practical wireless - britain's best selling amateur radio magazine

pw

www.pwpublishing.ltd.uk

Reviewed

Cushcraft Dual-Band Vertical Antenna

September 2005 £3.00

pwp

9 770141 085082 09>

WATERS & STANTON

UK'S L

New Matlock Opening Hours: 9am-5pm Tuesday to Friday, 10am-4pm Saturday, Closed Monday

HEAD OFFICE & SOUTHERN STORE • SPA HOUSE, 22 MAIN RD, HOCKLEY, ESSEX, SS5 4QS ENQUIRIES: 01702 206835/204965 FAX: 01702 205843
MIDLANDS STORE • W&S @ LOWE, BENTLEY BRIDGE, CHESTERFIELD RD, MATLOCK, DERBYSHIRE, DE4 5LE ENQUIRIES: 01629 832375 FAX: 01629 580020
SCOTTISH STORE • W&S @ JAYCEE, 20 WOODSIDE WAY, GLENROTHES, FIFE KY7 5DF ENQUIRIES: 01592 756962 FAX: 01592 610451-CLOSED MONDAYS

LOWE OPEN DAY

Saturday 10th September

Stalls from Icom, Kenwood, Yaesu, the RSGB FunBus, and a Boot Sale too!
Starts at 10am

Programming Software For Your Radio

Programme Memories and all your radio's functions from your PC. Includes Windows software and serial lead with adaptor for your Radio.

ADMS-1F	Software for VX-110/1	£39.95
ADMS-1G	Software for VX-7	£39.95
ADMS-1H	Software for VX-2R	£39.95
ADMS-1J	Software for FT-60E	£39.95
ADMS-2H	Software for FT-8900	£39.95
ADMS-2I	Software for FT-8800	£39.95
ADMS-2J	Software for FT-2800	£39.95
ADMS-2K	Software for FT-7800	£39.95
ADMS-3	Programming Kit for VR-500	£39.95
ADMS-4A	Software for FT-817	£29.95
ADMS-4B	Software for FT-857/D	£29.95

PRICEMATCH!

We will match or beat any UK advertised price on UK sourced and UK guaranteed stock items must be in stock with the competitor and brand new not B Stock or old stock clearance.

CALL FREEPHONE SALES 08000 73 73 88

Visit our eBay shop for more bargains!

eBay

Go to www.wsplc.com then click on the link to our eBay shop

PAY NOTHING 'TIL 2006!

BUY NOW PAY LATER AT ALL 3 STORES

AVAILABLE ON ALL SALES OVER £200

You won't find a better deal!

Proof that at W&S you get the best possible deal. On selected items it is now possible to pay nothing for a whole year without incurring any interest charge. Amazing but true. And what's more, you get probably the best prices in the business. Give us a call today or visit one of our branches.

0% APR Typical example of buy now pay later. Cash price £600. Pay no deposit and pay the full amount by the due date. Pay no interest.

OR

29.8% APR Repay £31.53 per month for 36 months, after the 12 month period . Total amount due £1135.08. Interest is calculated from the date of the agreement.

All finance subject to status written quotation on request.

IC-E90 SPECIAL OFFER!

- 50MHz, 144MHz, 433MHz
- FM • 5W
- 0.495 - 999.990MHz Wide band Rx
- AM/FM/WFM
- 550 memories
- Dial speed adaptive tuning
- 50 CTCSS & 104 DTCS tones
- DTMF encoder 10 memories
- Backlit ten-key pad
- Aluminium die-cast case & chassis
- 5.5-11.5V DC external supply
- 1300mAh Li-ion battery
- 58 x 87 x 29mm

Carriage £6

LIST PRICE ~~£309~~
SAVE £110!
NOW £199

THE SGC ADSP² SPEAKER

The Cheapest DSP Speaker on the Market!

The SGC ADSP² Speaker has built in ADSP noise filters. There are 3 modes selectable with a press of a button.
1)No Reduction
2)Original ADSP
3)New ADSP² noise reduction

£69.95 B
Order as ADSP-2-EXT

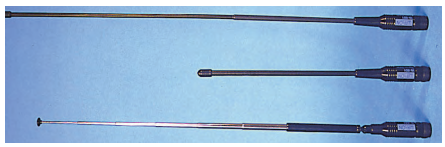
FAST SAME-DAY DESPATCH

www.wsplc.com

GREAT AFTER-SALES SERVICE

FREEPHONE ORDER LINE **08000 73 73 88**

Hear the difference! These antennas make to your scanner really perform!



W-801	BNC 25-1900MHz 21cm Long	**£12.95**
WSMA-801	As above but SMA connector	**£12.95**
W-881	Super Gainer 25-1900MHz 42cm L.	**£19.95**
WSMA-881	As above but with SMA fitting	**£19.95**
W-901	VHF/UHF Airbander BNC 10cm L.	**£19.95**
W-889 BNC	Telescopic Gainer 25-1900MHz 40cm	**£14.95**
WSMA-889	As above but with SMA 13 - 40cm L.	**£14.95**

Icom HF Transceivers

ICOM IC-756 PRO III

Top of its range of HF transceivers. HF & 50MHz, features large colour LCD with spectrum scope, auto ATU and 32-bit floating point DSP unit.

£2099 C

IC-7800 £6400 C
Icom' Flagship HF 200W transceiver. 200W max. The ultimate receiver - the ultimate design! AC psu built in.

IC-7800-PACK £6995 C
The superb transceiver as above plus 17" flat screen, keyboard and SM-20 base microphone.

IC-7400 £1299 C
HF/VHF 160m - 2m transceiver 5 - 100W. SSB CW FM AM. 12V DC. Nice big display. Lovely price.

IC-706 MkIIGDSP £769 C
It's unbeatable. 160m - 70cm (up to 100W HF) yet so small with detachable head. The ultimate mobile..

IC-718 £449 C
This is a budget class radio HF 160 - 10m at a price that belies its performance. Beautiful display.

IC-703 *FREE IC-703 Logbook* £539 C
Take an IC-706, reduce power to 10W max and get rid of VHF/UHF. 160 - 6m of pure QRP joy!!

Going HF Mobile?

Then check out the great 80m - 6m SIDEKICK magnetic mount whip from USA. No hassel and great performance. £249.95 C

Kenwood HF Transceivers

KENWOOD TS-2000

Top-of-the-range Kenwood transceiver. The Station in a box. 160m-70cm with every feature imaginable inc. DX Cluster. Kenwood fans dream rig. HF/VHF/UHF or up to 23cm with the optional module. Built-in auto ATU, DSP and its unique TNC.

£1389 C

TS-2000X £1799 C
Take the TS-2000 and add a superb 23cm module. The best 23cm we know of plus all other bands!

TS-B2000 £1299 C
Designed for the 21st century. You get HF - 70cm with PC software for direct PC control. It works great.

TS-570DG £839 C
The best budget radio at the price. Superb 100W from 160m to 10m. As used by Peter Waters, G3OJV

TS-480HX £1049 C
Take the TS-480SAT, remove the auto ATU and offer a beefy 200W output. That's a really potent package!

TS-480SAT £899 C
HF 160m - 6m with remote front panel. Large enough for base use, small enough for mobile. Big display

Buy a TS-480SAT & get Free Of Charge a Heil Microphone Package. To claim send a copy of invoice to Kenwood

Yaesu HF Transceivers

YAESU FT-1000 MKV

200W HF transceiver, EDSP, Collins filter, auto ATU, 220V AC PSU. Acknowledged as one of the finest DX rigs on the market. Superb tailored audio and the ability to select Class A bias for dramatic signal purity.

£2099 C

FT-1000 FIELD £1699 C
The HF choice for DXers. With this rigs reputation on DXpeditions what more persuasion do you need?

FTV-1000 £729 C
6m 200W module for the FT-1000 range. Probably the ultimate for 6m DXing.

FT-897D £649 C
160m - 70cm self-contained portable. 100W and up to 20W from optional internal batts.

FT-857D *SPECIAL LOW PRICE* £579 C
160m - 70cm mobile with up to 100W output. Lovely tuning control from remote head unit - and great price!

FT-847 £999 C
Complete station in a box! 160m - 70cm - up to 100W (50W 2m/70cm). Great for satellite work.

FT-840 £399 C
Is there any other radio that comes close to this price? One of our all-time best sellers. 100W 160m - 10m

FT-817ND *SPECIAL OFFER* £489 C
The ultimate QRP self-contained radio. Up to 5W output 160m - 70cm. New low price. UK warranty.

FT-817DSP *SPECIAL OFFER* £589 C
FREE CSC-83 CARRYCASE WITH FT-817ND/DSP

Warning - as a regular advertiser you can be sure all our stock is genuine UK warranted. Check serial numbers!!

Carriage Charges: A=£3, B=£6, C=£10

OWEST PRICES

ZERO DEPOSIT ZERO INTEREST

Enquiries 01702 206835

Freephone Orderline 08000 73 73 88

Icom
VHF/UHF Mobile/Base

ICOM IC-E208

VHF/UHF FM Dual Band Mobile Transceiver
*Freq range 144-146MHz, 430-440MHz Tx
*55/50W (3 pwr steps each band)
*Wideband Rx 118-173, 230-549 & 810-999MHz
£239 C

IC-910H £1099 C
2m / 70cm 100W Base station all - modes with option for 23cm module (**UX-910 £359**)

IC-910HX £1249 C
As above but with 23cm module ready fitted and a big saving as well.

IC-2725E £269 C
Icom's new dual band 2m / 70cm radio. Very easy to operate and install and a lovely detachable head.

Kenwood
VHF/UHF Mobile/Base

KENWOOD TMD-700E

2m/70cm dual band mobile transceiver with APRS. Does not need extra high cost boards to function. Only extra if required is a compatible GPS receiver. **£439 C**

TM-G707E £269 C
Dual Band 2m & 70cm with detachable front

TM-V7E £359 C
Dual Band 2m & 70cm with 50/35W output

TM-271E £189 C
Single Band 2m FM 60W mobile transceiver

Yaesu
VHF/UHF Mobile/Base

YAESU FT-7800E *SPECIAL OFFER*

*2m/70cms Dual Band Mobile *High power 50W 2m /40W 70cms *Wide receive inc. civil & military airband *CTCSS & DCS with direct keypad mic. *Detachable front panel *1000 memories plus five one-touch
FREE YSK-7800 SEPERATION KIT
£229 C

FT-2800M *FREE MLS-100 SPEAKER* £159 C
*2m FM Mobile transceiver * High power 65W * Capable of VHF wideband receiver

FT-8800E *LOW PRICE* £269 C
*2m/70cmDualband FM Mobile transceiver * 50W 2m, 35W 70cm * Wideband receiver

FT-8900R £339 C
*2m, 70cm, 6m & 10m Quadband FM Mobile transceiver * Independent dial for each band

Watson
On-Glass Antenna

WGM-270

Dual Band 2m/70cm mobile whip. 2.5dB gain and 1.5:1 VSWR. 0.5m long. Complete system including 3.5m cable. No drilling involved. Antenna sticks on glass and interface assembly sticks on inside. Simple and very effective.
£29.95 B

Icom
VHF/UHF Handhelds

NEW
IC-V82 Digital Handy
2m FM Handheld 7W, 4W, 0.5W with optional digital voice capability.
Phone for discounted price!

IC-T3H £129 C
2m FM handheld 5.5W c/w BC-01 & BC-146

IC-T22A £149 C
2m FM 5W handheld transceiver

Kenwood
VHF/UHF Handhelds

KENWOOD TH-F7E

• 144-146MHz Tx/Rx: FM
• 430-440MHz Tx/Rx: FM
Up to 6W out with Li-ion battery and **"scanner" style coverage from 100kHz to 1300MHz** including SSB on receive! This is a great radio to have at all times when you are on your travels.
£239 B

TH-D7E £299 C
2m/70cm dualband FM handheld transceiver with data communications

TH-G71E £179 C
2m/70cm dualband FM handheld transceiver

TH-K2E £139 C
2m FM 5W portable transceiver c/w Ni-MH battery/charger

TH-K2ET £145 C
2m FM 5W portable transceiver c/w Ni-MH battery/charger

TH-K4E £139 C
70cm FM 5W portable transceiver c/w Ni-MH battery/charger

Yaesu
VHF/UHF Handhelds

YAESU VX-7R

SPECIAL OFFER
Totally waterproof, wide frequency coverage 500kHz-900MHz AM/FM. 132x64 dot matrix display providing easy-to-read frequencies and information plus pictorial graphics.
£249 C

NEW VX-6R 2m /70cm
Submerrsible 5W £199 B

FT-60E See top of page £179 C
VX-2E 2m/70cms min £119 C
VX-110 2mhandheld £99 C

Alinco
VHF/UHF Handhelds

DJ-V5E £159 C
2m/70cm FM 5W dualband handheld transceiver

DJ-193E £91 C
2m FM transceiver no keypad, Ni-Cds & charger

DJ-195E £99 C
2m FM transceiver with keypad Ni-Cds & charger

DJ-C7E £124 C
2m, 7cm credit size FM handheld

Linear Amp UK
HF Linear Amplifiers

RANGER 811H

*1.8 - 29.7MHz *800W CW or SSB, 400W RTTY *Uses 4 x811A vertically mounted *Drive 10 - 100W *Toroidial AC Power Transformer *6:1 Reduction Drive on Tuning Controls *"Near Silent" Papst Cooling fan *Front-panel ALC Adjust Control *Built-in AC 230V @ 8A Supply
£945 B

CHALLENGER III £1795 C
HF linear amplifier 10-160m WARC 100W in 1.5kW out

W3FF
NEW Mini Buddipole

Portable 40 - 2m Ant
Just 14" long packed!

£199

Comes in a case **just 14" long** yet extends to a **highly efficient 4.6m long rigid rotatable dipole.** Great for camping and back-packing. Handles 200W and band changing is just a coil tap away. Supplied with 25' of coax and balun. Centre has standard 1/2" plumbers pipe thread. Optional telescopic mast and tripod available.

SGC
HF Linear Amplifiers

SG-500 £1399.95 C
"Power Cube" 1.6-30MHz 500W solid state

Yaesu
HF Linear Amplifiers

VL-1000 QUADRA £3795 C
HF + 6m linear amp. 1kW comes with PSU

Super Antennas
40 - 2m Screwdriver

A very efficient portable vetical 185cm long when fully extetended approx 40cm packed down. Coil is continuously hand adjusted for resonance. Covers 80 - 10m plus 6/2/70 with just whip. Supplied with universal base table clamp and SO-239 plus radials. 100W Max. "Superb performer" says G3OJV
Order MP1-SA £139.95 B
Mini tripod support £22.95 A

ANTENNAS

W-2LE	1/4 wave 2m 0.48m 200W	£9.95	B
W-285	5/8th 2m 1.33m long 200W	£14.95	B
W-72LS	2m/70cm 0.42m 50W	£14.95	B
W-70HB	2m/70cm 1.1m 200W	£24.95	B
W-7900	2m/70cm 2m/70cm 1.58m	£32.95	B
WSM-270	Dual band mini magnetic	£19.95	B

BASES

WM-08	8cm diam magnetic	£9.95	A
WM-14B	14cm diam magnetic	£12.95	A
W-3HM	Hatch mount	£14.95	A
ECH	Cable kit	£10.95	B

NOTE: All antennas have PL-259 ends. Mag mounts have cable attached. Hatch mount needs ECH cable.

NEW STOCK & OFFERS

YAESU FT-60E *NEW*

*Wide band Reception 108-520MHz & 700-999.990MHz (Cellular blocked) *New Emergency Automatic ID System *High 5W Power Output *Ni-MH Long-Life Battery FNB-83 (7.2V,1400mAh) *Programmable Keys for user convenience *Split CTCSS/DCS and DCS Encode-Only Capability.
£179 B

MFJ-936B "Magic Circle" Loop Tuner *NEW*

This is the most amazing antenna we have seen in years. For optimum results take a wire around 1/5th wave long, bend into square loop (14ft on 20m = 3.5ft square) and attach to MFJ-936B. Result: Ultra low indoor noise and VK, ZL & W all on SSB! That's what we achieved in one day's operation! 20m loop works on 15m as well. Now In Stock. Great for QRP and portable as well.
£229.95 B

bhi
DSP Equipment

bhi NES10-2 MkII

NES10-2 Combined speaker and programmable DSP unit. Offers dramatic noise reduction, even reduces annoying heterodynes. Power On/Off switch with audio bypass, 8 Ohms, 8 filter settings, 3.5mm plug, 12-24V DC.
£99.95 B

NES-5 £79.95 B
DSP Speaker Basic Plug & Go model

NEIM-1031 £129.95 B
Noise Eliminating In-Line Module with DSP

1042 £19.95 A
Switch box allowing up to 6 items to connect to one bhi speaker/module.

NEDSP-1061 £89.95 B
Small DSP PCB module for retrofitting into rigs

NEDSP-1062-PCB £89.95 B
Amplified DSP module to insert in speaker path

NEDSP-1062-KBD £99.95 B
As NEDSP-1062 but with small keyboard

NCH £34.95 B
ANR Noise Cancelling headphones

Watson
Mobile Antennas

Carriage Charges: A=£3, B=£6, C=£10

WATERS & STANTON

Freephone Orderline
08000 73 73 88
Enquiries 01702 206835
www.wsplc.com

UK'S LOWEST PRICES!

NEW STOCK & OFFERS

MANSON SDC-2010

£9.95 A

NEW

* Cigar Plug-in DC adaptor
* 1.5 - 12V DC 1.5 Amps
* Stabalised and protected.
* 7 - way DC adaptor set.
* Matches most Yaesu / Alinco sockets.
* Works from 12 V or 24 V vehicle systems.

POCKET MORSE READER MFJ-461

Reads CW
Just hold near receiver speaker

£79.95 B

That's right, just hold this self-contained decoder near your speaker and see the text scroll across the screen. Absolutely amazing

SG-2020 ADSP QRP 20W HF Radio

160m - 10m
0.1 - 20W
Full DSP
Diecast Chassis

Perfect for QRP. SSB / CW and DSP processing. Passband down to 100Hz. Built-in SWR meter and electronic keyer. Max Tx drain 4A. Size 15 x 6.5 x 18cm. 680g.

£589.95 B

Antenna Accessories

Dipole Kits

Kevlar	Strong 400lb strain line 200ft	£22.95	A
FW-PVC-50	50m clear PVC 2mm wire	£39.95	A
Maxweave	50m multi-strand 2mm wire	£29.95	A
HDCW	50m hard drawn 16g copper	£14.95	A
Insul-8	Black ribbed insulator	£0.99	A
WDC-50	SO-239 dipole centre insulator	£6.49	A
Egg-I	Large ceramic egg insulator	£4.99	A
Egg-s	Small ceramic egg insulator	£1.75	A
WS-2580	25pcs 3" ladder line spacers	£9.95	A

Diamond 50 Ohm Balunas

BU-50	1:1 1.7MHz 40MHz 1.2kW	£26.95	A
BU-55	1:1 3.5MHz - 75MHz 500W	£34.95	A

Antenna Traps (pairs)

TR-200-14	200W bands 10m - 20m	£14.95	B
TR-200-10	200W 10MHz	£47.95	B
TR-200-7	200W 7MHz	£49.95	B
TR-200-3.6	200W 3.6MHz	£59.95	B
TR-1000-14	1kW balun 10m - 20m	£59.95	B
TR-1000-10	1kW 30m	£61.95	B
TR-1000-7	1kW 40m	£64.95	B
TR-1000-3.6	1kW 80m	£73.95	B

German Made High Quality Baluns

HB-1-200	1:1 3.5 - 30MHz 200W	£25.95	B
HB-4-200	4:1 3.5-30MHz 200W	£25.95	B
HB-6-200	6:1 3.5 - 30MHz 200W	£25.95	B
HB-1-1	1:1 3.5 - 30MHz 1kW	£34.95	B
HB-4-1	4:1 3.5 - 30MHz 1kW	£41.95	B
HB-6-1	6:1 3.5 - 30MHz 1kW	£41.95	B

Remote 4:1 1.5kW Balun

REM-BAL	For 600 to ladder line match	£45.95	B

Patch Leads

WPL-75	V low loss 75cm PL-259	£6.95	A
WPL-50	Standard 50cm PL-259	£2.99	A
WPL-50BNC	BNC Version of above	£2.99	A
HQ-66	66cm RG-213 PL-259	£4.99	A
HQ-10m	10m long PL-259	£13.99	A

SGC External Auto ATU's

SGC SG-231

1 60MHz. 3 100W pep (50W CW). Min wire length, 7m. 50 Ohm feed. Needs 12V at approx 900mA.

£349.95 C

SG-239 £189.95 C
Mini auto ATU 1.8 - 30MHz 1.5 - 200W PEP primarily for long wires - non waterproof. 12V DC

SG-231 £349.95 C
1.8 - 60MHz 100W PEP. A great random wire tuner that you can use outdoors. 12V DC

SG-237 £299.95 C
1.8 - 60MHz 100W PEP. Great for mounting outdoors and feeding long wire. Waterproof. 12V DC

SG-230 £339.95 C
1.8 - 30MHz 200W PEP. The original design that handles end fed or coax unbalanced. Waterproof. 12V

SG-235 £749.95 C
3.5 - 54MHz. A hunky 500W PEP tuner that handles long wires. Great outdoor design. Waterproof.

Icom External Auto ATU's

AH-3 £479.99 C
1.8 - 28MHz. A hunky 120W PEP tuner that handles whips or wire longer than 2.5m. Waterproof.

Alinco External Auto ATU's

EDX-2 £289.95 C
1.8 - 30MHz 150W long wire tuner designed for use with DX-70 transceiver. Waterproof.

MFJ Internal Auto ATU's

MFJ-993

*Auto ATU with digital data display *1.8-30MHz *Long wire, coax & balanced line *300W SSB, 150W CW *Cross needle metering

£209.95 C

MFJ-991 £179.95 C
1.8 - 30MHz auto ATU. Similar to MFJ-993 but no digital display. Works with any HF transceiver. 150W PEP

MFJ-994 £299.95 C
1.8 - 30MHz high power auto ATU. 600W PEP / 300W CW. Tunes wire, coax and balanced feed.

SGC Internal Auto ATU's

MAC-200 £259.95 C
1.8 - 60MHz 200W PEP. Wire, coax and balanced feeder. Features auto antenna switching.

SG-237PCB £279.95 C
1.8 - 60MHz 100W PEP. Same as SG-237 but without housing for building into your own housing.

SG-211 £189.95 C
1.8 - 60MHz works off internal dry cells. Zero drain wait state. 60W PEP. Ideal for portable (Min 1W).

Yaesu Internal Auto ATU's

FC-20 £249.95 C
1.8 - 60MHz 100W matched for FT-100/Ft-847. Desk top unit to match transceivers. Coax systems only.

FC-30 £249.95 C
1.8 - 60MHz 100W. Designed for use with FT-857/FT897. Coaxial input / output.

FC-40 £239.00 C
1.8 - 60MHz 100W. New waterproof ATU designed for use with FT-897 / FT-857 and mobile operation.

Icom Internal Auto ATU's

AT-180 £349.95 C
1.8 - 54 MHZ ATU designed for IC-706. Plugs directly into transceiver for seamless operation. Coax only.

Kenwood Internal Auto ATU's

AT-50 £319.95 C
1.8 - 30 MHZ 100W ATU specifically designed for use with TS-50 transceiver. Coaxial only.

Cushcraft HF Antennas

MA5V £239.95 C
Vertical 5-band 20m - 10m. No separate radials needed. 250W. Self-supporting. 4.48m tall.

A3-S £469.95 D
The classic 20, 15, 10m 3-el beam. 2kW 8dB gain. 8.45 el. Turn radius 4.72m. F/B ratio 25dB.

A3-WS £379.95 D
Dual Band 3 el. beam for 17m & 12m. 2kW. El length 7.66m. Turn radius 4.4m. Gain 8dB. F/B ratio 25dB.

A4-S £569.95 D
Tri-band 4 element Yagi. for 20m - 10m. DXers delight. 2kW . 8.9dB gain F/B 25dB. Turn radius 5.49m

R-8 £469.95 C
8-band vertical 40m - 6m. No separate radials needed. 1.5kW. Height 8.7m

R-6000 £329.95 C
6-band vertical 20m - 6m. No separate radials needed. 1.5kW. Height 5.8m. Great small garden ant.

MA5B
£369.95 C

5-band 2 El mini beam. 20m - 10m 2kW. Elements 5.2m Turn radius 2.7m. (Dipole on 17/12m) 5dB gain

Diamond HF Antennas

DIAMOND CP6

Covers five popular HF bands and the 6m band. Low angle radiation makes it ideal for DX work. Outperforms dipoles for long distance contacts and compares favourably with beams located 10m+ above ground.

*Bands: 3.5 -50MHz *Power: 200W *VSWR: Better than 1.5:1 *Socket: SO-239 *Height: 4.6m *Radials: 1.8m rigid adjustable

£239.95 C

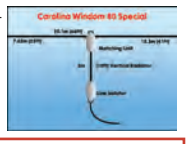
Radio Works HF Antennas

CW-160 £129.95 C
8-band 160m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 265ft long.

CWS-160 £119.95 C
Compact 8-band 160m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 133ft long.

CW-80 £89.95 C
7-band 80m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 133ft long.

CWS-80 £109.95 C



Compact 7-band 80m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 133ft long.

G5RV Plus £59.95 C
Rugged 2kW balun matched G5RV with 102ft element and 31ft ladder line. Requires ATU. Made in USA

Hustler Base Antennas

6-BTV £229.95 C
80 - 6m 6-band vertical. 7.3m tall 1kW. Can be used at ground level with earth stake. Ideal small gardens

5-BTV £199.95 C
80 - 10m 5-band vert. 7.64m tall 1kW. Can be used at ground level with earth stake. Ideal small gardens

4-BTV £169.95 C
40 - 10m 4-band vert. 6.52m tall 1kW. Can be used at ground level with earth stake. Ideal small gardens

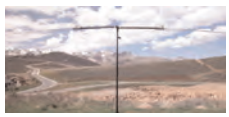
Butternut Antennas

HF-2V £229.95 C
80 / 40m high performance vertical. 1kW PEP 9.75m tall. Self supporting for ground mount use.

HF-6V £299.95 C
6 band vertical 80-40-30-20-15-10m. 2kW. 7.9m tall. Use own radials or ground mount.

HF-9V £349.95 C
9-band 80 40 30 20 17 15 12 10 6m vertical 1kW 7.9m tall. Use radials or ground mount

Buddipole Products



HF Portable at its Best

W3-BP £199.95 B
40m - 2m adjustable dipole. 250W and max length of 4.65m. Packs down to 65cm approx.

W3-MBP £199.95 B
Sames as W3-BP but packs even smaller.

W3-BS £134.95 B
40m - 2m vertical is half a Buddipole. Ideal for QRP and rucksack - as used by Peter Waters G3OJV.

Peter Waters says: *I think these products are great. Superbly engineered and very efficient.* Options include adaptor for dipole to decorators pole £6.95, Field tripod £89.95, 2.45m telescopic mast £49.95, mini tripod for Buddistick.

Super Antennas

MP1-SA £139.95 B
Screwdriver style adjustable HF QRP whip 40m - 70cm. 150W PEP. Max extended 185cm approx

MP2-SA £199.95 B
Electrically tuned version of the above. Requires around 9V - switch control box not included.

MP-80M £29.95 A
Add on 80m coil to extend the LF coverage of the MP1 and MP2.

High Sierra Mobile Whips

HS-1800/PRO
£379.95 C
The ultimate mobile whip. Electrically tuneable 80m - 6m 1kW PEP Includes switch box and 12V cable. Massive 2" coil. Made in USA. Superb!! Available in Black or Grey.

SIDEKICK
£249.95 C
As used by Peter Waters G3OJV/M

Get mobile on all bands from 80m to 6m in minutes. This compact screwdriver antenna comes with cables and control box. Designed to go on our 3-way magnetic mount (£39.95 extra) it is an amazing performer and only 1.37m maximum! Available in Black Only.

Carriage Charges: A=£3, B=£6, C=£10

Now available for 2mtrs or 4mtrs

TETRA COMMUNICATIONS LTD

PHILIPS/SIMOCO
FM 1000 2mtr or 4mtr MOBILE

Now available fully converted to cover the entire 2mtr or 4mtr band with this top of the range model. Frequency selection via numeric keypad as well as selection via up/down buttons in 12.5KHz steps Variable power in 5w 10w 15w 20w 25w. Variable squelch via up/down buttons, squelch defeat button. Complete with original mic, speaker, power lead and mounting bracket. Six months service exchange warranty (However you break it, you pay for the repair)

£65.00 - £7.50 p&p

EXTRAS
2m, 4m, 6m Base station Aerials £29.95
2m, 4m Mobile Mag mount Aerials £19.95
FM1000 Powerleads £10.00
FM1000 Microphones (copy) £15.00

NewsFlash!

General Electric Rangr 6Mtr

The GE Rangr was designed jointly between the General Electric Company (USA) and the Japanese Radio Company (Japan). The main radio unit was manufactured by JRC to the highest standard as the majority of the radios we destined for the internal security forces of the USA. The radio is available in three bands Lowband 50Mhz Midband 150Mhz and UHF 440Mhz. The Rangr is available in two models (The Rangr and the Rangr 89) with two versions in each band (60w and 110w) Radios with 50 within the serial number are earlier than those with 51 within the serial number (Rangr and Rangr 89 respectfully). P7 denotes 60w P8 denotes 110w.

All of the units that we are supplying are the following type P19C852051P8 110w model with 32ch (The radios will be set at 50w ONLY) The radio is in fact a 64ch however the control head has only the facility for 32ch. I am sure that before very long some brainy person will find a modification to throw a switch to give the extra 32ch (We will keep you informed) These radios are ALL USED with only one owner and have been removed fully operational from New York Police Department Vehicles mainly Police Cars (95%). FYI They have gone to 800Mhz (!!!)

We have learnt our lesson on the supply of the FM1200 4Mtr radios, so the price of the Rangr on any 32ch of your choice with in the 6Mtr band is £75.00 plus £7.50P & P you send us a cheque or ring with your card details (you may visit and we will accept cash) we will then select your radio give it a number and by means of a post card or E-Mail send you a confirmation. We will also keep your name and address & call sign (Data Protection Thingy) with your permission so that we may update you on delivery and also any modifications that the brainy person comes up with.

CASH / CHEQUE / DOLLARS / EURO's / VISA / MASTERCARD / AMEX

If you have any questions regarding the above then you are welcome to give me a ring on
01604 234333 or 07836 600700 Gary G6NYH
TETRA Communications Ltd, Victoria Chambers, 1 Victoria Road, Northampton, NN1 5EB
Or by the written word to G6NYH@AOL.COM www.tetra.tv

September 2005
On Sale 11 August
Vol 81 No.9 Issue 1181
(October Issue on sale 8 September)

Published by
PW Publishing Limited
Ar owsmith Court
Station App oach
BROADSTONE
Dorset BH18 8PW
Directors: Stephen Hunt & Roger Hall

Editorial Department
☎ 0870 224 7810
Fax: 0870 224 7850

Editor
Rob Mannion G3XFD/EI5IW
rob@pwpublishing.ltd.uk

Production Editor
Donna Vincent G7TZB/M3TZB
donna@pwpublishing.ltd.uk

Technical Editor
NG (Tex) Swann G1TEX/M3NGS
tex@pwpublishing.ltd.uk

Art Department
☎ 0870 224 7820
Fax: 0870 224 7850

Art Editor
Stephen Hunt
steve@pwpublishing.ltd.uk

Layouts
Bob Kemp
bob@pwpublishing.ltd.uk

Typesetting
Peter Eldrett
peter@pwpublishing.ltd.uk

Sales Department
Fax: 0870 224 7850

Advertisements
Roger Hall G4TNT
roger@pwpublishing.ltd.uk
☎ 0207 731 6222

Advertisement Administration
Joan Adams
joan@pwpublishing.ltd.uk
☎ 0870 224 7820

Book Orders
Clive Hardy G4SLU
clive@pwpublishing.ltd.uk
☎ 0870 224 7830

NEW Subscription Administration
(See page 17 for full details)
Webscribe
Practical Wireless Subscriptions
PO Box 464
Berkhamsted
Hertfordshire HP4 2UR, UK
pw@webscribe.co.uk
www.webscribe.co.uk
☎ 01442 879097
Fax: 01442 872279

Finance Department
☎ 0870 224 7840
Fax: 0870 224 7850

Finance Manager
Alan Burgess
alan@pwpublishing.ltd.uk

Finance Assistant
Margaret Hasted

PW Publishing Website
www.pwpublishing.ltd.uk

All our 0870 numbers are charged at the BT Standard National Rate

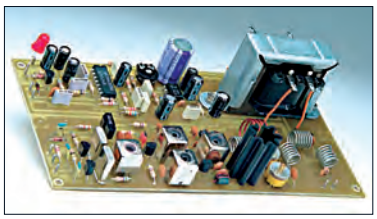
Cover subject

We hope you'll agree that this month's cover is rather striking. The clever design shows part of the circuit from the PW Mellstock with the project superimposed over it. **Steve Hunt** our Art Editor applied some clever techniques to achieve the effect. There's plenty in this issue, so settle down and enjoy!

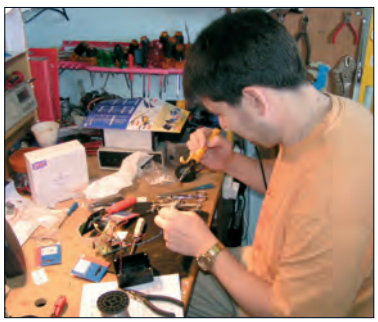
Design: Steve Hunt
Photograph: Tex Swann G1TEX

september features

Page 20

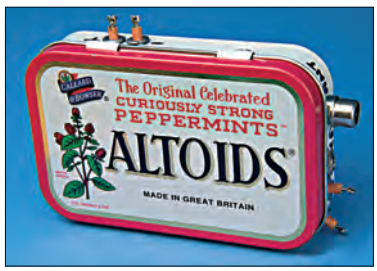


Page 24



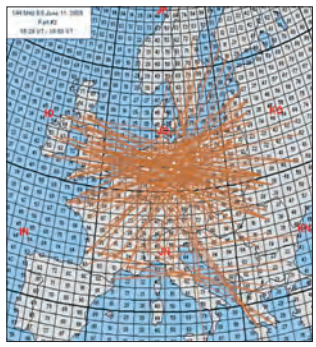
Page 34

Page 39



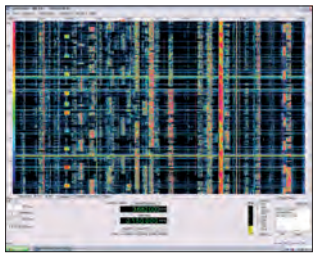
Page 48

september regulars



Page 54

Page 56



Page 58

book store

Page 60 - The biggest and best selection of radio related books anywhere!

author info

Our Radio Scene reporters' contact details in one easy reference point.

