. No. JX24)

ANTENNA TUNER

For outside or **INDOOR** antennas, end-fed **LONG WIRES** or dipoles, **BOOST DX** and reduce interference 100KHz-30MHz in 6 overlapping ranges, **IDEAL** for FRG7700 etc or 10W tx, **BANDPASS** design (not just usual "T" high pass) with pre-wound high Q coils and air spaced capacitor, **ALSO** adapts to **WAVEMETER**, field strength meter etc, **only £29.90**, hear **FAINT DX**.

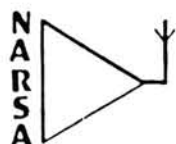
V.L.F.7 EXPLORE 10-150KHz, **Receiver £28.20**.

SOUND METER, 40-120dB(A), built-in calibrator, **MEASURE** how noisy things are, **£31.30**, use for photo flash etc.

Each fun-to-build kit (ready-made to order) includes **ALL** parts, **CASE**, **pcbs** are fibre glass, **CONNECTORS**, instructions, by-return postage, (Europe same, Giro 21.923.4000) and **FREE "Kit News"**.

CAMBRIDGE KITS

45 (PA) Old School Lane, Milton, Cambridge.



BELLE VUE / NORBRECK RADIO AND ELECTRONICS EXHIBITION

by the Northern Amateur Radio Societies Association

at the

NORBRECK CASTLE HOTEL EXHIBITION CENTRE
QUEENS PROMENADE, NORTH SHORE, BLACKPOOL
(Formerly held at Belle Vue, Manchester)

on **Sunday, January 31st, 1988**

Doors open at 11 am

The North's Premier Amateur Radio & Electronics Event

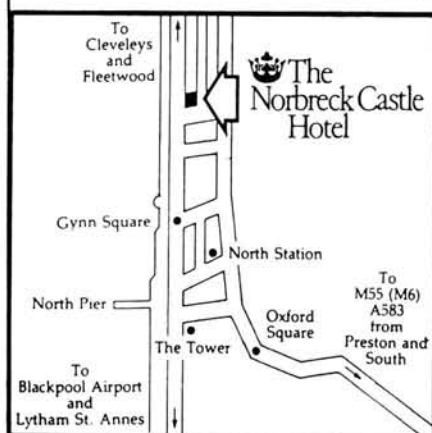
- | | | |
|---|---------------------------|--------------------------|
| ★ Inter-Club Quiz | ★ Grand Raffle | ★ Restaurant & Bar |
| ★ Bring & Buy Stall | ★ Amateur Computer Stands | ★ Free car parking |
| ★ R.S.G.B. Book Stall | ★ Club Stands | ★ Attractions for Ladies |
| ★ R.S.G.B. Morse Tests (Book direct via R.S.G.B.) | | |
| ★ Overnight Accommodation at reduced rates (contact hotel directly) | | |

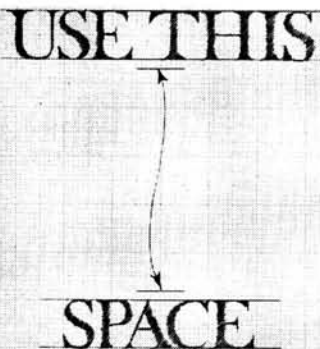
★ ALL THE USUAL "BELLE VUE" TRADERS ★

RADIO TALK-IN ON S22 and SU8

ADMISSION £1 (OAP's 50p, under 14's free) BY RAFFLE TICKET AND EXHIBITION PLAN

Business Manager: Peter Denton G6CGF 051-630-5790





SMALL ADS

The prepaid rate for classified advertisements is 40 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.24 per single column centimetre (minimum 2.5 cm). Please add 15% VAT to total. All cheques, postal orders etc., to be made payable to Practical Wireless. Treasury notes should always be sent 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) 678558.

Whilst prices of goods shown in advertisements are correct at the time of closing for 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 and Components

SCANNER MODIFICATIONS. Specialist reception equipment. Extensive frequency listings. For FREE catalogue send large SAE to: S.S.C. PO Box 71, Bournemouth, Dorset BH9 1DL.

SCANNERS 25-520MHz, 760-1300MHz, 300 channels. Realistic PRO-2004. Full features £329.00, carriage free of charge. Access & Visa. All Realistic scanners stocked. Catalogue free with large s.a.e. LINK ELECTRONICS, 228 Lincoln Road, Peterborough. Tel. 0733 46770.

QUARTZ CRYSTALS and FILTERS

Large numbers of standard frequencies in stock for amateur, CB, professional and industrial applications. Stock crystals £5.00 each (inc. VAT and UK post). Any frequency or type made-to-order from £6.50. Phone or SAE for lists.

GOLLEGE ELECTRONICS
Merriott, Somerset, TA16 5NS.
Tel: (0450) 73718.

SHORT WAVE BANDS AND AIR BAND RECEIVER

1. Vega Selema. 5 Shortwave MW/LW FM mains and battery radio £36.95
2. Vega 206. 6 Shortwave MW/LW offering exceptional international coverage. £24.95
3. Goodmans S6778R. Pocket Radio. 10 Shortwaves MW/LW FM stereo £38.95
4. Steeplestone 3 Band including shortwave air and marine, mains and battery £39.95
5. Steeplestone Pocket Airband + LW FM MW £21.50
6. RS375. Tunable air band 118-136 MHz + The facility for two crystal controlled channels. £73.00
7. RS32. A synthesized Receiver covering 110-136 MHz with 100 programmable memory channels. £224.95

All Sets Guaranteed. Send for Leaflet.
COMPONENT CENTRE
7 Langley Road, Watford, Herts. WD1 3PS. Tel. 0823 26535

RADIO CANADA, Peking, Australia, Voice of America. A Vega 206 (6xSW/MW/LW) pulls these and dozens more £25.45. Steeplestone FM/MW airband pocket radio £13.49. Year's guarantee. Return despatch. CORRIGAN-RADIOWATCH. Building 109, Prestwick Airport, KA9 2RT.

