

PRACTICAL
WIRELESS

PW

THE RADIO MAGAZINE

REVIEW

Topward 7021 Oscilloscope From Maplin Electronics



BUILD

A Pre-amp for
70 and 50MHz

Antenna Construction:
Circular & Square Loops +
Dual Band Antenna

BOOK REVIEWS:

Shop Early To Fill Your Stocking This
Christmas

PLUS

SPECIAL CHRISTMAS SUBSCRIPTION OFFER

Competition, 1990 Index, What A Good Idea! and lots more

DECEMBER 1990

£1.60

ISSN 0141-0857



9 770141 085006

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

This is Yaesu's FT-747GX.

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

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

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

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

You get 20 memories to store frequency and mode. Dual VFOs with split frequency operation for DX-pedition work. And manual band scan

plus auto-resume memory scan via the microphone up/down buttons.

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

Lightweight construction. Housed in a metallized high-impact plastic case, the FT-747GX weighs in at about 7½ pounds! With the loud-speaker mounted on the front panel for maximum audio transfer. And internal heatsinking for the transmitter, rated at full power for FM, packet, RTTY, SSTV, and AMTOR when used with a heavy-duty power supply.

Available options. FC-1000 or FC-757AT Automatic Antenna Tuners. FL-7000 500-watt Automatic, Solid-State Linear Amplifier. TCXO-747

Temperature-Compensated Crystal Oscillator. FAS 1 4R Remote Antenna Selector. FRB-757 Amplifier Relay Box. FP-700 Standard Power Supply. FP-757HD Heavy-Duty Power Supply. MMB-38 Mobile Mounting Bracket. MH-1B8 & MD-1B8 Microphones. New heavy duty metal case MMB42A.

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

South Midlands Communications Ltd

S.M. House, School Close,
Chandlers Ford Industrial Estate,
Eastleigh, Hants SO5 3BY

Tel: (0703) 255111

UK Sole Distributor

YAESU

Fill your logbook. Without emptying your pocket.



DECEMBER 1990
(ON SALE NOVEMBER 8)
VOL. 66
NO. 12
ISSUE 1005

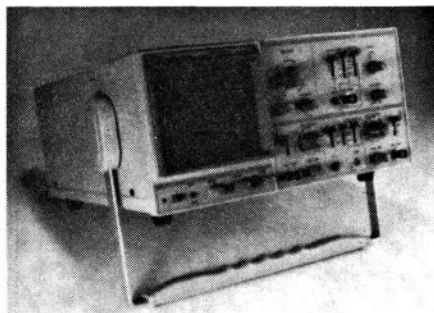
Editor
Rob Mannion G3XFD
Art Editor
Steve Hunt
Technical Projects Sub-Editor
NG ("Tex") Swann G1TEX
Technical Artist
Rob Mackie
Production
Sharon George
Editorial Assistant
Donna Vincent
Administration Manager
Kathy Moore
Accounts Manager
Alan Burgess
Accounts Assistant
Darren Howe
Clerical Assistant
Rachel Parkes

Advertisement Manager
Roger Hall G4TNT
PO Box 948
London SW6 2DS
☎ 071-731 6222
Cellphone 0880 511382
FAX 071-384 1031

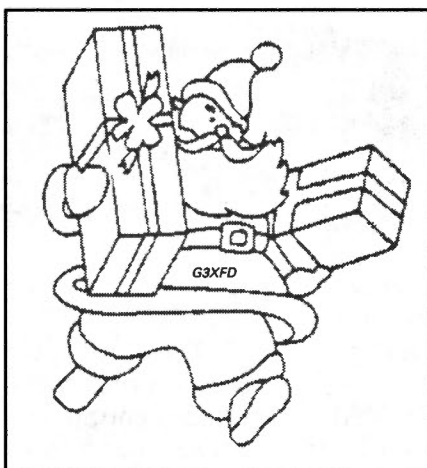
**Advert Copy and Make-up
(Poole Office)**
Marcia Brogan
☎ Poole (0202) 676033
FAX Poole (0202) 666244

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

Contents December 1990



19



36

Regular Features

- 69 Advert Index
- 51 Backscatter
- 46 Binders
- 65 Book Service
- 14 Competition Corner
- 11 Keylines
- 15 Newsdesk '90
- 30 PCB Service
- 26 Radio Diary
- 11 Receiving You
- 13 Services
- 42 Subscriptions
- 50 Wanna Swap
- 17 Wireless-Line

19 PW Review - Topward 7021 Oscilloscope

Mike Richards G4WNC

22 A Simple Pre-Amplifier For The 70MHz And 50MHz Bands

Adrian Knott G6KSN

24 Valve Technology & Characteristics - 4

Peter Buchan G3INR

29 A Novel Dual Band Antenna

Noel Orrin G3BBK

33 What A Good Idea!

*Dr. G. L. Manning &
J. C. Peerless G3JPJ*

34 What Is Propagation?

Ron Ham

35 CB Corner

Rick Maybury

36 Christmas Stocking Fillers

38 Circular And Square Loop Antennas

Fred Judd G2BCX

45 Packet Panorama

Roger Cooke G3LDI

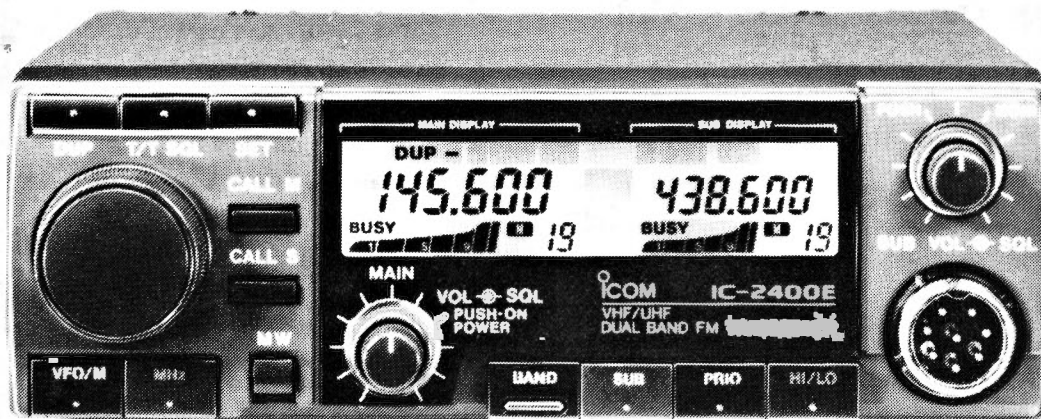
49 Lower Frequencies In Smaller Gardens - 2

Paul Essery GW3KFE

70 PW 1990 Index

ICOM

DUAL-BAND FM TRANSCEIVERS



IC-2400
144/430MHz
2m 45W
70cm 35W

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

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

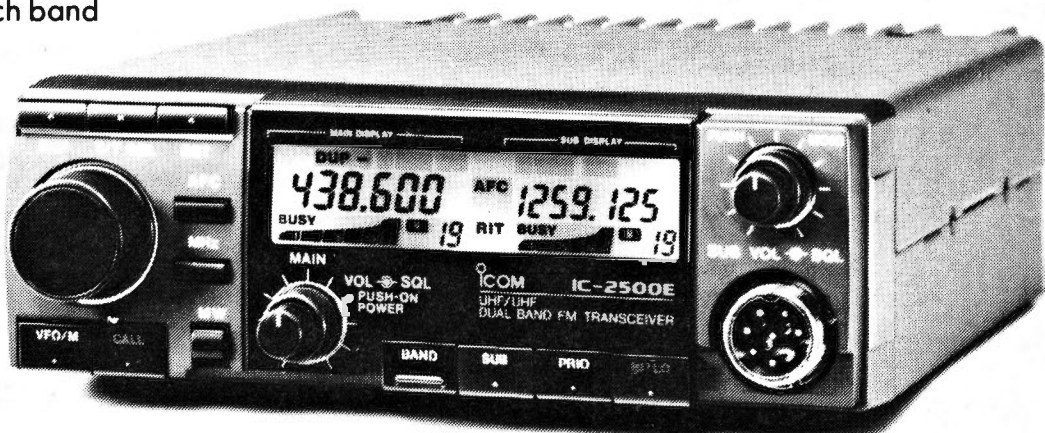
Full duplex operation lets you transmit on one band while receiving on the other for telephone style contacts. Each band can be independently

regulated using separate volume and squelch controls.

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

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

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



icom (UK) Ltd.

Dept. PW, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour. As from 1st September our showroom opening times will be Mon-Fri 09.00-13.00 and 14.00-17.30.

Count on us!

NEW MULTIBAND IC-970E Base Station



Designed for the serious operator on the 144, 430 and 1200MHz bands, Icom's new IC-970E has up-to-date technology for DX, digital and satellite communications.

The IC-970E is supplied as an all mode dual-bander for 144 and 430MHz bands. Optional units expand its capabilities to 1200MHz or wideband receiving from 50-905MHz.

Communications via satellites has never been easier. The IC-970E automatically tracks uplink and downlink frequencies as the tuning control is rotated also, ten specific memory channels for satellite frequencies.

The dual-band watch allows you to receive both MAIN and SUB band audio simultaneously, multiple scanning systems on the MAIN and SUB bands plus 99 memories, an easy to read central display and Icom's DDS system make this one of the most comprehensive multi-band transceivers available.

For more detailed information on the IC-970E Base Station or any other Icom radio equipment contact your local authorised dealer or call Icom (UK) Ltd.

Helpline: Telephone us free of charge on **0800 521145** Mon-Fri 0900-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.

Datapost: Despatch on same day whenever possible.

Visa & Mastercards: Telephone orders taken by our mail order dept. instant credit & interest-free HP.



SMC**South Midlands C**

SCHOOL CLOSE, CHANDLERS FORD IND. EST., EASTLEIGH, H

DX-PEDITION SPECIAL

**OPTIONS**

FP-22 Internal 240V AC P.S.U.

DVS-2 Digital Message Storage Unit

XF455m CW Filter 600Hz

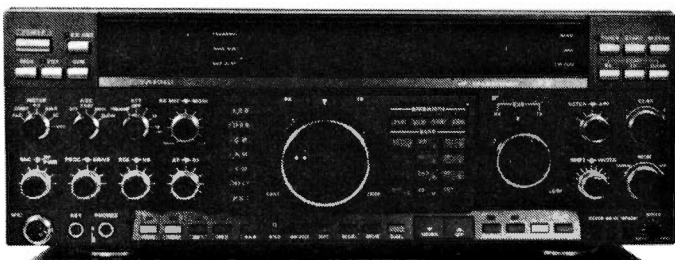
£995 inc VAT

Noisy, crowded frequencies are about as productive as motorways in rush hour. Now, you can jump the queues and head for the wide, open spaces with the FT650 from Yaesu.

The FT650 packs substantial communications power in a streamlined, compact case. A flip out handle makes it the perfect portable, especially for those remote locations. The three frequency operation lets you win the battle of the bands on 6m, 10m, & 12m. The transceiver covers from 24 to 56MHz continuous on receive with a full 100W output.

An optional power supply and desk mic are available for base station operation.

The Best of The Best — the FT-1000



Designed with no spared effort or expense for optimum performance and operability, the FT-1000 is the fruit of over 25,000 man-hours of intensive research and development by Yaesu's top design engineers. Instead of merely offering incremental improvements on existing designs or adding bells and whistles to an old model, the FT-1000 project involves a wholly new approach to the application of the latest digital and RF technologies to today's most demanding needs on the hf bands. Extensive surface-mount component technology allowed six microprocessors and five Direct Digital Synthesizers to be harmoniously integrated with a simple operator interface into a highly reliable full-featured transceiver optimized for serious hf applications.

BRIEF SPECIFICATIONS

- ★ General Coverage Receiver 100kHz-30MHz
- ★ Ham bands TX 160-10m
- ★ Modes CW, USB, LSB, AM, FM, RTTY and Packet
- ★ VFO steps 10Hz CW, SSB, RTTY, 100Hz, AM, FM, PKT
- ★ Auto antenna impedance range 16.7 to 150 ohms
- ★ Selectable receiver band widths 2.4kHz, 2kHz, 500Hz, 250Hz
- ★ Dual band receiver tuning and monitoring with balance control
- ★ Power output up to 200 watts P.E.P. 50W AM
- ★ Sensitivity preamp on SSB/CW 0.25 micro volts 10dB S/N
- ★ D.D.S. Direct Digital Synthesiser
- ★ Dual Selectable noise blankers with adjustable threshold
- ★ 99 memories

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

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

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

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



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

G-5400B/G-5600B SATELLITE INTERFACE



The IF-100PC & IF-100C64 are two new computer interfaces that work with the Yaesu G-5400B and G-5600B azimuth/elevation rotators. This is possibly the most comprehensive, yet easy to use satellite antenna control interface. Supplied with comprehensive software for either PC's or CBM 64/128 computers. The satellite tracking programme is valid for all present and future satellites up to the next century. Rotator control is automatic once the satellite to be tracked is chosen. Satellite data can be updated at anytime, very easily.

IF-100PC Interface, lead & software for IBMPC.....£139.00
IF-100C64 Interface, lead & software for CBM64/128....£145.00

TOKYO HY-POWER



SAGRA-600

- ★ 2m Linear Amplifier
- ★ 600W Output 25W Drive (Nominal)
- ★ 2 x 4CX250B VALVES

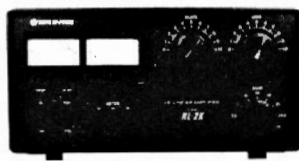
NOW ONLY £799.00

HF LINEARS



HL/KGX

160-10m 2a, 4CX250B
1KW PEP RF INPUT
70-120W DRIVE
£945.00



HL2K

160-10m 2 x 3-5007
2KW PEP RF INPUT
60-120W DRIVE
£1425.00

VHF LINEARS

HL66V	6m 10W in 50-60W out RX Preamp	£129.00
HL166V	6m 3/10W in 80-160W out RX Preamp	£249.00
HL37V	2m 3W in 32W out RX Preamp	£89.00
HL62V	2m 10W in 60W out RX Preamp	£135.00
HL110V	2m 2/10W in 100W out RX Preamp	£215.00
HL180V	2m 3-25W in 120W out RX Preamp	£295.11
HL180V	2m 3-25W in 120W out RX Preamp	£295.00
HL36U	70cm 6/10W in 25/30W out RX Preamp	£135.00
HL60U	70cm 10/25W in 50W out RX Preamp	£215.00
HL130U	70cm 3-25W in 120W out RX Preamp	£389.00

HX240/HX640 TRANSVERTERS

2m to HF & 6m to HF



AVAILABLE FROM
STOCK FOR

£249

80, 40, 20, 15
& 10m coverage

**NOW BACK IN
STOCK THE
POPULAR
HT-106
6m TRANSCEIVER
£299 inc VAT**

*FREE FINANCE ON SELECTED ITEMS

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

CARRIAGE CHARGES

Carriage is charged on all items. Small items, Plugs, Sockets etc by post £1.75. Antennas, Cables and larger items by LYNX from £5.75. Transceivers etc, next day delivery from £8.35. Overnight delivery can be specified at extra cost for other items. Same day despatch whenever possible.

YAESU DISTRIBUTOR WARRANTY

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

PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

ROTATORS



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

ROTATORS

AR200XL	OFFSET TYPE 3 WIRE	£49.50
G-250	BELL TYPE TWIST/SWITCH CONTROLLER	£78.00
G-400	BELL TYPE METER CONTROLLER	£139.00
G-400RC	BELL TYPE ROUND CONTROLLER	£169.00
G-600RC	BELL TYPE METER CONTROLLER	£219.00
T2X	BELL TYPE METER CONTROLLER	£499.00
G-800SDX	BELL TYPE 450 DEG VAR. SPD.	£325.00
G-1000SDX	BELL TYPE 450 DEG VAR. SPEED	£368.00
G-2000RC	BELL TYPE ROUND CONTROLLER	£445.00
G-500	ELEVATION METER CONTROLLER	£149.95
G-5400B	AZIMUTH/ELEV DUAL CONTROL	£375.00
G-5600B	AZIMUTH/ELEV DUAL CONTROL	£435.00
RC5-3	BELL TYPE PRESET	£275.00
RC5-1	BELL TYPE ROUND CONTROLLER	£219.00
RC5A-3	BELL TYPE VAR. SPEED AND PRESET	£425.00
RC5B-3	BELL TYPE VAR. SPEED AND PRESET	£675.00

ROTATOR HARDWARE

AR200AB	ALIGNMENT BEARING AR200XL	£17.50
K3505	ROTARY BEARING 1 1/2" MAST	£19.95
GS-065	ROTARY BEARING 2" MAST	£29.95
GC-038	LOWER MAST CLAMP G-400, 600 etc.	£16.95
9523	CHANNEL MASTER BEARING	£19.95
CK46	ROTARY BEARING 1.5-2.5 MAST	£34.95
MC1	LOWER MAST CLAMP RCS SERIES	£25.00

ROTATOR CONTROL CABLE

RC5W	5 WAY G-400RC, 800, 1000SDX PER MTR.	£0.48
RC6W	6 WAY G-250, 400, 600, RC KR500 PER MTR.	£0.66
RC8W	8 WAY HAMV, T2X 2000RC RC SERIES PER MTR.	£0.72

CARRIAGE:

ROTATORS £7.50, ROTATOR HARDWARE £3.50, ROTATOR CABLE £3.50 UP TO OVER 20 MTS, OVER 20 MTS £5.00.

SWR/PWR METERS



YS60



FS710V

FS710V	50-150MHz	15/150W	PEP £107.80
FS300H	1.8-60MHz	20/200/1000W	£53.40
FS210	1.8-150MHz	20/200W	Auto SWR £66.50
FS301M	2-30MHz	20/200W	£42.25
FS301MH	2-30MHz	200/2000W	£42.25
FS711H	2-30MHz	20/200W	Head/Display £43.65
FS711V	50-150MHz	20/200W	Head/Display £43.65
FS711U	430-440MHz	5/20W	Head/Display £43.65
FS711C	26-30MHz	10/100W	Head/Display £24.55
FS500V	50-150MHz	20/200W	£81.95
W720S	130-440MHz	20/200W	Head/Display £52.75
SWR50B	3-5-150MHz		£36.75
T200DL	3-150MHz	1/10W	£43.65
FS200	3-150MHz	5/20W	£43.65
SWR3E	3-5-150MHz	20/200/1000W	£28.75
JD110	1.5-150MHz	10/100W	£16.50
T435	144/430MHz	20/200W	£85.00
YMDX	3-5-150MHz Rel. Power/SWR Twin meter		£31.50
OSCAR-171B	3-5-150MHz Rel. Power/SWR Twin meter		£28.85
SP425	140-524MHz	5/15/150W	£119.95
YS60	1.6-60MHz	20/200/2000W	£93.15
YS300	140-525MHz	4/20/200W	£81.65

Carriage on all power meters £4.00

MORSE KEYS



MORSE KEYS

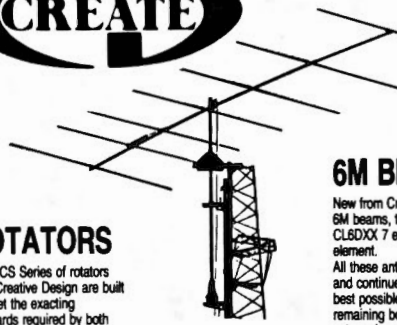
		p.p.
HK702	STRAIGHT KEY	£42.75 £1.75
HK703	STRAIGHT KEY	£49.69 £1.75
HK704	STRAIGHT KEY	£26.35 £1.75
HK705	STRAIGHT KEY	£26.25 £1.75
HK706	STRAIGHT KEY	£28.95 £1.75
HK707	STRAIGHT KEY	£25.49 £1.75
HK708	STRAIGHT KEY	£26.45 £1.75
HK710	STRAIGHT KEY	£41.75 £1.75
HK711	STRAIGHT KEY KNEE MOUNTING	£41.75 £1.75
BK100	MECHANICAL BUG	£41.45 £2.00
MK701	SINGLE LEVER PADDLE	£38.35 £1.75
MK702	SINGLE LEVER PADDLE	£41.50 £1.75
MK703	SQUEEZE KEY	£37.00 £1.75
MK704	SQUEEZE KEY	£24.99 £1.75
MK705	SQUEEZE KEY	£32.78 £1.75
MK706	SQUEEZE KEY	£35.00 £1.75
HK802	DELUXE BRASS KEY	£99.95 £2.50
HK803	DELUXE BRASS KEY	£89.95 £2.50
HK804	DELUXE BRASS KEY	£95.00 £2.50

MORSE EQUIPMENT

KP100	SQUEEZE KEYS	£109.25 £2.50
DEWSKEYSTD	STAR MASTER KEYS	£54.69 £2.50
DEWSKEY M	STAR MASTERKEY MEMORY	£94.99 £2.75
D70	MORSE TUTOR	£63.40 £2.50

DATA TERMINAL

PK232/FAX	MULTIMODE DATA TERMINAL	£289.95 £3.50
PK232/MAIL	MULTIMODE DATA TERMINAL	£319.95 £3.50
	C/W Mail Drop	



6M BEAMS

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

All these antennas are the result of long and continued research to achieve the best possible performance whilst remaining both cost effective and extremely robust.
CL6DX 5 ele 13dB* £115.00 P&P £8
CL6DXX 7 ele 14.3dB* £188.99 P&P £14
CL6DXZ 8 ele 14.5dB* £225.00 P&P £14
*Manufacturers figures

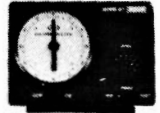
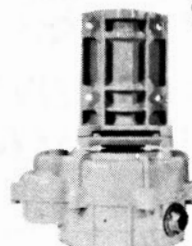
ROTATORS

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

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

Carriage on:

Rotators	£7.50
CK46	£3.50



COMET & HOKUSHIN ANTENNAS

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

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

MOBILE ANTENNAS

20W	2m 1/2 wave	£4.95
2NE	2m 5/8 wave folding	£13.25
78F	2m 7/8 wave	£15.00
78F	2m 7/8 wave folding	£21.50
88F	2m 8/8 wave	£24.10
258	70cm 2 x 5/8	£29.37
358	70cm 3 x 5/8	£33.73
268E	70cm 2 section colinear	£32.80

DUAL BAND MOBILE

CHL21J	Mini dual band mobile	£14.95
CHL23J	Small dual band mobile	£16.90
CA2X4KG	2m 2 x 5/8 70cm 4 x 5/8	£39.95
CA2X4MB	2m 4.5dB 70cm 7.4dB	£37.75
HS-727SS	Dual band mini antenna NEW	£16.95
HS-727VMS	2m 1/2 70cm 2 x 5/8 NEW	£25.95
VM-720SKR	2m 1/2 70cm 2 x 5/8 NEW	£24.95

DUAL BAND BASE ANTENNAS

WX1	2m/70cm colinear	£54.99
WX2	2m/70cm colinear	£75.00
WX4	2m/70cm colinear, high gain	£98.00
CA2X4WX	2m/70cm colinear, high gain	£79.00
CA2X4MAX	2m/70cm colinear, high gain	£99.95
CF416MN	Duplexer 1.3-500/400-540MHz	£25.50
HS790DN	Duplexer Vless 1.6-150/410-460MHz	£25.50

ANTENNA MOUNTS

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

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

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

LEEDS (0532) 350606
BIRMINGHAM 021 327 1497
 For full addresses see display advert

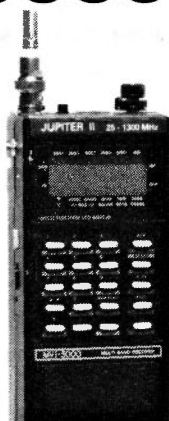
For a good deal – a fair deal – the best deal...

ARROW RADIO LTD

MVT-5000

JUPITER
SCANNERS
25-550 +
800-1300MHz
incl. Nicads,
case, DC lead!

£249



SPECIAL OFFER! FT-747GX

Full UK spec inc. filters

Please ☎ any showroom

INTEREST FREE CREDIT

Many major items available with
interest free credit at one third
deposit balance over 9 months
(APR zero)

Arrow welcome your part exchange equipment
in UK!! Call for the best deal!!

DAIWA

ANTENNA TUNERS

CNW 419 160-10m/200w
£199

CNW 319 80-10+six!/150w
£179

CNW 727 200w SWR/PWR
+ ATU TWO & seventy cms
£145

POWER SUPPLIES

PS30 XMII 30amp **£129.95**
Variable voltage

PS120 12amp max **£79.50**
Variable voltage

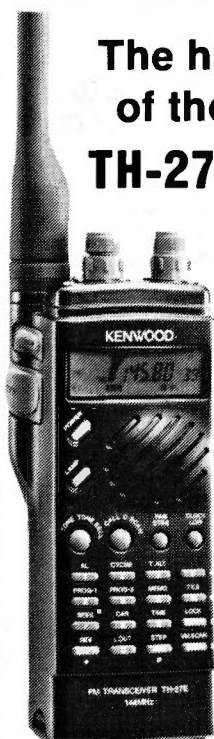
PS140 13.8v 10amp **£62.50**

HERE NOW!

KENWOOD

The handhelds
of the future!

TH-27E/TH-47E



- ★ Choice of
144MHz and
430MHz models
- ★ 5W/2.5W/1.5W
options
- ★ Multi-function
scan
- ★ 40 multi-
function, split
freq memory
channels
- ★ DTMF memory
- ★ Large LCD
display
- ★ Built-in timer

TH-27E £249

TH-47E £269

TH-77E DUAL BANDER

- ★ World's smallest
package for 2M/
70cm dual bander
- ★ 5W & hi-low
power output
- ★ Dual scan-dual
VFO's
- ★ Built in DTSS and
pager function
- ★ Larger dual
displays
- ★ 40 multi-function
memories

TH-77E £389

Full range of
accessories for all
models



NEW ICOM IC-R1

Micro-size handheld
scanner 150KHz/
1300 Mhz

£399



NEW MK II AR1000

1000 channel Superscanner
8-1300Mhz

£249 inc. Dual band antenna
nicads and charger



COMET ANTENNA

'The effective aerial'

NEW

GPX2010 Highest Gain Dual Band Base antenna in the WORLD!!
7.9 Metres long 9.5dB/2M 13.2 dB/70cms**£142.95**
CDS150 DISCONE in S/Steel 25/1300 Mhz ONLY**£58.95**
CHL72S NEW 2/Band BNC whip for Dual Band handhelds**£11.85**

NON RADIAL: Mobile antennas independent of vehicle ground plane
CHL21J 144/432 Mhz, Unity/2.15dB 100W Only 29cms long**£15.95**
CHL23J 144/432 Mhz 2.15dB/3.8dB 100W Only .44 metres**£17.95**
CHL24J 144/432 Mhz 2.15dB/5 dB 100W 0.8 metres long**£25.30**
CHL250H 144/432 Mhz 3.0dB/5.5dB 200 Watt 0.95 metres long **£32.80**

2x4 Series + Triband mobiles and base station antennas
2x4M 144/432 Mhz 4.5/7.2dB 150 watt 1.53 metres**£37.65**

2x4 SERIES & DUAL BANDERS featuring the unique super linear converter system
2x4MAX 144/432 Mhz 8.5dB/11.9dB 200 Watt 5.4 metres "N" G.
Fibre**£125.00**
2x4WX 144/432 Mhz 6.5/9.0dB 200W 3.18 metres Glassfibre**£78.95**
2x4SUPER II 144/432 Mhz 6.0/8.4dB 200W 2.43 metres Glassfibre.**£77.35**
2x4FX Compact 144/432 Mhz 4.5/7.2dB 200W 1.79 metres**£55.80**

DUPLX & TRIPLEXERS Zinc alloy diecast
CFX5140 50/144/432 Mhz 800/800/500 Watt PEP 55dB isolation **£38.10**
CF413N 432/1296 Mhz 500/200W PEP 55dB Isolation "N"**£36.65**
CF416 144/432 Mhz 800/500 W PEP 60dB isolation**£26.60**

SR Series to order only. MONO BANDER MOBILE ANTENNAS
CA285 5/8 wave 3.5dB 300Watt 1.32 Metres Base loaded**£15.00**
CA287C 7/8 wave 5.2dB 200W 1.89 metres double co-phase**£22.50**
CA430TM 3 x 5/8 wave 432 Mhz 6.8dB 150W 1.47 metres**£29.95**

MONOBAND BASE ANTENNAS
ABC21 5/8wave Ground Plane 144 Mhz 3.4dB 200W 1.74 metres**£24.50**
ABC22A 2 x 5/8 wave 144 Mhz 6.5dB 2.87 metres**£36.00**
ABC23 3 x 5/8 wave 144 Mhz 7.8dB 200 W 4.5 metres**£59.50**
ABC71 5/8 wave ground plane 432 Mhz 3.4dB .54 mtrs**£21.56**
ABC72 2 x 5/8 wave GP 432 Mhz 200W 5.8dB 1.07 metres**£34.65**
CA712EF 432 Mhz Twelve x Half wave! 9.5dB 3.10 metres**£55.00**

HF & 50 MHZ
CHA-5 Vertical with Loaded Radials for 80/40/20/15/10 M 200W SSB 5.29
Metres. Features trifilar wound toroidal core**£218.95**
52HB4 4 El HB9CV Beam 10.4dB for 50 Mhz 400W SSB 3.2M**£67.90**
CBL30 HF 1.7 — 30 Mhz Balun 1:1 1kw**£20.85**

CRZ/DISCONE & HANDHELD ANTENNAS
CRZ120B A Unique wide band Active antenna 500Hz to 1500 Mhz 1.24
Metres with controller**£96.30**
CDS180 Discone 28-1300Mhz + TX 6/27/70/23**£69.50**
CRZ-07 Mobile Wide-band Active**£66.50**

HEAD OFFICE:

5 The Street, Hatfield Peverel,
Chelmsford, Essex CM3 2EJ
Tel: 0245 381626/381673
Fax: 0245 381436
Hours: 9-5 (Closed Thursdays)

GLASGOW:

Unit 17
Six Harmony Row
Govan
Glasgow
Scotland G51 3BA
Tel: 041 445 3060
Hours: 8.30-5.30 Mon-Fri
(closed Saturday)

WIGAN:

Greensway Arcade
Gerrard Street
Ashton-in-Makerfield
Wigan, Lancs
Tel: 0942 713405

LEICESTER:

DAVE FOSTER (Agent)
Telephone: 0533 608189
Latest calls
8.30pm please!



YOUR ORDER CAN BE TELEPHONED WITH CREDIT
CARD DETAILS & DESPATCHED IMMEDIATELY!
FREE FINANCE ON MANY MAJOR ITEMS AT RRP.
(Ask for details of qualifying items —
see examples above).

ARE COMMUNICATIONS

THE SHOP WITH THE SMILE

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

ONLY FROM US -
WITH SSB
NOW ONLY

£499

ICOM IC-R100



IC-R100 Mobile/Base Receiver
now with **SSB!**

WHY SETTLE FOR ANYTHING LESS!

For the enthusiast who prefers a more permanent installation the IC-R100 is ideal giving full frequency coverage of 500kHz-1800MHz and AM/FM. FM wide modes of operation. The IC-R100 boasts 100 memory channels to store your favourite stations and has features similar to the little pocket receiver. 48 monthly payment terms of £17.97.

IC-R1



This scan
receiver now at
a new
AMAZING price

£379

Frequency range
100kHz to 1300MHz
no gaps A.M. or
F.M. Also available
on easy terms.

**48 payments
of £13.65 per
month.**

**Other
Scanners
Available -
JUPITER II
FAIRMATE
UNIDEN**

ICOM

IC-725 or 726

HF Transceivers for both mobile or base -
the 726 has 6 metres inc.



**PHONE FOR OUR PRICE YOU
MIGHT BE AMAZED.**

IC-R72

THE NEW ICR72 RECEIVER 100KC to 30MHz SSB AM CW

Powered by either internal batteries or
external supply.
Superb selectivity and sensitivity



PHONE FOR OUR PRICE

ICR7000

**HF Receiver
500kHz - 2GHz**



Now available on super credit terms.
48 Monthly payments of £35.61.
Cash/cheque/credit card price.

£989 with HF Fitted

Yes, 500kHz to 2 GHz
CONTINUOUS receive in one unit



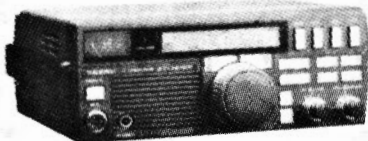
a.p.r. 34.4%

YAESU

NOW INCLUDING FM BOARD
YAESU FT 747

NOW **£499** inc VAT

CW & AM Filters are available if required.



**AVAILABLE WITH NO DEPOSIT AND
48 MONTHS TO PAY - £17.97**

The FT747 HF Transceiver SSB/CW/AM (and optional FM) 100 Watts pep output on all HF Bands and general coverage on receive 100kHz-30MHz. Dual VFO 20 memories. Altogether a super economical HF Transceiver.

A DREAM COME TRUE

**Bored with two metres?
Then why not turn that 2m rig
onto the HF bands**



**FT290R II £395 2 METRE
TRASVERTER**

TOKYO HX240 £249

With the HX 240 feed in 3 to 10 watts on
2m and transmit on 10-15-20-40 or 80
with 40 watts output.

KENPRO

Once again **A.R.E. COMMUNICATIONS** BREAK THE PRICE BARRIER!
Now a 2 Metre Hand Held transceiver
made by Kenpro. Model

KT22E for £129 inc. VAT

Package includes NICAD pack charger
and antenna

- ★ Fully synthesised
- ★ Thumbwheel tuning
- ★ 10MHz cover on RX
- ★ 1750kHz Tone Burst
- ★ 600kHz Shift for
repeater operation
- ★ Low and High power
switch

£129

or 12 Monthly
payments of
£12.58



**YOURS - FOR LESS
THAN 50P PER DAY**

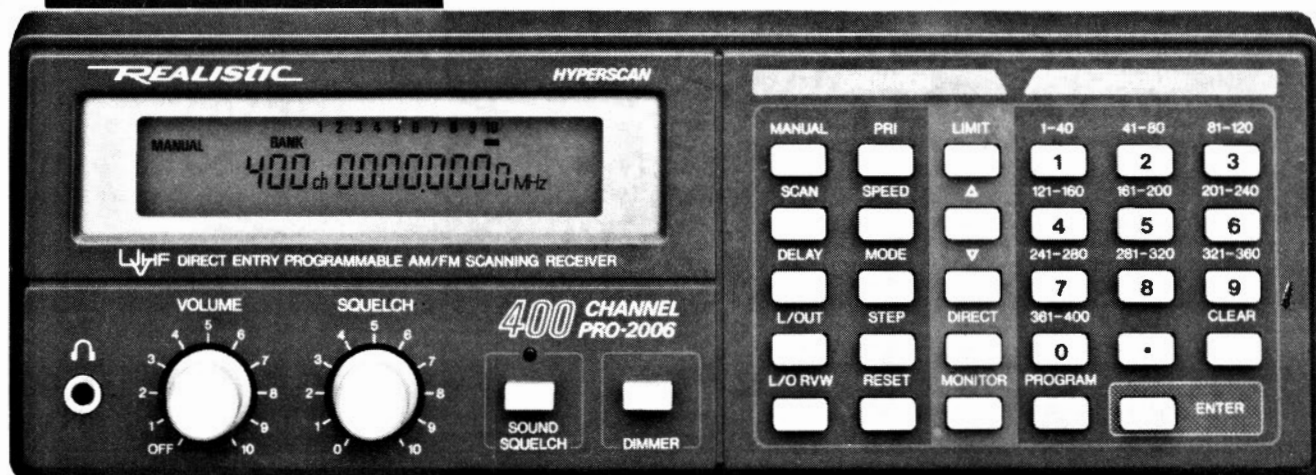
PHONE 081-997 4476



**Opening Hours Monday-Friday 9.30-5.30
NOW OPEN SATURDAY 9.00-3.00pm**

ARE Communications Limited, 6 Royal
Parade, Hanger Lane, Ealing, London
W5A 1ET, England
Tel: 081-997 4476 Fax: 081-991 2565

REALISTIC



**Covers: 25 - 520 MHz
And 760 - 1300 MHz**

400-Channel With Hyper Scan

£349 ²⁰⁻⁹¹⁴⁵ 9%

Realistic PRO-2006. Features ten 40-channel memory bands, a 10-channel monitor bank for temporary storage, plus search and favourite channel priority functions. Hyper scan doubles the scanning speed - 13 or 26 channels per second. Backlit LCD display with dimmer. AM, FM-narrow and FM-wide modes. Jacks: tape out, 3.5mm headphone, external speaker, external DC power and BNC aerial input. Memory backup requires 9v battery. Measures: 76 x 222 x 209mm. Mains operation (or 12 VDC cord, extra).

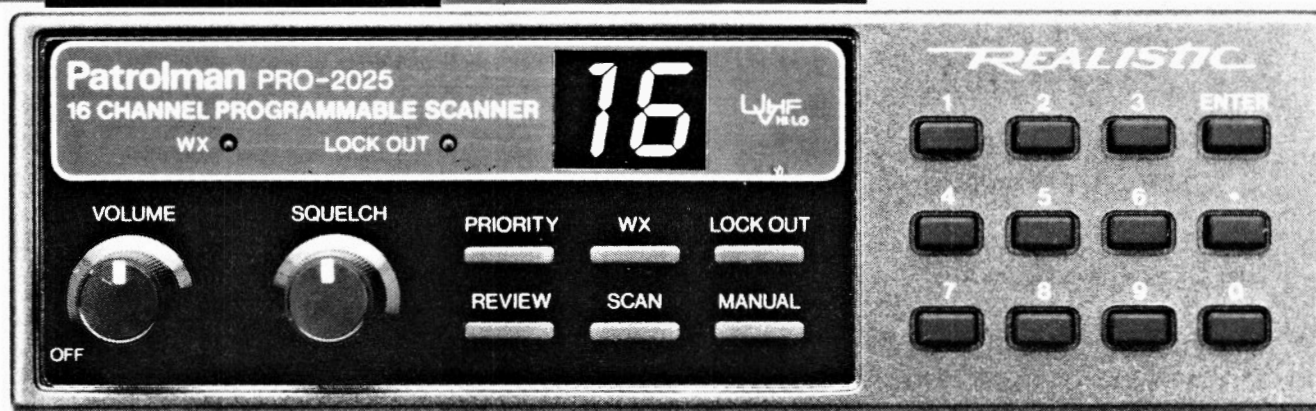
PRO SCANNERS

16-Channel Mobile Scanner

£99 ²⁰⁻⁹¹⁴⁶ 9%

**Covers: 66-88, 136-174 MHz
And 406-512 MHz**

Realistic PRO-2025. This scanner gives you direct access to different frequencies. You can select up to 16 channels to scan and you can change your selection at any time. Features automatic two-second scan delay, memory backup, priority channel and lockout function that lets your scanner skip over specified channels. Squelch and volume controls. Jacks: power, external speaker and aerial. 12 VDC neg. gnd. only. Measures: 45 x 140 x 175mm.



Tandy

**All The Action
As It Happens**

**Over 500 Tandy Stores And Dealerships Nationwide.
See Yellow Pages For Address
Of Store Nearest You.**

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

Waters & Stanton

BEST PRICES! FAST MAIL ORDER

**0702 206835
or 204965**

KENWOOD
YAESU
ICOM
JAYBEAM
AZDEN
MIZUHO
REVEX
JUPITER
ALINCO

SAGANT
ADONIS
SONY
PANASONIC
DATONG
TONNA
DIAMOND
PAKRATT
AOR
ERA

ALINCO

The Serious Alternative!

Join the hundreds of happy ALINCO users with one of these 1991 models.



£219

DJ-160E

3 Watts 2m FM 140-170MHz Rx • Key pad Entry • Rotary tuning • Scanning • 12.5/25kHz steps • 21 memories • DTMF • Battery Saver • 12v DC-DC • 700mAh Pack • Rapid charger • Tone Burst • 600kHz shift • Auto Power Off • 142 x 57 x 32mm • Rubber Duck etc.



£179

DJ-120E

2.5 Watts 2m • 140-170MHz Rx • LCD Readout • 10 memories • 12.5kHz steps • 1750Hz tone • Repeater shift • 12v DC-DC • Battery Saver • S-meter • 700mAh Pack • AC Charger • Rubber Duck • 165 x 60 x 30mm • Full UK Spec.



£339

DJ-560E

2m & 70cm 2W • 130-174 & 400-520MHz Rx • Key pad entry • Rotary tuning • 2 x Vol/Squ controls • 5/12.5/25kHz etc steps • DTMF • Dual Watch • Scanning • Bell alarm • 40 memories • 12v DC-DC • Auto dial • AC charger • 700mAh pack • 169 x 57 x 32mm • Rubber Duck • Plus many other features. • Phone for details.

DJ-460E For 70cms also in stock £229

25W 2M

Price Crash!

£239



NEW DR-112EM MISER'S MOBILE!

This latest model from ALINCO is the ideal mobile rig for those on a budget. The only sacrifice has been the transmit power level which at 25 Watts is enough for most applications. Just off the production line, we are able to offer this at an amazing price. Full 12 months parts and labour warranty. If you want one from the first batch, then get on the phone now!

2m FM • 25 Watts • 5 Watts Low Power • 14 memories • 6 channel steps • 4 Scan modes • 1750Hz tone • Reverse repeater • Memory skip • Priority • Call channel • fist mic • Mounting kit • Built in speaker

FT-747 Special!

Normally £675— Now £ Phone!
Special Package with PSU!

KENWOOD TH-27E

New mini handheld £249
+ Free 24 Hour Delivery!

Dual Band TH-77E

Kenwood's Dual Bander £389
+ Free 24 Hour Delivery!

NEW TM241E

Kenwood's 2m mobile £289
+ Free 24 Hour Delivery!



DR-590E 2M & 70CMS £499

The new DR 590E transceiver should be available by about the time you read this! Compare its features and you will see why ALINCO is growing from strength to strength in the UK. Send for details.

2m & 70cms • 45 Watts • 10 or 5 Watts low power • Dual watch • Full Duplex • Automatic Repeater Memory • 38 Memories • Auto Band Change • Reverse Repeater • 6 channel steps • 5-25kHz • Brightness control • Priority • Bell Function • Detachable front panel option • Built-in speaker • Fist mic and full mounting kit • 150 x 50 x 178mm.

NEW - SX2000

DIAMOND Auto VSWR Power meter covering 1.8-200MHz. Power to 200 Watts. Needs 12V for "Auto". £89 Post Free!

NEW - SX9000

DIAMOND Auto VSWR Power meter covering 1.8-1300MHz. Power to 200 Watts. Superb specification. £169 Post Free!

PCS-6000 DOWN

AZDEN 2m FM transceiver + AM Airband Receiver is now even better value. 110-180MHz. Rx £299 + £3 Carr.

TS-940/950-SAVE!

We can offer a superb package deal or save you money by offering good part exchange deals. Ring today for quotes.

TS-440S

Currently our best selling HF transceiver. We can offer a particularly good deal if you need ACPSU as well. Ring today!

Trade UP!

We can supply any make of equipment usually from stock. Instant cash offers for your old gear and very good prices on your new purchase. Ring!

Retail and Mail Order: 18-20 Main Road, Hockley, Essex SS5 4QS. Tel: (0702) 206835/204965

Retail Only: 12 North Street, Hornchurch, Essex. Tel: (04024) 44765

VISA & ACCESS MAIL ORDER. 24 Hour Answerphone. Open 6 Days a Week 9am-5.30pm.

Rail: Liverpool St./Hockley or District Line/Hornchurch

ALL MAJOR BRANDS STOCKED

LARGEST IN SOUTH EAST

Keylines

Several times during 1990 the media - particularly the 'Tabloid' press - has carried stories based on 144MHz repeater mis-use. The 'tabloids' thrive on this type of story but unfortunately for amateur radio, the facts are rarely accurately reported.

Repeater mis-use, whether it be foul language, rudeness in its many and varied forms or 'vendettas' against particular people or groups - is on the increase. It's also bad news for a hobby struggling to attract

new blood in order to survive.

This dreadful problem is becoming so widespread that I feel sure there must be very few radio enthusiasts who have not come across this stupid behaviour. I've even heard some appalling behaviour myself on several repeaters in the south and in the north of England.

I have often been forced to turn my mobile rig off! I've also no doubt it's a big 'turn-off' for other amateurs and NEWCOMERS to the

hobby. We must act quickly before the Department of Trade and Industry either say "Enough is enough" and remove the facility, or stipulate that remote shut-down facilities be fitted at ALL repeaters.

Amateur radio with a 'duty censor', ready with his blue button? Not for me! We must act and the RSGB must also act before others do (in ways we would not wish) and rid the hobby of this creeping evil before it damages amateur radio further.

Ringing The Changes

For the past year many of you will have had the chance to fill in a survey form to help us to help you, so to speak. Feedback from readers is essential and we must act on it if we are to achieve our aim and provide the best we can.

Space is always a problem in a monthly magazine and we try our utmost to avoid 'part 1' and 'part 2', etc, wherever possible. We now know what the majority

of our readers want, and we're going to act on the information!

From the January issue, the editorial content of *PW* will reflect your requests as we put the results of the survey 'into gear'. However, in the meantime you have an extra chance to let us know **YOUR** wishes. Your letter won't be a waste of time - the 'What A Good Idea' feature has been introduced because of reader demand. So get writing **NOW!**

73s from G3XFD

Receiving You...

From the office of the Secretary and Chief Executive, Radio Society of Great Britain to the Editor of *PW*.

Dear Sir,

I refer to the support being given to the Radio Society of Great Britain which you expressed in your November 'Keylines'. Such support is warmly welcomed by Council, for the future success of amateur radio in the UK is closely linked to the ability of the RSGB, with its affiliated clubs and individual members, to gain new recruits to our unique hobby/service.

Quite simply, without new recruits amateur radio will die as we start to lose precious frequency allocations to expanding radio services if our numbers contract.

Your readers, who may not be members of the RSGB, may be interested to know that in February 1992 there is another major conference being held by the International Telecommunications

Union in Spain. This conference could affect the future of some of our h.f., v.h.f. and microwave amateur bands.

Those that are members of the RSGB already support, through their membership fee, the work that the RSGB does to prepare for these conferences. Such work is essential and is at present only supported by just over half of the licensed radio amateurs in the UK.

The RSGB work of course, benefits every licensed amateur in the UK, in terms of the retention, we hope, of existing privileges. Without the RSGB work and that of other national Societies in the World, there is certainly a greater risk of having existing frequency allocations reduced or taken away.

An obvious conclusion is that there is more safety in numbers and that is why the RSGB urges all licensed non-members and active s.w.l.s to join the Society. The agenda for the 1992 Conference has only just been published and thus the amateur community only has 15 months to prepare. The support of all licensed amateurs and active s.w.l.s is needed now.

In the November 'Keylines' piece you also referred to the fact that the potential Novice Licence instructor has been asked to pay for his/her own teaching course manual. In fact, approved instructors will only pay £3 for the manual instead of £5. The RSGB has thus taken your point about sponsorship seriously and has already sponsored

the manual to the tune of £2 per copy.

The society would be delighted to receive additional support and we wonder whether *Practical Wireless* would itself be prepared to match the existing RSGB sponsorship?

I believe that it is also worth mentioning that the RSGB Council is exceedingly generous, possibly to the society's own detriment, when it comes to membership fees. Concessionary fees are offered to the disabled, the young and the old. With other concessions this generosity cost the RSGB some £65 000 in its 1989/90 financial year. I believe that such actions are unequalled in the UK by any other organisation involved in amateur radio.

Apart from

Government and International liaison, the RSGB also supports other major aspects of UK amateur radio. For example the UK repeater network (estimated cost to the RSGB of some £10 000 per annum) and special event stations (estimated cost to the RSGB of some £15 000 per annum), together with other services which include the QSL Bureau, RAYNET, Contests, Operating Awards, EMC and Planning advice, etc.

All in all, the RSGB subscription is excellent value for money and the RSGB already sponsors a considerable amount of work within amateur radio, which perhaps many have previously just taken for granted.

David Evans G3OUF
RSGB Secretary and Chief Executive

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

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

Receiving You...

★★★★★STAR LETTER★★★★★

Dear Sir

I happened to pick up my husband's copy of the July *PW*, the other day and on browsing through stopped at 'Receiving You'. There was a debate on about a CB page and you requested a vote. I don't know the outcome and I'm not really fussed but I thought I'd just add my 'two penn'orth'.

My husband passed his RAE after a short spell on CB which had aroused his interest in radio, but he was not happy with the 'goons' and 'bucket mouths' to be found on the CB channels.

With encouragement our daughter has also become interested. She is only eleven years old and we were very pleased for her. Despite this, she is unable to listen on the bands due to the constant barrage of foul language that blocks our local repeaters and channels.

When I say foul language, I mean disgusting, stomach churning comments. My husband is an ex-lorry driver and has served in the forces but this behaviour makes him ill. So if amateurs want to retain their 'upper-crust' superiority I suggest they do something to clean up their act!

I have also never been so 'battered' about as when I went to a rally (my first) last year. I mistakenly thought it would be a 'chummy' get together like the CB 'eye-balls'. Instead I was pushed about and trampled on by these so-called gentlemen. I'd rather go to a jumble sale or the January sales!

You probably won't want to print this as it is detrimental to radio amateurs, not all, but just the few who consider themselves above us 'mere mortals'.

Quite frankly, I personally will stick to CB as the people seem to have more personality and be far more genuine.

M. Littlewood
Warley
West Midlands

Editor's comment: Despite Mrs Littlewood's pre-conceived notion that we would not want to print her letter - we have! We also consider that it makes such a valid point that it warrants the 'Star Letter' position.

We MUST do something about the repeater abuse problem - before the matter is taken out of our hands. The DTI and the Radiocommunications Agency have recently met the RSGB to discuss this problem. As soon as we have more information on the outcome of this meeting (called by the DTI) we'll publish it.

I must also strongly agree with the last point in the letter. Why have so many rallies become akin to rugby 'scrummages'? They're not all like it by any means, but I'm often pushed and trodden on at rallies - and I'm very much larger and taller than the average man. The problem must be bad if Mrs Littlewood prefers the January sales to rallies!

G3XFD.

Dear Sir

I have been reading *PW* for eight years and have had little cause for complaint. I have tried others but none can touch the 'old faithful'. So I am not being hasty with the criticism but I do think you've slipped up of late. Why? The Novice Licence!

Up to now *PW* has done a fine job of reporting the major events in amateur radio, the opening up of 50MHz for example, without just repeating the RSGB party line. I am not an RSGB member and I accept that I have to pay the penalty of not having a voice on new developments, but I still like to know what's going on!

In addition to being a licensed operator I am a father and school governor so I have more than a passing interest - I would hope to be able to contribute to the implementation of a novice scheme. I have written to the RSGB for information but have not received a reply.

Due to this lack of information, I cannot speak with authority on the way ahead but I have to say that I think Dave Milne is way off the mark! (Oct *PW* 'Receiving You').

I would like to answer a few of his points using some observations I've made during the last eight years of my 'self-training'.

1 Type tested ('Black Box') equipment is so expensive that it has kept many a potential amateur from ever starting in the hobby.

2 Most v.h.f. equipment is expensive to buy and difficult to build (even *PW* projects!).

3 Using keyboards (data modes) would be yet another financial

hurdle to stop newcomers getting a 'foot in the door'.

The following suggestions for the Novice scheme would attract young and old to the hobby and hopefully once hooked - they'd be in for life!

1) Some basic 'building block' theory backed by simple construction.

2) Practical demonstrations of operational ability (a.m. phone and/or 5 w.p.m. Morse?).

3) Limited (spot frequency?) h.f. and v.h.f. band space.

4) QRP operation to prevent QRM.

5) Limited time scale - two years maximum.

6) Supervision of training, operating and progress to full licence by sponsoring licensee.

So, where are we? Is there to be a novice licence? Will it be exclusive to RSGB members? What will qualification be? Who will supervise it? I realise you don't want to be caught out printing hearsay, but come on Rob - what's happening? **Steve Hartley G0FUW**
Little Broughton
Cumbria

Editor's reply: With benefit of hindsight I must agree that Steve Hartley is right and it may appear that *PW* has ignored the Novice Licence proposals. However, I must firmly state my reasons and remind readers that - via 'Keylines' - I have attempted to continually draw attention to the horrendous confusion surrounding the Novice Licence, whether it be regulations, training or suitable training kits and specifications.

The full proposals were so confused that - at the time - I considered

that if they were published in this magazine the Novice Licence could have been 'murdered' before it was even been introduced. Since then (I'm very pleased to say!) the various anomalies have been gradually - and continue to be - sorted out. I'm afraid to say that they way things were going - we were heading for a typical British 'Cock Up'!

As soon as we have a **FINAL** date with proposals that make sense, that cause no discrimination or confusion between A and B licensees, we will publish them!

At this stage we can firmly state that there is to be a Novice Licence. The DTI has not announced a start date yet, but the RSGB hopes that the first examinations will take place in the Spring of 1991.

It is planned - of course - so that ANYONE (RSGB member or not) can participate. The RSGB has (among other institutions) tendered for the contract to handle the examination, but the authorities have yet to announce who the examining body will be. The RSGB is planning to run the training courses - via the volunteer 'army' of instructors and as I understand the situation, membership of the society is not a requirement for instructors.

Finally, G0FUW will be pleased to note that some of his - common sense suggestions - are very similar to the official proposals and I hope he'll see them when we (as promised) publish the finalised details.

G3XFD.

Receiving You...

Dear Sir

Ref: Permitted power on amateur h.f. bands

It is reported in the September issue of the RSGB's *Radio Communication* magazine that 400W c.w. power is to be permitted on h.f. bands because "There is an anomaly (sic) whereby higher power is permitted on s.s.b. which is measured in peak envelope power output".

Surely the present s.s.b. power limit was set at 400W because it was recognised that the average power of an s.s.b. transmission is much less than the peak power. An anomaly will rather be created if the effectiveness of a c.w. transmission is increased by 6dB over the vast superiority which the c.w. test enthusiasts have assured us exists already.

Fairness would propose that any new limit should be on average power, which given the modern addiction to 50Ω resistive load, something akin to hot wire ammeter should be enough to establish, and less argument should arise about digital modes, f.m. and a.m.

If this thing is to be,

does not the affront to the 'Morse-men' of a no-Morse h.f. licence become so minimal that such a licence should be instituted forthwith?

**Alex (Sandy) L. Dick
GM0IRZ
Dundee**

The Radiocommunications Agency have sent us the following reply to Mr Dick's letter:

Dear Sir

Ref: Permitted power on amateur h.f. bands.

I refer to your letter of 25 August 1990 addressed to *Practical Wireless* and concerning the above. You kindly copied the letter to the Radiocommunications Agency (RA) for clarification and so, I thought you may like to have our comments on this matter.

The present level of 400W (26dBW) peak envelope power (p.e.p.) for single side band (J3E) was derived from the equivalent p.e.p. of an amplitude modulated (A3E) transmitter with a carrier output of 100W (20dBW). An A3E transmitter with 100%

modulation has a p.e.p. output of 400W (26dBW)

A measurement of average power is inappropriate for speech waveforms. For J3E emissions, the p.e.p. under linear operating conditions of the transmitter is specified.

This encourages amateurs to use an oscilloscope to observe the output waveform and ensure there is no distortion (and consequent interference) due to overdriving. It is not possible to do this with a hot wire ammeter.

It is agreed that a c.w. (A1A) transmission has a considerable communications advantage over s.s.b. (J3E) in terms of signal-to-noise ratio, particularly if the narrow bandwidth of A1A (100Hz) is exploited by the use of narrow receiver filters. However, the Agency is not concerned with establishing 'fairness' between operating modes and will grant amateur facilities within operating modes and will also grant amateurs facilities (within national and international regulations) that can be

used provided there is no risk of undue interference to other radio users.

We cannot agree with the point you make in the last paragraph of your letter. The increase of power for A1A (and the consequent further increase in communications advantage over J3E) is not relevant to the case for a 'non-Morse' h.f. licence. It is an international requirement for amateurs to be proficient in Morse code to qualify for a licence to operate on frequencies below 30MHz.

At a recent meeting of the Conference of European Postal and Telecommunications (CEPT) administrations, where harmonisation of amateur examinations was discussed, the majority of administrations were in favour of retaining the Morse requirement for the use of amateur frequencies below 30MHz.

I hope this has clarified the situation for you.

**Richard D. Griffin
Radiocommunications Agency, London**

Dear Sir

It's not very often you hear of praise for planners but my previous doubts have now been dispelled.

Having, in all innocence, erected a 144MHz beam antenna, a polite letter from the town hall followed shortly inviting me to discuss whether I needed planning permission. After a very helpful chat with a planning officer he advised me to apply retrospectively.

Did they require plans? No, a decent photo with relevant dimensions shown would suffice. Despite vociferously objecting neighbours, the planning committee were happy for my antenna to stay up and my hobby to continue.

So not all 'faceless' town hall people are anti-amateur!

**Dave Neale G7DHW
Paignton
South Devon**

Editor: We'd be pleased to hear of similar experiences. Perhaps other readers have met helpful local authorities?

Practical Wireless, December 1990

Services

Queries

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

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

Back Numbers & Binders

Limited stocks of many issues of *PW* for the past years are available at £1.65 each including post and packing.

Binders, each holding one volume of *PW*, are available price £4.50 each (£1 P&P for one, £2 for two or more).

Send all orders to the Post Sales Department.

Subscriptions

Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Constructional Projects

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

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

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

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

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article. Kits for many of our recent projects are available from CPL Electronics and FJP KITS, both of who advertise in the magazine. The printed circuit boards are available, mail order, from the Post Sales Department.

Mail Order

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

Wireless Line

This is an information service for the radio enthusiast, updated each Friday. Calls cost 44p per minute peak time and 33p per minute off-peak. The number to ring is: (0898) 654632.

THANKYOU READERS

We're pleased to say that readers responded in a very generous way to the letter from Asantha Cooray in Sri Lanka (star letter November *PW*). Asantha now has a full subscription to *PW* and we'll pass on all the letters and best wishes to him.

EDITOR

Competition Corner

Wordsearch

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

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

Send your entry to PW Publishing Ltd., Dec 1990 Wordsearch Competition, Enefco House, The Quay, Poole, Dorset BH15 1PP. Closing Date last post received Friday 14 December 1990. The Editor's decision on the winner is final, no correspondence will be entered into.

First prize is a years subscription to Practical Wireless, two runners-up receive six months subscriptions.

Scanners
Wires and Waves
Dial Search
Flight Routings
Peter Rouse
WRTH

Doug de Maw
Klingenfuss
RAE Manual
Complete DXer
QRP Notebook

Aerial Projects
Out of Thin Air
Introducing Morse
ATV Compendium
Guide to FAX Stations

Name

Address

.....

.....

.....

.....

Postcode

Newsdesk '90

Volt Converter

New from CDS is the Isis (Intrinsically safe isolated supply), which has been designed and manufactured to comply with BS recommendations and will run any 12V p.m.r. or cellular transceiver from a 24V source with full 1000V isolation. This small switch-mode converter (only 65x70x108mm) and weighing only 380g has a panel-mounted fuse and fast-on terminals.