VHF DXer
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed
Herefordshire
HR2 0HP
Tel: (01873) 860679
E-mail: g4asr@btinternet.com

HF Highlights
Carl Mason GW0VSW
12 Llwyn y Bryn
Crymlyn Parc
Skewen
West Glamorgan
SA10 6DX
Tel: (01792) 817321
E-mail:
carl@gw0vsw freeserve.co.uk

Data Burst
Robin Trebilcock GW3ZCF
15 Broadmead Crescent
Bishopston
Swansea
SA3 3BA
Tel: (01792) 234836
E-mail:
robin@broadmead.eclipse.co.uk

Jack Weber
c/o PW Publishing Ltd
Arrowsmith Court
Broadstone
Dorset
BH18 8PW
E-mail:
databurst@pwpublishing.ltd.uk

In Vision
Graham Hankins G8EMX
17 Cottesbrook Road
Acocks Green
Birmingham
B27 6LE
E-mail: g8emx@tiscali.co.uk

Published on the second Thu sday of each mon h by PW Publishing Ltd., Ar owsm th Court, Station Approach, Broadstone, Do set BH18 8PW. Tel: 0870 224 7810 P inted in England by Unwin B os., Surrey Distributed by Seymour, 86 Newman Street, London , W1P 3LD, Tel: 0207-396 8000, Fax: 0207-306 8002, Web: http //www seymour co uk. Sole Agents for Australia and New Zealand - Gordon and Gotch (Asia) Ltd.; South Africa - Cent al News Agency. Subscriptions INLAND £32, EUROPE £40, REST OF WOR D £49, payable to PRACTICAL WIRELESS, Subscription Department PW Publishing Ltd., Ar owsm th Court, Station Approach, Broadstone, Do set BH18 8PW. Tel: 0870 224 7830. PRACTICAL WIRELESS is sold subject to he following conditions, namely that it sha l not, w thout written consent of the publishers fi st having been given, be lent, re-sold, hi ed out or othe wise disposed of by way of t ade at more than the ecommended selling price shown on the cover, and that it shall not be lent, re-sold, hi ed out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of T ade, or affixed to or as part of any publication or advertising, lite ary or pictorial matter whatsoever. *Practical Wireless* is Published monthly for $50 per year by PW Publishing Ltd., Ar owsm h Court Station App oach, B oadstone Dorset BH18 8PW, Royal Mail Inte national, c/o Yellowstone Inte national, 87 Burlews Court, Hackensack, NJ 07601. UK Second Class Postage paid at South Hackensack. Send USA add ess changes to Royal Mail Inte national, c/oYellowstone International, 2375 P att Bouleva d, Elk Grove Village, IL 60007-5937. The USPS (Un ted States Postal Se vice) number for P actical Wi eless is: 007075.

practical wireless services

Just some of the services *Practical Wireless* offers to readers...

Subscriptions

Subscriptions are available at £33 per annum to UK addresses, £41 Europe Airmail and £50 RoW Airmail. Joint subscriptions to both *Practical Wireless* and *Short Wave Magazine* are available at £62 (UK) £75 Europe Airmail and £93 RoW Airmail.

Components For *PW* Projects

In general all components used in constructing *PW* projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified, a supplier will be quoted in the article.

Photocopies & Back Issues

We have a selection of back issues, covering the past three years of *PW*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. See page 72 for details.

Placing An Order

Orders for back numbers, binders and items from our Book Store should be sent to: **PW Publishing Ltd., Post Sales Department, Arrowsmith Court, Station Approach, Broadstone Dorset BH18 8PW**, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone **0870 224 7830**. An answering machine will accept your order out of office hours and during busy periods in the office. You can also FAX an order, giving full details to Broadstone **0870 224 7850**. The E-mail address is **clive@pwpublishing.ltd.uk**

Technical Help

We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. Any technical queries by E-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by *PW*, then please write to the Editorial Offices, we will do our best to help and reply by mail.

rob mannion's keylines

Welcome to 'Keylines'! Each month Rob introduces topics of interest and comments on current news.

I'm very concerned for the future of the administration of Amateur Radio in the United Kingdom. It seems to me that our wonderful pastime is at the mercy of two organisations with separate agendas.

Ofcom's agenda is obvious to all: Regulation must not (as I've suggested before) cost money. If at all possible it should earn revenue. If it does cost money - Ofcom's masters (HM Government in the form of invisible Civil Servants) say it must cost as little as possible.

What the Radio Society of Great Britain's real agenda is - following the advert published in the August *PW* - can only be the subject of conjecture. Only the inner circle of the Society (I am a member) know why they are so against any form of change of regulation, possibly effecting their planned business interests.

In the long term I plan to continue RSGB membership and sincerely hope that Amateur Radio in the UK will be regulated by the hobby itself. It may be that our national society will then require very few, or even no full time employees with the minimum of expensive property involved. If other national societies can do it - we can! We could then put all our voluntary energies into protecting, promoting and enjoying Amateur Radio rather than running a business - with no (perhaps) hidden agenda.

Finally, we must not forget Ofcom is a seemingly chaotic, expanding organisation. I urge individual readers to write to their Members of Parliament to ensure they know what's being done in the name of Government. They've have their problems and we'll have to sort ours out very soon!

Radio - But Different!

Now for something completely different although it's still about radio! As a proud father I'm delighted to announce that my youngest daughter **Alexandra** has just completed a three year degree course in drama and gained a 'First' and a 'Second' Honours. She trained under no less than the authority of Dame **Judy Dench** at the **Central School for Speech and Drama**. In doing so, life has come full circle for Alex and I'm delighted the journey started with a ZN414 home-brew radio!

Twelve years or so ago, I was busy running the school radio society (**G0RSC** was our callsign) at **Clayesmore School** at Iwerne Minster near Blandford Forum here in Dorset. Both my daughters had won scholarships to the school and during the time Alex was in the Preparatory School she asked me to build her a radio so she could listen to BBC Radio 4 after dormitory 'lights out'.

The Clayesmore radio society's standard first project was a ZN414 receiver built on to a wooden baseboard with a choice of medium or long wave coverage. Everyone in Alex's dormitory had a torch for bedtime use so I built the receiver into a torch body! The lens was replaced by a telephone insert dynamic earpiece (ideal for ZN414 use) and the set was fixed tuned onto the Droitwich 198kHz transmissions.

Alex Mannion (left) - finds a refuge in Dad's ample figure to hide, while Rob's wife Carol and eldest daughter Charlotte laugh at the photographer's suggestion that Rob has room to shelter all three plus the grandchildren!

Alex had already taken part in school plays and delighted in listen to radio drama in the evenings. The radio soon became a popular open secret and even teachers wanted one for their own use!

The circle has now been completed because on Tuesday 12 July Alex. (**left in Fig. 1**.), made her own history by working as a professional actor in her first radio play (where she played variety of parts!), written, and produced by the exceptionally well known actor-writer **Martin Jarvis** - I particularly enjoy his series of readings (complete with his own superb presentation of the individual character voices) of the **Richmal Crompton** *Just William* stories). And to top it all - the radio play was recorded at the London studios where Alex's fiancée **Trevor Best** is Recording Manager!

However, Alex is not the first Mannion to 'tread the boards'. This is because my Aunt, the late **Moira Mannion** - played the part of Woman Sergeant Grace Millard in the long running series *Dixon of Dock Green* in the early 1960s. Additionally, many of my extended family are involved in broadcasting, particularly Television and Radio news production/editing.

Just imagine, the pathway to Alex's career started with a simple radio project that provided endless pleasure, entertainment and education. Consider what your radio skills could do to encourage your own youngsters, grandchildren - and the children of those not privileged to enjoy the hobby themselves!

Obviously, my unfortunate colleagues at PW Publishing Ltd. have been kept informed. They've also been extremely indulgent towards this proud (and no doubt often boring!) G3XFD father figure!

However, if you're like myself and enjoy BBC Radio 4 drama you may like to tune in when the play is broadcast? If so I'll be delighted to let you know when it's to be broadcast.

Perhaps I should listen in to the radio play on my grandson Freddy's newly built crystal set? Perhaps that will be possible - if I can get him to share the headphones!

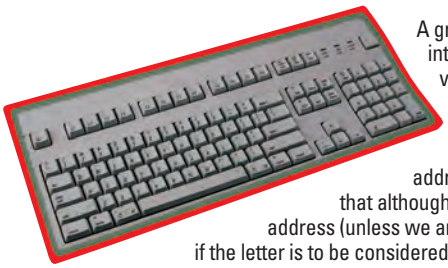
Rob G3XFD

amateur radio waves

The Star Letter will receive a voucher worth £20 to spend on items from our Book or other services offered by *Practical Wireless*.

Keep your letters coming to fill *PW*'s postbag

Letters Received Via E-mail



A great deal of correspondence intended for 'letters' now arrives via E-mail, and although there's no problem in general, many correspondents are forgetting to provide their postal address. I have to remind readers that although we will not publish a full postal address (unless we are asked to do so), we require it if the letter is to be considered. So, please include your full postal address and callsign with your E-Mail. All letters intended for publication must be clearly marked 'For Publication'. **Editor**

● **Dear Sir**

I offer an open letter as I read with interest the Guest Keylines by **Peter Kirby G0TWW**, General Manager of the RSGB. I think he's missing what Radio Amateurs think of the RSGB. They, as an organisation are nothing better than the old jokes about the Gas Board.

Let me explain: As Secretary of **The Bristol Amateur Radio Club**, I wanted to get our calendar of events listed in the GB2RS news on a Sunday. I looked at their web site and it said "for news inclusion to GB2RS click here to send an E-mail". So I did! Wrong It went to the wrong desk. This was for *RadCom* news only. Instead of forwarding it for me they chose to ignore it even though their desks face each other. (Gas Board syndrome). To cut a long story short, it took three months and lots of 'phone calls to sort out. Then the big day, it was not read out. On their website it was found in the East Anglia news instead of the West country. (I don't bother now). The only thing the club gets from its subs is insurance and *RadCom*, and they're stopping *RadCom* to clubs, so we won't even get that! Wake up RSGB, get rid of the Second World War RAF image, sack the incompetent and get in the 21st century. Look at the American ARRL and Wireless Institute of Australia (WIA) to see how to run a society with cheaper subscriptions. Sort out your news, record it and put a bit of zing into it and maybe, just maybe, Amateurs will start to join!

Dave Bendry G7BYN
Chipping Sodbury
Bristol

Revulsion & Shame

● **Dear Rob**

I received my August issue PW yesterday and saw the full page 'Grim Reaper' advert from the Radio Society of Great Britain. I cannot express my revulsion and shame that the National Society can stoop to what most people would say it comes from the gutter press department of the RSGB. **Peter Kirby G0TWW** should hang his head in shame, or even better resign.

Thank the Lord we have an independent body such as *PW* who give unbiased reports for the Amateur Radio fraternity. Incidentally, it was, as usual a very good magazine thanks to you, and everyone at *PW*.

Geoff Piper G4LLU
Wolverhampton
West Midlands

The RSGB advert

● **Dear Rob**

I know you are aware of the RSGB advert in the August issue of *PW* and indeed I was forwarded a copy of your comments to another reader. However, I just wanted to say that the whole attitude of the RSGB has been despicable right from the start.

We, the **Radio Amateurs Old Timers' Association (RAOTA)** have already expressed our views regarding some of this, but this last effort from the RSGB is more in keeping with the 'Gutter Press'. The RSGB's actions are not even in agreement with what they have said on their own web site or even in *RadCom*.

Keep up the good work with *PW*, we are doing what we can via *OTNews* and our website. At least I have the privilege of controlling adverts in *OTNews*! Take care.

Ted Rule G3FEW
Editor OTNews
& Membership Secretary
Radio Amateur Old Timers' Association
Norwich
Norfolk

Guest Keylines

● **Dear Rob**

I'm writing regarding the Guest Keylines Editorial in the July issue of *PW*. I used to be an RSGB member, and watched it grow from the days of the late **John Clarricoates G6CL** and May Gadsden into the much larger organisation based on the Industrial Estate in Potters Bar. In that time I occasionally submitted articles for publication, and had them initially returned, with certain adverse criticisms from someone who had not done the work to someone who had (i.e. me), who had got it right in the first place!

The RSGB also had several experts (?) who were available to give advice on various subjects. I once had a problem (I believe it was how to cure breakthrough of my low power single sideband signal to my telephone). Instead of receiving advice I got excuses as to why my query had not been dealt with. Correspondence went on for about three months until I said ****** (comment censored by G3ESP) and resigned there and then. I've not felt any loss since.

Instead, I joined the G-QRP Club, which has no paid employees, publishes a quarterly journal Sprat, and has its own members-only QSL bureau. To my mind this is a good substitute for the RSGB, and certainly more friendly. Its membership runs into many thousands, including a number (well over 1000) from countries outside the UK.

Radio Basics: On another point I've just been reading Radio Basics in the July 2005 issue of *PW* and have a warning lesson to share. When I was about 14 somebody gave me the chassis of a mains radio to play with. My first desire was to determine the connections on the mains transformer, so I removed it and set about testing the windings.

My test equipment was a dry battery in series with some high-resistance headphones, some fingers and thumbs. If the wire ends were applied to two of the transformer connections and a 'clonk' (from the laminations) was heard then that was one winding sorted. Unfortunately, I was holding the connections with my bare fingers and, at that time, not yet aware of the back electromotive force (e.m.f.) set up by a multi-Henry winding - I got quite a belt! No mention of this possible hazard in the article, but I think a postscript would be a useful safety point.

There's also the fact that a high-value smoothing capacitor can maintain a significant charge after the circuit has been switched off. So you one can get a nasty belt if you're careless. I was once careless with some capacitors on a high-voltage circuit. Note I said 'once'!

Walter Farrar G3ESP
Pontefract
Yorkshire

Editor's comment: Thank you for the warnings on safety procedures Walter. I ask readers to join me in this month's Topical Talk on page 69 where I discuss the points raised by G3ESP.

Oscilloscope Power Supplies

● **Dear Rob**

In the July issue of *PW* you wrote about power supplies for the 1 inch oscilloscope project but mainly with a view to generating the required voltages from a mains input. My wish is to make the instrument truly portable but I don't feel competent to construct the circuit originally used by **Phillips Electronics** unless there is a source of suitable transformers.

There is also the need to use readily available and inexpensive components if a number of readers are to join in. It occurs to me that the 'wall wart' plug-in power supplies favoured by **George G3RJV** may provide one suitable method.

If a transistorised oscillatory circuit is fed into the low voltage side of a transformer recovered from a 'wall wart' the output should be around 250V, which could be enhanced sufficiently to drive the tube.

There are some high current mains converters amongst the surplus on sale at rallies. Is this a runner or are the demands of the tube and valve too great? Please feel free to publish this as a readers' letter if you wish. Regards to everyone at *PW.*
Ron Davies G0WJX
Warrington
Cheshire

Editor's comments: You have some interesting points Ron and other readers have asked the same questions. I'm already working on a solution and ask you to please join me on the Topical Talk page, 69, for further discussion on this topic.

Amplitute Modulation on VHF

● **Dear Rob**
It's some months since I last wrote about 144MHz (and other v.h.f. bands) operation and I'd like to update you on what is happening, and to make a small plea!

Firstly activity: Following the creation of the VHF-AM Yahoo group (164 members currently) and a loose agreement on operating frequencies a number of pockets of activity have been shooting up around the UK on 144.57MHz a.m. In the Cambridge area there are a couple of us on every Monday at 8pm and we have been joined by three others on occasions. I know of others in the Midlands and south west England as well as others elsewhere too.

My own results have included a report at 76km using my 10mW 'Fredbox' hand-held from south Devon when on holiday recently as well as several local a.m. QSOs at microwatt levels. Many of us are looking to resurrect old former p.m.r. rigs using a.m., many of which are available at very low cost for 70 and 144MHz. Activity on 70.26MHz a.m. has been increasing too.

Secondly, frequencies: Partly as a result of the surplus p.m.r. rigs using a.m. rigs being available, people have requested that we move from 144.57MHz to 144.55MHz as an a.m. calling/working frequency (i.e. on a 12.5kHz raster). This was polled in our group and received a 95% agreement so the move has been agreed amongst a.m. operators. Monday nights at 8pm on 144.55MHz is the time and place to try for an a.m. QSO.

Our hope is that if we can get this officially backed up in the bandplan (anyone interested can contact me directly), even if only as a footnote, then we will encourage operators currently using 145.8MHz in some parts of the UK to migrate to the new channel(s) in the all-modes section instead. This would be a "good thing" I think you will agree.

Although we've not yet discussed it, I suspect a move to 50.55 and 432.55MHz (from the x.57MHz a.m. spots on these bands) is likely, so people can easily remember the a.m. centres of activity on these bands too. For 4m the 70.26 a.m. frequency is well established of course.

Amplitude modulation may not be the latest 'state of the art' mode by any means, but gear for a.m. can be cheaply bought and cheaply made, so encourages people to have a go at some modifications or home brewing when perhaps they might not have done so otherwise. In the spirit of experimentation I feel it is important for people to try the mode to see how it compares with f.m. and s.s.b.

So, in conclusion (a) please give the VHF AM Movement a plug in *Practical Wireless* and (b) please reconsider the view that an a.m. 'centre of activity channel' should not be included in the band plans. We 'AMers' feel it should be included, to discourage activity in the 'wrong' parts of the band, like 145.8 and to encourage a.m. more generally.

To join the group: VHFam-subscribe@yahoogroups.com

I can be contacted by E-mail at rogerlapthorn@hotmail.com and my website is at **www.g3xbm.co.uk**
Best 73s
Roger Lapthorn G3XBM
Burwell
Cambridge

Editor's comments: We are pleased to help and publicise your activities Roger! I hope readers will enjoy the PW Mellstock 70MHz a.m. transmitter project being published in this issue. The designer - Tony Nailer G4CFY - has also obtained some excellently priced crystals for the project. I've already purchased my Mellstock kit (so has Tex Swann G1TEX) and I hope to have it on air with it soon. Tony G4CFY is now trying to find time to design the a.m. receiver. Watch this space!

amateur radio rallies

Radio rallies are held throughout the UK. They're hard work to organise so visit one soon and support your clubs and organisations.

August 12
Cockenzie & Port Seton ARC Junk Night
Contact: **Bob Glasgow GM4UYZ**
Tel: **(01875) 811723**
E-mail: **bob.gm4uyz@btinternet.com**
The 12th Annual Junk Night of the Cockenzie & Port Seton Amateur Radio Club will take place at the Cockenzie & Port Seton Community Centre, South Seton Park, Port Seton in Scotland. Entrance fee is just £1 and all proceeds will go to the British Heart Foundation. There will be disabled access and a raffle at approximately 2100. Refreshments will also be available.

August 28
Milton Keynes ARS Annual Rally
Contact: **Dave M0BZK**
Tel: **(01908) 647662**
Website: **www.mkars.org.uk**
The Milton Keynes Amateur Radio Society's Annual Rally is taking place at St. Paul's School, Chaffron Way, Leadenhall, Milton Keynes, Buckinghamshire starting at 0900. Talk-in on 145.550MHz. The rally location is three miles from J14 of the M1 and quarter of a mile from the local Maplin store.

August 28
Torbay ARS Communications Fair
Contact: **Colin G4FCN** or **Peter G4VTO**
Tel: **(01803) 812117** or **(01803) 864528**
The Torbay ARS Communications Fair is to be held at Churston Ferrers Grammar School, Greenway Road, Churston, near Brixham, Devon. Doors open 1000 and the entrance fee is £2. There will be a free car park, trade stands, catering and a raffle.

August 29
Huntingdon ARS Bank Holiday Rally
Contact: **Peter Herbert M5ABN**
Tel: **(01480) 457347** (between 1800 and 2200)
E-mail: **peteherbert@aol.com**
The Huntingdon Amateur Radio Society are holding their Annual Bank Holiday Monday Rally at the Ernulf Community College, St. Neots, Cambridgeshire (near Tesco superstore on A428). Doors open 1000 and admission is £1.50. There will be hot and cold refreshments available. Features hall and car boot on hard standing and talk-in on S22.

September 4
Telford Radio Rally
Contact: **Martyn Vincent G3UKV**
Tel: **(01952) 255416**.
The Telford Radio Rally is to be held **at a new venue** - the **Shrewsbury Agricultural Showground**, home of the well-known West-Mid-Show. For full details contact Martyn on G3UKV.

September 4
Suffolk Data Group Radio & Computer Rally
Website: **www.sdgrally.org**
Taking place at the Foxhall Stadium, Foxhall Road, Ipswich, Suffolk IP4 5TL there will be plenty of boot pitches, (pay on the day, £8). Doors open at 0930 and the entrance fee is just £1 - accompanied under 14s free. There will be a large car park adjoining the stadium with hot refreshments available. Talk-in on S22.

September 11
The Lincoln SWC Hamfest
Contact: **Roger**
Tel: **(01522) 693848**.
Website: **hamfest2005@mail.com**
The Lincoln SWC Hamfest will be held at the Newark Showground, at jn of A46, A1 and A17 at Newark, Nottinghamshire. Doors open at 1000. There will be all the usual rally favourites, plus craft, classic cars and possibly a fly-in by a Second World War Auster V reconnaissance plane.

If you're travelling a long distance to a rally, it could be worth 'phoning the contact number to check all is well, before starting off.

amateur radio news & products

A comprehensive look at what's new in our hobby this month

Telford Radio Rally

After five years at the RAF Museum at Cosford, the Telford Rally has had to move, as major re-development is taking place at the previous venue. A great alternative has been booked for Sunday 4 September, with all the usual attractions.

The Telford Rally's new home is on the banks of the River Severn in Shrewsbury's West-Mid Showground. The site is right next to the Town Centre and the organisers expect the historic town to be popular with families and have spoken to the local Tourist Information Centre who hope to provide Guided Tours of this medieval town for those interested.

A particular feature of this year's Rally will be a Test Equipment Centre, combined with 'rig clinic'. Various test sets will be available to undertake a range of transmitter and receiver checks. With the support of vendors, it should be possible to check-out a piece of second-hand gear before a firm purchase is made - very useful!

Point your browser at **www.telfordrally.org.uk** for more information, maps etc., or contact **Martyn G3UKV** on **(01952) 255416**. The organisers promise a warm welcome for every visitor.

● **There's something for everyone here - you just have to find it.**

● **A previous Telford Rally free draw prize being drawn by the then RSGB President Bob Whelan G3PJT.**

RAYNET Guard the Way

Not only do RAYNET members keep a close eye on things at special events etc., one branch made sure that G6IFA and M3HWV got off to a good start in married life.

A guard of honour by fellow Radio Amateurs greeted the wedding of **Dave G6IFA** and **Audrey M3HWV Hicks** on 18 June at the church of St. Mary's on the Hill, Halton, Cheshire.

David is well known as an RSGB Board and RAYNET Committee of Management member for the North West. We wish David and Audrey all the best for the future!

● **Forming the guard of honour were: Dave Ollerhead G4JMF, Greg Mossop G0DUB, Kath Wilson M1CNY, Derrick Sumner M1SUM, Dave Wilson M0OBW, Lisa Mossop M0LSA, Alan Hopkinson G8OJQ and Mike Hampson G8RXB. (Photograph by Simon Taylor G1NTX).**

New Editor At RadCom

As from the September issue of RadCom (The Radio Society of Great Britain's monthly journal) has a new Editor.

Alex Kearns takes over the post of Editor from **Steve Telenius-Lowe G4JVG** who has been in the Editor's chair since 2000. Steve is taking early retirement to start a new life in Malaysia with his wife **Eva 2E1FHJ**. Steve is not leaving his radio hobby behind though as he plans to be active as **9M6/G4JVG** - so listen out for him!

Alex Kearns comes into the post from editing *European Semiconductor*, the leading journal for the European chip making industry. Alex commented, "It is a great honour to be given the chance to edit *RadCom*, the leading magazine for Amateur Radio enthusiasts in the world. I am hugely excited about editing this fantastic publication and I hope that this enthusiasm will be evident in upcoming issues of the magazine".

We wish him all the best in his new post.

Lighting-up the World

Listen out for GB0HL over the weekend of 20 & 21 August operating as part of the International Lighthouse/Lightship Weekend.

Members of the **Norfolk Amateur Radio Club** will be operating **GB0HL** from **Happisburgh Lighthouse** as part of International Lighthouse/Lightship Weekend. The distinctive red and white lighthouse is the oldest working light in East Anglia and is unique being the only independently run lighthouse in Great Britain.

Throughout the Lighthouse/Lightship weekend GB0HL will be active on the h.f./v.h.f. bands with stations operating s.s.b./c.w., SSTV and ATV. All stations contacting GB0HL will receive a colour QSL card and short wave listening reports are encouraged. Further information about GB0HL together with a full list of club contacts and programme details can be found at **www.norfolkamateurradio.org**

Members of the public are encouraged to visit GB0HL during the weekend. Members of the Happisburgh Lighthouse Trust will be on hand to provide guided tours of the Lighthouse to those wishing to climb the 112 steps to the lantern (please note that children under eight years of age are unable to climb the tower).

Norfolk Amateur Radio Club is a thriving organisation with over 80 members and anyone interested in radio, communications or electronics is welcome to join. The club meets weekly on Wednesday evenings from 1900 hours at the Norwich Aviation Centre, Norwich Airport. More information on the club and its activities can be obtained by E-mailing: **pr@norfolkamateurradio.org**

Thanks From Scarborough

The ever active Scarborough Special Events Group raised a good sum of money as a result of their recent GB2HQ event.

The Scarborough Special Events Group wish to thank all licenced Amateurs and listeners who supported their GB2HQ event. Applications for the Enigma Award were received from hundreds of stations in the United Kingdom, across Europe and Africa. By using the settings displayed on the group's website (**sseg.co.uk**) and downloading software from the Internet, many listeners were able to decipher the Enigma message to read 'Sixty Years Have Passed'.

The photo here shows Chairman **Roy Clayton G4SSH** handing over a cheque of £610 to **Ian Dent**, Officer in Charge GCHQ Scarborough, for the GCHQ Charities Fund. Also present were secretary **Kevin Prince G0NUP** and Treasurer **John Earnshaw G4YSS**.

Summer Price Reduction

If you're quick you just have time to take advantage of bhi's price reduction on their NES10-2 MKII DSP noise cancelling speaker.

Until the end of August you can take advantage of a 10% summer price reduction on their popular NES10-2 MK II DSP noise cancelling speaker from the bhi range. The speaker is effective at removing random noise, electrical impulse noise, white noise and many other types of interference from difficult communication channels such as noisy Amateur and packed broadcast bands.

The price of the NES10-2 has been reduced from £99.95 to **£89.95** until the end of August and is being offered on a sale or return basis for peace of mind. The speaker is available direct from bhi on **0870 240 7258**, online at **www.bhi-ltd.co.uk** or from any of their authorised dealers.

From Radio Amateur to Priest

Well known to PW readers, George Dobbs G3RJV is an enthusiastic Radio Amateur, fitting in his hobby around his '24-hour a day job' of Vicar - and now John G3WWT is treading a similar path!

John Teed G3WWT was recently made a priest in the Church of England in a service at St Mary Abbots Church, Kensington on Sunday 3 July. He was supported by four members of the Echelford Amateur Radio Society (EARS). The photo shown here taken after the service shows from left to right **Gerald Stancey G3MCK, Jeff Voller G3JUL**, **John Teed G3WWT**, **Peter Townshend G6PMT** and **Anthony Rush G3HBZ**.

Congratulations John from all the *PW* team!

Icom Sponsors Live 8

Radio communication company, Icom (UK) Ltd., together with the Worthing Amateur Radio Club put on a Live 8 Amateur Radio station in support of the concerts that took place around the globe.

The station was given a special callsign by the Radio Society of Great Britain of **GB8MPH** (GB8 Make Poverty History) and was aired on 2 and 3rd July at the Worthing Steam Gardens in Sussex. Amateur radio plays an important role in the developing world, as it is often the only way people in poor or sparsely populated areas of the world can communicate with each other. In many parts of the developing world there is no Internet or mobile 'phone coverage. Therefore the only way that people can communicate with each other is by Amateur Radio.

Phil Hadler, Managing Director of Icom (UK) Ltd said, "Icom fully supports the aims of Live 8 in the goal of highlighting the global issue of poverty. One of the main aims of this station will be to contact all parts of the globe, especially those isolated areas and to show solidarity with the ideals of Live 8. In our own way the project will be representing the large population of Amateur Radio enthusiasts across the world in saying that we care about the global issue of poverty. There is no better way for Amateur Radio enthusiasts to support this event than by getting involved by contacting this station. To celebrate this event, a specially made celebration QSL card was produced and sent to all people who communicated with GB8MPH."

Kelvan Gale, chairman of Worthing Amateur Radio Club said, 'We were very proud to put on the special Amateur Radio Station for Live 8. We worked closely with Icom who supplied us with top of the range base radios."

The station GB8MPH operated on the 7, 14 and 144MHz bands. Did you or your club 'work' it? If so why not let us know, especially if you did so from an usual location or have photos of your club taking part.

Limerick 430MHz Repeater

The new Limerick repeater has completed its testing phase and was installed on site in Co. Limerick on the 13 July.

Paul EI6FE, President of **Limerick Radio club** while mobile near Shannon had the first QSO with the installers on site. This was more by chance than an inaugural ceremony!

Good 430MHz coverage is expected in West Clare, most of Limerick and parts of East Kerry, Tipperary South Riding and North Cork. Low power 'rubber duck' hand-held access should be available in Shannon Town and Limerick city.

The repeater is permanently linked to Limerick R5 144MHz only. There may be mobile or base station access in Mallow, Blarney, Tralee and Tipperary Town. Please send reports to Mike via E-mail at: **ei9feb@eircom.net.**

Send all your news and club info to Donna Vincent G7TZB at the PW editorial offices or e-mail donna@pwpublishing.ltd.uk

Foundation Course Threatened by Power Cut

The Foundation Course run by the Chelmsford Amateur Radio Society was put in jeopardy when the village of Danbury suffered a major power cut.

When the tutors and 16 students turned up to attend the Foundation Course for the course they discovered there was no electricity to power their equipment. Telephone calls were quickly made to fellow club members resulting in **John G8DET** and **Clive M0SIX** providing portable power units to keep the course running. Both had kept their emergency power systems fully charged and available for immediate use. (Highly commendable!)

To save what little power was available **Murray G6JXB** gave his presentation without the use of the usual PC projector system, the students had to refer to the paper handouts instead. Only cold drinks were provided instead of the usual tea or coffee during the break, fortunately it was warm outside so cold drinks were a good idea!

The power unit for the 100W h.f. rig, which the students used to carry out their On-Air contacts managed to keep going right up until the last '73 of the last QSO before it ran out! The power was eventually restored to Danbury some 12 hours later.

● **Trevor M5AKA operating an h.f. rig.**

● **Students learn how to tune the radio.**

Well done to the tutors and students for their perseverance and for displaying the true spirit of Amateur Radio! For further information on CARS Courses see the club website at **www.g0mwt.org.uk** or contact **Clive Ward M0SIX** on **(01245) 224577** or **(07860) 418835** or via E-mail at **training2005@g0mwt.org.uk**

Stand Up!

Do you have a NEIM1031 In-line module laying on your shack bench? If so the latest product from bhi will help to improve your use of it and make for more comfortable working.

The 1031-STD is a quality stand made from high impact clear acrylic for mounting the NEIM1031 Noise Eliminating In-line Module. The NEIM1031 simply sits vertically or horizontally in the stand allowing you to see and operate all the controls much more easily.

The stand comes boxed and includes Velcro strips for mounting the NEIM1031 securely to the stand. This is particularly useful if you wish to use the module with an extension speaker and headphones as it allows you to raise the module's position in the stand so you can get access to the Headphone Socket.

Priced at **£9.95,** the 1031-STD is available now from bhi Ltd direct or any of their authorised dealers.

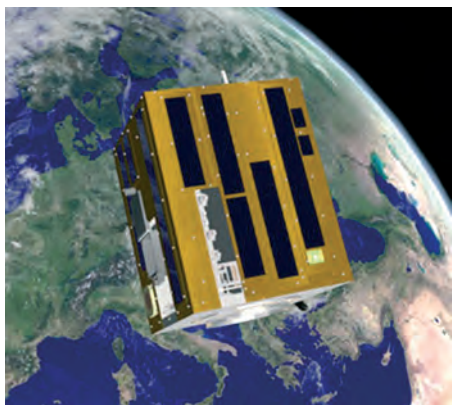
bhi Ltd, PO Box 136, Bexhill on Sea TN39 3WD
Tel:(0870) 240 7258 FAX: (0870) 240 7259
E-mail: info@bhi-ltd.co.uk
Website: www.bhi-ltd.co.uk

SSETI Express Update

The European Space Agency (ESA) have released an update on the SSETI Express Satellite.

The update on the progress of the SSETI Express Satellite can be found at **www.esa.int/esaCP/SEMPQH6DIAE_index_0.html** The 2.4GHz transmitter on SSETI Express was built by members of AMSAT-UK and the satellite is due to be launched on 25 August.

If Satellites are your interest why not join AMSAT-UK? Full details on how to get involved etc can be found at **www. uk.amsat.org/**



amateur radio clubs

Keep up-to-date with your local club's activities and meet new friends by joining in!

KENT

Hilderstone Radio and Electronics Club
Contact: **Ken Smith G3JIX**
Tel: **(01304) 813175**
Website: **www.g0hrs.org.uk**
No meetings at Hilderstone in August but a 430MHz Foxhunt at Stelling Minnis will be followed by the club barbecue at Hardres Court on **August 28.** Normal meetings recommence at Hilderstone Adult Education Centre, St Peter's Rd, Broadstairs in September, on the second and fourth Friday starting at 1930 hours.

SHROPSHIRE

Telford & District ARS
Contact: **Mike Street G3JKX**
Tel: **(01952) 299677.**
E-mail **mjstreetg3jkx@aol.com**
Website: **www.tdars.org.uk**
The Telford & District Amateur Radio Society meet at the Community Centre, Bank Road, Dawley Bank, Telford, Shropshire TF7 2AX from 2000hrs every Wednesday (unless otherwise stated and are subject to amendment). Forthcoming club events include: **September 14**: Visit to Sleap Airfield; **21st:** Quiz; **28th:** Talk on Enigma/War radios and **October 5**: Open evening/h.f. OTA/Committee meeting.

HAMPSHIRE

Horndean & District ARC
Contact: **Stuart Swain G0FUX**
Tel: **(02392) 472846**
E-mail: **G0FYX@msn.com**
The Horndean & District Amateur Radio Club meet at Lovedean Village Hall, 160 Lovedean Lane, Lovedean Lane, Lovedean, Hants. Meetings take place on the 1st and 4th Tuesday of every month and start at 1930. New members and visitors are always welcome. Why not go along to one of these meetings? **August 23:** 'History of Portsmouth's Commercial Road' a talk by Peter Rogers; **September 6**: Social Evening; and **27th**: 'Heath Robinson', a talk by Owen Neal.