FJP KITS COMPONENTS, 63 PRINCESS STREET, CHADSMOOR, CANNOCK, STAFFS, UK WS11 2JT

TEL: 05435 6487, 10am-10pm
Now available. RF Linear with up to 15 watts from the PW Meon Transverter at 50mhz in kit, or built form. Less box - Prices £127.50. Built £35. All for 0.5 watt input. 70mhz available soon. Also 144mhz suits handhelds.
PW Meon 50mhz. Kit £44. 28 if. £46.50. 2mtr if. Built £70 & £75. P.P £1.50
Other PW Kits as project prices. SAE or phone. Components So42p, £2.39, Mc 1496 £1.15, SBL1 £6.35, BF224 20p, 2N3866 £1.30, just a few of our stock.
All Kits include box unless specified. P.P small 50p, large £1.25. Payment Cheque/P.O. Visa to FJP Kits.

Special Offers

FREE MEMBERSHIP to a new national electronics club. For details and a free pack of components worth over £10 send only £1 p&p to: WOODSIDE, Dowsett Lane, Ramsden Heath, Billericay, Essex CM11 1JL.

ORDER DETAILS

Please send your advertisement, written in block capitals, along with a Cheque or Postal Order made payable to Practical Wireless to the address below.

NAME

ADDRESS

Company registered in England. Registered No. 1980539. Registered Office: Towngate House, 2 Parkstone Road, Poole, Dorset, BH15 2PJ.

Masts & Antennas

AERIALS, TRAPS. Data 26p S.A.E. Aerial guide £1.00. G2DYM, Updownman, Devon EX16 7PH.

Software

AMATEUR RADIO SOFTWARE

RTTY Transceive or Receive only for 1) Spectrum, 2) VIC20, 3) CBM 64, 4) MSX(1), 5) Rx only for ZX81 (16K) Split Screen. Type Ahead Etc. Various Baud rates. Rx only uses full screen. 1) & 5) require filter, 2) & 3) need starter terminal, 4) Uses tone demodulator. **Tx/Rx £9.00**
Rx ONLY £7.00
MORSE Transceive for the Spectrum. No interface. **£9.00**
Receive Only for Spectrum, ZX81 (16K), CBM 64, C16, MSX, VIC20, BBC B, Dragon. Atari (400-600 & XL) & AMSTRAD (484 & 6128) Sinclair needs no interface. **PROGRAMME £7.00**
INTERFACE £3.00
Tutor for Spectrum or MSX(1) BBCB, Electron, Amstrad, CBM64 and Atari (400/800 & XL) Beginner to test & beyond. Very comprehensive program. **£5.00**
SSTV Transceive or Receive Only for Spectrum. Transceive includes Design programme. Picture stores for Tx or Rx (8 on 48K or 30 on 128K), 8 text etc. etc. NO interface required. **Tx/Rx (inc. design) £25.00**
Tx/Rx only £14.00
Rx only £7.00

S.A.E. for details of all our products
Programmes for P.C. computers under development

J.&P. ELECTRONICS LTD.

New Road Complex, New Road,
Kidderminster DY10 1AL.
Tel: (0562) 753893

COMMODORE COMPUTERS (+4, C16, 64, 128). "MICROCOM" cw/rtty tx/rx with superb morse tutor. "TURBO LOG" ultimate high speed station log. "MICROCOM INTERFACE" ready built. S.A.E. to: Moray Micro Computing, Enzie Slackhead, Buckie, Moray, AB5 2BR. Tel. 0542 7384.

RF ENGINEERING SOFTWARE

FOR PROFESSIONAL, TEACHING, AND AMATEUR USE.

SMITHCHART. A comprehensive chart matching program. Standard (non-printing) version computes and displays on screen chart up to 9 impedance or admittance values. For matching with up to 6 sections selected from 13 types. For BBC(B) computers. **£46 incl.**

Tape (NPSB) **£48 incl.**
Disc (NPSB) **£48 incl.**

THREEPROBE. Computes complex impedance and admittance at distant load, using simple measuring system with 3 voltage probes. Especially suitable for VHF/UHF. Hardware described but not supplied. For BBC(B) Tape (PR1BT) **£40 incl.**

Disc (PR1BD) **£42 incl.**
For Spectrum + Tape (PR1ST) **£34 incl.**

Details from:

SCIENTIFIC AND ENGINEERING SOFTWARE

PO Box 416, Marlow SL7 1XU. (06284) 2508

Wanted

PRACTICAL WIRELESS AUG. '87. Also someone to peak my AR88D expenses plus. A STAPLETON, 130 Sherwell Valley Road, Torquay.