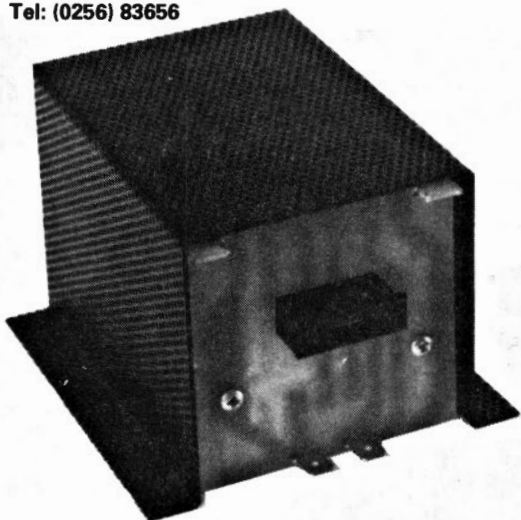
At less than £30.00, CDS consider it is probably the most cost-effective isolated converter in the industry.

For further information, contact:

Susan Saunders, CDS Ltd, PO Box 83

Basingstoke, Hampshire RG25 2PX.

Tel: (0256) 83656



Marconi Appointed

Marconi Marine, a division of Marconi Communication Systems, is the radio traffic accounting authority for the vessel 'Hoverspeed Great Britain', which during the summer completed the fastest crossing of the Atlantic Ocean by a

passenger vessel.

The appointment, made shortly before the record-breaking attempt, means that Marconi Marine will be co-ordinating all the charges for bridge communications from 'Hoverspeed Great Britain' and providing itemised billing and administrative services to Hoverspeed (UK) Ltd. the craft's owners.

Unique Morse Key

G4ZPY Paddle Keys are making a 'Once in a Lifetime' offer - for a unique Morse Key.

Their first key on offer is for a 22ct gold-plated 'very high speed' twin-paddle key. All the components (except for the silver contacts which will be gold-plated) will be made from best quality brass. This includes the base, which will be slightly larger than their steel-based models.

The final touch - the perspex paddles will have gold half Sovereigns inlaid in them.

The price, hold your breath, a mere £750 sterling!

They are also making a limited number of all-brass twin-paddle keys marked 'Special' under the base. The price for this key is £68.95.

If you would like a special type of key, they are open to suggestions. How about a gold-plated key inlaid with diamonds?

G4ZPY Paddle Keys
41 Mill Dam Lane
Burscough, Ormskirk
Lancs L40 7TG
Tel: (0704) 894299

Multi-function Control Module

The Universal Control Module is the quick plug-in answer to thousands of sensing, control and interfacing requirements.

Functions such as light sensing, temperature control and interfacing computers and PLCs to transducers, are easily achieved using a minimum of external components.

Available in 110/240V a.c. and 12/24V d.c. versions, the module contains a power supply, comparator, output relay, set-point control and status I.e.d.s. When the voltage at the sense input pin 6 exceeds the preset control

point, the relay contact changes over enabling heaters, motors, lamps, etc, to be switched directly. A regulated output of 9V at 50mA is available for driving sensors or external circuitry.

The set of data sheets supplied illustrate the products versatility in numerous engineering environments.

A new range of low-cost plug-in power supplies is also available.

Stuart Richards
Technova
Earl Road
Rackheath Ind Est
Norwich
Norfolk NR13 6NT
Tel: (0603) 720999

New Membership Secretary

BARTG are pleased to announce that Ann Reynolds G6ZTF, has taken on the task of their Membership Secretary.

Miss Ann Reynolds
G6ZTF
169 Bell Green Road
Coventry CV6 7GW.
Tel: (0203) 668491

Radio Club

Recently brought to our attention is an Electronics and Radio Club for Youth in Thanet, Kent. The average age for members is 13 and they'd be very pleased to hear from any interested young person. The person to contact is:

Ross Collins
37 Royal Road
Ramsgate, Kent

Amtor



AMT-3 Amtor/ RTTY Terminal Unit

Bored with simply sending packet messages via mailboxes on VHF? Itching to have a live QSO with someone on the other side of the globe again? Try Amtor. Amtor is by far the most reliable method of HF data communication, and the AMT-3 has been optimised to get the best from the mode. The AMT-3 is a third generation product from ICS, with firmware by G3PLX, the 'father' of Amtor.

- Compact packaging
- Status displays, tuning indicator
- RTTY transceiver
- CW ident
- Includes IBM-PC software
- 12 volt DC operation

Amtor gives virtually error free copy, even with poor signals, and yes, HF mailboxes with local VHF packet links can be accessed.

AMT-3: £179.95 inc. VAT
(£5.00 post and packing)



ICS Electronics Ltd. Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD

Telephone: 0903 731101 Facsimile: 0903 731105



Newsdesk '90

Greenweld Catalogue

The 1991 Greenweld Catalogue is out now. It has 132 pages packed full of components and equipment at prices you'll really appreciate. Included in each catalogue are their famous 'Bargain List' pages, plus an extra 16-page supplement and reply paid envelope. The catalogue is available at £1.50. Just send cheque/p.o./cash/credit card no. to:

Greenweld Electronics Ltd
27B Park Road
Southampton SO1 3TB
Tel: (0703) 236363

Capacitors

Now available from Unitel is the Kemet T399 Series of resin-dipped solid tantalum capacitors. These miniature axial products offer a number of useful design advantages including compactness and low leakage/dissipation factor performance - making them ideal for filtering, bypassing, coupling, blocking and RC timing circuits.

The range is available in a capacitance range of 0.1 μ F to 100 μ F ($\pm 10\%$ tolerance) and in voltages from 6.3 to 35V. For further details, contact:

Alan Coulling, Unitel Ltd, Tel: (0438) 312393

ARE Communications

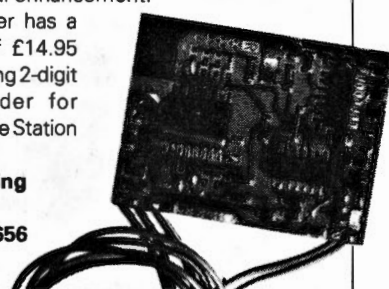
Brenda and Bernie Godfrey wish to point out that they are in no way connected with any other company and are still actively involved with ARE Communications.

Vehicle Identification

CDS Ltd have developed a low-cost vehicle identification system. The 2-digit encoder will send a 190 millisecond DTMF burst at the end of each over with a unique identity. The encoder can be programmed to one of 255 identities and will cut out 'horseplay' and despatcher confusion. This unit will operate on any two-way radio system (p.m.r., Band III repeater, etc) and its small size and price make it a useful enhancement.

The encoder has a dealer price of £14.95 and the matching 2-digit display decoder for fitting in the base Station is £49.95.

Stewart Harding
CDS Ltd
Tel: (0256) 83656



The Perfect Accessory

The New Maplin Electronics Portable Battery Powered Soldering Iron is a novel product which is powered by either 4 alkaline C cells or two NiCad C cells. The combined low voltage element/bit retracts when not in use. This serves both as a safety feature and also protects the element/bit from damage.

A conveniently placed push-to-heat button operates the iron and working temperature is reached in approximately ten seconds. A charging socket is provided so that NiCad cells may be charged in situ from an a.c. or d.c. adaptor (suitable type XX09K). Charging time is 12 to 16 hours.

The unit is supplied with two element/bits and solder, batteries are not included in the price of £4.95. Spare element/bits are available separately.

Maplin Electronics
Tel: (0702) 552911 Enquiries

Inlet Filter

Introduced by SASCO is a Belling Lee inlet filter which incorporates both a line fuseholder and double-pole switch. Designed to protect business machines, computers and similar equipment from mains-borne interference, the Type L2144 can also be 'snap-fitted' into a panel, thus saving both space and mounting costs.

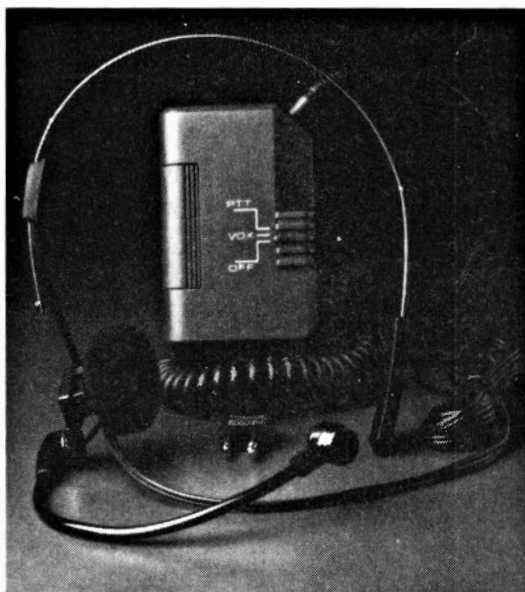
The filter can be supplied with either a red or green illuminated pushbutton switch and is rated at 1, 2 or 4A; 0-400Hz and 250V a.c. max. It will

normally employ X and Y type self-healing metallised paper interference capacitors which are SEMKO, NEMKO, DEMKO and VDE approved. These are rated at 0.1 μ F between lines (Class X2) and 2200pF for each line to earth (Class Y).

Inductance/line is 1A, 7.0mH; 2A, 2.4mH; 4A, 1.6mH; 6A, 0.9mH and the switch has a life in excess of 50 000 operations.

For further details, contact:

Steve Bacon SASCO
Tel: (0279) 28700



Introducing the MA18

Nevada are particularly pleased to introduce the MA18, a new VOX headphone and boom microphone into the UK, where there has been an increase in demand for a safe and reliable method of controlling transceivers whilst on the move.

The MA18 has selectable p.t.t. controls that enable either automatic voice operation or manual operation of the transceiver. Full control of both delay and mic. sensitivity enables the unit to be used in many different environments. The microphone element has an electret capsule that gives particularly clear and crisp audio reproduction.

The MA18 retails for £45.00.

Nevada, 189 London Road, North End
Portsmouth, Hampshire PO9 9AE.
Tel: (0705) 662145

The Supa-Tuta Plus

The new Dewsbury Electronics Supa-Tuta Plus is the complete solution in learning to send and receive the Morse code.

The self-contained unit contains all one needs to learn Morse and learn it thoroughly. From absolute beginner to expert, all can make use of the onboard facilities.

For learning to send Morse, the Supa-Tuta Plus offers: socket for Morse key or paddle, unique 'echo' mode, allowing students to send Morse back to the Supa-Tuta Plus for comparison, variable speed 2-99w.p.m. and weighting 30-70%, Morse character/element check, relay output as standard, dot and dash memory with iambic/single paddle operation. After learning Morse you can then use the Supa-Tuta Plus as a Morse keyer by simply connecting to your transceiver and talking to the world - in Morse.

Dewsbury Electronics
176 Lower High Street
Stourbridge
West Midlands DY8 1TG
Tel: (0384) 390063

Newsdesk '90

Bruel & Kjaer

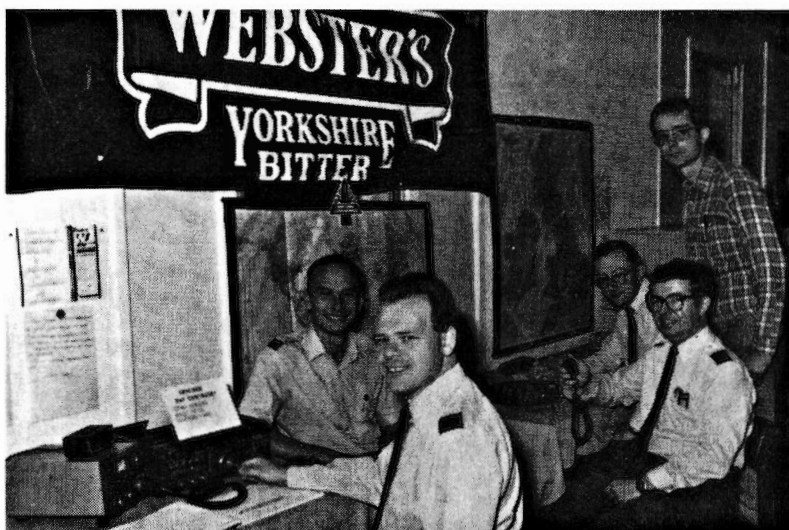
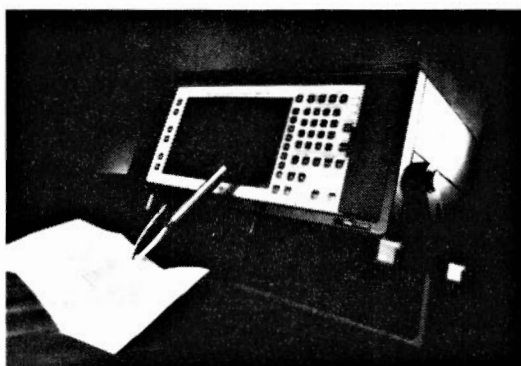
Bruel & Kjaer announce that a fast Fourier transform (FFT) option for its Type 2143 portable real-time analyser will be available later this year.

This firm-ware enhancement means that the 2143, introduced late last year by Bruel & Kjaer to transport laboratory performance in digital signal analysis into the field, will also offer faster FFT analysis than most mains-powered alternatives - indeed faster than Bruel & Kjaer's own bench-bound units.

Real-time operation (with 2/3 overlap and Hanning weighting) to 25kHz, variable number of analysis lines from 50 to 400 lines, 10x zoom anywhere in the frequency range and menu selection for ease of use - all in a battery-powered unit weighing less than 10kg will make the 2143 the ultimate tool for field analysis of noise and vibration.

For further information, contact:

Les Minikin
Bruel & Kjaer (UK) Ltd
92 Uxbridge Road
Harrow HA3 6BZ.
Tel: 081-954 2366



GB50 Battle of Britain

The special event amateur radio station, GB50BOB Battle of Britain, operated from the Battle of Britain Memorial Flight at RAF Coningsby proved a great success.

Operations started at 0001 Saturday September 1 and continued until 2359 Friday September 7. During the event 1176 contacts were made, all six

continents were worked, with RAFARS members contacted in three different continents.

The event was also sponsored to raise money for the RAF Benevolent Fund, British Aerospace Ltd., and Mann Norwich Breweries were their main sponsors, with donations being made by Katie Pearce Dental Surgeon, Lloyds Bank Ltd., National Westminster Bank Ltd. and

many other private individuals.

The call proved very popular and they send their apologies to anyone they missed in the pile-up. They received 75 QSLs direct during the week and a card will be on its way to every station contacted by the time this is published.

Plans are already underway for their next operation at RAF Coningsby.

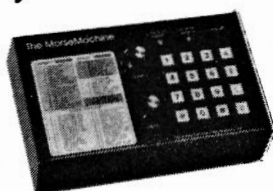
For the latest news of special event stations, rallies, what's on the bands - ring

Wireless-Line on 0898 654632

Calls charged at 33p off-peak, 44p all other times.

If you have news for inclusion on Wireless-Line ring (0202) 678558 in the evenings and leave a message on the answering machine.

Keyer



MM-3 Morse Machine

The MM-3 has all the features possibly needed in a morse keyer by either the complete novice or the experienced contest operator.

- 2 - 99 WPM speed range
- 8 K Bytes of Lithium backed memory in 20 soft partitions
- Comprehensive training facilities include random group, word generator and a QSO simulator

- Automatic contest serial number generation
- RS-232 computer interface
- Beacon mode
- Remote switches to activate memory send

The MM-3 is a third generation keyer from AEA which incorporates their years of experience. Dare we say that it's the best in the world?

MM-3: £169.95 inc. VAT
(£5.00 post and packing)



ICS Electronics Ltd. Unit V, Rudford Industrial Estate, Ford, Arundel,
West Sussex BN18 0BD Telephone: 0903 731101 Facsimile: 0903 731105



SPECIALISTS IN DRESSLER ACTIVE RECEIVE ANTENNAS

NEW ARA 1500

50-1500MHz
Now UPGRADED Sept 90

'N' Type Connection

Gain 11.5dB

Noise 3.0dB

Intercept point
3rd Ord
+ 21dbm

£159.00

Now with fully
tuneable
interface.



Now UPGRADED Sept 90

ARA 30 ACTIVE ANTENNA
50kHz...40MHz WITH LIMITED
PERFORMANCE UP TO 100MHz

Professional electronic circuitry
with very wide dynamic range.
Meets professional demands
both in electronics and mechanical
ruggedness. 1.2m long glass
fibre rod. Circuit is built into
waterproof 2.5mm thick
aluminium tube. Ideal for
commercial and swi-receiving
systems. £139. See Review in
August 1985 issue p.35

£139

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



Also a wide range of masthead pre-amps available
for most V.H.F. and U.H.F. frequencies,
including scanner pre-amps from £89.

dressler
COMMUNICATIONS LTD.

191 FRANCIS ROAD
LEYTON - E10 6NQ - LONDON

TELEX 8953609 LEXTON G

PHONE 081-558 0854 081-556 1415

FAX 081-558 1298

24hr Hotline ansaphone No: 081-558 0854

OPEN MON - FRI 9AM - 5.30PM

OPEN SAT - 9.30AM - 4.30PM

INTEREST FREE HP FACILITIES AVAILABLE

PROMPT MAIL ORDER

ON MANY ITEMS

AMERICAN EXPRESS



Prices correct at time of going to press. Please phone for latest
quote.

Or contact your local agent anytime on the following numbers:
Stuart (Bromley, Kent) 0860 634528. Terry (Biggleswade, Beds.)
0787 316431.

SPECIAL OFFERS

IC-R9000

INCLUDING
ARA 30 +
ARA 1500(N)
£3,995



IC-R7000

INCLUDING
ARA 1500(N)
£999



IC-R71

INCLUDING
ARA 30
£855

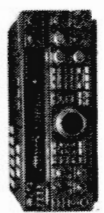


KENWOOD R5000

INCLUDING
ARA 30
£899



KENWOOD

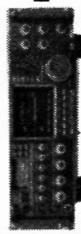


**NEW
TS950
H.F. TRANSCEIVER
EP.O.A.**

ALSO PANORAMIC DISPLAY
SM 930 STATION MONITOR AVAILABLE
P.O.A.

Kenwood R5000 + ARA 30 £3999
Kenwood R5000 £7999
VC200 Converter £190
TS980 HF + 6 Mtr Inc. Microphone £395
TS940 Inc Auto ATU £1,150
TS940 Inc Auto ATU £2,000
TS790 270 + SAT P.O.A.
TM241 2mtr FM NEW T.B.A.
TM77 Dual Band Handie T.B.A.
TR751E 2mtr Multimode £575

ICOM



**IC781
H.F. TRANSCEIVER
EP.O.A.**

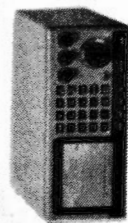
All ICOM stocked including accessories

IC 2SE IC 238E/H IC 970E/H
IC 2SE1 IC 322E/H COMPLETE
IC 4SE/SET IC 2400 VHF/UHF
IC 24ET IC 2500 BASE STATION
NEW MODEL IC 1275 IC 765
ALPHA 6 IC 735 IC 735
50 MHz IC 272 IC 726
6 CHANNEL IC 21 IC 751A
HANDIE IC 100 + SSB

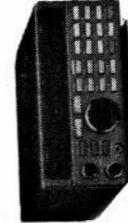
SCANNERS

AOR

AOR 3000 FIAM/SSB £985
AOR 1000 Mk II £249
AOR 2515 5MHz-1500MHz £575



**STANDARD
AX700**
PANADAPTOR DeLuxe
£575.00



FRG 9600
50 - 950 MHz
£500.00

YAESU



**FRG
8800
HF RECEIVER
£585.00**

VHF CONVERTER £100
FRG9600M 60-950MHz £500

LARGEST LONDON YAESU STOCKIST
FT747GX COMPLETE WITH FILTERS £549
UK SUPPLIED

FT736R £1195
FT4700R £499
FT470R (Inc. Nicad & Charger) £385

STANDARD

WE ARE STANDARD AUTHORISED DEALER
C500 DUAL BAND £335
C150 2 MTR £230
C528 DUAL BAND £379
AX700 SPECTRUM RECEIVER £575

SONY

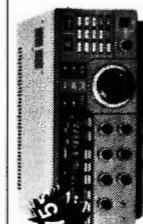
SONY ICF 2001D

76-100MHz
116-136 AIRBAND
153MHz-29.995MHz
FM - AM - SSB 32 MEMORIES
INC PSU, CARRY STRAP
& EARPHONE



Sony ICF SW 7600 £159
Sony SW1 150-30M C/S + FM Stereo £249
Sony Pro 80 £285
Sony Air 7 £229
Sony Accessories Available

JRC-NRD



**NRD 525
HF RECEIVER**
Special Price
Inc. ARA 30
£950 without

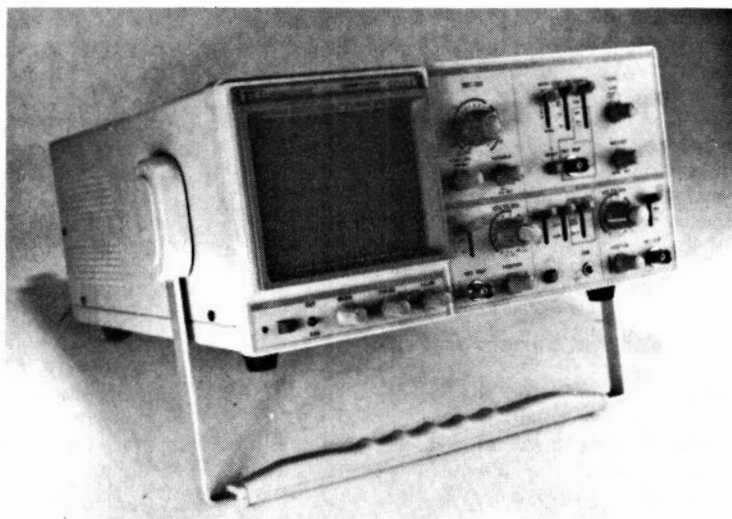
SPECIAL OFFERS ON YAESU

SPECIAL OFFERS ON ICOM

LARGEST ICOM YAESU DEALER IN LONDON

Topward 7021 Oscilloscope

The oscilloscope is perhaps the most versatile servicing and testing 'tool' to find its way into the radio enthusiast's workshop. Mike Richards G4WNC checks out the Topward 7021 from Maplin Electronics



The Topward TOS-7000 series of oscilloscopes distributed by Maplin Electronics has great appeal to the amateur and professional. The 7021 reviewed here represents a very popular model from the range that has particular appeal to the amateur. It features a 20MHz bandwidth, triple trace and a clear 150mm rectangular display.

So without more ado, let's take a closer look at the TOS-7021.

Facilities

The main rectangular display featured the usual controls with the intensity (brightness) and focus independently adjustable. There was also a variable panel light that could be used illuminate the graticule when working in poor light. Tilting of the display could be corrected by adjustment of a small pre-set that was accessed via the front panel.

The Y Amplifiers

Moving on to the Y amplifiers, these were both identical and featured standard b.n.c. input connectors. The input characteristics were at $1M\Omega$ in parallel with 25pF, which again is standard. The great advantage of keeping to standards is that a wide range of oscilloscope probes can be connected with predictable results.

The Y amplifier sensitivity could be adjusted in steps from 5mV/division through to 5V/division. There was also the facility to continuously adjust the sensitivity using a concentrically mounted rotary control. When working with very low level signals the sensitivity could be increased to 1V/division by pulling out the inner section of the sensitivity control. The only disadvantage with this was that the bandwidth of the Y amplifier reduced from 20MHz to 15MHz. However, it was still a useful feature.

An extra facility associated with Ch. 1 was that the Y amplifier output was available via a b.n.c. socket on the rear panel. This was handy for feeding less sensitive test equipment, i.e. a frequency counter.

The input coupling could be set to one of three options - a.c., d.c. or ground. This is a standard oscilloscope feature that is essential for practical use.

Unusual Features

One of most unusual features of the TOS-7021 was the provision of a third trace. Although the

input characteristics of this channel were the same as the others there were no coupling or sensitivity adjustments.

On the review model the sensitivity was fixed at 100mV/division. The only adjustment provided was the trace position and that was via a rotary control on the rear panel. Incidentally, I ought to mention that the third trace is turned on and off via a push-button on the front panel.

The TOS-7021 gives the operator several options as to how the outputs from the Y amplifiers are displayed. These are handled by two 3-way switches on the front panel. The first gives the option of displaying either one or both channels. The second switch controls how the signals are to be displayed.

With modern multi-trace oscilloscopes there is in fact only one trace available, the illusion of more is created by multiplexing the signals. The 7021 has three options - add, alternate or chop.

The add function simply displays the algebraic sum of the two input signals, so giving a single trace. Alternate and chop are the two multiplexing options. Alternate means the display alternates between the two channels after each complete sweep.

The chop option, on the other hand, changes between the two channels about 250 000 times per second. The choice between the two systems depends entirely on the frequency of the signal you are measuring. Generally speaking, chop should be used for low frequency signals and alternate for high frequencies.

Probe Calibration

The final point on the Y amplifiers concerns probe calibration. It is important that test probes are properly adjusted to compensate for the input characteristics of the scope, if accurate measurements are to be taken. The process is quite simple and involves displaying a square wave signal and adjusting the probe so that the signal is square with minimum under or over shoot (thus providing the squarest wave-shape). To facilitate this the TOS-7021 has an internal 1kHz squarewave generator that is accessed via a pin on the front panel.

The X Timebase

The X timebase operation was very simple comprising of a rotary control giving a variation of 0.2 μ S/division through to 0.5S/division in twenty steps. Continuous adjustment of the timebase was also available via a rotary control. Pulling this

REVIEW

control out gave a times ten magnification that could be very useful when monitoring high frequency signals.

An unusual but very handy extra was the ability to take the timebase signal from the Ch. 1 Y amplifier. When this was selected the external timebase signal was fed to Ch. 1 whilst Ch. 2 acted as the Y input.

The great advantage of this system was that you could adjust Ch. 1 amplifier sensitivity to suit the signal source. In many oscilloscopes the external X input is a fixed level point and is not always the easiest to use. From the amateur's point of view this facility is great for comparing two frequencies using Lissajous patterns.

Vital Synchronisation

One vital area for any oscilloscope is the triggering options. This is the section that allows synchronisation between the input signal and the timebase. Without this, it would be very difficult to obtain a steady display.

The 7021 gave the operator three areas of selection - mode, coupling and source. The mode defines the way in which the trigger is generated from the input signal. The options here were auto, normal and single.

Auto and normal were very similar, except that auto rejected signals of 50Hz and below. This is useful for signals affected by mains hum. The single mode gave a single sweep of the trace when a button was pressed and really only has an application when photographing the screen.

Rejection Option

Moving on to the coupling, as well as a.c. or d.c. there was an option to provide rejection of h.f. signals above 50kHz. This has particular application in the radio environment where the signal under test may have r.f. superimposed. If this is not removed it can be very difficult to get a steady trace on the

oscilloscope.

The final coupling option enabled the 7021 to synchronise to television video waveforms and has obvious applications.

Once the trigger mode and coupling had been set there were two rotary controls to be adjusted. The first set the trigger point and could be set anywhere on the positive or negative part of the signal.

The second was an unusual addition to this type of oscilloscope and provided a variable hold-off. This puts in a variable delay between each sweep of the display and can be useful for synchronising some complex signals.

The Z Axis Option

The only feature not yet covered was the Z axis input socket on the rear panel. For those not familiar with this option, it gives the facility to modulate the brightness of the trace with an external signal. The input for this comprised a B.N.C. socket on the rear panel with a sensitivity of 3V p-p and a bandwidth of 5MHz. This input was also t.t.l. compatible, so could be driven directly from standard logic signals.

That about covers the operational features of the TOS-7021. So let's now take a closer look at just how it performed on the bench.

Operation

The first point I noted about the TOS-7021 was its very smart and well laid out front panel. The panel was very uncluttered with plenty of room around all the controls.

Another good point was that controls were grouped neatly into functional areas. The 150mm display used by the TOS-7021 has become an industry standard and presents a very useful sized image. The brightness of this display was good, but don't expect to be able to get a bright trace when viewing in sunlight!

Bandwidth Benchmark

Bandwidth of the Y amplifiers is something of a benchmark test among oscilloscopes. Because of this, I thought it would be appropriate to measure the performance of the TOS-7021.

Before I go into that however, I ought to explain what bandwidth is in this context. Because oscilloscope Y amplifiers usually operate between d.c. and some upper frequency limit, bandwidth is the term used to specify that upper limit.

As the oscilloscope is a measuring instrument, we also need to define how much the gain can drop at these higher frequencies before the accuracy is severely compromised. The standard used is to quote the frequency at which the gain has reduced by 3dB.

As this reduction is usually a gradual one you will find that many oscilloscopes can still operate as indicator well above their specified bandwidth. One important point to note though is that at the higher frequencies, fast rise time signals such as a square wave will be severely distorted.

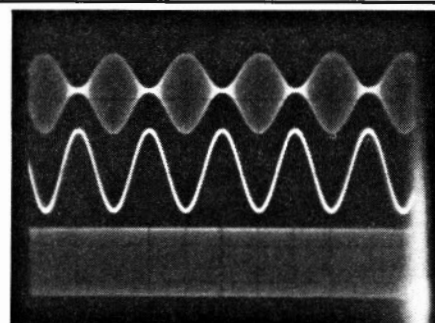
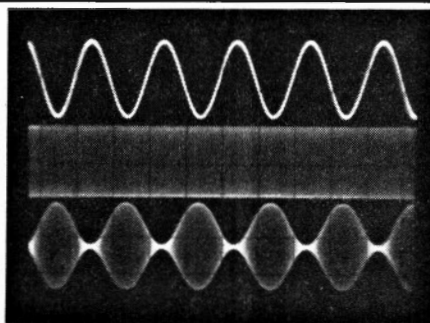
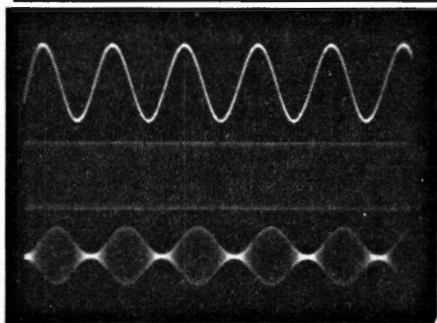
Excellent Performance

So back to the matter in hand and the performance of the TOS-7021. The Y amplifiers showed a very smooth gain roll-off with -3dB points of 31MHz and 37MHz for Ch. 1 and two respectively. This was an excellent performance and well within the advertised specification. This gain reduction continued smoothly up to 60MHz where both channels were -12dB. Above 60MHz the gain dropped very rapidly indeed.

With my testing of the two main Y amplifiers completed, I moved on to the Ch. 3 amplifier. This

Specifications

Sensitivity	
Ch.1 & Ch.2	5mV/Div. to 5V/Div. \pm 3% 10 calibrated steps.
Ch.3	0.1V/Div. fixed.
Bandwidth (-3dB)	
Ch.1 & Ch.2	d.c.(a.c. 10Hz) to 20MHz
Input Chars.	1M Ω /25pF
Max. Input	
Ch.1 & Ch.2	400V d.c. + peak a.c.
Ch.3	100V d.c. + peak a.c.
Timebase	
Internal	0.2 μ S/Div. to 0.5S/Div. \pm 3%
External	5mV/Div. to 5V/Div.
Bandwidth	d.c. to 1MHz
Phase Error	
X/Y operation	<3 degrees, d.c. to 50kHz
Z Axis	
Sensitivity	3V p-p t.t.l. compatible
Bandwidth	d.c. to 5MHz
Impedance	5k Ω
Display	
Size	152 x 152mm
Effective Area	80 x 100mm
Phosphor	P-31
Power Supply	
Voltage	115, 125, 230 or 250V; 50 or 60Hz; 40W
Dimensions	314 wide x 165 high x 425mm deep
Weight	9kg approximately



A selection of waveforms from a variety of radio and audio frequency signals as displayed on the Topward TOS-7021.

was specified as having a fixed input sensitivity of 100mV/division with no bandwidth quoted.

The measured 3dB bandwidth of this channel was 5MHz, though the response continued as a smooth roll-off up to 20MHz. As this channel was configured more as an indicator than an accurate measure, this performance was adequate.

Whilst dealing with the Y amplifiers, I made some checks on the calibrator output. This was specified as having an approximately 1kHz output of $0.5V \pm 5\%$. The review model was within specification having a frequency of 950Hz and giving a square-wave measuring 0.49V p-p.

I continued with several measurements around the timebase accuracy. These all proved to be well within the advertised specification.

Particularly Useful Feature

I spent some time using the TOS-7021 to examine many different types of signal and found no problems worthy of note. However, one feature that I found particularly useful was the ability to use Ch. 1 to supply an external X timebase.

This feature was really good for frequency comparisons using Lissajous patterns. The great advantage being the full adjustment of the X and Y axis sensitivities.

The only point I found slightly irritating was the placement of the Ch. 3 vertical position control on the rear panel.

PW

Conclusion

The TOS-7021 certainly proved itself to be a very smart and capable instrument throughout the review period. Many of the measured performance areas exceeded the published claims, so making the TOS-7021 particularly good value for money.

The range of features included were well thought out giving the TOS-7021 excellent versatility. The amateur in particular will, I'm sure, find this oscilloscope fits the bill. However, if you have a particular interest in digital signals it may well be worth considering one of the TOS-7021's bigger brothers. There are instruments with bandwidths to 40MHz and delay timebases in the range.

The TOS-7021 is on special offer at £299.95 (£334.95 from 1 January 1991) and is available from Maplin Electronic Supplies.

My thanks to Maplin for the loan of the review model.

"YOU NEVER KNEW THERE WAS SO MUCH IN IT"

- AVAILABLE FROM LARGER NEWSAGENTS OR DIRECT FROM CIRKIT
- £10 WORTH OF DISCOUNT VOUCHERS
- LOW COST MULTIMETERS
- MANY NEW PRODUCTS



THE NEW WINTER 90/91 CATALOGUE OUT NOW FREE!

25W SOLDERING IRON WORTH £5.98

WHEN YOU SUBSCRIBE TO THIS AND THE NEXT TWO ISSUES - FOR ONLY £5.00. SIMPLY FILL IN THE COUPON AND KEEP UP TO DATE!

184 PAGES PACKED WITH COMPONENTS, KITS, TEST EQUIPMENT AND BOOKS...

BATTERIES
BOOKS
CABLE AND WIRE
CAPACITORS
COMPONENT PACKS
COMPUTERS
CONNECTORS
COUNTERS AND TIMERS
CRYSTALS
FILTERS
HARDWARE

INDUCTORS
KITS AND MODULES
METERS
PCBs & EQUIPMENT
RELAYS
RESISTORS
RIGS AND RECEIVERS
SEMICONDUCTORS
SPEAKERS/SOUNDERS
SWITCHES
TEST EQUIPMENT
TOOLS
TRANSFORMERS

Cirkit

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



Please supply:

- ☐ Winter '90/91 Catalogue @ £1.60
☐ Winter '90/91 Catalogue and subscription to the next two Issues @ £5.00

I enclose Cheque/Postal Order for

Please debit my Access/Visa card for

NAME:

ADDRESS:

POST CODE

ACCESS OR VISA

EXPIRY DATE:

SIGNATURE:

DATE:

A Simple Pre-Amplifier For The 70MHz and 50MHz Bands

Is your 70MHz or 50MHz receiver a little 'deaf'? If so, Adrian Knott G6KSN suggests that you try this little pre-amplifier project to 'pep' it up!

Now that the 50 and 70MHz bands can be used by both A and B licensees, much of the surplus p.m.r. equipment suitable for conversion to the bands has found its way into shacks throughout the UK.

I bought a couple of surplus E band f.m. Pye Westminsters - at a very reasonable price. These were subsequently re-crystalled and re-aligned for the 70MHz band. It wasn't a difficult job and there were no problems. The transceivers have been working for some while, with (touch wood!) no faults as yet!

I found that for local working my dipole at 15m combined with my 13W (or should that be 11.14dBW?) of r.f. produced many interesting QSOs from stations who were up to 80km away.

Lacking Sensitivity

Despite the successful contacts, I noticed that stations using transverters, and the like, were giving me consistently better reception reports than I was able to give them. I put this down to the suspicion that the 'front end' of my converted p.m.r. rig was a little 'deaf' so to speak!

After some investigation I discovered that the receiver side of the rig used a pair of cascaded 2N3819s as r.f. amplifiers. Although the 2N3819 is an excellent f.e.t., their performance drops off at 50MHz and they are even less effective at 70MHz. So, after my discovery I decided that I had to find a cure for the problem.

Dramatic Increase

It's well known that in an f.m. system, even a modest increase in the carrier level can result in a dramatic increase in receiver quieting. In other words, this is the amount by which an un-modulated carrier reduces the demodulated audio noise level at, or around the receiver's threshold point.

With this in mind and the fact that the low v.h.f. bands have a high ambient noise level, I decided that a pre-amplifier based on a BF180 transistor would do the job - especially as they're cheap, have a reasonable performance and they lurk in abundance in old u.h.f. TV tuners in my junk box!

The Pre-Amplifier Circuit

The full circuit diagram is shown in Fig. 1, and to give some idea of the improvement - a 3dB quieting signal without the pre-amplifier was increased to over 20dB quieting! This certainly made the difference between a signal being awarded readability 2 and fully 5 on the RST gradings.

Obviously this improvement would not be obtained with a modern receiver using up-to-date techniques. In fact, the performance of such equipment could be degraded rather than enhanced, but the change in performance of older Pye equipment has to be heard to be believed.

The improvement would be even more marked if the amplifier was used in conjunction with one of the much older Pye Cambridges or Westminsters - and I've no doubt that there are many of those still in circulation.

How It Works

The input signal is fed to the tap at 1.5 turns up from the earthy end of L1, which is resonated by C3. Correct matching to TR1 is provided by the auto-transformer action of L1.

The capacitor C1 acts as an r.f. coupling capacitor for the input to TR1, and as a d.c. block so as not to interfere with the transistor biasing. TR1's bias supply is obtained from potentiometer R4 which can be a fully variable or of the 'trimpot' type with C2, acting as a low-pass filter to help prevent instability.

The resistor R2 provides d.c. stabilisation while C4 effectively decouples the emitter of TR1 at r.f. The collector of TR1 is fed to the resonant combination formed by L2/C6 and the r.f. output is then taken from the tap on L2 via the coupling capacitor C7.

Power for the amplifier is fed to the circuit via R3 with C8 and C5 de-coupling the 12V supply lines at l.f. and r.f. respectively.

Because high gain is available from the amplifier, instability could result from r.f. coupling between L1 and L2. To prevent this, a simple tinplate screen is fitted so that neither coil can 'see' the

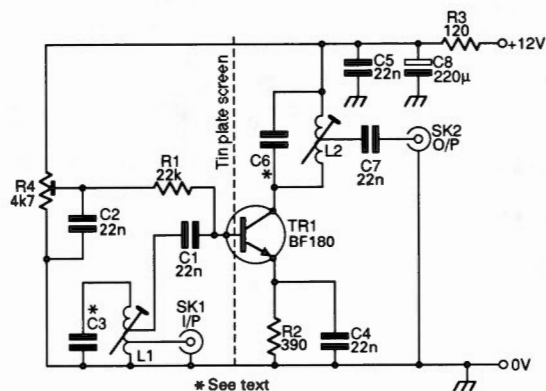


Fig. 1. Circuit diagram.

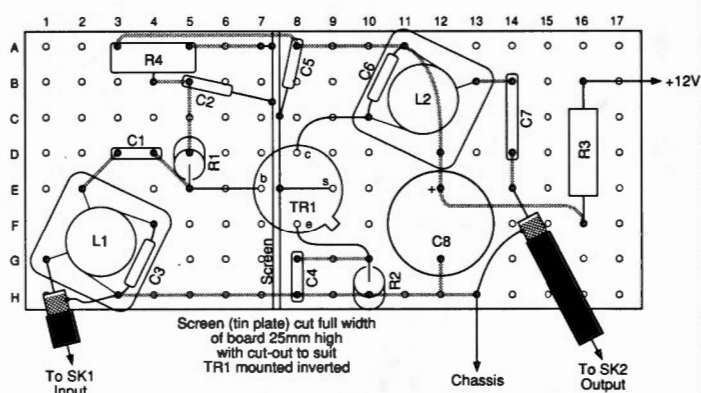


Fig. 2. The overlay built on 0.1in. perforated matrix board.

other and is soldered (with care) directly to the 'can' of TR1.

Construction

Building the amplifier should be quite easy and very straightforward if standard v.h.f. construction practices are followed. You should keep all leads as short as possible, bearing in mind that the one lead you do leave slightly longer than necessary - will be the one to cause you problems later!

Extreme care must be taken when the tin-plate screening is soldered directly to the can of TR1. The soldering iron must be in contact with the transistor for the shortest time possible. I thoroughly recommend that a large heat-sink is used immediately afterwards, or that you have an ice-cube (suitably wrapped in a corner of a water-proof plastic bag) ready to place on the rather warm device!

Alternatively, you may prefer a safer method utilising the shield connection from the BF180, which can then be soldered directly to the tin-plate screen as shown in the diagram.

Setting Up

With the amplifier installed, you'll be ready to start testing and setting-up the amplifier. If you have access to a suitable signal generator it should be set to initially provide a fairly strong signal output. Alternatively, you could arrange that another (preferably local) amateur be on stand-by to provide a test signal.

To adjust the amplifier, you should turn the spindle of R4 to its middle setting and 'trim' the cores of L1 and L2 to achieve the best 'quieting'. Repeat this operation until no further improvement can be obtained.

You should now adjust R4 for optimum 'quieting', which will probably require the potentiometer to be somewhere near its mid-value setting.

The pre-amplifier is now aligned and ready for you to hear weaker stations that were previously 'down in the noise'.

Six Metre Option

Since the 50MHz band is not too far removed in frequency terms from 70MHz, it's only a simple matter of changing the resonating capacitors C3 and C6 from 33pF to 68pF. No other modifications are necessary.

HOW MUCH? £8

HOW EASY? INTERMEDIATE

Shopping List

Resistors

5% 0.4W carbon film

120Ω 1 R3

390Ω 1 R2

22kΩ 1 R1

Variable Potentiometer

4.7kΩ 1 R4 (See text)

Capacitors

Ceramic Miniature Plate

33pF 2 C3, C6 (See text)

22nF 5 C1, 2, 4, 6, 7

Electrolytic 16V Working

220μF 1 C8

Coil Data

L1 6 turns 24s.w.g. wound over 15mm on 5mm former, tapped at 0.5 and 1.25 turns

L2 6 turns 24s.w.g. wound over 15mm on 5mm former, tapped at 1 turn

Semiconductor

BF180 1 TR1

Miscellaneous

Screened metal box, perforated matrix board, tinned copper wire, coaxial plugs and sockets to suit, power supply leads.

Conclusions

On 70MHz with the pre-amplifier fitted to former p.m.r. rigs, I get very good results. The 13W from my transceiver into a home-brewed 3-element beam produces many interesting QSOs, especially as I can now hear the more distant stations!

Mobile 'flutter' on 70MHz is also much reduced and reception is generally very much improved. All these factors make 70MHz the ideal band for inter-G and mobile working. I'm now beginning to explore 50MHz and with the gradual easing of restrictions, I'm sure there'll soon be much more activity on that band too!

PW

**Be sure of getting your
copy of PW each month.
Place this regular order
form with your
newsagent... today**

Dear Newsagent, Distributed by Seymour
please reserve / deliver my monthly
copy of PRACTICAL WIRELESS

NAME

ADDRESS

.....

.....

Signed

Valve Technology & Characteristics Part 4

This month Peter Buchan G3INR deals with the methods of calculating the gain of pentode audio stages.

The circuit of Fig. 4.1 shows a pentode valve circuit complete with anode cathode, and screen resistors. The cathode and screen resistors are de-coupled to earth. We note that the pentode is an EF86 (this valve followed on from the popular EF37A) and those more familiar with valves will remember that the EF86 was designed to be a very low noise audio amplifier valve.

What can we deduce about this circuit, apart from the fact that it is an amplifier? The value of coupling and de-coupling components might give a clue about the bandwidth of the circuit, but will not tell us much more. Perhaps if we stretch the imagination (just a little!) we can assume that we have the circuit on the bench before us, made up on a chassis complete with a power supply.

Now we can take measurements of the supply voltage, the anode, screen, and cathode voltages, and from these calculate the currents flowing through the valve.

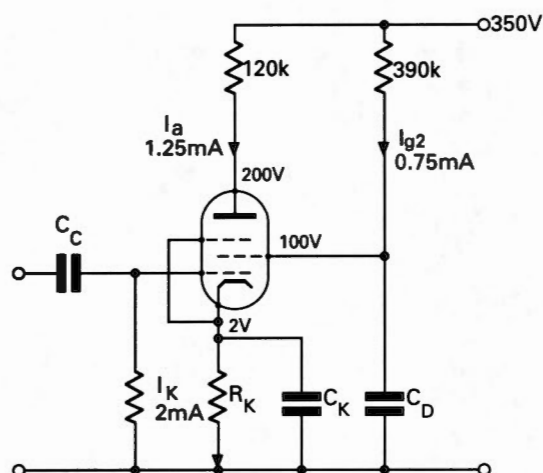


Fig 4.1: Shows an EF86 pentode valve with anode, cathode and screen resistors and the various voltages that constitute the d.c. conditions.

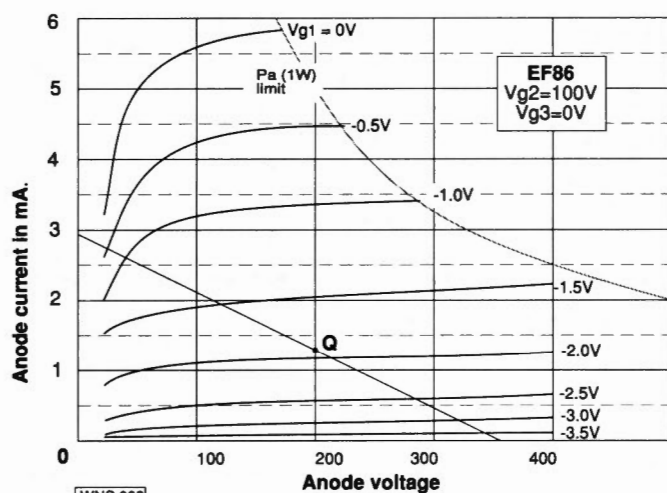


Fig. 4.2: Characteristic for the EF86 with 'Q' point set at a V_{g1} of -2V.

Power Limit

On the diagram, Fig. 4.2, you will notice printed on the characteristic curves a line titled (at the upper end) $P_{a\max}$ 1.0W. This is the valve maximum dissipation curve. Any setting of anode current and voltage must lie below this curve. This is for the Class A operation of the valve as an amplifier.

Although desirable for high fidelity applications, class A is nevertheless inefficient. From this grew the AB₁ or AB₂ class of operation for valves. In this particular class, two valves are used in 'push-pull' operation.

To achieve this, each valve is biased towards its 'cut-off' point and operates over one half signal-cycle only. One valve taking care of the positive going half-cycle and the other valve the negative half cycle.

Voltages

Starting with the supply voltage V_s , we find that it is 350V, the anode voltage V_a , 200V, the screen voltage V_{g2} , 100V, and finally the cathode voltage V_k , about 2V. The control grid voltage g_1 , being tied to 0V is about -2V with respect to the cathode. (Note; you will see that the grids have been given numbers, i.e. the control grid being g_1 , the screen grid g_2 , and finally the suppressor grid g_3 . Some valves have more than three grids but the same system still holds).

So - where do we go from here? Well first let's calculate the anode current I_a . Noting that the supply voltage is 350V and the anode voltage 200V, then the drop across the anode load resistor (R_a) is $350-200=150V$. Dividing this difference by the anode resistor, $120k\Omega$, gives an anode current of 1.25mA.

Moving now to the cathode, we see that there is about 2V dropped across a $1k\Omega$ resistor, so the cathode current is in the region of 2mA. But in the triode both the anode and cathode currents were the same, so why is there this discrepancy?

Extra Grids

Don't forget we are dealing with a pentode and there is an extra grid, g_2 , which draws some current. Can this difference of about 0.75mA, be the screen current? Let's see!

The difference between the supply voltage and screen voltage is 250V, the value of the screen resistor is $390k\Omega$, and hence the screen current is about 0.64mA, which is close to 0.75mA, the 0.11mA can be considered as being due to experimental error.

Characteristics

Look now at Fig. 4.2, which shows the EF86 characteristic. A load line has been drawn through from slightly under 3mA (2.92mA) on the I_a axis, to 350V on the V_a axis. The chosen working point, often called the 'Q' or quiescent point, is set at almost -2V. V_{g1} , indicates an anode voltage of 200V and an anode current of just about 1.25mA.

So, you can see that the calculated values tie up nicely with the graphical ones. What we have done is to establish the d.c. conditions for the valve.

For the valve to function as desired it is essential that the d.c. conditions are correct. This would be one of the first things you would want to find out if you were looking for a fault in an audio amplifier.

Incidentally, what would you need to know about the meters you used to measure these voltages with, especially the screen grid voltage? (You'll be able to check to see if your answer was right at the end of the article).

Calculating Gain

So much for the d.c. conditions then, but what about the performance of the valve as an amplifier? It is possible to extract the constants r_a , g_m , and μ , from the graph but better perhaps to take advantage of the fact they are to hand with the characteristics.

The manufacturers figures are $r_a=2.0M\Omega$, $g_m=2.2mA/V$, and by calculation μ , is 4400. Do you remember the equation for voltage gain for the triode? Don't panic - there's no need to worry as it's the same equation for the pentode!

$$A_v = \frac{\mu}{1 + \frac{r_a}{R}} \quad (250 \text{ without other stage loading})$$

Putting in the values for r_a and R in the above equation, yields a voltage gain of about 250. This is only the stage gain without the following stage load.

To be of any use we must include this extra load for the amplified signal. This is usually the grid circuit of the following stage.

It is from here that we modify the circuit to that as shown in Fig. 4.3, where we see the familiar pentode circuit but with additional components. One of these components is the anode-cathode capacity C_{ak} (about 5pF) the second is the coupling, or d.c. blocking capacitor C_c (10nF) and the third is the following stage g_1 grid resistor R_1 (1.0M Ω).

The fourth component is the grid-cathode capacitance of the following valve, C_{gk} , which is approximately 4pF. Finally the stray capacitances C_{Stray} must also be considered. These components have a definite effect on the bandwidth of the amplifier stage, and it's this effect that we must now examine.

Equivalent Circuits

To help with this investigation, an equivalent circuit is often drawn. Unfortunately, this sometimes seems to cause more confusion than assistance!

Despite this, it does in fact make the matter clearer, so persevere and remember that to the signal, the supply voltage line appears to be 'earth' by virtue of the fact that the smoothing capacitors in the p.s.u., have a very low impedance at the signal frequency.

So study the figures Fig. 4.3 and 4.4 and see if you can understand why the anode resistor, R_a , is in parallel with the valve r_a , not forgetting the following grid resistor together with the capacities C_{ak} and C_{gk} as well.

The coupling capacitor C_c is in series with the stages and affects the low frequency performance. All these components constitute the load into which the EF86 transfers its energy.

Don't worry too much about how the three equations for low, mid and high frequency performance were arrived at, unless you feel inclined that way!

However, I do recommend that you try and use

Practical Wireless, November 1990

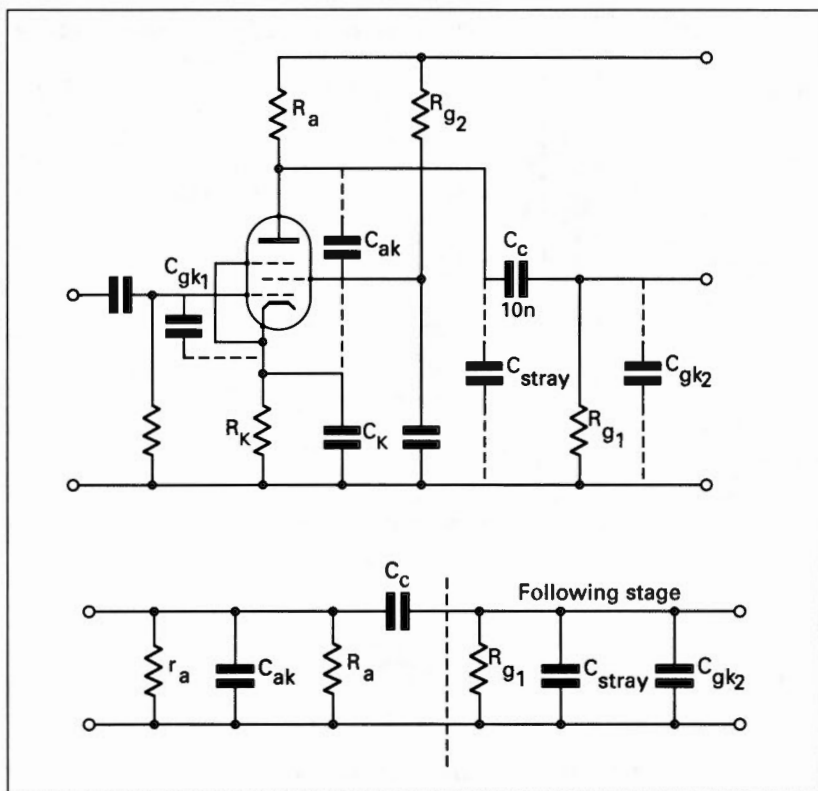


Fig. 4. 3. Circuit showing the various capacitances C_{ak} , C_{gk} , and the 'strays' plus the following input components with the equivalent a.c. calculation criteria shown underneath.

the equations because they are very enlightening and are very similar to those used for transistor circuits.

You will now realise that the bandwidth of the amplifier is calculated utilising three performance characteristics. Starting with the mid frequency performance, followed by either the upper or lower frequency performance.

Current Source

The equivalent circuit used to describe the pentode valve circuit is usually a current source, by virtue of the fact that the pentode looks and behaves like a current source. Remember the characteristic? The current source drives current into the combination of resistors and capacitors.

At mid frequencies - say from 500Hz to about 20kHz - some of the components have virtually no effect on the performance of the valve as an amplifier, so they are not used in calculations.

The small diagram Fig. 4.4 shows the mid-band load equivalent. Above and below the mid frequencies other components become significant and they must be taken into consideration. You will see this from the different circuits, Fig. 4.5 and Fig. 4.6, which are used to describe the performance of the valve above and below the mid-frequency range.

Mid Band Gain

Always start from the mid-band range and you can see from the calculation:

$$\text{Calculating } R_{Total} \text{ using } \frac{1}{R_{Total}} = \frac{1}{r_a} + \frac{1}{R_a} + \frac{1}{R_{g1}}$$

$$R_{Total} = 102k\Omega.$$

At mid - band the stage gain then becomes :

$$A_v = \frac{\mu}{1 + \frac{r_a}{R_{Total}}} = 214$$

that the theoretical amplification, using a figure of $1\text{M}\Omega$ for R_{g1} , is 214, about 15% lower than that without this load. At each 3dB point the amplification will have fallen to a factor $1/\sqrt{2}$ times the mid-band gain figure. In Fig 4.5, the high frequency circuit equivalent is shown with C_T shunting the load circuit and the 3dB point is calculated:

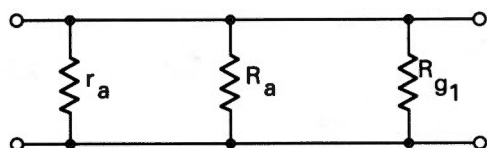


Fig. 4.4: The circuit which describes the conditions for mid-frequency amplification.

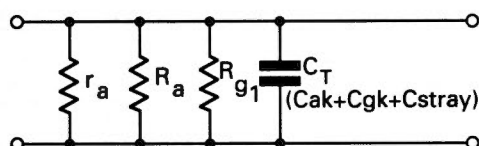


Fig. 4.5: High frequency gain equivalent circuit.

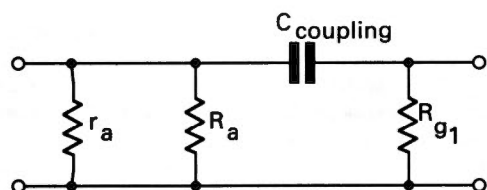


Fig. 4.6: The low frequency equivalent circuit.

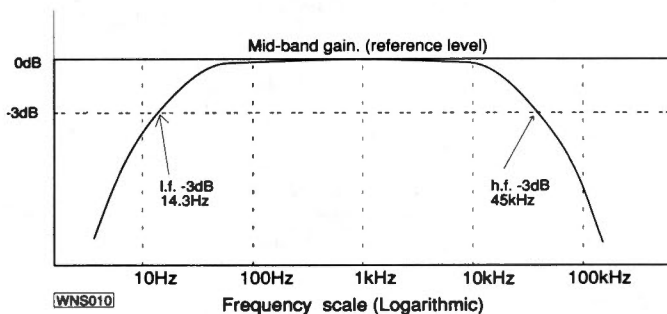


Fig. 4.7: A graphical representation of the gain bandwidth curve.

$$f_{3dB(h.f.)} = \frac{1}{2\pi \times R_{Total} \times C_T} \text{ where } C_T \text{ are strays}$$

If we assume C_T to be about 25 - 50pF (35pF used) then the high frequency - 3dB point is :

$$f_{(h.f.)} = \frac{1}{6.28 \times 1.02 \times 10^5 \times 3.5 \times 10^{-11}} = 44.6\text{kHz}$$

Some improvement could be made to the high frequency response by careful dressing of the wiring. The figure of 25pF for the 'strays' was an arbitrary choice, but serves to demonstrate the general idea behind the subject. In practice the 'strays' are found by plotting the amplifier performance and deducing from that what stray capacity is present.

At the lower frequency Fig. 4.6, the equivalent circuit is shown with $C_{Coupling}$ limiting the voltage developed across R_{g1} and here the low frequency 3dB point is calculated.

$$\frac{\text{Gain at low frequency}}{\text{Gain at mid frequency}} = \frac{1}{\sqrt{1 + \left(\frac{X_c}{R_{Total(l.f.)}}\right)^2}}$$

$$\text{where } R_{Total(l.f.)} = R_{g1} + \frac{r_a \times R_a}{r_a + R_a} = 1.1\text{M}\Omega \text{ and}$$

$$X_c \text{ is the reactance of } C_{coupling} = \frac{1}{2\pi \times f \times C_{coupling}}$$

$$\text{When } X_c = 1.1\text{M}\Omega, f = 14.3\text{Hz}$$

Perhaps you will also notice that the l.f. -3dB point is really very low in frequency. This is due to the fact that the 10nF capacitor used as coupling capacitor is quite a large value. A 1nF capacitor would have been satisfactory and would have given a 3dB point at about 143Hz, which is a sufficiently low a frequency for all practical purposes. The gain/bandwidth parameters are shown diagrammatically in Fig. 4.7.

So much for the pentode at audio frequencies, in Part five we will explore the use of a pentode valve in an r.f. circuit.

Measuring Grid Voltages

As with any measuring method, the loading of the test equipment causes changes in the condition(s) to be measured. A voltmeter of greater than $20\text{k}\Omega/\text{V}$ should be used on at least 200V f.s.d. (and even this could cause a 10% lower than expected reading.)

To be continued

Radio Diary

*Practical Wireless and Short Wave Magazine in attendance.

***November 18:** The Bridgend Annual Amateur Radio Rally will be held in the Leisure Centre, as last year but in 1990 they are taking over the whole of the building! **Don Chennell GW4DUY. Tel: (0656) 863084.**

December 9: The Leeds & District ARS have their Christmas Rally in The Civic Hall, Dawsons Corner, Pudsey (junction of the Leeds Outer Ring Road and Bradford Road A647). Talk in on S22. All usual facilities. Admission is by program only, 50p. Doors open 10.45. **Geoff on Leeds (0532) 585801.**

THE COMPANY THAT BRINGS YOU THE LATEST TECHNOLOGY - FIRST !