CHESTER

Chester & District RS
Contact: **Derrick Summner M1SUM**
Tel: **0151-356 1572**
Meeting at the Burley Memorial Hall, Waverton, Chester, the Chester & District Radio Society offer a varied programme events for club members. These include: **September 6th**: The Secrets of the Samurai; **13th:** Committee Meeting; **20th:** Talk by Phil G3SES and **27th**: Surplus Sale. Why not go along and join in?

doing it by design

Tony Nailer G4CFY's latest article concluding his survey of mixers, looks at doubly balanced mixers. As usual there are suitable project, with the option of d.i.y. or printed circuit boards and kits.

Welcome to Doing it By Design (DiBD). And, following on from Singly Balanced Mixers in the July issue *PW*, I now consider Doubly Balanced Mixers.

Look at the mixer circuit, **Fig 1**. which shows that the diodes are all nose-to-tail and hence are described as a ring rather than a bridge. A signal applied to any port will be largely balanced out by the toroid and diode arrangement.

A sinusoidal signal applied between J1 and earth will produce anti-phase signals at the ends of the secondary winding of T1. When the top of the winding is positive and bottom negative the diodes D3 and D4 will conduct equally and the junction of D3-D4 will not move. Diodes D1 and D2 will be reverse biased so the junction D1-D2 will be effectively open circuit.

The centre tapped winding of T2 will have no potential difference (p.d.) across its windings so there will be no output of the signal passed to J4. Similarly, the centre tap of the secondary winding of T1 will be electrically mid way between the ends, and so will also have no signal on it.

Now, let's think of a signal applied between J2 and earth. Being the centre point of the secondary of T1 it will produce identical in-phase signals at the ends of the winding. No p.d. will exist across the winding so no signal will be coupled back to J1.

During positive excursions of the wave at both ends of the winding, diodes D2 and D3 will conduct equally and current will flow into the ends of the centre tapped winding of T2 and out through its centre point. There will be no potential difference between the ends of that winding so no signal will be coupled to J4.

During negative excursions of the wave at the ends of the winding, diodes D1 and D4 will conduct equally. And again no signal will be coupled to J4.

Apply a signal between earth and J4 will have the same effect as applying the signal between J1 and earth. The circuit will be balanced to ports J1 and J2.

Now if a signal is applied between J1 and earth and alternately causes D3 and D4 then D1 and D2 to conduct equally, and another signal is applied between J2 and earth which causes D2 and D3 then D1 and D4 to conduct, then the latter signal is unbalancing the diode ring. The effect of this is that the signal between J2 and earth effectively opens and closes the path between J1 and J4. The signal that then appears at J4 will be the product of the two input signals only. Neither of the fundamentals will get through.

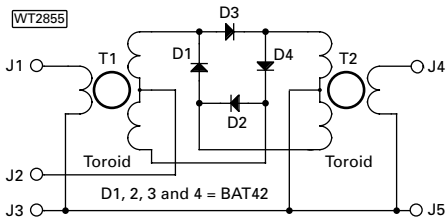


Fig. 1: In this mixer circuit, the diodes are all nose-to-tail and hence are described as a ring rather than a bridge. A signal applied to any port will be largely balanced out by the toroid and diode arrangement (see text).

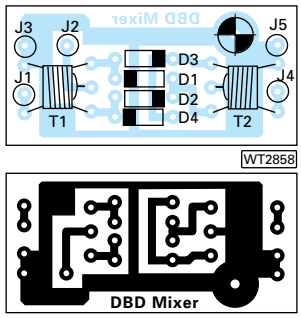


Fig. 2: The mixer p.c.b. design and artwork (see text).

Best Performance

I've found that for best performance an oscillator signal of 1.5 to 2V is required and should be applied between J1 and earth. The lower level signal can then be applied between port J2 and earth. Output at J4 and earth is -6dB to -10dB relative to the signal at J2. The oscillator signal applied to J1 will be suppressed by at least 50dB at port J4.

Toroids T1 and T2 can be made using traditional ferrite toroids with up to 12 turns of trifilliar wire. Any gauge will do so long as it doesn't fully fill the torus. Separate the three windings and then put one winding to one side and connect the start of the second winding to the finish of the third.

Good wideband operation to at least 60MHz can be achieved using 5mm long 4mm diameter beads. Choose one with a 2mm central hole. Use three 80mm lengths of 34 to 36s.w.g. wire twisted tightly together and pass them three times through the centre of the bead. Pull each winding tight before starting the next one. Arrange the windings as described above.

Diodes with low forward switch-on characteristics like the old style germanium detector diodes OA47, OA90 and OA91 can be used but are not as well defined as modern Schottky types BAT42, BAT43, BAT81 or BAT86 are to be preferred.

The necessary p.c.b. artwork and layout is provided (for dedicated followers of this series!). These are shown in **Fig. 2**.

Four Quadrant Multiplier

Next, we'll take a look the Four Quadrant Multiplier, **Fig. 3**. The configuration Tr1 and 2 of a differential amplifier with T3 providing a high

impedance current source. This is commonly called a 'long tailed pair'.

In the first scenario let's consider decoupling **In1** and **In2** to earth with a low reactance capacitor at the signal frequency. Now apply the signal to **In3**. The transistors Tr1 and 2 will each become grounded base amplifiers and produce equal phase and amplitude signals at **Out1** and **Out2**.

Each output, taken with respect to earth will produce a worthwhile signal. If a transformer is connected between Out1 and Out2 there will be no potential difference across it, and consequently no output.

The second scenario is to decouple In2 and In3 at the signal frequency and apply the signal to In1. The transistor Tr1 now becomes a common emitter amplifier and Tr2 an emitter coupled common base amplifier (the classic differential amplifier). This produces equal amplitude but opposite phase signals at Out1 and Out2. The diagram, **Fig 4**, now takes this a step further by taking two complete 'long tailed' pairs and paralleling in anti-phase the tail transistors Tr3 and 6, paralleling in phase the bases Tr1 with Tr5, and Tr2 with Tr4, then paralleling anti-phase the collectors Tr1 to 4 and Tr2 to 5.

A signal applied to In3 or **In4** will as before produce equal amplitude and in-phase signals at Out1 and Out2 as before. A signal applied to In1 will through Tr1 and 2 produce anti-phase signal at Out1 and in-phase at Out2. Also the signal at In1 will through Tr5 and 4 produce anti-phase signal at Out2 and in-phase at Out1. These are equal and opposite signals and will hence cancel out. (The unit is fully balanced with respect to signals applied to any port).

As in the case of the diode ring mixer, the combination of signals applied to either of the header devices and to either of the tail devices will upset the fragile balance. Output will then be the product of the input signals, but the fundamentals will be massively attenuated.

Due to the amplification factors of the transistors in the headers and tails, the signal levels are typically 10% of those needed to operate the diode ring. Typically 200mV p-p is close to the limit at any port.

It's not really practical to build a four quadrant multiplier using discrete components - the variations between transistors would make good balance difficult to achieve. Fortunately, integration here is a great benefit as it allows header and tail devices to be produced with near identical geometry on a single chip.

The MC1496 Chip

One of the earliest versions of the circuit I just described was the MC1496 by Motorola. It contained just the semiconductors, and all the biasing resistors were external. In all it uses 18 components to

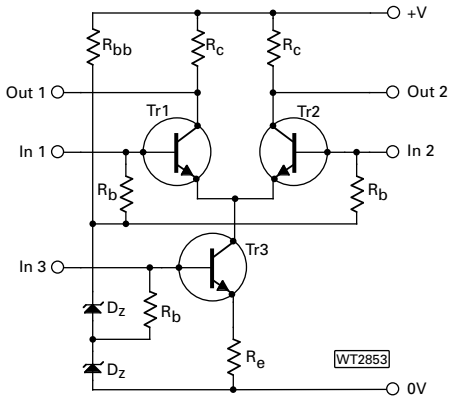


Fig. 3: A four Quadrant Multiplier. The configuration Tr1 and 2 are a differential amplifier with T3 providing a high impedance current source. This is commonly called a 'long tailed pair' (see text).

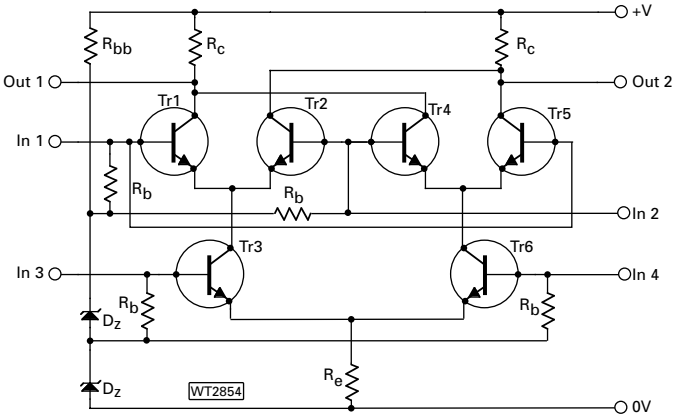


Fig. 4: This circuit takes the concept further. Two complete 'long tailed' pairs and paralleling in-phase the tail transistors Tr3 and 6, paralleling in phase the bases Tr1, 5, 2 and 4, then paralleling anti-phase the collectors Tr1 to 4 and Tr2 to 5 (see text).

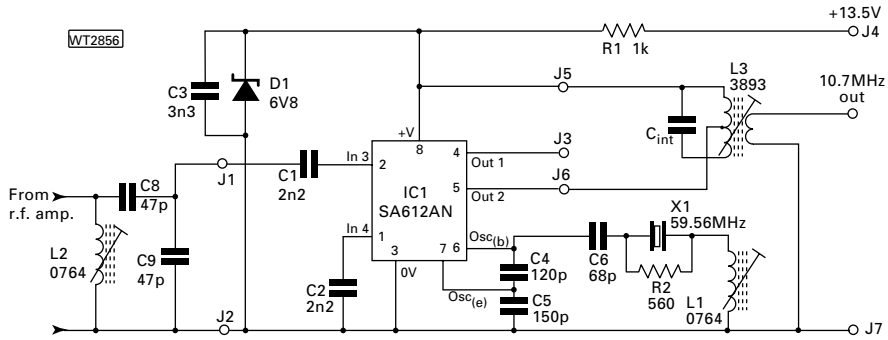


Fig. 6: Two circuits are provided to give examples of completely different uses of the 602/612 device. One is a mixer oscillator unit to accept 70.26MHz input from a radio frequency (r.f.) amplifier and convert it down to a 10.7MHz intermediate frequency (i.f.) for filtering and further signal processing (See text).

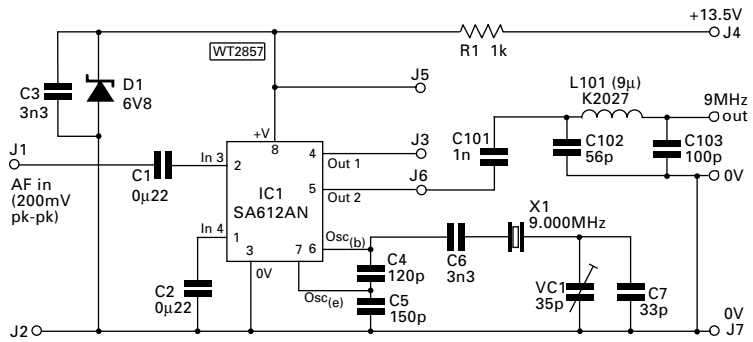


Fig. 7: A double sideband (d.s.b.) generator accepting audio up to 200mV p-p and mixing it with a 9MHz carrier. The output at pin 5 of the device is 1.5kΩ so this is transformed by a Pi network down to about 500Ω suitable to interface with an single sideband (s.s.b.) filter (see text).

produce an operational mixer - but the results are outstanding.

Unfortunately, the early versions were in a 10-pin round TO39 style can. The data sheet in the Motorola handbook showed the pin-outs from the top of the can, although it looked like you were viewing from the pin side! If you didn't spot this you would not produce an operational circuit. Later versions of the integrated circuit (i.c.) were available in a 14-pin dual in line (DIL) package.

In normal signal mixing and balanced modulator operation it runs happily from a single 8V to 13.5V rail. When used as an amplitude modulator it requires +12V and -8V to work properly. This is clearly a pain, and it adds further complexity to a project to produce a low frequency (l.f.) oscillator and negative rectifier to produce the negative rail. However, if you want good amplitude modulation (a.m.) it's really worth the effort.

The operating frequency range of the i.c. is from d.c. to 80MHz. Supply voltage ranges from 8 to 30V with current requirements being from 3 to 5mA. The conversion gain is 10dB, with carrier suppression at 10MHz being typically 50dB.

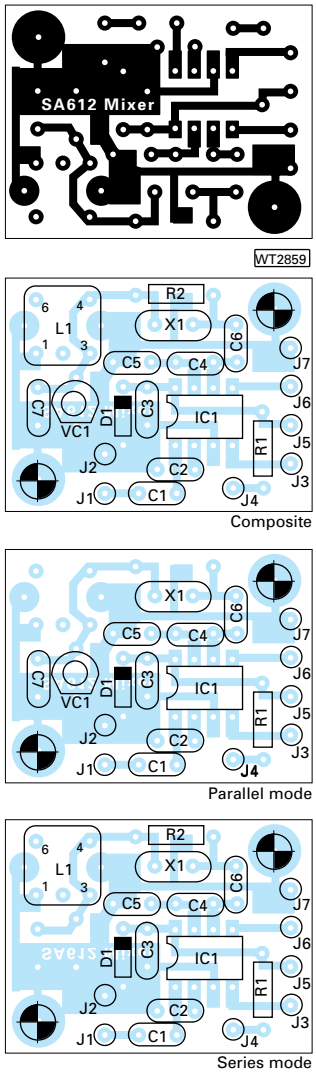


Fig. 5: A composite p.c.b. design for use with the SA602AN or SA612AN. This can be configured for fundamental parallel mode crystals or for 3rd or 5th overtone crystals up to 70MHz..

The SO42P IC

The SO42P i.c. is a version produced by Siemens and contains all the biasing components. It's available as a 14-pin DIL package and runs from a single supply consuming only about 2mA. The balance is not as good, as that provided by the MC1496 with its external balancing trimpots.

Nevertheless, the SO42P it has usable suppression of the fundamental signals and only requires relatively low levels of oscillator injection. I find this mixer (with its low external component requirement) ideal for the transmit mixer in my range of transverters.

The i.c. has an operating frequency range of d.c. to 200MHz. The supply voltage can be 4 to 15V and the supply current 1.4 to 2.9mA. It has a typical input to output power gain 16.5dB.

The NE602 & Derivatives

The NE602 is a particularly useful i.c. and has been popular with authors such as the **Reverend George Dobbs G3RJV** in his series 'Carrying On The Practical Way'. Like the SO42P it contains all the biasing components, so only requires coupling and decoupling capacitors to be fully functional.

Our sister publication *Short Wave Magazine* carried a four page article on the NE602 in December 1997. I would recommend that a reprint of the article is obtained from PW Publishing Ltd. Incidentally, at the time of writing the device is readily available as version SA602AN (or with higher dynamic range) as the SA612AN version.

In addition to the four quadrant multiplier section the SA602AN also contains a common emitter amplifier with base and emitter resistors. This only requires the reactive and resonant components to make a Colpitts oscillator and it's also internally linked to the header transistors. An added attraction is that it comes in an 8-pin DIL package.

The i.c.'s operating frequency range is from d.c. to 500MHz with an oscillator section frequency range from d.c. to 200MHz. Supply voltage can be between 4.5 to 8V and current demand is between 2.4 to 2.8mA.

The '602/612 contains the collector resistors shown in Fig. 4, (the value 1.5kΩ, the output Out1 is pin 4 and the output Out2 is pin 5. The bias supply is pin 8. The tail transistors are internally connected and have an emitter resistor with earth connection on pin 3. The input In1 is internally connected to the oscillator transistor (the input In2 does not come out to a package pin).

The base of the oscillator transistor is pin 6 and its emitter pin 7. An external oscillator signal can by applied to pin 6, and pin 7 is then decoupled. If the oscillator signal is large then it may be possible to leave pin 7 un-decoupled. The input In3 is pin 1 and the input In4 is pin 2.

It appears from all the application notes that the device is targeted at the receiver front end use. I must obtain the manufacturer's specification sheet for the device to learn more about it!

Clearly the device has potential of feeding audio frequency (a.f.) signals to In3 or In4 and having the oscillator running as a carrier oscillator. The output would then be double sideband suppressed carrier (d.s.b.s.c.).

Composite PCB

Space doesn't allow me to provide circuits and p.c.b. layouts for all the mixers detailed. So I have created a composite p.c.b. design for use with the SA602AN or SA612AN. This can be configured for fundamental parallel mode crystals or for 3rd or 5th overtone crystals up to 70MHz (See **Fig. 5**.).

Two circuits are provided to give examples of completely different uses of the 602/612 device. One is a mixer oscillator unit to accept 70.26MHz input from a radio frequency (r.f.) amplifier and convert it down to a 10.7MHz intermediate frequency (i.f.) for filtering and further signal processing (See **Fig. 6.)**.

The second circuit is as a double sideband (d.s.b.) generator accepting audio up to 200mV p-p and mixing it with a 9MHz carrier. The output at pin 5 of the device is 1.5kΩ so this is transformed by a Pi network down to about 500Ω suitable to interface with an single sideband (s.s.b.) filter (see **Fig. 7**).

On this occasion I haven't yet tested this circuit. So when I produce the boards - I hope to have as much fun as yourselves with a brand new project!

If you wish to correspond regarding this article or previous ones subscribe to the list **pw-g4cfy-on@pwpublishing.ltd.uk** by sending a blank E-mail with the word subscribe in the subject box. When you receive confirmation from the server you can send an E-mail to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will be answered by myself or the *PW* team. Cheerio until next time.

PW

Kits & Bits

Kits & bits: DBD Mixer p.c.b. £1.50. Four Diodes £1, two Toroids £2, p&p 50p.
The SA612AN p.c.b. is £3. The p.c.b. components for the d.s.b. generator without crystal £4.30 with p&p at 50p.
The p.c.b. components for the 70MHz receive mixer oscillator (without crystal) cost £4.55 with p&p costing 50p.
Other off board components, TOKO Coils 0764 or 3893 or K2027, 75p each and ceramic capacitors are 10p each. **Please make cheques payable to A.J & J Nailer, Spectrum Communications, 12 Weatherbury Way, Dorchester, Dorset DT1 2EF**.

The Cushcraft MA8040V Dual-Band Vertical

Roger Cooke G3LDI has the ideal Amateur Radio site with plenty of space for antenna work and an extensive antenna farm. Following the evaluation Roger thinks the MA8040V will appeal to modern small garden owners and for 'P operations.

The *PW* Editorial staff know how keen I am on antenna work, so I was pleased to be offered the chance of evaluation of the Cushcraft MA8040V dual band vertical. The antenna eventually arrived in a 2.1m (7ft) long cardboard box.

I decided to be careful and opened the box on the grass outside to check the contents. It was a wise move - there seems to be no such thing as a 'simple vertical' these days! Looking at the contents check list, there are some 42 parts to check off, including some with multiples, such as 45 8-32 Hex nuts and bolts!

However, the proper thing to do is to check the list to make sure nothing is missing, before assembling the antenna. Prior to that, I'd laid out the components on the grass, **Fig 1**.

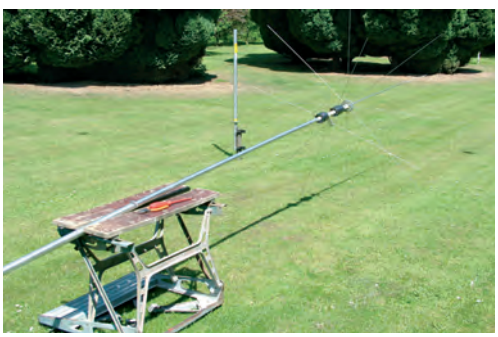
- **Fig. 1 (below): Roger G3LDI took no chances with the antenna kit and checked everything was there first! Cushcraft provide everything that's needed, all he had to do was the assembly!**

- **Fig. 2 (bottom): During the later stages of assembly Roger G3LDI found it useful (and safer) to use a saw bench to support the antenna at a safe distance above the ground. (see text).**

Follow The Instructions!

Assembly is relatively straightforward, so long as you follow the instructions! The first important thing to do is to run through the check list of components again, to identify each item.

Make sure that everything is there before starting assembly. After that, it is just a matter of reading and ticking each step as you work your way through the book. The instruction booklet is 12 pages in length and has quite a good selection of pictures to help. On the front cover, there's a picture of the completed antenna so that you can check the finished product looks the same!

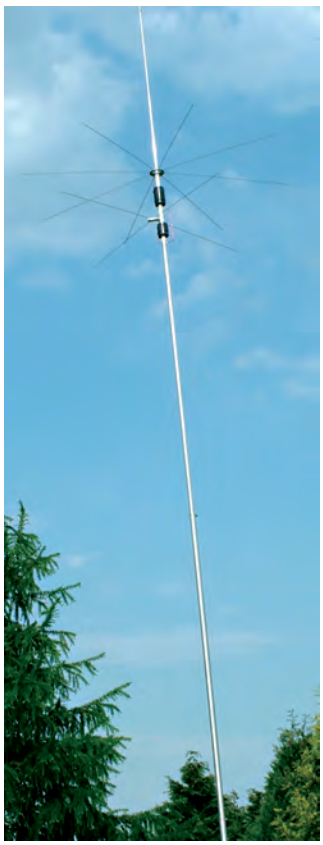


Particular attention should be paid to the loading coil assembly, as it's quite easy to start mounting the coils in the wrong holes. So my advice is; follow the diagram very carefully and it will save time.

Some of the holes that have to be aligned do not align very well. But I am perhaps being hypercritical here as it was easy enough to overcome that problem. Incidentally, I took around three hours to assemble the complete antenna.

Note: This antenna uses radial rods and when installing them, it is a good idea to employ something like a saw bench to clamp the antenna main mast. This is to ensure the top remains well off the ground. Incidentally, the radial rods are stainless rod stock but I suspect they would bend quite easily.

The loading coils are well made and waterproofed, and a very neat way of mounting them is used to good effect. Likewise, the radial rods are mounted in a novel mounting clamp, and are very rigid after assembly. It would also be an easy matter to replace any if needed.



- **The Cushcraft MA8040V Dual-Band 3.5/7MHz) Vertical Antenna assembled and erected at G3LDI's Norfolk 'country estate' ready for the review evaluation (see text).**

Experimentation with the radial rods is a good idea too, depending on your own operating preferences. For example, the 3.5MHz rods may be clamped at maximum extension from the radial ring to give a better coverage of the low end of the 80 metre band.

The completed antenna is only around 7.6m (25ft) tall, but it does become top heavy. So it's advisable to thoroughly read the book a couple of times, as I have already suggested, before starting. There is some very good advice provided by Cushcraft and it seems that most problems have been thought of and catered for with good advice.

Temporary Installation

As the antenna was to be a temporary installation for the *PW* review, I decided that knocking a 900mm (3ft) length of 50mm (2in) diameter Dural tube into the ground and clamping the antenna to the side of it would be sufficient.

The main top part of the antenna is offered to the bottom section, which is already mounted as just described, and then clamped. However, the bottom piece is about 1.2m (4ft) off the ground, so I had to stand on a saw bench, **Fig. 2**, and lift the

antenna above the bottom section before lowering and then clamping it.

The job I've just described was more difficult than you may imagine! The antenna tends to whip around and I only just managed to do it on my own. In fact Cushcraft realise the problem; I should have taken their advice given in the booklet about using the 'buddy' system. In other words, get some help!

If the installation is to be a permanent, the mounting post must be concreted into the ground. I found that even with 600mm (2ft) into the ground for temporary evaluation, the antenna pulled it over. I had to resort to a single guy to hold it in a vertical plane and I advise that substantial mounting clamps should also be used.

Ground Radials.

Cushcraft provide a 122m (400ft) reel of 18s.w.g. enamelled copper wire for the ground radials. The suggested configuration in the booklet is for four 19.8m (65ft) and four 10.6m (35ft) radials.

When laid out in a spoke pattern in a straight line from the base of the antenna, the suggested radial lengths would require a garden roughly 39.6m (130ft) by about 24.3m (80ft) of free space. Unfortunately, most modern places these days are not that large including the house and front garden!

However, I cut the radials and installed them as suggested. Incidentally, with ground radials, the usual aim is for as many as possible although this tends to reduce the feed impedance below 50Ω. A compromise can be reached however, with the aid of an antenna analyser.

The radials should preferably be buried (or you'll have problems when cutting the grass). However, despite being careful to move all the radials prior to cutting my grass, I then got one caught around my 'Strimmer'! Just remember, it takes a lot longer to untangle the wire than it does to catch it in the first place, so cut a slot with the spade any bury them deep enough to be out of the way.

Coaxial Cable

Good quality coaxial cable such as RG213U, or similar should be used for the feeder. Connection is at the base with a couple of solder tag connections. Make sure that the connections are secure, tight and waterproofed. Self-amalgamating tape should be used on the end of the cable, and perhaps painted with a coaxial cable seal. (I've not used this myself but have read of good results from those who have).

The coaxial cable can be buried, but for this review it was left on the surface, just like the radials. I also made a common-mode choke balun at the feed by winding about 3m (10ft) of the coaxial cable into a coil and taping it together. This has the effect of isolating the antenna from the rest of the feed line.

Antenna Analyser

I used an MFJ 259 antenna analyser to test the antenna. And because I'd not been too fussy about where the top resonators were fixed, decided to test it before tuning.

However, I was quite surprised - it was resonant on 3.540MHz with a 1.1:1 standing wave ration (s.w.r.) and a feed impedance of 50Ω. Pleased, I then tried 7MHz and it was resonant at 7.011MHz with 1.1:1 s.w.r. and a 50Ω feed impedance.

On 3.5MHz the bandwidth was roughly 80kHz and on 7MHz about twice as much before the s.w.r. exceeded 2:1. I carried this test out back in the shack, and I then decided to test again at the bottom of the antenna. To my surprise it didn't change very much at all!

As most modern Amateurs will probably be interested in single side band (s.s.b.) operation rather than working the Morse mode (c.w.), I decided to tune the Cushcraft for the top end of the bands.

To help, my friend **Dave G3MPN** came over to give a hand. We lowered the antenna and shortened the top. In fact we almost lost it, as we left the top with about an inch visible. On re-assembly, the resonant frequency had changed to 3.740MHz and the bandwidth had increased slightly. The 7MHz bandwidth was not affected at all.

I then altered the ground radials in such a way that they extended from the base of the antenna in a spiral fashion. This would allow somebody with a smaller garden to install this antenna. I found that the effect on the performance hadn't changed much at all. Cushcraft mentions in the booklet that the radials can be bent around objects, and I found this did not affect the performance very much at all.

Amateur Adage

There's an old adage in Amateur Radio that says "a vertical antenna radiates an equally weak signal in all directions". However, if you are unable to put up towers or poles taller than 12m (40ft), this antenna definitely offers an ideal opportunity to operate on 3.5 and 7MHz where a suitable full size alternative could not be employed.

I did more listening than actual transmitting as it enabled me to get a more comprehensive overall performance idea of the antenna. To be honest, I was slightly unfair here, in that I was comparing the Cushcraft to inverted V dipoles at 27m (90ft) a.g.l.

However, it is true that the Cushcraft was on average two S-units down on most signals, but then it is a compromise type of antenna and only 7.6m (25ft) above ground. The only signals where it was equal in performance to my Vs were on very local stations, within a few miles. There the two were just about the same.

Propagation is not good at present, plus we are in the summer doldrums anyway, so I didn't get a chance to hear any real DX. However, a vertical works well by virtue of its low angle of radiation, so it will obviously be of value to those with limited space. There is also the added advantage that this antenna offers a solution to the problem of 3.5 and 7MHz operation in a small space. And one it's dismantled, it can be packed into quite a small box - ideal for portable use. The antenna rated at 1.5kW so will handle the full legal limit with no problems.

My thanks go to Waters & Stanton of Hockley in Essex for the loan of the review antenna.

PW

Product

Cushcraft MA8040V Dual-Band 3.5/7MHz) Vertical Antenna

Company

Cushcraft USA (Imported by Waters & Stanton)

Contact

Waters & Stanton Tel: (01702) 206835, FAX: (01702) 204965.

Pros

Relatively small (7.6m tall) and portable antenna. Helpful instructional manual with well thought out advice, easy to set-up and use.

Cons

Received signals down when compared to full size antenna systems.

Price

£199.95 (delivery normally £10, but will be free to readers quoting the G3LDI review in *PW*).

Supplier

My thanks for the loan of the review unit go to **Waters & Stanton PLC, Spa House, 22 Main Road, Hockley, Essex SS5 4QS 4QS.**

YAESU G-450C

Heavy duty rotator for HF beams, etc. Supplied with circular display control box and 25m of rotator cable.

OUR PRICE **£299.99**

G-650C .....our price £359.99
G-1000DXC.....our price £449.99
G-5500 (azimuth/elevation) rotator .....our price £499.99
GC-065 thrust bearing.....£48.00
GC-038 lower mast clamps.....£25.00

AR788 *NEW MODEL*

Quality rotator for VHF/UHF. Superb for most VHF-UHF yagis, 3 core cable required. 3 core cable 50p per mtr.

OUR PRICE **£44.99**

AE-201 thrust bearing £14.99

New station log books (A4) **£4.99** P&P £2.00
5 log books **£20.00** P&P £6.50

D-308B DELUXE DESK MIC

(with up/down). Many amateurs using this mic (over 4000) have expressed extreme pleasure with it's performance. Includes 8-pin round Yaesu mic lead.

£49.95 P&P £6.00

Yaesu 8 pin round to modular adapter (8 pin).....£19.99
Yaesu 8 pin round to 6 pin modular adapter £19.99
A-08 8 pin "Alinco" round.....£9.95
K-08 8 pin "Kenwood" round.....£9.95
I-08 8 pin "Icom" round.....£9.95
IM-08 Modular phone "Icom".....£9.95
KM-08 Kenwood modular lead £9.95

CUSHCRAFT BARGAINS

Delivery £12.00

MA5B	Mini beam 10, 12, 15, 17, 20m	~~£389.00~~	£329.95
A3S	3 ele beam 10, 15, 20m	~~£499.95~~	£379.00
A4S	4 ele beam (10-20m)	~~£599.95~~	£449.99
R-6000	Vertical 6, 10, 12, 15, 17, 20m	~~£349.95~~	£315.95
R-8E	Vertical (40-10m) "special"	SPECIAL ~~£499.95~~	£399.99

CAROLINA WINDOM

CW-160S	(160-10m) 40m long	£119.95 P&P £8.50
CW-160	(160-10m) 80m long	£129.95 P&P £8.50
CW-80	(80-10m) 40m long	£89.95 P&P £8.50
CW-80S	(80-10m) 20m long	£109.95 P&P £8.50
CW-40	(40-10m) 20m long	£84.95 P&P £8.50

MFJ-125

12" Dxer's quartz wall clock. give:- 24hr time + 3 smaller dials give 12 hour time/day of week/date.

£37.99 P&P £6.00

HHC-2 Police style holster

A unique "stretch case" designed to fit atatched to your belt or fixed to your body via the 3-point body harness (supplied). (Ideal for hand-held/mobile phones).

£22.95 P&P £2.50 2 for £35.00

TH-887 headset

DAP ERS OR MOB LE CVRS AVAIL BLE - PHONE

Superb headset for most handies. 887K (fits Kenwood) £24.95. 887 fits most twin socket-Alinco, Icom, Yaesu, etc.

£24.95 P&P £3

FIBRE GLASS POLES

Del £10.00

	1½"	1¾"	2"
1m	£8.50	£12.50	£13.50
2m	£16.00	£24.00	£26.00

Longer lengths available – phone

COPPER ANTENNA WIRE ETC

Enamelled (50m roll) .....£16.95 P&P £5
Hard drawn (50m roll).....£16.95 P&P £5
Multi-Stranded (Grey PVC) (50m roll).....£13.95 P&P £5
Flexweave (H/duty 50 mtrs) .....£30.00 P&P £5
Flexweave H/duty (18 mtrs) .....£15.95 P&P £5
Flexweave (PVC coated 18 mtrs).....£18.95 P&P £5
Flexweave (PVC coated 50 mtrs).....£40.00 P&P £6
Special 200mtr roll PVC coated flexweave .....£99.00 P&P £10
Copper plated earth rod (4ft).....£13.00 P&P £6
Copper plated earth rod (4ft) + earth wire .....£18.99 P&P £6
New RF grounding wire (10m pack) PVC coated.....£12.50 P&P £5

MAST HEAD PULLEY

A simple to fit but very handy mast pulley with rope guides to avoid tangling. (Fits up to 2" mast).

£8.99 + P&P £2.50

30m pack (4.4mm) nylon guy rope.....£12.50

NEW EASY FIT WALL PULLEY

Pulley will hang freely and take most rope up to 6mm. (Wall bracket not supplied).

PULLEY **£8.99** + P&P £2.50

Wall bracket, screws not supplied. Simply screw to outside wall and hang pulley on

WALL BRACKET **£2.99** P&P £1.00

BARGAIN WINCH

500kg brake winch.
BARGAIN PRICE
£59.95 Del £8.50

Winch wall bracket.....£19.99

COAX BARGAINS

RG-213 Mil spec x 100m.
£69.99 or 2 for £110.00 P&P £10

RG-58 Mil spec x 100m.
£35.00 or 2 for £50.00 P&P £10.00

Coax stripping tool (for RG-58) £4.50

COAX SWITCHES

(P&P £4.50)

2 way CX-201 (0-1GHz) SO239 .....£19.95
2 way CX-201 'N' (0-1GHz) 'N'.....£24.95
4 way CX-401 (0-500MHz) SO239 .....£69.95
4 way CX-401 'N' (0-500MHz) 'N'.....£79.95

LOW LOSS PATCH LEADS

£2.50 P&P

Connectors	Length	Price
PL-259 - PL-259	0.6m	£5.99
PL-259 - PL-259	4m	£9.99
BNC - BNC	1m	£6.99
BNC - BNC	5m	£10.00

MOBILE ANTENNAS

P&P £8.50

DB-770M	2m/70cm (3.5 - 5.8dB) 1m PL-259	£24.95
DB-7900	2m/70cm (5.5 - 7.2dB) 1.6m PL-259	£39.95
PL-62M	6m + 2m (1.4m) PL-259	£21.99
PLT-20	20m mobile whip (56" long)	£24.95
PLT-40	40m mobile whip (64" long)	£24.95
PLT-80	80m mobile whip (64" long)	£24.95
PLT-259	PL-259 converter for above	£5.95

NEW NOISE FILTER!

A superb TDK 'snap fix' ferrite clamp for use in Radio/TV/ Mains/PC/Phone etc. *Simply close shut over cables and notice the difference!* Will fit cables up to 13mm diameter. Ideal on power supply leads/mic leads/audio leads/phone leads.