Service Sheets

TECHNICAL INFO SERVICES (PW) 76 CHURCH ST, LARKHALL, LANARKS

Comprehensive Practical TV Repairs	£9.50
Complete Radio Service & Repair	£9.50
Domestic VCR - Servicing Guide	£15.95
Colour TV Servicing, King	£12.95
Servicing Mono Portable TV	£14.95
Servicing Personal Computers	£17.95
Spectrum Service & Repair	£5.00
VHS Common Faults	£4.50
Principles of Compact Disc	£3.95
British CTV Circuits, 1972-1985	£60.00

Any published service sheet full size from stock. CTV or any combi £3.50; others £2.50; both + Isae. World's largest collection service manuals, thousands unobtainable elsewhere.

We are sole MO suppliers McCourt/Tunbridge Repair Mans; Newnes Techn Books; other unique publications. STREE Review, any quotation, Price lists, Isae please.

FOR FAST QUOTES PHONE 0698 884585
After 5pm - 0698 883334

THE DATAMAN

1914-1966. For circuits, service sheets, manuals, handbooks on all valve and early transistor equipment including audio, military (British & foreign), radio and TV. Quotation by return via 'phone or letter (S.A.E.), brochure supplied with S.A.E. Credit card orders taken over 'the phone'.

THE DATAMAN, TUDOR HOUSE, COSSHAM STREET,
MANGOTSFIELD, BRISTOL BS17 3EN. PHONE: 0272 565472.

- *****
★ **CIRCUIT DIAGRAMS** ★
★ Any Make, Model, Type, Audio, Music Systems, ★
★ Television, Video Recorders, Amateur Radio, ★
★ Test Equipment, Vintage Wireless etc. ★
★ £3.00 plus LSAE. State Make/Model/Type with order. ★
★ Full Workshop Manual prices on request with LSAE. ★
★ **MAURITRON (PW), 8 Cherry Tree Road,** ★
★ **Chinnor, Oxon, OX9 4QY.** ★
★ *****

Valves

BILLINGTON VALVES

VALVES, TRANSISTORS, I.C. - RARITIES OUR SPECIALITY!
Usually the lowest prices!

DON'T MISS OUR NEW VALVE CATALOGUE! Send SAE today for your copy, or phone for quotation. Wholesale/export enquiries welcomed! French & German spoken, by arrangement.

AMAZING BARGAIN PACKS 20lbs (9kg) of resistors, capacitors, transistors, switches etc. £10 + VAT delivered! We wish to purchase audio valves PX4, PX25, DA100, KT66, KT88 etc. Complete valve collections, shop clearance etc. considered. Ideally send listing mentioning price required.

BILLINGTON VALVES, 39 Highlands Road, Horsham, West Sussex RH13 5LS.
Tel: 0403 854086. FAX 0403 210206. Telex: 87271 PRODS G.
Please phone to check office is attended before calling in person.

For Sale

ICOM IC735, PS55 power supply, ATU and G5RU antenna. Reluctant sale. Perfect condition. £850. Leatherhead 373241.
PW MAGS. 140 to 81. Offers to 35 Knox Road, Forest Gate, London E7. Tel. 01-555 3796 after 6pm.
SONY ICF7600DA. New model world receiver. Brand new, unused. Cost £160, sell £110. Tel. 041 334 2811.

For Sale (Cont.)

USED AMATEUR EQUIPMENT bought, sold, exchanged. SAE for latest list. Secondhand price guide updated monthly. Useful guide for buying/selling. £2. ATU mods add top band to SEM KW, etc £6.50. Call MARTYN G4SUI-GEEFOR ENTERPRISES, 112 Leeds Road, Mirfield, West Yorks. WF14 0JE. Tel: 0924 495916. Personal callers by arrangement.

PRO32 REALISTIC SCANNER. Police, Fire, Radio-Ham etc. Ni-cads included. Excellent condition, £185. Tel. (0253) 53915.

ONE PAIR MONITOR GOLD Tannoy Speakers type LSU/HF/12/8 dual concentric. Unused. Offers. Write PW Box No. 18.

C.W. FILTERS. FT101Z/ZD. FT707. FR902. etc. Original Yaesu 300 Hz band width £35 p.p., 600 Hz £29.99 p.p. G3LLL HOLDINGS AMATEUR ELECTRONICS, 45 Johnston Street, Blackburn BB2 1EF. (0254) 59595. Access/Barclay Card.

Miscellaneous

MORSE CODE PREPARATION

Cassette A: 1-12 wpm for amateur.
Cassette B: 12-25 wpm for professional examination preparation.
Each cassette is type C90.
Price of each cassette (including booklets) £4.95
Morse key with separate battery (PP3) — driven solid-state oscillator and sound transducer produces clear tone for sending practice. Price of key with electronic unit £8.95.

Price includes postage etc. Europe only

MH ELECTRONICS (Dept PW)
12 Longshore Way, Milton, Portsmouth PO4 8LS

HEATHKIT U.K. Spares and Service Centre, CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

FILTERS FOR TX's AND RX's HF 6m 2m VHF UHF. High Harmonic rejection. Rejection filters for those living near broadcasting stations. Also attenuators, connectors, rf leads and other accessories. SAE details. WAVEBAND ELECTRONICS, c/o PW Box 19.

GVF LOOP ANTENNAS COMPLETE WITH ATU FOR HIGH FREQUENCY HAM BAND TRANSMISSION (SWR One to One 40, 15 and 10 and One Port Five to One 80 and 20) AND SWL's, AND LONG AND MEDIUM WAVE BANDS FOR BCL's. Loops 21 inches square or triangle D.I.Y. projects. No special skills required. Circuits, Parts Lists with sources of supply and full assembly data. HIGH FREQUENCY LOOP 80 to 10 Metres £5. LONG AND MEDIUM WAVE LOOP FOR BCL's £3. LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP 1500 to 10 Metres FOR THE BCL AND SWL £2. SHORT WAVE ATU FOR USE WITH EITHER A LOOP OR LONG WIRE ANTENNA £4.