SALES HOTLINE 021 552 0073 and HELPLINE 021 552 0051 (Office Hours)

ANOTHER RAYCOM PACKAGE

The **TOKYO HX240** HF Transverter when coupled to an all-mode 2m rig will give you 50W on 80 to 10m. RAYCOM have put together this unique unit with the new YAESU FT290RII.

IT WORKS GREAT !



FT290R II £429.00
TOKYO HX240 £249.00
1/2 Size G5RV £ 14.95
12 Amp PSU £ 59.95
Nicads & Wall Charger £ 31.30
Total regular price £784.20

RAYCOM PACKAGE .. £699.00

YOU SAVE £85.20 !

Includes ALL D.C. and Co-ax leads

**EXCELLENT HF AND VHF STARTER PACK
COME IN AND TRY IT FOR YOURSELF - YOU
WILL NOT BE DISAPPOINTED**

FULL RANGE OF YAESU AND ICOM ALSO STOCKED

HP100E/AR1000

**Exclusive to RAYCOM
Short wave converter Module**

Made in the UK by AKD

Coverage 200kHz to 30MHz

HP100E with converter £299.00

HP100E no converter £249.00

Converter only £ 59.00

NOTE

HP100/AR1000 not purchased from RAYCOM requires modification to work with the converter Cost £15.00

THE UK SCANNER EXPERTS

**WE HAVE SECURED LIMITED QUANTITIES OF THE NEW ICOM SCANNERS
DIRECT FROM JAPAN - HURRY TO RESERVE YOUR ONE NOW !**

The FANTASTIC ICOM ICR1 and ICR100

IC-R1 500kHz to 1300MHz £399.00
IC-R100 500kHz to 1800MHz £499.00

OTHER HIGH QUALITY SCANNERS FROM RAYCOM

BEARCAT UBC 50/55XL 66-88/136-174/406-512MHz £99.95
10 memories, channel review, including FREE charger worth £4.95
BEARCAT BC 70XLT 66-88/136-174/406-512MHz £149.99
20 memories, full frequency display, with FREE car charger kit worth £4.50
BEARCAT UBC 100XLT 66-88/118-174/406-512MHz £199.99
100 memories, airband, search, including FREE car charger kit worth £4.50
BEARCAT UBC 200XLT 66-88/118-174/406-512/806-956MHz £229.99
200 memories, top of the range, including FREE car charger kit worth £4.50
BEARCAT UBC760XLT 66-88/108-174/350-512/806-956MHz MOBILE £229.99
100 memories, 5 search bands, including FREE mains adapter worth £4.95
NEW JUPITER MVT 6000 mobile ONLY £329.00
25 to 550 MHz and 800 to 1300MHz, 100 Memories
JUPITER MVT 5000 Hand-held ONLY £249.00
25 to 550MHz and 800 to 1300MHz, 100 Memories
AOR 3000 base Limited Supplies available £699.00
0.1 to 2036 MHz, 400 mems, LSB/USB/CW/WFM/NFM/AM

MANY OTHER TYPES AND MODELS STOCKED - NEW AND USED.

SEND AN SAE FOR OUR LATEST USED LIST

URGENTLY WANTED - USED SCANNERS AND HAM GEAR, WORKING OR NOT.

ICOM IC-R7000



Listen to weather, fire, coastguard, TV, airband and many, many more. Wide frequency coverage provides you with all the channels you need to become a VHF and UHF listener. Frequency coverage is guaranteed from 25 to 1300MHz, but may extend on individual units to 2GHz! Features include:

- USB, LSB, FM, FM-N, AM
- 99 memory channels, keypad entry
- optional infra-red remote control
- variable speed scan and delay
- optional voice synthesizer
- six tuning steps
- sensitivity < 0.3µV for 10dB SINAD

Save £108! Raycom price £925

including FREE Royal 1300/AH7000 25 - 1300MHz discone complete with co-ax and plugs.

CHARGE IT!

Why not take advantage of the **RAYCOM Credit Card** and spread the payment for that scanner you've always wanted. Example: Yaesu FRG9600 MKV package £70 deposit and £28 per month (APR 36%). Call for a quote and written details! Licensed credit broker.

YAESU FRG9600

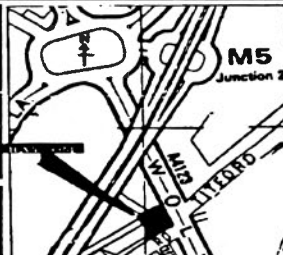


9600 standard 60-905MHz £469.00
9600 MkII 60-950MHz £499.00
9600 MkII pack 60-950MHz .. £545.00
9600 MkV 0.2-950MHz £625.00
9600 MkV pack 0.2-950MHz .. £699.00
Standard to MkII .. Upgrade £ 40.00
Standard to MkV .. Upgrade £149.00
MkII to MkV Upgrade £129.00
Packs include PSU and ROYAL 1300!

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

RAYCOM
COMMUNICATIONS SYSTEMS LIMITED

Telephone **021 - 544 6767**



RAYCOM gives you more BUYING POWER
ALL MAJOR CREDIT CARDS ACCEPTED. BC, ACCESS, DINERS. INSTANT CREDIT UP TO £1000 (SUBJECT TO STATUS) WITH RAYCOM CREDIT CARD (APR 36%). INTEREST FREE CREDIT ON CERTAIN ITEMS AT MRP. CALL FOR MORE DETAILS.

ORDERING INFORMATION

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

TEL: 021-552-0073

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

INFOLINE 0836-771500 5-9pm (week days)

OPENING HOURS 9-5.30 MON TO SAT, 73 DE RAY G4KZH, PETER GAUWD COLIN and JOHN on the 'phone.

NEVADA

THE UK'S SCANNER SPECIALISTS

FAIRMATE HP100E MKII

1,000 ch. memory. 8-600 MHz, 830-1300 MHz

Latest UK Version.....£249

FAIRMATE HP 100E WB1

Limited Edition Wideband Version

Covering 1.600 MHz, 830-1300 MHz,

includes 3 Antennas and Charging Unit.....£289

PSU 101

Universal Base Holder and Charger,
powers most makes of H/Held scanner whilst
allowing convenient Desktop use.....£26.50

JIM LOW NOISE PRE-AMPLIFIERS

Suitable for both base and handheld scanners

- 25 - 2100 MHz
- Low Noise GaAs Fet
- Selectable Filters
- Variable Gain Control
- M100 Transmit Version

Model M75 for Receivers/Scanners.....£69.95

Model M100 For Transceivers.....£79.95

Model M50 Low Cost Fixed Gain.....£49.95



Send £2 for our Latest Bumper Catalogues
We Supply Dealers Throughout The UK and Europe
Call for Details of Your Nearest Stockist

SCANNERS AND RECEIVERS

ICOM

IC-R1.....	£399
IC-R100.....	£499
IC-R7000.....	£925
IC-R71E.....	£855
AOR	
AR 3000.....	£765
AR 2002.....	£487
AR 950.....	£249

SONY

ICF 2001 D.....	£275
ICF 7600 D.....	£99
Air 7.....	£229
Pro 80.....	£299
ANI Active Ant.....	£49

KENWOOD

R 2000 Comm. RX.....	£595
R 5000 Comm. RX.....	£875

BEARCAT

UBC 50XL.....	£99.95
BC 55XL.....	£99.95
UBC 100XL.....	£179.00
UBC 100XL T.....	£199.00
UBC 200XL T.....	£229.00
UBC 145XL T Mobile.....	£115.00
UBC 175XL T Mobile.....	£169.99
UBC 750XL T Mobile.....	£235.00
UBC 800XL T Base.....	£149.00

YUPITERU - (JUPITER)

MVT 5000 Hand Held.....	£245
MVT 6000 Base.....	£279

MISC

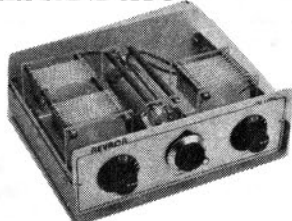
Black Jaguar MKIII.....	£199
Standard AX700.....	£575
Lowe HF 225 Comm. RX.....	£429
ASA Airband Radio.....	£59.95

BUILD YOUR OWN 1 KW ALL BAND ATU

The Tm1000 1kW 1-30 MHz.
ATU Allows Effortless Matching
of Long Wire, Vertical, G5 RV,
and Coax Fed Antennas.

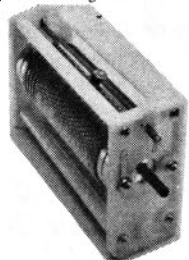
Tm 1000 Kit Complete.....	£138
Tm 1000 Ready Built.....	£168
Tm 1000 W/2kW Buhun.....	£199

(add £5 carriage for all models)



HIGH POWER COMPONENTS VARIABLE CAPACITORS

150 pf (9.8kV).....	£19.95
170 pf (9.8kV).....	£19.95
250 pf (7.8kV).....	£19.95
250 pf (wide spaced 14kV).....	£26.95
500 pf (7.8kV) (250pf + 250pf).....	£28.00
750 pf (7.8kV).....	£29.95
Roller Coaster 1kW 30 µH.....	£28.00
Turns Counter (48 turns).....	£15.95



USE YOUR CREDIT CARD FOR IMMEDIATE DESPATCH

HOTLINE (0705) 662145

OR FAX US FROM ANYWHERE IN THE WORLD ON:
(0705) 690626

NEVADA COMMUNICATIONS

189 London Road, North End, Portsmouth PO2 9AE

New to Packet? Phone
or write for our beginners
help pack and join in the fun!

PACKET RADIO FROM THE SPECIALISTS!

Siskin Electronics have a policy of supplying the best range of packet radio equipment available for the radio enthusiast. We have examined the products of many manufacturers and are pleased to be able to offer what must be the widest range of equipment available from just one UK supplier. All prices include VAT and were valid when going to press.

KANTRONICS

DATA ENGINE (56,000 baud).....	£327.95
KPC2 HF/VHF with Wefax.....	£165.00
KPC4 VHF/VHF dual port.....	£242.00
KAM all mode with Wefax.....	£285.00
"Smart Watch" Real Time Clock.....	£29.95

PACCOMM

STATE MACHINE DCD (3105).....	£19.95
HANDIPACKET (Le TNC).....	£199.00
MICROSAT PSK MODEM.....	£189.00
PC-320 dual port PC card.....	£129.00
TINY-2 with PMS version 3.0.....	£129.00
TNC-320 dual port HF/VHF.....	£179.00
9600 baud modem.....	£95.00
Real Time Clock fits BSX etc. tool.....	£29.95

AEA

AMT3 AMTOR/RTTY.....	£179.95
PK-232+MAILBOX.....	£299.95
PK88 VHF/HF TNC + new MBX1.....	£129.00

LATEST UPDATE RELEASE DATES

PK-88 & PK-232MBX latest July 1990.
PacComm V1.1.6C1 (PMS V3.0)
Kantronics Version 3.0

BOLT ON GOODIES

ATARI Portfolio pocket PC.....	£199.99
ATARI 520STFM + "HamPack".....	£289.95
ATARI SM124 Hi-res monitor.....	£119.00
32K (62256) static ram.....	£ 12.50
Custom made audio leads from.....	£ 11.95
Custom made RS232 leads from.....	£ 9.95
In house custom RS232-TNC lead service!	
PCW 8256/85 12/9512 RS232 1/F.....	£ 69.95
SPECTRUM 48K TNC 1/FACE.....	£ 14.95

TRANSCIVERS/RECEIVERS

Alinco DJ120E handheld/bat/Chgr.....	£179.00
HF-225 Gen. Coverage Receiver.....	£425.00
Navico AMR 1000 Transceiver.....	£199.00
Alinco DJ510E dual bander.....	£399.95

SOFTWARE

We supply driver software for most computers FREE of charge with all TNC purchases.

JUST IN!

RLC 100 4 port PC card.....	£289.00
Kantronics V3.0 update.....	£20.00
Data Engine 9600 modem board.....	£95.00

If it's in stock (and it usually is!) we will despatch it same day.

NOTE: Prices do not include carriage

Siskin Electronics Ltd

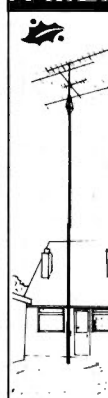
2 South Street,
Hythe, Southampton,
SO4 6EB.

Tel: 0703-207587, 207155

FAX: 0703-847754



A MERRY XMAS FROM TENNAMAST



GM60AL - GM4VHZ - GMONHH

Our wind up, tiltover Tennamasts are ideal for HF and VHF beams. Designed and professionally built by amateurs for amateurs, they are safe and easy to use, slim, elegant and economically priced from £215. Immediate delivery.

BEAM KITS Homebrew your own GM4UTP 5 Band Quad or VK2ABQ Beam with our low cost kits.

We can supply Head Units separately to suit, 2-3".

Call 05055 3824 (24 hours) for
Brochure and Info plus
friendly technical advice

TENNAMAST SCOTLAND
81 Mains Road, Belth, Ayrshire KA15 2HT



"Characteristics" for Amateur Radio

44 Hildethorpe Road, Bridlington, East Yorkshire YO15 3BG
Tel: (0262) 673635 Fax: (0262) 670568

THE IDEAL CHRISTMAS GIFT



Door Plaques "The Shack"
£3.25

Personalized Mugs £3.75
(UK PRICES ONLY)

Allow 3 weeks for delivery of mugs.
Prices include P&P. Cash with order.

A Novel Dual Band Antenna

Construction

I've used a 144MHz ground plane vertical antenna at the top of a 20m fir tree in the rear garden for some four years. Its prime use has been for local working via repeaters or simplex. Nothing new in that you say!

Up A Tree

However, I wanted to use the 3.5MHz band without the disadvantage of a rather low dipole (in terms of high angle radiation). It occurred to me that because of the height of the feeder up the tree, there was the potential for operating the vertical run of the feeder as a $\lambda/4$ wave vertical for 3.5MHz. The plan envisaged cutting the feeder at the base end of the tree so that the overall vertical height, inclusive of the ground plane antenna, was correct for the centre part of the band, i.e. a little over 20m, then joining the outer braid of the coaxial cable to its inner conductor. Make sure your 144MHz antenna is insulated from its mounting. Having produced a vertical for 3.5MHz, all that is needed is some method of switching between these two dissimilar methods of feeding, as shown in Fig. 1.

Join the braid of the coaxial cable to as many radials as you have the patience for, or space to apply. In my case, I ran one length of wire 20m long, and three others of random length (averaging roughly 13m) at approximately 90° to each other.

Laying Radials

These radials, in my case, are of 1.25mm wire and start off fairly close to the ground. Anything substantial will do. Initially, I pinned these radials at the foot of the tree, stretched them out tight and twisted the last few centimetres of each around a large nail, before pushing the nail into the ground. This minimised the chance of my XYL tripping over them, and was good enough to try the system out.

I found that without an a.t.u., a 1:1 v.s.w.r. was obtained at 3.650MHz, this did not rise over 2:1 at either end of the band. My TS-930S has a built-in a.t.u., so there was no problem in correcting to 1:1 anywhere on the band. Most rigs should work reasonably efficiently at 2:1, even without an a.t.u.

End Results

Results were, and have continued to be, most satisfactory. Good reports have been obtained from both near stations - British Isles and Europe - and DX when the band has been open.

However, I've jumped ahead a little, and need to describe the finalised installation. First I buried the radials, a little tedious, but not too bad. Because the radials were laying across the lawn under a degree of tension, I found a very convenient way to bury the radials. Use a piece of clear plastics material some 100 x 150mm and about 3mm thick. Place this tool edge-on along the radial wire and hit it smartly with a mallet.

A few taps and the radial was soon buried just under the surface of the grass with absolutely minimal disturbance to the lawn. Working this way along the length of a radial is quite quick, providing the wire has been laid under tension.

Switch-Over

The next step was to install a relay. In my case, I used a 12V 100Ω d.p.d.t. change-over type with 3A contacts that I had spare. A single-pole change-over would be fine, but if one has the extra contacts paralleling them is worthwhile. The relay contact wiring was arranged as shown in the circuit diagram, Fig. 2.

In its de-energised state, it restores feed to the vertical as if the coaxial cable had never been cut. In other words, the 144MHz ground plane antenna works in the normal manner. Energising the relay from a separate pair of wires laid from the shack, immediately transfers the system to the 3.5MHz vertical configuration.

As an extra bonus in terms of radials, I arranged to feed the d.c. to the relay so that one leg was at earth and connected as a *pseudo* radial. I enclosed

Eighty into two will go, and Noel Orrin G3BBK shows you how to achieve this magical feat!

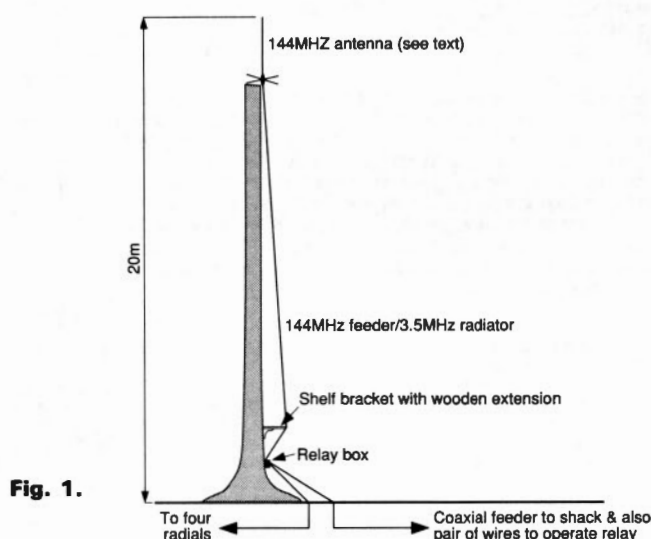


Fig. 1.

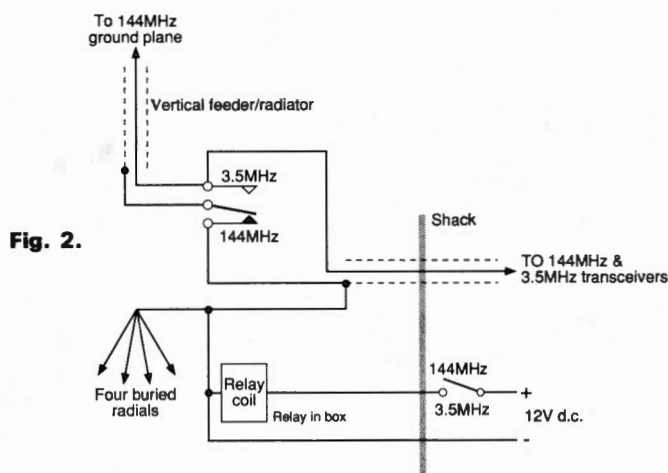


Fig. 2.

the relay in a die-cast box to protect it. Any plastics box would be just as good. Spread a little sealant around the point where the cables enter the box to keep moisture out.

I also thought that it would be useful to hold the vertical feeder clear of the tree as much as possible, particularly at the lower end. The diagram, Fig. 1, shows how I nailed a shelf bracket to the tree about 1.8m from the ground, with a strip of wood about 0.5m long attached to hold the feeder quite clear.

No Tall Tree Around?

If you've read this far, you may be thinking, "fine but I haven't got a 20m tree around in the garden". Well a smaller tree, or even an attachment to the side of the house, could probably be worth

considering. If you can't run to a quarter wave for 3.5MHz, consider a vertical of around 10m for use on 7MHz. Whatever band you choose to tailor the vertical for, don't forget to include the length of your ground-plane antenna on the top. Obviously, it's better to over-estimate by initially cutting it longer than you expect to need, then check it for 1:1 tuning. At least if you've over-estimated, it will mean cutting a bit off, rather than having to add more wire! Although I haven't tried it, I believe the top antenna could even be a 144MHz Yagi, and the whole thing would still be tuneable for the chosen lower frequency band.

Ground-plane radials, or whatever, at the top will tend only to act as a capacity-hat loading system.

Try a bit of experimentation, it costs virtually nothing except your time. **PW**



0202 665524

PCB SERVICE

Printed circuit boards for *Practical Wireless* constructional projects are available from the PW PCB SERVICE. The boards are made in 1.5mm glass-fibre, and are fully tinned and drilled. All prices include postage, packing and VAT for UK orders.

Orders and remittances should be sent to: **PW Publishing Limited, FREEPOST, Enecco House, The Quay, Poole, Dorset BH15 1PP**, marking your envelope **PCB SERVICE**. Cheques should be crossed and made payable to PW Publishing Ltd.

When ordering, please state the Article Title and Issue Date as well as the Board Number. Please print your name and address clearly in block letters, and do not send any other correspondence with your order. You may telephone your order using Access or Visa. A telephone answering machine will accept your order outside office hours.

Please allow 28 days for delivery. Always check the latest issue of PW for the current details of price and availability. Please enquire for p.c.b.s not listed here.

Board	Title of Article	Issue	Price £
WR276-80 +263/4	MARLAND SET (7 BOARDS) TRANSMITTER	SEPT 90	21.50
WR272	NICAD RECYCLER	JUNE 90	6.92
WR275	LOW VOLTAGE ALARM	JUNE 90	6.36
WR273	VALVE PSU	MAY 90	6.86
WR274	RX ATTENUATOR	MAY 90	5.72
WR271	PRODUCT DETECTOR	APRIL 90	4.95
WR270	BADGER CUB	APRIL 90	4.94
WR269	GLYME	FEB 90	6.70
WR268	IRWELL (r.f. p.a.)	FEB 90	6.00
WR264	IRWELL (relay)	FEB 90	5.00
WR263	IRWELL (vfo)	JAN 90	6.00
WR267	FORTYNINER	JAN 90	6.00
WR266	TUNED ACTIVE ANTENNA	JAN 90	5.60
WR265	TUNED ACTIVE ANTENNA (psu)	JAN 90	5.60
WR262	REPEATER TIME-OUT	DEC 89	4.82
WR261	AM TX FOR 1.8MHz	NOV 89	6.50
WR260	10MHz RECEIVER	OCT 89	5.00
WR259	10MHz RECEIVER	OCT 89	5.00
WR258	10MHz RECEIVER	OCT 89	5.00
WR257	LOW BATTERY WARNING	SEPT 89	5.88
WR256	ACTIVE FILTER	AUG 89	6.96
WR254	TX CONTROL FOR MOBILE USE	JULY 89	5.08
WR253	TS940S MODIFICATION	JUNE 89	5.54
WR252	TWO TONE OSCILLATOR	MAY 89	6.52
WR251	RF OPERATED RELAY	FEB 89	3.80
WR250	DC/AC POWER CONVERTER	JAN 89	3.22
WR249	"MARLBOROUGH" MF CONVERTER	DEC 88	4.60
WR248	"BADGER" 144MHz RECEIVER	OCT 88	9.10
WR247	ZENER DIODE TESTER	AUG 88	3.56
WR246	"PORTLAND" RF VOLTMETER	JULY 88	3.59
WR244	PRACTICE MORSE KEY	JULY 88	2.96
WR245	STOPBAND FILTER FOR PW BLENHIEM	JUNE 88	2.90
WR243	VHF MONITOR RECEIVER (AUDIO)	APRIL 88	2.30
WR242	"ORWELL" VARICAP TUNE OPTION	MAR 88	6.00
WR241	"ORWELL" MED. WAVE RECEIVER SET	MAR 88	
WR240	"	"	9.10
WR239	"	"	
WR238	"OTTER" 50MHz RECEIVER	JAN 88	7.10
WR237	RTTY TUNING INDICATOR	NOV 87	5.20
KANGA	HIGH STABILITY VFO (see issue)	OCT 87	-
WR236	"BLENHIEM" VHF CONVERTER	SEPT 87	7.00
WR235	MAINS ON/OFF FOR BATT RADIOS	SEPT 87	3.00
WR234	SIDE-TONE OSCILLATOR	JUNE 87	2.70

Board	Title of Article	Issue	Price £
WR233	"DOWNTON" F-V CONVERTER	JUNE 87	3.90
WR232	"AXE" SIGNAL TRACER	MAY 87	
WR231	"	"	9.20
WR230	"	"	
WR228	"BLANDFORD" RECEIVE CONVERTER	APRIL 87	
WR227	"	"	9.70
WR226	"	"	
WR298	"ITCHEN" LCR BRIDGE	APRIL 87	5.85
WR225	"WOODSTOCK" SW CONVERTER	MAR 87	4.10
WR219	MASTHEAD PRE-AMP PSU	FEB 87	2.50
WR218	MASTHEAD PRE-AMP FOR 144MHz	FEB 87	4.20
WR224	"WESTBURY" BASIC WOBBULATOR	JAN 87	3.50
WR214	MOD SRX-30D (AUDIO)	DEC 86	3.00
WR223	HIGH-IMP MOSFET VOLTMETER	DEC 86	2.90
WR222	"TAW" VLF CONVERTER	NOV 86	5.80
WR216	LF BANDS ACTIVE ANTENNA	NOV 86	2.40
WR220	GET STARTED LOW-COST CONVERTER	OCT 86	2.40
WR215	SIMPLE 50MHz CONVERTER	SEP 86	3.60
WR213	MOD FRG-7 (CARRIER Osc)	JUN 86	2.70
WR210	"ARUN" PARAMETRIC FILTER	MAY 86	8.10
WR211	"MEON" FILTER (SMALL)	APR 86	3.10
WR209	SIMPLE AUDIO OSCILLATOR	MAR 86	4.30
WR208	RF SPEECH PROCESSOR	MAR 86	4.10
WR207	CRYSTAL CALIBRATOR	JAN 86	2.10
WR206	RTTY/MORSE MODEM (Plug-in)	JAN 86	2.80
WR205	RTTY/MORSE MODEM	JAN 86	5.40
WR203	SIMPLE CAPACITANCE METER	OCT 85	2.80
WR199	"MEON" 50MHz TRANSVERTER	OCT 85	6.70
WR202	ECONOMY UHF PRE-SCALER	SEP 85	3.70
WR201	ADD-ON BFO	AUG 85	2.50
WR200	LOW-COST CRYSTAL TESTER	JUL 85	2.50
WAD302	BATTERY CHARGER CONTROLLER	JUN 85	3.00
WR197	"COLNE" (Osc/Converter)	JUN 85	3.90
WR198	"COLNE" (Product Det/Audio)	MAY 85	3.90
A005	"COLNE" (VFO)	APR 85	3.10
A004	"COLNE" 3.5/114MHz RX (RF Amp)	APR 85	3.10
WAD249	MOD FRG-7 (BFO)	FEB 85	3.00
WAD280**	TRIAMBIC KEYS	FEB 85	7.10
WA002	"TEME" (RECEIVER)	JAN 85	6.55
WA001	"TEME" (VFO/DOUBLER)	DEC 84	5.19
WR178	DART (Audio / change)	DEC 83	3.00
WR177	DART (p.a.)	NOV 83	3.00
WR176	DART (v.f.o.)	NOV 83	3.00
WAD246	"DART" FOLLOW-UP	DEC 84	4.00
WR196	"TEME" 7/14MHz WRP (TX)	NOV 84	3.70
WR195	STABLE TONEBURST	NOV 84	2.60
WR194	MOD FRG-7 (FM/SQUELCH)	NOV 84	4.50
WR189/92 Pair	BUG KEY WITH 528-BIT MEMORY	OCT 84	8.50
WR190	MOD FRG-7 (SWITCHING)	OCT 84	4.50
WR187	MORSE SENDING TRAINER	JUL 84	4.50
WR185	AUTO-NOTCH FILTER	JUN 84	6.50
WR183	TOP-BAND DF RECEIVER	APR 84	6.50
WR179	TRANSCIEVER VOX UNIT	MAR 84	7.50
WR161	"MARCHWOOD" 12V 30A PSU	JUL 83	4.20
WR165 ect set	"SEVERN" 7MHz QRP TX/RX	-	14.90
WR169	"SEVERN" (TRANSMITTER)	JUL 83	6.50
WR168	"SEVERN" (CH.OVER/SIDETONE)	JUL 83	6.50
WR166	"SEVERN" (RECEIVER/AUDIO)	JUN 83	6.50
WR165	"SEVERN" (VFO)	JUN 83	5.20
WR167	RTTY TERMINAL UNIT FOR ZX81	JUN 83	7.80
WR160	LMS REGENERATIVE RECEIVER	FEB 83	5.20
WR156	REPEATER TIME-OUT ALARM	NOV 82	5.20
WR143	ATV CONVERTER	APR 82	7.10
WR144	IAMBIC KEYS	MAR 82	6.50
WR126	"EXE" 10GHz TRANSCIEVER	AUG 81	7.70
WR095	TRANSCIEVER POWER SUPPLY	SEP 80	3.85
WR068	AF SPEECH PROCESSOR	JAN 80	5.20

DEWSBURY



ELECTRONICS



**PRESENTS THE
SUPA RANGE OF PRODUCTS**

SUPA-TUTA



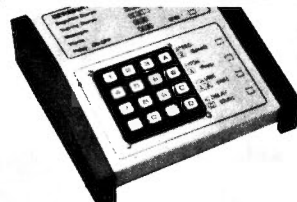
TO TEACH YOU MORSE — QUICKLY

£69-95 + £2.50 P&P

STOP PRESS

Now available — **SUPA-TUTA PLUS**
(includes keyer) £82.50 + £2.50 P&P

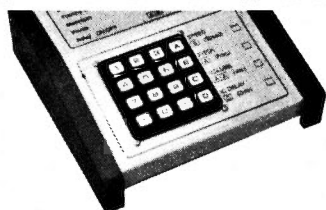
SUPA-KEYA



THE MOST USER FRIENDLY
KEYER AROUND

£97-50 + £2.50 P&P

SUPA-TUNA



MAKES SELECTING
FREQUENCIES EASIER

£65-95 + £2.50 P&P

**LATEST RELEASE —
THE SUPA-CODA**

special decoder for morse, RTTY, etc. It also
speaks (so you could call it a SUPA-CHATA).

PRICE TO BE ANNOUNCED

**SEND S.A.E. FOR DETAILS
OR ORDER NOW
BY PHONE.**

**ALL PRICES
INCLUDE VAT.**

FULL RANGE OF KENWOOD PRODUCTS STOCKED

We are also stockists of DAIWA — POCOM — JRC — TAR — WAVECOM — VIBROPLEX

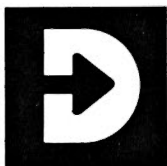
Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands DY8 1TG

Telephone: Stourbridge (0384) 390063/371228

Fax: (0384) 371228

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





D A T I N G
ELECTRONICS LIMITED

Clayton Wood Close
West Park
Leeds LS16 6QE
Tel: 0532 744822

For products you can rely upon to give amazing results

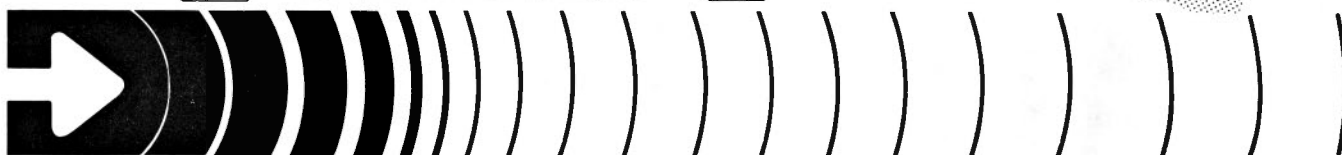
For information on **Active Antennas, RF Amplifiers, Converters, Audio Filters, the Morse Tutor and Speech Processors** send or telephone for a free catalogue and selective data sheets as required.

All our products are designed and made in Britain.

Orders can be despatched within 48 hours subject to availability.



— VISA AND ACCESS WELCOME —



AKD

Unit 5
Parsons Green Estate
Boulton Road
Stevenage
Herts SG1 4QG



THE FILTER SPECIALISTS



MAIL ORDER DEPT.
Stock Items Normally
Despatched within 48 hours,
21 days latest.
TEL. 0438 351710

TV INTERFERENCE PROBLEMS??!!

Are you having trouble receiving a watchable picture on your TV? If so, the cause may be airborne interference. For many years AKD has manufactured a low cost range of in-line interference suppression filters that are easily inserted into the aerial system to help reduce the effects of interference from local taxi radio, CB, amateur radio, airport radar, etc. Each filter is terminated in standard aerial co-ax plug and socket and requires no external power. Fitting could not be more simple. No technical knowledge is needed. There are 13 standard stocked filters in our range, but individual filters can be tuned to reject interference at specific frequencies if required. If you are not sure which filter type to order or have any questions regarding interference phone our helpline on 0438 351710 and ask for John who will be pleased to assist you in making the best choice of filter.

THE FILTER RANGE IS AS FOLLOWS:

FILTER TYPE RBF1

A range of filters designed to eliminate Radar Blip, especially noticeable on video recorders. Stocked on channel 36 and 846MHz (RAF Boulmer interference) can be tuned at our factory from 420MHz to 890MHz. £7.65

FILTER TYPE TNF2 (Suitable for UHF TV only)

A range of Tuned Notch filters stocked on generally useful frequencies used by Amateur Radio operators, CB users, Private Taxi companies. Can also be factory tuned to reject any spot frequency up to 300MHz. Now stocked at 50 & 70 MHz. £8.75

FILTER TYPE HPF1

Used in weaker reception areas for general interference problems. Use with UHF TV, Video & Pre-Amps £7.65

FILTER TYPE HPFS

Used in strong signal area for severe interference on UHF only £8.25

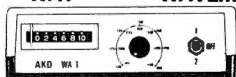
FILTER TYPE BB1

A general purpose filter that can be used on its own or together with other filters in our range for severe interference problems. Ideal at the input of VCR and Pre-Amps. £7.65

WA1

WAVEMETER

£27.25

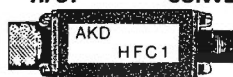


Our Waveabsorption meter for 2 Mtr transmitters meets licensing requirements range 120MHz to 450MHz, very sensitive, can also be used as field strength meter within its range. Requires PP3 type battery (not supplied).

HFC1

CONVERTER

£49.00



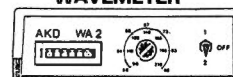
For the FRG 9600/965 our new HF Converter, connects to the aerial socket, and powered direct from the 8 Volt a/p of the FRG 9600.

Tune from 100, 1MHz to 160MHz, gives tuning range of 100KHz to 60MHz, uses double balanced mixer, with low pass filter on input. ★ Can be supplied with BNC termination for other scanners ★

WA2

WAVEMETER

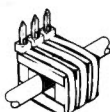
£27.25



Our Wave absorption meter for the 50 & 70 MHz Bands. Meets licensing requirements. Can also be used as field strength meter within its range. Requires PP3 battery (not supplied).

Unifilter 'CLAMP-ON' RADIO-FREQUENCY CHOKE

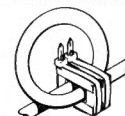
PHONE OR SAE FOR PRODUCT SPECIFICATION & APPLICATION NOTES



Allows leads to be toroidally protected without the need to cut or remove plugs or connectors. Ideally suited for moulded plugs, leads, ribbon, and large diameter cables. Can easily be fitted and stacked in multiples to increase rejection. 'UNIFILTER' works by suppressing the interference currents that flow along the outside of cables without affecting the signals or power flowing inside. This means that you don't need to worry about upsetting normal operation or invalidating guarantees. Suitable for both reducing the emission of, or rejecting the effect of, 'common mode' interference as experienced on computer, hi-fi & speaker leads, as well as the normal mains & aerial cables.

UF 4 KIT (SUITABLE FOR SMALLER INSTALLATIONS) £10.85

UF 8 KIT (FOR MULTI INSTALLATIONS) £21.50



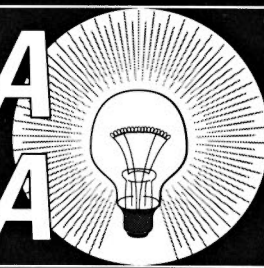
ALL PRODUCTS ARE AVAILABLE FROM US DIRECT
MAIL ORDER OR WHY NOT MAKE USE OF OUR ACCESS
& VISA FACILITIES TO ENSURE MINIMUM DELAY

ALL AKD PRODUCTS CARRY THE USUAL AKD 2 YEAR
GUARANTEE. PRICES QUOTED ARE CORRECT AT TIME
OF GOING TO PRESS AND INCLUDE VAT,
POSTAGE & PACKING

TRADE ENQUIRIES WELCOME
TRADE ORDERS CAN NOW BE PLACED BY
FAX ON 0438 357591

Props: RT & VEL Wagstaffe. Technical Adviser: John Armstrong

WHAT A GOOD IDEA



Eliminate Mistakes

Some equipment has a low voltage external power supply connection. When operated from the mains supply, a battery eliminator type of power supply can be used. Now how about operation in a vehicle?

The first step is to design the pre-regulator stage of the p.s.u. to operate from a transformer with a secondary r.m.s. voltage about the same as the vehicle battery voltage. Then take the input of the bridge rectifier via a change-over switch to the vehicle battery supply. A suitable connection point would be the cigar lighter socket.

As the vehicle supply is connected before the bridge rectifier, it is immaterial which polarity is used. This minor dodge could save you an expensive mistake, which is why I think it is such a good idea.

Dr. G.L. Manning
Edgeware,
Middlesex.

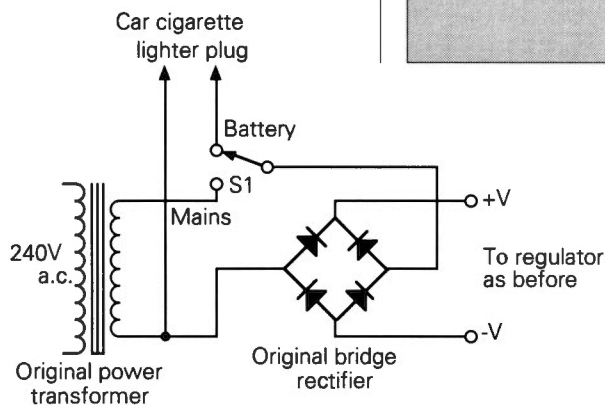


Fig. 1

Innovation Into Investment

We've always been proud of our authors and their work. Now you can join in - and win £25 - by sending circuits and projects to 'What A Good Idea'. It's the ideal solution to the advice often offered by friends who suggest that 'You should publish that!'

Circuits - accompanied by the minimum of text - must be **neatly** and **clearly** drawn in ink. Wherever possible the idea must be original, although your suggestion might be a significant improvement based on another idea. In which case you should always quote the original source. All entries will be acknowledged. Send your entry, with your name and address, to: **'What A Good Idea', Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.**

PLEASE NOTE: that we at PW may not have built and tested the circuit, but present it on an 'as-is' basis. We do take the greatest care in preparation of the article, but cannot be held responsible for the suitability of the original suggestion, or for any damage that may occur to property or equipment in implementing this idea.

Booting The Weather Out

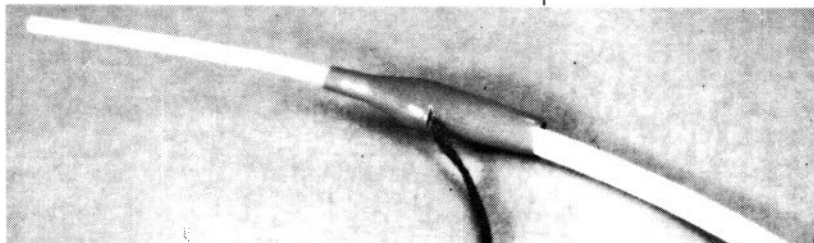
Many people use coaxial cable to connect to the centre of a dipole. One problem that can occur, and usually does, is that water will eventually find its way under the outer cover of the coaxial cable and virtually destroy the signal carrying capabilities of the cable. This is especially true if the dipole is used for transmission.

The following idea ensures a watertight connection at the feedpoint and the materials are very cheap. All that is required is silicone grease and the vinyl insulating cover from a large crocodile clip. These are available in various sizes from most car accessory suppliers.

Begin by making a small hole in the side of the vinyl boot. Then stripping away the cable outer about 80mm, separate the outer braid and twist it and solder it along all the exposed length. The prepared end of the cable is inserted in through the large hole that the clip jaws would occupy. The soldered braid is taken out through the small hole made in the side of the boot, leaving the smaller original hole for the inner of the coaxial cable.

It is important that the boot chosen is a good tight fit on the inner of the coaxial cable. Apply the silicone grease liberally to both inside and outside of the boot. This forms a good weather-proof seal which should be just as successful as the one which has been in use for seven years at my location.

J. C. Peerless G3JPJ
Edgeware,
Middlesex.



Ron Ham suggests methods of radio 'forecasting' when propagation is about to pick up due to Sporadic-E.

What Is Propagation?

Sporadic-E

Generally speaking, the 'E' region of the earth's ionosphere, about 100km above us, forms at sunrise and disperses at sunset. However, during the period May to August, called the Sporadic-E season, this region is liable to break-up suddenly into clouds of more densely ionised gas and deflect radio and television signals far beyond their intended range. A typical example of the strength of these signals is the Czechoslovakian test-card, **Fig. 1**, received by **David Glenday**, in Arbroath, on Chs. R1 (49.75MHz) and R2 (59.25MHz) at 1130 on August 10.

The most vulnerable area of the spectrum to be influenced by even a mild dose of Sporadic-E is around 50MHz. Here, such signals can appear in the 50MHz amateur band and on the nearby television channels E2 (48.25MHz) and R1.

Paradise

This would be a DXers paradise if only they knew when this was going to happen. However, readers with scanners or v.h.f. communication receivers can have an early warning of Sporadic-E by listening for synchronising-pulses on Chs. E2 and R1 or on their respective sound channels of 53.75MHz and 56.25MHz. Under normal conditions in the UK, only the receiver background noise should be heard on these frequencies until Sporadic-E is present and then the signals begin to appear.

At first they are weak and bursting, but soon become very strong before dying away. Although the average life for an 'in-season' event is three to four hours, such a disturbance to terrestrial radio signals can last from as little as 15 minutes to a mammoth 15 hours. It is interesting to hear the deep and sharp fading at the beginning and towards the end of each major event.

The 1990 Season

By the time you read this, the 1990 Sporadic-E season will be over. The amateur and v.h.f. broadcast band DX enthusiasts, CBers and TV DXers will now be looking for those brief and sudden openings which often occur during the winter months. Only a few of these events are likely

to follow the usual 'in-season' pattern. It can gradually extend its influence from 50MHz downwards, to open up the 27MHz Citizens Band and the 28MHz amateur band, and upwards, through the v.h.f. television Band I (48-68MHz), the East European broadcast band (66-73MHz) and tail-off toward the end of Band II (87.5-108MHz). In mid-summer, the latter can go as high as 200MHz and give fantastic DX opportunities to the amateurs on 144MHz and the television buffs at the lower end of Band III.

End to End

To illustrate this point, **Simon Hamer** (New Radnor) received pictures from the USSR on Chs. R6 (175.25MHz) and R7 (183.25MHz) during a massive disturbance on June 1 and from Algeria on Ch. E7 (189.25MHz) on the 3rd. At the opposite end, **Leon Greenfield** (Storrington), received very strong CB signals on 27MHz from stations in Ireland and Scotland at 1030 on August 2 and between 1600 and 2300 on the 20th.

Ern Warwick (Plymouth) heard one CBer say that he was receiving TV pictures from Czechoslovakia and Portugal. At midday Ern made contact himself with stations in the Midlands and Norfolk. The 27MHz band was also influenced by Sporadic-E during the mornings of the 3rd and 4th. Again, he logged signals from Northern Ireland and Scotland. In addition, he copied signals from Germany and Holland at 1930 on the 9th and worked/heard stations in Scotland and Wales during the morning of the 12th. Then there were Ireland and Scotland around 1100 on the 13th, Scotland again at 2048 on the 14th and North Wales at 1700 on the 23rd.

25 Years Ago

An intense Sporadic-E opening occurred early on 4 July 1965 and its peak coincided with the start of a 144MHz portable contest organised by the RSGB. Can you imagine the surprise, when UK competitors warmed up their sets around 1030 and heard amateurs calling from Hungary, Yugoslavia and remote parts of the UK. The signals were amazingly strong while the event lasted. Afterwards, I wrote to HG5KDQ who acknowledged my letter with his QSL card, **Fig. 2**.

Equipment

Obviously, matching the correct antenna to the receiver or transceiver will give the best results. Readers wishing to just listen, or view, while

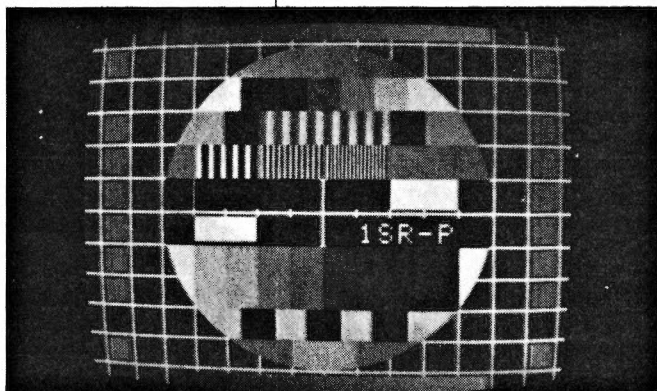


Fig. 1: A Czechoslovakian test card received in Arbroath by David Glenday.

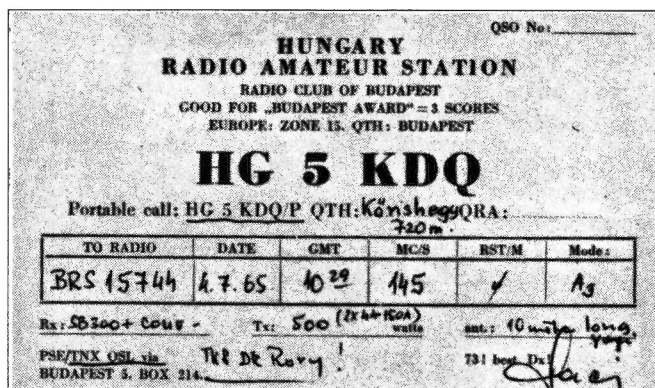


Fig. 2: A Hungarian QSL card of 25 years ago confirming a report submitted by Ron.

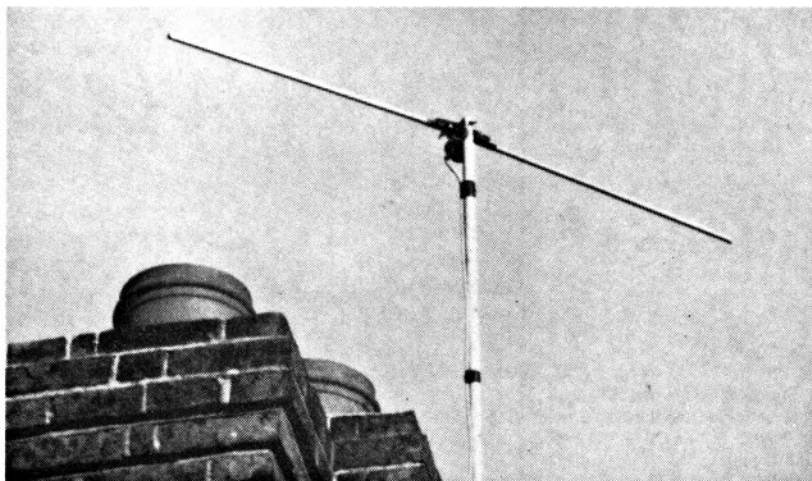
Sporadic-E is present, can get reasonable results with a dipole cut to work between 50 and 70MHz. But, because the signals are so strong, the telescopic rod fitted to portable sets for v.h.f. TV and Band II, and many scanners, may well suffice.

Barry Bowman (Prestwich) uses his 27MHz CB antenna for Band I television. For monitoring Bands I and II, I use a dipole, **Fig. 3**, made with the insulator block and rods from a redundant TV antenna. Operating under Sporadic-E conditions is both scientifically interesting and good fun, because the unexpected can happen at anytime while the event is in progress.

Do let me know how you get on.

PW

Fig. 3: The simple dipole, made from an old TV antenna, to monitor Bands I and II.



CB CORNER

This month, Rick Maybury looks into the depths, but ends on a high note for CB and includes a list of the countries with CEPT agreement.

Reputations Again

I had hoped to concentrate on the positive side of CB through this column and thankfully good news still outweighs the bad. However, not everything in the CB garden is rosy - as if you needed telling. I was saddened to receive a letter from a regular reader who lives in the Peak District - he wishes to remain anonymous for reasons that should become obvious. This elderly gentleman - we'll call him Mr B - is a regular and dedicated hill-walker. He quite sensibly purchased a hand-held CB transceiver for use in emergencies. However, after listening to the 'conversations' of a number of foul-mouthed

locals, (we won't go into details), Mr B was in no doubt that any call for help would either be completely ignored, promote a torrent of abuse or get him into even deeper trouble. A very sorry story indeed, and precisely the kind of thing that has been damaging CB's image with the general public for the past ten years.

I doubt if these individuals ever read *PW*, or indeed if they can read at all, but the message must go out to them and their like. Their actions in blocking what could be a vital, and potentially life-saving, communications medium - especially in that part of the country - are wholly unacceptable and must stop! I trust the Radio Investigation Service will receive enough complaints to encourage them to find time to visit that part of the country. I hope no-one will have any hesitation in reporting blatant abusers to the authorities, whatever your personal opinion of CB.

Short Range?

In the United Kingdom, we tend to think of CB as an uncomplicated local, short-range, communications system and long may it be so. But, as anyone who has crossed the great divide to amateur radio, or even just listened to it, will know there's a whole world out there just waiting to chat over the airwaves.

At the risk of sounding controversial, it's worth pointing out that CB also has a role to play in international communications. Even as I write this I can sense hackles rising - relax, I'm not about to advocate illicit s.s.b. and high-power

operation - that's a big subject for another day. I'm talking now about the European Conference of Postal and Telecommunications (CEPT) recommendation T/R 20-02 and 20-07. In essence they say that UK CB rigs which conform to the MPT 1333 specification, and have received type-approval, can freely be used in a number of European countries. Of course, this comes with the proviso that operators adhere to normally accepted codes of behaviour and practice, and that users carry their UK licence with them whilst abroad. Ah... now how many of you have one of those I wonder?

CEPT Countries

The current list of participating countries who are complying with the CEPT directive comprises Austria, Belgium, France, Germany, Luxembourg and The Netherlands. There may be a very slight question-mark hanging over Germany - the agreement certainly applied to the Federal Republic, but there's no indication at the moment how this will have been affected by the recent Unification. Hopefully not at all, or preferably by extending the facilities to the eastern area of Germany. This means that legal UK CB users are now fully entitled to take their rigs on holiday with them, to spread their unique message across the breadth, and much of the depth of Europe. A daunting prospect, or a real break through in international relations? Only time will tell. It's a small, but encouraging, step towards European unity - let's just hope that this facility is used responsibly and the small, but

noisy, element that persists in giving CB a bad name, leave their rigs at home. We've enough problems with this country's reputation abroad without CB adding to its troubles!

Now The Good News

Just time for some good news. A number of companies associated with manufacture, importation, distribution and retailing of CB equipment have recently formed the Citizens' Band Radio Trade Association. The Association aims to provide the industry with a much needed voice, and hopefully some muscle too. They will be able to draw upon well-established relationships with the DTI and Radiocommunications Agency, as well as large and influential user groups. Until now there has been little or no opportunity for the trade to put their point of view across, or liaise with the DTI, particularly when decisions have been taken that have resulted in important changes in legislation.

Trade associations have a vital role to play in many industries, but CB has been sadly lacking since the early formation, (and eventual dissolution) of a number of unco-ordinated organisations back in the mid 1980s. The CBRTA shows that the CB business is alive and kicking. According to their own figures, it provides jobs in over 500 companies throughout the UK. For those that may be interested they can be reached at: **CBRTA, 50-54 Mina Road, Bristol, Avon BS2 9JX**, or by telephone on **(0272) 541254**.

PW

Christmas Stocking



Passport To World Band Radio 1991

Editor-in-Chief Lawrence Magne
International Broadcasting Services Ltd (publishers) ISBN 0-914941-26-7

383 pages, £13.95
Available from **PW Book Service**, 85p post and packing
Unlike many handbooks - for that's what this extremely useful book is - this one is very readable. In fact, this book seems to be the ideal reference book to have for 'armchair' listening as it contains a great deal of information ranging from the programme, times and frequency details to a truly excellent 'buyer's guide'.

Although 'Passport' is well known for its buying guide, it also contains a good 'choose your receiver' section and very comprehensive frequency listings. An unusual - and very helpful guide for the newcomer and 'old hand' alike is the 'When and Where to Listen' type of feature which guides you through the bands - hour by hour. This section alone would make the book a good buy for the keen listener as it helps you to find where and when to listen and who you should be able to hear.

The ARRL UHF/Microwave Experimenter's Manual

Various Authors
American Radio Relay League (publishers) ISBN 0-87259-312-6
446 pages, price £13.50
Available from **PW Book Service**, 85p post and packing

This new book has been worth waiting for! A truly excellent manual for the keen microwave enthusiast and for the budding 'microwaver'. If you've had doubts whether or not you could manage the techniques involved 'up there' - this thoroughly comprehensive manual will dispel any doubt.

With contributions from over 20 specialist authors covering techniques, theory, projects, methods and mathematics, this book has everything. Of particular interest is the fascinating historical section where the use of hardware store 'funnels' adapted for use as microwave horns is covered! All in all this book could be the instigator of as boom in microwave activity in the UK. A must for your bookshelf!

A Beginner's Guide to Modern Electronic Components BP285

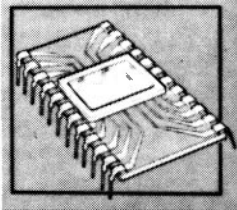
R. A. Penfold
Bernard Babani (publishing) Ltd ISBN 0-85934-230-1
166 pages, £3.95
Available from **PW Book Service**, 85p post and packing

This is a book which could become a standard for those involved with the new Novice Licence. As befits a book for beginners and those who intend teaching beginners, the chapters are limited in number. This small, but information packed, pocket-book has but four chapters. These chapters are 'Passive Components', 'Semiconductors', 'Integrated Circuits' and last but not least 'The Rest'.

The information contained within this small volume however, is not limited to a mere skimpy description. Each subject, be it resistor, capacitor, audio transistors or high speed digital i.c.s is dealt with in a simple 'no nonsense' way, with large clear diagrams included where they help the text.

Do you want to know about pyroelectric detectors, or such so-called mundane items as plugs and sockets? It's all here in this book ready and waiting to be found by any keen beginner.

A Beginner's Guide to Modern Electronic Components



Edited by E. A. Parr
Newnes ISBN 0-434-91519-X
315 pages, £8.95
Available from **PW Book Service**, 85p post and packing

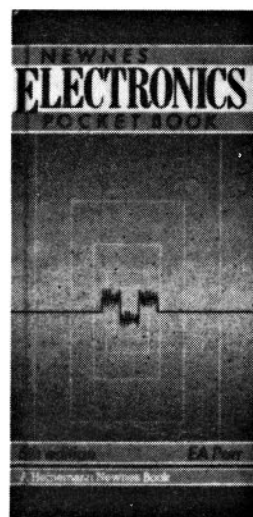
digital and analogue computers, p.s.u.s., maintenance and safety. The section about safety is particularly welcome as few publications deal with this essential subject in such an easily understood way.

So comprehensive is the information in the book that the section on computers even explains the workings of printers, disk drives, memory and other storage devices.

The communication section has information and diagrams from CB to satellite communications, video recorders to the humble telephone's working. The subjects covered in this pocket reference book are tabulated in a comprehensive nine-page index at the rear of the volume.

Few pages escape without an illustration of one kind or another, and many have more than one diagram on them. An excellent and unobtrusive reference book to carry with you at all times.

Electronic Pocket Book 5th Edition



This long, narrow hard-backed pocket reference book covers topics for everyone. Some of the 17 chapters deal with components, amplifiers, oscillators, i.c.s, optical devices, transmission and reception information. There are other chapters on servo mechanisms,

The Radio Amateurs World Atlas Radio Amateur Callbook Inc. £3.50

Available from **PW Book Service**, 85p post and packing
This slim atlas opens out into 17 double-sided 420x276mm maps featuring all the radio areas of the world. Shown on the detailed maps are the names, call prefixes and the major towns and cities of each country. Continental boundaries, DX zone numbers are all found along with the limits of both DX zone and callsign prefixes. Hidden away unobtrusively on the map, but still visible, are the relative local time zones with respect to UTC so you can gauge what time it is at the other station. The last page also carries a useful list of callsign prefixes in alpha-numeric order.



BEAM ANTENNA HANDBOOK

Everything you need to know about beam antenna construction, design, and operation. Includes a complete glossary of terms and a list of suppliers.

Beam. William Radio Pu 268 pages Available Fancy built in 12 chap Chap propagation Care various ty The e in the leas All pa suitable for This i all wheth

Oscilloscopes How To Use Them How They Work

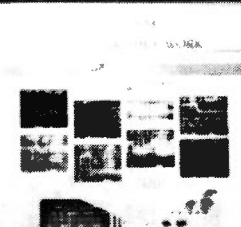
Ian Hickman
Heinemann Newnes ISBN 0-434-90808-8
248 pages, £12.95

Available from **PW Book Service**, 85p post and packing

This book - the 3rd edition - has earned itself a place on many bookshelves due to its clear, concise and well illustrated format. Ian Hickman's practical approach is supported by the good quality graphics and clear styling.

Even if you have never used or owned an oscilloscope, this book will introduce you to what must be the most versatile 'tool' to be found in any radio amateur's workshop.

OSCILLOSCOPES



Coil Design And Construction

B. B. Babani
Bernard Babani (publishing) Ltd ISBN 0-85934-230-1
106 pages, £2.50

Available from **PW Book Service**, 85p post and packing
This handy little book is jam-packed with lots of who wish to build their own transformers, be it a frequencies. The 16 chapters cover such topics as coils and transformers for various general project design is the area dealt with in greatest detail.

The book could prove invaluable for those of you looking for help in renovating that fascinating old radio bought at that last car boot sale! There are sections dealing with power transformers, low frequency chokes, r.f. and i.f. transformers.

Spread throughout the book are many worked examples to help with calculations. These and the many diagrams and tables make this book very worth while at its price.

g Fillers



3th edition

d packing

D ATLAS



Scanners Third Edition

Peter Rouse GU1DKD
Argus Books ISBN 1-85486-006-2

245 pages, £8.95

Available from PWBook

Service, 85p post and packing

If you are planning to ask Father Christmas for a scanning receiver this year then don't forget to include this book on your list. The technical manuals may be a source of information but they often don't tell you what to expect from your gleaming new scanning rig.

In the early part of the book Peter discusses radio waves, antennas, propagation, modulation and general frequency bands. He also offers advice on the pros and cons of headphones or loud speakers.

There's a glossary and description of the meaning of the somewhat baffling terms confronting the newcomer to the scanner hobby. These carry clear explanations of terminology, like VOLMET, TACAN, p.m.r. CT2 and other expressions in current and frequent use.

With this knowledge under your belt you can delve into the section giving the UK frequency allocations within the bands 25-2000MHz, which is covered in fair detail.

Having difficulty choosing a scanner, or you've been offered one and want to know 'is it worth it? What does it do?' The section on many commercial scanning receivers should answer most of those questions for you. It even provides names and addresses of suppliers and traders.