2 for £10.00 or 6 for £25.00 (P&P £3.50)

DOUBLE THICK FERRITE RINGS

A superb quaility ferrite ring with incredible properties. Ideal for "R.F.I". Width 12mm/OD35mm. 6 for £12.00
12 for £20.00 P&P £3.50
50 for £40.00 P&P 7.00

METAL WORK & BITS

P&P available on request

2.4m/2" alloy poles £19.99
2" Mast base plate .....£12.95 P&P £5
6" Stand off.....£6.95 P&P £5
9" Stand off.....£8.95 P&P £5
12" T&K Brackets .....£18.00 P&P £8
18" T&K Brackets .....£22.00 P&P £8
24" T&K Brackets .....£26.00 P&P £8
U bolts (1½" or 2").....£1.20 each
8 nut universal clamp (2" - 2") £5.95
2" - 2" cross over plate £10.95
3-way guy ring £3.95
4-way guy ring £4.95
2" 3-way rotary guy ring.....£29.99
2" mast sleeve.....£9.95
Heavy duty guy kits (with wire) .....£29.95 P&P £6
Ground fixing spikes (3 set) powdered coated £24.00 P&P £8
30m pack nylon guy 4.4mm/B/load 480kg .....£12.50 P&P £3
132m roll nylon guy (4.4mm) .....£40.00 P&P £7.50
Self amalgamating tape (roll).....£6.50
'Nylon' dog bone insulators.....£1.00 each
PL-259 plugs (large or small entry).....£1.10
N-type plugs (large or small entry) £3.95

DIAMOND CP-6

A superb (diamond quality) 6 band trap verticle antenna with trap radials – "rotary" trap system allows "flat wall" mounting. 80m/40m/20m/15m/10m/6m. 200W SSB, HT 4.6m

SEND SAE FOR DATA SHEET

OUR PRICE **£219.99**

Q-TEK PENETRATOR

"WE'VE SOLD 100S ALL OVER EUROPE"

★ 1.8 - 60MHz HF vertical ★ 15 foot high ★ No ATU or ground radials required ★ (200W PEP).

ONLY **£179.95** Del £10.00

SEND SAE FOR LEAFLET

DELUXE G5RV

P&P on either full/half size £6.50

Multi-stranded heavy duty flexweave wire. All parts replaceable. Stainless steel and galvanised fittings.

Double size - 200ft (160-10m).....**£84.95**
Full size - 102ft (80-10m) **£42.95**
Half size 51ft. (40-10m) **£36.95**

Inline (SO-239) line isolator (ideal for G5RV).....£29.99

STANDARD G5RV

Full size 102ft (now includes heavy duty 300Ω ribbon)....£28.95 P&P £6
Half size 51ft (now includes heavy duty 300Ω ribbon).....£24.95 P&P £6

Q-TEK INDUCTORS

80mtr inductors + wire to convert ½ size G5RV into full size. (Adds 8ft either end) .....£25.00 P&P £4.00 (a pair)

G5RV PARTS

Open wire dipole centre £5.99
SO-239 dipole centre £5.99
SO-239 to 300Ω joiner £9.99
300Ω ribbon (Extra heavy duty).....£1/mtr

Q-TEK COLINEARS (VHF/UHF)

P&P £10.00

X-30 GF 144/70, 3/6dB (1.1m) £39.95
X-50 GF 144/70, 4.5/7.2dB (1.7m) £54.95
X-300 GF 144/70,6.5/9dB (3m) £69.95
X-510 GF 144/70, 8.5/11dB (5.4m) .....special £89.95
X-627 GF 50/144/70, 2.15/6.2/8.4dBi (2.4m) ..£79.95

BALUNS & TRAPS

1.1 Balun .....£25.00 P&P £4
4.1 Balun .....£25.00 P&P £4
6.1 Balun .....£25.00 P&P £4
40 mtrs Traps .....(a pair) £25.00 P&P £4
80 mtrs Traps .....(a pair) £25.00 P&P £4
20 mtrs Traps .....(a pair) £25.00 P&P £4

1kw Handling

TELESCOPIC MASTS

6 section telescopic masts. Starting at 2" in diameter and finishing with a top section of 1 /4" diameter we offer a 8 metre and a 12 metre version. Each mast is supplied with guy rings and steel pins for locking the sections when erected. The closed height of the 8 metre mast is just 5 feet and the 12 metre version at 8 feet. All sections are extruded aluminium tube with a 16 gauge wall thickness.

8 mtrs **£109.95** 12 mtrs **£149.95** *Carriage £12.00.*

Tripod for telescopic masts £89.95

REPLACEMENT POWER LEADS

DC-1 Standard 6-pin/20A fits most HF £20.00
DC-2 Standard 2-pin/15A fits most VHF/UHF £10.00

BARGAIN ALUMINIUM POLES

2.4m x 2" aluminium pole. **£19.99 each** (del £10.00) or **4 for £50** (del £15.00)

CAR BOOT MAST SET

Once they've gone, they've gone! 5 section (15') 4.5m 1¼" slot together mast set. Collapsed length 0.92m (3') makes this ideal for travelling.

£24.99 Del £10.00

2 for £35.99 del £12.00 3 for £45.99 del £12.50

NEW 20' SLEEVED MAST SET

A heavy duty-sleeved, mast set that will tightly slot together. 4 x 5' (2" dia) 16 guage heavy duty aluminium tubes. (Dimensions approx).

£49.99 Del £10.00.

TWO FOR £90.00 DEL £12.50

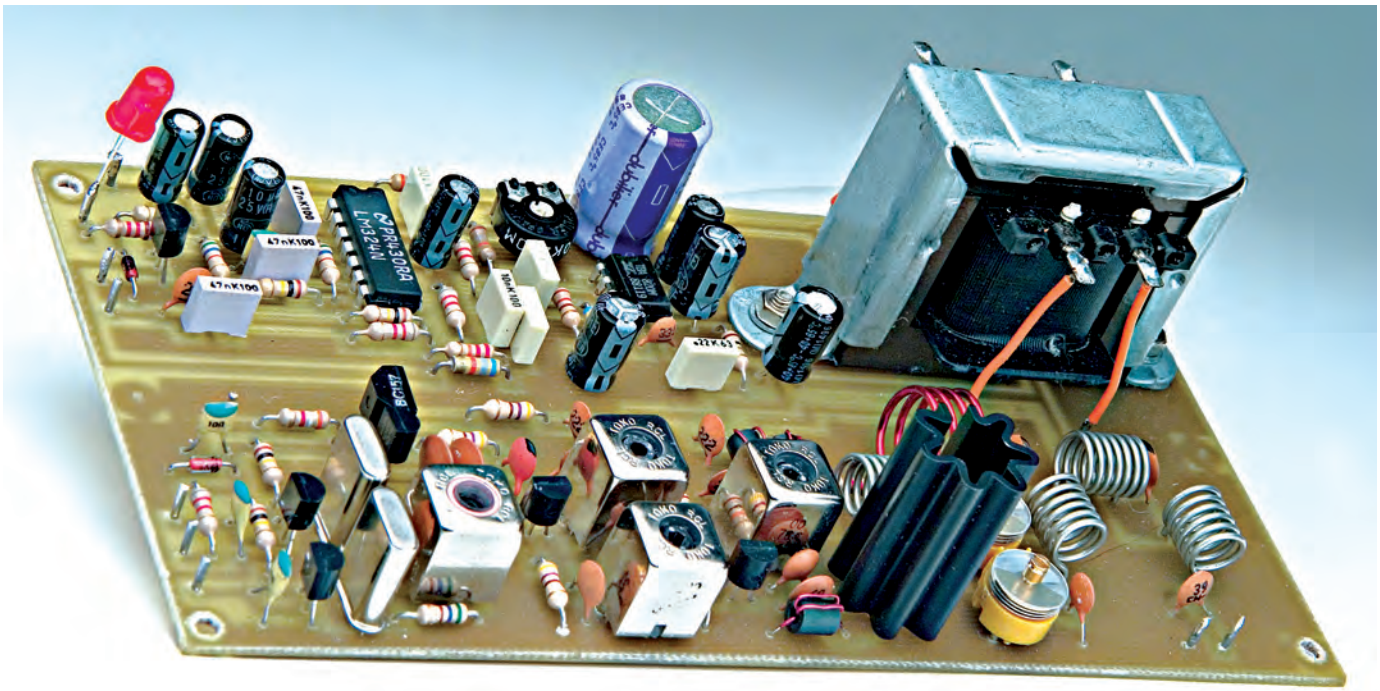
ALUMINIUM POLE CLEARANCE

We have sets of 4 (2") poles (3 of which are swaged) that slot together to make a (approx) 20' pole. Each section is approx 5' long – some have small dents in – some have been swaged slightly off centre – hence the price.

3 FOR £40.00 DEL £15.00 SCRAP PRICE **£19.95** Del £ 0.00

The PW Mellstock 70 MHz 1W AM Transmitter Part 1

Introducing Part 1 of the PW Mellstock 70MHz a.m. transmitter, Tony Nailer G4CFY mentions the gentle Editorial blackmail techniques used to get the project off the ground. He starts by describing what turned out to be a fascinating adventure in design!



The completed PW Mellstock 1W a.m. 70MHz transmitter project (see text) design by Tony Nailer G4CFY.

Earlier this year, during a working lunch with the Editor **Rob Mannion G3XFD**, he showed me a circuit diagram of a 70MHz amplitude modulated (a.m.) transceiver from the *Short Wave Magazine* February 1968 issue. The project was by **John Hey G3TDZ**, and having built it himself many years ago Rob intended to reprint the project in Radio Basics in the April 2005 *PW* as an encouragement for his readers.

However, after a brief look at the circuit I told him it was a really bad idea. The receiver was a super-regenerative which might be a pig to try and produce in a repeatable form. The variable capacitor was probably unobtainable. Six of the transistors were *npn* and still available, the remaining eight were obsolete germanium *pnp* types.

Worst of all (and the real clincher in my opinion) was the modulation transformer - a home wound 130 turns trifilar on a gutted microphone transformer measuring 1.25 x 1 x 0.4in. Now, I wondered, "where are the constructors going to find those"? I also understand that many *PW* readers really hate winding their own coils or toroids. So a transformer has no chance!

Protests From G4CFY!

Despite my protestations regarding what I considered to be a non-viable project, Rob went ahead and reprinted the article as planned! Talking to him afterwards I suggested that the modulator could be replaced by a modern audio amplifier integrated circuit (i.c.). However, here again the transformer would still be problem.

I also pointed out that the crystal mentioned in the article

was quoted with its fundamental mode frequency and then being used in a circuit firing it on its third overtone. The resulting frequency would be between 10 and 20kHz lower than expected. The answer would be to use modern 3rd overtone cut crystals **(see note below; Editor)**.

It wasn't long before I realised that Rob been baiting me and I had taken the bait, hook line and sinker! The trap was - "Why didn't I design and develop a 2005 version of the 1W a.m. 70MHz transmitter"? It was agreed and I set to with the design and development after we'd enjoyed a good lunch!

Note: *Of course, I fell right into the overtone confusion myself! I could not understand (at that time) why I couldn't join the Southampton 70MHz group on 70.26MHz. Several stations heard me but the only comment was "Why's Rob down on that frequency!). Moral of the story- check the crystal and mode of operation!* **G3XFD**.

Modulation & Transformer

So, back in my workshop I set about addressing the issues. Knowing that the problem would be the modulator and modulation transformer I assembled an audio amplifier i.c. onto a blank printed circuit board (p.c.b.) 'dead bug' style and checked it worked well.

Then I proceeded with the radio frequency (r.f.) strip. As I'm really familiar with oscillators, multipliers and amplifiers at v.h.f. it was fairly straightforward for me to draw up a suitable r.f. strip.

The circuit, using a 23MHz overtone crystal oscillator, a tripler, a driver and power amplifier (p.a.) stage was quickly assembled dead bug style. On test it produced just under 1W output.

Transformer Problem

Now came the difficult part, to modulate the transmitter! What was needed was a 1:2 ratio transformer. Next I tried an LT700 audio transformer, but it was no good at all. Then, on the suggestion of **Tex Swann G1TEX** from *PW*, I tried several small mains transformers with dual secondary windings but they were horribly inefficient.

The answer of course was to find a suitable modern transformer core and wind my own, just as John Hey G3TDZ had done. Looking through the component suppliers catalogues I found the RM ferrite cores with a variety of bobbins. These looked ideal as they quoted operation up to 300kHz and I presumed from this that they would work from low frequency (l.f.) to 300KHz.

Next, it was time to read through the pages and pages of literature I'd accumulated over the years about transformer design. Finally, when I was reasonably certain that I understood the theory I obtained the characteristics of the RM ferrite core material available from a couple of the major suppliers.

I then designed a 1:2 ratio transformer using an RM10 core and tested it with my modulator and transmitter. Unfortunately, the whole circuit went into l.f. oscillation. Many attempts to stabilise it finally tamed the beast - but the modulation efficiency was low and the envelope pattern was distorted.

Whilst sweeping the frequency of my audio generator I noticed the modulation depth increased with increasing frequency and the distortion steadily reduced. Sweeping it well above the audio range I found that the efficiency approached 100% and with little distortion at 100kHz!

However, although I noted that the amplitude of the positive peaks was considerably smaller than the amplitude of the negative peaks. Clearly this would produce negative going modulation. I even developed some new equations for quantifying it. Eventually, I determined that the percentage positive modulation was about 60% of what theoretically should be achieved.

Assuming that the low frequency lack of efficiency was due to insufficient turns, I designed a new transformer and wound a new bobbin using hundreds of turns. When I tried it the performance was worse - but the maximum efficiency was still at 100kHz.

My conclusion was that the ferrite core was just no use at audio frequencies (probably why all the manufacturers use laminated steel cores in this frequency range). Unfortunately, I could not find suppliers of laminated core kits, nor would I have wanted to wind and build transformers using them.

Different Approach

It was time for a different approach. Maybe there was a better way to produce 70MHz a.m. by generating the signal at low r.f. level in a balanced modulator and then using wideband linear amplifiers to raise the level to 1W. So I proceeded to do just that and built a whole new prototype transmitter.

As before, I used the 23MHz overtone oscillator, then a tripler, and then into the two transistor balanced modulator described in Doing it By Design July 2005 PW. This produced a perfect signal and according to all my measurements was close to 100% positive modulation.

Next, a field effect transistor (f.e.t.) amplifier was added which gave about 10mW carrier and about 35mW peak power, with the positive modulation achieving 87%. A further stage comprising two BSX20 transistors in transformer push-pull using ferrite bead transformers achieved 125mW carrier and 400mW peak with positive modulation achieving about 80%.

That was unfortunately as far as I could get. Attempts to use a pair of 2N4427s in a push pull wideband amplifier failed to produce worthwhile results. Toroid core samples were obtained and turns calculated but nothing worked. In the end I shelved it and returned to the modulation transformer problem.

Back To Drawing Board

It was time to go back to the drawing board! Again I searched the catalogues, the web, and even started 'phoning

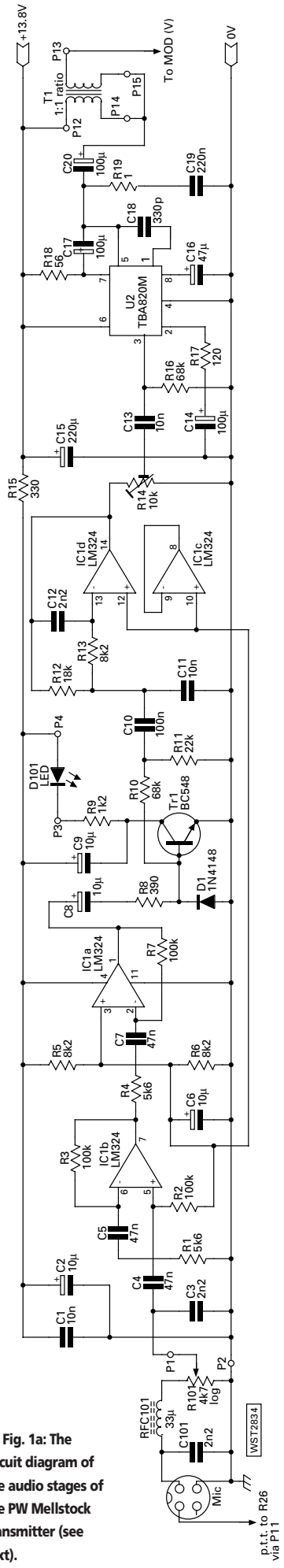


Fig. 1a: The circuit diagram of the audio stages of the PW Mellstock transmitter (see text).

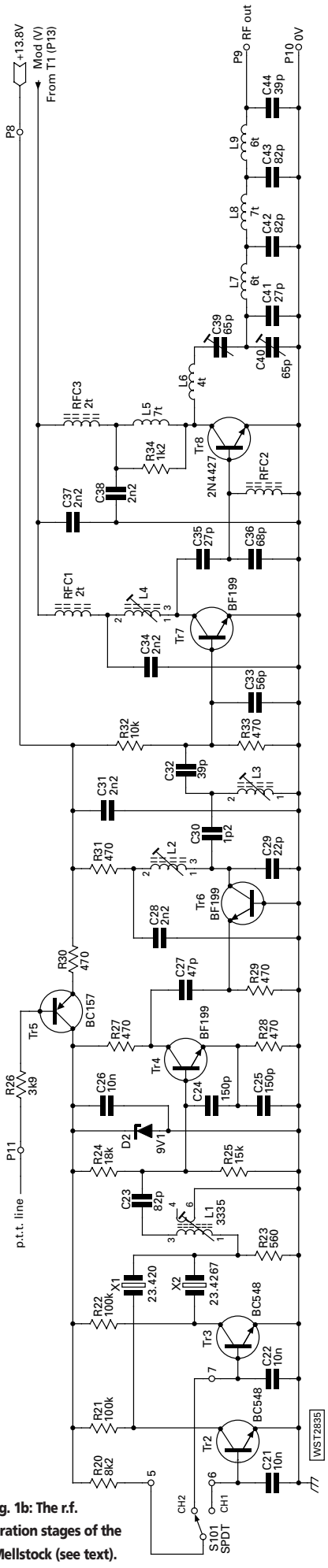


Fig. 1b: The r.f. generation stages of the PW Mellstock (see text).

companies to see if they had any suitable transformer. Most were willing to make a special but the minimum order value had to be £500.

Then I found a transformer rated at 2W for audio use with a 1:1 turns ratio and thought it might work configured as an auto transformer. I ordered a sample and when it arrived I had to rebuild the original prototype modulator and r.f. strip.

To my absolute delight the circuit worked! Maximum efficiency was at 200Hz with a falling efficiency with increasing frequency. I recalculated the coupling capacitor to resonate with the inductance of the transformer at 600Hz and tried it again. Wonderful, a gently rising response from 200Hz to 600Hz and then a gentle fall with increasing frequency.

Speech Processor

In order to maximise the sideband power due to the higher voice tones, and to reduce the modulation depth due to low voice tones, I incorporated a speech processor. This I had designed for another transmitter project which is still on-going.

In conjunction with the audio i.c. modulator a response was then achieved with a sharply rising characteristic from 200Hz to 600Hz and then a falling characteristic up to 2.5kHz. Quite high levels of amplification are used, and then the audio is clipped and filtered. The result is that full 100% modulation depth is achieved for a large part of the voice syllables but over modulation is severely restricted.

Modulator Described

Let's now take a detailed look at the modulator section. Here the signal from a microphone is amplified in a non-inverting op-amp IC1b. This stage has a high pass characteristic with -3dB point at 600Hz created by the components R1 and C5. The gain of the stage is x18 (25dB).

The signal is then further amplified in IC1a which is an inverting amplifier of gain x18. This also has the same high pass characteristic due to R4 and C7.

Output from IC1a is fed to D1 in parallel with the base-emitter diode in Tr1. This is effectively a pair of back-to-back diodes to symmetrically clip the audio. Incidentally, use is made of the collector of this transistor to illuminate a light emitting diode (l.e.d.) when the base-emitter junction is conducting.

The l.e.d. feature allows the adjustment of the microphone gain control. It's an aid to setting the gain so the l.e.d. is fairly bright when speaking with a regular voice level. Following the clipper is, IC1d, which is configured as a multiple feedback low pass

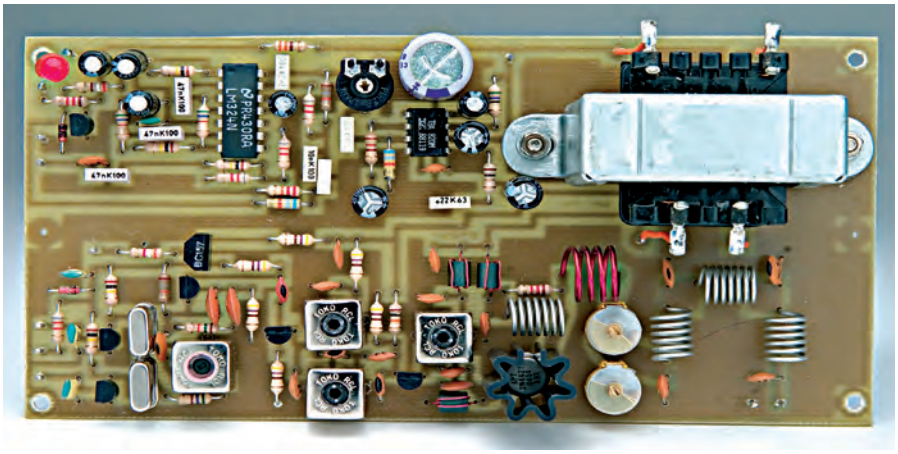


Fig. 2: Overhead view of the completed Mellstock p.c.b. (see text).

filter with a corner frequency around 2.4kHz.

Output from the processor section is then fed to the modulator i.c. via a trimpot which is used to preset modulation depth. The i.c. has a low value input capacitor which couples voice frequencies well into its high impedance input but prevents low frequency instability.

The RF Section

Time to look at the r.f. section now. Here, the third overtone crystals operate in conjunction with Tr4 and the reactive components L1, C23, C24, & C25 to produce an impedance inverting Colpitts oscillator. (Details of the design of this stage are covered in detail in Doing it By Design September 2004 PW).

Transistors Tr2 and Tr3 provide direct current (d.c.) switching of the crystals and prevent effects from switch wiring. When one of these devices is off, the collector will be a very high impedance and effectively the crystal is in series with the 100kΩ resistor to the positive rail.

When the transistor is switched on, it grounds that end of the crystal thereby completing the circuit. Resistor R2 (560Ω) is across the active crystal and prevents operation in the high impedance parallel mode.

Output from the oscillator is taken from the collector where the signal is less rich in second harmonic than it would have been taken from the emitter. The following stage is a tripler and 'hitting' it with high levels of fundamental and second harmonic would produce lots of unwanted products.

Transistor Tr5 is in series with the oscillator supply rail to act as a push-to-talk circuit (p.t.t.). Unless the terminal P11 is grounded the oscillator will not run. Observing the envelope of the carrier on a scope when triggering the p.t.t. pin P11, I noticed that the leading edge of the envelope exhibits a cycle and a half of low frequency bounce. If this causes a 'burp' when the transmitter is keyed then a capacitor from the base of Tr5 to the junction of R30 and R31 may need to be fitted. (perhaps a value in the range 100nF to 10µF could be tried).

Transistor Tr6 is operated in grounded base mode which produces higher levels of third harmonic than common emitter mode. The values of C27 and R29 are adjusted to reduce the portion of the of the driving wave during which TR6 will conduct.

When Tr6 conducts for just one third of the period of the negative swing of the fundamental wave the collector will produce an amplified copy of the same. This half cycle at one third the period is now a half cycle of the third harmonic.

The coil L2 has its top end decoupled to ground by C28 which has a reactance of about 1Ω. In respect of the alternating current (a.c.) the top of the coil is grounded at 70MHz. This puts the coil effectively in parallel with C29 and together they resonate at 70MHz. The output pulse from Tr6 triggers this resonant circuit, thereby enhancing 70MHz and rejecting other frequencies.

The signal is coupled from L2 and C29 resonant circuit by C30 and into another resonant circuit comprising L3, C32, and 33. This is another parallel tuned circuit where the series arrangement of C32 and 33 provides a low impedance output for the next stage.

Transistor Tr7 is a straightforward amplifier d.c. biased so it's just below conduction. The positive swing of the 70MHz signal applied to its base drives it hard into conduction during that half cycle. The collector produces a massively amplified negative half cycle for the same period.

The collector circuit of Tr7 is another parallel tuned resonant circuit comprising L4, C35, and 36 with low impedance output for the following stage.

The power amplifier stage is biased through radio frequency choke 2 (RFC2) so that it does not conduct until the driving positive half wave reaches 0.65V. The drive signal swing is of the order of 6V and so has TR8switched on for 90% of the half cycle. This produces a corresponding negative half cycle swing of the collector circuit.

Coil L5 is an r.f. supply choke and is not really part of the tuned circuit. The reactance of L5 is chosen to be about 10 times the load resistance of the collector circuit. Coil L6 together with variable capacitor 1 (C39) and C40 form a series driven parallel tuned circuit capable of matching a collector resistance between 35 and 100Ω to 50Ω.

Capacitors C41, 42, 43, and 44 together with L7, 8, and 9 form a seven element Chebychev low pass filter. This is as complex as a filter needs to get if it's to be built without screens on a p.c.b.

Transmitter & Filter Performance

Performance of the transmitter and filter combination is that an unmodulated carrier of 1W output has the second harmonic -52dB, 3rd harmonic -55dB and no others except 700MHz at -60dB. These could possibly be further reduced if the output filter coils were screened from each other.

A circuit diagram is provided in Fig. 1. **The p.c.b. layout diagrams, complete with artwork to enable you to home brew p.c.b.s, will appear next month along with the full component listing.**

Individual parts or the complete kit are available now (see information box below). Next month I'll conclude the project with construction, alignment, and measurements. **PW**

Reader & Constructor Feedback

If you wish to correspond regarding this article please subscribe to the list **pw-g4cfy-on@pwpublishing.ltd.uk** by sending a blank E-mail with the word subscribe in the subject box. When you receive confirmation from the server you can send an E-mail to pw-g4cfy@pwpublishing.ltd.uk and your comments will be answered by myself or the *PW* team.

Kits & Bits

The p.c.b. is available on its own for £15 including p&p. The transformer is available on its own for £9 including p&p.

The complete kit with p.c.b. and all components including the modulation transformer, microphone gain pot, channel switch, microphone chassis plug, l.e.d. holder, microphone filter capacitor 2n2 and choke 33µH is available for £57.50 including p&p.

Please make cheques payable to **A.J. & J.R. Nailer, Spectrum Communications, 12 Weatherbury Way, Dorchester, Dorset DT1 2EF.**

Heritage & History - It's there to be discovered and enjoyed!

Rob Mannion G3XFD enjoys exploring our technology's heritage and history. He's a firm believer that industrial archaeology isn't a boring topic - indeed it seems to keep him fizzing with enthusiasm!

Nobody here at PW Publishing Ltd. enjoys travelling with me in my car to radio rallies and shows. In fact, unless they have to - they'll do their best to avoid being told many things they didn't know of before - and perhaps didn't want to know in the first place!

The reason for the reluctance is that I'm an inveterate railway enthusiast who has a passion going far deeper than just watching and enjoying trains! In fact, my interest includes railway history, the social history, the engineering and the fascinating remains that can be loosely grouped under the ponderous, but basically accurate name of Industrial Archaeology.

Anyone riding in my car is subject to the driver suddenly pointing out that the long mound of earth running parallel to the M1 is "The remains of the Great Central London Extension", etc. Boring it may be to the non railway enthusiast (I actually think of myself as an amateur historian) but to me it's fascinating and has been a life-long passion.

The reason I've mentioning my passion for railway history and the remains of the industrial archaeology associated with it - is because I see a clear parallel between my railway interest and that of radio and associated communications history. And, although it may not be so obvious as the overgrown railway embankments, abandoned stations and lonely viaducts of long closed railway routes - the heritage and history of radio communication sites literally surrounds us, either as forgotten sites, or in some case still actively serving their original purpose.

Almost Invisible!

Even though the heritage and historically connected radio communication site are all around us - they are often, in effect, almost invisible because most of us, keen as we may be on radio, tend not to realise they are there! Indeed - how many people who live near the historic former BBC transmitter at Brookmans Park north of London realise it's a pioneering radio site? It is - and it's still in full operation.

Another, equally important historic radio site - the Droitwich BBC 198kHz Radio 4 transmitter - is also still in full operation. Indeed, with its two co-channel companion transmitters - Westerglen near Falkirk in Scotland, and Burghead near Inverness - this truly dramatic installation provide a 24 hour a day service. However, the transmitters used within the original installation and facade (un-manned nowadays and completely automatic in operation) comprises of state-of-the-art solid state equipment.

The Droitwich station (officially known as Wychbold Farm) stands alongside the M5 southbound lane between Birmingham and Bristol. It's a magnificent looking installation, especially to anyone like myself whose interest is aroused by radio masts!

However, I know I'm not alone in my interest (eccentricities?) and this has been proved by the fact there was an interesting programme on television some while ago where a number of (can we call them 'Mast-Heads'?) were grouped together to discuss their fascination in radio and broadcasting masts. I watched the programme and was delighted to find several Radio Amateurs in the group. There was at least one former colleague who also worked for the old Independent Broadcasting Authority at the same time - in the 1970s - as I did.

Valuable Support

To help with this special series I've recruited the extremely valuable support of two well known Radio Amateurs who are also very keen on history. They are both well known to *PW* readers through their support to the hobby and the magazine. **Stan Brown G4LU**, who lives not far from Shrewsbury is a keen radio historian. Before retiring Stan managed both the famous Rugby l.f. transmitter and its sister station Criggion, on the Welsh Borders. Stan also looked after many other installations during his time with the old Post Office radio service, which was eventually passed on to British Telecom.

I'm also very grateful for the help and keen support coming from my good friend **John Corless EI7IQ**. John is one of the mainstays of Amateur Radio in the Republic of Ireland, particularly in County Mayo. John is a keen writer and when this is combined with his extensive experience as a Civil Engineer we end up with an author who can talk with authority about the radio and related civil engineering feats in his beautiful homeland.

John EI7IQ has prepared a very special item on the majestic pioneering Clifden, County Galway, Marconi station. In his article he's also provided a fascinating insight into the difficulties after the First World War, which ended in the birth of the

Fig 1: The original pioneering Chain Home high frequency radio location (latter called Radar) transmitter sites could be found from southern England to the Shetland Isles. Although most have disappeared, some sites are still used for other purposes (see text)

Fig. 2: John G3COI's humorous interpretation of the 'Biggest Aspidistra In the World' probably plays along with the same imaginative mind that coined the code name for an extremely powerful transmitter The 'Black Propaganda' transmitter 'Aspidistra' was buried under a forest in Sussex and the site still exists - under a Police Training facility within the beautful Ashdown Forest in East Sussex. (see text).

Irish Republic. If you enjoy the article half as much as I did - you're in for a great read!

Incidentally, in my extended family we've long had a possibly legendary belief that a relative - one **Joseph Mannion**, an older brother of my late Grandmother - actually worked at the Marconi station in Galway. He had been working on the railway as a fireman when, due to an accident, he could no longer carry out footplate work and ended up stoking the peat-fed steam boilers at Clifden.

Family tradition has it, that Joseph (who disappeared after 1918) was a victim of the terrible world-wide influenza epidemic. John EI7IQ and I are now hoping to confirm the story. Either way it will be fascinating - because even if it's an unconfirmable myth, the story makes me feel proud to think there may, just possibly, have been a family connection with Marconi's pioneering work.

Finally in this introductory article I would encourage anyone who is interested in the 'archaeology' of radio and communications to contact me. Please feel free to share your own memories, and knowledge of sites you know of. I'm planning to prepare a special map where all such sites can be recorded. I have no doubt - there'll be plots on the map from Orkney to Oban, from Glasgow to Galway and the Lizard to London!

Results Of War

Even though radio communication - in all its forms - has been with us for just over 100 years, the biggest expansion of the technology has come directly as the result of war. The *PW* cartoonist, **John Worthington G3COI** (he's now left Wales, and lives near Shrewsbury) has provided us with one of his own memories, **Fig. 1**, of an early Chain Home Radio Location (later Radar) station. And fortunately, many of the sites used for these stations can still be found easily.

Many years ago I was based on the Isle of Wight for a period (not long enough!) and my favourite location for operating /P on 70 and 144MHz was St. Boniface Down, above Ventnor. This was the site of the famous original Chain Home (CH) station, where incidentally, well known *PW* Author **Charles Miller** (Editor of *The Radiophile*) also served while 'getting some in'- the popular term referring to the 'call up' for National Service.

Although the underground rooms still exist, the original CH tower masts have long since been demolished. However, the site is still very much concerned with radar and the large 'over the horizon' arrays connected with Air Traffic Control for the southern half of the UK are working 24 hours a day.

The Ventnor site was a dramatic looking installation and it surely drew the attention of the Zeppelin airships that cruised around our coast, not long after the original CH system was active. In fact there's a story (confirmed as true by RAF sources!) that the Zeppelin was observed from the East Coast near the Humber estuary on a new radar station's screen while it was giving its (incorrect) position to Friedricshafen. The RAF operators hesitated and decided not to radio them with the correct plot!

The Ventnor site was also one of the few actually shut down for a period due to air raids during the Battle of Britain, mainly because (I'm sure) it was so easy to see. Perched high above the sea literally on the first land west of the Kent Coast, it was easily visible from aircraft approaching across the Channel from France, espcially from the Cherbourg penisular.

If *PW* readers visit the Isle of Wight on holiday there's much of radio interest, and I thoroughly recommend a visit to the Ventnor site. The narrow road twists and turns its way up through gorse clad bank and is prone to sea mist. But when you arrive - the view is stupendous, the v.h.f./u.h.f. take-off is great and you can think back at that pioneering h.f. radar system and its important role.

Finally, on this aspect, I'm pleased to say that I have several items of historical components made for the CH stations by Marconi Company in Chelmsford. These include quartz crystals for the main transmitters and were offered for sale by

long term *PW* advertiser **John Birkett**. John sold boxes of these crystals almost 40 years ago for around £2 a dozen! Not only did they provide a bargain method of getting on to the 10 metre bands - they're now a link to those darks days of 1940 when the CH stations helped protect our airspace.

Broadcast Transmitters

When looking at our radio heritage and history, it's important to remember the roles played by the extensive BBC transmitter system. And while remembering the information packed book I use for reference, I urge readers who don't have a copy of *BBC Engineering History 1922-1972*, to locate a copy through the local library service. It's a truly wonderful read and lays tribute to the fantastic efforts played by the broadcasters during the Second World War to keep the public informed (informed of what the Government wanted us to know!), entertained, and at the same time denying enemy aircraft the unintentional direction finding assistance provided by a fixed broadcasting station.

Many low power stations were set up by the BBC during the war and a number of their Engineers (manning the stations) paid the ultimate price for their devotion to duty. Transmitters were instructed to go 'off air' when aircraft were seen to be heading in their direction. The bravery of the people (often provided only with a steel box - single person sized - to shelter in during a raid) is beyond my imagination.