SAE for details. Callers welcome any day any time.

F. G. Rylands, 39 Parkside Avenue, Millbrook, Southampton
Tel. (0703) 775064

Miscellaneous - Cont.

THE SCIENTIFIC WIRE COMPANY 811 Forest Road, London E17. Telephone 01-531 1568				
ENAMELLED COPPER WIRE				
SWG	1 lb	8 oz	4 oz	2 oz
8 to 34	3.63	2.09	1.10	0.88
35 to 39	3.82	2.31	1.27	0.93
40 to 43	6.00	3.20	2.25	1.61
44 to 47	8.67	5.80	3.49	2.75
48	15.96	9.58	6.38	3.69
SILVER PLATED COPPER WIRE				
14 to 30	10.10	5.20	2.93	1.97
TINNED COPPER WIRE				
14 to 30	3.97	2.41	1.39	0.94
Fluxcore				
Solder	5.90	3.25	1.82	0.94
Post free, please add VAT @ 15%. Orders under £3.00 add 50p. SAE for list of copper and resistance wire. Dealer enquiries welcome.				

QSL CARDS. Gloss or tinted cards. SAE for samples to: TWROG PRESS, Dept PW, Penybont, Gellilydan, Blaenau Ffestiniog.

MICROWAVE TRANSISTORS and Devices for Industrial use. Quotation sent on request. TSUTOM YOSHIHARA, CI-105, Deguchi-cho 34, Suita-shi, Osaka 564, Japan.

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys (new material only) from stock. Special sizes to order. Call: EARTH STATION 01-228 7876. 22 Howie Street, London SW11 4AR.



SHURE 450 MICROPHONES

For C.B. P.A. and HAM RADIO
THE BEST FOR ONLY
£39.95 plus £2.00 P&P
Normally sold for £69.95

Also available HI-BAND
VHF MOBILE ANTENNA'S
Only £9.95 plus £1.50 P&P
Normally sold for £18.00

Cheques please allow 7 days for clearance.
Postal Orders same day dispatch

STEFAN'S RADIO LTD.
78 Market St Church,
Accrington BB5 0DN, Lancs.

★ BAKER ★

GROUP P.A. DISCO AMPLIFIERS post £4				
150 watt Output, 4 input Mixer pre-amp. Illustrated				£99
150 watt Output, Slave 500 mv. Input 3 Speaker Outputs				£80
500 watt Heavy duty mono slave amplifier				£75
150 watt P.A. Vocal, 8 inputs. High/Low Mixer Echo Socket				£149
60 watt Mobile 240v AC and 12v DC. 4-8-16 ohm + 100v line				£89
Compact PA amp 20 + 20 Stereo or 40 watts Mono				£65
30 watt Guitar/PA Amplifier, 2 inputs, Treble, Bass etc.				£59
30 Watt Guitar COMBI, 12A, Speaker, Treble, Bass etc.				£95
FAMOUS LOUSPEAKERS FULLY GUARANTEED				
Make	Model	Size	Watts	Price
GOODMANS	H8 WOOFER	8in	60	£16
BAKER	DISCO/GROUP	10in	50	£22
BAKER	MID-RANGE	10in	100	£30
BAKER	DISCO/GROUP	12in	75	£24
BAKER	DISCO/GROUP	12in	120	£34
GOODMANS	DISCO/GROUP	12in	120	£38
LOUSPEAKERS REPLACEMENT TYPE. STATE IMP REQUIRED.				
2in. 3in. 5in. 6x4in. 7x4in. £2.50. 6/2in. 8x5in. £4 P&P 75p.				
8in. £5. 10in. £7.50 P.P.1. Many others in stock.				

MAINS TRANSFORMERS All 240V Primary Price Post
250-0-250V 80mA. 6.3V 3A. 0.5. 6V 2A. £10.00 £2
350-0-350V 75/120 6.3V 3A. 0.5. 6V 2A. £16.00 £2
220V 25mA. 6V 1 Amp £3.00. 220V 45mA. 6V 2 Amp £4.00 £1
Auto Wound 120V/240V. 150W £10. 250W £12. 500W £16. Post £2
LOW VOLTAGE TRANSFORMERS £5.50 each post paid
5V. 3A; 12V. 3A; 15V. 2A; 20V. 1A; 24V. 1/2A; 2A; 35V. 2A; 20-40-60V. 1A; 12-0-12V. 2A. 20-0-20V. 1A.
VARIABLE POWER SUPPLY 0 to 12 volts up to 400 M.A. D.C. Ready made on P.C. board. Size 5x2 1/2x2in. £8.50 P.P. £1.

* NEW * NEW * NEW * NEW * NEW * NEW * NEW * NEW * NEW *
R.C.S. VARIABLE VOLTAGE D.C. BENCH POWER SUPPLY
0 to 20 volts up to 1.5 amps D.C. fully stabilised. Compact unit size 9x5 1/2x3 inches. Twin panel meters for instant voltage and current readings. Overload protection. Fully variable operates from 240V A.C. £36. P.P. £2.