Finally, there is even a suggested layout for a reception log sheet in the back of the book. This is an excellent book which although aimed at the first time user, contains more than enough interest for the 'old-hand'.

A VHF/UHF Listener's Guide

Peter Rouse GU1DKD



Antenna Handbook (New edition)

Orr W6SAI and Stuart D. Cowan W2LX

Publication Inc. ISBN 0-933616-04-X

£6.75

from PWBook Service, 85p post and packing

ing a beam antenna, and don't quite know where to start? William Orr and Stuart Cowan lead you, ers, through beam antenna technology from conception to construction and operation.

r one deals with radiation and propagation, considering how sunspot activity can affect and how the maximum usable frequency (m.u.f.) is affected by season, weather and the sun.

d feeding of the antennas are discussed and compared. Comparisons are made between the os of beam, single or multi-band, wire or tubing, single antenna or multiple stack and bay types ential subject of coaxial cable and connectors are dealt with in a pictorial way which informs well space.

s of the r.f. spectrum from 3.5-430MHz have their own designs and types. From wire beams the attic to stacked and bayed monsters for use on 144MHz moonbounce.

atest edition of this popular beam-antenna reference source. An excellent well-illustrated book for it be the beginner, taking his or her first tentative steps, or the expert just checking calculations.

ual BP160

4-050-3

d packing

formation for those audio or r.f.

design and building of, although audio

esign and

uction

al

Hint and Kinks For The Radio Amateur

Edited by Charles L. Hutchinson K8CH and David Newkirk AK7M

American Radio Relay League (publishers)

140 pages, £4.95

Available from PWBook Service, 85p post and packing

The best practical ideas straight from the pages of QST, the ARRL magazine, brought together in one publication. The 12 chapters cover such diverse topics as antennas, c.w. computers, p.s.u.s, portable operations and testing.

You'll find hints about modifying commercial rigs to make them even better and ideas about making your own circuit boards. To help those who have to use 'the kitchen table' - the first article shows how to make an operating desk from covered chipboard!

The book tells you how to modify an antenna system to suit your own location. Then you learn how to feed the system with balanced feeder and make your own balun transformers. Then you find out more about traps, trees and toroids.

This book is so full of ideas that it would take almost as many pages to describe as there are in the book itself. A highly recommended source of information for your bookshelf.

HINTS AND KINKS for the RADIO AMATEUR

A collection of practical ideas gleaned from the pages of QST



Only a few more shopping days left before Christmas.....

Are you having trouble choosing a suitable present for a loved one, or perhaps you are the one no-one can think of an appropriate gift for?

We have the answer -

a Gift Subscription to Practical Wireless

For just £19 we will send the recipient a Christmas card telling them about their gift and a free copy of Wires & Waves - A Practical Antenna Guide.

A one year subscription to Practical Wireless also entitles the recipient to free membership of the Subscribers' Club, which will give them special offers and free-to-enter prize competitions every month.

Fill in the form below and send it to Practical Wireless Christmas Subscription Offer, FREEPOST, PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Payment can be made by cheque or credit card. All orders received before December 14 will be despatched by Monday December 17.

Please indicate the type of subscription required:

PRACTICAL WIRELESS, 1 YEAR

☐ £19.00 (UK)

☐ £21.00 (Europe)

☐ £22.00 (Rest of World)

Prices current at October 1990.

Subscription to commence with issue dated January 1991.

Recipient's Name.....

Address.....

To: Practical Wireless Christmas Subscription Offer, FREEPOST, PW Publishing Ltd, Enefco House, The Quay, Poole, Dorset BH15 1PP

Your Name.....

Address.....

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

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

Card No.

Valid from to

Signature.....



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

Circular And Square Loop Antennas

Beginning in this issue Fred Judd G2BCX looks at loop antennas and examines both the circular and square forms.

This feature is concerned with vertical single-turn square and circular loop antennas which, relative to the wavelength of operation may be considered large or small. In order to function efficiently for receiving, or transmitting, or both, this type of antenna must be either self-resonant or tuned to resonance for an operational frequency within a given frequency bandwidth. This includes so-called 'magnetic' loop antennas for h.f. bands operation.

Early Loops

One early reference to the use of loop antennas for receiving may be found in the 1927 edition of the *Admiralty Handbook of Wireless Telegraphy*. Though Heinrich Hertz might well have been the first to use a self-resonant circular loop antenna for receiving during his experiments with 'wireless waves' in 1888. (PW December 1988).

A vertical circular loop antenna has defined directional properties. When used for receiving it may be orientated as to intercept a maximum or minimum portion of an incident radio wave. Also the magnitude of the induced signal is increased as the area (πr^2) of the loop, is increased, or the number of turns are increased. At low, medium and high radio frequencies the physical dimensions of a loop are usually small compared with the wavelength, so it becomes necessary to tune it to resonance with parallel capacitance in order to obtain maximum efficiency.

The induced r.f. voltage from a passing radio wave is maximum when a loop intercepts the maximum number of magnetic flux lines. That is when the field is normal to the plane of the loop as illustrated in Fig. 1.1(a). Because of this, vertical loops of small diameter (or area) respond to a vertically polarised wave travelling in the direction of the plane of the loop. If the loop is rotated through a right angle the magnetic flux no longer couples with the loop and the received r.f. signal falls to zero. The signal reception pattern, therefore, has a figure-of-eight shape, Fig. 1.1(b).

Very Small Loops

Untuned loops of very small circumference, e.g. a few hundreds of millimetres diameter and not directly related to the wavelength at operational frequency, are useful as 'search loops'. These may be used to pin-point a source of radio interference that is otherwise known only approximately. I used a small loop of this nature to find the absolute point where harmonics, generated by a 2kHz pulse modulator, were occurring from an otherwise screened microwave marine radar equipment. The harmonics were causing severe interference to a number of the ship's h.f. radio communication channels.

Small loops of this nature can also be used as a pick-up device. Coupled to a suitable detector and meter they are suitable for checking current and

Fig. 1.1:
(a) The relationship between electric and magnetic fields in a small receiving loop antenna.
(b) The polar 'pick-up' pattern of this loop (see text).

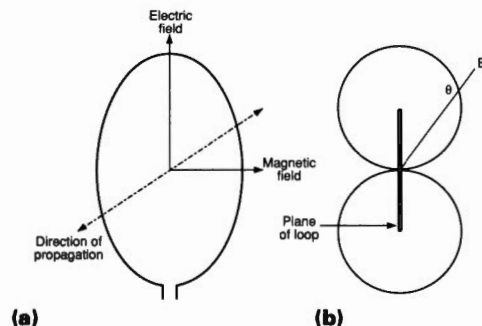


Fig. 1.2:
(a) Construction of a small 'search' loop.
(b) The attenuator described in the text.

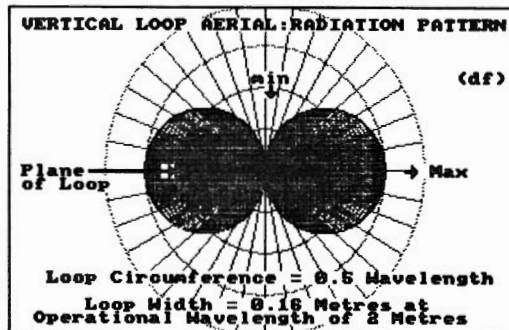
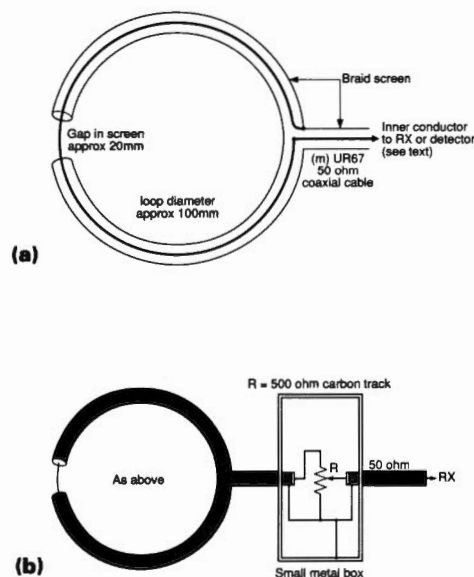


Fig. 1.3: Computer produced polar radiation pattern of a small circular loop.

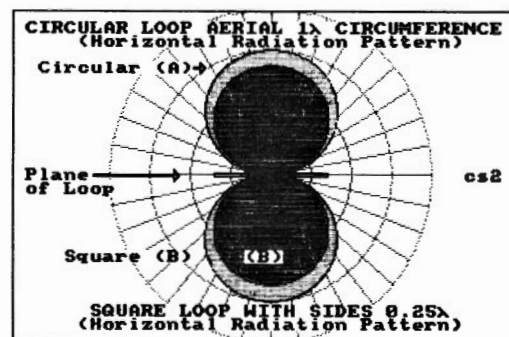


Fig. 1.4: Computer produced patterns of:
(a) circular loop antenna one wavelength in circumference.
(b) a square loop with sides $\lambda/4$ long.

voltage distribution along a linear antenna, or standing waves on a transmission line. Search loops are usually almost completely screened and may be coupled to the antenna input of a reasonably well screened portable receiver via a short length of low impedance coaxial cable.

A small search loop can be made from coaxial cable as shown in Fig. 1.2(a). If the receiver used has no r.f. gain control, a suitable simple attenuator, as in Fig. 1.2(b), may be connected at the loop antenna, or at the receiver normal antenna input.

Small Self-Resonant VHF Loops

Circular loop antennas with a circumference of 0.5λ and self-resonant at operational frequency, radiate (or receive) vertically polarised waves. The pick-up and/or radiation pattern is a figure-of-eight (cosine) with sharp nulls at 90° to the plane of the loop as in Fig. 1.3. These have proved successful for direction finding in v.h.f. 'Foxhunts' when the transmitter is normally vertically polarized. Constructional details for a 144MHz band direction finding loop were given in *Out of Thin Air* §. Provision is made for obtaining minimum v.s.w.r. so it can also be used for transmitting over short ranges.

A self-resonant circular loop one wavelength in circumference also produces a figure-of-eight radiation pattern. Radiation is *horizontally* polarised and in this case, it is a maximum at 90° to the plane of the loop. The nulls are therefore in line with the plane of the loop as in Fig. 1.4. Used for reception the pick up pattern and polarisation make it useful for direction finding when the incoming signal is also horizontally polarised. Incidentally, such loops can also be equipped with a sensing antenna connected to the loop (in anti-phase) to change the pick-up pattern to a cardioid, i.e. a pattern with a single null for determining the general direction of a signal with respect to the loop.

A Loop Beam Antenna

A circular loop with radiation pattern as in Fig. 1.4 may also be employed as the driven element, when, with a passive loop reflector or director, this can become a compact v.h.f. beam antenna. A design known as the 'Ring Beam For The 144MHz Band' (measured forward gain a little over 8dBd) may be found, with full constructional details, in *Wires and Waves* §.

Omni-Directional VHF Loops

Self-resonant, omni-directional circular loops are little used now but were popular at one time for v.h.f. mobile operation. One design, 0.5λ in circumference and known as a 'Halo', operates horizontally and is suitable only for transmitting and receiving horizontally polarised radiation. Details on this antenna may be found in most books dealing with antennas.

Square Loops

Square loops were more generally known as 'quad' beam antennas and used as a driven element or as passive reflector and directors, ref: *Cubical Quad Antennas* §. The far field radiation patterns of square or circular loops with the *same area* are identical when the loops are small with respect to the working wavelength. This property depends on the area of the loop only and its shape has no effect

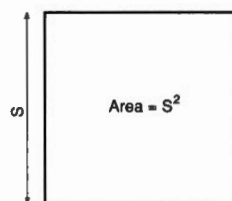
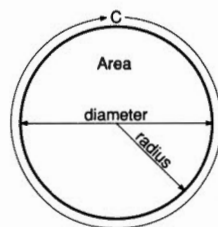


Fig. 1.5: The relationship between sizes and areas of both types of loop (see the text for more information).

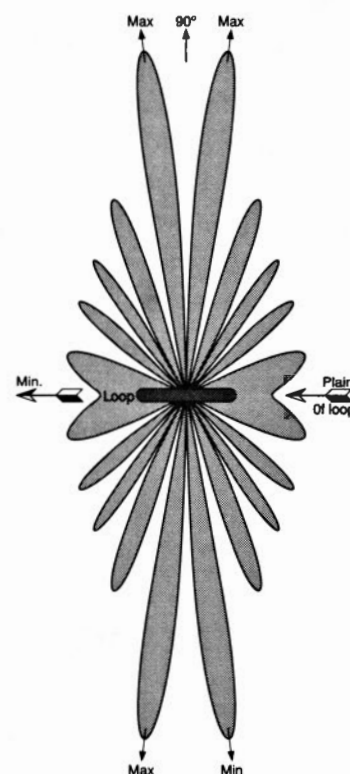


Fig. 1.7: Polar radiation pattern of a circular loop antenna with a circumference 15.7λ long. (from *Antennas* by J.D. Kraus Ph.D)

Fig. 1.6: Polar radiation pattern of a circular loop antenna one wavelength in diameter.

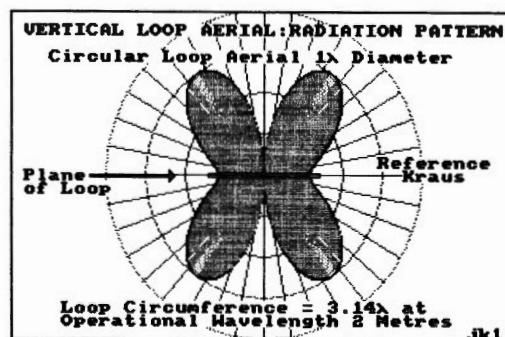


TABLE 1.1:

Sizes of circular and square loops with similar enclosed areas.

Area (m ²)	Circum (m)	diameter (m)	length S (m)	S x 4 (m)
0.02	0.5	0.159	0.141	0.564
0.029	0.6	0.191	0.169	0.676
0.039	0.7	0.223	0.197	0.788
0.051	0.8	0.255	0.226	0.904
0.064	0.9	0.286	0.254	1.016
0.08	1.0	0.318	0.282	1.128
0.096	1.1	0.350	0.310	1.240
0.115	1.2	0.382	0.339	1.356
0.134	1.3	0.414	0.367	1.486
0.156	1.4	0.446	0.395	1.580
0.179	1.5	0.477	0.423	1.692



when the loop is small as stated. The radiation pattern of a square loop is as shown in Fig. 1.4(b). Note that the gain at maximum directivity is slightly less than that obtained with a circular loop.

There is further relationship between small circular and square loops which stems from the fact that if the length of a side (S) of a square loop equals $\sqrt{\pi}$ x (radius of a circular loop with the same cross sectional area) then the area of both loops will be the same. Refer to Fig. 1.5. The radius (r) of the circular loop is calculated from $C/2\pi$. The area enclosed by the loop is πr^2 although the square loop has a circumference ($4 \times S$) greater than the equivalent circular loop. A selection of examples are shown in Table 1.1. However, when the circumferences are the same, the circular loop, by virtue of enclosing a greater area, will have slightly higher directivity gain, as shown previously in Fig. 1.4.

If a small circular or square vertical loop antennas, fed at the base, is rotated through 90° (in the plane of the loop) so that the feed point is on a side, then the polarization of radiation will be changed from vertical to horizontal.

Large Dimension Loop

As the diameter of the circular, or the width of a square loop becomes large in terms of wavelength at the working frequency, four major lobes are produced much the same as with long wire antennas one or more wavelengths in physical length. Diagram Fig. 1.6 illustrates the horizontal radiation pattern of a circular loop one wavelength in diameter, or $\pi\lambda$ in circumference. It shows a four lobe pattern similar to that of a one wavelength linear antenna but without side lobes.

Considering linear antennas several wavelengths long (working frequency), there are still four major lobes and each may have considerable directivity gain. There will also be a variety of side lobes depending on the length of the antenna. The far field radiation patterns of circular loops several wavelengths in circumference, also show four major lobes. These are at shallow angles either side of 90° to the plane of the loop, with a number of side lobes at other smaller angles as in Fig. 1.7.

A square loop with sides each 4.4λ long, has a radiation pattern consisting of two main lobes with

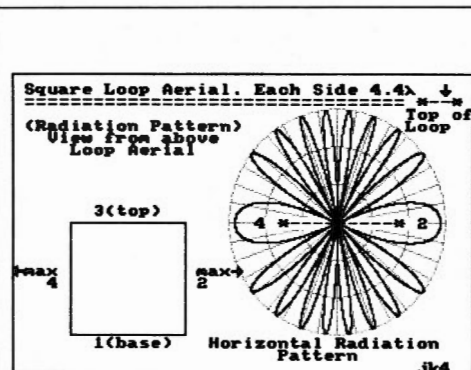


Fig. 1.8: Polar radiation pattern of square loop with sides 4.4λ long (computer produced).

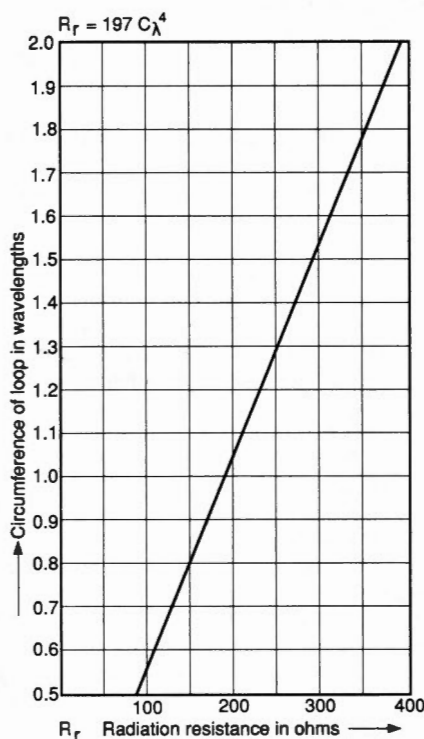


Fig. 1.9: Radiation resistance of small loops.

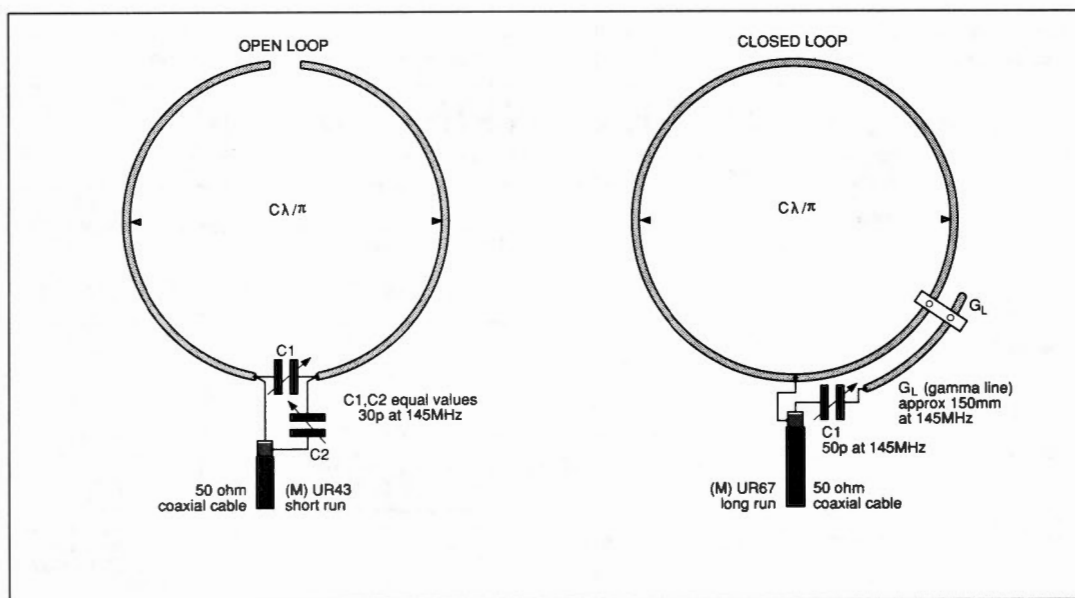
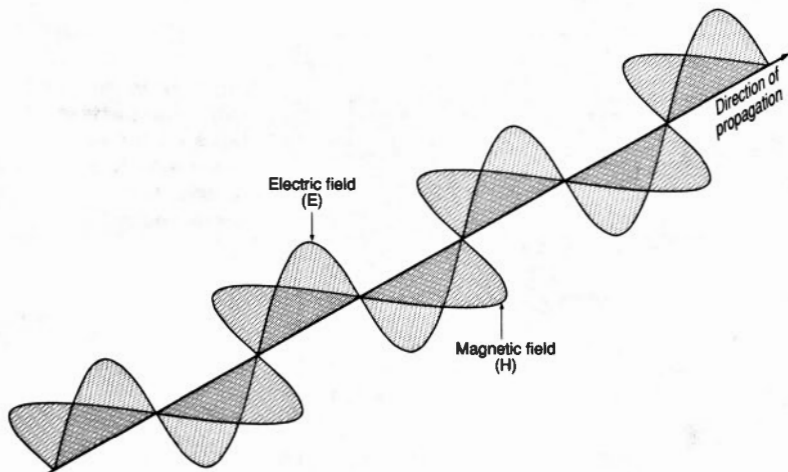


Fig. 1.10: (a) A simple method of attaching a small open resonant loop with a 50Ω coaxial cable. (b) A 'gamma' matching line, used on a small closed loop antenna fed as above.

Fig. 1.11: The electric and magnetic components of an electromagnetic wave in free space.

§ Many of the publications quoted in this and other articles may be available from the PW Book Service. Please consult the PW Book Service Pages for the latest information and prices.



some directivity gain, plus a number of side lobes with approximately the same magnitude as the main lobes in the computer produced radiation pattern Fig. 1.8.

Feeding Resonant Loop Antennas

The radiation resistance for a small circular resonant loop antenna (also approximately the same for small square loops) may be found from the graph Fig. 1.9. A loop even as small as $\lambda/2$ in circumference would not match directly to 50 Ω coaxial cable. Two matching methods are illustrated in Fig. 1.10. Method (a) being suitable for loops $\lambda/2$ circumference (as the v.h.f. d.f. antenna mentioned earlier).

The gamma match Fig. 1.10(b) is more suitable for larger loops (circumference $\leq \lambda$). It is also suitable for quarter-wave, or larger, square loops. Small circumference tuned loop antennas for h.f. band operation, known as 'magnetic' loop or compact h.f. loop antennas, will be dealt with in a later issue of the magazine.

Meantime, for a better understanding of the radiating properties of the various types of loop antenna and for that matter all antennas, we delve a little into the discovery and principles of electromagnetic radiation.

Electromagnetic Radiation

When an electric current flows in a conducting element, which may be part of a dipole or loop antenna, or indeed any other kind of antenna, then three fields are produced by that current. One is the

induction field, first discovered by Michael Faraday (1832) which finds application in low frequency (50Hz and audio frequency) transformers and in radio frequency tuned circuits (r.f. and i.f.) when a voltage is induced in one coil by current flowing in another.

However, James Clerk Maxwell interpreted the Faraday discovery in another way. He found that the changing magnetic field created by one coil produced an electric force, or field which, in turn, caused a current to flow in another (adjacent) coil. In other words a changing magnetic field creates an electric field. Maxwell similarly interpreted Oersted's experiment, q.v. that a changing electric field creates a magnetic field.

From these interpretations, Maxwell also showed mathematically that at any point in space, distant from the source, the electric and magnetic fields are mutually *self-supporting* and co-existent (i.e. inseparable and can only exist in this manner). Hence the term electromagnetic field. At a distance, this field is commonly referred to as the *far field*. Maxwell also showed that any electromagnetic disturbance travels through space and that the velocity of this propagation is:

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$

where ϵ_0 is the permittivity (electric) of space μ_0 and is the permeability (magnetic) of space. When the appropriate values of ϵ_0 and μ_0 are substituted in the above equation, c is equal to the *velocity of light*., approximately 300 000 000m/sec.

The electric and magnetic components of an electromagnetic field can only exist mutually perpendicular to each other (in free space) and perpendicular to the direction of propagation as shown in Fig. 1.11. These components are simply separate but equivalent manifestations of one and the same thing, namely, the electromagnetic field. In some instances it may be easier, or more convenient, to work out a problem in terms of the electric field and at others in terms of the magnetic field. The choice is made for simplicity or convenience, and should not be interpreted as reality since the electric and magnetic fields are always together and inseparable. You can't have one without the other!

The second part of this feature will deal first with the near field of radiation (applicable to all transmitting antennas) and continue with the function and performance of 'magnetic' or compact loop antennas for h.f. bands operation.

TO BE CONTINUED

Please indicate the type of subscription required:

PRACTICAL WIRELESS 1 YEAR

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

SHORT WAVE MAGAZINE 1 YEAR

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

SPECIAL JOINT SUBSCRIPTION 1 YEAR ONLY

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

Prices current at November 1990

Subscription to commence with issue dated...

If you do not want to deface your PW, a photocopy of this coupon will be acceptable.

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

Name.....

Address.....

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

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

Card No.

Valid from to

Signature.....

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

KW COMMUNICATIONS LTD

CHATHAM ROAD, SANDLING, MAIDSTONE ME14 3AY

Tel: 0622-692773 Fax: 0622-764614 Tlx: 965834

SCANNERS & RECEIVERS

Item	Description	Price incl. VAT	P/P
AR900K	6 band hand held scanning RX	£235.00	
AR1000	Scanning RX 8-1300MHz	£249.00	
MVT500	Scanner RX 25-1300MHz hand held	£275.00	
MVT6000	Scanner RX 25-13MHz Base/Mobile	£345.00	
R100	Wideband RX	£499.00	
R700	Wideband RX	£999.00	
FRG9600(M)	60-950MHz	£498.00	
R535	Airband VHF & UHF	£249.00	
WIN108	Handheld Airband 108-136MHz	£175.00	
R2000	General Coverage HF Receiver	£595.00	
R5000	General Coverage HF Receiver	£875.00	
HF225	General Coverage HF Receiver	£425.00	
R 1	Hand portable Receiver	£399.00	
R 71	General Coverage HF Receiver	£855.00	
FRG 8800	General Coverage HF Receiver	£649.00	

BUTTERNUTT (U.S.A.)

Item	Description	Price incl. VAT	P/P
HF6VX	6 Band Vertical	£179.09	
HF2V	HF 2m Vertical	£224.00	£4.00
A1824	18 & 24MHz Add on Kit	£36.85	£2.00
STR 11	HF6V Radial Kit	£33.50	£3.00
MPS	Mounting Post HF6 & HF2	£6.00	£2.00
20MRK	HF2V 20m Add on Kit	£33.50	£2.00
30MRK	HF2V 30m Add on Kit	£33.50	£2.00
TB180S	160m Add on Kit for HF6 & HF2	£64.48	£3.00
2MCV	3dB 2m Colinear	£53.99	£3.00
2MCVS	5dB 2m Colinear	£63.99	£3.00
HF5B	5 Band Mini Beam	£234.15	

CUSHCRAFT (U.S.A.)

Item	Description	Price incl. VAT	P/P
124WB	Cushcraft 124WB VHF Beam Ant.	£37.08	£4.00
153CD	Cushcraft 15-3CD 3E1 25m Beam	£140.06	£8.00
154CD	Cushcraft 15-4CD 4E1 15m Beam	£148.29	£8.00
203CD	Cushcraft 20-3CD 3E1 20m Beam	£238.91	
204CD	Cushcraft 20-4CD 4E1 20m Beam	£328.70	
215WB	Cushcraft 15E1 2m Yagi Antenna	£98.99	£8.00
4218XL	18 Element 2m Boomer	£121.90	£8.00
A3SS	Cushcraft 3 Ele Tribander SS	£234.02	
A4S	Cushcraft 4 Ele Beam Antenna	£391.95	
A50-6	Cushcraft 6m 6 Ele Beam Antenna	£182.51	£8.00
AP8	8 Band Vertical	£164.76	£8.00
ARX2B	Cushcraft VHF Vertical Antenna	£45.59	£3.00
ARX450B	Cushcraft VHF Beam	£42.84	£2.00
AV3	Cushcraft AV3 Trapped Vert Ant.	£75.00	£8.00
AV5	Cushcraft AV5 Trapped Vert Ant.	£151.80	£8.00
DW3	Cushcraft 10, 15 & 20m Dipole	£138.67	£4.00
D3W	Cushcraft 10, 12 & 17m Dipole	£138.67	£4.00
LAC1	Cushcraft Lightning Arrestor	£6.58	£1.00
LAC2	Cushcraft Lightning Arrestor	£6.58	£1.00
LAC4H	Cushcraft Lightning Arrestor	£22.78	£1.00
R45K	R4 to R5 Conversion Kit	£35.01	£4.00
R5	Cushcraft 1/2 Wave Vert 10-20m	£259.01	
TEN3	3 Element Monobander	£115.03	£4.00

MFJ (U.S.A.)

Item	Description	Price incl. VAT	P/P
MFJ1274	Packet Radio Terminal	£204.25	£3.00
MFJ1276	Multi Mode Data Controller	£228.49	£3.00
MFJ1701	6-way Antenna Switch	£39.30	£2.00
MFJ1704	4 Position Ant Switch	£66.41	£2.50
MFJ202B	RF Noise Bridge	£63.20	£2.00
MFJ204B	Antenna Noise Bridge	£84.31	£2.00
MFJ260	300W Dummy Load	£32.57	£2.00
MFJ401B	Econo Keyer Kit	£59.21	£3.00
MFJ407B	Electronic Keyer	£78.73	£3.00
MFJ422B	Electronic Morse Key Bench	£146.25	£3.00
MFJ422BX	Electronic Morse Keyer W/O Bench	£76.46	£3.00
MFJ484C	Grandmaster Memory Keyer	£162.32	£3.00
MFJ722	CW Filter	£76.46	£2.50
MFJ723	CW Filter	£48.54	£2.50
MFJ752C	Tunable Filter	£104.42	£3.00
MFJ815	SWR Meter 2kW	£87.74	£2.50
MFJ840	2m Wattmeter	£21.02	£2.00
MFJ841	2m In-line Wattmeter	£42.14	£2.00
MFJ901B	200 Watt ATU	£70.05	£2.50
MFJ931	Artificial Ground	£86.61	£3.50
MFJ941D	300 Watt Basic Tuner	£105.40	£3.50
MFJ945C	Versa Tuner 11 Mobile	£97.37	£3.50
MFJ949D	De Luxe 300W ATU	£168.82	£3.50
MFJ962B/C	1.5kW ATU	£258.01	
MFJ986	1.5kW Roller Inductor Tuner	£279.62	

LOADS & SWITCHES

Item	Description	Price incl. VAT	P/P
T35	Toyo 30W 1-500MHz Dummy Load	£10.20	£2.00
T100	Toyo 100W 1-500MHz Dummy Load	£45.00	£2.00
T200	Toyo 200W 1-500MHz Dummy Load	£84.00	£2.00
DL1	Texpco 1.5kW 160-10M Dummy Load	£75.00	£2.00
KS 2	Koyo Coaxial switch 2 way 10kW	£28.89	£2.00
S20N	Koyo Coaxial Switch 2 way 10kW 1-1000MHz 'N'	£32.86	£2.00
SA 450M	Toyo Coaxial Switch 2 way 2.5kW 1-1500MHz SO239	£18.50	£2.00
SA 450N	Toyo Coaxial Switch 2 way 2.5kW 1-1500MHz 'N'	£26.00	£2.00
DRAE UHF	UHF 3 position Antenna Switch 'N'	£24.15	£2.50
DRAE VHF	VHF 3 position Antenna Switch 'SO239'	£18.89	£2.50

VSWR/POWER METERS

Item	Description	Price incl. VAT	P/P
W160	Koyo 15/60W 2m In-Line VSWR	£32.91	£2.00
W544	Koyo 7/40/400W 140-460MHz	£107.00	£2.00
W560M	Koyo 3/20/200 1.8-520MHz	£99.90	£2.00
W570	Koyo 5/20/200 1.8-1300MHz	£124.75	£2.00
K 20	Koyo 15/50W 2m	£24.60	£2.00
K 100	Koyo 2kW 1.8-60MHz	£79.98	£2.00
K 200	Koyo 200W 1.8-60MHz	£61.55	£2.00
K 400	Koyo 200W 140-525MHz	£83.65	£2.00
YM 1E	Toyo 120W 3 5-1500MHz	£32.00	£2.00
T 435	Toyo 200W 2m & 70cm VSWR/Wattmeter	£87.77	£2.00

WIDE BAND ANTENNAS

Item	Description	Price incl. VAT	P/P
AH 7000	Discone 25-1300MHz	£82.50	£4.00
YADC 2	Discone 14-1300MHz	£78.00	£4.00
DSC 8	Discone TX/RX 70-680MHz	£29.95	£4.00
SC3000	Discone 300-512MHz	£63.99	£4.00

ICOM

Item	Description	Price incl. VAT	P/P
IC-751A	HF All Band, General Coverage Rx 12V	£1500.00	
IC-735	HF All Band, General Coverage Rx 12V	£979.00	
IC-726	HF All Band, General Coverage Rx + 6m	£989.00	
IC-725	HF All Band, General Coverage Rx 12V	£759.00	
IC-505	6M Transceiver, SSB/CW 12V	£529.00	
IC-2SE	2M FM Handportable with Nicad/charger	£275.00	
IC-2SEET	2M FM Handportable Keypad entry DTMF	£295.00	
IC-2GE	2M FM Handportable with Nicad/charger	£265.00	
IC-228E	2M FM Mobile 25W 20 Memo 12V	£365.00	
IC-228H	2M FM Mobile 45W 20 Memo 12V	£385.00	
IC-290D	2M SSB/FM/CW 25W 5 Memo 12V	£559.00	
IC-275H	2W Transceiver SSB/FM/CW 100W 12V	£1,039.00	
IC-4SE	70CM FM Handportable inc Nicad/charger	£310.00	
IC-4SET	70CM FM Handportable Keypad entry DTMF	£310.00	
IC-4GE	70CM FM Handportable inc Nicad/charger	£299.00	
IC-R100	Wideband Receiver	£499.00	
IC-AT150	Automatic Antenna Tuner 100W	£329.00	
IC-AT500	Automatic Antenna Tuner 500W	£529.00	

KENWOOD

Item	Description	Price incl. VAT	P/P
TS950SD	NEW Transceiver	£3,199.00	
TS940S	9 Band TX General Cover Rx	£1,995.00	
AT940	Auto/ATU	£244.88	
TS140	HF 9 Band Gen. Cov. TX/Rx	£862.00	
TS605	HF 6m TX Gen. Cov. Rx	£985.00	
TS440	9 Band TX General Cov. Rx	£1,138.81	
P550	H/Duty PSU	£222.49	
AT230	All Band ATU/Power Meter	£208.67	
TH25	NEW 2m H/Held	£238.00	
TH45	NEW 70cm H/Held	£269.00	
TH75	NEW 2m/70cm H/Held	£398.00	
TH205	2m H/H	£215.26	
TH215	2m H/H Keyboard	£252.13	
TH751	2m 25W M/M Mobile	£599.00	
TM701	NEW 2m/70cm FM Mobile	£469.00	
TM721	2m/70cm FM Mobile	£575.00	
TM231E	NEW 2m FM Mobile 50/10/5W	£289.00	
TM431E	NEW 70cm FM Mobile 35/10/5W	£318.00	

TEN TEC (U.S.A.)

Item	Description	Price incl. VAT	P/P
TT 562	Omni V HF Transceiver CW/SSB/FM 200 9 bands	£1,900.18	
TT 585	Paragon General Coverage HF Transceiver 200W	£1,839.00	
TT 561	Power Supply for Omni, Paragon	£21.00	
TT 282	6.3MHz 250Hz Filter	£60.00	£2.00
TT 285	6.3MHz 500Hz Filter	£60.00	£2.00
TT 288	6.3MHz 1800Hz Filter	£60.00	£2.00
TT 1140	Circuit Breaker	£16.00	£2.00
TT 217	9.0MHz 500Hz Filter	£60.00	£2.00
TT 218	9.0MHz 1800Hz Filter	£60.00	£2.00
TT 219	9.0MHz 250Hz Filter	£60.00	£2.00
TT 256	FM Transceiver Module for Omni & Paragon	£60.49	£2.50
TT 220	9.0MHz 2.4kHz Filter	£60.00	£2.00
TT 425E	Titan Linear 1.5kW 160-10m	£2,171.00	
TT 120	Hercules II 500W Solid State 160-10m	£399.00	
TT 9420	Hercules II Power Supply 100A 13.8V	£160.00	
TT 700C	Ten Tec Electret Hand Microphone	£32.00	£2.00
TT 705	Ten Tec Electret Desk Microphone	£85.00	£2.00
TT 238	Ten Tec ATU 2.0kW 'L' match 160m-10m	£361.69	
TT 254	Ten Tec ATU 200W 'T' match 160m-10m	£153.33	£3.50

YAESU

Item	Description	Price incl. VAT	P/P
FT1000	HF Transceiver	£2,995.00	
FT167	HF Transceiver	£1,599.00	
FT147GX	Budget HF Transceiver	£659.00	
FT757GX	Mk II HF Transceiver	£969.00	
FP700	20A P.S.U.	£219.00	
FC700	Manual ATU	£149.00	£3.00
FP757HD	Heavy Duty 2m P.S.U.	£256.75	
FT4700	New 2m/70cm Dual Band FM Mobile	£875.00	
FT290	Mk II Super 290 2m Multimode 2.5W	£429.00	
FT690	Mk II 6m M/Mobile 2.5W	£399.00	
FT411	New 2m H/H Keyboard	£225.00	
FT811	New 70cm H/H Keyboard	£239.00	
FT470	New 2m/70cm Dual Band H/H	£389.00	
FT23R	2m Mini H/H	£209.00	
FT73R	70cm Mini H/H	£229.00	
FN89	Nicad Battery Pack (23/73)	£34.50	£2.00
FN810	Nicad Battery Pack (23/73)	£34.50	£2.00
FT736	2/70cm 25W Base Station	£1,399.00	

ROTATORS

Item	Description	Price incl. VAT	P/P
AR40	Hy Gain for up to 3 sq. ft. wind load	£186.67	£4.00
CD4511	Hy Gain for up to 8.5 sq. ft. wind load	£236.80	
HA4M	Hy Gain for up to 15 sq. ft. wind load	£325.60	
T2X	Hy Gain for up to 20 sq. ft. wind load	£389.00	
G400RC	Sky King Light Duty Rotator	£39.99	£4.50
G600RC	Yaesu Round 360° metre	£169.00	£5.00
AR200XL	Yaesu Round 360°	£219.00	£5.00
G250	Offset lead unit, 3 wire, rotary dial control	£49.50	£4.00
KS050	Yaesu twist and switch control	£78.00	
GC038	Kenpro Stay Bearing	£19.95	£4.00
	Yaesu Rotator lower mast clamp	£16.95	£4.00

If you don't see it please ask — we have over 1000 items in stock. We are located just off the Eastern side of the A229 between Junction 3, M2 and Junction 6, M20. Follow the signs to SANDLING.



Instant credit available
Mail/Telephone order by cheque or Credit Card
(E&OE)



OPEN TUES.-SAT. 9.30-5.30
(CLOSED MONDAYS)

STOCK ITEMS USUALLY
DESPATCHED WITHIN 24 HRS.

DELIVERY/INSURANCE PRICES
MAINLAND ONLY

'RAD COMM' for the Radio Amateur

'Radio Communication'

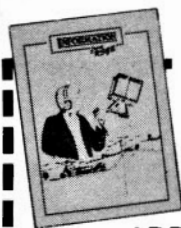
is internationally recognised as one of the world's leading journals for the radio amateur and short-wave listener. Published monthly by the Radio Society of Great Britain, it is circulated exclusively to members of the Society and carries wide ranging and authoritative articles, technical reviews and data essential to those seeking to keep themselves briefed on the most up to date developments in the hobby. Regular columns cater for HF, VHF/UHF, microwave, satellite, data transmission and ATV enthusiasts. Regular constructional articles are supported by a PCB service.



JOIN THE RSGB TODAY

Membership services include a QSL Bureau, advice on planning permission for aerials plus technical and EMC problems, specialised contests and much, much more!

FOR YOUR FREE 'RAD COMM'
and a membership pack, post the coupon today, or
CALL 0707 59015



PLEASE SEND YOUR PACK

NAME

CALL SIGN

ADDRESS

PW

To **RADIO SOCIETY OF GREAT BRITAIN**

Lambda House, Cranborne Road,
Potters Bar, Herts, EN6 3JE.



KITS OR READY BUILT

TRANSVERTERS	Boxed Kit	Boxed built
28/50MHz 500mW out, TRC6-10	£64.00	£99.00
28/70MHz 500mW out, TRC4-10	£64.00	£99.00
28/144MHz 500mW out, TRC2-10	£64.00	£99.00
28/144MHz 500mW out rep shift TRC2-10r	£70.00	£105.00
144/50MHz 500mW out, TRC6-2i	£72.00	£114.00
144/70MHz 500mW out, TRC4-2i	—	£114.00
LINEAR AMPLIFIERS		
50MHz 500mW in 25W out switched, TA6S2	£58.50	£72.75
70MHz 500mW in 25W out switched, TA4S2	£58.50	£72.75
144MHz 500mW in 25W out switched, TA2S2	£58.50	£72.75
50MHz 25W switched for FT690, TA6S1	£42.50	£55.00
144MHz 25W switched for FT290, TA2S1	£42.50	£55.00
SPEECH PROCESSOR		
Popular new product SP444E	£20.00	£35.00
RECEIVE PREAMPS		
28MHz 20dB gain, 100W handling RP10S	£25.00	£35.50
50MHz 20dB gain, 100W handling RP6S	£25.00	£35.50
70MHz 20dB gain, 100W handling RP4S	£25.00	£35.50
144MHz 20dB gain, 100W handling RP2S	£25.00	£35.50
50MHz as above, masthead RP6SM	£41.00	£53.00
144MHz as above, masthead RP2SM	£41.00	£53.00
RECEIVE CONVERTERS		
28/50MHz, low noise, 26dB gain, RC6-10	£29.25	£41.00
28/70MHz, low noise, 26dB gain, RC4-10	£29.25	£41.00
28/144MHz, low noise, 26dB gain, RC2-10	£29.25	£41.00
144/50MHz, low noise, 15dB gain, RC6-2	£29.25	£41.00
144/70MHz, low noise, 15dB gain, RC4-2	£29.25	£41.00
TRANSMIT TONES	PCB KIT	PCB BUILT
1750Hz repeater toneburst, AT1750	£4.00	£6.00
Piptone, like APOLLO beep, PT1000S	£6.00	£8.00
Keytone, morse dah-di-dah, KT1000	£8.00	£12.00

PLUS MANY OTHER KITS AND 10 METRE CONVERSIONS
AND COMPONENTS

Send SAE for Shortlist of other kits, or £1 for Full Catalogue.
Kits include pots and heatsinks. VAT & P&P inclusive prices.
Shop times: 9-1 2-5 Tue-Fri, 9-1 Sat. Closed Sun & Mon.



SPECTRUM COMMUNICATIONS



Unit B6 Marabout Industrial Estate,
Dorchester, Dorset. Tel 0305 262250



RADIO LINE

THE UP-TO-DATE NEWS &
INFORMATION SERVICE FOR THE
LISTENING ENTHUSIAST

0898 654676

UPDATED EVERY SATURDAY

Calls charged at 33p per minute cheap rate,
44p per minute at all other times.

RADIO LINE

PW PUBLISHING LTD. ENEFCO HOUSE, THE QUAY, POOLE,
DORSET BH151PP.

PACKET PANORAMA

This month Roger Cooke G3LDI continues with the finer points of packet working

Another month passes by - time goes so quickly these days, I am fighting old age but obviously not alone in that respect (see last paragraph for more info).

I wish something could happen with the h.f. bandplan. From the comments received both on packet and the landline, there are some that favour them being sorted out. To that end, I have written to the secretary of BARTG with a consensus of suggestions as to a fair share of the bands for digital modes. I would emphasise once again that it really is imperative that YOU add your written support, before the next IARU meeting.

Forwarding Schedules

As promised a while back I am starting with the forwarding schedule of GB7GUR, owned and operated by Chris GU4YMV, in Guernsey. This can be found in Fig. 1. Chris is obviously very busy on h.f. with two rigs going! Tables such as this can be very useful for routing of h.f. traffic, sometimes with a creditable time-saving, especially with the 3.5MHz link. I hope to be joining him soon on that band, to try to alleviate the problem of south-bound traffic, especially bulletins, from Scotland. John GM4IHJ, originates 'Satgen' bulletins that never seem to arrive down south. He now sends them as private mail addressed to me for re-direction. This should improve when I activate the 3.5MHz link.

Joe Kasser, the author of the very popular terminal program, 'Lan-link', sent news of another of his programs, 'What's Up'. The information is given below regarding obtaining a copy.

Now that DOVE is sending TLM again, I'm updating 'What's Up' from 0.42 to a newer 0.5X version. This version should be released sometime in September.

This version runs on the PC only and will contain decode display data for Fuji-OSCAR 20 (and Fuji-OSCAR 12 if someone provides some data on disk). If you'd like to see

What's happening up there you can get a copy of the new 'What's Up' by sending a formatted disk containing at least 100Kbytes of telemetry from any OSCAR satellite together with a mailer and return postage to:

Joe Kasser W3/G3ZCZ
11421 Fair Oak Drive,
Silver Spring, MD 20902.

All telemetry received will be examined and then forwarded to AMSAT's archives. If you are on my mailing list, I'll send you a copy of the new version. If you'd like to send me a packet message (G3ZCZ@N4QQ) expressing interest in receiving the new 'What's Up' and telling me which satellites you like to copy telemetry from and what you do with the telemetry, and provide some suggestions for features you'd like to see in 'What's Up'. You never know, you may see them there.

Due to the deliberate QRM on the forwarding channels by RTTY, continuous carriers and, when on 14.098MHz, other packet stations assuming one of the forwarding stations call signs and forcing a disconnect, Jim 4X1RU has put out this bulletin. It is hoped that it will help to explain exactly what the

forwarding BBS stations are trying to achieve and also give a little education at the same time.

Subjects:

1. Use of the W-4XGB7-Transatlantic Gateway.
2. Request QTH SERVER available in the US
3. 'White Pages' (WP) SERVER available in the US
4. QRM 1. Use of the W-4XGB7-Transatlantic Gateway.

Use of the Gateway

This is an h.f. circuit operating daily between 4X1RU (in Herzlia, Israel) and N4QQ-1 (located in McLean, Virginia, USA) and N4QQ-1 and GB7LDI (in Norwich, England). The call N4QQ belongs to John, but the station N4QQ-1 is located at the QTH of and run by Art KB4ZJ.

The W-4X link is the only one operating between the Americas and Europe, the Middle East and Africa, except for GB7LDI (Roger G3LDI) who handles all the UK traffic. Stations in Australia working with stations in California handle Asian traffic.

Due to technical limitations on this link, which is 9400km long, we've had to restrict

message sizes to no more than 2Kbytes (including headers) when the message arrives at either end of the link. For messages longer than this, please split them up into smaller ones.

The local BBS of the addressee MUST be present. If not, your message may not be deliverable and will just be another source of QRM.

When you sign your messages, ALWAYS sign your call sign and YOUR local BBS. Let the other station know where you want to get your mail. It may not be the same BBS that you sent your message. Make this a matter of habit so that you never forget. For example: 4X1AT @ 4Z4SV, where 4Z4SV is 4X1AT's local BBS. It's to your advantage.

Please do not send repetitive messages. If you wish to send the same message to more than one address, send them as follows:

From Europe:

SP REFILE @ N4QQ

or from the Americas:

SP REFILE @ 4X1RU and

state in the message where you want individual messages sent. The local SYSOP will refile for you thus saving transatlantic link time.

QTH Server

Available in the US, it is possible to ask for individual addresses of amateur stations by using the facilities offered by WA4ONG. The following is an explanation of its use: In order to reduce the network loading, the WA4ONG BBS REQQTH feature has been enhanced to allow requesting more than one call QTH per message!

The format is:

SP REQQTH @ WA4ONG

[Note this must be an 'SP' message Enter Subject for Msg # 9999]

WB3ABC,WA4ONG,WB0TAX K4NGC @W3IWI. Note use only commas or spaces. No full stops. Send message. Use CNTL-Z or /EX to end: (^Z) Anything placed in the message field will be discarded.

14MHz
SM7DLZ MAIL, BULLETINS
SM5BKI MAIL, BULLETINS, HAS BACK UP LINK TO USA
OZ5BBS MAIL, BULLETINS
IK4BLV MAIL, BULLETINS
LA6HX MAIL ONLY
4X1RU MAIL ONLY
ALSO BACK UP FOR USA MAIL
EXPERIMENTAL LINK WITH GB7FRI MAIL, BULLETINS
EA8RT, BULLETINS, SOME MAIL FOR EA8
IT8PKB BAK UP FOR I MAIL, NORMALLY GOES TO IK8BLV
HOPING TO SET UP A LINK TO N4QQ
3.5MHz
GB7ERA MAIL BULLETINS, USED AS BACK UP TO MAIN
VHF/UHF. LINKS
GB7BNM DITTO
GB7KAW EXPERIMENTAL LINK
GB7ZZZ EXPERIMENTAL LINK
GB7FRI MAIL, BULLETINS
2 HF. RIGS, 24 HOUR OPERATION (UNTIL GB7GUR ISSUED,
80M ATTENDED)I AM ALSO LOOKING FOR SOMEONE TO
CARRY OUT TEST ON 40M. SHOULD BE GOOD FOR
DAYTIME INTER-UK LINKS.

Fig. 1

PACKET PANORAMA

White Pages

The 'White Pages' (WP) SERVER is available in the US. It is possible to obtain the local BBs of stations in the US using the 'White Pages' SERVER available in California, as follows:

Subject: White Pages
Documentation
Bulletin ID: K0CM00883
R:870730/1257t @:WB0TAX
#242 <K0CM. [Tidewater BBS, Hampton, Va.]

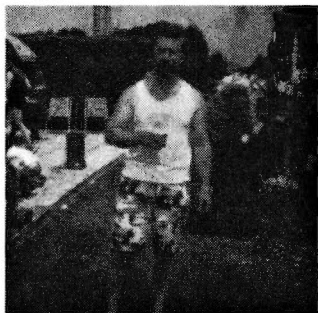
WP stands for 'White Pages' and is a directory system for packet radio mailboxes. It allows remote query and updating of a database that lists the users of RLI-compatible mailboxes and their home BBS. To use the program, a message is sent to 'WP' at W9ZRX. The message can have several lines (a single message can contain several queries/updates), but each line must have one of the following formats: <callsign> QTH? <callsign> QTH <mailbox> DE <callsign> @ <mailbox>.

The first form is a query and will return the home BBS of the person with the given callsign. The second form adds or changes the entry for the given callsign, storing his home mailbox with his callsign. The third form provides a return

address for the requested information. If the message does not contain a line of the third form, the WP program will try to get the return address from the forwarding headers. This will work as long as the mailboxes in the forward path use the NK6K format for forwarding headers. Replies will be sent to the originating station at the mailbox specified as described above.

The reply will be generated a few minutes after the message is received at W9ZRX. Currently, the WP program is run every 15 minutes, so that is the maximum wait for a reply. Of course, queries sent from other mailboxes will have to make their way through the forwarding system, as will the reply.

For example, suppose you wanted to find out where



Alan G0KRU at the Eastnet barbecue.

KE6AD was located? You would send a message to WP like this:

Msg# TR Size To From @
BBS Date/Time Title 2005 PN
11 WP W9ZRX 0319/1207 A
query ke6ad qth?

Notice that case is insignificant within the message. If the station was not on file, WP would send you a reply that looked like this:

Msg# TR Size To From @
BBS Date/Time Title 2006 PN
74 W9ZRX WP 0319/1207
Reply to WP query KE6AD no
record, sorry. 73 DE WP @
W9ZRX

If you happened to know that KE6AD was at N7EQN, you could tell WP that. Let's say you also wanted to look up N7EQN. The message would look like this:

Msg# TR Size To From @
BBS Date/Time Title
2007 PN 27 WP W9ZRX
0319/1208 ke6ad qth n7eqn
ke6ad qth n7eqn n7eqn qth?
The reply from WP would be:

Msg# TR Size To From @
BBS Date/Time Title
2008 PN 85 W9ZRX WP
0319/1208 Reply to WP query
KE6AD QTH N7EQN QSL
TNX N7EQN QTH N7EQN
Redwood City, CA
(SKYWARN) 73 DE WP @
W9ZRX. The database is in a

growing state so it may not contain the callsign you're interested in. If you wish to add an entry, please make sure that the information is accurate.

QRM

I only request the following from those of you who are h.f. operators. If you hear the link in operation, please do not use the same frequency. Do not bounce your signal off N4QQ-1, 4X1RU or GB7LDI. Do not call these stations since both are programmed to respond to registered BBSs only. If you hear another station doing these things and it is a local station to you, please contact them 'off frequency' and POLITELY ask them for their co-operation and explain what you are trying to accomplish.

Message Ends

Finally this month on a much lighter note, there has been a change in the British National Costume. Spotted at the Eastnet Barbecue is Alan G0KRU. Unfortunately this year he forgot his Australian sun-hat, complete with corks on strings! A great day, weather superb and attended by about 75 people. Hope to see you there next year!

73 and happy packeting from Roger G3LDI, @ GB7LDI, QTHR or Tel: (0508) 70278.

(0202) 665524 (24-hour Answer Service)

PW BINDERS Only £4.50 each

(plus £1 p&p for one binder, £2 p&p for two or more, UK or overseas)



Are you tired of sifting through cardboard boxes and carrier bags to find that useful item in PW? Our smart binders, covered in blue plastics, are a must for your library, keeping your radio magazines in good condition and easily accessible.

Plus!

Tidy up those other mags too. Plain binders to take any A4 size magazines at the same price- no names, no pack drill !!!

HOW TO ORDER

Send a postal order, cheque or international money order with your order stating number and type 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) 665524. Normally despatched by return of post but please allow 28 days for delivery.

Prices include VAT where appropriate.

YAESU
ICOM
Authorised Dealer

MARTIN LYNCH

G4HKS

AMSTRAD
STANDARD
Authorised Dealer

THE AMATEUR RADIO EXCHANGE CENTRE

286 Northfield Avenue, Ealing, London W5 4UB. Tel: 081 566 1120 Fax: 081 566 1207

My thanks go to the many hundreds of customers who have visited me during the first month - the response was overwhelming - so were the bargains!! For those of you who missed last month's ad; Ealing has, once more, the largest and brightest Amateur Radio Showroom in the country. In fact, in a very familiar location - at the other end of NORTHFIELDS AVENUE where the original "AMATEUR RADIO EXCHANGE" used to be! Easy to park, with Northfield Tube Station just across the road, Bus Stops everywhere, M4 and M25/M40 motorways within minutes.

My policy? Much as it used to be in the earlier days - offering you a chance to buy or exchange good, clean Amateur Radio Equipment at sensible prices. I'm an **AUTHORISED OUTLET** for Yaesu, Icom, Standard and many more, that means you will get full service and spares back-up on all that I'll sell you. Since the opening, I have taken in a multitude of second hand equipment, ranging from accessories to complete stations - **CALL NOW FOR YOUR REQUIREMENTS.**

If you have any **Amateur Equipment, Computers, Hi-Fi or Video** to part exchange or sell, then ring now for a quote. If you cannot get to the shop, I will collect it within 48 Hours and, if it is as good as you say, a cheque will be on its way by return. Alternatively, exchange it for something of more interest to you or leave it with me to sell for you on "Sale or Return". You tell me what you want, and I will guarantee that amount, once sold on the spot!

Whether you have something to buy or sell, give me a ring - you will find other familiar faces at the shop who are dying to talk turkey, (or salt beef in Valerie's case!)

73 Martin G4HKS

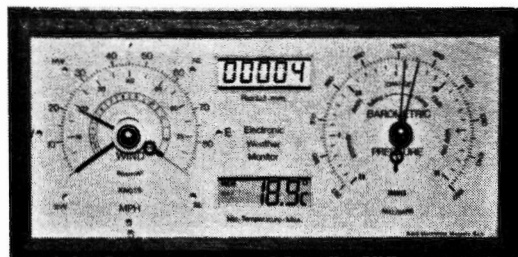
For fast mail order Tel: 081 566 1120
Please add £10 for 48 hour delivery.
Shop opening hours:
Tuesday - Saturday 10 - 6pm.
Fax order line open 24 hours.

Martin Lynch is a Licenced Credit Broker
Full details upon request
PHONE 081 566 1120



WEATHER MONITORING

Check out our
NEW LOW PRICE MODELS!



- WIND DIRECTION
- WIND SPEED
- GUST ALARM
- GUST SPEED
- RAINFALL
- SUNSHINE
- BAROMETRIC PRESSURE
- OUTSIDE TEMPERATURE
- MIN-MAX TEMPERATURE
- RELATIVE HUMIDITY
- TIME
- WOODEN CABINET
- MAINS & 12-24V DC

Models to suit all requirements



Available direct from manufacturers

**R&D ELECTRONICS, 318A NORTHDOWN RD
MARGATE, KENT CT9 3PW TEL: (0843) 221622**

HENRY'S

ELECTRONICS DISTRIBUTORS

**FOR TRADE, INDUSTRY,
EXPORT, EDUCATION
AND ALL
HOBBYISTS**

**LARGE
RANGE OF
ELECTRONIC
COMPONENTS
IN STOCK!!!**

**AUDIO, TV,
VIDEO,
TELEPHONE
& COMPUTER
ACCESSORIES**

Two Car Parks
Nearby

**A COMPLETE RANGE OF
CATALOGUES, COVERING
THE VAST HENRY'S STOCK**

TEST INSTRUMENTS (SAE 38p) Includes: Scopes, Counters, PSU's, Dmm's, Generators, TV/Video, Clamps, Insulation, Temperature, Logic plus much more (UK's largest in stock range).

SECURITY (SAE 28p) Home, Office, Shop, Store etc. Alarms and Alarm Systems, CCTV, Doorphones, PIR Indoor/Outdoor, TV/Video, and Telephone Accessories, Intercomms.

COMPONENTS (SAE 32p) Tools, Service Aids, Components, Computer Accessories, Semiconductors etc.

COLOUR CATALOGUE (SAE £2.00) Huge Range of Audio, Test, In Car, PA, Disco Equipment plus Leads, Plugs etc.

PUBLIC ADDRESS (SAE 32p) Disco, PA, Speakers etc.

COMMUNICATIONS (SAE 28p) CB Radio, Scanners etc.

TRADE/INDUSTRY/EDUCATION Write or fax for your FREE (UK only) CATALOGUES with Trade Prices (Export Send £5)

RETAIL MAIL ORDER Send SAE min. Size A4 with Stamp as Indicated (UK). Complete set with colour catalogue send P0/Chq (no SAE) £3.00. Export £5.00

**HENRY'S
AUDIO ELECTRONICS**

404 EDGWARE ROAD
LONDON W2 1ED

Instruments/PA/Audio 071-724 3564
Security/Communications/CCTV 071-724 0323
Components 071-723 1008
Trade/Education/Export 071-258 1831
Account facilities available Fax: 071-724 0322

OPEN 6 DAYS A WEEK FOR CALLERS AND TELEPHONE ORDERS



**ALL CATALOGUES
CONTAIN PURCHASE
VOUCHERS WORTH**

£90

FOR RETAIL MAIL ORDER ONLY

G6XBH

G1RAS

G8UUS

Visit your Local Emporium
Large selection of New/Used Equipment on Show

AGENTS FOR:
YAESU • AZDEN • ICOM • NAVICO • ALINCO

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

AERIALS, Tonna, New Diamond Range of Mobile Whips, Jaybeam
BRING YOUR S/H EQUIPMENT IN FOR SALE
JUST GIVE US A RING

Radio Amateur Supplies

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

Tel: 0602 280267

EVERY ISSUE OF
SHORT WAVE MAGAZINE
IS FOR BROADCAST, AIRBAND,
SCANNING AND WEATHER
SATELLITE ENTHUSIASTS.