The BBC book I've mentioned gives many details of the war time services and the evacuation (and the enormous effort involved) to Worcestershire for the duration of the war. It also tells of some amusing - and extremely unusual - locations for temporary stations.

I've no doubt that most *PW* readers living in the Bristol area know of the Clifton Gorge funicular railway. This wasn't a very successful affair because people preferred to see the beautiful scenery of the Gorge, rather than being inside what was almost a lift shaft! However, the installation - close by the famous Clifton Suspension bridge - proved useful during the War when it was turned into a BBC stand-by transmitter!

The first stages of the transmitter were at the bottom of the funicular railway shaft, with the power amplifier and final stages at the top. Although the site is interesting (I've visited it myself) there's no sign of any mast bases at the top and I can only assume they must have been wooden, temporary types. perhaps If you live in Bristol and remember the installation you could add some information?

Biggest Aspidistra?

Apart from Military communications sites, and general broadcasting installations dotted throughout the UK, there were also the 'clandestine' or 'political' transmitters. Often the services provided by these stations are given the term 'Black Propaganda'. If you're interested in this particular subverse form of broadcasting there are many sources of information. My personal recommendation is that you look for anything which involves the work of the late **Sefton Delmer**. It was he who was in effect, in charge of the 'Biggest Apsidistra In The World'!

No, we're not thinking about (as John Worthington G3COI is in his humorous cartoon suggests in **Fig. 2**) the singer/actress **Gracie Field's** comical song 'The Biggest Aspidistra In The World', which was popular before the Second World War. Instead, by coincidence (perhaps not!) the name was that applied to the Black Propaganda transmitter buried underneath Ashdown Forest in Sussex (now East Sussex) isn't far from Crowborough.

The transmitter was given a tongue-in-cheek code name of Aspidistra and was for many years the most powerful type of its class in the world. It was so powerful that when our Government required a high power transmitter to transmit to the Communist Eastern Bloc countries during the 'Cold War'- they re-used the Aspidistra transmitter and sited it near Orfordness on the East Coast of England. Indeed it was so powerful that passing ships reported sparks coming form their mast rigging and radio antennas! It's not an exaggeration either because I've seen it for myself during Royal Navy service!

The huge Aspidistra installation had an amazing history. Originally made for the BBC Woofferton wartime short wave station, one of the three important 'War time three' stations (more about the 'Wartime Three' in Part 2) they'd not long been installed when they were literally torn out again! In fact, the American-made transmitters were somewhat damaged in the change-over and during their journey to Sussex. The beautifully finished equipment got a real battering.

A large number of Royal Canadian Army Engineers built a huge underground chamber to house the new Aspidistra transmitter Located deep in 'Rupert Bear country (the creator of the famous cartoon character knew the Forest well) and not far from author **A. A. Milne's** Christopher Robin's and Winnie the Poo's 'Poo Stick' river. The transmitter site is still there, buried deep below a Police Training Centre! The Crowborough & District Amateur Radio Club have long promised me a special visit and I hope to see it in the near future.

The transmitter equipment is no longer there, but the art deco style control panels and the control room itself still exist. It's just another of the heritage and history wonders that wait for our visits!

Purely Military

Finally for this month, I must briefly mention the enormous number of military radio communication sites that existed (and in some cases still exist) in the UK. Of course having served in the Royal Navy and spent most of my youth not far from Portsmouth, it's the Royal Navy communications aspects that fascinates me.

One of the most abiding memories I have from childhood is travelling sometimes by train or in a relative's car from Southampton to Portsmouth via Porchester (site of the ancient Roman waterside castle). Approaching the headwaters of Portsmouth Harbour we were greeted by the hulk of a war time submarine stranded on the mud flats, the castle and the enormous array of radio antennas and masts on Horsea Island.

In fact, the island seemed to me be just a floating radio site and nothing else! However unknown to me at the time, there was (and still is) a large man-made lake, which is used for diver training by the Royal Navy.

Long dismantled, the Naval radio installation at Horsea is only a vivid memory for me now. However, nowadays the site can be seen from the M27, although it's partly screened by the extensive land reclamation and building undertaken in recent years.

I've no doubt that there are readers (particularly members of the **Royal Navy Amateur Radio Society**) who may have stories and photos of this and other sites! If you can help - please contact me to add your story to this series.

Next Time

Next time, in Part 2 as I expand - with your support - on the various themes to further explore our radio heritage and history, **Stan Brown G4LU** will share some of his memories of the various stations he worked at, including Rugby and the historic Criggion transmitter which played a part in the Battle of the Atlantic.

John Corless EI7IQ will also provides a truly fascinating account of the Marconi Company's Clifden transmitter in the west of Ireland. If either of these contributions don't set at least some of you off on your travels to take a look - I'll eat one of my favourite Great Central Railway Timetables at the Liecester Amateur Radio Show!

PW

We all know the benefits of subscribing - never missing a copy, getting the latest issues before they go on sale to everyone else, snapping up the bargains in the private adverts and so on. But we also know that sometimes it can seem like just too much trouble to fill in the forms and post them back to us.

We've been asked so many times why readers can't subscribe via the Internet and now you can! We've teamed up with a new subscription company and now you can use their website to:

NEW subscribe on-line

order a new subscription

Simply pay with a credit card on-line using their secure server.

check the status of a subscription

Existing subscribers can now log in to their own accounts and see how many issues they have left to run.

update your details

If you move or change your personal details, you can now update them on-line without having to write in to let us know.

renew an existing subscription

We've made renewing easier too. Everything you need to renew is now available on-line as well as by regular mail.
(Subscribers still get a reminder in the post when it's time to renew).

Internet Orders can be placed at

www.webscribe.co.uk

or by **E-mail** to

pw@webscribe.co.uk

See the subscription page in this issue for a full list of prices and a form you can use if you'd prefer to use the post to set up your subscription.

Please note cheques should be made payable to PW PUBLISHING LTD and CASH is NOT accepted.

Of course you can still subscribe by mail, FAX and telephone as well.

Simply contact **Webscribe** at:

Practical Wireless Subscriptions
PO Box 464
Berkhamsted
Hertfordshire HP4 2UR, UK

Credit Card Orders taken on:

Tel: (01442) 879097

FAX: (01442) 872279
between 9am & 5pm. Outside these hours your order will be recorded on an answering machine.

The bhi NEDSP1062-KBD DSP filter Review

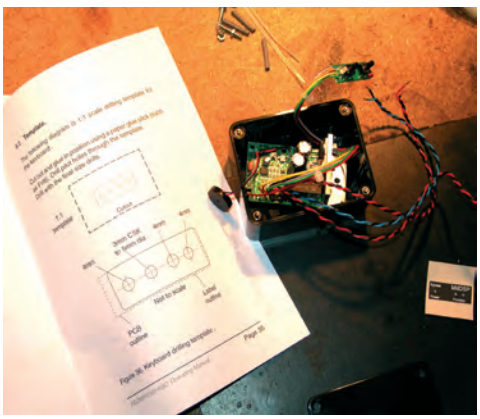
Richard Newton G0RSN has tried out the latest in a long line of DSP innovations from the UK based bhi company. Read and discover what Richard thought of bhi's latest product.

The first time I ever came across digital signal processing (DSP) was in the Kenwood TS-870 transceiver. This was when it was a relatively new innovation and very expensive. Since then I've used many rigs with built-in DSP and even purchased a multi function DSP filter for use at home.

The bhi NEDSP1062-KBD DSP filter is one of a series of DSP products bhi have marketed in differing formats on the same theme. The NEDSP1062-KBD DSP module is promoted by bhi as "a simple solution to adding DSP noise cancellation in a wide range of applications".

Eight Levels

The module offers a total of eight preset levels of noise reduction. These levels incorporate both white noise reduction and tone reduction. The eight pre-sets can be reduced to a choice of four if a more simplified set up is preferred.



● **Fig. 1: The pre-wired DSP unit and the supplied manual (see text).**

The lowest possible level is 9dB of white noise reduction/4dB of tone reduction. There's a maximum of 35dB of white noise reduction/65dB of tone reduction.

The module includes an audio amplifier providing 3W output (into 4Ω) this allows it to be effortlessly used with any rig by installing it between the rig and an extension speaker. The module runs on any voltage in the range 12 to 18V d.c.

The unit proved to be very versatile, measuring approximately 37 x 50mm it easily fits inside most large extension speakers. The two examples given by bhi are the Kenwood SP31 and the Yaesu SP8. The handbook supplied with the module gives specific fitting instruction for both these speakers including alternative wiring and installation advice.

● **Fig. 2: The unit is controlled by two small buttons (see text).**

Ham-Fisted Richard?

When *PW* asked me to do this review I had visions of G0RSN ruining this piece of kit with a ham-fisted attempt at wielding his soldering iron! Don't get me wrong, I love construction - I was just not entirely certain of my dexterity with a soldering iron as I'm a little out of practice!

Fortunately, I discovered that the module is supplied pre-wired, **Fig. 1**, even including the 2.1mm power connector. Phew thank goodness for small mercies!

In fact I was very impressed by the whole package. You get the module itself, a heat-sink (the review model had this pre-installed), mounting screws, insulation in case required, a pad of double sided sticky foam labels, a fused d.c. power lead and a couple of small cable ties. The build quality by bhi is excellent.

● **Despite Richard G0RSN's 'hamfisted' suggestion, he's adept at constructional work and enjoyed assembling the bhi DSP unit (in a friend's shack!) and was genuinely surprised by the results of his efforts!**

Two Button Control

The completed installed module is controlled by two small buttons, **Fig. 2**. These are mounted on a small board, which again is pre-wired and attached to the main board. There are also fly leads for audio in and audio out.

When it's in use the module shows the user what the current function and status are by using tri-colour l.e.d.s. These are on the small board with the buttons, together with a small piezo-electric sounder.

At first glance the 40-page instruction manual seemed a little intimidating! However I have to say that once I got started and actually read it properly instead of trying to skip read it, the book was well laid out and very helpful indeed!

As the module is designed for, and optimised to pass speech signals, it seemed to make sense to try it out on single side band (s.s.b.) signals, which are easily found on the high frequency (h.f.) bands. But of course the module could just as easily be used for s s.b. signals on any band - including v.h.f.

Tried & Tested

I decided to use my Icom IC-7400 for the testing and evaluation process. The first snag I came upon was that the speaker I had available didn't have sufficient room inside to fit the module! However, I hit on the idea of just making the unit up in its own box to put between the rig and the extension speaker.

A quick visit to the local Maplin store yielded the required bits, which came to the princely sum of just under £4. I then came across another snag.

My workshop is under renovation at the moment and all my tools are packed in boxes. So I enlisted the help of **Terry 2E1EJC** who kindly offered to let me use his work bench and tools. He also made two cups of tea!

Just to illustrate how easy the installation and set-up is, I arrived at Terry's house at midday and by 1500 I had finished and was on the

way home to meet my boys from school.

The first thing I did was to plan how I was going to place the module in the box I'd chosen. This in turn suggested where the control buttons would be mounted and the audio cables and audio and power connectors.

I chose a plastic box, for ease and economy (**see comment panel**). Of course, I realise there is an obvious trade-off here as far as shielding is concerned. However, the extension speaker I was using was also encased in plastic.

The hole-drilling template, **Fig. 3**, supplied by bhi in the handbook was a godsend and worked very well. Although, I did have to slightly readjust the holes with a round file after discovering that one of the buttons was catching (**see comment panel**). The button caught after I had secured it in place with the supplied bolt. The design is such that a single bolt going through the centre of the board secures the small board to the case.

The button switch causes the board to stand proud of the case and therefore, no matter how careful you are, the board will bend very slightly when tightened. Although the movement is so slight that you cannot see it, it was enough to prevent the button from operating. (After I had eased the hole it was absolutely fine).

Great Fun!

To be honest it was great fun putting the whole thing together. I put a cable on the audio input and wired a 3.5mm jack on to that, bringing it out of the rear of my box and making it long enough to reach the speaker socket of the rig.

The extension speaker didn't have a plug on it so I got a phono plug for the speaker and a phono socket for the rear of the DSP module box. I also put the 2.1mm power socket on the rear panel of my box.

Setting the module up was a breeze! All that's required is the setting of the audio in and out levels. Just follow the flow diagrams in the book and you're there. If I could do it - then it must be straightforward!

When the power is turned off the unit will still allow audio through. So you can happily have your speaker working normally without any DSP function.

You control the box to access the DSP by pressing two buttons, one is simply power **On/Off** while the other is the **Function** control. This will enable you to turn on the DSP function, go into one of the two demonstration modes and also choose between having four or eight levels of noise cancelling available.

Once you have chosen between four or eight levels you use this button to select the actual level. Each level is bleeped out to you by the piezo-electric sounder, three beeps for level three, five for level five and so on.

I took the finished module home and connected it to the Icom IC-7400, **Fig. 4**. The speaker itself is a good quality one but I was soon discovering how much the NEDSP1062-KBD DSP module enhanced the audio quality.

A friend of mine, **Ian Squires** had called round to visit and was with me when I turned it on for the first time in anger. I mention this because Ian is not a radio enthusiast - but even he remarked on the following experience.

On Air Tests

I turned the rig on to assess the module's results on the air and tuned to a very strong s s.b. signal on 14MHz. It was **Gary UA3QDX** near Moscow. He was a massive signal and there wasn't a huge amount of noise, I played around with the settings on the NEDSP1062-KBD DSP module and although it definitely cleaned up the signal, it was so good it was difficult to hear a difference.

I was turning the module on and off and just generally getting used to the controls while I was listening to Gary calling "CQ DX". I heard him enter a QSO. But I couldn't hear the other station – until that is, I turned the NEDSP1062-KBD DSP module on.

As soon as I turned the DSP on **W2LOP** from New Jersey USA was there! Albeit not the best signal I've ever heard, but none the less it was an audible, readable signal. A fluke perhaps?

I turned the unit off, and W2LOP disappeared, I turned it on again and there he was! This signal was not intelligible at all without the NEDSP1062-KBD DSP module, but with it I could hear him well enough to have made a QSO. Now that was impressive! Indeed - even Ian remarked on how impressive it was.

In conclusion, the NEDSP1062-KBD DSP module appears to be a relatively inexpensive option in comparison to other DSP items on the market. I am no expert but to the untrained eye build quality appears to be excellent, the literature that accompanies the module is first class.

The module is simple to install and wonderfully easy to operate. It does exactly what it says on the box and does it very well indeed if you want my opinion! **PW**

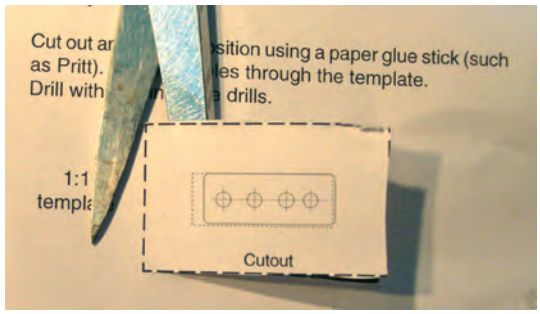


Fig. 3: Richard found the paper template provided by bhi Ltd. to be useful, however final adjustments were required due to a printing error (see reply panel).

Fig. 4: Richard G0RSN's Icom transceiver during the on air tests to evaluate the bhi DSP module. (see text for Richard's comments).

Graham Somerville of bhi Ltd., comments on Richard G0RSN's review: "We shall be making the unit available presented in a separate box in the same way Richard prepared his unit. Marketed under the 'Noise Away range they will be available for £119.95 plus £4.95 postage. **Drilling template:** I apologise for the errors, which crept in during the printing process and they'll be corrected in the next print run of the manual. However, the dimensions provided in the manual are accurate and can be used to make your own template. All current stock has had a note included to this effect".

Product

NEDSP1062-KBD DSP filter

Company

bhi Ltd.

Contact

Sales on 0870 240 7258

Pros & Cons

Pros

Easy to assemble and set up and effective in use, bringing stations out of the noise on h.f.

Cons

Time required on work bench!

Price

£99.95 plus £4.95 P&P. Optional plug mounted power supply (part number 1030-UKPA) at £9.95.

Supplier

My thanks go to Graham Somerville of **bhi**, **PO Box 136, Bexhill-on-Sea, East Sussex TN39 3WD. E-mail: sales@bhi-ltd.co.uk Website: www.bhi-ltd.co.uk** for the loan of the review unit.

ML&S martin lynch & sons

Suppliers of Communications Equipment

Take Away Now and Pay NOTHING Until This Time Next Year!!

Having many years of experience offering specific finance packages for our customers, we can now offer various options on payment. We have added "Take-Away Now & Pay Later" to all our products over £199. It works like this:0% APR An example of our Take-Away Now: Discounted price of £300. Pay no interest provided you pay by the date the amount is due, in full. After the 12 months period has expired pay £15.76 for 36 months. TAP £567.43
Please note that interest is calculated from the date of the original agreement. 29.8% APR.

The ML&S Ham Radio Top Sellers, Antennas & Accessories - much more on show at the store

★ **No.1 NEW Yaesu FT-60E** Latest Twin Band 5W Handie from Yaesu.
Only £169

Or buy the FT-60E with a lapel speaker microphone for only **£189.95!**

★ **No.2 Yaesu FT-847 + MFJ-993 & MP-250A Bundle! Plus FREE MD-100 desk Mic!**
Still our best selling All Band Base Transceiver. Bundled with the MFJ-993 Auto Tuner (that tunes practically anything) & the excellent MyDEL MP-250 PSU.
Total Package £1279
(Rig only + MD-100: £999)

★ **No.3 FT-1000MP mkV 200W + MD-100 & SP-8** Identical to the FT-1kField but 200 Watts and external PSU. With Desk Mic & Speaker.
Package Price: £2249
(Rig only £2099)

★ **No.4 Yaesu FT-1000MP mkV Field + MD-100 & SP-8** The FT-1k Series has never been such good value. Offered with the matching Desk filtered Speaker and Base Microphone at an even bigger saving.
Package Price £1859
(Rig only £1699)

★ **No.5 Yaesu FT-857+ ATAS-120A** Nobody can match the flexibility of the 857 & ATAS-120A Auto Antenna. Just plug the ATAS into the FT-857 & operate anywhere from 7MHz-432MHz, without having to change or touch the antenna! (Duplexer is required for 2/70).
We can even offer a professional car install service.
Only £799 for both
(Rig only: £579)

★ **No.6 Yaesu VX-7R** The U.K's best selling Triple Band Handie.
Only £269, or with lapel microphone: Only £289

★ **No.7 Yaesu VX-150** Built on the commercial VX-400, simple to use rugged 2m Handie, supplied with Nicads & Charger.
RRP: £149, ML&S: £99.95 or 'Twin Pack' only £199

★ **No.8 Yaesu FT-817ND Latest Version** The latest FT-817ND comes complete with HF+6+2+70 and Metal-hydride batteries, charger, mic & antenna.
Call for best price
(FT-817ND-DSP Version available)

★ **No.9 Yaesu FT-897 + FNB-78 & CD24 PAckage** High Power version of the FT-817. 20W output as a transportable, 100W as a base/mobile. This month we are offering the full transportable set-up including the internal battery & charger.
Total package £779
Don't forget the Miracle Antenna!
(Rig Only £649)

★ **No.10 Yaesu FT-DX9000** Hopefully by the time you read this we should be taking deliveries of the first few FT-DX9000's. 200 Watts or 400 Watts, TFT Screen or not. You choose. Call now to request a brochure. **Price - TBA.**

★ **No.11 Yaesu FT-7800** Bar make the tea it'll give you 2m/70cm- @ 50W/40W.
RRP: £239, ML&S: £239

★ **No.12 Yaesu FT-8800** Similar to the FT-7800 but can receive on 2 & 70 simultaneously.
RRP: £289, or 48 x £8.26 p/m

★ **No.13 Yaesu FT-2800M** 2M brick-built 65W rig.
RRP: £179, ML&S: £159

★ **No.14 Yaesu VX-2E** Micro Handie 2/70 with scanner. Complete with Li-ion battery, charger & antenna.
NEW LOWER PRICE
Now only £119

★ **No.15 Yaesu FT-8900 with FREE YSK-8900 Remote Kit!** One-stop solution to high-power FM on 10m, 6m, 2m & 70cm. When your local repeater is busy, slip onto 10m & work DX! **Only £339**

★ **No.16 Kenwood TS-2000E** Just superb on all bands 160m-2m with optional 23cm (X-Version).
RRP: £1699, ML&S: £1299

★ **No.17 Kenwood TS-2000X** As above but with 23cm fitted.
RRP: £1999, ML&S: £1699

★ **No.18 Kenwood TS-480SAT with FREE HEIL MIC!** The best selling Kenwood H.F. Can be used mobile or base. Includes ATU. **ML&S: £699.95**

★ **No.19 Kenwood TS-480HX with FREE HEIL MIC!** As TS-480SAT but 200 Watts, no ATU.
ML&S: £799.95

★ **No.20 Kenwood TS-570DGE** Still the ideal choice if you are keen on H.F. and want an easy to use radio.
RRP: £999, ML&S: £799 or 48 x £23.64 p/m

★ **No.21 Kenwood TMD-700E** The unique 700E is not only a dual-band FM rig but has APRS and TNC built-in.
RRP: £519, ML&S: £439 or 48 x £12.99 p/m

★ **No.22 Kenwood TH-F7E** 2/70 Handie with Gen Cov RX. If you must have SSB RX on your dual-bander then buy one!
RRP: £289.95, ML&S: £249

★ **No.23 Kenwood TH-D7E** A 2/7- Handie with TNC and APRS capability.
RRP: £359, ML&S: £299 or 48 x £8.85 p/m

★ **No.24 Kenwood TS-50S** It's been around 10 years but if you want an HF rig in a compact package with excellent performance then buy one of these. As used by the recent DX-pedition FT5XO to Kerguelen Island. **Only £595**

★ **No.25 NEW Icom IC-756Pro mkIII** The latest in the IC-756Pro Series
RRP £2495 ML&S £2099 or 36 x £76.31
Package deal: IC-756ProIII, SM20 Microphone, SP-23 New Base Speaker with filters.
RRP £2768, ML&S only £2299
(Rig only: £2099)

★ **No.26 Icom IC-7800** The worlds best H.F. Transceiver? Probably.
RRP: £6400.00

★ **No.27 Icom IC-7400 + SM-20 + SP-21 + MP-250A What a package!** New IC-7400 with Matching Desk Mic, Speaker & MyDEL Metered Base PSU.
Only £1349

★ **No.28 Icom IC-7000** The replacement for the IC-706 will be arriving with us shortly.
HF/VHF/UHF All-mode Transceiver
IF-DSP technology comes to a new multi-bander.

Please see our website for more details or call for a brochure.

★ **No.29 Icom IC-703** 10W Portable/Base HF Transceiver with built-in ATU.
RRP: £703, ML&S: £449

★ **No.30 Icom IC-718** Basic ready to go 100W HF Transceiver supplied with Microphone & DC Lead.
RRP: £649, ML&S: £449 or 48 x £13.29 p/m

★ **No.31 Icom IC-910X** The best 2/70 & 23cm dedicated all mode base. 23cm included.
RRP: £1675, ML&S: £1239 or 48 x £36.66 p/m
Basic Version (without 23cm) also available £1089 or 48 x £31.93 p/m

★ **No.32 Icom IC-E208** 2/70 mobile 50/55W Transceiver with host of additional features. Remote head leads included.
RRP: £365, ML&S: £239

★ **No.33 Brand New IC-E90** Triple Band Handie
Only £199.95!
(Limited Stocks)

BARENCO

For more details see our web site or CALL.

Buddipole

W3 BP Buddipole Compact Portable Dipole 40m 2M £199.95
W3 BM Buddipole Mast for Buddipole £49.95
W3 BPT Tripod for Buddipole £89.95

For the full range see the website.

Palm Keys

MP 817 The smallest retractable paddle key ever! £59.95
Code Cube Bolt on memory keyer for Mini paddle. £79.95

Noise reduction

bhi Ltd. A British company producing probably the worlds best DSP noise reduction speakers and modules. ML&S stock the whole range of BHi products offering excellent technical engineering, quality and reliability. You just wouldn't believe how much noise these units remove - SSB transmissions almost sound FM quality!

NES-5 Only £79.95 Entry Level DSP Noise Cancelling Speaker for AM & FM Reception

NES10-2 Only £99.95 Adjustable Noise Eliminating Speaker

NEIM-1031 Only £129.95 Noise Eliminating In-Line Module
The same as the NES-10 but an in-line module for you to place between your receiver/rig and own speaker.

Six Way Switch Box Only £29.95
Need to Connect more than one piece of equipment to your bhi Noise Eliminating Speaker or In-Line Module? The 1042 Switch box is the answer...

Apply now for your very own ML&S Store Card Conditions Apply

"Classic" Finance example: Kenwood TMD-700E. RRP: £519. Payment illustration: Zero deposit and 48 payments of £12.99 per month. Total amount payable: £623.52. APR: 19.9%. ML&S is a licenced credit broker. Finance offered subject to status. Full written details on request. E&OE

Don't forget! ML&S are approved stockist for the following: bhi Ltd, Casio, Icom, Kenwood, Maldol, M

fax: 0845 2300 339
Web: www.hamradio.co.uk
e-mail: sales@hamradio.co.uk

Got a Motorbike and use Ham Radio?

Here's another excuse to get the bike out

Bikers Day at ML&S!

Saturday 10th September 2005

As it's Chris Taylor's 50th Birthday (oh yes the big one) that weekend, he has offered to do the barbeque himself...but needs some helpers! Bring your bike and come and meet the birthday boy himself. No Saga representatives allowed. (apparently).

SMALL GARDEN? NO GARDEN?

Install an EH Antenna for HF today.

Introducing a new range of antennas from Arno Electronics. Available for any band 10m-160m, ML&S stock this exciting new product available for immediate despatch.

All antennas are beautifully built and pre-tuned at the factory. Supplied with fixing clamps & clear installation instructions. Easily fine tuned with outer ring sleeve. You will be totally amazed at how well they work. No ATU required. Just plug-in and work!

Cobra 10	28-29.8MHz,	2kW	90cm long	(500W RTTY/AM) £105.00
Cobra 12	24.890-24.990	2kW	90cm Long	(500W RTTY/CW).....£105.00
Cobra 15	20.7-21.7MHz	2kW	90cm long	(500W RTTY/AM) £105.00
Cobra 17	18.068-18.168MHz	2kW	90cm long	(500W RTTY/CW).....£105.00
Cobra 20	13.8-14.8MHz	2kW	90cm long	(500W RTTY/AM) £105.00
Cobra 30	9.9-10.3MHz	2kW	93cm long	(500W RTTY/AM) £105.00
Cobra 40	7-7.2MHz	2kW	93cm long	(500W RTTY/AM) £105.00
Venus 80	3.5-3.8MHz	2kW	248cm long	(500W RTTY/AM) £179.00
Venus 155	1.913-1.933MHz	2kW	248cm long	(500W RTTY/AM) £179.00
Venus 160	1.830-1.850MHz	2kW	248cm long	(500W RTTY/AM) £179.00

Delivery: Cobra £20, Venus £25. (England & Wales, phone for other destinations)

Have you any USED HAM RADIO EQUIPMENT FOR SALE?

Why risk selling your equipment to someone who only wants to pay the lowest price? I've been buying and selling Ham Radio since I was 14 and whilst it's polite to ask "How much do you want?", if you're really unsure then contact ML&S. Either myself or Chris, my sales director, will personally advise you.

Not only do I pay the most for quality gear, I can arrange collection and pay either cash or credit direct onto your Debit Card.

My company has an excellent reputation because we are trusted - that goes a long way in this day and age.

If you have any Amateur Radio equipment, however small or old, we're interested. From SWR meters to the top of the range Base Station, the transaction will always be the same....

top price and treated professionally. 73 Martin G4HKS

Extended offer on CDXC membership. Must end soon.

Due to the tremendous success of the CDXC promotion with Kenwood UK and ML&S, Kenwood have agreed to offer **FREE MEMBERSHIP** for one final month. Buy any Kenwood HF Radio from ML&S this month and receive a FREE one year subscription to world famous CDXC - the Chiltern DX Club. This offer is sponsored by Kenwood UK.

The aim of the club is to promote HF operating in Amateur Radio and to encourage excellence, particularly in DXing and contest operating. CDXC approach this through mutual assistance, by the support of DXpeditions, by the issuing of achievement awards and by whatever other means are deemed to be appropriate.*

* This is only for UK customers who are not already a CDXC member.

Use SBS-1 from home

Use Basestation in your car

Basestation is perfect for spotters

SBS-1 Real-time Virtual Radar

Combining state-of-the-art electronics and new technological advances has enabled Kinetic Avionic Products Limited to produce the revolutionary SBS-1. For the first time aircraft enthusiasts worldwide are able to directly monitor the skies in an unprecedented fashion. Additionally, the SBS-1 provides small and medium sized airfields with many of the safety and operational benefits previously only available to large international airports - at a fraction of current radar costs. Coupled with a Mode-S/ADS-B transponder the SBS-1 becomes an invaluable tool in flight training operations.

Key Product Features

- Track Mode-S/ADS-B equipped aircraft in real time*
- An invaluable tool for aircraft enthusiasts
- Enhances operational efficiency at airfields
- Easy to install, portable and lightweight
- Real-Time aircraft position and identity data
- Connect to laptop/desktop PC via USB or Ethernet
- Powerful SBS-1 Basestation software included
- Package includes all necessary components to connect to your PC

The receiver apparatus connects to your PC via USB 1.1 or 2.0. Ethernet / 802.11b wireless with USB versions are also available. An external magnetic mount antenna and external low voltage power supply are provided. The SBS-1 is designed for portable use and can be powered directly from a suitable laptop PC via the USB port without the requirement for an external power supply. Additional tuned antennas, mounts and extension cables are available.

ML&S are the sole distributor of the SBS-1: £499.95 plus £10 P&P

Daiwa Meters

Daiwa CN-101L: SWR/PWR Meter 1.8-150Mhz
Power range: 15/150/1.5kW ..... ML&S only £59.95

Daiwa CN-103LN: SWR/PWR Meter 140-525MHz
Power range: 20/200W ..... ML&S only £65.95

Daiwa CN-801H: SWR/PWR Meter 1.8-200Mhz
Power range: 20/200/2000W ..... ML&S only £109.95

Daiwa CN-801V SWR/PWR Meter 140-525MHz
Power range: 20/200W ..... ML&S only £119.95

Daiwa CN-801S SWR/Power Meter 0.9-2.5Ghz
Power rating: 2/20 watts..... ML&S only £139.95

Miracle Antennas

Miracle Whip Others try & copy it but never quite get there. £129.95

Miracle Ducker Like the Miracle Whip but has BNC socket in lieu of whip to connect random wire. £129.95

Miracle Ducker IL Latest model! Identical to Ducker but has BNC plug for mounting instead of PL-259. £129.95

QPAK The best QRP ATU money can buy. £149.95

MyDEL Power Supplies

A new rage of PSU's from MyDEL. The neatest smartest looking desk top power supplies that money can buy. Ideal for powering any main rig or accessory requiring 13.8V DC at up to 25 Amps.

MyDEL MP-250A

Only £89.99 incl VAT!

25 Amps maximum, 22Amps constant, ideal for most modern HF Transceivers

- Variable Voltage 9-13.8VDC
- 110-234V input
- 2 x outputs: 25A Binding Posts, 7A Cigar Socket
- Fan cooled, speed variable to voltage supplied
- Two huge back-lit meters, Volts/Amps
- Fully protected, supply shut off if more than 25A is drawn, re-setable by switching off for 25 seconds.
- Only 5 3/4"W x 4 1/2" H x 6" D in size
- Less than 35mV peak-to-peak ripple under full 25AMP load
- Full exchange warranty for 2 Years

MyDEL MP-4128

Another new switch mode PSU from MyDEL. Similar in spec to the MP-250A but without meters or cigar lighter o/p. 22-25 AMP output with heavy duty binding posts on the front panel and push on terminals for lower current output on rear. Fully protected. £69.99

Yaesu FP-1030A

A power supply for Life? Probably.

25 30 Amp power supply £179.00

FJ, Miracle Antenna, Oregon Scientic, Revex, Tokyo-Hypower, Watson, Diamond, Yaesu and many more!

ML&S martin lynch & sons

Suppliers of Communications Equipment

Call us 6 days a week, mon-sat 9.30-5.30

0845 2300 599 local call number

e-mail: sales@hamradio.co.uk web: www.hamradio.co.uk fax: 0845 2300 339

MFJ Products at Lower Prices!

MFJ-902 Tiny Travel Tuner.
Tiny 4½ x 2¼ x 3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything! **£65.95**

MFJ-904H Tiny Travel Tuner/ SWR/Wattmeter & Balun.
Tiny 7½ x 2¼ x 3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything! **£109.95**

MFJ-949E 300 Watt Antenna Tuner. More Hams use MFJ-949's than any other antenna tuner in the world! Why? Because the world's leading antenna tuner has earned a worldwide reputation for being able to match just about anything. **£139.95**

MFJ-974H 160 Thru 6 Meters Balanced Line Antenna Tuner.
The MFJ-974H is a fully balanced true balanced line antenna tuner. It gives you superb current balance throughout its very wide matching and frequency range. **£159.95**

MFJ-993 300 Watt IntelliTuner Automatic Antenna Tuner.
The MFJ-993 IntelliTuner lets you tune any antenna automatically balanced or unbalanced - ultra fast. It's a comprehensive automatic antenna tuning center complete with SWR/Watt-meter, antenna switch for two antennas and 4:1 current balun for balanced lines. **£209.95**

MFJ-969 Roller Inductor Antenna Tuner.
The MFJ-969 Antenna Tuner gives you MFJ's superb AirCore Roller Inductor and full 6 meteres through 160 Meter coverage! 300 Watts PEP SSB full featured antenna tuner, widest matching range, full size lighted Cross-Needle SWR/Wattmeter reads true peak forward power, QRM-Free PreTune, 8 Position antenna switch, built in 50 Ohm dummy load, heavy duty 4:1 balun. **£169.95**

MFJ-259Z Special * With Batteries, Charger & Loop *
Range: 1.8-170MHz. MFJ's favourite Antenna Analyser with HF frequency coverage. It's simple to operate and keeps your antennas in check. MFJ-259B gives you a complete pictures of your antenna's performance. You can read antenna SWR and Complex Impedance 1.8 to 170MHz. **£199.95**

MFJ-269
Range: 1.8-450MHz. MFJ's latest Antenna Analyser with UHF frequency coverage. Based on the successful MFJ-259B it combines all of the features plus more. **£269.95**

If you see it advertised cheaper in this magazine (or on the web) from a UK stockist **we will try and BEAT it!**

Don't forget! ML&S now stock one of the largest displays of MFJ in the country!