PANEL METERS 50µA, 100µA, 500µA, 1mA, 5mA, 10mA, 50mA, 1amp, 2amp, 5amp, 25 volt. VU 2 1/2x2 1/2x1 1/4in. £5.50 post 50p
MINI MULTI TESTER Volts AC-DC. ohms, milliamperes £8.50
DELUXE RANGE DOUBLER METRE 50K O.P.V. £25.00 PP £1

PROJECT CASES. Black Vinyl Covered Steel Top. Ali Base
4 x 2 1/2 x 2 1/4in. £3.00; 6 x 4 x 1 1/2in. £4.00; 8 x 5 x 2in. £4.50;
11 x 6 x 3in. £6.00; 11 3/4 x 6 x 5in. £10.00; 15 x 8 x 4in. £13.50.
ALUMINIUM PANELS 18 s.w.g. 12 x 12in. £2.50; 14 x 9in. £2.40;
6 x 4in. 65p; 12 x 8in. £1.50; 10 x 7in. £1.50; 8 x 6in. £1.00;
14 x 3in. £1; 12 x 5in. £1.15; 16 x 10in. £2.70; 16 x 6in. £1.80.
ALUMINIUM BOXES. PLEASE ADD EXTRA POSTAGE
4 x 2 1/2 x 2in. £1.35; 3 x 2 x 1in. £1.15; 6 x 4 x 2in. £2.20; 8 x 6 x 3
£3.40; 12 x 5 x 3in. £4.00; 6 x 4 x 3in. £2.50; 10 x 7 x 3in. £4.00.
HIGH & LOW VOLTAGE ELECTROLYTICS Many others in stock.

20500V 75p 470MF 400V £3 20+20350V 75p
32/350V 50p 680MF 350V £3 32+32/500V £2.35
47/350V 75p 2200MF 400V £5 32+32/350V 85p
220/400V £2 8+8MF 450V £1 80+40+20/350V 95p
470MF 63V 40p. 1000MF 40V 50p. 100V £1.20. 1200MF 76V £1.
1500MF 63V 80p. 100V £1.20. 2000MF 63V £1.50. 100V £1.80.
2500MF 50V 70p. 3300MF 63V £2. 4700MF 63V £3.
6800MF 100V £5.50. 30000MF 25V £2.50.
AIR-SPACED GEARED TWIN GANGS 365 + 365 + 25 + 25p £2.00.
VERNIER DIALS. 0-100, 36mm, £3.00, 50mm, £3.50.
MORSE CODE TAPPER & BUZZER Practice Set £3.00.
RESISTORS, CAPS, DIODES, TRANSISTORS 1000s IN STOCK

RADIO COMPONENT SPECIALISTS

ACCESS 337 WHITEHORSE ROAD, CROYDON
SURREY, U.K. Tel: 01-684 1665 VISA
Post 65p Minimum. Callers Welcome.
Last, Large S.A.E. Delivery 7 days Closed Wednesday

INDEX TO ADVERTISERS

A.H. Supplies	7	FJP Kits	78	Radio Component Specialists	79
Aerial Techniques	69	Garex Electronics	10	Radio Shack Ltd	80
Allweld Engineering	69	Golledge Electronics	78	Random Electronics	9
Amateur Electronics Holdings Ltd	7	G4TNY	6	Rapid Results	77
Amcomm of London	11	ICOM(UK) Ltd.	39, 40, 41, 42, 79	RST Valve	10
Arrow Electronics	22	ICS Electronics	7	Rylands, F.G.	79
B.N.O.S.	Cover 3	ICS Intertext	73	Scientific & Engineering Software	78
Billington Valves	78	Interbooks	4	Scientific Wire Company	79
Birkett, J.	55	J. & M. Amateur Radio	9	S.E.M.	8
C.P.L. Electronics	8	J. & P. Electronics	78	Short Wave Magazine	38
Cambridge Kits	77	Kelly, A.	4	South Midlands Communications Ltd	Cover 2, 2, 3, 69
Cirkit	5	Lake Electronics	5	Spectrum Communications	73
Colomar Electronics	6	Lee Electronics	59	Stefan's Radio Ltd	79
Component Centre	78	Lowe Electronics	20, 21, 73	Stephens James	8
Cricklewood Electronics	9	Maplin	Cover 4	Tandy	15
Dataman	78	Mauritron	78	Technical Info Services	78
Datong Electronics	10	MH Electronics	79	Technical Software	9
Dewsbury Electronics	5	Northern Amateur Radio Society	77	Tennamast Scotland Ltd	5
Dressler	6	Photo Acoustics Ltd	35	Ward, Reg & Co Ltd	4
Elliott Electronics	77	R.A.S. Nottingham	6	Waters & Stanton	60
				Withers, R. Communications Ltd	29



ICOM (UK) LTD/RETAIL.

Everything you need for your shack is available from Icom UK's retail shop. Andy G6MRI is on hand with new and secondhand stock from ICOM plus Yaesu, Kenwood, MET, Tono, Jaybeam, Welz, Drae, BNOS and many more. RSGB publications also available, if Andy can't help, you've got a problem. Why not call in, we are on the corner of Stanley Road and Kings Road, Herne Bay, Kent and open 9 - 5.30 mon-sat, lunch is 1-2.15, 1/2-day closing thursday afternoons open 9-1.00. BCNU.

Credit facilities available, plus VISA & ACCESS accepted.



ICOM (UK) LIMITED.