NOVEMBER ISSUE ON SALE NOW.

Many Radio Amateurs and SWLs are puzzled.

JUST WHAT ARE ALL THOSE STRANGE SIGNALS YOU CAN HEAR BUT NOT IDENTIFY ON THE L.F. AND H.F. FREQUENCIES?

A few of them, such as CW, RTTY, and Packet you'll know - but what about the many other signals?

Hoka Electronics have the answer! There are some well known CW/RTTY decoders with limited facilities and high prices, complete with expensive PROMS for upgrading, etc., but then there is **CODE 3** from Hoka Electronics! It's up to you to make your choice - but it will be easy once you know more about **CODE 3**! **CODE 3** works on any IBM-compatible computer with MS-DOS having at least 640Kb of RAM. **CODE 3** hardware includes a complete digital FSK Converter with built-in 230V a.c. power supply and RS232 cable, ready to use. You'll also get the best software ever made to decode all kinds of data transmissions. **CODE 3** is the most sophisticated decoder available, the best news of all is that it only costs **£249 plus VAT!** The following models are included in the base-program (with the exact protocols).

★ Packet Radio AX25, 50 to 1200 Baud
★ Hell: Synchronous/asynchronous, all speeds
★ Fax: Weather charts, photographs with up to 16 grey scales at 60, 90, 120, 180, 240 rpm
★ Morse: Automatic and Manual with speed indication
★ Press DPA: F7b spec., 300Baud ASCII

★ Wirtshaftdienst: F7b spec., 300 Baud ASCII
★ Sport Information: F7b spec., 300 Baud ASCII
★ FEC-A: FEC 100(A) ITA 2-P FEC Broadcast Spread 11, 21 and 51
★ Autospec Bauer: ITA 2 including 3 modes
★ SITOR A and B automatic

★ Pol-ARQ
★ Duplex ARQ Artrac ITA 2
★ TWINPLEX F7b-1 upto F7b-6
★ Duplex ARQ
★ ASCII
★ Baudot: ITA 2 plus all types of Bit inversion, at any speed

★ ARQ: CCIR 476, CCIR 625 mode A
★ FEC: Self-FEC CCIR 625 476-4 mode B Sitor Amtor
★ ARQ-S: ARQ 1000S
★ ARQ-Swe: CCIR 518 variant
★ ARQ-E: ARQ 1000, IRA 2-p Duplex

★ ARQ-N: ITA 2 Duplex
★ ARQ-E3: CCIR 519 ITA 3
★ ARQ-6: 5/6 character 90 and 98
★ TDM 242: CCIR 242 2/4 channels
★ TDM 342: CCIR 342 2/4 channels
★ FEC-S: FEC 1000S ITA 3

All models in preset and variable user-defined speeds and shifts.

Three options are available to use with the **CODE 3** and consist of:

- 1: **OSCILLOSCOPE**, this facility displays the measured frequency versus time, including split-screen, storage and non-storage modes at £25.
- 2: **PICCOLO MK VI** (Everybody wants this facility, but it's only on offer from Hoka!), the well-known multitone-mode at £60.
- 3: **LONG-TIME AUTO-STORAGE** in ASCII (up to several days) £25.

Plus many other special codes. Send for details, price on application.

ALL PRICES IN BRITISH POUNDS.
Along with the many facilities listed, the analysis section of the **CODE 3** offers you a wide choice of unique facilities such as: a built-in **low frequency spectrum analyser** for shift measurement and tuning, plus precision speed measurement up to 0.001 Baud resolution. Other tool-facilities include Speed Bit analysis, Speed Measurement, Character Analysis, Auto-correlation of MOD and RAW signal, bit Analysis. All these state-of-the-art features are included in **CODE 3** to assist the experienced user. All options are available from the main menu, saving or loading to or from hard or floppy disk in bit form (no loss of unknown signals), hard copy with printer, on-screen tuning indicator and very easy to use Help-files.

HOKA UK, 84 Church Street, Langford, Biggleswade, Beds SG18 9QA. Tel: (0462) 700644

Bredhurst
electronics



BREDHURST ELECTRONICS LTD.
High St, Handcross, W. Sx. RH17 6BW
(0444) 400786

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

RECEIVERS

Lowe HF225	£425
Icom ICR71	£865
Kenwood R2000	£595
Kenwood VC10 V.H.F.	
Converter	£161
Yaesu FRG8800	£649
Yaesu FRV8800 V.H.F.	
Converter	£100
Kenwood R5000	£875

HF TRANSCEIVERS

Kenwood TS950s	£3199
Kenwood TS940s	£1995
Kenwood TS440s	£1138
Kenwood TS140s	£862
Kenwood TS680s	£985
Yaesu FT1000	£2995
Yaesu FT767GX	£1599
Yaesu FT757GX2	£969
Yaesu FT747GX	£659
Icom IC765	£2499
Icom IC751A	£1500
Icom IC735	£979
Icom IC725	£759
Icom IC726	£989

2M TRANSCEIVERS

Kenwood TH27E	£249
Kenwood TH25E	£238
Kenwood TH205E	£199
Kenwood TH215E	£228
Kenwood TR751E	£599
Kenwood TM231E	£289
Yaesu FT411 + FNB10	£259
Yaesu FT290R II	£429
Yaesu FT211RH	£309
Yaesu FT212RH	£349
Icom IC2GE	£265
Icom IC228H	£385
Icom IC275E Inc PSU	£1089
Icom IC25E	£275
Icom IC2SET	£295

70CM TRANSCEIVERS

Kenwood TM431E	£318
Kenwood TH405E	£245
Kenwood TH415E	£268
Yaesu FT790R11	£499
Yaesu FT712RH	£375
Icom IC4GE	£299
Icom IC4SE	£310
Icom IC448E	£429

DUAL BAND TRANSCEIVERS

Kenwood TM731E	£665
Kenwood TS790E	£1495
Yaesu FT470R + FNB10	£1495
Yaesu FT736R	£1199
Icom IC32E	£399
Icom IC3210E	£499
Icom IC2400E	£635
Icom IC2500E	£675
Icom IC24ET	£385

SCANNING RECEIVERS

Icom ICR7000	£989
Yaesu FRG9600M	£509
Kenwood RZ1	£465
AOR AR2002	£487
Signal R535 Airband	£249
Icom ICR100	£499

ANTENNA TUNER UNITS

FRT7700	£59
FC757AT	£349
AT230	£208
AT250	£366
ICAT100	£379
MFJ941D	£116
MFJ949C	£165

DATONG

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

COAXIAL SWITCHES

SA450 2way SO239	£19.49	1.50
SA450N 2way N	£26.99	1.50
Drae 3way SO239	£20.18	1.50
Drae 3way N	£35.94	1.50
C54 4way BNC	£30.39	1.50
MFJ-1701 6way SO239	£38.35	1.50

HAND HELD RECEIVERS

Icom ICRIE	£399.00	2.00
R5375 Airband	£69.00	2.00
Win 108 Airband	£175.00	2.00
AOR AR1000	£249.00	2.00
YUPTERU MVT5000	£299.00	2.00



AR-1000 Handheld Scanner

- ★ 1000 Channels
- ★ 8-600MHz continuous
- ★ 805-1300MHz continuous
- ★ AM, FM (narrow & wide)
- ★ Complete with NICads and mains charger

£249

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

PALOMAR PRODUCTS

R-X Noise Bridge for antenna checks up to 100MHz	£59.95
Receiver Preamp — 1.8 to 54 MHz	
Up to 20dB gain	£119.95
Transceiver Preamp — R.F. Switched — up to 20dB gain	£149.95
Super Snooper — vertical indoor antenna for SWL	£39.95
Loop antenna — Directional indoor antenna 6 loop ranges	
Tuner-Tuner — ATU adjustment without transmitting	£99.95
SWR & Power meter — LED display SWR without adjustment 20W	
2000W PEP	£129.95
SWR Power meter — expanded LED display 2W, 20W, 200W, 2000W PEP	£189.95
2W 20W 200W 2000W PEP expanded display	£189.95
VLF converter — 10-500 KHz converter	£79.95
Baluns 1:1, 1.5:1, 2:1, 3:1, 4:1, 5:1, 6:1, 7.5:1, 9:1, 12:1, 16:1 350W PEP 1.7-30MHz	£23.95 each
Baluns — up to 6Kw PEP phone for details	

ANTENNA BITS

PB 1 1:1 Balun 2kW P.E.P.	£17.95	2.00
LC 160 160 Mtr Wire Antenna Shortener (Pairs)	£22.95	2.00
LC 80 80 Mtr Wire Antenna Shortener (Pairs)	£21.95	2.00
T15 21 MHz Traps 1kW (Pairs)	£34.95	2.00
T20 14 MHz Traps 1kW (Pairs)	£34.95	2.00
T40 7 MHz Traps 1kW (Pairs)	£30.95	2.00
T80 3.5 MHz Traps 1kW (Pairs)	£34.95	2.00
16SWG Hard Drawn Copper Wire (50 mtrs)	£12.95	2.50
Small Ceramic Egg Insulators (each)	£0.65	0.30
Large Ceramic Egg Insulators (each)	£0.85	0.40
300 ohm Slotted Ribbon Cable (per mtr)	£0.40	0.10
450 ohm Slotted Ribbon Cable (per mtr)	£0.50	0.10

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

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

Lower Frequencies in Smaller Gardens Part 2

Feature

I always take care with calibration. For s.w.r. measurements, my s.w.r. meter is checked in the following manner: First, at d.c. I measure the resistance of the big carbon resistor labelled 100Ω, to see if it is still 50Ω. No, I'm not nuts, I brought it as a 100Ω resistor and it turned out to be 50Ω! Secondly, I measure the s.w.r. as seen by my three different meters.

All will be slightly different, but so long as all three give the same answers as before, using the same load, I know none have changed since I last measured. All the results are recorded in the notebook.

Remember, no radio amateur has all the facilities to measure any antenna parameter accurately for themselves. To do that the amateur must borrow some professional tackle and even that isn't always trustworthy!

Testing Time

So - once the wire was up, I made s.w.r. measurements every 50kHz up the band of frequencies being tested. At the same time I was monitoring the peak-to-peak r.f. volts with an oscilloscope across the 50Ω line between a.t.u. and transceiver.

At each frequency tested, the field-strength meter readings were also noted. I also had a note of the a.t.u. settings. None had any 'meaning', save that if anything changed I would know.

A point to remember here is to be sure to stand in exactly the same place when taking readings and to record this detail in the notes. It's surprising how much variation in field-strength can occur if you aren't careful!

The system was now ready to operate 'as is' for a while to get a feel for behaviour on the bands. In the notebook I had enough data to go back a step if needed. These 'measurements' are meaningless in real terms, but they do provide data should one wish to reproduce the circumstances at a later date.

Practical Results

The results of the period of operating on 3.5MHz in this fashion showed that firstly, the antenna tended to favour the south-east. This was not surprising, since this direction provided the clearest 'take off', with fewer buildings and lower hills. The earth radials also spread out in this direction. However, it was at least trying its best as far as other directions were concerned!

Losing Power

Secondly, in wet weather, because of the system's close proximity to the building, I could see distant changes to the figures already recorded, implying that I was losing some power. However, it didn't seem to be significant in terms of reports. So far, I haven't had the opportunity to try it out in snow, but I would expect to find further changes to the readings, indicating greater losses.

On 7MHz, while it was a little better than the previous arrangement - I'd never been able to get on the band before moving to this QTH and from that point of view it was super!

Further Progress

I was confident that I could improve the system even more. I could add lots more copper wire to the ground side of the system by way of as many radials as possible, all parallel with the existing ones. I even managed to hide a couple of 44m radials above ground and behind some of the local authority ground-cover shrubbery.

Another idea was to try loading the system for each band. I could also take the end away from a.t.u. to live outside, using a little inductance between antenna and earth, so that the coaxial feed-back to the a.t.u. indoors was reasonably matched over its short length.

Notice that if you use more than one resonant radial in this fashion, it is more important that the two radials are both the same length electrically. This is, if anything, more important than getting an individual radial exactly resonant, if you are to avoid unwanted upwards radiation.

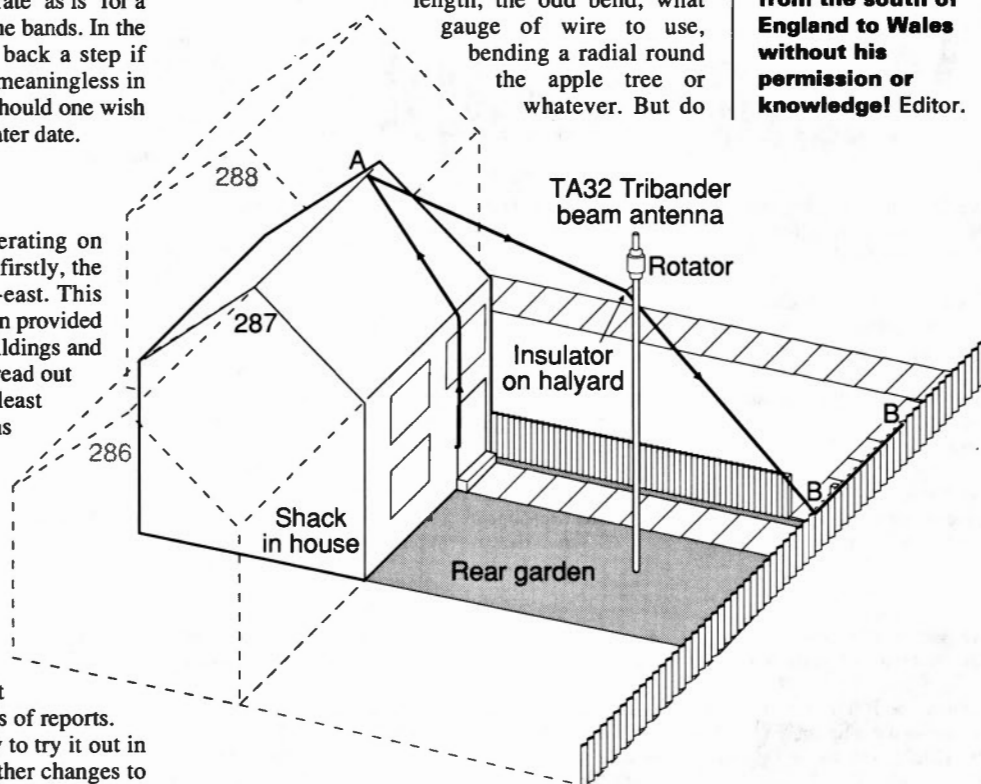
Laying Radials

I have already mentioned how to lay lots of radials just below ground. Despite this, as it's so important I'll briefly mention it again. You should just cut a small trench long enough to take the wire length, drop the wire in the trench, walk along to 'heel' the trench soil flat and it's done.

Don't fret too much about the length, the odd bend, what gauge of wire to use, bending a radial round the apple tree or whatever. But do

To round off his article on tackling lower frequencies, Paul Essery GW3KFE takes a careful look at calibration and testing.

Editorial Note: We apologise to 'Andy The Light' GW3UUZ, - referred to by Paul Essery - whose callsign was turned into GW3VVZ, due to misinterpretation of dot-matrix 'u' and 'v' computer printed letters. We also apologise for transferring G3VVZ from the south of England to Wales without his permission or knowledge! Editor.



think carefully before you start so you end up with the most useful combination. If you have approximately 150m of wire, then you will find one long radial less effective than using twenty lengths of 10 metres.

One clever method, adopted by G3BDQ, uses wire netting. First, you should mow your lawn closely. Next you should unroll the netting, lay it out flat and staple into the ground so it stays flat!

The grass will then grow through the netting, and the mower will pass over it easily if you have laid the netting carefully. If you have room for several lengths of netting you can solder the separate ends together.

Don't make the mistake of going to all this trouble and then using thin wire to run the earth to the shack! A bit of old coaxial cable with inner and outer strapped together will serve well. Better still, you could use some of the very heavy duty flexible strapping used for earthing in cars. Not much point in a 1Ω earth connected to the rig through 10Ω of lead resistance!

Looking At Loading

In my system, the vertical section of the wire crossed in front of an upstairs window. I brought the wire in, secured it firmly and cut it open so that I could add a loading coil or capacitor.

Remember that a loading coil will make a short wire 'look' longer and by the same token if the antenna 'looks' too long, a bit of capacitance could make it look a bit shorter. As it happened, I had enough to resonate as a quarter-wave vertical on 7.050kHz, so a bit of loading inductance was arranged to resonate on 3.5MHz and a bigger coil prepared for 1.8MHz.

Band Coverage

Even a full-size dipole can't cover the whole of

such bands as 1.8 or 3.5MHz with a reasonable s.w.r. Thus, I have a problem. For the 1.8MHz band my loading coil is arranged to give resonance at 1810kHz. The coil windings can also be 'shorted' to resonate the system at higher frequencies up the band.

On 3.5MHz I have two favourite spot-frequencies and only these two are catered for, plus a small band on either side of these frequencies to overcome QRM situations.

On 7MHz, the system covers this narrow band adequately. Looking from the roadway next to my house, the antenna system is quite invisible. This was achieved by replacing the 'gardening string' with clear nylon monofilament as used by fishermen.

Results

The system works well, bearing in mind that I thought I would be QRT when I moved to this QTH. My transmissions don't dominate the band by a long chalk but the system gets out as well as can be expected and has given QSOs outside Europe on all three bands.

On the v.h.f. bands even the indoor beam, although low, is quite successful. In other words I can operate with pleasure on six bands, and I have v.h.f. 'chat-channels' on 144 and 432MHz.

Never Give Up

If I happened to lose my outside two-element beam, I could still operate all eight bands with reasonable results. As for 10, 18, and 24MHz, my few forays on those bands have been achieved by various 'bodes'. Don't give up heart if you have a tiny garden. You might not have a world-beater of a signal, but you should be able to make DXCC or even 5BDXCC, if you 'work on it'! **PW**

Wanna Swap!

Have Eddystone speaker type S688/A. Would exchange for National table model speaker (v.g.c.). I am also looking for a HRO receiver for spares. Tel: Bill on 041-649 4345.

Have six-band Eddystone v.h.f. receiver with very large dial. Would exchange for a Hallicrafter or other valved h.f. all-band set. Tel: F. Walker on Cambridge (0223) 241088.

Have Matsui MR-4099 all-band receiver and JVC stereo tuner-amplifier both in as new. Would exchange for an FRG-7 receiver, Midi gear or w.h.y. Tel: Seon Smyth on (0436) 71181.

Have Yaesu FT-290R MkI all-mode with microphone, NiCads, flexible and telescopic antennas. Valued at about £225. Would exchange for a synthesised 430MHz mobile rig with a minimum of 10W output. Tel: Kevin on (0782) 314383.

Have AR950 100 channel scanning receiver, less than one year old. Would exchange for an h.f. portable scanner or w.h.y. Tel: Alan on (0223) 412236.

Have Icom R-100 receiver 0.5-1800MHz a.m./f.m./s.s.b. Has 100 memories and built-in pre-amplifier. Would exchange for NRD-515/525, Icom R-71 or Lowe HF225. Tel: Ian on Derby (0332) 668272.

Have Bimetallic Thermograph MkII Met. Office ref: No. 1123 with ink bottle

and charts. Plus PCR2 general coverage receiver with p.s.u. and spare valves. Would exchange for a general coverage receiver such as EC10, EB35 or similar. Tel: Peter Beardsmore on St. Albans (0727) 839908.

Have 2.5m g.r.p. dingy with 4h.p. Mercury outboard motor, has run for only 18 hours. Would exchange for v.h.f. scanning receiver, h.f. a.t.u. or w.h.y. Tel: Tony on (0272) 563491.

Have 24GHz waveguide, directional couplers, mixers, bends, attenuator, twists etc. Also have 1920's portable four valve receiver with built-in antenna and speaker, works well. Would exchange all or some for a good camera. Tel: Mann on Cambridge (0223) 860150.

Have Trio TS-430S, Yaesu FTV-102 transverter wired to suit the TS-430S. Has 50 and 144MHz fitted. Also Daiwa 30A p.s.u. Yaesu FT-790R, three Microwave Modules linears, 432/100, 144/30LS and 144/100, Yaesu FC902, Fortop TVT-435 transceiver plus antennas and camera. Would exchange all, or some of above for a good speedboat. Tel: Bob G4TKP on (0332) 383442.

Have Yaesu FT-690R MkII in boxed mint condition, plus FT-290R MkI. Also NiCads and charger in g.w.o. Would exchange for a Yaesu FT-726R in g.w.o. and with 50 and 144MHz boards fitted. Tel: John GM1ZVJ on Edinburgh 031-331 3360.

Have many World War two radio sets and accessories. Would exchange for WS No. 18 MkII/MkIII or WS No. 68. Tel: Brian on (0757) 708805.

Have RN Electronics 144/50MHz transverter and HB9CV antenna for 50MHz. Also have Sony ICF-7600D h.f. general coverage receiver and Datong D70 Morse-tutor. I am looking for an Optoelectronics hand-held frequency counter or w.h.y. Tel: Graham G6SUQ on (0494) 424227 during office hours or at 42 David Close, Harlington, Middlesex UB3 5EA.

Back-Scatter

HF Bands

Reports to

Paul Essery GW3KFE

287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

It seems a mere few days ago that yours truly was grousing about hot weather; now autumn has descended upon us with a vengeance, causing a wary eye to be cast upon the antenna farm such as it is. So far the only problem has been the wind slewing the beam round a few degrees upon the stub mast - something which happens every year to some extent, and which brings to the mind's eye visions of gear-teeth stripping as they try to hold things steady against the fury of an equinoctial gale...not the pleasantest last thought as I drop off to sleep at night!

Conditions

People say things have been quite reasonable, but whenever the columnar rig is operated, I seem to find dead bands or local QRM in due accord with Sodde's Law; putting things another way, happy chances seem to be in short supply around this QTH. No doubt about it, the sooner I have some e.m.c. legislation with teeth, plus a mite of enforcement, the better!

Forthcomings and Phoneys

Thanks to all for input in this area and in particular *K1AR's Contest Calendar*, *The DX Bulletin* and *DX News Sheet*. Perhaps the first item to be mentioned is that the Bangladesh authorities not only won't permit amateur radio operation, but they will accept donations of amateur radio equipment, provided they are prepared to pay a fee for offering the donation and pay tax on it and a fee and tax on the equipment! About all we can say about that is that the S2 authorities have a minor official with a bloody cheek, and we hope no one is prepared to indulge this unprincipled greed.

The news from USSR continues to be a little puzzling; we hear that various new autonomous republics are being set up with status similar to, for example, Ukraine: notably Tatar and Gagauz areas, which would mean a couple of new DXCC countries.

The sorry state of the Middle East has meant that DJ3TF when he tried for a Tunisian licence, couldn't even get through the security to reach the PTT authorities. Ergo, no 3V8 activity for the moment.

One of the more interesting sidelights on human nature is revealed when one notes that a single station is using various calls in the IOTA net; there seems to be some doubt as to whether this gink is a pirate or not. Whoever it is, we only hope that his name will be made public and broadcast by every DX column around the world.

Hopes of an Albania, ZA, operation seem to have faded away; at the time of writing nothing has been heard from the HA group for some weeks.

On the DXCC front, 3X1SG cards are not acceptable; the same goes for the moment for 701AA and 708AA QSLs, both the latter being still mulled over by ARRL. On the other hand, all XU8DX cards, including the ones for QSOs with YL operator Sokun can be submitted for credit.

Silent Keys

It is reported that **Gus Browning W4BPD** passed away on August 21 at the age of 81 after a long illness. Older DXers will recall his various DXpeditions back in the late fifties and early sixties. One could almost say that Gus Browning and Danny Weil, the Bournemouth watchmaker, each invented the art of the DXpedition. Gus will be sadly missed.

On August 28, **Richard Hughes G4DZI**, passed away after a short illness to the surprise and shock of his many friends on the DX bands. Our sympathies are expressed to Diana G4EZI, who has said she will keep the G4DZI/G4EZI station up and running for the DX as before.

1.8MHz

Just the one report, from **G2HKU** (Minster) who says he used his s.s.b. to work ON7BW and took c.w. practice upon OL7BTG/P, DJ9KG and OK1HCG. Ted says he hopes that with autumnal conditions coming up, he hopes the S9 noise level with drop a little.

Where's all the DX reportage gone? Surely someone out there uses the band?

3.5MHz

ON7PQ (Kortrijk) mentions that his c.w. managed to raise OH0BT, RLOPY, UZ0WWL, UA9YNG and UL8LYA.

Turning to **G0KRT** (Welling) we find Eric is still using his Lake DTR3 at 1.5W, but now the summer is over he reckons to get on and finish the HW9 rig. Meantime, there were two-way QRP QSOs with G0CHV, G0GJG, G3XBM, G3VFX, G4EHT and GW4KVJ for a first two-way QRP GW contact. In addition Eric hooked DL4BA, GB2WFC, G0IGP, G0JUE, G0KAU, G3INR, G3TLF, G3YLL, G4CAL, G4SQV, G4DNB, G4UZE and ON5AG, all running more power.

Now to **G0HGA** (Stevenage); we have two letters from Angie, since the local postmen sealed the box without clearing it and proceeded to have a one-week unofficial local strike. So, combining the 3.5MHz lists, we find c.w. contacts with Y44NK, IK1FWG, G0HLF, G3JUT, G4AXO, G4ENZ, G4YLO, G3ZWL and F6BWF.

Now to **GW0HWK** (Wrexham); Mike mentions VK2DZM for a new one on the band, plus a gaggle of Gs and assorted Europeans for makeweight.

7MHz

A close lot the 7MHz addicts, who hug their DX to themselves and don't let on what they are up to! Seriously, there is much of interest to be found, given a decent receiver front-end.

First **ON7PQ** who admits to DF2UU/TF, FM/F2YT, CN2BB, FJ/I4IND, FG5ED, JA2NNF, ZF2PK, KC7EM, AH3C, UM8QDX,

K70Q, VE7SW, SV7/DK9CG, V63AN and ZM7AMO.

G0HGA has about 30W on this band and this when keyed yielded contacts with K1SS twice, K1ZZI, C02VG, DA1WA, TM1BRE, 4L1QRQ, FJ/I4IND, CU2AK, TK4MI, UL0GWJ, UA9FM, U050IV, UC500FS, 4K0ADH, UL8GSAK, UA9MAN and OH9ADV plus the smaller fry.

On to Mike at GW0HWK who notes that LX1NW on the band gave him a new country. Out of the blue came a welcome letter from **Phil G3XAP** (Stowmarket), who wrote a useful series on his trials and tribulations while endeavouring to brew up antennas good enough to obtain a WAC on Top Band a couple of decades ago. Nowadays Phil is to be found on 7MHz c.w. using the transmit half of a KW20008 while receiving with a Racal RA117E. The only real snag with this seems to be the need to keep a fork-lift truck in the shack in case one wants to move it!

Using c.w. on 7MHz netted G2HKU contacts with UL0GWJ, UL8LYA, UW9CP, CM3RA, RV9CFA and LU6EBY.

WARC Bands

First we turn to **9H1IP** (M'Scala); Vince says he managed HA0HW, ZL2BCG, HL1IUA, FS/PAOCRA, V51P, HK5LEX and T5RR. On 24MHz not much was raised due to the conditions on the band, but on August 29 N9AAI, OZ7MY, CT1TM, SM5OMP and DL5BCW were all entered into the log.

G3VWC (Bath) commented that he tried 14MHz for a change and discovered half the USSR calling CQ DX... so he returned to his favourite 18MHz, where he worked VE2PA, VE7QU, VE7SR, NR5Q, KC0AQ, WK0B, KB6NRL, W6VD, W7ELH, W7QK, U8LA, JA8BB and KL7CYL.

G3ZZG, in the intervals of beating a new electronic typewriter into submission found time to get on 18MHz, where his c.w. exchanged details with 3C1EA (QSL via EA3CJA), 4S8WP, V47NXX, W3TZW, WB2AGT, N5CB, JA2IVY and 7X3DA for a Gotaway. On the s.s.b. front, A92BE was noted.

On 18MHz GW0HWK (Wrexham) mentions HL1TUA, A92BE, C30EMA, HB9JIG, EA3FQV, 6W1QJ and OA4BWE. As for 24MHz, Z55NK gets the only mention.

At **G3NOF** (Yeovil) 18MHz gave him A92BE, AH3C, AL7I, FH8CB, FP5DX, KA7AIG, KD0EE (S. Dakota), SV1UM/8, VE7EPK, VK6AKG, VK7CK, W5AL (New Mexico), W7VO (Arizona), ZL2APW, 3X1SG, 4K0ADS, 4X1MO, 6W1PZ and 6W1QJ. Don found 24MHz patchy, with deep fading. However, he reached A92BE, D44BC, FR5EL, FT4XG, HK6BER, JA7JH, JR2KDN, NP2FI/MM, LU9FFA, OH9OM, OA1J/4, PY2CDS, SV9AKI, TA0B, TI2KD, UM8MTA, VP2E/KT8Y, W6SAI of antenna fame, W85KYF, YB0USJ, Y07KAJ, ZP5JCY, 4X6TF and 6W1QJ.

The c.w. activity on the band by ON7PQ found him interesting signals by way of 9L1US, SV0HS, KC6CW, 7Q7XB, 9M2AX, V63AN, ZM7AMO and 3B8CF.

A new reporter at this point; **Dudley Taylor G4ZAU** (Oswestry). Dudley operates as G4ZAU/M, either from near Llansantffraid or near Chirk, using a TS-440S with internal a.t.u. and a Navy Special triband whip. This combination used on c.w. on 18MHz reached out to TA7/KUQJ, VE2PA, 3C1EA, 9H3IL, EK3DA/MM, FE1JKK/FY, VK6HD, TK/HB9ASZ, UA1NBW, UA1ZFE, U3CN, UA3DBM, U24HYC, U24PWB, UA9MG0, UA9XDU, JA1WPX, JR2CQS, JA3AA, JA3AQ, JA3MQY, JG3QCW, JA3TYT, JA5NNS, JA6PA, JA7XGN, JA9CJWJ, NOKSV, KA0GGI, KA1DHY, W2LZX, WA2SPL/1, W2TO, K2SWZ, W2QN, WB2V, K13S, N4KG, N4YDU/A, K6EID, W6OV, W6PT, W7CG, K57P, NX7U, WW7W, K8NA, KA8WOG, W8ZD, N4AR/8 and WA9SQH. 24MHz was a bit neglected, but GW4OVH at Wrexham was raised for some real DX!

It was the c.w. mode all the way for G2HKU who used 18MHz for TA2AO, TF3CW, W0KZV, JA7FS, K9QVB, C06CG, K9BG, PY6WT, HI8A, UA9TS, 4S7WP, VE2LI, W3ARK, N4AR, K4II, 9Y4VU, 8R1J, N4KTU, VE2PA, W7CG, PT7SY, W0ZR, VP2E/KT8Y, K2AGJ, LU4FFG, PY2EY and KT2TQC; contrast that with 24MHz where there was simply Y03CD.

28MHz

Alas, like the curate's egg, G2HKU says he managed TR8BY, PZ1AP, K6EID, PT2KT and FH5EJ, all on c.w.

Pat at ON7PQ is very much of a c.w.-only man; his list shows C56/DL7FT, A41JR, Y90ANT, 3B9FR, 5H0QL (Lloyd and Iris Colvin), KC6EE, YN1CC, HS0E, VP2V/W9VME, G0GWA/9L2, WZ6C/ST4, 7Q7KG and SV0HS.

G3NOF noted the short path to JA open between 0700-0900Z, among VKs who stayed in till 1100; South Americans were noted from 1900, and Ws between 1100 and 2000. SSB contacts were made with FR5DX, HK3KPC, JAS, K7OWZ (Utah), KB0NL (S. Dakota), KP4GY, PT9ZZ, TI2JJP, UA0FF (Zone 19), ZW0JR, ZC4B0B, 5B4AAL and 8J90XP0. All were s.s.b. of course.

G0HGA has just 10W to an untuned wire, but her signals exchanged c.w. reports with DL2HD, IK4NOQ, I2DMK/IY1TTM, EA8AB, ZW5B, W4APU, WA1UDH, W8EGB, KA1BB, N4AR, KBXF, K4EJQ, K3BEQ, K8KJQ, W2LZX, K2AGJ, W8CC, VE3KLM, 5B4ES, ZD8Z, U66GAW, UA9CDV, UW4HM/RL3L and UF6FJ.

We come now to GW0HWK who offers CX9AAW, A22AA, IK4MRI, IK6CAC, Y02CWL, HB9ATA, HG7JBF, I5TZR, I6SRP, F5GI, DL11AR, G0NOR, KA1OWG, Y24UH, SM4RDG, GW0DYZ and OE5DI/500.

G4ZZG found FH5EJ, plus Europe, Canada, North and South America, but alas couldn't attract the attention of 7Q7KG in spite of umpteen tries.

21MHz

A firm favourite with many people, this

Back-Scatter

one. GW0HWK notes his QSOs with VK2FMW, VU2TTC, RA3QG, TA2KA, 9M2CW, UJ8JJ, UI8ZAC, DU2USK, TU2UI, ZS5S, OL0GM/A and S92LB.

GOHGA seems to have fun with 10W and an end-fed; W4BQF NA8G, W7ZQ, UA9SGE, UL0GE, UL3DX, UA3UDA, UZ3DZ, UA3TAM, UA3FQM, LZ2YL, OE5DEM, CN2DX, UL8UYA, OA2ZV for a new one, UA0SAU, UA00GH, UA9AKU, KF4ZH, N4KER and UB5FDO, not to mention an assortment of other W call areas.

As for G3NOF, Don racked up QSOs with A61AD, HL2GS, HL9HH, JAs, JY3ZH, P29SC, PJ6/KV4AD, R1SO, R6L, RL7PDB, SV8/15DCE, T5RR, UZ0QXU (Zone 19), UM8MGO, various VKs including VK8TM,

VP8CED and VP8CEG (Falklands), VQ9TB, VU2TTC, ZL4TS, ZM2N8K, 4K2BDU, 4K0ADS, 5H0QL, 7K1UBJ/3 (=JA1), 7Q7KG, 9H3NH and 9X5SW.

ON7PO mentions JU750SH, 9X5HG, T32BU, KC6EE, 4K4POL (IOTA AS-65), HL1CG, YU3PR/4U in YK-land, 5H0QL, ZM7AMO, SV0HM, 7Q7KG, V73BL, F2JD/CE7 (IOTA SA-18), H18A and PZ1DY all c.w.

Still all c.w., G2HKU mentions YC3FFB, UM9MZZ, UH8BO, K1SEC, YC2ESQ, PP5HQ, PY1RCR, LU1HNL, PY1HQ, PY7PZ, K9QVB and H18A. On s.s.b. the tally was less: W4GXT and N4HH.

Finally 14MHz

GW0HWK looked at the band a time or two, and to prove it offers ZB2JB, VK6NS, VK6HM, 4S7EF, OE1HAB, DU7ZM/MM, VE1TJP, K1CSB, SM4SET and G8VPC.

Angie GOHGA's two letters show that 20W into the end-fed was enough to work JH10QT, U5ND, UQ0A, 4K0WH, OE5EIN, OM60ARDP (QSL via OK3CNF), 7X2CR (QSL via ISOLYN), LZ1JZ, HA3HU, DL7AFM (a YL), HB9CNE, UB5UFA, UA6AIR, UB5AEY, UV3AJ, UA3/VE3GRG, VK3APK, W2s and W4s, these last in the contest.

For G3NOF, the VKs on the morning

long path openings have been intermingled with West Coast Ws, while the 1500-1700hrs have been on occasion good to Africa and Asia. s.s.b. contacts resulted, with A92C, CQ7YH, BV2FA, TA5C, TF5BW, VKs, YK1AA, Z2ZJE, 5H0QL, 5U7NU, 7Q7KG, 9M2CW and 9X5SW.

ON7PQ successfully went after 3B9FR, VK9NX, T32HK, FO5JR, EK0ACC (IOTA AS 69), 4K2BDU, VP2V/N5XX, 5H0QL, KC6EE, J8/FG5ED, 9J2AL, VU2GSM, UA0QX/A (IOTA AS-70) and ZM7AMO.

G2HKU rounds off; Ted used s.s.b. for the ZL3FV sked, while c.w. gave him EA8AVK, VP2V/N5XX, LU6FBR, HK3RQ, PY1APS, G0GWA/9L3, UA9CW, UV0BB, 5H3TW, JT1T and UZ0QWA.

Come on you regulars - how about some photographs of you in the shack?
Send them direct to the PW office or via Paul.

Solar Data for September 1990

The last week of August saw an increase in geomagnetic activity with a number of flares being reported. With the active side of the sun in view there was an expected rise in solar activity during the first few weeks of September. Geomagnetic activity was also disturbed during this period with a sudden storm commencement (SSC) being recorded on September 10. The A index level was up to 25 units on the 11th dropping to 19 units by September 14. On the 12th there was an M1.5/2N type flare lasting for nearly an hour. The sunspot count also increased, reaching 221 by September 16. On the 17th an M5.3/1B type flare occurred lasting about 10 minutes. Despite this there was very little solar activity. Sunspot numbers declined from 228 down to 172 by September 23. The solar flux was reasonably steady, averaging around 198 units, but considering that this was the period when the active side of the sun was in view, it is a large drop from the 283 flux units recorded during the last solar rotation. During the last week of September the quiet side of the sun was looking our way and there was very little solar input. By September 28 the solar flux had dropped to 150 units and the geomagnetic A index was reported to be quiet to slightly unsettled on most days, averaging just under 10 units for the period.

The 50MHz Band

September was a very lean month for DX. Openings to South America, CX, LU, PY and Africa, V51, ZS6, ZS9, 3DA0, 7Q7 did occur but these were very brief. I am fairly confident that by the time you read this the band will have taken a turn for the better and there will be DX for all. However, please don't get the impression that 50MHz can only be used for working DX. This column generally reports on long distance contacts or the more unusual modes of propagation. Although tropo QSOs are quite often ignored they are still very valid. It is a pity that so few people make the effort to call CQ on 50.200MHz. Perhaps you should try it - you may be surprised.

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

Conditions during August were very much better as the report from **Steve Damon G8PYP** (DOR) testifies. He was fortunate to work 1A0KM (JN61) on August 1 for a new DXCC country. Other contacts during the month included SV1DH (KM27) on August 2 and HB0/HB9QQ (JN47) on August 11. Later the same day, at 1805UTC, LU8YYO was heard calling CQ but Steve was unable to work him. A contact was made with HB9SNR (JN36) at 2238UTC on August 16 via meteor scatter. Although the Sporadic E season is generally regarded as diminishing during August it was still prevalent on a number of occasions during September. The 2nd was a good day for this mode, contacts being made between 1500-1600UTC with OZ1CDE (JO65), OZ1LO (JO55), OZ5DX (JO54), SM7CMV (JO75), SM7FJE (JO65), SM7SCJ (JO65) and SM7THS (JO76).

"A rather quiet month" is how **Jim Smith G1DWQ** (DOR) sums up the month. On September 1, between 1905-1915UTC, he heard LU8YYO but signals were very weak. Signals from southern Africa were heard on September 21 between 1250-2015UTC. At 1257UTC, ZS6AXT was worked on s.s.b. peaking S5. The Namibian beacon V51E was copied for a considerable time, fading out at 2015UTC. Signals were heard from South America on September 22 with CX8BE being worked at 1820UTC. On the following day, between 1640-1720UTC, the band was open again to southern Africa but nothing new was heard. An interesting c.w. burst "CQ de VK6..." on 50.110MHz was heard at 1110UTC on September 29, but nothing came of it. The band was open to eastern USSR at the

time via F2 propagation. In the afternoon Jim heard a brief opening to ZS6.

At my QTH, conditions were no different from elsewhere. The only DX of any note came on September 29 between 1750-1800UTC. Whilst beaming towards central South America, I heard the 9L1US and V51E beacons. Signals were not audible on the correct beam-heading. On the same heading I was also able to copy CT0WWW, GB3SIX and GD3AHV. The c.w. contest on September 30 was poorly supported which was a pity as the band opened up to southern Africa during the last hour of the contest. Contacts were made at 1640UTC, with ZS9A (JG77) for a new country, Walvis Bay and at 1738UTC, with V51SW (JG87). The V51E beacon on 50.100MHz was heard between 1715 to 1750UTC.

Paul Baker GW6VZW (GWT) is using an FT-890R into a 35W BNOS amplifier and 3-element MET Yagi. The antenna is fixed at 9° elevation giving a great improvement in signal strength at this particular location. With this arrangement over 600 QSOs have been made outside of the UK since April. Paul caught the good conditions on September 21, working ZS4S (KG41), ZS6AXT (KG33) and ZS6RAD (KG43), all between 1246-1257UTC. On September 22, he worked DJ1ZU (JN68), OE5NEL (JN78) and OE5OLL (JN68) via Sp-E. Excellent results, just showing what can be done with low power and perseverance.

Ted Collins G4UPS (DVN) certainly perseveres when it comes to 50MHz. He caught the opening on September 21 hearing the ZS6DN and ZS6PW beacons at 599, ZS4S, ZS6AXT, ZS6LN, ZS6RAD, ZS9A

144MHz QRB Table				
Distances in kilometres				
Station	Tropo	Aurora	Meteors	Es
G0CUZ	2943	1758	1996	2943
G0DAZ	2923	1780	2026	2923
G0DKM	2811	1488	—	2203
G0EVT	3080	1640	1808	3080
G0FYD	1315	1624	—	2019
G0ISW	1059	566	—	2057
G0LBK	3060	1755	1876	2350
G1DWQ	1454	1812	—	1836
G1EZF	1730	1757	1920	2375
G1KDF	3023	1421	—	2386
G1LSB	1319	733	1732	2723
G1SWH	3035	1429	—	2372
G3FPK	1835	1686	—	2337
G3LTF	1824	1846	2021	2174
G3SEK	1560	1681	1872	2154
G4ASR	2848	2029	2107	2853
G4DHF	1498	1530	2000	2448
G4JCC	1334	1158	1018	2173
G4MUT	1163	684	1533	2058
G4N8S	1321	1714	—	1901
G4RGK	1466	1757	1920	2375
G4VXE	2862	1446	1501	2880
G4YTL	1404	1774	2025	2172
G4ZTR	935	1535	—	2130
G6DER	1834	997	1957	2068
G6DZH	2924	711	—	2233
G6HCV	2880	1450	1912	2880
G6HKM	1304	1555	—	2265
G6LEU	2620	910	—	2430
G8HJH	1742	—	—	2058
GBJDX	2667	1368	—	2663
G8LHT	3070	1780	1868	2510
G8MFJ	1209	1210	1329	2168
G8PYP	1240	1451	1479	2318
GD4XTT	3053	—	—	1700
G11JUS	3067	1614	1507	2216
G18YDZ	1216	1809	1901	2562
GJ4ICD	1620	1100	2050	2090
GM4CXM	1428	1750	2100	2023
GM4YXI	3160	1881	2048	2513
GW4VX	2823	1391	1313	1910
GW6VZW	2830	1473	—	2236
ON1CAK	1420	1186	1948	2725
ON1CDQ	1420	1186	1948	2124

and V51E. In the opening to South America, between 1830-1930UTC on September 22, Ted heard CX8BE, LU7DZ and PY5CC, although none were strong enough to work. African signals, V51SW, ZS6LN and ZS6WB were heard from 1643UTC on September 23. The first Japanese station of the season, JA2BZY, was heard calling CQ at 0836UTC on September 27 but despite peaking 579, Ted couldn't make contact. In the early evening of September 29, Kosie V51E was heard on c.w. but nothing else was heard apart from the 9L1US beacon on a beamheading of 240°.

ENTERPRISE RADIO APPLICATIONS LTD.



NOW WITH
VERSION 3
SOFTWARE

Tel: (0925) 573118.

ERA LTD
26 CLARENDON COURT
WINWICK QUAY
WARRINGTON WA2 8QP



All prices
include VAT
& P&P

£154.95

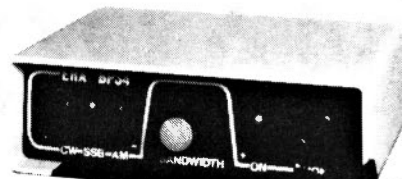
MKII MICROREADER

The Microreader is a small compact unit that allows anyone equipped with a suitable SW receiver, to read Morse & RTTY signals simply and without fuss. No computers, interfaces or program tapes are needed, just connect the Microreader to the ear or speaker socket & switch on. The decoded words appear on the built in 16 character LCD display screen.

The Microreader contains all the filtering & noise blanking needed to allow reception even under bad conditions. A three colour bargraph tuning indicator makes precise tuning simple, while shift indicators take some of the guess work out of RTTY. Despite the fact the Microreader contains two fast processors (12 MHz), it is extremely quiet generating virtually no RFI. The Microreader can also if you wish, transfer the decoded messages to any printer, computer or terminal unit equipped with an RS232 port.

In the tutor mode, the Microreader will send random groups of characters with variable speed & spacing, or plug in your own morse key to check your sending. In both cases the characters are shown on the display.

The MkII Microreader comes complete with audio lead & demonstration tape. Full technical support & advice & upgrade service.



Price £99.50

SEE
REVIEW
PW SEPT 89

BP34

The BP34 audio filter helps you hear weaker stations by eliminating adjacent channel & wide band noise interference. A must for SWLs/Contest groups/CW operators/Weather Fax users.

Easy to connect & use but despite it's apparent simplicity, the BP34 has the highest performance specification of any filter you can buy. Exceptionally sharp cutoff, 80dB of stopband rejection & less than 0.3dB passband ripple makes the BP34 more versatile than a whole set of expensive crystal filters!

To order or for more information ring or write. We are open Saturdays for personal callers.

Also available from:

Electromart	— Swansea	Third Eye	— Aberdeen
Flightdeck	— Stockport	Wants	— Plymouth
Johnsons SW	— Worcester	Ward Elect	— Birmingham
R.A.S.	— Nottingham	Waters &	— Hornchurch
Star	— Tyne & Wear	Stanton	— Essex

All Products unconditionally guaranteed for 2 years.

Books for
radio amateurs
NAVCO

**ELLIOTT
ELECTRONICS**
for the Radio Enthusiast

MICROWAVE MODULES

INSTANT HP
AVAILABLE
(WRITTEN BY THE 3 SW-AL QUT 1)

QSY
OLD
MAN TO

AERIAL
ACCESSORIES
AND
MASTS

APPOINTED
DISTRIBUTOR

**JAYBEAM
AMATEUR
ANTENNAS**

RIGS, ANTENNAS, SWR BRIDGES,
POWER SUPPLIES, TEST GEAR,
COMPONENTS, MORSE KEYS, COAXIAL
CABLES, ROTATORS, MICS, PLUGS
AND SOCKETS, SWITCHES

Call us on (0533) 553293
OR COME AND LOOK AROUND AT
26/28 Braunstone Gate, Leicester

The "SRW KILOWATT"

Covers all 9 HF Bands. Weighs under 7Kg. Has internal mains PSU! Matches small rigs size wise (747 etc.). Only 14" wide, 10" deep, 5" high!

Order now whilst you can still buy direct from the designers:

SRW Communications Ltd., ASTRID HOUSE, The Green, Swinton, MALTON, North Yorks. YO17 0SY. Tel 0653 697513. Please write or phone Steve Webb, G3TPW, for details and leaflets.

RUGBY TIME?

MSF CLOCK is EXACT — never gains or loses, SELF SETTING at switch-on, 8 digits show Date, Hours, Minutes and Seconds, receives Rugby 60kHz atomic time signals, built-in antenna, fun-to-build kit, only £97.90, includes all parts, case, pcb, UK postage etc. and details of other kits, RIGHT TIME

CAMBRIDGE KITS

45 (PM) Old School Lane, Milton, Cambridge.

ILLEGAL CB RADIO APPARATUS

Licensed radio amateurs are reminded that in accordance with the provisions of the Wireless Telegraphy (Citizens' Band and Amateur Apparatus) (Various Provisions) Order 1988 it is an OFFENCE to possess non-approved CB sets (ie NOT marked CB27/81 or PR27-) unless under an authority issued by the Secretary of State.

If you are a licensed radio amateur and already possess a non-approved CB set which you intend to convert or which has already been converted to amateur frequency bands but in respect of which you do not hold an authority to possess then you must apply to the RADIOCOMMUNICATIONS AGENCY for an authority by 31 December 1990 if you have not already done so.

Failure to apply by this date will render the apparatus liable to seizure by the RADIO INVESTIGATION SERVICE acting under Section 79 of the Telecommunications Act 1984 and forfeiture by order of a Court under Section 80 or 81 of the Act.

Applicants should write giving the make, model and serial number of the apparatus together with their full name and call sign to:

Radiocommunications Agency
Room 102
Waterloo Bridge House
Waterloo Road
LONDON SE1 8UA

The 1988 Order also makes it an offence to sell non-approved CB apparatus and radio amateurs are therefore advised not to purchase such sets.



Issued by the Radiocommunications Agency of the
DEPARTMENT OF TRADE AND INDUSTRY

MARCO TRADING



ELECTRONIC COMPONENTS & EQUIPMENT



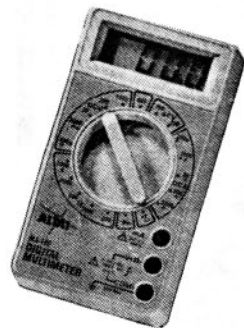
MAIL ORDER • WHOLESALE • RETAIL

LATEST 1991 CATALOGUE

AVAILABLE NOW

- ★ Free-paid envelope
- ★ Many new lines
- ★ Pages of special offers
- ★ Free gifts

SEND £1.50 to address below



December Special Offer 10MΩ MULTIMETER

- ★ 19 ranges
- ★ 3½ digit 12mm LCD display
- ★ Signal injector function
- ★ Diode test
- ★ Fuse protection
- ★ Automatic polarity and zero
- ★ Test leads with 4mm plugs

AC volts 0-200-750V AC ± 1.2%
DC volts 0-200m-2-20-200-1000V DC ± 0.8%
DC current .. 0-200µ-2m-20m-200m-2A dc ± 1.0%
Resistance 0-200-2k-20k-2MΩ ± 0.8%
Signal injector 50Hz square wave
5V peak to peak
Dims 126 x 70 x 24mm
Battery and instruction manual included

FANTASTIC OFFER ONLY £15.99
Y 122AJ (MX190) Normally £39.50

MARCO TRADING, DEPT PW12, THE MALTINGS
HIGH STREET, WEM, SHREWSBURY SY4 5EN.
Tel: 0939 32783

MARCONI TF2015 SIGNAL GENERATORS

AM-FM-CW 10MHz to 520MHz. HF-VHF-UHF.
Small, modern, transistorised instruments designed for the professional workshop.
IDEAL FOR THE AMATEUR SHACK.
Variable mod 0-80%, deviation 0-100kHz in 2 ranges (5kHz + 50kHz centre scale).
11 ranges with ±1.5% Calibration Accuracy.
0.2µV to 200mV emf output (-127dbm to -7dbm)
50Ω BNC output + counter output at 80mV.
MAINS or 24V DC operation.
Dimensions H(5½") W(11¼") D(12¼") Weight (12lb)
TESTED + CALIBRATION VERIFIED, INCL. COURIER DELIVERY £130

'SPY' Receivers MK328

2.5-30MHz AM CW SSB. Twin Range Crystal Calib' POCKET SIZE. Operation 9-18V DC.
Supplied with Full Operation Manual, Telescopic Whip, Wire Ant, All Leads, Headphones... Twin Audio Outputs for Headphone or Tape/Amplifier.

FULLY TESTED & GUARANTEED

EXCELLENT CONDITION...

COMPLETE...

AS FAR AS WE KNOW THESE ARE ONLY AVAILABLE FROM US.

ANOTHER ANCHOR SPECIAL

ONLY... **£125.00** P/P £5

BRADLEY CT471 ELECTRONIC MULTIMETERS

VERSATILE MULTIMETERS

WITH RANGES:

AC-DC Volts: 11 RANGES 12mV to 1200V FSD ±3%
AC-DC Amps: 11 RANGES 12µA to 1.2A FSD ±3%
RESISTANCE: 5 RANGES 0.1Ω to 1000MΩ ±5%
RF VOLTS: 20KHz-1000 MHz

TESTED, WITH 50Ω + 75Ω PROBES +

LEADS incl. Post/Packing

£60

ALSO AVAILABLE UNTESTED £35

ALL THIS AND MUCH MUCH MORE AT OUR 3 ACRE DEPOT IN NOTTINGHAM,
WE ARE OPEN 6 DAYS A WEEK. CALLERS ALWAYS WELCOME
MON-FRI 9am-6pm... SAT 8am-4pm

Please Phone for up to the minute Details/stock info...
MAIL ORDER A PLEASURE

ACCESS... VISA. ORDERS IMMEDIATE DESPATCH ON PRE 4PM ORDERS.

ANCHOR SURPLUS LTD
THE CATTLE MARKET
NOTTINGHAM NG2 3GY

TELE: (0602) 864902/864041... FAX: (0602) 864667

AMPLE FREE PARKING... EASY ACCESS M1, J24, J25, J26. BR STN & CITY CENTRE 1/2 MILE

VALVES

	*High Quality	**Very High Quality							
A1065	2.40	EFB89	0.80	EF39	1.40	EL80SE	4.50	PL81	1.30
A2293	7.00	EC52	0.65	EF80	0.65	EM80	1.50	PL82	0.70
A2900	12.75	EC91	5.20	EF83	3.90	EM87	2.85	PL83	0.70
AR6	1.40	EC92	5.55	EF85	0.90	EL81	0.90	PL84	0.70
ARP3	1.45	EC81	1.25	EF96	1.45	EY81	1.10	PL504	1.25
ARP35	1.50	EC82	0.95	EF89	1.60	EY86/87	0.75	PL508	2.00
ATP4	0.90	EC83	1.50	EF91	1.60	EY88	0.85	PL509	5.35
B12H	6.90	EC84	0.60	EF92	2.15	EY90	0.80	PL519	5.85
CY31	2.40	EC85	0.75	EF95	1.40	EZ81	0.80	PL802	6.60
DAF70	1.75	EC88	1.25	EF96	0.65	GM4	11.05	PY80	0.90
DAF96	1.35	EC189	1.20	EF183	0.75	GN4	6.30	PY81	0.75
DET22	32.80	EC204	0.65	EF184	0.75	OY501	1.50	PY81/800	0.85
DF92	0.95	ECF80	1.25	EFB12	0.75	GZ32	2.80	PY82	0.75
DF96	1.15	ECF82	1.60	EFB200	1.85	GZ33	4.20	PY88	0.80
DH76	1.15	ECF802	1.80	EH90	0.85	GZ34	2.80	PY500A	2.10
DL92	1.70	ECF804	4.50	EL32	0.85	GZ37	3.95	QV03/10	5.95
DY86/87	0.65	ECH35	2.75	EL34	3.25	K777**	16.10	QV03/10*	7.50
DY802	0.75	ECH42	1.65	EL34*	9.50	MX120/01	29.50	QV03/20A	27.50
E92CC	1.95	ECH81	1.25	EL82	0.70	N78	9.90	QV06/40A	28.50
E180CC	9.80	ECI84	0.90	EL84	1.35	O82	1.70	QV06/40A*	46.00
E1148	0.75	ELC80	0.75	EL86	1.45	PLC82	0.95	QV03/12	7.40
EA76	1.60	ELC82	0.95	EL90	1.75	PLC84	0.85	QV4/300	101.60
EB34	1.15	ELC85	0.95	EL91	6.50	PLC86	0.80	SP81	3.20
EB91	0.60	ELC86	1.20	EL95	1.80	PLC85/85	0.95	TT21	47.50
EB333	2.20	ELC800	17.25	EL504	2.30	PO500/510	5.60	TT22	45.00
ECB90	1.20	EF9	3.80	EL519	7.70	PL200	1.10	UA600	0.75
ECB91	1.15	EF22	3.90	ELB21	7.50	PL200*	2.80	UBF80	0.95
EF80	0.75	EF37A	2.45	ELB22	11.50	PL36	1.60	UBF89	0.95

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc. as below.
POSTAGE £1.13 75p; £3.15 95p; £5.10 £1.15; £10.15 £1.40; £15.12 £2.00; Over £20 but below 2kg £2.85, over 2kg at cost.
Delivery by return.

COLOMOR (ELECTRONICS) LTD 170 Goldhawk Rd, London W12 8HJ
Tel: 081-743 0899 Fax 081-749 3934. Open Monday to Friday 9 a.m.-5.30 p.m.

MARCONI SIG GENS. as follows. TF 2016A freq 10Kc to 120Mc/s AM/FM small compact unit with provision for use with ext synchroniser tested with book. £165 TF144H (CT452) freq 10Kc to 70Mc/s A.M. in 12 bands older larger bench unit. £95. TF995A/2 1.5/220 Mc/s AM/FM £115 also TF995B/2 200Kc to 220Mc/s AM/FM £135 TF1060 UHF AM 450 to 1250 Mc/s larger bench type £95 also with book. **AVO MOD.8** meters with high current range ext kits AC/DC Amps to 500 etc. £95 Meters only £55 **TOOL KITS** customised kits for servicing CRO RTTY equip in fitted hinged lid case size 12x8x4" contains special tools etc. £19.50 **GEIGER COUNTER** hand held as one range with meter and 0 to 300Uv very sensitive unit fitted type G.10H GM tube reqs 1.5v D cell & 120v DC at 1 Ma tested with carry case. £28 **CIR CIRBOARDS** set of 4 PCBs recovered from VHF Dat link equip nom freq 70/80 Mc/s with Rx board crystal controlled IF nmo 30 Mc/s, Tx board with 2N5642, Tx driver board & electronic Ae swt reg 12/24v Dc no info but I/Ps marked. £14.50 **AIRCRAFT GYRO STAB BOMB SIGHTS** Type T.4 about 57 in fitted transit cases. £75 **BATTERIES** nom 6.75v Mercury type not rechargeable size 2½x1½" rated 2 A.Hr at 100 Ma cont load new £6.50 for 8 or 16 for £11.50 **FREQ CONV RACAL RA.70** sold for parts etc as 240v I/P P.U. with 240v DC O/P at 40 Ma 2x6.3v AC, crystal in oven, valves etc in case size 19x12x3" with circ, these units conv 100Kc I/P to 14Kc O/P. £23 **ROTARY CONV I/P** 18v DC at 18 amps for full O/P of 230v 50c/s 180 watts sine wave approx ext size 12x7x5" new cond. £48 **POWER UNIT** general purpose HT/AT P.U. for use on 240v provides var DC O/P 0 to 500v at 100 Ma to 350v also 6.3v at 3 amps ct. fitted V/Ma meter, fuses, etc in table case size 13x8x13" tested with circ. £42 **PLATE TRANS** Prio 200/250v sec 1270v at 550 Ma for F.W. bridge size 8x5½x8" tested. £55.