Maldol Maldol Maldol

Maldol HVU-8

The Maldol HVU 8 is a unique and ultra compact HF, VHF, and UHF antenna developed for confined and restricted space installations like apartments and condominiums or for temporary or portable use. Installation is easily accomplished and convenient due the HVU 8 being only the traditional height and weight of HF vertical antennas. The HVU 8 comes with mounting brackets, U bolts, etc. for easy installation.

HVU-8 Specifications
- Frequency: 80/40/20/15/10/6/2M/70cm bands
- Type: 1/4λ (3.5/7/14/21/28/50MHz)
  1/2λ (144MHz)
  5/8λ x2 (430MHz)
- Gain: 2.15dBi 144MHz. 5.3dBi 430MHz
- 70cm: Two 5/8 waves in phase 5.5 dBi gain
- Power: 200 watts SSB on HF and 150W FM on 6M to 70 CM
- SWR: 1.5:1 at fO frequency
- Connector: UHF (SO 239)
- Mast Diameter: 1.0 2.36 inches (25 60 mm)
- Height: 8.5 feet (2.62 m)
- Weight: 5 Lbs. 7 ounces. (2.4 kg)

Maldol HMC-4

Type:	Amateur HF/VHF/UHF mobile antenna
Band(s):	10m 1/4 wave 6m 1/4 wave 2m 1/2 wave 70cm 2*5/8 wave
Gain:	10 0 dBi 6m 0 dBi 2m 2.15 dBi 70cm 5.5 dBi
Max power:	120W (10/6 m: 80 W)
Impedance:	50 ohms, M plug/PL 259
Length:	1.19m
Weight:	390gr
Other:	Suitable for Yaesu FT 890OR.

Only £69.95

Maldol VK5-Jnr.

Compact ground plane antenna covering: 3.5/7/14/21/28mHz. It combines low-loss traps, with newly designed coil-bobbin, that can handle up to 500W on SSB. Adjustable solid radials give directional and omni-directional patterns. All traps and elements are adjustable to cover all bands and desired centre frequencies.

Only £219.95

NEW! GDX-50 Wide-Band Discone TX/RX Antenna

RX: 50MHz - 1500MHz
TX: 6/2/70
POWER: 50W
LENGTH: 1360mm
WEIGHT: 910g
DIAMETER: 530mm
SUITABLE MAST: 60mm

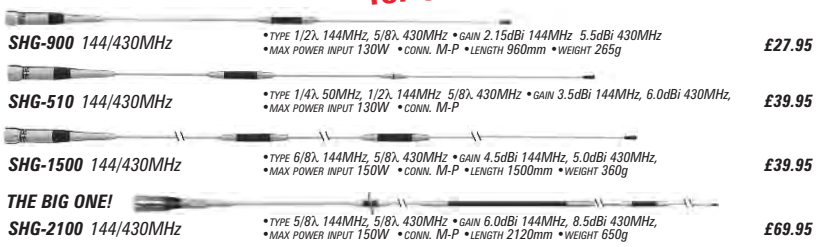
Only £69.95

For the complete range of antennas & mounts call for the 2005 catalogue or see our website

Maldol

FREE Carriage on all Maldol products for orders placed during August

Super High Gain Range



SHG-900 144/430MHz — •TYPE 1/2λ 144MHz, 5/8λ 430MHz •GAIN 2.15dBi 144MHz 5.5dBi 430MHz •MAX POWER INPUT 130W •CONN. M-P •LENGTH 960mm •WEIGHT 265g — **£27.95**

SHG-510 144/430MHz — •TYPE 1/4λ 50MHz, 1/2λ 144MHz 5/8λ 430MHz •GAIN 3.5dBi 144MHz, 6.0dBi 430MHz, •MAX POWER INPUT 130W •CONN. M-P — **£39.95**

SHG-1500 144/430MHz — •TYPE 6/8λ 144MHz, 5/8λ 430MHz •GAIN 4.5dBi 144MHz, 5.0dBi 430MHz, •MAX POWER INPUT 150W •CONN. M-P •LENGTH 1500mm •WEIGHT 360g — **£39.95**

THE BIG ONE!
SHG-2100 144/430MHz — •TYPE 5/8λ 144MHz, 5/8λ 430MHz •GAIN 6.0dBi 144MHz, 8.5dBi 430MHz, •MAX POWER INPUT 150W •CONN. M-P •LENGTH 2120mm •WEIGHT 650g — **£69.95**

HMC Range

HMC-6S 7/21/28/50/144/430MHz — •TYPE 1/4λ 7/21/28/50MHz, 1/2λ 144MHz, 5/8λ 430MHz •GAIN 3.5dBi 144MHz, 6.0dBi 430MHz, •MAX POWER INPUT 120W 7/21/28, 150W 50/144/430MHz •CONN. M-P •LENGTH 1800mm •WEIGHT 800g — **£79.95**

HMC-10 & HMC-14 10m & 20m add-ons for the HMC-6 — **£22.95 each**

HFC Range

NEW! HFC-217 7/21MHz. Max power input 120W. Length: 1300mm. Weight: 450g — **£44.96**

HFC-80L 3.5MHz — •TYPE 1/4λ. •MAX POWER INPUT 120W SSB •CONN. M-P •LENGTH 2110mm •WEIGHT 530g — **£44.95**

HFC-80 3.5MHz — •TYPE 1/4λ. •MAX POWER INPUT 120W SSB •CONN. M-P •LENGTH 1540mm •WEIGHT 360g — **£38.95**

HFC-40L 7MHz — •TYPE 1/4λ. •MAX POWER INPUT 200W SSB •CONN. M-P •LENGTH 1870mm •WEIGHT 330g — **£34.95**

HFC-40 7MHz — •TYPE 1/4λ. •MAX POWER INPUT 120W SSB •CONN. M-P •LENGTH 1310mm •WEIGHT 210g — **£29.95**

HFC-20L 7MHz — •TYPE 1/4λ. •MAX POWER INPUT 250W SSB •CONN. M-P •LENGTH 1515mm •WEIGHT 275g — **£34.95**

HFC-20 14MHz — •TYPE 1/4λ. •MAX POWER INPUT 120W SSB •CONN. M-P •LENGTH 1010mm •WEIGHT 190g — **£29.95**

HFC-15L 21MHz — •TYPE 1/4λ. •MAX POWER INPUT 250W SSB •CONN. M-P •LENGTH 1515mm •WEIGHT 250g — **£34.95**

HFC-15 21MHz — •TYPE 1/4λ. •MAX POWER INPUT 120W SSB •CONN. M-P •LENGTH 1010mm •WEIGHT 190g — **£29.95**

HFC-10L 28MHz — •TYPE 1/4λ. •MAX POWER INPUT 250W SSB •CONN. M-P •LENGTH 1515mm •WEIGHT 245g — **£34.95**

HFC-10 28MHz — •TYPE 1/4λ. •MAX POWER INPUT 120W SSB •CONN. M-P •LENGTH 1010mm •WEIGHT 190g — **£29.95**

Maldol Mounts

EM-K80 £17.95 — EM-L80 £19.95 — EMW-325 £34.95 — PRM-K £19.95 — PRM-L £19.95 — PRM-T £17.95 — PRM-TW £19.95

Earpiece & Microphone Headsets available for Yaesu, Icom & Kenwood

To see the full range of Hokushin's famous Maldol range please see our web site or call into the new showroom

Hustler 6-BTV Only £229.95

The best performing H.F. Vertical - ever!

We have literally sold hundreds of these with fantastic customer reports. At last a vertical that gives you REAL PERFORMANCE on 80m and 40m, as well as the other bands. No radials required. Just mount 18 inches above the ground, connect to a decent earth spike close by and operate.

6-BTV HUSTLER 80-10m Vertical 1kW.
6 Bands: 10, 15, 20, 30, 40, 80m. VSWR 1.6:1 or better. 10-40m Bandwidth up to 100kHz 80m. Power: 1kW

If you can't mount the Hustler 6-BTV on the ground then the only choice is the new VK5Jnr. It's so good we use one at our new H.Q.!

MyDEL MultiTrap

Forget the G5RV. Install a proper TRAPPED wire dipole MutiTrap for 80-10M. Only 66'. Must be centre supported.
£99.95

MyDEL MegaTrap

Same as Multitrap but 160m/80/40m, 105' long .
£109.95

NCS Multi Switcher

New Low Price! £239.95

The NCS Multi-Switcher is a "mini-console" that lets you switch all ope ator equipment (microphone, headset, keyer, foot-switch, etc) to any of four radios at he push of a button. You can switch be ween a headset, desk or hand mic, TNC, Phone Patch, Sound Card, etc. The Multi-Switcher matches the impedance, audio level and pin-out of nearly any microphone to virtually any radio including vintage rigs. The Multi-Switcher also switches your foot- or hand-switch and CW keyer to the selected radio.

Connecting cable for any Yaesu, Icom or Kenwood Radio £19.95 each

For more details and the complete range of NCS products see our web site.

LOG ON NOW

www.hamradio.co.uk

Home-Brewed PCBs!

You may say "How can I make good quality printed circuit boards using equipment, I don't have the capability"? But it's easier than you may think says Duncan Westland M0DJW and you probably already have all you'll need!

There are lots of ways to construct projects You can use strip-board, ugly construction, matrix boards, tag strip and sticking copper pads onto a ground plane, cut and peel and etch resist pens - to name but a few. They all have their pros and cons and, given time and ingenuity, good results can be obtained.

It's true though that most Amateur Radio circuit construction methods are best suited to simple circuits. Many of them struggle at v.h.f. and more so at u.h.f. In particular, none of the usual methods employed in Amateur projects are really suited to high 'contact-count' project or surface mount components. It's also difficult to make p.c.b.s with repeatability!

I'm sure most people would agree that a printed circuit board (p.c.b.) is one of the better ways to build circuits. The trouble is that traditional p.c.b. manufacture usually requires access to a reasonably well-equipped photographic studio. Even though most of us don't have this capability, there's still no reason why a using photo-resist p.c.b. material should be beyond the reach of most amateur constructors.

Actually, it's perfectly possible to make near-professional quality double-sided p.c.b.s with equipment that you are likely to have already. The aim of this article is to describe how to go about it.

Create The Artwork

To create the artwork for p.c.b.s requires some basic skills with drawing or image manipulation software, such as *Corel Draw, Illustrator, Paintshop Pro,*or a dedicated p.c.b. layout package such as *Eagle*. For the purposes of this article, I'll assume you have one or more of these programs and the capability to use them.

Firstly I'll look at what you'll need on the on the computing side. Depending on the 'art' program you're using, almost any computer and an ink-jet made within the last 10 years will probably do. If you want to copy already existing p.c.b. artwork, then you'll need a suitable optical scanner. That might mean a rather more modern PC, although one that's been made in the last five years should be fine.

The operating system for the computer matters little, be it Linux, Macintosh or Microsoft as long as you you can print the artwork out to an ink-jet printer. My ink-jet printer is an Epson LC70, but I've also used an Epson Stylus Colour printer successfully. To go with the printer, you'll need some ink-jet overhead projector transparencies.

Another item is a cheap picture frame, the kind that has a sheet of glass with a hardboard back and four metal clips holding it together. Something about 150×200mm is best. Whatever size frame you chose, it should, of course, be bigger than the largest p.c.b. you intend to make.

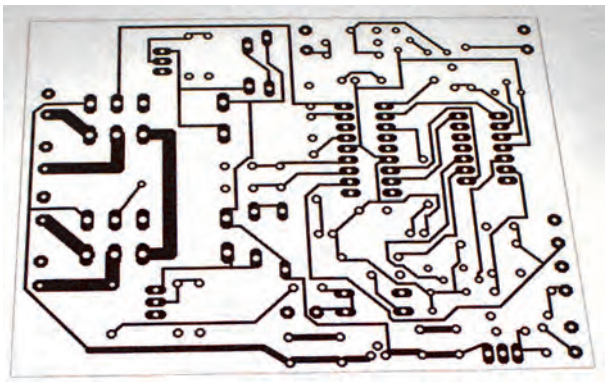


Fig. 1: A mask pattern printed, with an ink-jet printer, on to suitable overhead transparency film.

After you've created your p.c.b. layout (mask) on the transparency, you'll need an ultra-violet lamp - I use a portable suntan lamp - to expose the p.c.b. material. Such a lamp is the only tricky thing to find, I got my lamp from a jumble sale, it's a Philips' model with four u.v. fluorescent tubes, each about 300mm long. But you could also use a professional p.c.b. exposure box, or build your own using small u.v. fluorescent lamps.

The Developer

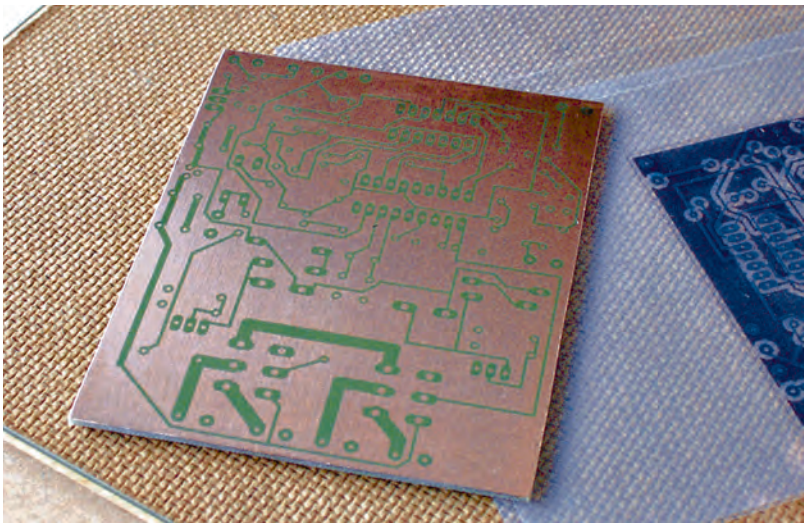
As we're producing the p.c.b. photographically, you'll need some developer, and Sodium hydroxide is the usual chemical employed. You should be able to get it in any d.i.y. store – it's used for clearing drains. To do the etching of the p.c.b., I use Sodium persulphate (available as 'press and peel' etch from Maplin). I'd also recommend a can of clear spray lacquer – the kind used for painting cars.

Finally, you'll need some p.c.b. material itself. I'd suggest buying the pre-coated type that already has the photo-resist on. I've never had good results applying the photo-resist coating myself!

Additionally, you'll need, some plastic containers, a pan (preferably glass) a largish thermometer of the type sold for photographic use. These often indicate temperatures up to, or above 50°C. Finally, you'll probably need some non-metallic tweezers or tongs, and perhaps rubber gloves would be a good idea, as the chemical used are less than pleasant to skin.

To Begin

Now to begin. The first thing to do is to prepare a mask for exposing the p.c.b. If you already have black and white artwork for the p.c.b. then scan it in to your PC using any convenient software. Make sure that you scan the artwork



Note that ideally each track mask must be printed as a mirror image (most image manipulation packages can do this). This may seem strange, but when the 'ink-side' of the transparency is touching the resist on the p.c.b.gives the sharpest image. Otherwise, the image will be slightly blurred and finer tracks may not be cleanly reproduced.

If you are making a double-sided p.c.b. then, once the top and bottom masks are printed and have dried, you need to align them together carefully and tape along one side (with small 'vertical' separation) to keep them aligned relative to each other. Again make sure the ink-printed surfaces are the inside surfaces of the taped-together masks.

The next step is to cut a piece of board to the size that you need with a hacksaw. **Do not remove the board's black protective coating until you are ready to expose the resist.** After cutting it out, a file can be used to remove burrs from the cut edge. The burrs can hold the edges of the mask away from the board and make the tracks fuzzy and indistinct.

- **Fig. 2 (above): A p.c.b. after exposing and developing. Note the green etch resist.**

- **Fig. 3 (right): A p.c.b. being etched in a non-metallic pan, most etchants have disastrous effects on normal household aluminium pans. This could lead to you becoming unpopular in the kitchen!**

and store it at a high enough resolution that the scanning doesn't degrade the quality of the mask image. A resolution of 300 dots-per-inch (d.p.i.) or more at the working size, is ideal.

If you don't have a p.c.b. image to scan and want to make your own design then you will need a software package designed for making p.c.b.s. A very good one is called *Eagle* and is free for non-commercial use. It's available for download from **www.cadsoft.de** Make sure your browser language is set for English, unless you can speak German! This package will produce p.c.b. layouts from a circuit schematic.

Once you have designed your own track pattern mask or scanned one in, the next step is to print it onto an overhead transparency (**Fig. 1**) so that you can use it to expose the resist on the p.c.b. As the printing process produces a printed mask that's not as opaque as a photographically produced one, you need to work to make the printed blacks as dense (black) as you can.

I've found out the hard way that only the printer manufacturer's own inks and transparency film give good enough results. (Often replacement inks and films, even from reputable companies do not seem to work well enough).

Make The Devoloper

I find that it's easier to make up the developer before I expose the p.c.b.. For the developer, you make up a sodium hydroxide solution. Take half a level teaspoon of sodium hydroxide crystals and gently put it into 250 milli-litres (ml) of water in a a non-metallic container. Stir the solution until all the sodium hydroxide dissolves. Be sure to use a non-metallic container and stirrer and follow the handling instructions on the packet. Although some people report poor results with sodium hydroxide. It's always worked fine for me but if you have trouble, you can buy ready-made developer.

Now to expose the board! As the photo-resist on the board is sensitive to u.v. light, it's stable in ordinary room light for at least 15 minutes. So, there is no need to rush or work in the dark. Don't take it outside though; as even dull cloudy daylight will affect it.

To expose the board remove the protective plastic coating

and slip the board between the mask transparencies taking a last opportunity to check that the 'ink-side' of the mask is facing the resist-side of the board. Then clip it into the picture frame. Expose one side by placing the picture frame close to the suntan lamp (about 20mm from the tubes). Depending on your lamp the exposure time will depend very much on your particular set up and you will need to try a range of exposure times until you get good results – try a series of small p.c.b. 'test-strips'.

I found that for my lamp and set-up, the exposure time was some 75 seconds, with a 'window' of about ±5 seconds If the exposure is too long then some of the finer lines will be removed. If it's too short, then not all of the exposed photo-resist will develop properly.

After the first side is exposed, you should carefully take out the mask/p.c.b. sandwich from the picture frame and turn it over. Then expose the other side. Be very careful not to let the masks move relative to the p.c.b. while you turn it over.

After you have exposed both sides the board can be developed. Place a little of the developer in the bottom of your ice-cream container (just enough to cover the p.c.b.) and place the p.c.b. into the solution. Gently rock the container and, after a couple of minutes, the exposed resist will dissolve away leaving an image of the tracks in green photo-resist, see **Fig. 2**. If it's a little under exposed, you can usually remove the excess by very carefully rubbing with a damp paper towel.

Remove the board from the solution using non-metallic tongs and put it straight into a bowl of water. Keep the developer in the ice cream container: you'll need it later.

Etch The PCB

The next step is to etch the p.c.b. to remove the unwanted copper foil. You can use ferric chloride etchant, it's cheaper than sodium persulphate but it stains everything yellow and its dark-brown colour makes it hard to see how well the p.c.b. is getting on. Assuming you are using sodium persulphate, make up the etchant according to the instructions supplied with it. (I usually make 250ml at a time). This solution has a shelf life of a couple of months when stored in a plastic bottle.

Place the p.c.b. into your ceramic or glass saucepan and pour all of the solution over it (**Fig. 3**). In my saucepan, 250ml covers the p.c.b. to a depth of about 15-20mm. Gently warm the solution on a stove until a temperature of 40°C is reached then remove from the heat. The etching will take about an hour.

Turn the p.c.b. over every 15 minutes or so if it's double sided and warm up the solution if it cools below 35°C. Once you see that the etch is completed, remove the p.c.b. again using non-metallic tongs and place it straight into a bowl of water. **Be careful not to drip the etch solution on anything**. You can re-use the etch solution about five times. I discard it when the etching time is more than one and a half hours.

Rinse the p.c.b. under running water and dry it gently on a paper towel being careful not to touch the tracks with your fingers. Then place the p.c.b. back on your u.v. lamp to expose the remaining resist – no need for a mask this time of course. The remaining resist can then be removed by using the developer solution again. Rinse and dry the p.c.b.

The p.c.b. is nearly finished (**Fig. 4**) but the surface of the copper will tarnish over time. The tarnishing is only cosmetic but it can be prevented by spraying a thin coat of clear car lacquer into the board. Just one pass of the spray can will be enough. It will not affect soldering. Professional lacquers for p.c.b.s are available but they are more expensive and don't seem to work any better. An alternative is to use tin-plating solution. I don't recommend this. The 'solderability' is average at best: not as good as a lacquered surface and the solution does not keep. Also it's very expensive!

The last thing to do is to drill the p.c.b. for which I use 0.8mm holes for most components. Tungsten carbide drills are best and last for ages, though you will usually break them before they go blunt and they can often be found cheaply at rallies. But and it should be borne in mind, they they are only suitable for pillar drills, being too brittle for a hand drill.

Plated-Through

That's it! a near professional quality double sided p.c.b. using equipment you already had. I haven't worked out a way to make plated-through holes. For most applications this can be worked around by soldering the component lead top and bottom when needed. If you really want something like a plated through hole Farnell make a product that consists of a 0.8mm tube filled with solder and scored at 1.6mm intervals (standard p.c.b. thickness).

The solder-filled tubing is pushed into the board and snapped off to leave a piece of tube in the p.c.b. A small centre-punch may be used to lock it into the hole, then melting the solder and blowing it out of the tube completes the electrical connection. Farnell also sell a special applicator but it's expensive and you don't really need it unless you are doing lots of holes.

There are a few points to note. I find that the track width is repeatable to about ±50µm (plus or minus a twentieth of a millimetre), which is normally good enough for microwave work. You can get the occasional defect however, so its best to keep tracks wider than 0.4mm (except for short runs) to avoid problems. If you are using the p.c.b. layout package, *Eagle,* then the default pad settings are too small, being designed for a modern multi-layer board with plated through holes. (Make them bigger so they are easier to solder to).

If you follow the above carefully then its perfectly possible to make p.c.b.s for 80-pin small outline packages. So next time you are thinking of home-brewing a more complex project, the lack of a p.c.b. won't hold you back. **PW**

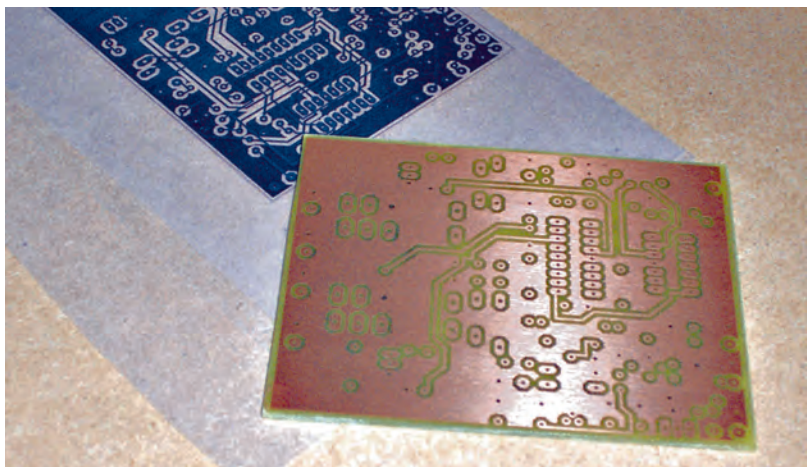


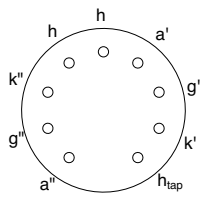
Fig. 4 (below): The completed board ready for drilling.

Valve & Vintage

Phil Cadman G4JCP has shed his brown dustcoat this month - it's too warm! But although hot in the shop - Phil's enjoying working on his Minitopper transmitter.

Welcome once again to the warm Valve and Vintage 'shop' and the second part of my look at the Minitopper transmitter. I've also found a little more information about the origins of the Gouriet-Clapp oscillator.

In the April 1950 issue of Wireless Engineer, **G. G. Gouriet** of the BBC Engineering Research Department wrote that the oscillator circuit was conceived and devised independently in the UK around 1941, and used by the BBC several years before **J. K. Clapp's** article was published in *Proc. I.R.E.* **Note:** There's a very interesting article on the Gouriet-Clapp oscillator - written by 'Cathode Ray' - in the August 1952 issue of *Wireless World.*



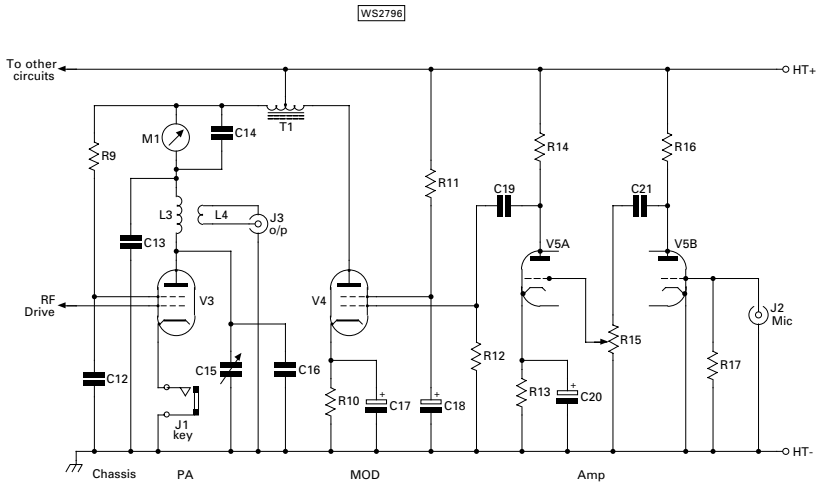


Fig. 1: The circuit of the Minitopper's ECC81 speech amplifier, plus the p.a. and modulator, with ECC83 valve base diagram inset (see text.

Speech Amplifier

The diagram, **Fig. 1**, shows the Minitopper's ECC81 speech amplifier, plus the p.a. and modulator. The circuitry is standard, suiting a crystal microphone but modifications will have to be made for moving coil and electret microphones.

The only component that needs further explanation is the modulation transformer T1, a standard push-pull valve output transformer with the secondary left unconnected. Note: The audio voltage present at the end of the left hand winding is equal - but opposite in polarity - to the audio voltage on the anode of the 6BW6 modulator valve. This is one method, and it's worth looking at alternatives.

The circuit, **Fig. 2a**, shows the conventional method of providing anode modulation (Link 1 and Link 2 not present). (All r.f. components have been removed for clarity).

The modulator has a single-ended output stage, although transmitters running more than about 10W use modulators with push-pull output stages. The main purpose of the modulation transformer is to match the optimum load impedance required by the modulator valve(s), to the load impedance presented by the p.a. stage (roughly p.a. voltage divided by p.a. anode and screen current).

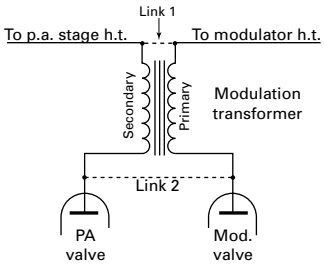
In many QRP designs the modulator h.t. is the same as the p.a. h.t., and so Link 1 in Fig. 2a is effectively present. In addition, if the optimum load required by the modulator valve is the same as - or very close to - the load presented by the p.a. valve (as in the Minitopper), then the transformer ratio will be 1:1.

By arranging the 'd.c.' current in the primary and secondary windings to flow in opposite directions, the net d.c. magnetising current can be very low, possibly zero. The modulation transformer can then have a significantly smaller core than would otherwise be the case.

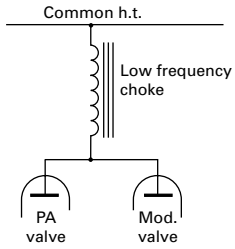
The impedance of T1 isn't critical; only the ratio - 1:1 - is important. However, the transformer's primary inductance is important, and a good quality push-pull output transformer rated at 8W or more will suit. Alternatively, it's possible to use just the centre tapped secondary of a full wave h.t. mains transformer

Returning to Fig. 2a; if the current in the primary and secondary is arranged to flow in the same direction, and the transformer ratio is still 1:1, then Link 2 can be connected. (The audio voltage across the secondary is exactly the same as the audio voltage across the primary).

In the situation described a transformer isn't needed at all, just a low frequency choke, as shown in **Fig. 2b**. The method is known as Heising or Constant Current Modulation, from the very early days of radio. It's effective, but has one drawback when wired as in Fig. 2b: it cannot achieve 100% modulation. The Minitopper circuit shares a



● **Fig 2a: Showing the conventional method of providing anode modulation (Link 1 and Link 2 not present). Notice also that all r.f. components have been removed for clarity (see text).**



● **Fig. 2b: Using a low frequency (a.f.) choke for modulation. (See text).**

$$L = \frac{a^2 \times n^2}{9a + 10L}\ (\mu H)$$

where:
L coil length (in)
a coil radius (in)
n number of turns

$$L = \frac{(a^2 \times n^2)}{25.4(9a+10L)}\ (\mu H)$$

where:
L coil length (mm)
a coil radius (mm)
n number of turns

● **Fig. 3: Wheeler's formula for calculating the inductance of wound coils, knowing the number of turns, the length and the diameter of the windings. Both Imperial (inches) and Metric (millimetres) forms are given.**

similar limitation, but really it's a benefit since any over modulation will produce less splatter than with other modulation methods.

Alternative Valves

It's possible to use valves other than those shown in circuit. The B9A based EF80s should work fine in the v.f.o. and buffer stages, while the 6AQ5 is effectively a 6BW6 (B9A) in a B7G envelope.

The Octal 6V6/G/GT also has the same characteristics as the 6BW6. Alternatives for V5 include the ECC83, base diagram inset in Fig. 1. It will give a little extra gain (Change R13 to 3.3kΩ if you make the substitution).

Key Clicks

The lack of key click suppression requires attention. Anyone contemplating using the transmitter on c.w. should (at least) add a series CR network across the key jack contacts (try 100Ω and 10nF).

The switch - S1 (in anode circuit of the v.f.o.) is for 'netting'. Normally switched to the right-hand position, when flicked to the left, the v.f.o. receives power from the receiver's h.t. supply. If there's no receive h.t. available, then an unswitched h.t. feed from the transmitter's power supply can be used.

When the Minitopper was designed, commercial coils and coil formers suitable for use with valve circuitry were readily available. Not so today, and I'll just give the inductance values required and leave it up to the individual constructor to wind (or find) suitable coils.

Wheeler's formula for single layer coils (see **Fig. 3**) is usually all you need for designing coils, although an inductance meter is definitely a help. (Don't forget Babani's very useful Coil Design And Construction Manual is available from the PW Bookstore.) You'll also need a grid/gate dip meter to check each resonant circuit.

I ask you to refer back to Fig. 1 on page 40 of the June 2005 issue of PW (Valve & Vintage). Beginning with L1, this is specified as a medium wave local oscillator coil (for a 455kHz i.f.). The effective value of the series/parallel combination of C3, C4, C5, C6 and C7 is in the region of 105pF (C3 at maximum, C4 half enmeshed), so to resonate at a frequency of 1.8MHz, the inductance of L1 should be 75µH. Inductor L2, which is an untuned load for V2, is given as a medium wave tuning coil. Anything from 250 to 500µH should work here. Both radio frequency chokes are 2.5mH and modern miniature types will (probably) work okay.

The 1.8MHz band - 'Top Band' - isn't as popular as it once was, and so it's worth trying to modify the Minitopper for operation on 3.5 and 7MHz. In both cases, the buffer amplifier - V2 - becomes a doubler, and L2 has to become part of a tuned circuit. Consequently, a 100pF variable capacitor needs to be connected between the anode of V2 and chassis. This will peak the drive to V3.

Ideally, buffer amplifiers should operate in Class A so as to minimise loading on the previous stage. However, Class A amplifiers don't make good frequency multipliers, which are better operating in Class C.

For operation on 3.5MHz, the v.f.o. stays the same, although C4 may have to be tweaked to get down to 1.75MHz. Try 27µH for L2; that will resonate at 3.5MHz when the additional tuning capacitor is set to about 75pF. The p.a. tank coil - L3 - needs to be somewhat less than half its 1.8MHz inductance, so try 12µH (simply halve the turns first). Take one turn off L4, and reduce C16 to 100pF.

For operation on 7MHz, the v.f.o. needs to operate at double the Minitopper's frequency: i.e. 3.5MHz to 3.6MHz. It will happen naturally if all the frequency determining components in the v.f.o. are halved. That said, it's better to keep C3 at 50pF and remove C5. Assume C4 to be half-enmeshed and C6 becomes 1000pF, C7 becomes 470pF and L1 becomes 35µH.

To achieve resonance with the additional tuning capacitor across V2 set to around 40pF, L2 must halve in value to 13µH. Similarly, L3 must also halve again in value to 6µH. C16 can be removed completely, and two or three turns for L4 should suffice. Note: I've ignored stray capacitance and the resonant frequencies of the tuned circuits should all turn out to be slightly low.

High Tension Supply

Any power supply capable of delivering 225 to 275V d.c. at 100mA will be satisfactory. Tune the p.a. by adjusting C15 for minimum dip on the anode current meter M1. Next, move L4 relative to the 'cold' end of L3 until the minimum dip is around 40mA - equating to 10W input with a 250V supply.

Next, peak the drive to V3, measuring the current through R8. Note: A closed circuit jack, bypassed with a 10nF disc ceramic, can be wired in series with the cold end of R8 to make periodic measurements easier.

Alternatively, use a 1kΩ resistor instead of a jack and measure the voltage developed across it. A resistance of 1kΩ will produce 1V per mA of grid current (aim for 2.5mA drive current).

When you're modifying a circuit to operate on another frequency - it's down to a combination of knowledge, experience, plagiarism and lots of experimentation! I thoroughly recommend old copies of SWM and the RSGB Bulletin for suitable circuits and information. And old (valve era) ARRL and Radio Communication Handbooks are an absolute must for keen valved equipment constructors.

Time to close the shop now! Please send your comments and letters to me, either via E-mail to: **phil@g4jcp.freeserve.co.uk** or by mail to: **21 Scotts Green Close, Scotts Green, Dudley, West Midlands DY1 2DX**. Cheerio!

PW

RADIOWORLD

www.radioworld.co.uk
42, Brook Lane,
Great Wyrley,
Walsall, WS6 6BQ.
Tel. 01922 414796.
Fax. 01922 417829.