2 Stanley Road, Herne Bay, Kent CT6 6SH. Tel: 0227 369464.

YOUR LOCAL DEALERS

STOKE ON TRENT

MRZ COMMUNICATIONS LTD

ICOM - Amateur/PMR/Marine/Air.
YAESU - Amateur MRZ Desk PSU
for ICOM/YAESU Portables.
UK and EXPORT
Tel: (0782) 619658

IRELAND

Radcom Electronics

Icom, Yaesu and most Amateur
Radio Accessories ex stock.

NEW PREMISES:-

Unit 4, Albert Quay,
Cork City.
Tel: 021-632725 and
088 553947
(Mon-Fri 9-5 and Sat 9-3.45)

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)

ESSEX

Selectronic

The UK's leading suppliers of
934MHz personal radio
equipment
203 High Street, Canvey
Island, Essex
Tel: 0268 691481
(Open Mon-Sat 9-5.30)
Amateur radio equipment also in stock

HERNE BAY

ICOM (UK) LIMITED

The Official Icom importer
2 Stanley Road
Herne Bay, Kent
CT6 5SH
Tel: 0227 369464
(Open Mon-Sat 9-5.30,
except Thurs 9-1)

SOUTHAMPTON

South Midlands Communications

Official Yaesu Importer

S.M. House, School Close,
Chandlers Ford Industrial Estate,
Eastleigh Hants SO5 3BY.
Tel: 0703 255111

PORTSMOUTH

Telecomms

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
(Mon-Fri 9.30-5.30, Sat 9.30-4.30)

LONDON

D & D ELECTRONICS (Kennington)

*The sort of shop you used to see in
Lisle St. All sorts of surplus supplies,
so come along and browse or send
SAE for info. sheets.*

3a Braganza Street
London SE17 3RD
Tel: 01-793 0054
(Open 6 days a week)

LONDON

AMCOMM OF LONDON

Approved dealer for Yaesu
and Icom

373 Uxbridge Road,
London W3 9RN
Tel: 01-992 5765
(Mail order a speciality)

DERBYSHIRE

Low Electronics

The official importer of the
Kenwood range of equipment
(See main ad. for the full list
of all our shops)

Chesterfield Road, Matlock,
Derbyshire, DE4 5LE
Tel: 0629 2817/2430/4057

MERSEYSIDE

MGR SERVICES

Wirral based communications

ICOM - YAESU - M. MODULES - HOWES
- CIRKIT - WOOD & DOUGLAS -
PART-EX - AERIALS - PMR - MARINE -
MET ANTENNAS - ALINCO -
HEATHERLITE - SPECTRUM COMMS

48, Shrewsbury Road,
Oxton, Birkenhead, L43 2HZ.
Tel: 051 653 3437

(Callers by appointment 9 am-9 pm. Mon-Sat)

PLEASE MENTION

PRACTICAL WIRELESS


WHEN REPLYING TO ADVERTISEMENTS

WEST SUSSEX

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.

MAIL ORDER  RETAIL

YEAR'S END
CASH
AND
CARRY

SALE

10am MONDAY
DECEMBER 28
UNTIL 5pm
NEW YEAR'S EVE

EVERYTHING REDUCED IN PRICE

CRAZY PRICES ON ANTENNAS (DON'T FORGET TO BRING A ROOF RACK)

Antenna Stockroom must be cleared — Hustler — Hygain — Avanti — Jaybeam — MET
— ASP to name a few

Pick up a bargain on Computers, Psion Organisers, Printers, Amateur Radio Equipment,
Scanners and all accessories. Terrific savings on T3234 low loss Coax. as well.



RADIO SHACK LTD

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 Telephone: 01-624 7174 Telex: 23718

188 BROADHURST GARDENS,
LONDON NW6 3AY



B.N.O.S. PRODUCTS

2M LINEAR AMPLIFIERS

L144-3-25	*New Linear 3w input 25w output	74.75
LP144-3-50	Linear/Preamp 3w input 50w output	145.00
LP144-10-50	Linear/Preamp 10w input 50w output	145.00
L144-1-100	Linear 1w input 100w output	205.00
L144-3-100	Linear 3w input 100w output	205.00
L144-10-100	Linear 10w input 100w output	175.00
L144-3-180	Linear 3w input 180w output	325.00
L144-10-180	Linear 10w input 180w output	325.00
L144-25-180	Linear 25w input 180w output	275.00
LPM144-1-100	Linear/Preamp/Meter 1w i/p 100w o/p	235.00
LPM144-3-100	Linear/Preamp/Meter 2w i/p 100w o/p	235.00
LPM144-10-100	Linear/Preamp/Meter 10w i/p 100w o/p	205.00
LPM144-3-180	Linear/Preamp/Meter 3w i/p 180w o/p	355.00
LPM144-10-180	Linear/Preamp/Meter 10w i/p 180w o/p	355.00
LPM144-25-180	Linear/Preamp/Meter 25w i/p 180w o/p	305.00

70CM LINEAR AMPLIFIERS

L432-1-10	*New Linear 1w input 10w output	74.75
L432-1-50	Linear 1w i/p 50w o/p	215.00
L432-3-50	Linear 3w i/p 50w o/p	215.00
L432-10-50	Linear 10w i/p 50w o/p	175.00
L432-3-100	Linear 3w i/p 100w o/p	355.00
L432-10-100	Linear 10w i/p 100w o/p	355.00
L432-25-100	Linear 25w i/p 100w o/p	315.00