Above prices include Carr/Post & VAT. Goods ex equipment unless stated new.
SAE with enquiry or 2x22p stamps for List 46

A.H. SUPPLIES

Unit 12, Bankside Works, Darnall Rd, SHEFFIELD S9 5HA.
Phone. 444278 (0742)

ANTENNAS TONNA (F9FT)

50MHz	144/435MHz	THE VHF/UHF ANTENNA SPECIALIST	POWER SPLITTERS
5 element..... £50.71(a)	9 & 19 element Oscar..... £81.07(a)		2 way 144MHz..... £48.36(b)
			4 way 144MHz..... £57.53(b)
			2 way 435MHz..... £45.69(c)
			4 way 435MHz..... £55.76(c)
14MHz	1250MHz		2 way 1250MHz..... £38.35(c)
4 element..... £29.39(a)	23 element..... £81.07(b)		4 way 1250MHz..... £43.36(c)
4 element crossed..... £37.26(a)	4 x 23ele - stacking frame - power splitter..... £175.00(a)		2 way 1250MHz..... £38.35(c)
9 element fixed..... £33.12(a)			4 way 1250MHz..... £43.36(c)
9 element portable..... £35.19(a)			2 way 2300MHz..... £38.35(c)
9 element crossed..... £52.10(a)	1296MHz		4 way 2300MHz..... £43.36(c)
13 element..... £49.06(a)	23 element..... £32.29(b)		
17 element..... £56.24(a)	4 x 23 ele - stacking frame - power splitter..... £175.00(a)		
	55 element..... £48.27(a)		
435MHz	4 x 55 ele - stacking frame - power splitter..... £250.00(a)		
9 element..... £30.43(a)			
19 element..... £38.64(a)			
19 element crossed..... £42.44(a)			
21 element crossed..... £47.61(a)	2300MHz		
21 element ATU..... £47.61(a)	25 element..... £43.47(b)		

All prices include VAT. Please add carriage (a) £5.50 (b) £2.20 (c) £1.20. U.K. MAINLAND ONLY ACCESS or VISA cardholders telephone your order for immediate despatch. Callers welcome, but by telephone appointment only, please. Send S50 for our catalogue which contains the full specifications.

RANDAM ELECTRONICS (P)

FREEPOST, ABINGDON, OXON, OX14 1BR.

Tel: (0235) 523080 (24hrs)



J. BIRKETT

RADIO COMPONENT SUPPLIERS

AIR SPACED VARIABLE CAPACITOR. Double Ball Bearing 1" Spindle either end. 100 + 100pF @ £3.50.
WIRE ENDED DIODES 1300 PIV 1 Amp BY 127 @ 10 for £1.00.
STORNO FM SYNTHESISED TRANSCEIVERS With Control Box and Loudspeaker Less Mike. Boot Mounting 107MHz to 140MHz. No other details @ £10.95 (P.&P. £4).
STORNO BOOT MOUNTING FM TRANSCEIVER 10 Channels. No Controls etc. @ £8.00 (P.&P. £3).
STORNO BOOT MOUNTING FM TRANSCEIVER 2 Channel. With Control Box and Loudspeaker. Less Mike and Transistors. 107 To 140MHz @ £8.00. (P.&P. £4).
VOLTAGE REGULATORS. 3 Amp MC78T12C 12 Volt @ £1.85, LM 29308 1 Amp 8 Volt @ 50p.
GAAS FETS 24GHz Red Spot @ £2.50, 18GHz Black Spot @ £1.85, Out of Spec. GaAs FETS @ 3 for £1.90.
FETTS. 2N 3819 @ 25p, 2N3824 @ 30p, 8FV11 @ 30p, 8FV12 @ 30p, Dual Gate MOS FETS. 3N201 @ 80p, 3SK88 @ 60p.
S0329 COAX SOCKET Nut Fixing @ 50p, 5 for £2.00.
MINIATURE TANTALUM BEAD CAPACITORS 4.7uf 10v.w., 15uf 10v.w. Both @ 15 for £1.
RF TRANSISTORS. TP2310 @ £1.15, Frequency Sources GC41085-800 @ £4.95, NEC 231153 @ £4.95, BF7-35 @ £5.95, PT9786A Matched Pair @ £12.95, BLV97 @ £3, 2GHz 50mW @ £1.15, VHF-UHF Termination 50 ohm @ £3.95, MRF422 150 Watt 30MHz @ £9.95.
VALVE ELECTROLYTIC CAPACITORS. 10uf 385v.w. @ 45p, 47uf 400v.w. @ 45p, 20 + 20uf. 450v.w. @ 85p, 32 + 32uf 350v.w. @ 80p, 50 + 50uf 275v.w. @ 80p.
ACCESS and BARCLAY CARDS ACCEPTED. P&P 80p under £5. Over Free. Unless Otherwise Stated.
C.M. HOWES AND WOOD & DOUGLAS KITS Available By Post and For Callers.



25 The Strait
Lincoln, Tel. 520787
(LN2 1JF)
Partners J.H.Birkett.
J.L.Birkett.

Back-Scatter

The 70MHz Band

Gerry Schoof G1SWH (MCH) made the most of the Trophy contest by making 66 contacts in 40 counties and 6 countries. On September 26, GM4SEU/P (IO76) was worked for a new square.

Bob Nixon G1KDF (LNH) came on the band for the first time during the contest on September 16 after being requested by G1SWH to provide a new county multiplier. Pressing a 50MHz 5-element F9FT Yagi into service Bob made 14 contacts in 30 minutes. A total of 8 squares and 5 countries were worked.

Another new station on the band is **Simon Harris G4WQG** (WLT). He is running a modified p.m.r. box giving 20W of f.m. on 70.450, 70.425 and 70.475MHz. He would like 70MHz operators in the Swindon area to contact him.

The only period of intense activity heard at my QTH was during the Trophy contest on September 16. Tropo conditions were quite good allowing contacts to be made with many stations including EI9FK/P (Louth), G14SJB/P (DWN), G14TVV/P (DWN), GJ4TAW/P (JER), GJ7AOG/P (JER), GM3CKR/P (BDS), GM4AFF (GRN), GM4SIV/P (DGL), GM4UJS/P (DGL), GM4ZUK/P (BDS) and GM8TFI/P (SCD). It was noted that many of the leading entrants now have f.m. facilities enabling them to contact stations that in the past have been missed. This strategy is quite useful. The duration of the contest and the reduced band occupancy on 70MHz, means that a number of leading entrants will have worked a similar number of stations by the end of the contest. Any means to increase the QSO total must be utilised, hence the increased usage of f.m. to provide those vital extra points.

The 144MHz Band

There were a number of tropo openings into central Europe during September but all were very fairly brief events. The IARU contest on September 1/2 created much activity but there was little in the way of DX. Similarly the c.w. cumulatives proved that this mode is used by a considerable number of operators but again the conditions had the upper hand.

David Sewell G4FVK (CBE) sent in a long list of stations worked during the Region 1 contest at the beginning of September. Contacts on s.s.b. included EI3GE (IO63), G1VHT/P (IO74), GJ3XBY/P (JER), GU4APA/P (ALD), F6GYT/P (IN99), F6HPP/P (JN19), F6IFR (JN09), FA1LIU/P (JO10), FC1CBC (JN09), FF1OLW/P (JO00), ON6HT/P (JO30) and ON7TR/A (JO11).

Gary Nicholas GW7EVG (CWD) made his best DX so far by contacting, on September 1, G8LNC/P operating from the Isle of Wight. A contact with G7FDC/P (DVN) gave him a new county. On September 8, contacts were made with GMOGTI/P on the Isle of Arran and with EI6ARB/P (IO54) located in Co. Donegal. A QSO, on September 10, was made with GMB0EG (TVS), being another of Gary's furthest contacts this year. Also reported

Annual v.h.f./u.h.f. table January to December 1990

Station	50MHz		70MHz		144MHz		430MHz		1296MHz		Points
	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	Counties	Countries	
G1SWH	46	33	54	7	85	20	45	8	15	5	317
G6HKM	53	35	—	—	65	23	34	13	27	10	260
GOIMG	47	29	44	4	51	13	32	4	—	—	224
G4ASR	27	36	58	8	55	31	—	—	—	—	216
GONFH	40	20	21	3	48	9	11	2	2	2	158
GOFYD	20	24	1	1	75	20	11	4	—	—	156
G8PYP	27	30	2	1	49	18	21	6	—	—	154
GD4XTT	31	18	—	—	73	17	10	4	—	—	153
G8MXL	5	17	17	3	34	9	17	5	13	4	124
G0EVT	21	23	—	—	36	14	5	1	—	—	100
GW4HBK	2	12	39	7	—	—	29	4	—	—	93
G4ZTR	—	—	—	—	59	19	—	—	—	—	78
GW1MVL	2	2	—	—	43	10	11	2	—	—	70
G7CLY	—	—	—	—	60	9	—	—	—	—	69
G4SEU	—	—	62	6	—	—	—	—	—	—	68
GW7EVG	—	—	—	—	37	6	—	—	—	—	43
G7CFK	18	12	—	—	—	—	—	—	—	—	30
GM1ZVJ	1	9	—	—	2	1	—	—	—	—	13

was a QSO with GW6TEO (DFD) in the rare WAB square SR99.

Ela Martyr G6HKM (ESX) found the period September 15/16 to be quite good with a number of DX contacts being made. On the 15th, GJ3YHU was worked for the first GJ of the year followed by QSOs with GM1YOA/P and GM0CDA/P, both in Borders Region. Between 1617-1820UTC, Ela worked OK1DXT/P (JO60), OK1HBL/P (JO60), OK1KPA/P (JN79), OK1KPU/P (JO60), OK1UZG/P (JO70), OK1VEI/P (JO70) and OK1VVP/P (JN79). Conditions were still good on the 16th, Ela contacting HB9STY/P (JN36).

Ralph Sachs G2CZS (ESX) also managed to find the DX. During August, contacts were made with EI2VPX/P, GD4IOM, G4ATA/P (IN79), G0NES/P (DHM) for a new county, LX/ON4MU/P (JN29) and OZ1BEF (JO64). The best DX during the contest on September 1 was LX/ON7RB/P (JN29). A few days later, QSOs were made with G0KTD/P and G1DUK/P, both in Cornwall. Ralph reports that he had been trying for well over a year to work this county. The good tropo on September 15 found OK1HBL and OK1VEI/P in the log.

"Have you noticed the number of whistlers appearing on 144.300MHz?" asks G8PYP. He mentions that some stations appear to be unable to call CQ without whistling into the microphone first, often several times. Not only is it unnecessary but it is also annoying for anyone listening and guaranteed not to get a reply to a CQ call. Steve reports that the Perseids meteor shower was very good this year with many strong and long reflections. Although many stations were heard on 144.200MHz (an unscheduled frequency) only 3 stations, OE8HWQ, OK3LQ and SM5FRH, were worked because of the large amount of QRM caused by other operators. Stations heard included HB9STI, HG1YA, I1CCB, IK1LGV, IK1MTZ, IK5EAR, IV3CER, IW5AVM, IW5EBM, IW0BZM, LA1K, OE5ABM, OH1AF, OZ1FDH, SK3LH and SP2NJI. Not much was reported in the period after the Perseids, only GM8ODG (IO86) via aurora on August 23 and PA3FOC (JO21) via tropo on August 26.

Trying out the Perseids meteor shower in August for the first time, G1SWH was pleased to contact G4DHF/TF (IP03), LA1K (JP53), SK3LH (JP93) and SM5FRH (JO88).

Annual c.w. ladder

Station	Band (MHz)					Points
	50	70	144	430	1296	
G4ASR	59	8	137	—	—	204
G0EVL	12	—	144	—	—	156
G4OUT	—	39	99	—	—	138
GOFYO	31	—	62	1	—	94
GD0JA	17	—	10	—	—	27
GW4VXX	3	—	9	—	—	12

Number of different stations worked since January 1 1990

Mick Toms BRS31976 (ESX) was able to spend much time listening to the proceedings during the Perseids shower. Hereckons that conditions peaked at around midday on August 12, with very good signals being received from Scandinavia. Mick uses a Yaesu FR101 receiver with inboard converters for all v.h.f. bands from 50-432MHz. On 144MHz he uses a 19-element Yagi at 12m above ground. This year was the first time that a computer Morse reader was used to decode high speed c.w. and although some more work is needed to reduce the r.f.i. produced by the p.c., results were very good. During the weekend of August 11-12 the following c.w. stations were heard, HG3DX, HG7BT, I1TXD, LA0HY, OH5LK, SM6EJY, SM0KAK and YU7AU. Mick also listened on 144.200MHz and comments that a large number of operators were heard operating without using the correct procedures. Examples of stations giving reports and only their own callsign were numerous. Stations heard on s.s.b. during August included DL4MDQ, DK5IE, DG9NCX, EA1YV, ES2RJ, ES2WX, G4PIQ/TF, HB9TFI, HG2NP, HG3DX, IK1DSP, IK1MTZ, I3LGP, I5JUX, LA1JU, LA1K, LA9BM, OE8HWQ, OH1AF, OH5LK, OH7EU, OK2ZZ, OZ1FDH, SM2CEW, SM2CKR, SK3LH, SM4DHN, SM5FRH, SM7BOU, SM7FWZ, SP8NCJ, SP9EWU, YT2C, YU2PT and YU7FF. I hope this report from Mick may encourage others to try this mode of communication. I still have available my 8 page guide to practical m.s. working which can be obtained on receipt of a stamped A4 envelope.

Dave Law G0LBK (YSS) runs a small e.m.e. system consisting of four 9-element F9FT Yagis. Recent QSOs via the moon have included DL3SAS, HB9CRQ and I2FAK bringing Dave's total up to 7. He attempted a schedule with OZ1HNE who uses only 2 Yagis and although signals were heard both ways the QSO was not completed.

Geoff Brown GJ4ICD (JER) has been

conducting t.e.p. tests with stations in V51 and ZS6, so far without results. However, Kosie V51E did manage to work into Monaco and Italy in early September. During the 1989 t.e.p. season, Geoff heard the ZS 144MHz beacon and is hoping to make a two way QSO this year.

The 430MHz and Microwave Bands

Want the Isle of Skye on 430MHz? **Collin Robertson GMOHBK** (WIL) is now active on the band with four 24-element Parabeam Yagis.

G1SWH is now fully QRV on 1296MHz with an Icom 271E giving 10W into a 55-element F9FT Yagi. A mast-head low noise amplifier and power amplifier will soon be added to the system.

G1KDF is now running high power on 1296MHz with a single water cooled 2C39BA. This arrangement gives about 90W output compared to about 40W from an air cooled version. Another advantage is that the p.a. is more thermally stable and you can't hear the blower noise. On August 10, an s.s.b. contact was made with EI2VPX/P (IO61). Bob was pleased to work into GD on 2320MHz during the contest on August 12. The QSO provided both a new country and square.

Activity on 10GHz narrowband is increasing according to reports in the RSGB Microwave Newsletter. This may in part be due to kits designed by Charlie Suckling G3WDG becoming easily available. Sam Jewell G4ODK has also, for a number of years, been designing modules for use on the s.h.f. bands. During this summer, tests have been conducted between G3WDG/G4KGC (XYL), G4DDK and G4FRE. The results have been very encouraging with signals from G3WDG being copied during each test. If you want more information regarding the availability of narrowband transverter kits contact the RSGB component service.

Packet Radio DX Cluster News

Following on from last month's explanation about the use of packet radio clusters for v.h.f. DX working, details have been obtained from **Ron Stone GW3YDX** about an expansion of the UK system. A new DX cluster will soon be on the air from the premises of South Midlands Communications Ltd. Although the Notice of Variation for the cluster GB7SMC, specifies only 70.325MHz as the input frequency, a multi-frequency node will be co-located with the cluster PC with access ports on 50.650, 70.325, 144.625, 144.650, 144.675, 432.675 and 1200MHz. In addition to user access, it is intended to have a 9600 baud link to GB7WDX, near Exeter, and to the proposed GB7DXS cluster near Handcross, West Sussex. The GB7DXS cluster will be linked to the first of the UK DX clusters GB7DXI at Wokingham and together with GB7SMC will form the long awaited link between the cluster in the south east and others in the UK. Another cluster GB7DXH will soon be operational from Hertfordshire. This brings the total of

Back-Scatter

UK systems up to 7. For further information contact GW3YDX, Secretary of the UK DX Packet Cluster Working Group.

Expedition Update

During August, G1KDF operated portable from a number of locations in France. He managed to find some good sites in IN77 and IN87 which enabled many contacts to be made into the UK on 144MHz. The only major problem encountered being the generator which failed to work, restricting Bob to only 50W output on 144MHz. He also took a TS-680S and HB9CV antenna for use on 50MHz, this system giving very good results. On August 23, operating from IN77, a total of 130 contacts were made in 51 locator squares. The band was open from 0Y through to 9H, allowing 13 countries to be worked in just over 4 hours. Conditions were not so good from IN87 but even so 10 squares in 3 countries were worked on August 28.

There can't be any keen v.h.f. DXers that didn't know about the Five Bells Group expedition to Iceland during August. The group consisted of David G4DHF, Keith G4ODA, Andy G4PIQ, Dave G4YTL and Chris G8LJC. I guess most of you have heard of the first 4 operators but may be wondering who G8LJC is. Chris doesn't claim to be a DX operator but without his help in the support role, looking after the needs of the group, the few operators who were available would have had less time to actually operate the radio.

The logistics of the trip were quite enormous. Apart from actually arranging a suitable location for their base they also had to organise the transportation of all the v.h.f./u.h.f. equipment. No mean task as they had e.m.e. capability on both 144 and 430MHz and a system on 50MHz. Three of the group and a V8 Land Rover set out for Iceland one week before the others. In order to reach their destination they had an overland journey of some 450km over roads which at times ended abruptly because of rock falls or floods caused by glacial meltwater.

Having set up all the gear, the group got to work on the various bands with impressive results. Keith G4ODA was the sole holder of the 50MHz permit and was therefore heavily committed to operate on this band. Operation commenced via m.s. on August 4, well outside the peak of the shower. It soon became clear that with the low e.r.p. levels allowed in Europe that reflections were going to be poor. The only completed m.s. QSOs were with stations located in Scotland at around 1000km.

It was via Sp-E that most 50MHz contacts were made. On August 5 there was a brief opening, at 1440UTC, to G1 which lasted for approximately 10 minutes. Later in the day, at 1838UTC the first major Sp-E opening started. In 3 hours, over 160 stations were worked in DL, F, ON, OZ, PA, SM and the UK. The best DX during this event was FC1BUU (IN94) at 2400km. The next event of any significance was on August 12, commencing at 0842UTC. Around 180 contacts were made with DL,

F, G, GI, GM, GW, HB0, LA, LX, ON and PA in an opening lasting over 4 hours. The best DX of the day being HB0/HB9QQ at 2500km.

The final event occurred on August 14, the last day of operation. In a 2 hour opening, contacts were made into DL, F, G, GJ, LA and OZ. On the 144MHz band results were equally impressive. The group had to rely on either m.s. or e.m.e. for the majority of the contacts. In 10 days of meteor scatter operation, 134 QSOs were completed with stations in 11 countries. With an e.m.e. system consisting of four 16-element F9FT Yagis, the group had not considered themselves a force to be reckoned with and they only expected to work a handful of stations. David G4DHF however described their results as being spectacular and extremely enjoyable.

Despite losing their remote-elevation facilities during a gale on the first night and having to improvise with poles and a length of rope, 37 QSOs were made with stations in DL, F, G, HB, I, OE, OK, OZ, PA, SM, VE and W. At moonrise, they were able to copy their own echoes every day, frequently at 539. Signals from such stations as KB8RQ, W5UN and VE7BQH were described as tremendous! Conditions were so good that they were able to complete with several 4 Yagi-equipped stations and even a 2 Yagi-equipped station. Conditions on 430MHz however were completely different. Faraday rotation caused many problems and it soon became noticeable that those stations equipped with dishes and rotatable feeds were providing much better signal strengths. Even so, every other contact was a first which heightened the satisfaction and success of the operation. In total, 10 e.m.e. QSOs were completed on 430MHz with stations in DL, F, OE, PA, SM and W. A truly tremendous effort. Well done lads!

Beacon and Repeater News

A number of 50MHz beacons have recently become operational. In Newfoundland, VO1MUN can be found on 50.0375MHz. It is running 10W into a vertical antenna. Reception reports should go to PO Box 51, St Johns, Newfoundland, A1C 5H3, Canada. It has already been heard in the UK.

A Brazilian beacon, PT7ACC is operating on 50.078MHz from locator HI06. It runs 5W into a ground plane antenna.

FC1FNH is running a beacon on 50.418MHz from locator IN96. I suspect this may be an unofficial personal beacon.

The 10GHz beacon GB3MHX, located at the British Telecom Research Laboratories at Martlesham Heath, Suffolk returned to service recently. Operating on 10368.830MHz it was running 20mW into a 1.2M dish, beaming due east, although by the time you read this it will have changed to an omni-directional antenna.

The 144MHz repeater GB3BI located near Inverness has been closed down for an overhaul of the repeater system and its antennas. It is expected to return to service in mid-December.

Meteor Showers

The following data, concerning meteor showers occurring in the next few weeks, will help you determine in which direction to beam at specific times and when the shower is below the horizon.

The Leonids meteor shower will be encountered between November 13-19, peaking on Saturday 17th. Between 0100 to 0300UTC beam north or south, 0300 to 0400UTC beam north-east or south-west, 0400 to 0800UTC beam east or west, 0800 to 1100UTC beam south-east or north-west. The usefulness of the shower for radio communication purposes is not very good from 1100UTC onwards and between 1700 to 2300UTC the radiant is below the horizon.

The Geminids shower lasts from December 6-14, with maximum activity occurring on Thursday 13th. Between 2000 to 2200UTC beam north or south, 2200 to 0100UTC beam north-east or south-west, 0100 to 0300UTC beam east or west, 0300 to 0500UTC beam south-east or north-west. The shower radiant is low between 0900 to 1900UTC.

SP8NCJ is planning to operate from locator KO12 during the Geminids. You can contact him on the 14.345MHz v.h.f. net.

QRZ Contest!

The UK 6 Metre Group are holding a 50MHz contest to coincide with the SMIRK QSO Party on November 17-18. Non members of the 6 Metre Group can participate.

The final session of the 144MHz c.w. cumulatives will be run on November 11 between 2030-2300UTC.

The 144MHz Fixed station and AFS contest is scheduled to take place between 0900-1700UTC on December 2. This contest provides an excellent chance to pick up those wanted UK counties and locator squares.

Details have been received from DL5MAE of a meteor scatter contest being organised by the Bayerische Contest Club. The contest will be held between 11-14 December, 0000-2400UTC each day, to coincide with the Geminids meteor shower. Single or multi-operator entrants should use c.w. at a speed of 1000 letters per minute and 2.5 minute periods, in the frequency band 144.095 to 144.105MHz.

Logs should be sent, no later than December 31, to the Bavarian Contest Club, MS Contest, Kelheimwinzerstrasse 40, 8420 Kelheim, Germany. Use the whole 10kHz spectrum, not only 144.100MHz. Full call signs and reports must be exchanged, each complete random contact counting as one QSO point. The final score is the total QSO points multiplied by the number of different prefixes worked. Prefixes are as defined by WPX rules, e.g. G3, G4, GW4, Y23, Y32. Your entry must give the operator's name, call sign and address, multi-op stations list of call signs, contact details giving date, time (UTC), station worked and both reports. Technical details about equipment and antennas should also be given. The first, second and

QTH Locator Squares Table

Station	50	70	144	430	1296	Total
G3IMV	319	—	447	125	51	942
G4JACD	407	—	263	119	59	848
G4ASR	279	43	350	41	3	716
G6HKM	265	—	224	112	48	649
G3JKN	204	22	187	134	88	635
G1KDF	309	8	184	104	38	643
G3JKN	204	22	187	134	88	635
E15FK	314	—	187	58	—	559
G0DAZ	146	—	221	137	39	543
G6HCV	309	—	233	—	—	542
G3UVR	—	50	257	140	83	530
G4KJX	—	—	372	120	—	492
G1SWH	196	31	165	60	8	460
G4RGK	—	—	284	124	50	458
G3XDY	—	—	206	148	91	445
G1DWQ	264	—	152	—	—	416
G0EVT	142	—	213	57	—	412
G0LBK	—	—	267	89	46	402
G4DEZ	55	—	249	49	49	402
G8ATK	103	—	145	94	52	394
G1LSB	73	—	176	144	—	393
G6DER	—	22	183	110	78	393
ON1CAK	48	—	280	53	11	392
G8LHT	79	19	185	93	14	390
G1EFZ	—	—	263	93	—	388
G4XEN	—	—	274	111	—	385
G4MUT	82	22	153	93	31	381
ON1CDD	43	—	255	56	7	361
G8PYP	199	2	120	34	—	355
G4NBS	—	35	138	108	67	348
G4ARR	—	—	255	80	—	335
G3CJJ	—	—	186	103	44	333
G8PNN	7	25	129	99	64	324
G4SSO	—	—	229	93	—	322
G4FRE	—	—	102	146	72	320
GM0HBK	132	8	156	19	—	315
G4TIF	—	—	200	110	—	310
G4DHF	—	—	307	—	—	307
G4ZTR	78	28	120	50	30	306
G1EGC	—	—	198	80	23	301
G8HHI	—	—	148	110	38	296
G6MGL	—	—	141	89	59	289
DL8FBD	—	—	280	—	—	280
G0FYD	110	1	160	6	—	277
GW6VZW	118	—	143	6	—	267
G4PCS	—	—	258	3	—	261
G6MXL	66	22	98	49	23	258
G3BDQ	256	—	—	—	—	256
G1GEY	—	—	168	77	11	256
G3NAQ	—	—	175	80	—	255
G6DZH	—	—	158	87	—	245
G6STI	—	—	152	69	24	245
G0NFH	113	25	78	18	9	243
G3FPK	—	—	241	—	—	241
G4IGO	—	—	238	—	—	238
G0EHV	—	—	160	75	—	235
GW4FRX	—	—	231	—	—	231
GM4CXP	—	—	198	31	—	229
G1SMD	165	—	110	—	—	275
G4DQL	—	—	216	—	—	216
G4MEJ	—	—	213	—	—	213
G8LFB	—	—	209	—	—	209
G8MKD	—	—	150	49	—	199
GJ6TMM	—	—	151	48	—	199
G4YCD	—	—	197	—	—	197
G1TCH	94	—	95	6	—	195
G1JUS	—	—	192	—	—	192
G8XIR	—	—	123	—	62	185
G7ENF	59	—	89	24	—	172
G4FVK	—	—	82	50	23	155
G7ANV	—	—	153	—	—	153
G4AGQ	—	—	104	42	1	147
G8XTJ	29	—	116	—	—	145
G6MEN	41	2	63	26	4	136
GW4VXX	10	—	117	—	—	127
G1WPF	—	—	97	29	—	126
G0FEH	—	—	101	24	—	125
G0ISW	45	—	59	17	—	121
GW1MVL	—	—	109	7	—	116
G1IMM	—	—	98	17	—	115
GM0GOL	—	—	88	23	—	111
G7CFK	109	—	—	—	—	109
G1CEI	11	—	77	18	—	106
G14OWA	—	—	103	—	—	103
G7CLY	—	—	100	2	—	102
G1SWH	—	—	148	53	—	101
GM0JOL	—	—	88	—	—	88
GM1ZVJ	35	—	48	—	—	83
G4WHZ	—	—	76	—	7	83
G0GTF	76	—	—	—	—	76
G1NVB	—	—	73	—	—	73
G0HDZ	—	—	64	—	—	64
G0HEE	—	—	73	—	—	73
GU4HUY	—	—	73	—	—	73
G2DHY	—	—	33	7	2	42
G7AHQ	—	—	34	—	—	34
GW7EVG	—	—	22	—	—	22

No satellite or repeater QSOs
Starting date 1 January 1975

Back-Scatter

third place winners will receive prizes, country winners will receive certificates.

The penultimate leg of the 430MHz cumulative contest will be held between 2030-2300UTC on December 4.

The three remaining legs of the 1.3/2.3GHz cumulatives will be run on

November 10, November 26 and December 12 between 2030-2300UTC.

The Scandinavian activity contests will be run on the following dates. Microwave activity on December 3, 144MHz on December 4 and 430MHz activity on December 6.

Deadlines

Please send your letters to reach me by the end of November. I always write up the column in the first few days of the following month. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM.

Photographs of your shack, antennas or any v.h.f. activity are especially welcome. Other pictorial items such as QSL cards, awards, certificates, etc, are also required. As they say, a picture is worth a thousand words!

Back-Scatter

Amateur Satellites

Reports to

Pat Gowen G3IOR

17 Heath Crescent

Hellesdon, Norwich, Norfolk NR6 6DX

Satellite Roundup

First this month, I update the amateur satellite scene and give you the latest information available.

RS-10

RS-10 is still active with both transponder and ROBOT at all times. RS-11 is still being kept 'in reserve'.

David Rowan G4CUO, spent part of his holiday break by using his call prefixed by W2 and VE2 whilst in North America. He found that the use of the RS-10 satellite was very low there compared with Europe, and had to stay up very late in order to get QSOs when the satellite was in range of Europe. David remarks, "I was only able to work Ron G3CAG and Don G3BGM on c.w., with many others called who apparently were unable to hear my low power signals!"

RS14/RUDAK-2

The launch date of the forthcoming satellite is still being given as mid-October, one month prior to the intent, so it must still be expected to be on and active when you receive and read this news. Whilst in the UK, Leo Labutin UA3CR, asked if it was permissible for the satellite to be called 'Radio-Oscar-21' after launch. AMSAT-NA said that they would be honoured with this terminology.

OSCAR-10

A-O-10 has been barely supporting transponder operations over the past month due to an insufficiency of solar illumination, and AMSAT have been requesting non-use of the spacecraft due to the discovered presence of f.m.ing of the plain carrier 145.810MHz beacon.

James Miller G3RUH calculates that on September 29 the A-O-10 attitude was ALON 14 and ALAT-5, with an eclipse lasting 28 minutes from mean anomaly 250 through perigee to MA 4. The next period when we expect to have no eclipses, hence potentially a power sufficiency to be able to operationally use the transponder, if the attitude of the solar panels to the Sun are then optimised, is from November 17 1990 to February 9 1991.

At this time the OSCAR-10 apogee and perigee are once again close to the equator, similar to that following launch. The satellite is 'upside down' terrestrially speaking, i.e. the end of the arm beams are earth pointing at perigee and space pointing

at apogee. Other than some angulated antenna shading by the spacecraft structure itself, this inversion will not effect communications, as since the IHU command loss only the monopole omnidirectional antenna is in use at all times.

OSCAR-13

A new Transponder Schedule for A-O-13 was planned to come into effect as from October 17, when the satellite attitude would be at ALON 180 and ALAT 0.

Mode 'B' from Mean Anomaly 0 to Mean Anomaly 95

Mode 'JL' from Mean Anomaly 95 to Mean Anomaly 125

Mode 'LS' from Mean Anomaly 125 to Mean Anomaly 130

Mode 'S' from Mean Anomaly 130 to Mean Anomaly 135

Mode 'BS' from Mean Anomaly 135 to Mean Anomaly 140

Mode 'B' from Mean Anomaly 140 to Mean Anomaly 256

The omni-antenna will be used from MA 220, through perigee to MA 040. This new schedule will remain in force until December 26, when a new plan will be provided.

John Nevin G3ZHG writes from Newark that he has been busy with OSCAR-13 working lots of JA stations on Mode 'B', so many says John that they have become "back garden DX."

He lists from the numerous QSOs made recently JE1NPN, JL6DUJ, JA2EVF, JA1PJS and JA5LG, none of whom were running more than 25W of power, and all of whom were 5 and 9. North America provided QSOs with WA2RDE (NY), WB6OVH (Cal), KC0TO (Colo), KJ7H (Ore) and VE6LQ in far Canada. John himself runs just 15 to 20W of uplink power to an 11-turn helical antenna and listens with an 8XY RHCP Yagi. G4ZHG has earned both WAC and WAS by satellite, both with his older Class B licence and with his newer Class A callsign.

Hardy DC8TS reports activity on

OSCAR-13 from Z22SAT at Victoria Falls since September 12 and Keith 5N0ETP, in Lagos, Nigeria whose QSL manager is Keith Appleton N6QLQ, POB 5046, San Ramon, CA 94583, USA. Also active were OY9JD from the Faroe Islands and on 145.945MHz, CU6AC, Salgueiro, from Pico Island in the Azores. Hardy says that CU6AC has little command of the English language, but is often in QSO with his manager AA6FT, so it is best to listen when AA6FT is asking for calls for CU6AC.

A-O-13 Descent

Further studies that have recently been carried out to check A-O-13s orbital irregularities more fully, show a mainly linear decay rate of some 785 metres per orbit at perigee until the spacecraft gets below 200km in mid-1992, when it starts to rise up towards a peak of about 800km in early 1994. It then turns about again and the mathematical model predicts the perigee to be 200km once again by mid-1996. By late 1996 it will have descended to 100km and imminent re-entry. AMSAT say that they trust the figures as far as 1994, but then it is best to wait and see what happens after this.

The change of other Keplerian parameters is also of interest, as whilst the perigee is cycling, the inclination changes from 56.8° to 58°, and the eccentricity rises from 0.696 to a maximum of 0.73 in mid-1992. Variations like these are most unusual, especially the 0.5° per year change in the inclination. Throughout the lifetime of A-O-13 the Semi Major Axis, therefore the period and the mean motion, show almost no change, so no actual energy is being lost. This change is all brought about by the juxtaposition of terrestrial, solar and lunar gravitational forces. If the perigee were not so low as to bring the satellite into frictional atmosphere, and hence terminal decay with a real energy loss in late 1996, the next century would see it recover its original perigee height once again.

FO-20

JARL confirm that since emerging from an eclipsing period in late August, FO-20 command stations have been having difficulty controlling the temperature aboard FO-20. The temperature of the battery had risen to over 40°C when mode 'JA' and 'JD' were in simultaneous operation. Even after turning off both transponders the temperature was still at 35°C, and by late October, with then only partial transponder use, was seen to be up to 42°C. If the batteries remain at these elevated temperatures for any prolonged period of time, it not only reduces the voltage, as NiCad cells have a negative temperature coefficient, but significantly reduces the battery life.

As a point of reference, the Microsat battery temperatures typically hover around the recommended 0 to 5°C level. Whilst the command station is collecting data on this problem and working towards a solution, it may be expected that FO-20 will not be firmly fixed to any sort of reliable and regular operating schedule, although the intended activity will be given out by JARL for some two to three weeks in advance.

FO-20 'JD' TAPR Improvements

JA6FTL suggests some modem modifications for the TAPR PSK modem when being used for FO-20 'JD' mode. He has found that the original TAPR PSK modem does not work well when TX audio is fed to the 'mic' input or to the rear data port. He writes: "I checked the waveform at the TX varactor cathode and the discriminator of another monitor receiver at the same time, and compared waveforms. I found that what I was looking at was not the wanted waveform itself, but the phase deviation of the transition point to time axis."

JA6FIL found (with the original unmodified TAPR/JAMSAT modem) that the phase error of the transition point at the output terminal, i.e. the 'hot' side of JP8, was too great, especially the 600Hz wave form, and that this was due to the incorrect time constant of the output filter R7/C8 combination. This he changed by replacing R7, the 22kΩ resistor with one of value 2.2kΩ, and also R5, the 22kΩ with a resistor of 4.7kΩ. He confirms that with this simple modification alone the phase error improved greatly.

Modification for the 726-R

W90DI reports a G3RUH modification to improve the auto-Doppler control on the popular 726R that has 20Hz steps. The recommendation is to install a 555 multivibrator circuit across the tuning switch which shorts the line twice a second. It then pulls the circuit into tune from 300Hz either side.

The MICROSATS

DOVE is back on 145.825MHz 1200 baud packet at full power following sorting out some of the problems. There are still some values in the telemetry that appear to be faulty. Battery cell 6 would have exploded if it were really at the voltage indicated and for some similar strange reason, battery cell 2 is reading a low temperature. At the end of September, the long awaited speech f.m. DIGITALKER had still not been heard, but it should not be long in coming now.

WEBERSAT

Each shot taken by WO-18 still does not result in a successful picture for a number of reasons, but about 1 in 4 does and that percentage will improve. Right now, emphasis is on brightening and obtaining land features.

UoSAT-OSCAR-14

Since the Colloquium week's activity the way has now been cleared for release of the PACSAT protocol. Complete definitions of PACSAT File Headers, PACSAT Broadcast format, and the File Transfer protocol Level 0 will be available. All have been in draft form for some time, and final versions will be published in the ARRL Network Conference proceedings and via the PACKET network as REQFILS once they are to hand.

Development of ground station software for BBS access is now in progress. FTLO is designed for automated access - not hunt-and-peck keyboard control. Availability of ground station programs, from AMSAT-UK, AMSAT-NA, and perhaps in a limited shareware version, will be announced in the very near future.

Porting of the file system and the FTLO BBS to AO-16 is underway. Although most of the code will run without modification, some differences need to be accounted for. This necessarily takes longer than a similar BBS-only effort on the ground. Reflect that UO-14 is simultaneously running 6 programs: sampling telemetry, collecting CPE data, providing a multiple-connection virtual TNC, broadcasting using a new protocol and waiting for file transfers at 9600 bits/sec.

Prospective users of the BBSs should note that you cannot use them with a dumb terminal and a TNC. A home computer is needed for the ground station software. Software will run on an IBM PC initially, but C source code will be published for compiling on any other computer for those who have a compiler.

PACSAT BBS Information

AMSAT-NA Area Co-ordinator **Jim White WDOE**, asked some questions that are undoubtedly of interest to OSCAR satellite users about the PACSATS. They have been answered here by AMSAT Software Engineer **Harold Price NK6K**.

WDOE: "Which PACSAT will commence BBS operations first?"

NK6K: "UO-14 is now about 80% functional with the BBS software. AO-16 will be brought to that level, then LO-19".

WDOE: "Will the TLM or Whole Orbit Data (WOD) format, frequency, or any other parameters change?"

NK6K: "This is more of a spacecraft control than an application question. There is nothing in the new code that will require a change. WOD will probably end up as files, and be downloaded or broadcastable. This means that it won't come down in frames sent to WOD, but the internal record format will be the same. I'd like to see some compression on the WOD, but we may be running out of code space. If it is compressed, the ground station software will know how to decompress it. We'll do an update to the Operating System run-time libraries next year that will give us back some program memory. There would be no frequency changes."

WDOE: "Will people still be able to just digipeat through the PACSATS?"

NK6K: "This has not yet been decided. Digipeating is a good way to check out your station. I don't think there is much other demand for it in the long run. The MICROSATS are available now for digipeating, but you don't see much of this type of activity. I would not want to see digipeating supplant the intended use of store-and-forward data, but if there is a big demand I suspect it would be addressed."

WDOE: "How will the 'user' ground software be distributed and tested?"

NK6K: "Jeff Ward G0/K8KA and I have discussed two approaches. However, nothing has been finalised. The first approach is to make a minimum implementation of the user ground-based software available, including C language source code, as shareware. We want to get something out soon, and, since Jeff and I are IBM PC-based, availability of code will hopefully encourage others to write for MAC, Amiga, C-64, Unix, and others. The only thing against it is we don't want to leave the impression that all AMSAT offerings are shareware. The minimum implementation will not be automated, and will not be pretty colours, windows, pulldown menus, etc. but will be more portable. The second approach is for AMSAT-NA and AMSAT-UK to make available an 'all-singing-all-dancing' PACSAT ground station program. This will be automated, easily interfaced to terrestrial BBSs, and will have a fancy menu driven format."

Simple Pacsat Hardware

John Branegan GM4IHJ, has been further developing his station and writes of his latest efforts and findings.

"Activity this last week has concentrated on the development of two pieces of hardware. The first is for UoSAT-3 9600bps reception, and consists of a Microwave Modules 434/28 converter, re-crystallised to 101.85MHz to give a 27.67MHz output from the 435.07MHz UoSAT-3 input. Four values of switched capacitance in series with this new crystal allow its frequency to be shifted through four 2.8kHz steps at 407.4MHz, providing inter-channel tuning between the 10kHz channel steps of the CB RX used as the i.f. The CB has a broad 12kHz ceramic filter replacing the normal 6kHz filter in its 455kHz i.f.

Additional modifications now under consideration are a centre tuning meter, and/or a.f.c. At present the oscilloscope eye diagrams are adequate for tuning, but not everyone will be able to afford a 'scope'."

"The second piece of hardware is a new DIY aerial for DOVE'S Band reception on 2401.22MHz, plus or minus 50kHz Doppler. Initial tests on a two metre diameter dish were a flop, with received signals at S9 one moment, S0 the next. Equally hopeless was the heavy and awkward large quad helix, just too cumbersome for good tracking of fast moving 'DOVE'."

"The new antenna looks like a medium size pair of binoculars, and, to add to this illusion, it fits nicely on a very manoeuvrable camera tripod complete with pan tilt head. The helixes are formed of welding wire, wound on plastics tube supports. The reflector is aluminum foil on a plywood backing board, and the helixes are parallel connected through matching coax to an 'N' type plug which carries the signal to the 2400/144MHz converter."

John continues "With this antenna, smooth tracking is at last possible for at least half of any orbit in range of Scotland. The antenna points out of a large open window in the roof and has a relatively clear view on all bearings from west through north to east. Dove is a very strong signal at times and once Doppler track charts had been checked, was easy to follow. Unfortunately, however, there is a fault on the modulator of Dove's 2401MHz beacon such that the phase modulation is nothing like the desired 180°. The next step here is to try to rig a.f.c., so that the modulation problem can be further explored. Meanwhile AMSAT NA Controllers are already trying Digital Signal Processing on this difficult signal to investigate whether they can achieve demodulation effective enough to allow investigation and correction of Dove's computer problem, which was earlier preventing use of its 2m transmitter."

"As a further test of the simple antenna described above, it was pointed at OSCAR-13 as it passed through Apogee, sending Mode S beacon and transponder traffic. The beacon was good, S2 copy, and so were the transponded c.w. signals from IZLIT, but although voice signals could be heard they could not be read. This latter is hardly surprising however, noting that OSCAR-13 is forty times further from the earth than Dove, hence there is approximately 33dB of path loss. So, do

not expect too much from OSCAR-13 if you decide to build a simple antenna with no pre-amplifier to listen to DOVE, but be aware you can test on AO-13 whilst you wait for DOVE to come around, noting that AO-13 has very little Doppler shift on its signal and once you have found it, no antenna tracking is required".

SALYUT-7

As well as OSCAR-13, the Soviet predecessor to 'MIR', SALYUT-7 is on the way down. Earlier hopes to gather up the spacecraft and transport it back to earth by means of the large 'BURAN' shuttle seem to no longer be viable, as the Soviets have yet to finalise the escape safety system necessary to permit the manned recovery flight.

The most recent sets of Keplerian elements show a steepening decline, with the large spacecraft likely to be re-entering earth's atmosphere some time between late December 1990 and early March 1991. Using the formula we earlier applied to the decaying COSMOS-1900, it should again be possible to get an increasingly accurate time and possible point of burn up. As undoubtedly some solid material will come to earth, providing some very spectacular fireworks, meteor scatter and ionised trail propagation to boot, this event should prove well worth while pre-calculating and watching.

Keplerian Elements

Our Finnish satellite listener colleague **Birger Lindholm** has again provided us with his edited set originating as NASA 2-line elements. Birger has shown a zero level P drag (nodal period decay rate per orbit) and I drag (increment decay rate per orbit) figure where the NASA decay is given as a negative number. The nodal period and increment are calculated for the epoch day given.

He points out that that METEOR 2/17 and METEOR 3/03 are now on, that OKEAN-2 is sometimes switched on during its afternoon passes, and that the mean motion of Fen Yung-2, yet to be listed, is probably closer to 14.0005. Birger also calculates that the true orbit number for OSCAR-13 is now the NASA number -3, and finally that FO-20 is now reliable, as NASA has finally stopped confusing it with nearby in-line similar DEBUT in their listings.

TLM

Joe Kasser G3CZ/W3 is collecting amateur satellite telemetry for the archives, to form a reference bank. Any would be welcome, in particular any that can be taken from JO-20 when found on in the warming non-eclipse period, which JARL advise will last until May 1991.

CCW and EME

Satellite users, and OSCAR-0 users (moonbouncers) in particular, may have considered that coherent c.w. (c.c.w.) is an ideal application for getting those ultra-

RF POWER AMPLIFIERS

NEW!

400 WATTS
(144-148 MHz)



TE SYSTEMS new **HPA Series** of high power amplifiers now available through select national distributors.

All amplifiers are linear (all-mode), automatic T/R switching, and incorporate optional GaAs FET preamp. Amps are usable with a wide input drive level range. Thermal shutdown protection and remote control capability included. All units are designed to ICAS ratings and meet FCC part 97 regulations. Approx. size is 2.8 x 10 x 11.5" and weight is 8 lbs.

Consult your local dealer or send directly for further product information.



**TE
SYSTEMS**

TE SYSTEMS

P.O. Box 25845

Los Angeles, CA 90025

(213) 478-0591 FAX: (213) 473-4038

SPECIFICATIONS

Model	Freq. MHz	Power		Preamp		+DC +Vdc	Power A	RF Conn.
		Input	Output	NF-dB	Gain-dB			
0550G	50-54	10	400	.6	15	13.6	60	UHF
0552G	50-54	25	400	.6	15	13.6	55	UHF
1450G	144-148	10	400	.6	15	13.6	54	UHF
1452G	144-148	25	400	.6	15	13.6	50	UHF
2252G	220-225	25	220	.7	14	13.6	36	UHF
4450G	420-450	10	175	1.1	12	13.6	34	N
4452G	420-450	25	175	1.1	12	13.6	29	N

Models also available without GaAs FET preamp (delete G suffix on model #). All units cover full amateur band – specify 10 MHz bandwidth for 420–450 MHz amplifier. Continuous duty repeater amps also available.

Amplifier capabilities: 100-200 MHz, 225-400 MHz, 1-2 GHz, Military (28V), Commercial, etc. also available - consult factory.

DEALER ENQUIRIES WELCOME

Reg Ward & Co. Ltd.

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

Telephone: Axminster (0297) 34918

Yaesu

T11000	HF Transceiver	2895.00 (10.00)
FT7767	HF Transceiver	1599.00 (9.00)
FEK787(2)	2m Mode (787)	179.00 (3.00)
FEK787(10)	70cm Mode (787)	225.00 (3.00)
FEK787(16)	6m Mode (787)	179.00 (3.00)
	Speaker	69.95 (3.00)
FT747GX	Budget HF Transceiver	699.00 (9.00)
FT757GX	MxII HF Transceiver	989.00 (9.00)
FP700	200 W	219.00 (4.00)
FT757H	Manual ATU	149.00 (3.00)
FP757HD	Heavy Duty 2m P.S.U.	258.75 (4.00)
FAS14R	Remote Antenn Switch	80.00 (3.00)
FT738	21/200 45/35W Base Stn. SPECIAL PRICE	1189.00 (10.00)
FT738	21/200 45/35W Base FM Mobile	1189.00 (10.00)
FT720MkII	MkII Super 2m 2m Multimode 2.5W	429.00 (5.00)
FT690MkII	MkII 6m M/Mode 2.5W	429.00 (5.00)
FT7211R	23cm FM Transceiver	475.00 (5.00)
FT7211R	2m 45W FM Mobile	309.00 (5.00)
FT7212R	New 2m 45W FM Mobile	349.00 (5.00)
YHA15	2m Helical	8.50 (2.00)
YHA44D	70cm j wave	12.50 (2.00)
YHA45D	Mobile Helical	14.55 (2.00)
FT411	2m H/H Key Board	225.00 (3.00)
FT811	70cm H/H Keyboard	239.00 (3.00)
FT470	2m/70cm Dual Band H/H (Body only)	349.00 (3.00)
FT723R	2m Mini H/H	239.00 (3.00)
FT732R	70cm Mini H/H	229.00 (3.00)
FN89	Nicad Battery Pack (23/73)	34.50 (2.00)
FN810	Nicad Battery Pack (23/73)	34.50 (2.00)
FN810	Nicad Battery Pack (23/73)	67.85 (2.00)
NC19C	Charger (23/73)	17.71 (2.00)
SMC2E	Charger (23/73) 13A Plug	17.71 (2.00)
NC28	Charger (23/73)	17.71 (2.00)
NC28	Beats Chnrg (23/73)	39.00 (3.00)
PA8	Car Adapt Charger (23/73)	24.16 (2.00)
M112A2B	Speaker Mic	31.05 (2.00)
M112A2B	Speaker Mic Miniature (23/73/27)	31.05 (2.00)
PH680A	60-950MHz Scanning RX	609.00 (9.00)
PA4C	Power supply for 8500	23.00 (2.00)
NC9C	Charger	11.50 (2.00)
PA3	Car Adaptor/Charger	21.88 (2.00)
Speaker A4A	Speaker	31.05 (2.00)
FRG8900	HF Receiver	949.00 (9.00)
FRB800	Converter 118-175 for above	100.00 (3.00)
FR71700	RX ATU	59.00 (3.00)
MH180	Hand 800 Spin mic	21.00 (2.50)
MD180	Desk 800 Spin mic	17.00 (2.50)
M61A3B	Boom mobile mic	25.00 (2.50)
YH77	Lightweight phones	19.98 (2.50)
YH55	Padded phones	19.98 (2.50)
YH55	Loudspeaker Hiast-Boom mic	28.75 (2.50)
SH1	PTT Switch Box 230-700	22.00 (2.50)
S810	PTT Switch Box 270-7000	22.00 (2.00)
FL2025	25W Lens	115.00 (3.00)
FL5020	50W Lens/Power	115.00 (3.00)

ICOM

IC765	HF Transceiver	2489.00 (10.00)
IC766	HF Transceiver	1500.00 (10.00)
IC735	New HF Transceiver	979.00 (9.00)
IG726	HF/6m base stn.	880.00 (9.00)
IC725	HF Base Transceiver	769.00 (9.00)
AT100	100W ATU (751/745)	385.00 (4.00)
AT100	100W ATU (735)	315.00 (4.00)
PS55	Ext PSU (735)	185.00 (4.00)
IC505	50MHz multi-mode portable	629.00 (5.00)
IC290D	2m 25W M/Mode	569.00 (5.00)
IC229E New	2m 25W M/Mobile	325.00 (5.00)
IC229E	2m New Mini M/Mobile	278.00 (5.00)
IC275E	New 2m 25W Base Stn IC75E	1069.00 (9.00)
IC745E	70cm Hi/Hd	310.00 (5.00)
IC24ET	70m/70cm Dual Band M/H/Hd	365.00 (5.00)
IC24ET	70m/70cm M/MMode	617.00 (5.00)
IC2400	2m/70cm FM Dual Band Mobile	835.00 (5.00)
ICR71	Gm Cov RX	869.00 (9.00)
IC7000	VHF/UHF Scanner	998.00 (9.00)
AK700	25-1300MHz Discone	82.00 (4.20)
EX257	Ext Speaker	61.00 (4.40)
EX257	FM Board (R70/R71)	7.00 (2.00)
GC5	World Clock	41.00 (2.00)
GC5	Waterproof Bag all com I/H	43.00 (3.00)
BC35	Deaf Charger	70.16 (3.00)
BP3	Battery Pack 8.4V (2/4E/02/04E)	29.90 (2.00)
BP4	Empty Battery Case (2/4E/02/04E)	9.20 (2.00)
BP5	Battery Pack 10.8V	60.95 (2.50)
DC1	10V Charge Lead BP3/B7/B	8.50 (2.00)
DC1	DC/DC converter operate from 12V	18.40 (2.00)
HM46	New Mini speaker mic	24.15 (2.00)
HM9	Speaker/Mic	21.85 (2.50)
HC55	Headset com PTT/Vox unit	41.25 (2.00)
LC41	IC32 + BP Base Head	9.20 (2.00)
LC42	IC32 + BP	9.20 (2.00)
SM8	1.3 μ 600 μ BP Base Head	82.00 (3.00)
R1	150kHz-1300MHz RX	P.O.A.
R1	HF RX	P.O.A.
R100	500KHz-1600MHz RX	P.O.A.

KENWOOD

TS860S	NEW HF Transceiver	24.99 (10.00)
TS840S	9 Band TX General Cov RX	1995.00 (10.00)
SP440	Auto/Tx/AT	244.89 (4.00)
SP940	Ext Speaker	87.55 (4.00)
TS140	HF 9 Band Gen. Cov. TX/RX	862.00 (9.00)
TS880S	HF/8m TX Gen. Cov. RX	995.00 (9.00)
TS880	9 Band TX General Cov RX	1138.81 (9.00)
AT440	Auto/Tx/AT	144.82 (4.00)
PS60	H/Duty PSU	222.48 (4.00)
AT230	All Band Auto/Power Meter	208.67 (3.00)
SP230	External Speaker Unit	56.49 (4.00)
SP430	Matching Power Supply	173.78 (4.00)
SP430	Matching Speaker	40.81 (4.00)
SM220	Station Monitor	343.62 (4.00)
B58	10 Band Auto Unit (830/940)	77.00 (2.50)
L832	11-174MHz CW Linear	1495.00 (10.00)
TH25	2m Hi/Held	238.00 (5.00)
TH45	70cm Hi/Held	269.00 (5.00)
TH75	2m/70cm Hi/Held	398.00 (5.00)
TH205	2m Hi/Held	216.28 (5.00)
TH215	2m Hi/Held Keyboard	282.13 (5.00)
TR751	2m 25W M/M Mobile	195.00 (6.00)
TS790	VHF/UHF Transceiver	1485.00 (9.00)
R2000	Gen Coverage HF/RX	968.00 (8.00)
R1000	11-174MHz Converter (R2000)	161.94 (3.00)
R5000	General Coverage HF/RX	875.00 (8.00)
VC20	11-174MHz Converter (R5000)	167.21 (3.00)
TM701	2m 70cm FM Mobile	469.00 (5.00)
TM701	2m 70cm FM Mobile	469.00 (5.00)
TM231E	2m 70cm FM Mobile 50/10/W	289.00 (5.00)
TM431E	70cm FM Mobile 35/10/W	31.00 (5.00)
SMC30	Speaker/Mic TH214/2600	28.31 (3.00)
MC50	4P Desk Mic	45.98 (4.00)
MC35	8P Desk/Mic	88.22 (4.00)
MC80	Electric Desk Mic	63.96 (3.00)
MC85	Desk Mic Audio Level Comp	90.00 (4.00)
MC43	8P Flat Mic	22.22 (3.00)
MC35	4P Flat Mic	21.72 (3.00)
MC55	Mobile Mic (fp.o., fp)	32.87 (3.00)
LF30	HF Low Pass Filter	32.28 (2.50)
HL30	Lightweight H/Phones	24.95 (2.50)
RZL	Deluxe H/Phones	37.54 (2.50)
R2L	500H+550MHz AM/FM Scanner	46.00 (6.00)

C W Keyers

HI-MOUND		
HK702 Straight key (adjustable tension)		42.75 (2.60)
HK703 Straight key (adjustable tension)		49.09 (2.50)
HK704 Straight key (adjustable tension)		26.35 (2.50)
HK705 Straight key (adjustable tension)		26.25 (2.50)
HK708 Straight key (adjustable tension)		28.95 (2.50)
HK707 Straight key (adjustable tension)		25.99 (2.50)
HK802 Straight key (Deluxe-Brass)		49.95 (3.50)
HK803 Straight key (Brass)		89.95 (3.50)
HK703 Squeeze key		37.00 (2.50)
MK704 Squeeze key		24.99 (2.50)
MK705 Squeeze key		32.78 (2.50)
MK706 Squeeze key		35.00 (2.50)

SWR/PWR Meters

HANSEN		
W720S	130/440MHz 20/200W	62.75 (2.50)
JD110	1.5-150MHz	16.50 (2.50)
YMIX	3.5-150MHz	31.50 (3.00)
Yaesu Y560	1.8-80MHz	93.15 (3.00)
Yaesu YS500	140-525MHz	81.85 (3.00)
FS600H	1.5-30MHz	63.40 (3.00)

Miscellaneous

SMCS 2U	2 Way S2039N Switch	18.96	(2.50)
SMCS 2N	2 way 'n' S2Ks Switch	23.99	(2.50)
Kempen K21N	2 way Switch 'n' Socket Duelle	27.00	(2.50)
T25	30W Dummy Load	11.26	(2.50)
T25	100W Dummy Load	18.00	(3.00)
T200	200W Dummy Load	65.00	(3.00)
WAI	Wavemeter 120-450MHz	24.86	(2.00)
PK232	Packet/RTTY Terminal	299.85	(3.00)
Datong D70	63.40 Audio Filter	100.91	(3.00)
Datong FL3	Audio Filter/Autotune	145.61	(3.00)
Datong ASP	Processor 4pin	93.16	(3.00)
Datong ASP	Processor 3pin	93.16	(3.00)
Datong ASP70	Active Processor	77.62	(3.00)
Datong PCI	General Coverage Converter	154.90	(3.00)

Antennas

DS/CT70	70-700MHz RK Deacone	24.96 (4.00)
D150	26 x 130MHz Deacone	76.00 (4.00)
Jaybeam	T83 Multi 3e HF Tribander	348.45 (8.00)
Creative	CD318 JR 4e HF Tribander	299.00 (8.00)
Creative	CD318 4e HF Tribander	349.00 (8.00)
CA2X4KC	2/70cm Mobile	39.95 (3.00)
WX1	2m/70cm Base Fibre Glass	54.99 (5.00)
WX2	2/70cm Base Fibre Glass	76.50 (8.00)
WX15Max	2/70cm Duplexer	25.50 (3.00)
CA2X4MMax	2m/70cm Base Fibre Glass	99.95 (5.00)
TOHP	10/80m trapped dipole	49.00 (5.50)

Rotators

G250	Light Duty	78.00	(4.00)
AR200XL	Light Duty	49.50	(4.00)
G400	Medium Duty	139.00	(5.00)
G400RC	Medium Duty (Round Face)	169.00	(5.00)
G600RC	Heavy/Heavy Duty	219.00	(5.00)
G200RC	Heavy Duty	44.50	(5.00)
G500	Elevating Rotator	149.00	(5.00)
GB5400	Azimuth/Elevating	279.00	(5.00)



Instant credit available.
Mail/Telephone order by cheque or
credit card. Cheques cleared before
goods despatched.



OPEN TUES.-SAT. 9.00-5.30
(CLOSED MONDAYS)
LUNCH 1-2pm

STOCK ITEMS USUALLY

**DELIVERY/INSURANCE PRICES
IN BRACKETS
(E&OE)**

Back-Scatter

weak signals out of the noise to give a solid readable output. Indeed, the circuitry and practical use of this technique to give better than a 20dB improvement of signal over noise, e.g. using one tenth of the power to end up with a 10dB signal gain has been well demonstrated with cross terrestrial signal paths by radio amateurs. See articles by **Charles Woodson W6NEY, QST** May 1981, pages 11-14 and June 1981, pages 18-23.

Dr Tom Clarke W3IWI, AMSAT-NA Chairman, referring to the ongoing discussion between Ray Soifer W2RS and myself of c.c.w. application to e.m.e., came up with the following considerations: "The simple naive c.c.w. won't help much. The moon is a rough enough scattering surface to broaden the intrinsic bandwidth to 50-100Hz (at 70cm) with coherence times in the 10-20 millisecond range. However, there are Digital Signal Processing tricks which will buy 10-15dB improvement. N4HY, W3IWI and I2KBD have all copied our own echoes from the moon with a typical AO-13 class station (e.g. 100W to a 10-15 dBi gain antenna), and N4HY and W3IWI have copied each other using long pulse non-coherent integration techniques.