ALINCO - AOR - BHI - CUSHCRAFT - DIAMOND - HEIL - ICOM - KENT - KENWOOD - MFJ - RADIOWORKS - WATSON - WEST MOUNTAIN - YAESU - YUPITERU

KENWOOD TS-2000

HF 6m 2m 70cm 23cms Option. DSP

UT-20 23cms Unit .. £369.95
DRU-3A Rec Unit ... £99.95
VS-3 Voice Synth ... £45.95
SP-23 Ext Speaker . £68.95
MC-60 Desk Mic £117.95
MC-90 DSP Mic £187.95

1 YEAR WARRANTY **£1,295.00**

KENWOOD TS-480SAT

WITH FREE HEIL MH5 + Cable

New HF+6m. HX-200W - £1099.00

VGS-1 Voice Unit ... £64.95
SP-23 Ext Speaker . £68.95
MC-60 Desk Mic £117.95
PG-4Z Ext Cable £44.95
PS-53T 23A PSU .. £229.95
SO-3 TCXO £109.95

1 YEAR WARRANTY **£699.00**

KENWOOD TS-870S

100W Base HF. 1.8-30MHz. DSP

VS-2 Voice Unit £45.95
SP-31 Ext Speaker . £82.95
MC-60 Desk Mic £117.95
LF-30A LP Filter £45.95
PS-52T 23A PSU .. £229.95
SO-2 TCXO £122.95

1 YEAR WARRANTY **£1,295.00**

KENWOOD TS-570DGE

100W Base HF. 1.8-30MHz. DSP ATU.

VS-3 Voice Unit ... £45.95
SP-50 Ext Speaker . £27.95
MC-60 Desk Mic £117.95
MB-430 Bracket £44.95
PS-53T 23A PSU .. £229.95
SO-2 TCXO £122.95

1 YEAR WARRANTY **£Phone**

KENWOOD TS-50S

100W Moble HF. 1.8-30MHz.

AT-50 TS-50 ATU .. £319.95
SP-23 Ext Speaker . £68.95
MC-60 Desk Mic £117.95
MB-13 Bracket £39.95
HS-5 Del Phones £52.95
SO-2 TCXO £122.95

1 YEAR WARRANTY **£594.00**

KENWOOD TMD700E

2m & 70cms. Dual Band. APRS. TNC

SP-50B Speaker £27.95
PS-33T DC PSU £199.95
MC-58DM DTMF £44.95
PG-4X Ext Cable £61.95
PS-53T 23A PSU .. £229.95
VS-3 Voice Unit £45.95

1 YEAR WARRANTY **£424.00**

KENWOOD TMG707E

2m & 70cms. Dual Band. Det Front

SP-50B Speaker £27.95
DFK-3C Panel kit £34.95
MC-58DM DTMF £44.95
PG-4X Ext Cable £61.95
MB-12 Mount £14.95
MB-201 Mount £14.95

£265.00

KENWOOD Handhelds

TH-F7E 2&70 .... £237.00
TH-D7E 2&70 .... £289.00
TH-22E 2m £135.00
THG-71 2&70 .... £219.00
TH/K2E 2m £139.00
TH/K4E 70cms .. £139.00
Plus much more phone...

www.radioworld.co.uk

YAESU FT-1000MP

HF Base DSP. MkV 200w £2099.00

SP-8 Ext Speaker . £136.95
MD-100 Base Mic . £116.95
TXCO-6 TXCO £124.95
DVS-2 Voice Unit .. £199.95
FH-1 Keypad £33.95
E-DC-20 DC Cable . £11.95

FT1000MP FIELD **£1,699.00**

YAESU FT-847

HF 6m 2m 70cm. DSP. ATU Option

ATAS-120 Act ant . £259.95
ATAS-25 Man ant . £189.00
FC-20 ATU £249.95
FVS-1A Voice Unit £199.95
MH-36D8 DTMF £54.95
MMB-66 Bracket £32.95

2 YEAR WARRANTY **£989.00**

YAESU FT-897D

HF 6m 2m 70cm.100W Transportable

FP-30U AC supply £199.95
FNB-78 Batt pack ... £99.95
FC-30 Ext ATU £249.95

MMB-80 Bracket £15.95

2 YEAR WARRANTY **£649.00**

YAESU FT-857D

HF 6m 2m 70cm.100W. Mobile

ATAS-120 Act ant . £259.95
FC-30 Ext ATU £249.95
MH-36E8J DTMF ... £57.95
CT-39 Packet cab ... £14.95
TCXO-9 TXCO £69.95
YSK-857 Sep kit £45.95

FREE DSP **£579.00**

YAESU FT-817ND

HF 6m 2m 70cm. Portable / Mobile

FP-30U AC supply £199.95
FNB-78 Batt pack ... £99.95
FC-30 Ext ATU £249.95
TCXO-9 TXCO £69.95
MMB-80 Bracket £15.95

FREE BATTERY & CHARGER **£Phone**

YAESU FT-7800E

2m & 70cms. Dual Band Mobile.

CT-39 Packet Cab .. £14.95
MEK-2 Mic ext cab . £29.95
MH-48A6J DTMF ... £39.95
MLS-100 Spkr £29.95
MMB-60 QR Brack . £18.95
MMB-36 Mob Bra .. £6.95

2 YEAR WARRANTY **£237.00**

YAESU FT-8800/8900

FT-8800 Dual Band Mobile. 2/70
£269.00

Quad Band Mobile. 10/6/2/70 **FT-8900**
£329.00

2 YR WARRANTY

YAESU FT-2800M

2m Mobile. 137-174 MHz RX. 65W. VHF Rugged Mobile TX.

MH-48A6J DTMF ... £39.95
SP-7 Speaker £34.95
MLS-100 Ext spkr ... £29.95
FP-1030A PSU £199.95
DC Power cord £17.95

2 YEAR WARRANTY **£159.00**

www.radioworld.co.uk

ICOM IC-7800 FLAGSHIP

HF+6m Flagship 200W. 32Bit DSP. ATU. LCD Scope.

Keboard&Monitor . £469.95
SM-20 Base Mic ... £144.99
SP-20 Ext Spkr £164.99
CT-17 CI-V Conv £99.95

2 YEAR WARRANTY **£6,400.00**

ICOM IC-756 PROIII NEW

HF+6m 100w ATU. 32 Bit DSP.

AH-4 100W ATU ... £359.95
SM-20 Base Mic ... £144.99
SP-20 Ext Spkr £164.99
PS-125 25A PSU .. £295.95
CT-17 CI-V Conv £99.95
UT-102 Voice unit ... £32.99

2 YEAR WARRANTY **£Phone** for the latest price

ICOM IC-7400

HF 6m 2m 100W ATU. 32 Bit DSP.

AH-4 100W ATU ... £359.95
SM-20 Base Mic ... £144.99
SP-20 Ext Spkr £164.99
PS-125 25A PSU .. £295.95
CT-17 CI-V Conv £99.95
CR-338 TXCO £43.48

2 YEAR WARRANTY **£1,279.00** Inc. SP-21 & SM20

ICOM IC-706 MkII G

HF 6m 2m 70cm 100W DSP Mobile.

AT-180 ATU £329.95
MB-62 Bracket M £17.99
MB-63 Bracket F £9.99
MB-72 Handle £9.95
OPC-581 Sep Cab . £32.99
UT-86 Voice unit £41.13

2 YEAR WARRANTY **£749.00**

ICOM IC-E208

VHF / UHF Dual bander FM Mobile.

CS-208 Cloan SW £329.95
MB-58 Bracket R £25.99
MB-65 Bracket C £25.99
HM-133 Rem mic .. £55.34
OPC-601 Sep Cab . £39.99
SP-10 Mob Spkr £49.99

2 YEAR WARRANTY **£215.00**

ICOM IC-718

HF 100W TX. Dual VFO. Auto Notch.

AH-4 100W ATU ... £359.95
MB-5 Bracket £35.25
MB-23 Carry strap £9.99
UT-102 Voice unit ... £32.99
OPC-599 ACC Cab £32.99
UT-106 AF DSP £84.99

2 YEAR WARRANTY **£439.00**

ICOM IC-910H / X

All mode 2 & 70. 100W. 9600bps op.

AG-25 Preamp £159.95
MB5 Bracket £35.25
CR-293 TXCO £89.99
UT-102 Voice unit ... £32.99
UX-910 23cms unit £349.99
UT-106 AF DSP £84.99

2 YEAR WARRANTY **£1087.00**

ICOM & YEASU Handhelds

IC-T3H 2m FM .. £129.00
IC-E90 6/2/70 .... £199.00
FT-60E 2&70 ..... £169.00
VX-2E 2&70 ..... £119.00
VX-5R 6/2/70 .... £199.00
VX-7R 6/2/70 .... £248.00
VX-150 2m FM £99.95
VX-110 2m FM £99.95

www.radioworld.co.uk

01922 414796

ORDER HOTLINE

Email: sales@radioworld.co.uk

Mon - Fri - 09:30 - 18:00,
Sat - 09:30 - 1600.

Most Goods are shipped for 24Hr delivery, [UK Mainland] is £10 P&P unless otherwise stated.

Credit Cards Accepted

Order Hotline - 01922 414796
Order Online - www.radioworld.co.uk

MFJ. Tuners

Tuners, Meters, Analysers.

MFJ-989C 3Kw	£319.95
MFJ-986C 3Kw	£299.95
MFJ-993 Intelliturner	£209.95
MFJ-971 QRP	£89.95
MFJ-969 300w	£169.95
MFJ-962D 1.5Kw	£249.95
MFJ-949E 300w	£135.95
MFJ-948 300w	£119.95
MFJ-945E Mobile	£99.95
MFJ-941E 300w	£109.95
MFJ-934 ATU+AG	£159.95
MFJ-921 2m	£59.95
MFJ-924 70cms	£59.95
MFJ-914 Extender	£56.95
MFJ-901 200w	£72.95

Reads SWR + Resistance(R) & Reactance(X) or Magnitude(Z) & Phase(degrees). Coax cable loss(dB) Coax cable length and Distance to fault... plus more.

Analysers

MFJ-249 1.8-170 Dig	£219.95
MFJ-259B 1.8-170 Rm&Dig	£199.95
MFJ-269 HF/VHF/UHF	£269.95

Dummy Loads

MFJ-250 1kw Oil filled	£69.95
MFJ-250X 1kw without oil	£44.95
MFJ-260C 300w PL259	£33.95
MFJ-260CN 300w N-Type	£39.95
MFJ-264 1.5kw PL259	£59.95
MFJ-264N 1.5kw N-Type	£69.95

MFJ-418
Morse Decoder / Tutor
£69.95

Learn Morse code anywhere, anytime with this MFJ Pocket Morse Code / CW Tutor! Take it everywhere! enjoy code at home, going to work, on vacation, on a plane or in a hotel. A large LCD display reads out letters, numbers and punctuation in plain English.

Heil. Audio.

Microphones, Headsets, Accessories.

Pro-Set-Plus Headset	£155.95
Pro-Set-Plus-IC Headset	£169.95
Pro-Set-HC-4/5 Headset	£109.95
Pro-Set-HC-IC Headset	£119.95
Goldline GM-4 Stick mic	£109.95
Goldline GM-5 Stick mic	£109.95
Goldline Vintage Stick mic	£129.95
HM-10-4 HC4 Reg stick mic	£69.95
HM-10-5 HC5 Reg stick mic	£69.95
HM-Dual HC4+5 Stick mic	£119.95
HM-10-I Icom Stick mic	£89.95
HMM-1C Icom Hand Mic	£59.95
HMM-K HC4/5 Ken hand mic	£74.95
HMM-Y HC4/5 Yae hand mic	£74.95
Traveller-817 Yaesu headset	£79.95
Traveller-706 Icom headset	£79.95

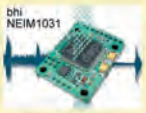
Call for Leads and Accessories

Adonis Microphones

AM-708E
Variable Compression
2 Microphone Outputs
£129.95

Adonis AM-7500E	£Phone
Adonis AM-708E	£129.95
Adonis AM-508E	£79.95
Adonis AM-308E	£69.95
Adonis FX-10	£59.95

bhi DSP



Noise Cancelling Solutions for Amateur Radio & SWL

NES10-2 Speaker with dsp	£89.95
NES1031 Inline dsp module	£129.95
NES1061 817 dsp module	£89.95
NES1061 817 brd inc fitting	£115.95
NES1062 dsp module	£89.95
NES1042 Switch Box	£19.95

Watson Supplies

W30-AM

0-15VDC
30/35A Peak
£119.95

W25-XM NEW

13.8VDC
25A Switchmode
£99.95

W-25AM 25A Supply	£89.95
W-10AM 10A Supply	£59.95
W-5A 5A Supply	£29.95
W-3A 3A Supply	£22.95
W-25SM 25A Supply	£79.95
W-10SM 10A Supply	£49.95

Diamond Supplies

GZV4000
5-15 VDC
40A Peak
£154.95

GZV-6000 60A Supply NEW.	£299.95
GZV-4000 40A Supply	£154.95
GSV-3000 30A Supply	£144.95
GZV-2500 25A Supply	£114.95

Frequency Counters

Will tune AR-8200, AR8000 & IC-R10
Super Searcher
£99.95

FC130	£79.95
Hunter	£59.95

Call for further details

* 10Hz-3GHz
* Imp - 50 Ohms
* LCD readout
* 10-Digit display

Super Hunter
£149.95

Daiwa Accessories

Cross-needle meters

CN101L HF/VHF	£59.95
CN103N VHF/UHF	£65.95
CN801H HF/VHF	£109.95
CN801V VHF/UHF	£119.95

Coax Switches 2/4 Way.

CS-201 2-Way	£24.95
CX401 4-Way	£49.95
CS401N 4-Way NType	£Call

Avair Meters

AV-200
HF / VHF PWR SWR meter

AV-201 HF/VHF	£49.95
AV-401 VHF/UHF	£49.95
AV-601 HF/VHF/UHF	£69.95
AV-1000 HF/VHF/UHF	£89.95
AV-20 HF/VHF	£29.95
AV-40 VHF/UHF	£29.95

Palstar Tuners

TThe AT1500CV is an antenna tuner that can handle up to 1500 watts (1500 watt PEP) with low profile construction and bullet proof operation

AT-1500CV **£389.00**

AT-1KD Digital Display	£299.95
AT-1KM Regular Display	£289.95
AT-1500BAL 1500w Bal	£599.95
AT-1500CV 1500w ATU	£389.95
BT-1500BAL Dual Bal	£569.95

Palstar ZM30 - Antenna Analyser
Micro-controlled SWR antenna analyzer **£289.00**

Watson Antennas

Watson W2000
Bands 6m/2m/70cm
Gain 2.15/6.2/8.4dB
Power 200W (50W 6m)
Type 1/2, 2x5/8, 4x5/8
Length 2.5m
£69.95

W-30 2/70 Base	£39.95
W-50 2/70 Base	£49.95
W-300 2/70 Base	£64.95
W-2000 6/2/70 Base	£69.95
WBV-70 4m 1/2 Wave Base	£39.95

Bencher Antennas

Butternut HF-6V
Bands: 80/40/30/20/15/10
Height (Adj): 26 ft (7.9 m)
Weight: 12 lbs (5.4 kg)
Impedance: Nom 50 ohms
VSWR: 1.5:1 or less
£299.95

Butternut HF-2V 40/80m	£229.95
Butternut HF-6V 80-10m	£299.95
Butternut HF-9V 80-6m	£349.95
Butternut HF-5B 20-10m	£319.95
30-MRK 30m ad for HF2V	£89.95
A-17-12 17&12 ad for HF6V	£49.95
A-6 6m ad for HF6V-X	£14.95
TBR-160S 160m HF2/6/9V	£114.95

Hustler Antennas

Hustler 5-BTV
5 Bands - 80-10m
Height 7.64m - Weight 7.7kg
SWR 1.15:1 - Power 1kW
£179.95

Hustler 4-BTV 4 Band Vert	£149.95
Hustler 6-BTV 6 Band Vert	£209.95

West Mountain Radio

RIGblaster Pro	£209.95
RIGblaster Plus	£119.95
RIGblaster M8	£89.95
RIGblaster M4	£89.95
RIGblaster RJ	£89.95
Nomic 8P	£59.95
Nomic 4P	£59.95
Nomic RJ	£59.95

Tonna Antennas

Tonna - 20655
23cms (1296 Mhz) 55 element 21.5 dbi gain "N" 4.64m long.

Tonna 20505 6m 5el	£89.95
Tonna 20809 2m 9el	£54.95
Tonna 20811 2m 11el	£79.95
Tonna 20817 2m 17el	£99.95
Tonna 20909 70cm 9el	£45.95
Tonna 20919 70cm 19el	£59.95
Tonna 20921 70cm 21el	£74.95
Tonna 20635 23cm 35el	£64.95
Tonna 20655 23cm 55el	£89.95
Tonna 20745 13cm 25el	£69.95

Diamond Antennas

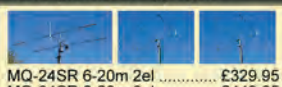
HF10FX 10m Mobile	£39.95
HF15FX 15m Mobile	£39.95
HF20FX 20m Mobile	£39.95
HF40FX 40m Mobile	£39.95
HF80FX 80m Mobile	£42.95
CR8900 10/6/2/70	£72.95
CP6 Base 6m-80m	£239.95
X50 Base 2/70	£54.95
X200 Base 2/70	£84.95
X300 Base 2/70	£99.95
X510 Base 2/70	£124.95
X700 Base 2/70	£249.95

Cushcraft Antennas

X-7 - 20/15/10 7el Yagi	£669.95
A3S - 20/15/10 3el Yagi	£499.95
A4S - 20/15/10 Yagi	£569.95
A3WS - 12/17 3el Yagi	£379.95
ASL-2010 13-32MHz Log	£749.95
MA5B - Mini Beam	£369.95
D3 - 20/15/10 Dipole	£249.95
D3W - 30/17/12 Dipole	£249.95
D4 - 40m Rotary Dipole	£349.95

TGM Antennas *Mini Beams*

** Call for prices on TGM upgrade kits.*



MQ-24SR 6-20m 2el	£329.95
MQ-34SR 6-20m 3el	£449.95
MQ-3 6-20m 3el	£379.95
MQ-26 6-20m 2el	£389.95
MQ-26SR 6-20m 2el + EH	£419.95
MQ-36SR 6-20m + Dir	£559.95

Radioworks Wire Ants

CW-160 160-10m (252ft)	£129.95
CWS-160 160-10m (133ft)	£114.95
CW-80 80-10m (133ft)	£89.95
CWS-80 80-10m (66ft)	£109.95
CW-40 40-10m (66ft)	£84.95
CW-20 20-10m (34ft)	£89.95
G5RV+ 80-10m	£59.95
Radioworld G5RV Fullsize	£29.95
Radioworld G5RV Halfsize	£27.95

ALINCO · AOR · BHI · CUSHCRAFT · DIAMOND · HEIL · ICOM · KENT · KENWOOD · MFJ · RADIOWORKS · WATSON · WEST MOUNTAIN · YAESU · YUPITERU

RADIOWORLD
If You Don't need it, we won't sell it to you.

price match
Find a lower price? We'll try to match it!

Credit Cards Accepted

MasterCard VISA VISA Electron SWITCH SOLO

Do a great deal better @ RADIOWORLD

01922 414796 - www.radioworld.co.uk

price match
Find a lower price? We'll try to match it!*

Linear Amp U.K.

Challenger Mk3
£1795.95

Challenger MK3 HF	£1795.95
Ranger811H HF	£945.95
Discovery 2-31 2m 1KW	£1395.95
Discovery 2-35 2m 1.5KW	£1595.95
Discovery 6-31 2m 1KW	£1395.95
Discovery 6-35 2m 1.5KW	£1595.95
Discovery70 70cms 700w	£1495.95
LA-STNM Bal Super Tuner	£345.00
LA-STWM Bal Super Tuner	£395.00

SGC. Smartuners

SGC-230 200Watts
£359.95

SGC-230 HF	£359.95
SGC-231 HF+6m	£359.95
SGC-235 HF-500w	£749.95
SGC-237 HF+6m	£299.95
SGC-237 Porta	£589.95
SGC-237 PCB	£299.95
SGC-239 HF	£185.95
MAC-200	£339.95

Rotators YAESU

G-2800SDX Rotator	£999.95
G-450C Rotator	£299.00
G-550C Rotator	£309.00
G-650C Rotator	£379.00
G-1000DXC Rotator	£429.00
G-5500C Rotator	£569.00

Feeders & Wire

Military Spec High grade
50 Ohm coaxial Cable
£69.95 A 100m Drum

RG58U	£0.50 per Metre
RG8 Super	£0.70 per Metre
RG213	£0.90 per Metre
W103 Westflex	£1.20 per Metre
RG-8 75 Metre Drum Special	£39.95
Flexweave 50m Flex	£29.95
Flexweave-PVC-50 50m	£39.95
Enamelled Copper Wire 50m	£12.95
Hard Drawn Copper Wire 50m	£14.95

Rotator Cable: - Color coded Cable

3 core	£0.45 per Metre
7 core	£0.79 per Metre
8 core	£1.09 per Metre

DC Connecting Cable

5A DC Cable	£0.50 per Metre
10A DC Cable	£0.75 per Metre
20A DC Cable	£1.00 per Metre
25A DC Cable	£1.10 per Metre

Wonder Wand *New

Wonder Wand MonoBand Antenna. Mono Band QRP antenna High Quality Mono Band antenna. Available for 3 x Bands.

MB-160 Mono 160m	£49.95
MB-80 Mono 80m	£49.95
MB-60 Mono 60m	£49.95
Wonder Wand 40m-70cm	£89.95
C-POISE Wander-Wand Tunable Counterpoise System	£40.00

The UK's No.1 Used Equipment Trader

Second Hand List.

Quality Used Equipment. 3 Month Warranty.
Best prices paid on your used equipment.

432-50 70cms Amp 50w SH MML 432-5 99.00
Adonis AM-708E SH AM-708E 89.00
AEA PK-232 MBX TNC SH PK-232 125.00
AKD 6001 6m FM Trx SH AKD 6001 135.00
Alan HQ-2000 SWR / Watt Meter SH HQ 2000 25.00
Alinco DJ-G5 SH DJ-G5 169.00
Alinco DJ-V5 Handheld SH DJ V5 99.00
Alinco DJ-X10 Wide Band Rx SH DJ X10 200.00
Alinco DJ-X3 SH DJ-X3 89.00
Alinco DR-150 2m Trx SH DR 150 150.00
Alinco DX-70TH HF & 6m transceiver SH DX-70TH 375.00
Alinco DX-77 HF Base SH DX 77 399.00
Ameritron QSK-5 SH QSK 5 200.00
AOR 5000 Rx SH AR 5000 899.00
AOR AR-1500 Rx SH AR 1500 129.00
AOR AR-3000 SH AR-3000 349.00
AOR AR-3000A SH-AR3000a 425.00
AOR AR-3030 HF Rx SH AR 3030 350.00
AOR AR-7030 SH AR-7030 550.00
AOR AR-8000 SH AR-8000 189.00
AOR AR-8200 2 SH AR-8200 199.00
AOR AR-8200Mk3 SH AR82003 275.00
AOR AR5000A+3 HF Rx SH AR 5000+ 1599.00
Bearcat BC780XLT SH BC-780XLT 199.00
Bearcat UBC-278 XLT Scanner SH UBC 278 99.00
Bnos 20AMP PSU SH BNOS 20 89.00
Bnos LP50-3-50 Amp SH BNOS LP50 89.00
Comet CD-270D Meter SH CD 270D 49.00
Comet CF-BPF6 SH CF-BPF6 25.00
Commtel Comm-225 Rx SH Comm 225 150.00
Daiwa CNA-1001 SH CNA-1001 149.00
Daiwa CNW-419 ATU SH CNW419 99.00
Daiwa CS-201 2 Way Switch SH CS 201 10.00
Datong FL-2 Multimode Filter SH FL-2 69.00
Datong FL-3 Multi-Mode Filter SH FL-3 69.00
Dewsbury Electronics Supa-Tuna SD DE Supa 35.00
Diamond SX-200 Meter SH SX 200 69.00
EDC-16B adapter SH EDC-16B 9.99
Emperor TS-5010 10m transceiver SH TS5010 129.00
Fairhaven RD-500 Comm Rx SH RD 500 299.00
FRT-7700 SH FRT-7700 69.00
FT-290R 2m Multi mode SH FT-290R 150.00
FT-817 SH FT-817 375.00
Fujion F-2000A Finder F 2000 A 99.00
Harvard 420M cb SH Har 420M 29.00
Heil BM-10-5 Headset SH BM-10-5 50.00
Hi-Mound Manipulator Paddle Key SH HMM 30.00
Hora C-150 2m FM Handheld Transceiver SH C-150 79.00
IC-7400 HF, 6m & 2m transceiver SH IC-7400 899.00
Icom AT-180 ATU SH AT-180 225.00
Icom IC-A1E SH IC-A 249.00
Icom IC-207H SH IC-207H 179.00
Icom IC-2100H 2m FM Mobile SH IC 2100H 150.00
Icom IC-251E SH IC-251E 249.00
Icom IC-2710H Dual Band SH IC 2710H 225.00
Icom IC-703 SH IC-703 449.00
Icom IC-706mk1 SH IC-706 399.00
Icom IC-706MkIIG SH 7062G 599.00
Icom IC-718 HF Mobile Base SH IC 718 375.00
Icom IC-735 SH IC-735 299.00
Icom IC-740 HF Transceiver SH IC-740 389.00
Icom IC-7400 SH IC-7400 899.00
Icom IC-756 PRO2 SH IC 756 PR 1499.00
Icom IC-756Pro SH IC-756Pro 995.00
Icom IC-775 DSP Base SH IC 775 1499.00
Icom IC-821H Dual Band transceiver SH IC-821H 549.00
Icom IC-PCR1000 Receiver SH PCR-1000 220.00
Icom IC-R10 Hand held Scanner SH IC R10 229.00
Icom IC-R3 Hand held Scanner SH IC R3 250.00
Icom IC-R5 Hand held Scanner SH IC R5 125.00
Icom IC-R70 HF Rx SH IC R70 299.00
Icom IC-R7000 SH IC-R7000 399.00
Icom IC-R72 Receiver SH IC R72 350.00
Icom IC-R75 SH IC-R75 449.00
Icom IC-R8500 RX SH IC R8500 899.00
Icom IC-T7E Dual Band Handy SH IC-T7E 139.00
Icom IC-T8E SH IC-T8E 159.00
Icom IC-W31E Dual Bander SH IC W31E 160.00
Icom PS-15 20A power Supply SH PS-15 119.00
Icom SM-8 microphone SH SM-8 80.00
Icom SP-21 loudspeaker SH SP-21 54.00
Jil SWR Meter SH Jil SWR 15.00
JPS NIR-10 Noise Unit SH NIR 10 99.00
JRC NRD-525 SH NRD-525 399.00
Junker Pump Key SH JP Key 75.00
Kamtronics KAM Multimode TNC SH KAM TNC 140.00
Kent RA Paddle Key SH KP KEY 40.00
Kent Straight Key SH Kent Key 45.00
Kenwood AT300 Tuner SH AT 300 275 00
Kenwood F7E 2 / 70 Handheld SH F7E 189.00
Kenwood IF232 SH IF232 50.00
Kenwood MB-201 SH MB201 20.00
Kenwood MC-60A SH MC-60A 80.00
Kenwood PS-31 Power Supply SH PS-31 129.00
Kenwood PS-430 Power Supply SH PS-430 109.00
Kenwood SP-31 Loudspeaker SH SP-31 59.00
Kenwood TH-D7E Dual Band Handheld SH TH-D7E 220.00
Kenwood TH-F7E SH TH-F7E 189.00
Kenwood TH-G71E Dualband Handie SH TH G71 129.00
Kenwood TH-K2E 2m Handie SH TH K2E 99.00
Kenwood TM-G707E Dual Band Mobile SH TM-G707E 189.00
Kenwood TM-V7E 2 / 70 SH TM V7E 250.00
Kenwood TMG 707 2m 70cm mobile SH TMG 707 199.00
Kenwood TR-751E 2m Multi-mode trx SH TR-751E 325.00
Kenwood TS-50 SH TS-50S 399.00
Kenwood TS-570 DGE HF Mobile SH TS 570 DG 639.00
Kenwood TS-570S HF / 6 100w SH TS 570S 825.00
Kenwood TS-850S /AT SH TS-850SAT 650.00
Kenwood TS-870S SH TS-870S 899.00
Kenwood TS-950SD HF Transceiver SH TS-950SD 1099.00
LDG Z-11 QRP ATU SH Z11 89.00
Linear Amp UK Challenger SH LAUK CHAL 1200.00
LinearAmp UK Hunter 750 SH Hunter750 699.00
M/Mods 144/100 SH MML144/10 119.00
M/Mods 432/50 SH MML432/50 99.00
Magnum 257 SH MAG 257 139.00
MFJ-1272B TNC / Mic Switch SH MFJ 1272B 20.00
MFJ-442 Elec + Memory keyer SH MFJ 442 89.00
MFJ-704 Low pass filter SH MFJ 704 30.00
MFJ-722 CW / SSB Filter SH MFJ 722 59.00
MFJ-784 DSP Filter SH MFJ 784 149.00
MFJ-9015 15m cw Trx SH MFJ 9015 84.26
MFJ-914 SH MFJ-914 39.95
MFJ-921 VHF 200 Watt ATU SH MFJ 921 50.00
MFJ-931 Artificial Ground SH MFJ-931 69.00
MFJ-948 ATU SH MFJ 948 89.00
MFJ-949E SH MFJ-949E 109.00
MFJ-969 ATU SH MFJ 969 130.00
Microset PT 135 PSU SH PT 135 120.00
Microset R50 2m Amp SH R50 79.00
MML432-30L SH MML432/30 89.00
MML432-50 70cm's Linear Amplifier SH MML432/50 79.00
Nissei DC 300 GL 30A PSU SH DC 300 80.00
Nissei MS-1228 Power Supply SH MS-1228 59.00
Nissei RS-402 2/70 SWR Meter SH RS 402 40.00
Palstar PS-30N PSU SH PS 30N 79.00
PK-900 SH PK 900 200.00
President Lincoln 26-30 mhz SH PRES LINC 165.00
Pro-2006 SH Pro-2006 99.00
Pro.Sis.Tel Rotator and Head Unit SH PST 289.00
Proset-Plus SH-PROSET-PL 109.00
Realistic DX-394 SH DX-394 119.00
Realistic Pro-2006 Scanner SH Pro-2006 129.00
Realistic PRO2042 Base Scaner SH PRO 2042 140.00
Standard C-156E 2m Handheld SH C-156E 125.00
Target HF3 HF3 RX SH HF3 99.00
Tentec Paragon HF Base Inc. Speaker SH TT PARA 700.00
TenTec RX-350 HF Receiver SH TT RX 350 799.00
Timewave DSP9+ External DSP Unit SH DSP9+ 99.00
Timewave PK-12 Packet SH PK12 99.00
Trio PS-430 Kenwood PSU SH PS 430 100.00
Trio R2000 HF Receiver SH R-2000 220.00
Trio TR-9130 2m multi mode SH TR 9130 220.00
TS-480HX SH TS480HX 799.00
TS-480S / AT TS-480S/AT 649.00
Vibroplex Vibro Keyer Deluxe SH VB-DK 119.00
Vibroplex Vibro Keyer Standard SH VB-SK 89.00
W-25-AM 25A PSU SH W-25-AM 70.00
Yaesu DSV2 Voice recorder SH dvs2 139.00
Yaesu FC-20 ATU for FT-847 SH FC-20 175.00
Yaesu FC-30 ATU for FT-847 SH FC-30 150.00
Yaesu FL-2025 Amplifier SH FL-2025 90.00
Yaesu FP-757GX 757 PSU SH FP-757 99.00
Yaesu FP-757HD 757 PSU SH FP-757 149.00
Yaesu FR-101 HF RX SH FR-101 399.00
Yaesu FRG-100 HF Receiver SH FRG-100 299.00
Yaesu FRT-7700 SH FRT 7700 70.00
Yaesu FRV-7700 Converter for FRG-7700 SH FRV 7700 60.00
Yaesu FT-100 SH FT-100 450.00
Yaesu FT-1000MP AC HF Base SH FT-1000MP 1199.00
Yaesu FT-1000MP Field HF DSP Base SH FT-1000 F 1399.00
Yaesu FT-1000MP MKV HF DSP Base SH FT-1000 F 1599.00
Yaesu FT-290MkII 2m Multi-mode transceiver SH FT-290MkI 250.00
Yaesu FT-290R Mk II 2m multi mode SH FT 290R 250.00
Yaesu FT-41R SH FT-41R 79.00
Yaesu FT-470R Dual Band Handheld SH FT 470R 129.00
Yaesu FT-690Rmk2 6m Multi mode SH FT 690 MK 275.00
Yaesu FT-7100M 2m / 70cms Mobile Transceiver SH FT 7100M 220.00
Yaesu FT-736R 2-70 Base SH FT 736R2 550.00
Yaesu FT-736R 6-2-70 Base SH FT 736R3 750.00
Yaesu FT-747 HF Trx SH FT 747 299.00
Yaesu FT-767GX SH FT-767GX 599.00
Yaesu FT-76R 70 cms Handheld Transceiver SH FT 76 99.00
Yaesu FT-7800 2/70 mobile SH FT 7800 199.00
Yaesu FT-790 SH FT-790R 159.00
Yaesu FT-817 SH FT-817 375.00
Yaesu FT-840 SH FT-840 299.00
Yaesu FT-847 SH FT-847 849.00
Yaesu FT-857D SH FT-857D 499.00
Yaesu FT-8800E Dual Band Mobile SH FT-8800E 220.00
Yaesu FT-8900 SH FT-8900 279.00
Yaesu FT-890AT HF Transceiver SH FT-890 425.00
Yaesu FT-897 Portable SH FT 897 549.00
Yaesu FT-900AT HF Transceiver SH FT-900 549.00
Yaesu FT-920AF SH FT-920AF 799.00
Yaesu FTV-1000 200 W Transverter SH FTV 1000 475.00
Yaesu MD-100 SH MD-100 80.00
Yaesu MD-200 Desk Mic SH MD200 175.00
Yaesu MW-1 Remote Control Mic SH MW1 60.00
Yaesu NC70 Battery Charger SH NC70 60.00
Yaesu PA-11C SH PA-11C 20.00
Yaesu VR-500 Receiver SH VR-500 139.00
Yaesu VR-5000 Base receiver SH VR5000 389.00
Yaesu VX-110 2m Handy SH VX-110 79.00
Yaesu VX-1R Handie SH VX1 89.00
Yupiteru MVT-225 SH MVT-225 149.00
Yupiteru MVT-7000 SH MVT 7000 129.00
Yupiteru MVT-7100 SH MVT 7100 140.00
Yupiteru MVT-7300 SH MVT-7300 179.00
Yupiteru MVT-9000 SH MVT 9000 200.00

PLUS SO MUCH MORE... CALL FOR DETAILS

ALSO CLICK AND BUY USED ONLINE !

www.radioworld.co.uk

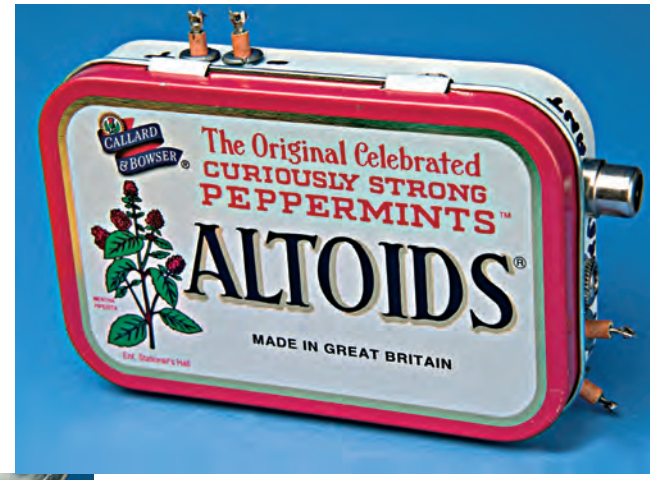
The UK's No.1 Used Equipment Trader - Call 01922 414796

ALINCO · AOR · BHI · CUSHCRAFT · DIAMOND · HEIL · ICOM · KENT · KENWOOD · MFJ · RADIOWORKS · WATSON · WESTMOUNTAIN · YAESU · YUPITERU

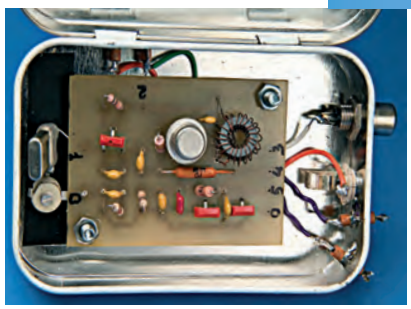
42 Brook Lane
Great Wyrley
Walsall WS6 6BQ

We are Premier UK Dealers for ICOM, Kenwood, Yaesu.
Full UK Warranty with full peace of mind. RADIOWORLD

Practical Way



This month the Rev. George Dobbs G3RJV has been enjoying working with the Pixie! No - George hasn't joined the fairies - you can join him trying a classic ultra-simple QRP rig after reading the appropriate quotation!