LPM432-1-50	Lin/Preamp/Met 1w i/p 50w o/p	255.00
LPM432-3-50	Lin/Preamp/Met 3w i/p 50w o/p	255.00
LPM432-10-50	Lin/Preamp/Met 10w i/p 50w o/p	215.00
LPM432-3-100	Lin/Preamp/Met 3w i/p 100w o/p	395.00
LPM432-10-100	Lin/Preamp/Met 10w i/p 100w o/p	395.00
LPM432-25-100	Lin/Preamp/Met 25w i/p 100w o/p	355.00

4M LINEAR AMPLIFIERS

LPM70-10-100	Lin/Preamp/Met 10w i/p 100w o/p	235.00
--------------	---------------------------------	--------

6M LINEAR AMPLIFIERS

L50-3-25	*New Linear 3w i/p 25w o/p	74.75
LP50-3-50	Linear/Preamp 3w i/p 50w o/p	175.00
LP50-10-50	Linear/Preamp 10w i/p 50w o/p	175.00
LPM50-10-100	Linear/Preamp/Met 10w i/p 100w o/p	235.00

POWER SUPPLIES

12/6A	13.8V 6A cont 7A max	75.00
12/12A	13.8V 12A cont 15A max	125.00
12/25A	13.8V 25A cont 30A max	185.00
12/40A	13.8V 40A cont 50A max	385.00
12/5E	*New 13.8V 5A cont 6A max	57.50
12/10E	*New 13.8V 10A cont 12A max	97.75
12/20E	*New 13.8V 20A cont 24A max	132.25
12/30E	*New 13.8V 30A cont 35A max	195.50

CUE DEE PRODUCTS

VHF/UHF ANTENNAS

VHF-DUO	6.5 Ele 6d Bd	129.95
4144A	4 ele 8dBd SO239	25.45
4144AE	4 ele end mount 8dBd SO239	27.60
10144A	10 ele 11.4dBd SO239	50.60
10144AN	10 ele 11.4dBd N female	57.50
10X144A	10 ele crossed 11.4dBd SO239	74.75
10X144AN	10 ele crossed 11.4dBd N female	86.25
15144A	15 ele 14dBd SO239	63.25
15144AN	15 ele 14dBd N female	78.20
15X144A	15 ele crossed 14dBd SO239	98.90
15X144AN	15 ele crossed 14dBd N female	110.40
17432AN	17 ele 14.5dBd N female	51.75
17X432AN	17 ele crossed 14.5dBd N female	82.80
23432AN	23 ele 15.5dBd N female	63.25

STACKED SYSTEMS

10144A2H	2 x 10 ele horizontal	228.85
10144AN2H	2 x 10 ele horizontal	243.80
15144A2H	2 x 15 ele horizontal	277.15
15144AN2H	2 x 15 ele horizontal	293.25
10144A4H	4 x 10 ele	405.95
10144AN4H	4 x 10 ele	447.95
15144A4H	4 x 15 ele	501.40
15144AN4H	4 x 15 ele	537.05
15144A8H	8 x 15 ele	1436.35
15144AN8H	8 x 15 ele	1511.10
15144A16H	16 x 15 ele	3382.15
15144AN16H	16 x 15 ele	3496.00
17432AN2H	2 x 17 ele horizontal	194.35
17432AN4H	4 x 17 ele	334.65
17432AN8H	8 x 17 ele	583.05
17432AN16H	16 x 17 ele	P.O.A.
23432AN2H	2 x 23 ele horizontal	212.75
23432AN4H	4 x 23 ele	379.50
23432AN8H	8 x 23 ele	645.15
23432AN16H	16 x 23 ele	P.O.A.

STACKING FRAME KITS

4S2	2 x 4144	39.10
10S2	2 x 10144	59.80
15S2	2 x 15144	66.70
10S4	4 x 10144	109.25
15S4	4 x 15144	123.05
71S2	2 x 17432	39.10
23S2	2 x 23432	40.25
17S4	4 x 17432	59.80
23S4	4 x 23432	63.25

PHASING HARNESSES INCLUDING POWER SPLITTER

4L2	2 x 4144A & 4144AE	72.45
10L2	2 x 10144A	74.75
10L2N	2 x 10144AN	81.65
10L4	4 x 10144A	112.70
10L4N	4 x 10144AN	129.95
15L2	2 x 15144A	77.05
15L2N	2 x 15144AN	87.40
15L4	4 x 15144A	112.70
15L4N	4 x 15144AN	129.95
17L2N	2 x 17432AN	70.15
17L4N	4 x 17432AN	109.25
23L2N	2 x 23432AN	70.15
23L4N	4 x 23432AN	109.25

POWER SPLITTERS

2-144	2 way 144MHz SO239	37.95
2-144N	2 way 144MHz N female	42.55
4-144	4 way 144MHz SO239	41.40
4-144N	4 way 144MHz N female	48.30
6-144	6 way 144MHz SO239	57.50
6-144N	6 way 144MHz N female	87.40
8-144	8 way 144MHz SO239	63.25
8-144N	8 way 144MHz N female	100.05
2-432N	2 way 432MHz N female	34.50
4-432N	4 way 432MHz N female	41.40
6-432N	6 way 432MHz N female	83.95
8-432N	8 way 432MHz N female	93.15