Sadly for e.m.e. enthusiasts, though fortunately for the amateur satellite community, Tom is working for AMSAT 25 hours per day, building Microsats, DSP boxes, running the AMSAT BBSs, and working hard for a living for the rest of the time, with never a non-committed moment to spare. He just needs time to perform the mechanics and resultant write-up in order to make it all work operationally so that some of us can give it a go. They know HOW to do it and will undoubtedly tell we readers as soon as time permits.

Try Weather Sats?

Jeff Wallach N5ITU, who is Chairman of the Dallas Remote Imaging Group wants to remind OSCAR satellite users they can easily process weather satellite Automatic Picture Transmissions (APT) using a large part of their current station. "If you have a 2m beam or a turnstile with a pre-amp, if you have satellite tracking software and a general coverage receiver which can tune to 137MHz, you are not far from being able to process WX pictures" says Jeff. "Ideally the 137MHz receiver you use should be capable of wideband f.m. modulation with a 50kHz wide i.f." (Jeff has experimented with f.m. scanners which have 150kHz wide i.f.s with good success!) He points out that there are several interface cards which can easily be installed into IBM PC computers and clones which will turn the APT signals into very detailed pictures with 4km resolution. Once you have the weather image signal and its audio is routed to the interface card in the back of your PC, with the proper software, the pictures are easily produced on a EGA or VGA screen. For a start, you can try looking for some of the signals from the satellites for which the Keplerian elements are given this month.

Satellite	NOAA 9	NOAA 10	NOAA 11	METEOR 2/18	AO-18	AO-19
Int. Design	84-123A	88-073A	88-089A	87-068A	90-005F	90-005G
Object No.	15427	16969	19531	18312	20441	20442
Element Set	817	481	343	467	108	107
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	235.19924558	238.41821235	241.31348508	210.05150029	237.75437792	237.11386243
Inclination	98.1717	98.5981	98.9885	82.5504	98.7007	98.7031
RAAN	238.5983	264.7812	189.7191	257.1065	313.8343	313.2197
Eccentricity	0.0015171	0.0014855	0.0013288	0.0012318	0.0011760	0.0011939
Arg of Perigee	177.4451	67.3341	79.1484	129.4886	316.7425	319.2050
Mean Anomaly	182.8802	292.9394	281.1175	230.7562	43.2838	40.8253
Mean Motion	14.12841537	14.23701038	14.11889484	13.83665228	14.28932011	14.29000413
Decay Rate	0.00000442	0.00000576	0.00000825	0.00000219	0.00000464	0.00000421
Orbit Number	29344	20480	9828	14877	3080	3071
Nodal Period	101.993029	101.202311	102.062089	104.130125	100.831939	100.827112
P-Drags	2.260E-06	2.878E-06	4.227E-06	1.192E-06	2.293E-06	2.080E-06
Increment	25.495408	25.300999	25.514239	26.161300	25.208979	25.205746
I-Drags	5.688E-07	7.240E-07	1.084E-06	2.979E-07	5.789E-07	5.233E-07
Beacon-QRG	137.620-APT 1707.0-HRPT	137.500-APT 1698.0-HRPT	137.620-APT 1707.0-HRPT	137.850-APT 1707.0-HRPT	437.075/1 437.102MHz	437.1535/1 437.125/1 437.125MHz
Ref. EQX	01 Sep 1990	30 Aug 1990	01 Sep 1990	03 Aug 1990	30 Aug 1990	30 Aug 1990
Orbit	29469	20511	9868	14948	3141	3141
HHMM.MM	0116.02UTC	0000.65UTC	0009.74UTC	0058.13UTC	0037.03UTC	0021.84UTC
Degrees W	113.29	69.80	149.92	72.99	29.11	25.29
Satellite	METEOR 2/17	METEOR 3/02	METEOR 2/18	METEOR 3/03	FO-20	UO-15
Int. Design	88-005A	88-064A	89-018A	89-086A	90-013C	90-005C
Object No.	18820	19336	19851	20305	20480	20438
Element Set	351	566	300	206	102	115
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	241.12367145	240.97555581	241.04223640	241.13668582	237.47999198	238.0883472
Inclination	82.5442	82.5240	82.5225	82.5552	98.0343	98.6952
RAAN	292.4839	225.9110	170.4087	188.5538	270.8937	314.9507
Eccentricity	0.0017916	0.0017635	0.0015914	0.0015788	0.0540177	0.0008756
Arg of Perigee	116.7539	130.2790	153.4871	142.0168	251.8210	311.1805
Mean Anomaly	243.5458	229.9790	206.7167	216.2082	102.5484	48.8550
Mean Motion	13.84366656	13.18904199	13.83937688	13.15864098	12.83159085	14.26414905
Decay Rate	0.00000211	0.00000392	-0.00000122	0.00000042	0.00000011	0.00000337
Orbit Number	13027	10053	7584	4054	2563	3098
Nodal Period	104.077395	109.405071	104.105385	109.491532	112.2805	100.888416
P-Drags	1.147E-06	2.474E-06	0	2.657E-07	28.08375	1.667E-06
Increment	26.148168	27.480186	26.155327	27.501559	25.218170	25.218170
I-Drags	2.868E-07	6.188E-07	0	6.844E-08	4.194E-07	4.194E-07
Beacon-QRG	137.300-APT	137.300-APT	137.300-APT	137.850MHz	435.796/ 435.910MHz	435.120MHz
Ref. EQX	01 Sep 1990	01 Sep 1990	01 Sep 1990	01 Sep 1990	30 Aug 1990	30 Aug 1990
Orbit	13067	10083	7605	4082	2821	3140
HHMM.MM	0021.18UTC	0021.00UTC	0009.14UTC	0037.51UTC	0003.44UTC	0044.53UTC
Degrees W	55.02	121.40	174.14	164.78	64.23	31.20
Satellite	OSCAR 10	OSCAR 11	RS10/11	OSCAR 13	AO-16	AO-17
Int. Design	83-058B	84-021B	87-054A	86-051B	90-005D	90-005E
Object No.	14129	14781	18129	19216	20439	20440
Element Set	546	771	303	144	103	111
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	238.81336052	237.59292487	240.87042174	233.10507940	237.63803604	237.06960698
Inclination	26.0406	97.9486	82.9234	56.9230	98.7008	98.7014
RAAN	187.8160	287.8695	274.8282	139.8507	313.8744	313.1244
Eccentricity	0.5953791	0.0013248	0.0010300	0.7012370	0.0011129	0.0011348
Arg of Perigee	170.7905	33.1708	279.0842	234.0055	318.7523	318.8345
Mean Anomaly	208.8811	327.0388	80.9192	39.5251	43.2786	41.2012
Mean Motion	2.05880615	14.85587481	13.72105396	2.09695679	14.28790888	14.28838028
Decay Rate	-0.00000014	0.00001618	0.00000193	-0.00000146	0.00000050	0.00000048
Orbit Number	5416	34813	15941	1873	3078	3070
Nodal Period	698.662	98.313211	105.007273	686.818	100.841904	100.838585
P-Drags	175.221	7.410E-06	1.077E-06	172.199	2.501E-06	2.214E-06
Increment	145.810/ 145.987MHz	24.579401 1.864E-06	26.377715 2.693E-07	25.209486/ 6.293E-07	25.209641 5.571E-07	25.209641 5.571E-07
I-Drags	145.810/ 145.987MHz	145.826/ 435.025/ 2401.5MHz	145.826/ 435.025/ 2401.5MHz	145.812/ 435.025/ 2401.5MHz	145.82625/ 437.05130/ 2401.143MHz	145.82516/ 437.05130/ 2401.2205 MHz
Beacon-QRG	145.810/ 145.987MHz	2401.5MHz	2401.5MHz	2401.5MHz	2401.143MHz	2401.2205 MHz
Ref. EQX	01 Sep 1990	01 Sep 1990	01 Sep 1990	31 Aug 1990	30 Aug 1990	30 Aug 1990
Orbit	5430	34707	15584	1694	3141	3141
HHMM.MM	1027.20UTC	0015.18UTC	0008.71UTC	0250.34UTC	0108.91UTC	0059.75UTC
Degrees W	310.26	49.82	69.57	243.29	37.12	34.82
Satellite	SALYUT 7	MIR	OKEAN 2	METEOR 2/19	FENG YUN 2	UO-14
Int. Design	82-033A	86-017A	90-018A	90-057A	90-	90-005B
Object No.	13138	16609	20510	20670	200	20437
Element Set	470	895	237	47	1990	200
Epoch Year	1990	1990	1990	1990	1990	1990
Epoch Day	241.02365089	240.78682715	211.86444949	241.10600192	247.85515168	235.48023174
Inclination	51.6011	51.6132	82.5238	82.5421	98.9373	98.6908
RAAN	293.9038	323.8284	57.8821	230.7768	262.3263	311.3834
Eccentricity	0.0001196	0.0025873	0.0020909	0.0017773	0.0010580	0.0011282
Arg of Perigee	51.3690	302.4545	130.0406	82.6304	282.5138	322.8890
Mean Anomaly	308.7384	57.3803	230.2614	277.8876	77.4587	37.1513
Mean Motion	15.70044339	15.61256444	14.73289847	13.83845377	14.011872778	14.28884771
Decay Rate	0.00069158	0.00047935	0.00001092	0.00000086	-0.00000017	0.00000564
Orbit Number	47627	25945	2247	860	77	3047
Nodal Period	91.855123	92.171558	97.800355	104.116568	102.826586	100.849392
P-Drags	2.570E-04	1.811E-04	4.923E-06	4.878E-07	25.706975	2.788E-06
Increment	23.302093	23.429044	24.579768	26.157975	7.015E-07	25.211450
I-Drags	6.320E-05	4.458E-05	1.230E-06	1.169E-07	137.800MHz	435.070MHz
Beacon-QRG	19.953/142.417/ 925.240MHz	143.625-voice 166.130-data+ ranging 247.5-KVANT	137.400-VIS+ 2xradio	137.800MHz	137.800MHz	435.070MHz
Ref. EQX	03 Sep 1990	31 Aug 1990	03 Aug 1990	01 Sep 1990	30 Aug 1990	30 Aug 1990
Orbit	47706	25980	2297	901	3141	3141
HHMM.MM	0113.21UTC	0038.83UTC	0128.82UTC	0141.42UTC	0131.34UTC	0131.34UTC
Degrees W	92.02	38.12	278.52	136.90	42.88	42.88

Keplerian Elements

Source: NASA 2-line elements, edited by Birger Lindholm (not to be used for precise scientific analysis).

Back-Scatter

Propagation

Reports to
Ron Ham
Faraday

Greyfriars, Storrington, West Sussex RH20 4HE

Propagation

Once again I hope that you, our readers, will see the importance of combining as many reports as possible to provide posterity with a widespread picture of the various events as they happened. No matter how small your observation may have been, if you think it was unusual then send me the details so that I can slot it in the right section.

Solar

During August, **Ron Livesey** (Edinburgh), using his refracting telescope and projection equipment, identified 5 active areas on the sun's disc on days 6 and 26; 7 on the 5th, 11th, 22nd and 31st; 8 on days 2, 10 and 28; 9 on the 1st, 17th and 25th; 11 on the 16th and 12 on the 20th. **Neil Clarke GOCAS** (Ferrybridge) added more about this solar activity when he wrote, "August saw the highest mean sunspot number so far this cycle at 199.9, the previous highest monthly mean was June 1989 at 196." As usual Neil sent along his computer print-out, **Fig. 1**, showing the daily variations in solar flux for the month, but points out, that although the spot count was the highest this cycle, the "solar flux did not respond so well" reaching only 4th place in the records to date. By making drawings of the sunspot positions, with his special apparatus, as often as possible, **Petrack Moore** (Selsey) has again shown how the active state of the sun can vary in as little as a couple of weeks. Who could have predicted that the number of sunspots that he observed at 0805 on August 16, **Fig. 2**, would rapidly grow and groups would form by 1100 on the 22nd, **Fig. 3** and then reduce again to a relatively small amount by 0640 on the 30th, **Fig. 4**. Many of these spots must have been independently active because it is not surprising to learn that **Ern Warwick** (Plymouth) heard variations in the background noise of his 28MHz receiver around 1600 on the 26th, 0900 and 1500 on the 27th, 1700 on the 31st and 1240 and 1550 on September 23.

Despite some cloud on September 1, 4 and 8, **Cmdr Henry Hatfield** (Sevenoaks), using his spectrohelioscope, managed to locate a sunspot group, 12 filaments and 8 quiescent prominences at 1120 on the 1st; 1 triple and 2 double spots at 1130 on the 4th; 1grp, 19fs, 6 small and 1 large qps at 1145 on the 6th; 1grp, a small hot spot almost flaring and a small eruptive prominence to the west of it, 11fs and 14qps at 1108 on the 8th; 8 spots, 18fs, 18qps and a few spicules at 1030 on the 9th; 2gps, 15fs and 16qps at 1140 on the 13th; 2gps, 13fs and 11 qps at 1340 on the 27th and 2gps, 18fs and 8qps at 1129 on the 28th. He also recorded individual bursts of solar radio noise at 136MHz on August 31 and September 18, 23 and 24 and a small burst on 1297MHz on the 18th. I had the pleasure of showing my old friend Henry, **Fig. 5** (left) and his wife Sue around the vintage wireless collection, during their visit for the tribute to **Gerald Marcuse**, pioneer of Empire Broadcasting, held at

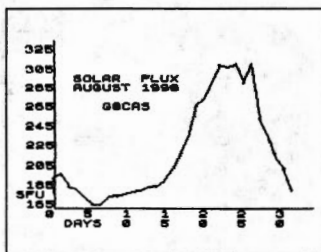


Fig. 1

the Amberley Chalk Pits Museum, Sussex, on September 2. Another VIP on that day was **Myles Eckersley** seen talking to Joan Ham in **Fig. 6**. Myles is currently writing a book about the work of his late father, Capt. Peter Eckersley, the first chief engineer of the BBC.

Auroral

Ron Livesey, the auroral co-ordinator for the British Astronomical Association, received reports of 'glows' from observers in Ireland and Scotland for the overnight periods of August 1, 3, 21 and 24; 'rays' from Scotland and Finland on the 16th and 25th respectively and 'homogeneous arc' from Canada and Scotland on the 21st and 22nd.

There is little doubt in my mind that the massive sunspot group, observed by **Patrick Moore** at 1100 on August 22, **Fig. 3**, was responsible for the aurora that manifested later in the afternoon. From his home in New Radnor, **Simon Hamer** received distorted auroral reflected pictures from distant television stations on Chs. E2 (48.25MHz), R1 (49.75MHz), Ireland's RTE on Ch.1B (53.75MHz) and on one of their channels in Band III. **Doug Smillie GM4DJS** (Wishaw) made auroral contacts on 144MHz with six amateur stations in Scotland, one in Norway and one in North Wales. During further events on days 23, 28 and 30 Doug made tone-A contacts with stations in Belgium, Denmark, Faroe Is, Germany, Holland, Poland, Scotland, Switzerland and Wales and copied signals from the propagation beacons in Buxton (GB3BUX-70.050MHz), Faroe (OY6VHF) Germany (DL0PR), Inverness (GB3RMK-50.060MHz) and Lerwick (GB3LER-144.965MHz). Shortly before the aurora faded out on the 22nd, Doug worked

GW4VEQ in North-Wales and had the unusual experience of hearing the GWs' Morse code signal direct as well as being reflected from the aurora. In other words T9 and Tone-A, hi! Ern Warwick tells me that the German beacon DK0WCY (10.144MHz) was giving a weak auroral warning between 1800 and 1900 on August 26 and that he heard an 'echo' on the signal from the South African beacon ZS6PW at 1700 on the 31st.

Magnetic

Neil Clarke's print-out of the 'Ap' index for August, **Fig. 7**, clearly shows the peak storm conditions around the 26th. Neil rightly points out that by comparing **Figs. 1** and **7** you will see that the increased magnetic activity coincided with the higher output from the sun. Apart from his own observations with a 'Jam-Jar' magnetometer, Ron Livesey also received reports from **Gerry Hawkins** (Bristol), **Tony Hopwood** (Worcester), **Karl Lewis** (Saltash) and Doug Smillie who between them observed magnetic activity on days 1, 3, 4, 11, 12, 14, 15, 16, 21, 22, 23, 26, 29, 30 and 31.

Sporadic-E

Lt. Col. Rana Roy (Meerut, India) reports receiving television pictures in Band I from the USSR and sometimes Dubai during Sporadic-E openings on 18 days in June; 8 in July and 7 in August. As the 1990 Sporadic-E season waned early in September **Bob Brooks** (Great Sutton) received pictures, in Band I, from Italy and Spain on August 23, Italy on the 31st and September 1 and Norway and Sweden on the 3rd. Simon Hamer logged Italy and Poland on the 31st, Iceland Norway and Yugoslavia on September 1 and Hungary and the USSR on the 2nd. Ern Warwick heard 27MHz CB activity from Holland at 1030 on August 27, parts of Europe at 1400 on the 28th and 1110 on September 23.

Propagation Beacons

First of all my thanks are due to **Ted Waring** (Bristol), **Mark Appleby G4XII** (Scarborough), **Chris van den Berg** (The Hague), **Henry Hatfield**, **John Levesley**

G0HJL (Bransgore), **Greg Lovelock G3III** (Shipston-on-Stour), **Ted Owen** (Maldon), **Fred Pallant G3RNM** (Storrington), and Ern Warwick for their detailed 28MHz beacon logs from which I compiled the chart in **Fig. 8**. Greg Lovelock reports hearing PT2AA on 28.220MHz and copied YO2X on 28.239MHz sending "KN050S QRV 10/2m QRP2W DIPOLES BEACON TIMOSOARA QSL VIA YO2IS". Ern Warwick added KATNSV (28.260) and PT2IBM (28.222MHz) to the list this time and heard W8UR on 28.218MHz sending "W8UR/B 500mW BOX 343 MACKINAW CITY, MI 49701" at 1250 on September 20. In addition to his 28MHz observations Ern kept watch on other beacon bands during the period and received frequent signals from PY2AMI on 24.931 and 18.100MHz, LU4AA, ZS6DN/B, 4U1UN/B and 4X6TU/B on 14.100MHz and DK0WCY on 10.144MHz. He also copied signals, less frequently, from IK6BAK on 24.915MHz and OH2B and W6WX on 14.100MHz

Tropospheric

Rana Roy received early morning television pictures in Band III from India and Pakistan on a few days in June and in his letter of September 17 he remarked "Tropo has been very poor with nothing in July, August or September."

The slightly rounded atmospheric pressure readings in **Fig. 9**, for the period August 26 to September 25, were taken at noon and midnight from the Short & Mason barograph installed at my home in Sussex and at times indicated the onset of a tropospheric opening. For instance, Simon Hamer received television pictures in Bands III, IV and V from stations in the Benelux countries, France and Ireland on September 2 and **John Woodcock** (Basingstoke) watched CANAL+ from France during the afternoons of the 4th and 7th.

George Garden (Edinburgh) conducted an interesting experiment while on holiday in Buckinghamshire early in September. On arrival at the hotel he set up his JVC CX610 receiver and amplified loop antenna and apart from strong 'local' television, he received a weak, black and white picture from the Midhurst transmitter of TVS on Ch. 58. On the 2nd he noted from the TV weather map that there was a ridge of high pressure to the south of the British Isles, so DXing for George began again at 0700 on the 3rd. "The sky was cloudless, blue and the weather very hot," said George

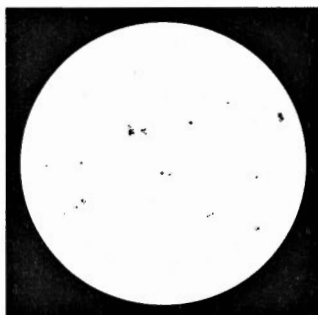


Fig. 2

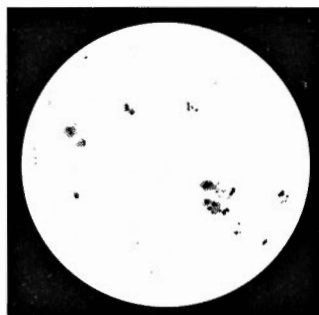


Fig. 3

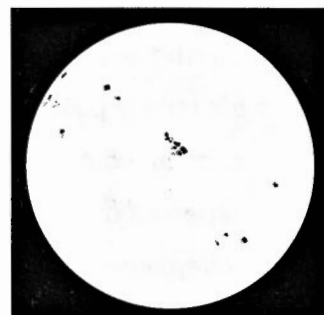


Fig. 4

Back-Scatter

934MHz

The cooler nights on August 12 and 13 enabled **Terry Wyatt** (Walton-on-Thames) to exchange reports with stations in the Channel Islands, Guernsey (UK-176) and Jersey (UK-797), Swanage, Dorset (UK-569/P) and in Sussex on Butser Hill (UK-1391/P), Hailsham (UK-1428) and Selsey (UK-1149). From Jersey, UK-797 told Terry that he made contact with a Spanish station EA2-WD/MM on 934MHz. John Levesley UK-627 logged signals from GY-186 in Guernsey on August 25, 27 and 29 and September 8 and Ern Warwick learnt from a 27MHz CB operator that conditions were good on 934MHz on the 26th. **Rob Petrie UK-1509** (Yewville) took advantage of the lift on September 28 and with his Delta One and P4TE Collinear antenna made contact along the Sussex coast with BT-203 and CY-01 in Angmering, TB-01 in Bognor Regis and heard UK-942 in Essex. All good stuff, but readers, what about a few more reports?

***Alternatively, we'll
be pleased to pass
on comments
received by
telephone.***



Fig. 5

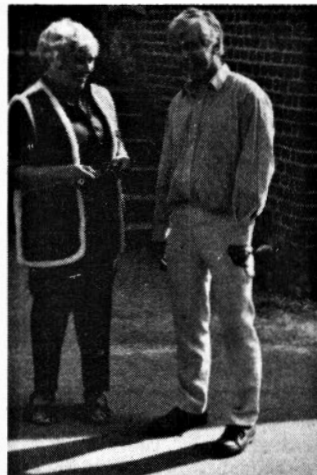


Fig. 6

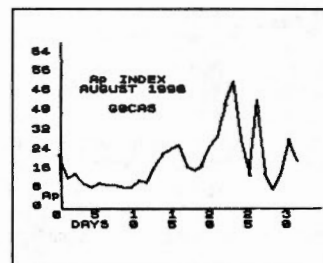


Fig. 7

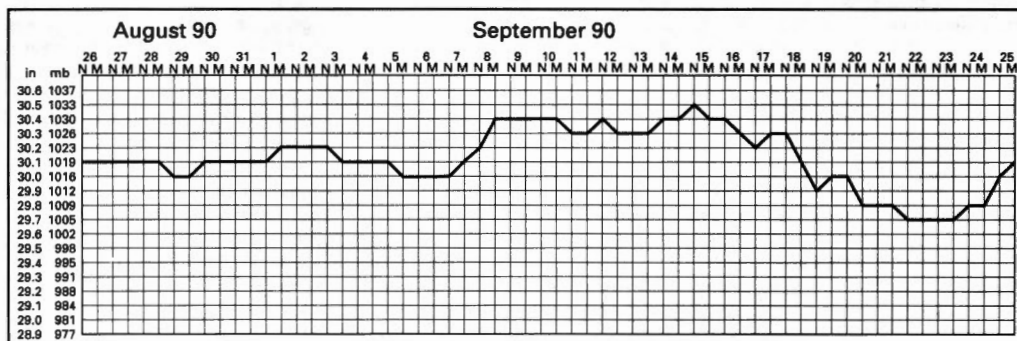


Fig.8

[illegible]

Fig. 9

Back-Scatter

Broadcast Round-up

Reports to Peter Shore via the PW Editorial Office

Unification

The main event on the international broadcasting scene during October was undoubtedly the changes to broadcasting in and from Germany following unification at midnight BST on October 2. The final broadcast in English from Radio Berlin International went out at 2045GMT with Robin Mitchell, Head of RBIs English Service, presenting a closing monologue which seemed to grumble (legitimately, perhaps) about the fact that rather than sharing the task of German international broadcasting, Deutsche Welle was simply absorbing its eastern counterpart.

The Director of RBI, Klaus Fischer, also presented his views on RBIs demise, saying that "in the past, it has not always been possible to respond...as openly and honestly as during the past few months", referring presumably to the Communist propaganda which the station broadcast for the last forty years. Radio Berlin International will be heard no more: on October 3, RBI short wave frequencies carried a transmission from the church service at Marienkirche in Berlin commemorating the day of unity (broadcast simultaneously by domestic programmes and Deutsche Welle), followed by programmes from Deutsche Welle in Cologne.

The medium wave transmitter on 1.359MHz used by Radio Berlin International for its European services now carries the programmes of Deutschlandfunk. All the signals from transmitters in the former East German territory are a split second behind DW and DLF transmitters, indicating that they are fed not by landline, but by satellite. Presumably this is because telecommunications across the now invisible inner-German frontier are still somewhat backward - even telephoning across the Berlin Wall proved highly problematic during the division of the country, and will doubtless take some time to catch up with the highly developed infrastructure of the West.

Interestingly amongst all this, Radio Moscow's medium wave sender on 1.323MHz in Leipzig still continues to be heard including the English transmissions during the evening. It will be worth keeping an eye on this to see just how warm relations between Germany and the Soviet Union are.

Reports from Deutsche Welle in Cologne suggest that following talks between the Soviet Foreign Ministry and its German counterparts, Moscow is prepared to offer time on ex-jammer transmitters to DW for programmes beamed to Asia. It is unlikely that DW's Sri Lankan relay station at Trincomalee will be back in service for the next eighteen months at least, and the station is investigating all possibilities to improve reception in Asia. Despite the acquisition of RBI's eight h.f. transmitters, DW's transmitting capacity is still well below that of its major Western competitors, BBC World Service and the Voice of America.

Gulf Crisis

In the news but further south, the Gulf Crisis continues, with jamming by Iraq of some Arabic language broadcasts actually diminishing at the beginning of October. It seems that Iraq's capacity to broadcast deliberate harmful interference does not match that of the UK and other broadcasters to add frequencies to Arabic language programme slots. Jamming of the VoA has certainly reduced.

The Voice of America has broken with convention and introduced a Gulf greetings programme for troops and civilians in the region. The programme can be heard at 0455, 0555 and 0555UTC, and people may telephone, FAX or write in with messages. VoA's charter does not include broadcasting to US citizens overseas - its main role is as a broadcaster to the rest of the world. It is therefore likely that the introduction of this broadcast is an indication of the seriousness that the US government attaches to the situation, and the likelihood of military intervention are too long. Should this be so, it will once again prove that watching the international radio scene is an invaluable way of keeping on top of the nuances of the world wide political scene. With the introduction of the new winter schedule at the beginning of October, BBC World Service increased its own *Gulf Link* programme from 15 minutes to half-an-hour, aired three times each day.

Civil War In Liberia

The civil war in Liberia has been mentioned in recent months and the absence of ELWA in Monrovia noted. The station was closed down on July 5 when conditions became impossible for operation to continue. Some 22000 refugees from the fighting came into the transmitter compound and stripped hundreds of coconut trees on the site bare. The station, which is run by an Evangelical movement, is not expected to be back on the air for some time.

Further rationalisation at Radio Moscow has reduced the Chinese output from the station by more than one third from around 182 to 112 hours a week. Similarly, Swahili output was reduced by one third from 21 to 14 hours each week when the winter schedule was introduced.

Radio Vilnius reports that the Voice of America may be prepared to help the station bypass a new law which is being considered to prohibit republican radio stations broadcasting to other parts of the Union. It is reported that a site outside the Soviet Union, provided by VoA, may be used to beam Radio Vilnius programmes back to the USSR.

European Stations All times UTC (=GMT)

Radio Tirana has been tinkering with

its frequencies for the winter period which leaves its European English service schedule:

0630-0700 on 9.50 & 7.205MHz
1830-1900 on 9.48, 7.12 & 1.395MHz
2230-2300 on 9.48, 7.215 & 1.395MHz

Iceland's Ríkisutvarpið short wave relays of the Iceland domestic service continue to be heard on s.s.b. at:

1215-1245 on 17.493, 15.77, 13.83 & 11.418MHz
1410-1440 on 17.44, 15.77 & 13.855MHz
1855-1930 on 15.77, 13.855, 11.418 & 3.295MHz
1935-2010 on 17.44, 15.77 & 13.855MHz
2300-2335 on 17.44, 15.77 & 13.855MHz
All transmissions use upper sideband.

Radio Free Europe's transmitters at the Portuguese relay station at Gloria are currently carrying the European services of the Voice of America which have been displaced by the need to use Kavalla, Werchtachtal and Munich for the 24-hour-a-day Middle East Arabic and English network mentioned in last month's column. This may improve reception of VoA's services in the United Kingdom.

Radio Sweden has reorganised its schedule for the winter period, with the full frequency schedule for English now:

0100 on 9.77 & 1.179MHz [Europe; Asia]
0200 on 11.705 & 9.695MHz [N America]
0300 on 11.705 & 9.695MHz [N America]
1230 on 21.57, 17.74 & 11.715MHz [Australasia]
1400 on 17.74 & 9.765MHz [Asia]
1530 on 21.50 & 17.88MHz [N America]
1800 on 11.90, 9.655, 6.065 & 1.179MHz [Europe; Mid East; Africa]
1930 on 7.265 & 6.065MHz [Europe; Africa]
2200 on 6.065 & 1.179MHz [Europe; Africa]
2300 on 11.705 & 9.695MHz [S America]

Some language services are also affected: Portuguese disappears and Spanish and French will be reduced to 15 minutes each day (a reduction of 50%). Estonian and Latvian transmissions, however, expand to 15 minutes each on a daily basis.

Middle East and African Stations

English from Radio Baghdad, describing itself in its broadcasts to the Middle East as the *Voice of Peace*, uses 11.86MHz at 1000-1300, 1600-1800 and 2000-2200, whilst English to Europe remains at 2000-2200 on either 13.66MHz or 13.60MHz.

Meanwhile, the allied Arab states are moving to the parts of the bands where, until the annexation of Kuwait by Iraq, Radio Kuwait was heard. Saudia Arabia's Broadcasting System (BSKSA) in Arabic is using 15.495MHz in parallel with the usual channel of 21.505MHz. United Arab

Emirates Radio in Dubai has been noted on 21.675 between 1000 and 1400 in parallel with 15.435 and 21.605MHz. Radio Baghdad has been heard on both 15.495 and 21.675MHz since shortly after the invasion with the *Voice of the Masses* programme.

Asian and Pacific Stations

All India Radio has introduced Hindi programmes beamed to expatriate workers in the Middle East, heard at 1745-1830 on 11.62, 9.55 and 7.412MHz.

Radio Thailand beams in Thai to expatriates in the Gulf region at 1500 for one hour on 11.905, 9.655, and 4.83MHz.

Radio Japan has altered its General Service in English very slightly for the new schedule period, which results in broadcasts at:

0700-0800 on 21.69*, 21.50, 17.89, 17.81 & 17.765MHz
1400-1500 on 21.70*, 11.865 & 11.815MHz
1500-1600 on 21.70* & 11.865MHz
2300-2400 on 21.61, 17.81, 15.195, 11.835* & 11.815MHz

Frequencies marked with an asterisk are transmitted from the Moyabi relay station. A temporary Arabic service transmission is beamed from Moyabi at 0930 for thirty minutes on 21.53MHz.

Following my suggestion to look out for Radio Ulan Bator in English in a recent column, **Hubert Ruysschaert** of Oostende in Belgium has written - but says that he has been unsuccessful so far! Hubert lists his attempts using both an RA17L and Grundig Satellit 400 with a 9m long wire:

0900 on 12.01 R Moscow in English SINPO 5543
12.03 R Moscow also SINPO 55433
1200 on 12.025 and 11.85 both nothing heard

12.03 has Radio Moscow and Swiss Radio International
1445 on 13.78MHz Deutsche Welle
1435 on 9.795MHz Radio Moscow
1945 on 11.85 and 12.05 three unidentified stations on both channels at the same time.

Has anyone had better luck than Hubert? Drop me a line at the PW Office.

The Americas

HCJB in Quito continues its s.s.b. tests using the 30kW transmitter supplied by the Swiss PTT and used during the 1960s for military communications from the Schwarzenburg site. 25.95MHz puts in a good signal during the daylight hours here in the UK. The station is keen to receive reception reports.

For the very latest Broadcast News you can ring RadioLine (compiled by *Short Wave Magazine*) on 0898 654676.

Calls charged at 33p per minute off peak, 44p per minute all other times.

Back-Scatter

ATV

Reports to
Andy Emmerson G8PTH
71 Falcutt Way
Northampton NN28PH

ATV Aloft Again

Dave Woodhall ZS6BNT/G3ZGZ writes from Edleen in the Republic of South Africa to describe some fascinating experiments with ATV aloft in a balloon carrying amateur radio (BACAR).

He writes: "As far as the balloon flight was concerned, we (Southern Africa AMSAT) approached both the Post Office and the South African Broadcasting Corporation (SABC) for permission to transmit in the u.h.f. television band. The Post Office gave us the go-ahead provided there was no objection from the SABC who would have to allocate the channel to be used. The SABC gave us the go-ahead provided the Post Office had no objections! We knew at this time that we were on to a winner!

Experimental Flight

"We were given the channel 35 to use on an experimental basis for the duration of our tests and the balloon flight. As a matter of interest the Post Office gave us permission to use 1602kHz for a c.w. beacon for one of the flights in order that school children could use medium wave receivers to pick up signals from our package. The Post Office were in fact very co-operative.

"The concept of the overall package is that several met balloons are filled with gas and connected via a release mechanism to the top of a parachute. The parachute has an equipment module connected to the bottom carrying our experimental payload and power sources. There is a completely self-contained 144MHz beacon with its own power source and antenna. This is used for tracking via Doppler equipped vehicles to ensure recovery. The release mechanism is totally self-contained and consists of a command receiver and decoder connected to a device used to sever the cord between the balloons and parachute. There is also a timer mechanism that will perform the release after a certain time period, just in case the command link fails.

"We had asked that the lowest

frequency channel be allocated as it was intended to use a 70cm video transmitter design suitably tweaked up. As it happens for channel 35 we had to start from scratch and design the transmitter. This was my task and I soon had a modulator and low power driver strip running. The intention was to obtain about 100mW from the driver then add a linear amplifier. I do not have sophisticated test gear and the driver strip was tuned up using wavemeters and a home-made spectrum analyser. The picture from a vidicon camera, v.t.r. and test card generator on the domestic TV looked good.

"In the mean time the rest of the team were doing their scrounging acts and had come up with a couple of fairly small (but heavy) 12V vidicon cameras but no c.c.d. one. We did power budget calculations and decided that we could manage to fly this camera if nothing else came available. The only constraint was that we would have to use more batteries than normal with a subsequent increase in weight, lower altitude obtainable and perhaps a shorter flight. To help counter this we commissioned one of our members to build a switch mode power supply to replace the simple linear one that was normally used.

"The rest of the flight package consists of telemetry sensors, a RTTY encoder, a 144MHz downlink transmitter, a command receiver and decoder plus a balloon release and timer mechanism. The telemetry encoder uses an a-d converter to measure 0 to 5V on eight channels and converts this to a telemetry block rather like that used on the Oscar satellites which is transmitted to the ground as a 50 baud RTTY signal using a.f.s.k. on 144MHz.

Chief Scrounger

"The 144MHz telemetry transmitter, command receiver, decoder and automatic timer had been used several times previously so were carefully checked out and declared ready for flight. The 'equipment sourcing manager' (chief

scrounger) had magically turned up a Philips c.c.d. camera without lens but with a slight fault. Fortunately the vidicon cameras we had got previously were fitted with suitable lenses and this solved the lens problem. I managed to repair the camera after tremendous effort in between the work on the transmitter and other parts of the package. All that was wrong was a dry joint on the back of the power connector socket! (I wonder if the previous owner of the camera was charged for a new unit?)

Mysterious Energy?

"Back to the video transmitter and the power amplifier stage. Well, I had looked in the scrap box, gone to our normal scrounging sources, and even considered BUYING a p.a. transistor. In the end we were donated a few transistors that should have been OK. Most of these devices were specified for use on the u.h.f. mobile radio frequencies around 500MHz and we figured that they would probably work at channel 35. Whenever I build gear such as this I am very fortunate in being able to borrow a 1GHz spectrum analyser and generator from one of the mobile radio manufacturers (one of the directors is licenced and is also on our committee - this seems to help strangely enough!) When the test gear was connected to the transmitter I was very disappointed to find that the 250mW that I thought the driver strip gave out turned out to be about 80mW on the correct frequency. Plenty of changes later resulted in an output on the right channel of about 150mW that should have been fine to drive the p.a. transistor to give about 1.5W out.

"The p.a. was driven to about 5W d.c. input and on the test set wattmeter gave about 3.5W output. This was great and I went to bed that night feeling very happy with myself. The next day I decided to check the stability of the transmitter and removed the crystal. There was still just under 3.5W output and I panicked thinking that the strip was self-oscillating. In an

attempt to sort this problem out the p.a. was disconnected from the rest of the circuit and the wattmeter still showed power. During the checks I even disconnected the p.a. collector lead from the circuit and there was still power going into the wattmeter! This was great, I'd invented perpetual r.f. without any transistors, all that was necessary was a tuned circuit, decoupling capacitor and a direct connection from the power rail to the r.f. output socket on the transmitter!

"It did say that the wattmeter would work from d.c. to 1GHz, but how silly I felt when the d.c. blocking capacitor was fitted and the 'r.f.' suddenly stopped! After the p.a. was reconnected there was some real r.f. of about 300mW. No matter what I did the output would not rise over 800mW. We had calculated that we needed at least 1.5W to get the 400km coverage that we needed from the balloon package. After many changes to the output matching no better levels could be obtained. A frantic call via the SA AMSAT bulletins resulted in two more transistors being given to me a week before the launch date. We were prepared to call off the flight if the required amount of r.f. could not be obtained.

Early Hours Decision

"Help was sought from those amateurs that worked in the r.f. field and most of them made comments like "that's a stupid frequency to tune up on as most devices are designed either for 500 or 900MHz". Well I can confirm this statement but by using an 'old fashioned' (in the words of the r.f. design engineers) 2N5044 I got about 1.25W out. This was just acceptable and by the Wednesday evening, no actually Thursday morning, at 2.30am I decided we could fly on the Saturday. On Thursday I got a phone call to say "there's a couple of driver transistors here that may work - do you want them?" The drivers were collected and put into the transmitter and what do you know, there was just over 2W of r.f. even with the d.c. blocking capacitor fitted! We were in with a good chance."

Read the next gripping instalment to see if they really got off the ground!

As from the January issue of PW, 'Backscatter' is changing. The 'feedback' received by readers via the survey forms, letters and comments clearly show that a different approach is required.

In future issues 'Backscatter' will carry 'HF Bands', 'VHF Up' and 'Broadcast Round-Up'. Pat Gowen's 'Amateur Satellites' will be produced as a separate monthly feature as will Ron Ham's regular article based on propagation.

The 'Propagation' feature now in 'Backscatter' will be absorbed into Ron Ham's popular 'What Is Propagation?' article and will appear as a separate feature under the title 'Reflections'. Ron intends to cover propagation, technology and personalities and their activities and interests with less of an emphasis on reports.

Pat Gowen plans to cover more news and items of interest from the satellite world. Personalities, techniques and news and reports of your own 'extra terrestrial' activity will be very welcome.

Andy Emmerson's 'ATV' feature from 'Backscatter' will appear bi-monthly as a separate feature in the magazine and we hope to include more personalities, news and topics in Andy's column.

To help our plans - based on YOUR requests - to work, the authors and PW staff require feedback from readers.

Help us to help you!

The books listed have been selected as being of special interest to our readers. They are supplied from our editorial address direct to your door. Some titles are overseas in origin.

HOW TO ORDER

POST AND PACKING: add 85p for one book, £1.20 for two or more books, orders over £30 post and packing free, (overseas readers add £1.50 for one book, £3.00 for two or more for surface mail postage) and send a postal order, cheque or international money with your order (quoting book titles and quantities) to **PW Publishing Limited, FREEPOST, Enefco House, The Quay, Poole, Dorset BH15 1PP.** Please make your cheques payable to Practical Wireless, payment by Access, Mastercard, Eurocard or Visa also accepted on telephone orders to Poole (0202) 665524. Books are normally despatched by return of post but please allow 28 days for delivery. Prices correct at time of going to press. Please note: all payments must be made in Sterling.

* A recent addition to our Book Service. O/P = Out of print, O/S = Out of stock.

RADIO

AIR & METEO CODE MANUAL

10th Edition. **Joerg Klingenfuss**
Detailed descriptions of the World Meteorological Organisation Global Telecommunication System operating FAX and RTTY meteo stations, and its message format with decoding examples. Also detailed description of the Aeronautical Fixed Telecommunication Network amongst others. 289 pages. £15.00

BETTER RADIO/TV RECEPTION

A. Nallawalla, A. T. Cashen and B. D. Clark
An Australian book giving guidance and advice to listeners seeking reliable reception of distant radio stations, and to DX listening hobbyists. 134 pages. £9.95

PASSPORT TO WORLD BAND RADIO 1991

This book gives you the information to explore and enjoy the world of broadcast band listening. It includes features on different international radio stations, receiver reviews and advice as well as the hours and languages of broadcast stations by frequency. 398 pages. £13.95

SCANNERS (Third Edition)

Peter Rouse GU1DKD
A guide for users of scanning receivers, covering hardware, antennas, accessories, frequency allocations and operating procedures. 245 pages. £8.95

SCANNERS 2

Peter Rouse GU1DKD
The companion to Scanners, this provides even more information on the use of the v.h.f. and u.h.f. communications band and gives constructional details for accessories to improve the performance of scanning equipment. 216 pages. £8.95

SHORT WAVE RADIO LISTENERS' HANDBOOK

Arthur Miller
In easy-to-read and non-technical language, the author guides the reader through the mysteries of amateur, broadcast and CB transmissions. 207 pages. £7.90

RADIOTELETYPE CODE MANUAL

10th Edition. **Joerg Klingenfuss**
This book gives detailed descriptions of the characteristics of telegraph transmission on short waves, with all commercial modulation types including voice frequency telegraphy and comprehensive information on all RTTY systems and c.w. alphabets. 96 pages. £8.00

THE SATELLITE EXPERIMENTER'S HANDBOOK (USA)

A guide to understanding and using amateur radio, weather and TV broadcast satellites. 207 pages. £7.50

1934 OFFICIAL SHORT WAVE RADIO MANUAL

Edited by **Hugo Gernsback**
A fascinating reprint from a bygone age with a directory of all 1934 s.w. receivers, servicing information, constructional projects, circuits and ideas on building vintage sets with modern parts. 260 pages. £10.15

HIGH POWER WIRELESS EQUIPMENT

Articles from *Practical Electricity* 1910-11
Edited by **Henry Walter Young**
A reprint of interesting practical articles from the early days of radio. 99 pages. £6.85

BEGINNERS

AN INTRODUCTION TO RADIO DXING (BP91)

R. A. Penfold
How to find a particular station, country or type of broadcast and to receive it as clearly as possible. 112 pages. £1.95

BEGINNER'S GUIDE TO RADIO

9th Edition. **Gordon J. King**
Radio signals, transmitters, receivers, antennas, components, valves and semiconductor, CB and amateur radio are all dealt with here. 266 pages. £7.95

ELECTRONICS SIMPLIFIED - CRYSTAL SET CONSTRUCTION (BP92). F. A. Wilson

Especially written for those who wish to take part in basic radio building. All the sets in the book are old designs updated with modern components. 72 pages. £1.75

THE SIMPLE ELECTRONICS CIRCUIT AND COMPONENTS Book One (BP92)

The aim of this book is to provide an in-expensive but comprehensive introduction to modern electronics. 209 pages. £3.50

TELEVISION

THE ATV COMPENDIUM

Mike Wooding G6JQM
This book is for those interested in amateur television, particularly the home construction aspect. There is not a 70cm section as the author felt this is covered in other books. Other fields, such as 3cm TV, are covered in depth. A must for the practical ATV enthusiast. 104 pages. £3.00

AN INTRODUCTION TO SATELLITE TELEVISION (BP195)

F. A. Wilson
Answers all kinds of questions about satellite television. For the beginner thinking about hiring or purchasing a satellite TV system there are details to help you along. For the engineer there are technical details including calculations, formulae and tables. 104 pages. £5.95

A TV-DXERS HANDBOOK (BP176)

R. Bunney
Information on transmission standards, propagation, receivers including multi-standard, colour, satellites, antennas, photography, station identification, interference etc. Revised and updated 1986. 87 pages. £5.95

GUIDE TO WORLD-WIDE TELEVISION TEST CARDS

3rd Edition. **Keith Hamer & Garry Smith**
Completely revised and expanded, this is a handy reference book for the DXTV enthusiast. Over 200 photographs of Test Cards, logos, etc., world wide. 60 pages. £4.95

SATELLITE TELEVISION INSTALLATION GUIDE

2nd Edition. **John Breads**
A practical guide to satellite television. Detailed guidelines on installing and aligning dishes based on practical experience. 56 pages. £11.95

THEORY

COMMUNICATION (BP98)

Elements of Electronics Book 5
F. A. Wilson
Fundamentals of line, microwave, submarine, satellite, digital multiplex, radio and telephony systems are covered, without the more complicated theory or mathematics. 256 pages. £2.95

FILTER HANDBOOK A practical design guide

by **Stefan Niewiadomski**
A practical book, describing the design process as applied to filters of all types. Includes practical examples and BASIC programs. 195 pages. £25.00

FROM ATOMS TO AMPERES

F. A. Wilson
Explains in simple terms the absolute fundamentals behind electricity and electronics. 244 pages. £3.50

AUDIO (Elements of electronics - book 6)

F. A. Wilson
This book studies sound and hearing, and examines the operation of microphones, loudspeakers, amplifiers, oscillators, and both disk and magnetic recording. Intended to give the reader a good understanding of the subject without getting involved in the more complicated theory and mathematics. 320 pages. £3.95

PRACTICAL ELECTRONICS CALCULATIONS AND FORMULAE (BP53)

F. A. Wilson
This has been written as a workshop manual for the electronics enthusiast. There is a strong practical bias and higher mathematics have been avoided where possible. 249 pages. £3.95

SOLID STATE DESIGN FOR THE RADIO AMATEUR

Wes Hayward W7ZOI and Doug DeMaw W1FB
Back in print by popular demand! A revised and corrected edition of this useful reference book covering all aspects of solid-state design. 256 pages. £10.95

THE ARRL ELECTRONICS DATA BOOK

Doug DeMaw W1FB
Back by popular demand, completely revised and expanded, this is a handy reference book for the r.f. designer, technician, amateur and experimenter. 260 pages. £8.95

A BEGINNERS GUIDE TO MODERN ELECTRONIC COMPONENTS (BP285)

R. A. Penfold
This book covers a wide range of modern components. The basic functions of the components are described, but this is not a book on electronic theory and does not assume the reader has an in-depth knowledge of electronics. It is concerned with practical aspects such as colour codes, deciphering code numbers and the suitability. 164 pages. £3.95

EVERYDAY ELECTRONICS DATA BOOK

Mike Tooley BA
This book is an invaluable source of information of everyday relevance in the world of electronics. It contains not only sections which deal with the essential theory of electronic circuits, but it also deal with a wide range of practical electronic applications. 250 pages. £8.95

LISTENING GUIDES

AIR BAND RADIO HANDBOOK (3rd Edition)

David J. Smith
Listen to conversations between aircraft and ground control. The author, an air traffic controller, explains more about this listening hobby. 174 pages. £5.90

AIR TRAFFIC CONTROL

David Adair
A guide to air traffic control with maps, drawings and photographs explaining how aircraft are guided through crowded airspace. 178 pages. O/P

DIAL SEARCH

8th Edition. **George Wilcox**
The listener's check list and guide to European broadcasting. Covers m.w., l.w., v.h.f. and s.w., including two special maps. 54 pages. £3.95

FLIGHT ROUTINGS 1990

T.T. Williams
Identifies the flights of airlines, schedule, charter, cargo and mail, to and from the UK and Eire and overflights between Europe and America. 104 pages. £4.95

GUIDE TO BROADCASTING STATIONS

20th Edition 1989/90. **Philip Darrington**
Frequency and station data, receivers, antennas, Latin American DXing, reporting, computers in radio, etc. 240 pages. £9.95

GUIDE TO FACSIMILE STATIONS 10th Edition

Joerg Klingenfuss
This manual is the basic reference book for everyone interested in FAX. Frequency, call sign, name of the station, ITU country/geographical symbol, technical parameters of the emission are all listed. All frequencies have been measured to the nearest 100Hz. 318 pages. £14.00

GUIDE TO FORMER UTILITY TRANSMISSIONS

3rd Edition. **Joerg Klingenfuss**
Built on continuous monitoring of the radio spectrum from the sixties until the recent past. A useful summary of former activities of utility stations providing information in the classification and identification of radio signals. 126 pages. £8.00

GUIDE TO UTILITY STATIONS

8th Edition. **Joerg Klingenfuss**
This book covers the complete short wave range from 3 to 30MHz plus the adjacent frequency bands from 0 to 150kHz and from 1.6 to 3MHz. It includes details on all

types of utility stations including FAX and RTTY. There are 15802 entries in the frequency list and 3123 in the alphabetical call sign list plus press services and meteorological stations. 502 pages. £18.00

HF OCEANIC AIRBAND COMMUNICATIONS

3rd Edition. **Bill Lever**
Aircraft channels by frequency and band, main ground radio stations, European R/T networks, North Atlantic control frequencies. 29 pages. £3.50

INTERNATIONAL RADIO STATIONS GUIDE (BP255)

Revised and updated in 1988, this book shows the site, country, frequency/wavelength and power of stations in Europe, the Near East and N. Africa, North and Latin America and the Caribbean, plus short wave stations worldwide. 128 pages. O/P

MARINE UK RADIO FREQUENCY GUIDE

Bill Lever
A complete guide to the UK s.w. and v.h.f. marine radio networks. Useful information, frequency listings and the World Marine Coastal Phone Stations. 62 pages. £4.95

NEWNES SHORT WAVE LISTENING HAND BOOK

Joe Pritchard GU0W
A technical guide for all short wave listeners. Covers construction and use of sets for the s.w.l. who wants to explore the bands up to 30MHz. 288 pages. £12.95

THE COMPLETE VHF/UHF FREQUENCY GUIDE

Updated 1988
This book gives details of frequencies from 26-2250MHz with no gaps and who uses what. Recently updated, there are chapters on equipment requirements as well as antennas, etc. 88 pages. £5.95

THE INTERNATIONAL VHF FM GUIDE

7th Edition. **Julian Baldwin G3UHK and Kris Partridge G8AUU**
The latest edition of this useful book gives concise details of repeaters and beacons worldwide plus coverage maps and further information on UK repeaters. 70 pages. £2.95

THE POCKET GUIDE TO RTTY AND FAX STATIONS

Bill Lever
A handy reference book listing RTTY and FAX stations, together with modes and other essential information. The listing is in ascending frequency order, from 1.6 to 27.1MHz. 46 pages. £2.95

SHORT WAVE LISTENERS' CONFIDENTIAL FREQUENCY LIST

Bill Lever
Covering the services and transmission modes that can be heard on the bands between 1.635 and 29.7MHz. £8.95

VHF/UHF AIRBAND FREQUENCY GUIDE (Updated)

A complete guide to the airband frequencies including how to receive the signals, the frequencies and services, VOLMET and much more about the interesting subject of airband radio. 74 pages. £5.95

WORLD RADIO TV HANDBOOK 1990

Country-by-country listings of long, medium and short wave broadcast and TV stations. Receiver test reports. English language broadcasts. The s.w.l.'s 'bible'. 576 pages. £18.99

INTERFERENCE

INTERFERENCE HANDBOOK (USA)

William R. Nelson WA6FG
How to locate and cure r.f.i. for radio amateurs, CBers and TV and stereo owners. 253 pages. £8.75

RADIO FREQUENCY INTERFERENCE (USA)

What causes r.f.i.? Are all r.f.i. problems difficult, expensive and time-consuming to cure? These questions and many more are answered in this book. 84 pages. £4.30

AMATEUR RADIO

AMATEUR RADIO CALL BOOK (RS6B)

Spring Edition
Now incorporates a 48-page section of useful information for amateur radio enthusiasts. 310 pages. £7.70

AMATEUR RADIO SATELLITES the first 25 years

Arthur C. Gee G2UK
This souvenir publication mainly a pictorial account of the pattern of developments which have occurred over the last 25 years. 34 pages. £2.25

AN INTRODUCTION TO AMATEUR RADIO (BP257)

I. D. Poole
This book gives the newcomer a comprehensive and easy to understand guide through amateur radio. Topics include operating procedures, jargon, propagation and setting up a station. 150 pages. £3.50

HINTS AND KINKS FOR THE RADIO AMATEUR

Edited by **Charles L. Hutchinson and David Newkirk**
A collection of practical ideas gleaned from the pages of QST magazine. 152 pages. £4.95

HOW TO PASS THE RADIO AMATEURS' EXAMINATION (RS6B)

Clive Smith G4FZH and George Benbow G3HB
The background to multiple choice exams and how to study for them with sample RAE papers for practice plus maths revision. 88 pages. £8.20

PASSPORT TO AMATEUR RADIO

Reprinted from *PW* 1981-1982
The famous series by GW3JGA, used by thousands of successful RAE candidates in their studies. Plus other useful articles for RAE students. 96 pages. £1.50

PRACTICAL IDEAS FOR RADIO AMATEURS

Ian Poole G3TWX
Offers a wealth of hints, tips and general practical advice for all transmitting amateurs and short wave listeners. 128 pages. £5.95

PRACTICAL GUIDE TO PACKET OPERATION IN THE UK

Mike Mansfield G6AWD

Aimed at all user of packet mode being an excellent introduction and reference manual. Spiral bound to lay flat 70 pages A4-sized. £8.00

RADIO AMATEUR'S GUIDE TO RADIO WAVE PROPAGATION

(HF Bands). F. C. Judd G2BXC

The how and why of the mechanism and variations of propagation in the h.f. bands. 144 pages. £15.95

THE 1990 ARRL HANDBOOK FOR THE RADIO AMATEUR

This is the 66th edition of this very useful hardback reference book. Updated throughout it has several new sections covering oscilloscopes, spectrum analysers, digital frequency synthesis, phase-noise measurement and new constructional projects. 1200 pages. £15.95

***THE ARRL OPERATING MANUAL**

Another very useful book from the ARRL. Although written for the American radio amateur, this book will also be of use and interest to the UK amateur. 684 pages. £12.95

THE ARRL SATELLITE ANTHOLOGY

The best from the Amateur Satellite News column and articles out of 31 issues of QST have been gathered together in this book. The latest information on OSCARs 9 through 13 as well as the RS satellites is included. Operation on Phase 3 satellites (OSCAR 10 and 13) is covered in detail. 97 pages. £4.95

THE COMPLETE DXER

Bob Lecher W9KHI

Now back in print, this book covers equipment and operating techniques for the DX chaser, from beginner to advanced. 187 pages. £7.95

THE RAE MANUAL (RSGB)

G.L. Beesow G3HB

The latest edition of the standard aid to studying for the Radio Amateurs' Examination. Updated to cover the latest revisions to the syllabus. 132 pages. £8.20

THE RADIO AMATEUR'S DX GUIDE (USA)

15th Edition

This guide contains information not easily obtained elsewhere and is intended as an aid and quick reference for all radio amateurs interested in DX. 38 pages. £2.95

THE RADIO AMATEUR'S QUESTIONS & ANSWER REFERENCE MANUAL

4th Edition. R. E. G. Petri G8CJ

This book has been compiled especially for students of the City and Guilds of London Institute RAE. It is structured with carefully selected multiple choice questions, to progress with any recognised course of instruction, although it is not intended as a text book. 280 pages. £7.95

VHF HANDBOOK FOR RADIO AMATEURS (USA)

H. S. Brier W9EGD & W. I. Orr W6SAI

VHF/UHF propagation, including moonbounce and satellites, equipment and antennas. 335 pages. £7.95

YOUR GATEWAY TO PACKET RADIO

Stan Horzepa WA1LOU

What is packet radio good for and what uses does it have for the 'average' amateur? What are protocols? Where, why, when? Lots of the most asked questions are answered in this useful book. It included details of networking and space communications using packet. 278 pages. £7.95

MAPS

RADIO AMATEUR'S MAP OF NORTH AMERICA (USA)

Shows radio amateur prefix boundaries, continental and zonal boundaries. 760 x 636mm. £2.95

IARU LOCATOR MAP OF EUROPE DARC

This multi-coloured, plastics laminated, map of Europe shows the IARU ("Maidenhead") Locator System. Indispensable for the v.h.f. and u.h.f. DXer. 692 x 872mm. £5.25

RADIO AMATEUR'S PREFIX MAP OF THE WORLD (USA)

Showing prefixes and countries, plus listings by order of country and of prefix. 1014 x 711mm. £2.95

RADIO AMATEUR'S WORLD ATLAS (USA)

Seventeen pages of maps, including the world-polar projection. Also includes the table of allocation of international call sign series. £3.50

DATA REFERENCE

DIGITAL IC EQUIVALENTS AND PIN CONNECTIONS (BP140)

A. Michaels

Equivalents and pin connections of a popular selection of European, American and Japanese digital i.c.s. 256 pages. 0/P

INTERNATIONAL DIODE EQUIVALENTS GUIDE (BP100)

A. Michaels

Possible substitutes for a large selection of many different types of semiconductor diodes. 144 pages. 0/P

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. 0/P

NEWNES AUDIO & HI-FI ENGINEER'S POCKET BOOK

Vivian Capel

This is a concise collection of practical and relevant data for anyone working on sound systems. The topics covered include microphones, gramophones, CDs to name a few. 190 pages. Hardback. £9.95

NEWNES COMPUTER ENGINEER'S POCKET BOOK

This is an invaluable compendium of facts, figures, circuits and data and is indispensable to the designer, student, service engineer and all those interested in computer and microprocessor systems. 203 pages. Hardback. £9.95

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. £9.95

NEWNES RADIO AND ELECTRONICS ENGINEER'S POCKET BOOK

18th Edition. Keith Brindley

Useful data covering math, abbreviations, codes, symbols, frequency bands/allocations, UK broadcasting stations, semi-conductors, components, etc. 325 pages. Hardback. £9.95

NEWNES TELEVISION AND VIDEO ENGINEER'S POCKET BOOK

Eugene Trandle

This is a valuable reference source for practitioners in "entertainment" electronic

equipment. It covers TV reception from v.h.f. to s.h.f., display tubes, colour camera technology, video recorder and video disc equipment, video text and hi-fi sound. 323 pages. Hardback. 0/P

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

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. 0/P

FAULT FINDING

ARE THE VOLTAGES CORRECT?

Reprinted from PW 1982-1983

How to use a multimeter to fault-find on electronic and radio equipment, from simple resistive dividers through circuits using diodes, transistors, i.c.s and valves. 44 pages. £1.50

GETTING THE MOST FROM YOUR MULTIMETER (BP238)

R. A. Penfold

This book is primarily aimed at beginners. It covers both analogue and digital multimeters and their respective limitations. All kinds of testing is explained too. No previous knowledge is required or assumed. 102 pages. £2.95

MORE ADVANCED USES OF THE MULTIMETER BP265

R. A. Penfold

This book is primarily intended as a follow-up to BP239, Getting the most from your Multimeter. By using the techniques described in this book you can test and analyse the performance of a range of components with just a multimeter (plus a very few inexpensive components in some cases). The simple add-ons described extend the capabilities of a multimeter to make it even more useful. 85 pages. £2.95

OSCILLOSCOPES, HOW TO USE THEM, HOW THEY WORK 3rd Edition

Ian Hickman

This book describes oscilloscopes ranging from basic to advanced models and the accessories to go with them. £12.95

PRACTICAL HANDBOOK OF VALVE RADIO REPAIR

Chas E. Miller

The definite work on repairing and restoring valued broadcast receivers dating from the 1930s to the 60s. Appendices giving intermediate frequencies, valve characteristic data and base connections. 230 pages. Hardback. £20.00

TRANSISTOR RADIO FAULT FINDING CHART (BP78)

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). £9.95

CONSTRUCTION

COIL DESIGN AND CONSTRUCTION MANUAL (BP 100)

B.S. Bambant

Covering h.f. coils to power transformers this 100 page pocket sized book is crammed full of information and tables for the constructor. 110 x 175mm 100 pages. £2.50

FURTHER PRACTICAL ELECTRONICS CALCULATIONS AND FORMULAE (BP144)

F. A. Wilson

Covering Maths, digital maths, electrostatics, electromagnetics and all forms of electronic calculations, with many worked examples, of amplifiers, noise, feedback etc. 450 pages. 110 x 175mm. £4.95

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. £2.50

INTRODUCING ORP

Collected articles from PW 1983-1985

An introduction to low-power transmission, including constructional details of designs by Rev. George Dobbs G3RJY for transmitters and transceivers from Top Band to 14MHz, and test equipment by Tony Smith G4FAL. 64 pages. £1.50

MORE ADVANCED POWER SUPPLY PROJECTS (BP192)

R. A. Penfold

The practical and theoretical aspects of the circuits are covered in some detail. Topics include switched mode power supplies, precision regulators, dual tracking regulators and computer controlled power supplies, etc. 92 pages. £2.95

POWER SUPPLY PROJECTS (BP76)

R. A. Penfold

This book gives a number of power supply designs including simple unregulated types, fixed voltage regulated types and variable voltage stabilised designs. 91 pages. £2.50

PRACTICAL POWER SUPPLIES

Collected articles from PW 1978-1985

Characteristics of batteries, transformers, rectifiers, fuses and heatsinks, plus designs for a variety of mainsdriven power supplies, including the PW "Marchwood" giving a fully stabilised and protected 12V 30A d.c. 48 pages. £1.25

QRP NOTEBOOK

Doug DeMaw W1FB

This book deals with the building and operating of a successful QRP station. Lots of advice is given by the author who has spent years as an ardent QRP'er. All the text is easy-to-read and the drawings large and clear. 77 pages. £4.95

TEST EQUIPMENT CONSTRUCTION

R.A. Penfold

Describes, in detail, how to construct some simple and inexpensive, but extremely useful, pieces of test equipment. 104 pages. £2.95

50 (FET) FIELD EFFECT TRANSISTOR PROJECTS

F.G. Rayer

50 circuits for the s.w.l., radio amateur, experimenter or audio enthusiast using f.e.t.s. 104 pages. £2.95

ANTENNAS (AERIALS)

AERIAL PROJECTS (BP105)

Practical designs including active, loop and ferrite antennas plus accessory units. 96 pages. £2.50

ALL ABOUT CUBICAL QUAD ANTENNAS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Theory, design, construction, adjustment and operation of quads 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 (BP106)

H. C. Wright

This book deals with the basic concepts relevant to receiving and transmitting antennas. Lots of diagrams reduce the amount of mathematics involved. 86 pages. £2.95

ANTENNA IMPEDANCE MATCHING

Wilfred N. Caron

Proper impedance matching of an antenna to a transmission line is of concern to antenna engineers and to every radio amateur. A properly matched antenna as the termination for a line minimises feed-line losses. Power can be fed to such a line without the need for a matching network at the line input. There is no mystique involved in designing even the most complex multi-element networks for broadband coverage. Logical step-by-step procedure is followed in this book to help the radio amateur with this task. 192 pages. £11.95

BEAM ANTENNA HANDBOOK (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Design, construction, adjustment and installation of h.f. beam antennas. 198 pages. £8.75

***NOVICE ANTENNA NOTEBOOK**

Doug DeMaw W1FB

Another book from the pen of W1FB, this time offering "new ideas for beginning hams". All the drawings are large and clear and each chapter ends with a glossary of terms. 130 pages. £3.95

OUT OF THIN AIR

Collected Antenna Articles from PW 1977-1980

Including such favourites as the ZL Special and "28CX 16-element beams for 2m, and the famous "Slim Jim", designed by Fred Judd G2BXC. Also features systems for Top Band, medium wave/long wave loop designs and a v.h.f. direction finding loop. Plus items on propagation, accessories and antenna design. 80 pages. £1.80

PRACTICAL WIRE ANTENNAS - Effective HF Designs for the Radio

Amateur. John D. Heyes G3BCQ

Wire antennas offer one of the most cost-effective ways to put out a good signal on the h.f. bands and this practical guide to their construction has something to interest every amateur on a budget. 100 pages. £7.53.

SIMPLE LOW-COST WIRE ANTENNAS FOR RADIO AMATEURS (USA)

W. I. Orr W6SAI & S. D. Cowan W2LX

Efficient antennas for Top Band to 2m, including "invisible" antennas for difficult station locations. 191 pages. £2.75

THE ARRL ANTENNA BOOK (USA) 15th Edition

A station is only as effective as its antenna system. This book covers propagation, practical constructional details of almost every type of antenna, test equipment and formulas and programs for beam heading calculations. £12.95

THE ARRL ANTENNA COMPENDIUM (USA)

Volume One

Fascinating and hitherto unpublished material. Among the topics discussed are quads and loops, log periodic arrays, beam and multi-band antennas, verticals and reduced size antennas. 175 pages. £7.50

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. £3.80

W1FB'S ANTENNA NOTEBOOK

Doug DeMaw W1FB

This book provides lots of designs, in simple and easy to read terms, for simple wire and tubing antennas. All drawings are large and clear making construction much easier. 124 pages. £3.95

25 SIMPLE AMATEUR BAND AERIALS (BP125)

E. M. Noll

How to build 25 simple and inexpensive aerials, from a simple dipole through beam and triangle designs to a mini-rhombic. Dimensions for specific spot frequencies including the WARC bands. 80 pages. £1.95

25 SIMPLE INDOOR AND WINDOW AERIALS (BP136)

E. M. Noll

Designs for people who live in flats or have no gardens, etc., giving surprisingly good results considering their limited dimensions. 64 pages. £1.75

25 SIMPLE SHORT WAVE BROADCAST BAND AERIALS (BP132)

E. M. Noll

Designs for 25 different aerials, from a simple dipole through helical designs to a multi-band umbrella. 80 pages. £1.95

25 SIMPLE TROPICAL AND MW BAND AERIALS (BP145)

E. M. Noll

Simple and inexpensive aerials for the broadcast bands from medium wave to 49m. 64 pages. £1.75

THE RADIO AMATEUR ANTENNA HANDBOOK

William I. Orr W6SAI & Stuart D. Cowan W2LX

Yagi, quad, quagi, l-p, vertical, horizontal and "sloper" antennas are all covered. Also towers, grounds and rotators. 190 pages. £8.75

COMPUTING

AN INTRODUCTION TO COMPUTER COMMUNICATIONS (BP177)

R. A. Penfold

Details of various types of modem and their applications, plus how to interconnect computers, modems and the telephone system. Also networking systems and RTTY. 96 pages. £2.95

AN INTRODUCTION TO COMPUTER PERIPHERALS (BP170)

J. W. Penfold

Covers a wide range of computer peripherals such as monitors, printers, disk drives, cassette recorders, modems, etc., explaining what they are, how to use them and the various types of standards. 80 pages. £2.50

MICROPROCESSING SYSTEMS AND CIRCUITS (BP77)

Elements of Electronics Book 4

F. A. Wilson

A comprehensive guide to the elements of microprocessing systems, which are becoming ever more involved in radio systems and equipment. 256 pages. 0/P

MORSE

INTRODUCING MORSE

Collected Articles from PW 1982-1985

Ways of learning the Morse Code, followed by constructional details of a variety of keys including lambic, Triambic, and an Electronic Bug with a 528-bit memory. 48 pages. £1.25

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

COMMUNICATION CENTRE OF THE NORTH

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

FULL KENWOOD RANGE IN STOCK.

BUTTERNUT

HF2V 40-80M vertical	£142.00
20MRK 20M add on kit	£33.49
HF6VX 6 band vertical	£167.00
TBR160S 160M add on kit	£53.99
HF5B Triband Mini Beam	£235.00
NEW R5 5 Band Vertical	£259.00

CUSHCRAFT

A3 3 element Triband	£329.00
A4 4 element Triband	£353.00
10-3CD 3 element 10m	£115.00
15-3CD 3 element 15m	£139.75
20-3C2 3 element 20m	£238.00
AP8 8 band 25ft vertical	£181.00
AV5 5 band 25ft vertical	£123.00
R5 5 Band vertical Antenna	£259.00
15 element 2 Boomer	£395.95

ANTENNA TUNERS

Kenwood AT230	£298.00
MFJ 962B 1.5kW Tuner	£241.00
MFJ 949C 300W Versatuner	£157.00
MFJ 941D watt Basic	£105.00
MFJ 1801 Random Wire Tuner	£42.82
Kenwood AT250 Automatic Tuner	£298.00
TEN TEC '254' 200 Watt Antenna Tuner	£150.00

SCANNING RECEIVER RANGE

AR300 Base Station	£795.00
AR2002 Base Station	£487.00
AR950 Base Station	£249.00
AR900 Hand-Held	£199.00
AR800 Hand-Held	£165.00
RS37S Airband Hand Held	£89.50
ICOM R7000 Base Station	£380.00
RS35 Airband Base Station	£235.00
WIN 108 Hand-Held Airband	£175.00
AR1000 Hand-Held	£249.00

SWR/POWER METERS

MFJ815 HF 2kW SWR/PWR	£57.32
SX200 1.8-200MHz	£85.00
SX400 140-525MHz	£79.00
W510 1.8-30MHz	£79.00
DIAWA CN410M 35-150MHz	£61.72
DIAWA CN460M 140-450MHz	£85.49
NS660P 1.8-150MHz + PEP	£115.00
KDYO-100 1.8-60MHz	£75.00
KDYO-200 1.8-200MHz	£80.00
KDYO-400 140-525MHz	£82.00

DUMMY LOADS

MFT300 Watt D. load	£33.50
TenTec 300 Watt Dummy Load	£33.00
L20 20 Watt Dummy Load	£22.00
HFZ25 GENERAL COVERAGE RECEIVER	£425.00

A FULL RANGE OF RECEIVERS FOR AIR-BAND - MARINE - SHORT WAVE - AVAILABLE

GSRV full size £18.50 half size £16.00. Full range of Antenna -
Accessories plus full range or VHF - UHF - HF mobile antennas.

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.
POSTAGE-CARRIAGE EXTRA AT COST.

FULL TEN-TEC RANGE

NOW AVAILABLE

"Paragon", "Corseil",
"Omni V"

plus all accessories

Phone 0942-676790.

STEPHENS JAMES LTD.

47 WARRINGTON ROAD,
LEIGH, LANCs. WN7 3EA

SGC

SG-230

SMARTUNER

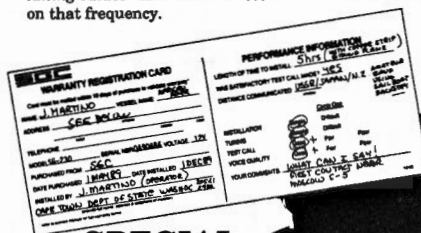
HF ANTENNA COUPLER

SSB, AM, CW & DATA

FAST - INTELLIGENT - ACCURATE

OPERATES WITH ANY HF TRANSCEIVER

The Smartuner high technology coupler intelligently tunes any length antenna (8 to 80ft) in the HF band. The unit will operate with any HF transceiver within its specifications. The Smartuner switches 64 input and 32 output capacitance combinations plus 256 inductance combinations in a "pi" network resulting in over a half-million different ways to ensure a perfect match for the transceiver; and, it remembers the frequency and the tuning values and will re-select these values in less than 10 ms next time you transmit on that frequency.



**SPECIAL
HAM PRICE:
\$555.00**

Includes shipping to U.K.

- MICROPROCESSOR CONTROLLED
- NON-VOLATILE MEMORY
- WATERPROOF
- B.I.T.E. INDICATOR
- FOR MARINE, AVIATION, HAM AND PARA-MILITARY APPLICATIONS
- 1.8 TO 30 MHz RANGE
- 10 TO 150W INPUT POWER
- 10ms RETUNING TIME
- 8 TO 80 FT ANTENNA (ALL Types)

Visa and Mastercard/Access Accepted

DEALER ENQUIRIES ARE WELCOME

DELIVERY FROM STOCK

SGC Inc. SGC Building, 13737 S.E. 26th St. Bellevue, WA. 98005 USA
P.O.Box 3526, 98009. Telex: 328834. Fax: (206) 746-6384 Tel: (206) 746-6310

FAX AND WEATHER SATELLITES

Full resolution charts and greyscale pictures from any **SPECTRUM** computer to a dot matrix printer. Basic system £40 plus interface for FAX £40 or WX SATS £59.

TX-3 RTTY CW ASCII TRANSCEIVE

The best software available with every feature you could want. Needs TIF1 or terminal unit. **BBC-B/Master** and **CBM64** tape £20, disc £22 **SPECTRUM** tape £35, +3 disc £37 inc. adapter board. Also **VIC20** RTTY/CW transceive program £20.

RX-4 RTTY CW SSTV AMTOR RECEIVE

4-mode performance, superb features and ease of use make this still a best-seller. Needs TIF1 interface. **BBC-B/Master**, **CBM64** tape £25, disc £27. **VIC20** tape £25. **SPECTRUM** tape £40, +3 disc £42 inc. adapter board (needs TIF1 also). Software-only version (input to EAR socket) tape £25, +3 disc £27.

TIF1 INTERFACE Designed for TX-3 and RX-4 software and only available with them. Kit £25 (assembled PCB + cables, connectors) or ready-made, boxed with all connections £40.

GX-2 FAX SSTV TRANSCEIVE

Greyscale FAX and mono and colour SSTV on the **BBC** computer. Fantastic system. Reviews March 90 Amateur Radio and August 90 Ham Radio Today. Complete system of EPROM, interface, instructions, leads, only £99 or £119 with direct FAX printing option.

RX-8 8 MODE RECEIVE

Every possible feature and performance to receive FAX, HF & VHF PACKET, COLOUR SSTV, RTTY, CW, AMTOR, UoSAT and ASCII on any **BBC** computer. Reviews Oct 89 Ham Radio Today and March 90 Amateur Radio. Complete system of EPROM, interface, instructions, leads and demo cassette £259.

APT-1 WEATHER SATELLITE MODULE

Enables all weather satellite signals to be displayed on any FAX system. £59. Version for our RX-8 system just plugs in and only £39 if ordered with RX-8.

BBC LOCATOR with UK, Europe, World maps £10, **MORSE TUTOR** £6, **LOGBOOK** £8, **LOCATOR** £7, **RAE MATHS** £9. For **BBC**, **SPECTRUM**, **CBM64**, **VIC20**, **Electron**. **BBC**, **CBM64** programs available on disc at £2 extra.

Lots of information available about everything, please ask. Prices include VAT and p&p by return.

technical software (P.W.)

Fron, Upper Llandwrog, Caernarfon LL54 7RF

Tel: (0286) 881886.

VISA



Classified Ads

Whilst prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check both prices and availability of goods with the advertiser before ordering from non-current issues of the magazine

Service Sheets and Servicing

Scanning Add-On

Valves

Wanted

**ACCESS
MASTERCARD**

TECHNICAL INFORMATION SERVICES (PW)

WORLD'S LARGEST COLLECTION OF SERVICE MANUALS ... from £3.50 to £50 ... Most unobtainable elsewhere
 Every issued **FULL SIZE SERVICE SHEET** in stock; CTVs or Combinations £3.50/Singles £2.50 plus :SAE
LSAE for any Quotation, plus huge FREE Catalogue, STREE Review, Pricelists, etc.
 For £3 ... Comprehensive Service Manuals & Sheets Catalogues PLUS 1989 Chassis Guide & £4 Vouchers
 Spectrum Repair & Service Guide **£5.00.** Video Recorders Service Guide 3rd Ed **£20.00**
Giant Collection of 10 Huge Binders covering all main CTVs to end 1989, (FREE Updating) £265

**VISA
EUROCARD**

 SERVICE MANUALS

MAURITRON TECHNICAL SERVICES (PW),
8 CHERRY TREE ROAD, CHINNOR, OXON, OX9 4QY
Tel: (0844) 51694 Fax: (0844) 52554

SERVICE MANUALS from £1.00

Grundig S7150GB	colour TV	£1.50
Grundig Z210, Z222, Z252R, 5012, 6022	colour TV	£2.50
Grundig 5011UE/GB, 6011TD/GB	colour TV	£1.50
Grundig 5010, 6010, 5011, 6011	colour TV	£1.50
Grundig 1621, 1631, 4210, 4230	colour TV	£2.50
Grundig 8240, 8610, 8630, 8250, 9280	colour TV	£3.00
Grundig GSC600/GSC700	colour TV	£1.50
Grundig Super Color 1644GB, 1645GB		
4245GB, 4445GB, 6245GB, 6445GB	colour TV	£1.50
Grundig P2002GB, T2002GB, R500GB	b/w TV	£1.00
Grundig Super Color 1514G, 4415GB, 6415GB	colour TV	£1.00
Grundig W6232GB	colour TV	£1.00
Grundig Super Color 8635GB	colour TV	£1.50
Bush BC6100, 611, 6200, 6300		
6338, 6437, 6438 (photocopy)	colour TV	£1.00
Murphy MC6103, 6201, 6301,		
6332, 6402 (photocopy)	colour TV	£1.00

**Others available from 50p, send large s.a.e.
Cheques payable to PWP Ltd.
Box No. 21. PW Publishing Ltd., Enefco House,
The Quay, Poole, Dorset BH15 1PP.**

TEST EQUIPMENT MAINTENANCE

HESING TECHNOLOGY

**41 Bushmead Road, Eaton Socon, St Neots,
Cambs PE19 3BT**
Tel: (0480) 214488 (anytime) 216870 (eves).

RACK CHASSIS

**FOR THE
CONSTRUCTOR**

RU=1.75"		
MODEL	SIZE (H,W,D)"	PRICE
1RU5	1.75 x 19 x 5	38.00
1RU7	1.75 x 19 x 7	40.50
1RU10	1.75 x 19 x 10	43.00
2RU5	3.50 x 19 x 5	40.50
2RU7	3.50 x 19 x 7	43.00
2RU10	3.50 x 19 x 10	46.00
3RU5	5.25 x 19 x 5	51.00
3RU7	5.25 x 19 x 7	54.00
3RU10	5.25 x 19 x 10	57.00



BESCOM, INC.
2100 WARD DR.
HENDERSON, NV
(702) 565-3400 FAX

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

(Cheques and Postal Orders should be made payable to Practical Wireless).

CATEGORY HEADING

Name

Address

[illegible]

Computer Soft/w & Hard/w

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, Buckle, Moray AB5 2BR. (Tel: 0542 7384).

IBM/COMPATIBLE SHAREWARE CATALOGUE, 7000+ files, wordprocessors, spreadsheets, communications, Ham & games. Send £1.50 or 2 disks & return postage. AK SHAREWARE, 54 Sheldrake Road, Christchurch, Dorset BH23 4BP.

ATARI 520/1040/STE MORSE MASTER Complete CW tutor for novices and professionals. Send/receive under realistic on air conditions. complete with cable. £29.99 from **BOSCAD LTD**, 16 Aytoun Grove, Baldridgeburn, Dunfermline, FIFE KY12 9TA. For info Tel: (0383) 729584, evenings.

PC SOFTWARE BY G4BMK

RTTY, AMTOR, CW (Tx and Rx) SSTV, FAX, Audio Analyzer (Rx only). See review PW June 1990 Page 66. A high performance multimode program for IBM PC compatibles. £99 complete.

Any mix of modes to your choice - send SAE for details and prices. Use with ST5 Versaterm etc, or our matching T.U., built, boxed: £69. State callsign, if any, with order.

GROSVENOR SOFTWARE (PW)
2 Beacon Close, SEAFORD,
East Sussex BN25 2JZ
Tel: (0323) 893378

Educational

ELECTRONICS WORKSHOP Repairs, rebuilds, modifications, advice. Specialists in valve equipment. See also PAYL School Green, G1NAK Chylean, Tintagel, Cornwall. Tel: (0840) 212262.

R.A.E. PAY AS YOU LEARN Correspondence. £2 per lesson includes tuition. See also Electronics Workshop. Green, C. Eng., M.I.E.E. Chylean, Tintagel, Cornwall. Tel: (0840) 212262

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of his and other courses (GCSE, Career and professional examinations, etc) write or phone - THE RAPID RESULTS COLLEGE, Dept. JX101, Tuition House, London SW19 4DS. Tel: 081-947 7272 (9am-5pm) or use our 24hr Recordacall service 081-946 1102 Quoting JX101.

INDEX TO ADVERTISERS

AH Supplies	54
AKD	32
ARE Communications	8
Anchor Surplus	54
Arrow	7
Birkett, J	54
Bredhurst Electronics	48
Cambridge Kits	53
Castle Electronics	40
Characteristics	28
Circuit	21
Colomor	54
Datong	32
Dewsbury	31
Dressler Communications	18
ERA	53
Elliott Electronics	53
Henrys Audio	47
Hoka Electronics	48
Howes C.M communications	14
ICS Electronics	15, 17
ICS Intertext	40
lcom (UK)	2, 3, Cover iii
KW Communications	43

Veteran & Vintage

THE VINTAGE WIRELESS BOOK LISTING. Published regularly containing 100s of out of print, old and collectable wireless and T.V. books, magazines, etc. Send three first class stamps for next copy or £1.75 for next 4 issues. **WANTED**, Pre-1960 wireless books, magazines, catalogues, any printed material or Ephemera relating to wireless. CHEVET BOOKS, 157 Dickson Road, Blackpool, Lancashire FY1 2EU. Tel: (0253) 751858

VINTAGE RADIO & AUDIO ENTHUSIASTS:- Contact us for components, valves, service sheets, radios & amplifiers. Mail order to anywhere - over the counter retail Saturday only. Send 46p stamp for FREE catalogues & newsheet. THE VINTAGE WIRELESS COMPANY, Tudor House, Cosham Street, Mangotsfield, Bristol BS17 3EN. Tel: (0272) 565472 or Fax: (0272) 575442. All major credit cards accepted by letter, PHONE OR FAX.

Components

ELECTRONIC COMPONENTS, any component, any quantity, PHONE FOR PRICES. F.O.E. Ltd. (0277) 811802.

JAPANESE TRANSMITTING TUBES and transistors for broadcasting, communication and industrial use. Please make enquiry by fax: 816-338-3381. TSUTOM YOSHIHARA, 1-105, Deguchi-cho 34 Suita-shi, OSAKA 564, JAPAN.

QUARTZ CRYSTALS and FILTERS

Large numbers of standard frequencies in stock for amateur, CB, professional and industrial applications. Stock crystals £5.50 each (inc. VAT and UK post). Any frequency or type made-to-order from £6.50. Phone or SAE for lists.

GOLLEDGE ELECTRONICS
Merriott, Somerset, TA16 5NS
Tel: (0460) 73718

J. A. B. The new name in Mail Order. Electronic and R. F. Components, with an evening telephone service. Catalogue 50p (Refunded on first order) from:- JAB 76 Wensleydale Road, Greatbarr, Birmingham B42 1PL.

TOROIDAL CORES, FERRITE BEADS, send 50p for catalogue to: FERROMAGNETICS, PO Box 577, Mold, Clwyd, N. Wales CH7 1AH.

NOTICE TO ADVERTISERS

Would intending and existing advertisers please note that *Practical Wireless* has an editorial policy not to accept advertising for surveillance and 'bugging' transmitting and receiving equipment.

Lake Electronics	40
Langrex Supplies	40
Maplin Electronics	Cover iv
Marco Trading	54
Martin Lynch	47
Nevada	28
RAS Nottingham	48
R & D Electronics	47
RN Electronics	40
RSGB	44
RST Valve	40
Radio Communication Agency	53
Radio Shack	72
Randam Electronics	54
Raycom	27
SGC	67
SRW Communications	53
Short Wave Magazine	48
Siskin	28
South Midlands Communications	Cover ii, 4, 5, 6
Spectrum	44
Stephens James	67
TE Systems	59
Tandy	9
Technical Software	67
Tennamast	28
Ward Reg & Co	59
Waters & Stanton	10

Miscellaneous

GZVF LOOP ANTENNAS COMPLETE WITH ATU FOR H.F. HAM RADIO BAND TRANSMISSION (SWR One to One 40, 15 and 10 and One Point Five to One 80 and 20) **AND SWLS AND LONG AND MEDIUM WAVE BANDS FOR BCLs**. Loops 21 inches square or triangle. No special skills required. Circuits, Parts Lists with sources of supply assembly/data. **HIGH FREQUENCY LOOP** 80 to 10 Metres **E3. LONG AND MEDIUM WAVE LOOP** for BCLs **E3. LONG WAVE MEDIUM WAVE AND SHORT WAVE LOOP** 1500 to 10 Metres **FOR THE BCL AND SWLS**. **SHORT WAVE ATU FOR LOOP OR LONG WIRE ANTENNA** **E4. SHORT WAVE ATU BUILT IN PRE AMP FOR LOOP OR LONG WIRE** **E7. Pre-amp LW, MW and SWave** **E2. MW LOOP** with pre amp ATU **E3. PRE AMP FOR GZVF HF Loop** or ATU **E4. SAE details**. All projects DIY. Metal Detector **E2. PhotoCopy HRO manual** **E4. F.G. Rylands**, 39 Parkside Avenue, Millbrook, Southampton SO1 9AF. Tel: (0703) 775064.

HEATHKIT U.K. Spares and Service Centre. Cedar Electronics Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel: (0684) 73127.

INVENTION, DEVELOPMENT & INNOVATION LTD Can help commercialise your idea - Telephone: Cambridge (0223) 892789.

THE SCIENTIFIC WIRE COMPANY

811 Forest Road, London E17. Tel: 01-531 1568

ENAMELLED COPPER WIRE

SWG	1lb	8oz	4oz	2oz
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

SWG	1lb	8oz	4oz	2oz
14 to 30	10.10	5.20	2.93	1.97

TINNED COPPER WIRE

SWG	1lb	8oz	4oz	2oz
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.

For Sale

COMMERCIAL SOLID - STATE

H.F. Linear Amplifiers.

1kW output continuous duty all modes. Complete units incorporating:- Aerial filter, Amplifier A.C. P.S.U. tested. As new and unused. Further details phone **PETER (0642) 242546** Office hours only

MITSUBISHI VIDEO PRINTER P-50B brand new £299, bargain provides hard copy text/video image on 4.5" thermal paper via decoder/computer video camera. Record Teletext, DXTV, WXFax, RTTY, CW. Tel: (0628) 482726. From 1930hrs.

3MIRTE SATELLITE DISH Reasonable offers accepted. Telephone: (0256) 83656 or write to: MR S HARDING Unit 4, Summerlea Court, Herriard, Basingstoke RG25 4PN.

MAINS FILTERS Specifically for amateur and commercial radio reduce T.V.I. and lower the noise threshold of reception significantly. Full details: RELLO ELECTRONICS, 16 Stirling Road, St Leonards-on-Sea TN38 9NF (0424) 852440.

AVO CT38 ELECTRONICS MULTIMETER G.W.O. Complete set of accessories including Hi-Impedance Adaptor £75.00 Tel: (0793) 491951 Evenings.

RCS VARIABLE VOLTAGE D.C. BENCH POWER SUPPLY 1 to 24 volts up to 0.5 amp. 1 to 20 volts up to 1 amp. 1 to 16 volts up to 1.5 amps D.C. Fully stabilised. Twin panel meters for instant voltage and current readings. Overload protection. Fully variable. Operates from 240V A.C. Compact Unit: size 9 x 5.5 x 3ins.

£42 Incl VAT + Post E2

NEW MODEL Up to 38 volts DC at 6amp. 10 amp peak. Fully variable. Twin Panel Meters. Size 14.5 x 11 x 4.5in. £96 inc VAT. Carr £5

RADIO COMPONENT SPECIALISTS VISA

337 Whitehorse Road, Croydon SURREY, U.K. Tel: 081-684 1665

List. Large S.A.E. Delivery 7 days. Callers Welcome. Closed Wednesday

144MHz to 2500MHz Cavity Wavemeter.

One Wavemeter to cover the VHF/UHF Bands 144MHz to over 2500MHz. Don't get caught without one.

Write to: P. Sergent G4ONF, 6 Gurney Close, Costessey, Norwich. Tel: (0603) 747782

100% WAVEMETER KIT

PW Index Volume 66 January to December 1990

Construational General

2-element Extended Collinear Antenna for the 144MHz Band by Fred Judd G2BCX.....	24	Nov
A Collinear for 144MHz by G4WUP.....	41	Mar
A Novel Dual Band Antenna by Noel Orrin G3BBK.....	29	Dec
A Tuned Active Antenna by Adrian Knott G6KSN.....	50	Jan
Circular and Square Loop Antennas by Fred Judd G2BCX.....	Part 1 38	Dec
Desk Top Microphone by Allan Lester-Rands.....	20	Aug
Folded Dipole Antennas for the 18 and 24MHz Bands by Steve Nicholls G0JFM.....	25	Oct
Low Voltage Warning Alarm by Mike Rowe G8JVE.....	50	June
NiCad Recycler by Peter A. Lovelock.....	Part 1 23	May
NiCad Recycler by Peter A. Lovelock.....	Part 2 52	June
Portable Ring Base Antenna by C.R. Eve GJ7ADG.....	84	Feb
Power Supply for Battery Radio by Stefan Niewiadomski.....	60	May
The G4XBY 6-element Yagi for 430MHz by Tony Martin G4XBY.....	36	June
The RB10 Antenna by F. C. Judd G2BCX.....	Part 1 22	Jul
The RB10 Antenna by F. C. Judd G2BCX.....	Part 2 39	Aug

Construational Transmitting

Earth Tuner by Godfrey Baillie-Searle G04EIP.....	21	Oct
PW Badger Club by Mike Rowe G8JVE.....	Part 1 33	Mar
PW Badger Club by Mike Rowe G8JVE.....	Part 2 43	Apr
PW Empire Transceiver by Tex Swann G1TEX.....	supp Jul	
PW Irwell by Rev G. C. Dobbs G3RJV.....	Part 1 26	Jan
PW Irwell by Rev G. C. Dobbs G3RJV.....	Part 2 42	Feb
PW Irwell by Rev George Dobbs G3RJV.....	Part 3 70	Mar
PW Peanut Transceiver by Gus Montgomery GMDATI & Bill Holt G7DHM.....	Part 1 23	Jun
PW Peanut Transceiver by Gus Montgomery GMDATI & Bill Holt G7DHM.....	Part 2 66	Jul
The Marland SSB Transmitter by Rev. George Dobbs G3RJV.....	Part 1 63	Jul
The Marland SSB Transmitter by Rev. George Dobbs G3RJV.....	Part 2 23	Aug
The Marland SSB Transmitter by Rev. George Dobbs G3RJV.....	Part 3 26	Sep

Construational Receiving

A Constant Impedance Receiver Attenuator by A. Langton.....	72	May
A Simple Pre-Amplifier for the 70MHz and 50MHz Bands by Adrian Knott G6KSN.....	22	Dec
PW 49'er In-car Short Wave Converter by Brian Robertson G4POL.....	41	Jan
PW Glyme by Brian Robertson G4POL.....	65	Feb
PW Millennium Valve Receiver Project by Peter Buchan G3INR.....	supp July	

Errors & Updates

A Simple Transistor & FET Tester February 1990.....	95	May
Basic Radio Calculations With Pocket Computers September 1990.....	22	Oct
Earth Tuner October 1990.....	38	Nov
Errors & Updates February 1990.....	71	Mar
Instruments For Weather Observation supp October 1990.....	38	Nov
Power Supply For Battery Radio May 1990.....	57	Jul
PW Badger Club April 1990.....	49	Aug
PW Empire Transceiver, supp July 1990.....	49	Aug
PW Irwell Part 1 January 1990.....	47	Feb
PW Review Ten-Tec Omni V February 1990.....	71	Mar

Construational Test Equipment

A Simple Transistor & FET Tester by J.A. Brett G6EBR.....	27	Feb
---	----	-----

Features

Alternative Technology - the Power Supply by Wyn Mainwaring G8AWT.....	42	Jun
Amateur Radio & Meteorology Go Hand-In-Hand by Jim Bacon G3YLA.....	33	Oct
Amateur Satellites - Our Business by Pat Gowen G3IOR.....	23	Apr
An Inexpensive Product Detector for SSB or CW by Adrian Knott G6KSN.....	29	Apr
CB 934.....	55	May
CB In The Highlands and Islands by Rob Mannion G3XFD.....	52	May
Communications Without Wires by Ron Ham.....	supp Jul	
CO Contest by Rob Taylor G8ZHF.....	36	May
Dayton Hamvention '91 by Roger Hall G4TNT.....	33	Ncv
Droitwich - Engraved on the Dial by Rob Mannion G3XFD.....	34	Jan
Friedrichshafen 1990 Show Report by Rob Mannion G3XFD.....	46	Oct
From Wet To All Dry by Ron Ham.....	32	May
Further Notes on the Small 50MHz Yagi by Ken Willis G8VR.....	24	Jul
G'day - News from Down Under by Greg Baker.....	Part 1 86	Feb
G'day - News from Down Under by Greg Baker.....	Part 2 86	Mar
G2BCX Antenna Clinic.....	Part 11 48	Feb
G2BCX Antenna Clinic.....	Part 12 50	Aug
G2BCX Antenna Clinic.....	Part 13 42	Sep

Instruments for Weather Observation by Ron Ham.....	40	Oct
Keyed-in Morse by G1TEX.....	66	Mar
Lower Frequencies in Smaller Gardens by Paul Essery GW3KFE.....	Part 1 46	Nov
Lower Frequencies in Smaller Gardens by Paul Essery GW3KFE.....	Part 2 49	Dec
No Linear - No HF DX! by Peter Barville G3XJS.....	51	Mar
On Track with the Racal-Decca Navigator by Rob Mannion G3XFD.....	50	Feb
Packaged Radio by Roger J. Cooke G3LDI.....	83	Jan
Packet Panorama by Roger J. Cooke G3LDI.....	45	Dec
Packet Panorama by Roger J. Cooke G3LDI.....	44	Oct
Packet Panorama by Roger J. Cooke G3LDI.....	54	Nov
Packet Update by Roger J. Cooke G3LDI.....	Part 8 82	Feb
Packet Update by Roger J. Cooke G3LDI.....	Part 9 77	Mar
Packet Update by Roger J. Cooke G3LDI.....	Part 10 66	May
Packet Update by Roger J. Cooke G3LDI.....	Part 11 40	Jun
Packet Update by Roger J. Cooke G3LDI.....	Part 12 48	Aug
Packet Update by Roger J. Cooke G3LDI.....	Part 13 48	Sep
PW 144MHz QRP Contest Results by Neill Taylor G4HLX.....	51	Nov
PW 144MHz QRP Contest Rules by Neill Taylor G4HLX.....	56	Jun
Radiation Hazards by Brian Dance.....	42	May
Radio Personality - Geoff Pagoda G4YXV.....	23	Nov
Radio Personality - HRH King Hussein JY1.....	33	Jan
Radio Personality - Jim Bacon G3YLA.....	29	Jun
Radio Personality - Ron & Joan Ham.....	73	Mar
Readers' Memories.....	supp Jul	
Receiver Front-end Limitations by J. King G4VFF.....	37	Apr
Receiver Sensitivity Signal and Noise by Gordon J. King G4VFF.....	59	Mar
RF Interference from Vehicle Engines by B.A. Berry.....	62	Feb
Satellites Mean Business! by W. D. Higgins.....	22	Apr
Special Event Stations by Michael Lawton GW4IQP.....	60	Jul
Stabberies Not Included by Peter Rouse GU1DKD.....	50	Apr
Taming Computer Hash by Peter Rouse.....	31	Jul
The Dayton Hamvention - An American Adventure! by George Dobbs G3RJV.....	43	Aug
The Father of Amateur Wireless by Stan Crabtree G3DXC.....	46	Jan
The HEMT - A very high performance microwave device by Brian Dance.....	77	Jan
The Man Behind It All - F. J. Camm by Joan Ham.....	supp Jul	
The Window Revisited by Dick Pascoe G0BPS.....	54	Apr
The World Service - The BBC's Hidden Voice by Rob Mannion G3XFD.....	74	Feb
Watts in the Air by Anthony Hopwood.....	29	Oct
We've Been Together Now For 55 Years by Gordon Lumley.....	supp Jul	
Weather Equipment Showcase Review by Rob Mannion G3XFD.....	38	Oct

Reviews

AEA IsoLoop Antenna by Rob Mannion G3XFD.....	43	Nov
AEA Morse Machine MM-3 by Ron Stone GW3YDX.....	70	Jan
AEA PK-88 Packet Radio TNC by Chris Lorek G4HCL.....	82	Mar
AKD Blackline Series Filters by John Bird.....	30	Sep
CB Rig Review - Satcom SCAN40 F by Richard Ayley G6AKG.....	48	May
Cirkit Multimeters by Mike Richards G4WNC.....	45	Sep
CM Howes HTX-10 Kit by Mike Richards G4WNC.....	47	Jun
Dewsbury Supa-Tuta by Mike Richards G4WNC.....	29	Nov
Icom IC-901E Dual Band VHF/UHF Mobile Trans by Rob Mannion G3XFD & G1TEX.....	27	Mar
Icom IC-R1 Review by Rob Mannion G3XFD.....	33	Jul
Kenpro KT-22E by Rob Mannion G3XFD.....	56	Nov
Maplin MF-1000 Multi-function Counter by John Bird.....	33	Jun
Maplin Topward 7021 Oscilloscope Review by Mike Richards G4WNC.....	19	Dec
Mizuho MX-7S 40m SSB/CW Trans & Accessories by Chris Lorek G4HCL.....	58	Jul
ProElectron PEK-1 Keyer by Mike Richards G4WNC.....	41	May
Ten-Tec Dmni-V HF Transceiver by Mike Richards G4WNC.....	55	Feb
The Palomar M-827 SWR & Power Meter by Mike Richards G4WNC.....	58	Apr
The Standard C52B 144/430MHz FM Handy Transceiver by Richard Ayley G6AKG.....	33	Apr
Tokyo High Power Transverter HX-240 by Rob Mannion G3XFD.....	28	May
Wavecom W4010 Data Decoder by Mike Richards G4WNC.....	27	Aug
Yaesu FT-100 HF Transceiver by Chris Lorek G4HCL.....	56	Jan

New Products

Allweld Engineering - All Change.....	20	Feb
Alpha Electronics Ltd - Four In One.....	16	Sep
Alpha Electronics Ltd - Hot & Cold DMM.....	22	Jan
Alpha Electronics Ltd - On-screen Cursors.....	20	Feb
Anglia Microwaves Ltd - Radiation Screening.....	20	Jun
Black & Decker - Cordless Soldering.....	18	Jun
Bopla Ltd - Cable Glands.....	22	Jan
Bopla Ltd - Element.....	21	Jul
Bruel & Kjaer (UK Ltd) - Powerful and Portable.....	19	Nov
Bruel & Kjaer (UK Ltd) - Waterproof Mic.....	21	Jul
Bruel & Kjaer (UK Ltd) - Bruel & Kjaer.....	17	Dec
CableMaster - Undercarpet Telephone Cable.....	19	Nov
Cambridge Kits - Kit News.....	20	Jan
CDS Ltd - Vehicle Identification.....	16	Dec
CDS Ltd - Volt Converter.....	15	Dec
Chaparral Communications - Motorised Antenna Mount.....	20	Jan
Characteristics - New Products.....	17	Oct
Cirkit Distribution Ltd - Multi-function Meters.....	23	Jan

CM Howes Communications - Howes AA4 Active Antenna.....	18	Nov
Crotech Instruments - Enhanced Teststation.....	21	Jan
Crotech Instruments Ltd - Large Display Multimeter.....	20	Mar
Cushcraft - 28MHz Cushcraft.....	18	Apr
Cushcraft - A 28MHz Yagi.....	21	Jan
Cushcraft - Cushcraft.....	17	Aug
Cushcraft - Dual Band Ringo.....	16	Oct
Dewsbury Electronics - The Supa-Tuta Plus.....	16	Dec
Duracell - Longer Lasting.....	21	Jan
Electrolube Ltd - Non CFC Photoresist.....	18	May
G4TJB QSL Cards - QSL Cards.....	18	Nov
G4ZPY Paddle Keys - Unique Morse Key.....	15	Dec
G5BM - Samson Keys.....	18	Jun
Geddon Performance Coatings Ltd - Waterproof Tape.....	18	Jul
Global Specialties - Triple Output PSU.....	20	Feb
Greenwood Electronics - New Soldering Iron.....	18	Nov
Holtwood Engineering Ltd - Gale Warnings.....	18	Jun
Incastec - Digital Wind Speed.....	18	Jul
International Radio & Computers Inc - TX Enhancer.....	16	Apr
ITW Switches - Custom Capability.....	16	Oct
ITW Switches - Low Profile Microswitches.....	20	Jun
ITW Switches - Super Tough Switches.....	16	Aug
Lake Electronics - Two New Kits.....	20	Nov
Lee Electronics - New Standard C5608D.....	20	Nov
LMI UK Ltd - Screw Contact PCB Connectors.....	18	Oct
Longs Ltd - Pocket-sized tester.....	22	Feb
Maplin Electronics - 1991 Catalogue.....	18	Nov
Maplin Electronics - Do-it-Yourself.....	18	Nov
Maplin Electronics - Power Supply Transformer.....	17	Oct
Maplin Electronics - The Perfect Accessory.....	16	Dec
Maplin Electronics - Weather Kit.....	16	Aug
Marco Trading - 1991 Catalogue.....	18	Nov
Martin Lynch - A New Emporium.....	19	Nov
MEC A/S - Miniature Push Button Switches.....	22	Mar
Moss Plastic Parts Ltd - Bolt Support Foot.....	18	Jul
Nanosecond Technology - Trigger.....	16	Oct
Nevada - High Power Capacitor.....	22	Jan
Nevada - Introducing the MA18.....	16	Dec
Nevada - UK Spec CB.....	16	Aug
Nevada - Wide-band Pre-amp.....	21	Mar
P. Beckett - PRO-2004 Upgrade Kit.....	19	May
Perancea - Regarding Feet, Where Do You Stand?.....	18	Oct
Periphex Inc.....	19	Nov
Philips Test & Measurement - New Philips RF Generators.....	17	Oct
Pioneer - Water Music.....	20	May
ProElectron - Add-on VOX.....	16	Apr
Quiller Ltd - Six DMMs.....	19	Aug
Quiswood Ltd - A Measure of Quality.....	20	Nov
SASCO - Inlet Filter.....	16	Dec
SASCO - The Right Switch For The Job.....	17	Oct
SRW Communications Ltd - Loudspeaker.....	16	Jul
Star Electronics - Star Electronics.....	20	Feb
STC Instrument Services - Benchtop Precision Multimeter.....	18	Oct
STC Instrument Services - Dual Channel 'Scope.....	18	May
Steepleprint Ltd - Label Service.....	20	Nov
Strikalite - Batteries.....	21	Feb
Summitek - Summitek Portabeam.....	21	Nov
Swift Television Publications - Where is that Satellite?.....	22	Jan
Tandy - 1991 Catalogue.....	20	Nov
Tandy - Modifications.....	16	Sep
Technical Software - Fax & Weather Satellites.....	18	Nov
Technical Software - WX Satellite Decoding Module.....	21	Mar
Technova - Multi-function Control Module.....	15	Dec
Thurby-Thander Ltd - TV Test.....	18	Jul
TMK Instruments - Basic Measurements.....	18	May
TMK Instruments - Voltage Indicators.....	21	Jan
Ungar Eldon Industries UK Ltd - New Concept Soldering.....	17	Sep
Unitel Ltd - 1991 Catalogue.....	21	Nov
Unitel Ltd - Capacitors.....	16	Dec
Unitel Ltd - Multilayer Ceramic Capacitors.....	18	Oct
VSO - Recruitment.....	18	Oct
Waters & Stanton Electronics - Alinco Hand-helds.....	19	Jul
Watts International Ltd - Binding Posts.....	21	Mar

Supplements

8-page Weather Special.....	Oct
CB Special Supplement.....	May
Leicester Show Pull-out Guide.....	Nov
Special 1000th Issue - Celebration Supplement.....	Jul

Theory

Basic Radio Calculations with Pocket Computers by Mike Hadley G4JXX.....	24	Sep
Magnetic DC Leakage Fields From Cables by Anders Borgstrom.....	20	Sep
Reading & Understanding Circuit Diagrams by Ray Fautley G3ASG..... Part 21	65	Jan

Reading & Understanding Circuit Diagrams by Ray Fautley G3ASG.....	Part 22	34	Feb
Reading & Understanding Circuit Diagrams by Ray Fautley G3ASG.....	Part 23	42	Mar
Reading & Understanding Circuit Diagrams by Ray Fautley G3ASG.....	Part 24	38	May
Valve Technology & Characteristics by Peter Buchan G3INR.....	Part 1	26	Jul
Valve Technology & Characteristics by Peter Buchan G3INR.....	Part 2	33	Aug
Valve Technology & Characteristics by Peter Buchan G3INR.....	Part 3	33	Sep
Valve Technology & Characteristics by Peter Buchan G3INR.....	Part 4	24	Dec

Competitions

Crossword.....	19 Jan, 17 May, 15 Sep
How Many Words?.....	15 Apr, 15 Aug
Morse Competition.....	17 Nov
Spot the Difference.....	19 Feb, 19 Jun, 15 Oct
Wordsearch.....	23 Mar, 17 Jul, 14 Dec

Special Offers

Dayton '91.....	34	Nov
Discone Antennas.....	62	Jan
Discount Vouchers.....	19 Apr, 21 May, 19 June, 16 Jul, 17 Aug, 16 Sep, 17 Oct, 20 Nov	
Radio Information Cassette-1 Offer.....	74	May
Revox W160 Power Meter.....	74	Jan
Special Book Offer Newnes Amateur Radio Computing Handbook.....	36	Sep
Special Offer - Ham Disk.....	49	Oct
Xmas Subscription Offer.....	37	Dec

Regulars

Amateur Satellites by Pat Gowen G3IOR.....	96 Jan, 96 Feb, 96 Mar, 70 Apr, 87 May, 68 Jun, 77 Jul, 66 Aug, 56 Sep, 59 Oct, 66 Nov, 57 Dec
ATV by Andy Emmerson G8PTH.....	104 Jan, 104 Feb, 103 Mar, 80 Apr, 94 May, 76 June, 85 Jul, 74 Aug, 66 Sep, 66 Oct, 72 Nov, 64 Dec
Broadcast Round-up by Peter Shore.....	103 Jan, 103 Feb, 101 Mar, 80 Apr, 92 May, 76 Jun, 83 Jul, 72 Aug, 65 Sep, 65 Oct, 71 Nov, 63 Dec
CB Corner.....	47 May, 31 June, 65 Jul, 39 Sep, 38 Nov, 35 Dec
Helpline.....	23 Feb, 104 Mar
HF Bands by Paul Essery GW3KFE.....	89 Jan, 89 Feb, 88 Mar, 61 Apr, 77 May, 58 June, 69 Jul, 56 Aug, 50 Sep, 51 Oct, 60 Nov, 51 Dec
Keylines.....	17 Jan, 17 Feb, 17 Mar, 13 Apr, 15 May, 15 June, 13 Jul, 13 Aug, 13 Sep, 13 Oct, 15 Nov, 11 Dec
Newsagents Box.....	72 Jan, 72 Feb, 72 Mar, 65 May, 54 Jun, 53 Aug, 24 Oct, 36 Nov, 23 Dec
Newsdesk '90.....	20 Jan, 20 Feb, 20 Mar, 16 Apr, 18 May, 18 Jun, 16 Jul, 16 Aug, 16 Sep, 16 Oct, 18 Nov, 15 Dec
PCB Service.....	72 Jan, 72 Feb, 72 Mar, 59 Apr, 86 Jul, 53 Aug, 41 Sep, 24 Oct, 36 Nov, 30 Dec
Practically Yours by Glen Ross G8MWR.....	86 Jan, 70 Feb, 53 Mar, 35 May, 57 Jul
Propagation by Ron Ham.....	101 Jan, 101 Feb, 99 Mar, 76 Apr, 90 May, 73 Jun, 81 Jul, 70 Aug, 61 Sep, 62 Oct, 70 Nov, 61 Dec
PW Book Reviews.....	67 Oct, 42 Nov, 36 Dec
PW Book Service.....	106 Jan, 106 Feb, 106 Mar, 84 Apr, 98 May, 79 Jun, 87 Jul, 75 Aug, 68 Sep, 68 Oct, 75 Nov, 65 Dec
Radio Diary.....	29 Jan, 105 Feb, 43 Mar, 56 Apr, 69 May, 37 Jun, 24 Jul, 46 Aug, 67 Sep, 23 Oct, 73 Nov, 26 Dec
Receiving You.....	18 Jan, 18 Feb, 18 Mar, 14 Apr, 16 May, 16 Jun, 14 Jul, 14 Aug, 14 Sep, 14 Oct, 16 Nov, 11 Dec
RTTY by Mike Richards G4WNC.....	95 Jan, 94 Feb, 95 Mar, 67 Apr, 83 May, 66 Jun, 76 Jul, 62 Aug, 55 Sep, 56 Oct
Services.....	36 Mar, 19 Apr, 37 May, 17 Jun, 15 Jul, 15 Aug, 15 Sep, 15 Oct, 19 Nov, 13 Dec
Subscriptions.....	23 Jan, 23 Feb, 19 Mar, 45 Oct, 30 Nov, 42 Dec
Ten Spot by John Petters G3YPZ.....	55 Jan, 81 Feb, 48 Mar, 57 Apr
VHF Up by David Butler G4ASR.....	91 Jan, 90 Feb, 90 Mar, 62 Apr, 79 May, 61 Jun, 70 Jul, 57 Aug, 51 Sep, 53 Oct, 61 Nov, 52 Dec
Wanna Swap.....	67 Jan, 41 Feb, 36 Mar, 81 Apr, 34 May, 67 Jul, 55 Aug, 23 Sep, 26 Oct, 74 Nov, 50 Dec
What a Good Idea!.....	22 Oct, 59 Nov, 33 Dec
What is Propagation? by Ron Ham.....	87 Jan, 71 Feb, 49 Apr, 65 May, 38 Jun, 54 Aug, 40 Sep, 34 Dec
Wireless-Line.....	41 Apr, 39 May, 77 Jun, 32 Jul, 43 Sep, 23 Oct, 26 Nov, 17 Dec

YOUR LOCAL DEALERS

SOUTH WALES

ELECTRO MART

Receivers, Scanners, Howes, ERA, CB, Marine radio etc. part exchange welcome.

96 High St. Clydach,
Swansea
Tel: 0792 842135

WEST MIDLANDS

BADGER BOARDS

QUALITY PCB's
MULTIPLE or SINGLES & KITS
Please send S.A.E. for information or
write for quotation to:

BADGER BOARDS
B7 Blackberry Lane
Four Oaks, Sutton Coldfield
B74 4J or 021 353 9326

**TO FILL
THIS SPACE
CALL:**

**0202
676033**

DERBYSHIRE

RILEY'S T.V. SERVICES LTD.

SUPPLIERS OF:
SCANNERS — C.B. 27-934 MHZ —
AERIALS — TEST METERS — TOOLS —
TELEPHONES KITS AND CABLES

125 LANGWITH ROAD
HILLSTOWN
CHESTERFIELD S44 9SP
PHONE 0246 826578

CLOSED WEDNESDAY

HERNE BAY



ICOM (UK) LIMITED

The Official Icom Importer
Unit 8, Sea Street
Herne Bay, Kent CT6 8LD
Tel: 0227 369464

Fax: 0227 360 155
Open Mon-Fri 9 am-5.30 pm
(Lunch 1-2.00 pm)

SOUTHAMPTON

South Midlands Communications

Official Yaesu Importer

S.M. House, School Close,
Chandlers Ford Industrial Estate,
Eastleigh Hants SO5 3BY.
Tel: 0703 255111

PORTSMOUTH

Nevada Communications

Importers of the Nevada
range of 934MHz equipment

189, London Road,
North End, Portsmouth,
Hants, PO2 9AE
Tel: 0705 662145

DEVON

Reg. Ward & Co. Ltd.

The South-West's largest amateur
radio stockist. Approved dealer for
Kenwood, Yaesu and Icom

1 Western Parade,
West Street, Axminster,
Devon, EX13 5NY
Tel: 0297 34918

(Closed 1:00-2:00 and all day Monday)

BUCKINGHAMSHIRE

Photo-Acoustics Ltd.

Approved Kenwood, Yaesu and
Icom dealer (part exchange
always welcome)

58 High Street, Newport Pagnell,
Buckinghamshire MK16 8AQ
Tel: 0908 610625

(Mon-Fri 9:30-5:30, Sat 9:30-4:30)

EAST YORKSHIRE

"Characteristics"

FOR YOUR AMATEUR RADIO AND CB
REQUIREMENTS
GOOD PRICES GIVEN FOR YOUR SURPLUS
EQUIPMENT
OPEN SUNDAY

44, Hilderthorpe Road
Bridlington
YO15 3BG
Telephone
0262 673635



WEST SUSSEX

MAIL ORDER
RETAIL



BREDHURST ELECTRONICS LTD.

High St., Handcross, West Sussex
Tel: (0444) 400786



Situated at the Southern end of
M23. Easy access to M25 and
South London.
Open Mon-Fri 9am-5pm
except Wed 9am-12.30pm.
Sat 10am-4pm.



YORKSHIRE

YAESU
ICOM
Kenwood

Alan Hooker Radio Communications

42, Netherhall Road, Doncaster.
Tel: 0302 325890
Open Mon-Sat 10-5pm
Closed Thursdays

CORNWALL 24hrs, 7 Days a Week

SKYWAVE

RADIO AMATEUR & MARINE
COMMUNICATIONS SERVICES
ICOM, YAESU, NAVICO
JAYBEAM, Etc.

47 Trevarthian Road,
St. Austell,
Cornwall PL25 4BT
Tel: 0726 65418

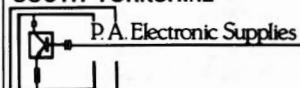
Voice Bank: 0426 961909

PLEASE MENTION

PRACTICAL WIRELESS

WHEN REPLYING TO
ADVERTISEMENTS

SOUTH YORKSHIRE



NEW COMPONENTS KITS TRANSISTORS I/C
AND SURPLUS EQUIPMENT MAIL ORDER
CATALOGUE SEND CO/PO FOR £1.50

98 Newmarsh Hill
Parkgate
Rotherham
South Yorks
S62 6EX

Open Six Days
Mon to Sat
Phone (0709) 527109

HF/VHF/UHF RECEIVERS FROM RADIO SHACK

We will be at our usual stand No. 61 at this year's Leicester Amateur Radio Show. For those of you who want a pedigree transceiver there may still be a Collins, but we have no axe to grind and will sell you anything from Icom, Kenwood and Yaesu to name but a few.

Do you want a new computer? We can also supply you with almost anything that takes your fancy and take in your amateur gear in trade!

Come along and talk to us

IC-R1 £399
IC-R100 £499
IC-R72 £645
IC-R7000 £895
IC-R9000 £3995
FRG-8800 £639
FRG-9600 £495

AR-800E £169
AR-900E £199
AR-950E £249
AR-1000 £249
AR-2002 £487
AR-3000 £765
R-535 £249

HF-225 £425
R-5000 £875
PRO-38 £99
PRO-34 £199
PRO-2005 £299
HP-100E £249
BC-200XLT £229

RECEIVING and TRANSMITTING

Equipment by

ICOM, KENWOOD, YAESU, JUPITER, FAIRMATE and all LEADING
MANUFACTURERS. COMPUTERS by TANDON, PHILIPS,
CAMBRIDGE, TANDY and OTHERS, ALL SOFTWARE.

MAIL ORDER & EXPORT A PLEASURE

73s — Terry G3STS
COME AND GET
A BARGAIN!



RADIO SHACK LTD

(Just around the corner from West Hampstead Station on the Jubilee Line)

Giro Account No. 588 7151 Fax: 071-328 5066 Telephone: 071-624 7174

188 BROADHURST GARDENS,
LONDON NW6 3AY





ICOM

Count on us!

IC-725 Budget HF



- General Coverage Receiver
- 105dB Dynamic Range
- 100W Output

- DDS System
- 26 Memories
- Scanning

- CI-V Computer Control
- Semi Break-in

The new ICOM IC-725 budget H.F. has been produced due to the demand for a simple, high specification transceiver. Despite the limited features, compared to more expensive equipment this set retains a superior level of technical performance necessary to operate on the H.F. bands today.

Additional features include Noise Blanking, Pre-amp, Attenuator, AGC and RIT. The DDS System (Direct Digital Synthesizer) ensures fast Tx/Rx switching times, ideal for Data Communications. An A.T.U. controller is built

into the IC-725 for use with the AH-3 H.F. Automatic Antenna Tuner for mobile or base station operation.

Accessory options available are the PS-55 20A P.S.U., AH-3 Auto Antenna Tuner, UI-7 AM Tx. FM Tx/Rx Unit, FL-100 500Hz CW Filter, FL-101 250Hz CW Narrow Filter and SP-7 External Loudspeaker.

For more information on the IC-725 budget H.F. and other ICOM amateur equipment contact your nearest authorised ICOM dealer or phone us direct.

Icom (UK) Ltd.

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

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

Datapost: Despatch on same day whenever possible.

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



1991 BUYER'S GUIDE TO ELECTRONIC COMPONENTS

Maplin

FEATURING:
AN ELECTRONICS
CAST OF
THOUSANDS!

POWER-PACKED
WITH OVER
600 PAGES!!

STARRING
HUNDREDS OF
NEW PRODUCTS
AT SUPER
LOW PRICES!

**SHOWING
NOW!**

at your local
WHSMITH

Order you copy of the New MAPLIN Catalogue on sale NOW
Pick up a copy from any WHSMITH for just £2.45 or post this coupon now to receive your
copy for just £2.45 + 50p p&p. If you live outside the U.K. send £4.85 or
20 International Reply Coupons. I enclose £2.95.

Name _____
Address _____
Post Code _____
Send to Maplin Electronics,
P.O. Box 3, Rayleigh,
Essex SS6 8LR.
PW91

PERFORMANCES DAILY
At your local branch
of WHSMITH
ONLY £2.45

ROD BROWN '90