MONOBAND YAGIS

27G	7MHz 2 ele 5.6dBd	581.90
37G	7MHz 3 ele 7.0dBd	861.35
314G	14MHz 3 ele 7.0dBd	216.20
414G	14MHz 4 ele 8.0dBd	249.55
414	14MHz 4 ele 8.0dBd	294.40
514G	14MHz 5 ele 9.0dBd	364.55
614G	14MHz 6 ele 10.0dBd	515.20
321	21MHz 3 ele 7.0dBd	148.35
421	21MHz 4 ele 8.0dBd	169.05
521	21MHz 5 ele 9.0dBd	264.50
621G	21MHz 6 ele 10.0dBd	331.20
721G	21MHz 7 ele 10.3dBd	416.30
328	28MHz 3 ele 7.0dBd	93.15
428	28MHz 4 ele 8.0dBd	116.15
528	28MHz 5 ele 9.0dBd	161.00
628G	28MHz 6 ele 10.0dBd	207.00
628	28MHz 6 ele 10.0dBd	249.55
728G	28MHz 7 ele 10.3dBd	309.35
928G	28MHz 9 ele 10.6dBd	416.30

DUOBAND YAGIS

DUO2G	14/21MHz 5/4 ele 9/8dBd	483.00
DUO3	21/28MHz 4/4 ele 8/8dBd	264.50
DUO4	14/21MHz 4/4 ele 8/8dBd	426.65

VERTICALS

VA40	7MHz inc guy wire & ground mount	93.15
2VA40	7MHz full 1/4 wave, complete	323.15
VA80	3.5MHz inc guy wires & ground mount	324.30
2VA80	3.5MHz full 1/4 wave, complete	796.95

PHASING HARNESSES FOR CIRCULAR POLARIZATION

IC144	10 x 144A & 15 x 144A	37.95
IC144N	10 x 144AN & 15 x 144AN	52.90
IC432N	17 x 432AN	51.75

SHF PRODUCTS

SHF ANTENNAS

SHF 9644	1296MHz 44 ele	123.05
SHF 9667	1296MHz 67 ele	148.35
SHF 1693	67 ele (meteosat)	167.90
SHF 2320	2300-2350MHz 67 ele	202.40

HOW TO ORDER

By Phone: using your Access or Visa/B Barclaycard
By Mail: Cheque, Postal Orders or Credit Card
Or from your local BNOS Authorized Dealer
Post, Packing & Insurance
should be added to order totals as below
3 Working day delivery service
BNOS products are free of charge on this service
other products as below
Orders with a value less than £50 add £2.50 to total
Orders with a value more than £50 add £5.00 to total
Orders with a value more than £250 add £7.50 to total
Next day delivery service
BNOS products add £7.50 to order total
Other products add £10.00 to order total



PKW PRODUCTS

VHF/UHF ANTENNA'S

2GP58	144MHz 5/8 groundplane 3.2dBd	39.10
2GP258	144MHz 2 x 5/8 groundplane 5.7dBd	70.15
7GP58	432MHz 5/8 groundplane 3.2dBd	39.10
7GP258	432MHz 2 x 5/8 colinear 5.7dBd	59.80

HF DIPOLES

DP 01	3.5/14MHz	59.80
DP 02	3.5/7MHz	59.80
DP 03	1.8/7MHz	59.80
DP 04	1.8/3.5MHz	101.20
DP 05	14/21/28MHz	70.15
DP 06	1.8/3.5/7/14/21/28MHz	110.40

HF MULTIBAND BEAMS

THF 1E	1 ele (dipole) 14/21/28MHz	83.95
THF 2E	2 ele 14/21/28MHz	213.90
THF 3E	3 ele 14/21/28MHz	264.50
THF 5E	5 ele 14/21/28MHz	384.10
THF 6E	6 ele 14/21/28MHz	571.55
THF 7E	7 ele 14/21/28MHz	741.75
THF 8E	8 ele 14/21/28MHz	878.60
SPQ 2E	2 ele Spider Quad 14/21/28MHz	408.25
LPO 12E	12 ele Log Periodic 13-30MHz	918.85

HF GROUNDPLANE

GP 3B	14/21/28MHz	81.65
-------	-------------	-------

COAXIAL CABLE: POPE H100....80p p/metre. RG213 (UR67)....62p p/metre

B.N.O.S.
ELECTRONICS

Mill Lane, Stebbing, Dunmow, Essex, CM6 3SL.
Tel: 0371-86681 Tlx: 817763 BNOS G

1988 BUYER'S GUIDE TO ELECTRONIC COMPONENTS

Maplin



UNIQUE

Make your own
**DIGITAL
WATCH
KIT**

1/2 PRICE OFFER
ONLY £1

SEE INSIDE COVER.
NO SOLDERING.
SUITABLE FOR
AGES 10+.



NEW! RADIO CONTROL MODELS
100's OF NEW PRODUCTS
AT LOW, LOW PRICES
£1.60

**VISIT OUR NEW
SHOP IN BRISTOL
NOW OPEN AT
302 GLOUCESTER ROAD
Tel: (0272) 232014**

AVAILABLE NOW IN ALL W.H. SMITH STORES GET YOUR COPY NOW!

Pick up a copy from any W.H. Smith for just £1.60 or post this coupon now to receive your copy by post for just £1.60 - 40p p & p. If you live outside the UK, send £2.75 or £2.95 for international reply coupons. Enclose £2.00.

Post Code Essex SS6 8LR

Send to Maplin Electronic Supplies Ltd., P.O. Box 3, Rayleigh, Essex SS6 8LR

Name _____

Address _____

GET YOUR COPY OF THE NEW MAPLIN CATALOGUE ON SALE NOW