"Pixie, kobold, elf, and sprite, all are on their rounds tonight".

Halloween Poem by Joel Benton

I'm sure the inquisitive readers of PW - after reading the quotation - will be asking; "What's a Kobold"? To explain - the word kobold (KOH-bold), is a noun. It's the name of a kind of domestic spirit in german mythology, corresponding to the scottish brownie and the english Robin Goodfellow. Cobalt, the metal, derived its name from 'goblin of the mines', because of the problems due to its arsenic content. What an instructive magazine this is.....!

Problem Producing PCBs

Please note: Before I go further with matters relating to mythical entities, I have a little reader feedback to offer. **Ian GW1MVL/GW0VML**, wrote to *PW* pointing out a problem with the method of producing printed circuit boards I described in the July issue.

Ian is a service engineer for a major printer manufacturer and points out that coated paper designed for inkjet printers should not be used with laser printers. So readers ought to read the paper specifications for their printer before they attempt to try this method. Thanks for the warning Ian!

Pixie & Foxx

In June of 1997 in this column, I discussed the Pixie and the Foxx, two very simple low power transceivers. Both were based upon the novel idea of using a single transistor as both a power amplifier and a receive detector.

From time to time, simple little ideas appear that spark the imagination of the radio constructor. One such idea was the **GM3OXX** Oner transmitter; a complete h.f. transmitter on a one inch square printed circuit board (p.c.b.). These were once produced in kit form and hundreds of them were built. Another similarly acclaimed project was the Pixie transceiver, which is probably the simplest possible Amateur Radio transceiver.

Pixie Birth

In fact the Pixie began life as a design called the MICRO-80 originally submitted to *Sprat*, the journal of the G-QRP Club by **Oleg Borodin RV3GM**. My interest in the MICRO-80 was recently revived when Oleg again began to produce kits for his little project.

The RV3GM kits for the Micro-80 are available, but only by Western Union money transfer, (not difficult) to Oleg. Information can be found on **www.qrp.ru/index_e.html**

I took some of the kits to sell at the 2005 Dayton Hamvention and built one as a demonstration.

The circuit of the Micro-80 is shown in Fig. 1 and it's a delightfully simple idea. The transistor, Tr1, is a crystal oscillator using a Colpitts oscillator, in this case on the 3.5MHz band.

The two 100pF capacitors provide the feedback path and the crystal controls the frequency of oscillation. The oscillator is coupled to a small power amplifier, Tr2, across a 100µH inductor load in the base. The amplified signal is tuned with a 680pF capacitor and a tapped coil (L) to give an output for the antenna. The emitter of Tr2 is keyed for c.w. operation.

The Micro-80 is a very simple transmitter which, depending upon the device used for Tr2, is capable of around 500mW of r.f. output. The output tuning is very rudimentary and it should only be used with a good antenna tuner.

Note: Transistor Tr2 operates in Class C and the output depends on the amount of drive available from Tr1. Oleg supplies Russian transistors with his kit, but readers wishing to reproduce the circuit might try devices like the 2N2222A or the BC108 or similar generic npn transistors. In practice Tr2 could be a similar transistor but something a little more beefy such as the 2N3866 or 2N4427 or 2N3553 should offer more output.

Inductor Core

The inductor, L, used by Oleg employs a Russian core of unknown type. Starting from scratch and retaining the 680pF capacitor, an inductance of 2.9µH will tune 3.560MHz (the QRP calling frequency on 3.5MHz.

The inductor could be made by winding 24 turns of

26s.w.g. wire on a T50-2 core. The tap should be made eight turns from the power supply end. This can be achieved by the usual method of making a loop of wire twisting it to form a pigtail, scraping off the enamel and tinning it with solder.

So, we now have a simple transmitter. But how does it become a transceiver? To answer, let's take a closer look at the circuitry.

Looking at **Fig 1**, you'll see that when the key is closed Tr2 conducts and r.f. power reaches the antenna via the tuned circuit. When the key is open, Tr2 no longer conducts but the oscillator, Tr1, is still running.

In practice Tr2 can still act like a couple of diodes and is receiving signals from the oscillator and from the 'outside world' via the antenna and the tuned circuit. Because of this, Tr2 will act as a mixer for these two signal sources, forming the basis of a direct conversion (DC) receiver.

When the difference between the two signals is in the range of several hundred Hertz, the mixer will produce the audio products of c.w. (Morse) or s.s.b. signals. All we need next is some audio amplification to hear these signals.

Directly Coupled Amplifier

Two transistors, Tr3 and 4 form a directly coupled audio amplifier to bring these weak audio signals to audible levels in a pair of high impedance headphones. Both Tr3 and 4 are generic *npn* devices of the sort described for Tr1.

Unfortunately nowadays

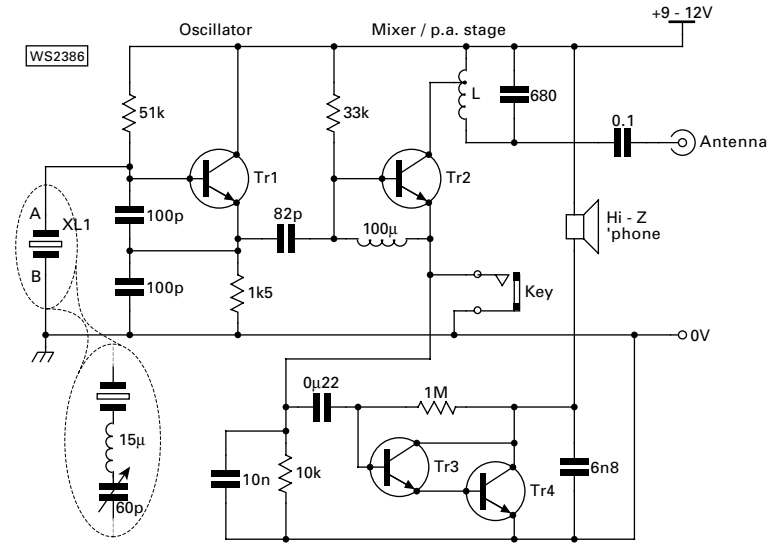


Fig. 1: The circuit of the Micro-80. George G3RJV says "it's a delightfully simple idea". The transistor, Tr1, is a crystal oscillator using a Colpitts oscillator, in this case on the 3.5MHz band (see text).

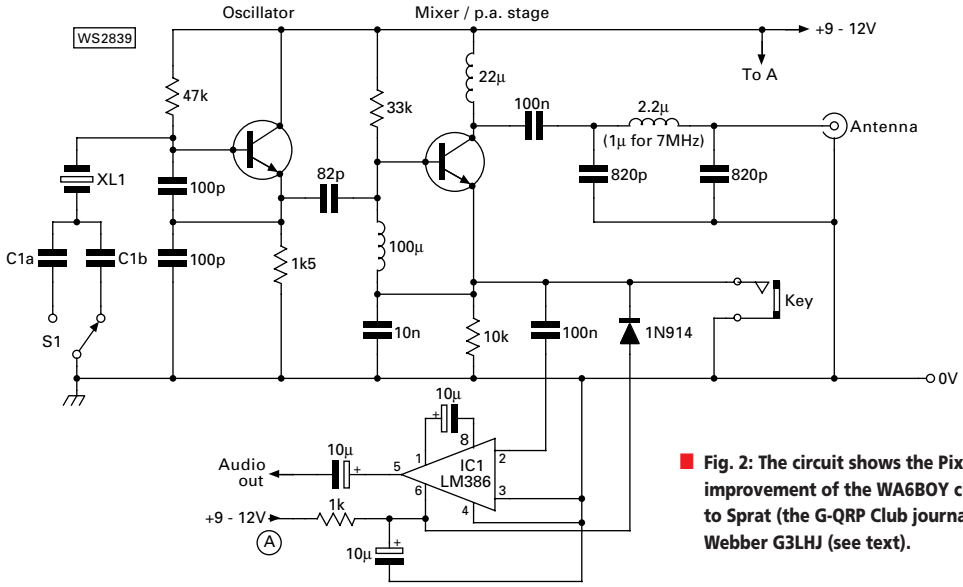


Fig. 2: The circuit shows the Pixie-2 an improvement of the WA6BOY circuit submitted to Sprat (the G-QRP Club journal) by Derrick Webber G3LHJ (see text).

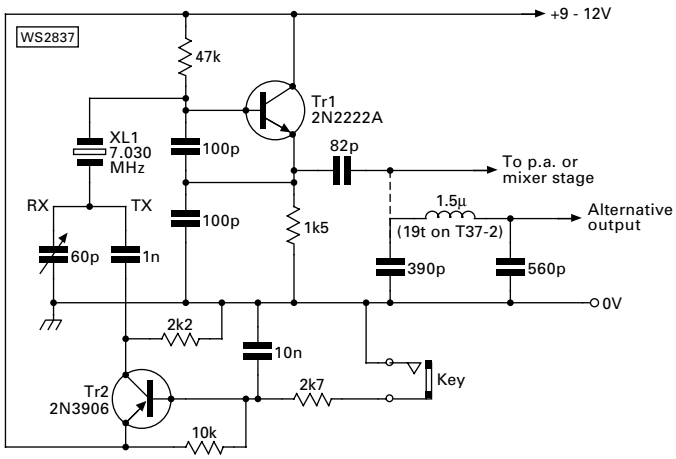


Fig. 3: The late Doug DeMaw W1FB had a go at improving the Pixie. Doug's modifications are shown in here (part circuit shown only, see text).

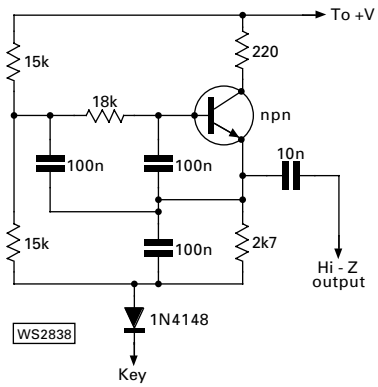


Fig. 4: Miguel Angelo Bartié PY2OHH, added the side-tone circuit shown here. This phase shift oscillator is keyed via a diode and gives an audio output with the keyed signal (see text).

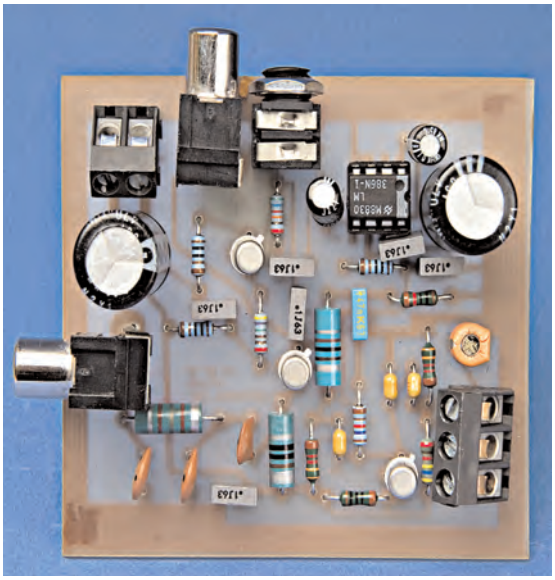


Fig. 5: The complete RV3GM kit as built by G3RJV (see text).

high impedance headphones are not easy to find. A possible alternative is to insert an audio output transformer, such as the LT700, in place of the headphones and use low impedance headphones on the secondary winding. It would also be possible to replace the headphones with a 4.7kΩ resistor and connect a crystal earpiece across the resistor.

The circuit also shows how to vary the frequency of the crystal a little to form a variable frequency crystal oscillator (VXO) using a variable capacitor and an inductance. The amount of frequency shift will depend upon individual crystals and will only be a few kilohertz.

So, here we have only four transistors making up a complete transceiver. Not only that - it has complete break-in! Press the key - it transmits, lift the key - it receives.

Please remember though - we only have four active devices and a few other parts so don't expect the Micro-80 to compete with a £1,000 transceiver! It only puts out about 500mW and the receiver, to say the least, is a little 'iffy'. There's very little front end tuning, and with a poor mixer and low audio amplification - receiving Amateur band signals is quite a challenge!

Rolls & Trabant

They say that the worst way to make a Rolls Royce is to buy a Trabant and bolt on Rolls Royce spare parts! Despite the advice many experimenters were inspired to improve upon the Micro-80.

Enthusiasm not with standing there are limits to the improvements that can be applied to simple designs. Increasing the complexity defeats the purpose of many such circuits, and if a more sophisticated result is required, it's probably better to start somewhere else. But undaunted by such limitations, several keen Amateur Radio constructors soon applied modifications and improvements to the MICRO-80.

The first of the modifications was from **Dave Joseph WA6BOY**, who improved the antenna filtering and added a better audio amplifier. Dave called the result the 'Pixie', a name that stuck, as further developments of the design were all designated as versions of the Pixie. The circuit, **Fig. 2,** shows the Pixie-2 an improvement of the WA6BOY circuit submitted to *Sprat* by **Derrick Webber G3LHJ.**

The Pixie differs from the Micro-80 in two main areas; improvement of the filters and improvement of the audio amplifier. The single tuned circuit at the collector of the power amplifier is replaced by a radio frequency choke (22µH) and a simple low pass filter at the antenna.

The values shown in Fig. 2 are for 3.5MHz, although I have also included the inductor value change that G3LHJ recommended for 7MHz. This arrangement provides better tuning for outgoing and received signals.

Audio Chip

The discrete component audio amplifier is replaced by an LM386 audio chip which gives better overall audio gain. Note: The arrangement around pin 6 provides elementary audio muting when the transmitter is keyed. These were the improvements from WA6BOY and to those G3LHJ added frequency offset between transmit and receive.

One of the problems of many direct conversion receivers is that they don't have a frequency change between transmit and the receive modes. In usual c.w. operation the receiver needs to be offset by a few hundred hertz (commonly 800Hz) from the transmitting frequency.

The result is that the DC station may be called by another station at a frequency which it cannot hear. Derrick G3LHJ simply added a manual switch with two capacitors (C1a and C1b).

Adding capacitance in series with the crystal raises the operating frequency a little. Derrick used values of 40pF and 1000pF (1nF) to obtain a 600Hz offset, this provided a comfortable tone for receiving c.w. and still be able to transmit on the right frequency.

The W1FB Modifications

Even that doyen of Amateur Radio construction the late **Doug DeMaw W1FB**, had a go at improving the Pixie. Doug's modifications are shown in Fig. 3. (Here I've only shown the oscillator stage of the Pixie).

Doug used a pnp transistor (2N3906 or similar) to automatically switch in the extra capacitance for the frequency offset. The trimmer capacitor is adjusted to allow an offset of some 600 to 700Hz. Although it involves adding a whole new stage to the simple transceiver, it's worth it in terms of ease of operation.

The diagram, **Fig. 3**, also includes the W1FB calculated values for a 7MHz low-pass filter. These values have a somewhat better frequency response than those shown in Fig. 2., and have values for a home-made inductor. Doug also included a one stage operational amplifier audio filter ahead of the LM386 audio amplifier - not included here because of limitation of space.

Many Modifications

There have been many other Pixie modifications but I'll add just one more because it's useful and it could be applied to many simple transmitters or transceivers. **Miguel Angelo Bartié PY2OHH**, added the side-tone circuit shown in **Fig. 4**. This phase shift oscillator is keyed via a diode and gives an audio output to follow the keyed signal. The output should be high enough to be applied directly to the speaker or headphones of the transceiver.

Isn't the radio hobby wonderful? One simple design inspires others to get out their soldering irons and see what they can do. Their simplicity means that the Micro-80 and the Pixie clones are perhaps more novelty than practical stations. But they do make contacts and they are certainly fun to use on the air! **PW**

Trader's Table

The equipment for sale on this page is secondhand or ex-demonstration

Disclaimer

Advertisements from traders for equipment that is illegal to possess, use or which cannot be licensed in the U.K, will not be accepted. While the publishers will give whatever assistance they can to readers or buyers having complaints, under no circumstance will the magazine accept liability for non-receipt of goods ordered, late delivery or faults in manufacture.

THE SHORTWAVE SHOP

01202 490099

TRANSCEIVERS

ICOM IC736 HF+ 50Mhz TCVR INT PSU £495
ICOM IC738 HF TRANSCEIVER £425
ICOM IC 207 VHF/UHF TRANSCEIVER £185
ICOM IC471E UHF MULTIMODE TCVR £295
ICOM IC706 MK2 HF/VHF/UHF TCVR £450
YAESU FT100D HF/VHF/UHF TCVR £495
YAESU FT100 HF/VHF/UHF TCVR £335
KENWOOD TS680 HF/50Mhz TCVR £325
KENWOOD TS430S HF TRANSCEIVER £185
KENWOOD TS850S HF TRANSCEIVER £495
KENWOOD THG71E VHF/UHF £145
KENWOOD/TRIO TS520 HF TCVR £125
YAESU FT736 50/144/430 MODULES £495
KENWOOD TH79A VHF/UHF HANDIE £99
KENWOOD TH-71E VHF/UHF HANDIE £95
PALSTAR KH-6 50Mhz HANDIE £65
STANDARD C5800 VHF ALL MODE TCVR £135
ICOM IC 24 HANDHE D TCVR £85
YAESU FT290R2 VHF PORTABLE TCVR £95
YAESU VX5 50/VHF/UHF HANDIE TCVR £125
YAESU VX7 50/VHF/UHF HANDIE TCVR £185
ICOM E90 50/VHF/UHF HANDIE TCVR £179
ALINCO DJ191 VHF HANDIE £95

RECEIVERS

SANYO WS1000 WOR DSPACE RCVR £85
ICOM PCR1000 HF/ VHF/UHF/DSP RCVR £265
FAIRHAVEN RD500 RECEIVER £395
YAESU VR500 HH RECEIVER £145
KENWOOD R5000 HF+ VHF RECEIVER £395
KENWOOD R1000 HF RECEIVER £135
KENWOOD R600 HF RECEIVER £85
REALISTIC DX394 HF RECEIVER £75
GRE PSR225 BASE SCANNER £135
LAFAYETTE HA 600A HF RECEIVER £135
AOR AR7030 HF HI SPEC RECEIVER £495
AOR AR5000 PLUS HF/VHF/UHF RCVR £1195
ICOM IC R75 HF RECEIVER £475
ICOM IC R71 HF RECEIVER £250
YAESU RG8800 HF RECEIVER £185
YAESU VR5000 W DE BAND DSP RCVR £335
YAESU RG100 HF RECEIVER 125 ..... £295

ACCESSORIES

PALSTAR AT300CN HF ANTENNA TUNER £89
WATSON W10AM 10AMP PSU £39
ICOM AT150 ANTENNA TUNER £120
MUTEC TVHF 230 VHF HF TRANSVERTER £95
RN ELECTRONICS 144/50 TRANSVERTER £85
KENWOOD PS 30 H/D POWER SUPPLY £85
LGD Z100 AUTO ATU wi h FT100 CONTROL £145
BNOS LP50-10-50 50Mhz AMPLIFIER £85
TIMEWAVE DSP9 PLUS DSP UN T £85
MICROWAVE MODULE 50Mhz 30W AMP £65
MICROSET R25 VHF AMPLIFIER £65
TINY 2 PACKET TNC £65
ICOM AT180 AUTO ATU £120
DATONG FL2/3 FILTER £55
WATSON W30 DUAL BAND RF AMP £45
ERA MICRO READER £35

For latest list please see www.shortwave.co.uk

NEVADA

023-9231 3090

Alinco DJ193 2m Handheld c/w battery & charger £89
Alinco DJC7 Handy Transceiver c/w Soft Case/Earphone/ERW4C Interface Lead £149
Icom IC2800 2/70cms Mobile Transceiver £259
Kenwood F7E Handheld Radio (wideband RX, dualband TX) wi h software & lead £195
Kenwood TM231e 50w 2m FM Mobile £110
Kenwood TMG707 Dua Band 50w Mobile Transceiver w/Quick Release Head £199
Kenwood TR751E 2M All Mode Mobile Transceiver 25w £275
Kenwood TR7730 2m FM 25w Transceiver £89
Kenwood TS711e 2m All Mode Base Transceiver £325
Trio TS700s 10w All mode 2m Base Tx wi h Ext VFO £299
Yaesu FT2800 60w 2m FM Mobile - Mint Condition & Low Mileage £129
Yaesu FT726R 2M/70CM All Mode 10W Base Transceiver £499
Yaesu FT726R 2M/70CM All Mode Base Transceiver £399
Yaesu FT736R VHF/UHF All Mode Transceiver £699
Yaesu FT8800 Dual Band Mobile Transceiver £239
Yaesu VX2E Twinband Compac Handie with Wide Receive... £139 95
Yaesu VX7R Wideband RX Tri-band TX Handy £225
Alinco DJX10 Wideband Scanning Receiver £199
Alinco DJX3 Handheld Scanner c/w accessories & book £159
Commtel COM213 100 channe Handheld Scanner £75
Fairmate HP2000 All Mode Scanning Receiver £99
Yupiteru MVT9000 Mkl Wideband Scanning Receiver £229
AOR AR7030 Hi Quality HF Receiver w th remote control £499
Icom PCR1000 Computer Receiver £285
Icom R7000 VHF/UHF Base Receiver £399
Icom R75 0-60Mhz Receiver inc PSU £499
Icom R75 General Coverage Receiver w th 50Mhz £499
Icom R8500 Wideband Receiver £899
Sangean ATS303 Portable Receiver 13 SW bands & FM/MW £39
Sangean ATS818 Portable Radio with Cassette £125
Steepletone SAB2000 Airband Receiver £35
Icom 706 Mk II G 0-500Mhz, All Mode Mobile Transceiver £599
Icom 756 Pro 100w HF & 6m Transceiver wi h ATU & DSP £899
Icom IC718 100W HF Transceiver £399
Kenwood T731e 2/70cms Twinband FM Mobile £199
Kenwood TS-430S 100W HF Transceiver £349
Kenwood TS570D 100W HF Transceiver £495
Kenwood TS870SAT 100w DSP HF Transceiver w th Auto Tuner £999
Realistic HTX-10 10m 25w All Mode Mobile £145
Yaesu FRG100 Communications Receiver £275
Yaesu FRG100 HF Receiver c/w Power Supply £259
Yaesu FT817 Portable HF/UHF/VHFTransceiver inc. Case/Hi Capacity Battery £329
Yaesu FT817 HF/VHF/UHF Transceiver & Accessories £425
Perstel Bluenote Persona DAB Radio £59
Moonraker Minor 40 Channel CB Radio £39 95
Zetag HP202 CB SWR/Power Meter £20
Zetagi M27 Antenna Matcher £20
Alinco EDX2 Automatic Antenna Tuner £225
Amdat ADC60 Frequency Standard Clock £99
Aor CT8200 CTCSS Card £55
AOR LA350 Loop Antenna £149
Astatic Desk Mic wire 8pin for Yaesu £59
Daiwa PS304II 30 Amp Power Supply (w th voltage protection board) £89 95
Dewsbury S/TUNER Super Tuner £25
Elmic CONTROLS Noise Limitor £10
Global AT2000 Tuner £65
Hansen FS-5S 1 8-150Mhz SWR/Power Meter, 20/200/1000w £39
Hei Prose Plus Studio Headphones £119
Icom AT160 Coaxial Auto ATU £179
Icom AT180 Automatic Antenna Tuner (matches 706) HF/6 ..... £245
Icom RSR75 Remote Control Software for R75 ..... £25
Icom SCR20 Software & Lead £35
Icom SM20 Base Microphone £110
Icom SM8 Microphone £79
Jim NF96XI Filter £15
Kenwood MB201 Mounting Bracket £10
Kenwood PS30m 20amp Power Supply £110
Kenwood SP430 Speaker £35
MFJ 934 Antenna Tuner & Artificial Ground £129 95
MFJ 948 Antenna Tuner £99
MML144/40 2M 40W Amplifier & PreAmp £69
Morse Key Brass Key £35
Nevada TM1000 1KW Coaster Antenna Tuning Unit £169
Pakratt 232 Data Terminal & Leads £99 95
Samlex 1223 20amp Switch Mode Power Supply £79 95
Tokyo HL50B 50W Amplifier 3.5-29 & 50Mhz (suits FT817) £215
Trio TL922 HF Amplifier £895
Trio TL922 HF Linear Amplifier £795
Twin Paddle Morse Key £45
Viboplex Key Deluxe Chrome Hand Key £119 95
Welz SP15M 1 8-200Mhz SWR/Power Meter £39
Yaesu CD24 Charger for FT897/FNB78 ..... £75
Yaesu FC107C Antenna Tuning Unit £175
Yaesu FC20 Auto Tuner £199
Yaesu FC902 500w Antenna Tuner £149
Yaesu FP708 20A Power Supply incl speaker £79 95
Yaesu MH35A2B Speaker/Mic for older models £19
Yaesu PA26 AC Adaptor for FT897 ..... £45

Check our web site for latest Items available. E&OE Prices quoted are in pounds sterling and exclude carriage.

WATERS & STANTON

01702 206835

Alinco DR-M03X 0m FM Mobile 0W ..... £ 59
Alinco EDX-2 1 6 30MHz Automatic 200W ATU for DX- 0, DX-77 ..... £ 99
Icom IC 821H 2m, 70cm All Mode Base Transceiver 45/40W 12V £799
Icom IC 3230H 2m 70cm FM Mobile,45/35W Full Duplex £249
Yaesu FRG-7700 50kHz 30MHz All Mode Communications Receiver Mains ..... £ 99
Lowe HF-250 30kHz-30MHz All Mode Receiver 12V + psu £329
AOR AR-3000 00kHz 2036MHz All Mode Receiver 400ch. 12V + psu £449
Yaesu FT 8800E 2m,70cm FM Mobile T ansceiver 50W,35W Full Duplex + DTMF mic, Remote Head ..... £ 99
Kantronics KAM plus Multimode Dual Port Data Contro ler + Pactor ..... £ 99
Linear Amp UK Explorer 1200 0-160m Linear 0-130W in, 00-1300W out £995
Kenwood TS-480HX HF, 6m All Mode Transceiver 200W (00W 6m) + DSP Filters, Gen Cov. RX £749
SGC Power Clear DSP Audio Noise Filter + 5W amp, Band Pass F lter £179
President LINC- 0 0m " incoln" All Mode Transceiver 0W (20W SSB) £149
Icom IC-M11 VHF Marine FM H/heId Transceiver 6W + sp mic £149
Icom IC 2SRE 2m FM H/held t ansceiver + 25 950MHz AM,FM,WFM receiver £129
Garmin GPS-V 12Ch. Navigator 500 Waypoints + CitySelect CD Rom ..... £ 89
Yupiteru MVT-9000 0 5 2039MHz All Mode Receiver + Dual VFO 000ch ..... £ 99
AOR AR-5000 0kHz 2 6GHz A l Mode Receiver 000ch. 12V + psu £999
Icom IC-7 8 HF SSB,AM,CW T ansceiver with Gen.Cov. 00W 12V £349
Yaesu FRV-7 00 B 50 59, 1 8-130, 140- 50MHz Converter for FRG-7700 8800 ..... £59
MFJ MFJ-784B Tunable DSP Audio Noise Filter ..... £ 89
Kenwood TM-451E 0cm FM Mobile T ansceiver 35W + 2m RX, Full Duplex £1 9
Icom IC-R3 0 5 2450MHz AM,FM,WFM Receiver 450Ch. + 2" TFT colour TV £269
AOR AR-8200 I 530kHz 2040MHz All Mode Receiver 000ch. Alpha £249
Icom IC-M1Euro VHF FM Marine Hand Held Transceiver 5W + Dual & Tri Watch £139
Yupiteru MVT-9000MK1 0 5 2039MHz All Mode 000Ch + voice inverter £249
Kenwood TS-440S AT HF Base Transceiver with Gen.Cov. RX and Auto ATU 00W 12V £449
MFJ MFJ 852 Power ine Noise Meter £69
Garmin St. Pilot Mono 12Ch. GPS "street map" upg adable mobile system £149
Mi age D-30 0 N 70cm 5-45W N 00W Out £249
ADI AT-400 0cm FM H/Held with Battery box 420-465MHz RX £99
Kenwood TM-451E 0cm FM Mobile T ansceiver 35W + 2m RX, Full Duplex £1 9
Bhi NEIM- 031 In Line Noise Eliminating F lter Unit (typ. 20dB) + Line Level input 12V £89
Alinco DR- 50 2m FM Mobile 50W with Airband RX ..... £ 85
BNOS T 50-144-25 6m 25W Linear T ansverter with 2m F at 1W 12V DC (5A max) 89
AOR AR-2002 25 550,800-1300MHz AM,FM,WFM 20Ch. 12V £149
Garmin GPS-II Plus 12Ch. 500 Waypoints,BackTrack £99
Realistic Pro 39 68 960MHz (with gaps) H/held scanner AM,FM 200Ch. Hyperscan £69
MFJ MFJ 204B 8 30MHz Antenna Tuning Bridge up to 500ohm £59
Yaesu FT 920 AF HF,6m All Mode + Gen.Cov. FM & Fi ter 00W 12V £899
Yaesu VR 500 00kHz-1300MHz A l Mode Receiver 000Ch.Alpha ..... £ 69
Lowe HF-125 30kHz-30MHz All Mode Receiver 12V ..... £ 99
Roberts RC-828 Portable Receiver w th SSB and Cassette £125
Roberts RC-828 Portable Receiver w th SSB and Cassette £125
Icom IC-R3 0 5 2450MHz AM,FM,WFM Receiver 450Ch. + 2" TFT colour TV £269
Icom IC 207H 2m,70cm FM Mobile T ansceiver 50W,35W (Remote Head) ..... £ 89
Yaesu FRG- 00 50kHz 30MHz AM,CW,SSB Base Receiver 12V + psu £279
MFJ MFJ 203 1 8 30MHz Bandswitch Dip Meter £65
Yaesu FRT-7700 50kHz 30MHz Receive ATU for FRG-7 00 8800 ..... £69
AOR AR-8000 500kHz-1300MHz All Mode H/held Receiver 000Ch £129
Icom IC-R72 00kHz 30MHz AM,CW,SSB Base Receiver mains or 12V £329
Roberts R 827 Portable 0 30MHz with FM Stereo & SSB via BFO £1 9
Kenwood AT 50 1 8-30MHz 00W Matching Automatic ATU for TS 50S £2 9
Icom IC-R3 0 5 2450MHz AM,FM,WFM Receiver 450Ch. + 2" TFT colour TV £269
Uniden UBC 3000XLT 25-1300MHz AM,FM Handheld Receiver 400Ch £129
Alinco DJ-X3 00kHz-1300MHz AM, FM, WFM 700Ch + 8 33kHz step £79
Team EURO-8000 80ch 4w UK CB Base Station 12V or mains £99
Diamond GZV-6000 12V variable 60A Regulated Sw tch Mode PSU + meters ..... £ 99
Team EURO-8000 80ch 4w UK CB Base Station 12V or mains £99
JRC NRD-535 50 KHz 30 MHz All Mode Receiver 13 8V DC or mains 50 ohms £599
Yaesu FT 50R 2m/70cm FM Hand Held T ansceiver + Dual Display, Wide RX £149
Garmin St. Pilot Colour 12Ch. GPS "street map" upg adable system + CD £249
Yupiteru MVT-9000 0 5 2039MHz All Mode Receiver 000Ch ..... £ 99
Yaesu FT 2800M 2m FM Mobile T ansceiver 65W + CTCSS £1 9
Icom IC-R75 30kHz-60MHz All Mode Receiver + DSP option 12V w th psu £525
Yaesu FT 8 00R 2m 70cm FM Mobile T ansceiver, 50/35W Full Duplex £229
Yaesu FT 8 00R 2m 70cm FM Mobile T ansceiver, 50/35W Full Duplex £229
Kantronics KAM plus Multimode Dual Port Data Contro ler + Pactor ..... £ 99
Nevada TM- 000 8 30MHz Roller Coaster 1kW ATU ..... £ 69
Heatherlite Hunter 3 5 30MHz 00W in, 1kW out Linear ampli ier 3 x 500Z £499
SGC SG 211 8 60MHz Microprocessor Controlled Automatic ATU 60W £139
Yaesu VR-120D 00kHz-1300MHz AM,FM,WFM Hand Held Receiver 640Ch ..... £ 09
SGC SG 239 8 30MHz Microprocessor controled ATU 200W £149
JRC NRD-525 90kHz-34MHz All Mode Communications Receiver 200Ch. Mains £449
Yaesu FT- 000MP MkV HF Base T ansceiver + Gen.Cov. , ATU & DSP ilters 200W 30V inc psu £1,399
GRE PSR 295 25-1300MHz (with gaps) AM,FM Hand Held Receiver 000ch £99
Yaesu VR 500 00kHz-1300MHz A l Mode Hand Held Receiver 000Ch.Alpha ..... £ 69
Icom IC-R75 30kHz-60MHz All Mode Receiver 12V with psu £499
Icom IC-756pro HF + 6m All Mode Base Transceiver + ATU, DSP & Gen. Cov. 12V £1,299
SGC SG 231 8 60MHz Microprocessor controled ATU 00W £259
Yaesu FP-800 13 5V Matching PSU with Extension Speaker £149
Avair AV-400 140-525MHZ SWR,PWR meter 400W £35
Global AT 2000 50kHz 30MHz SWL ATU with Q selector £69
Alinco DJ- 91 2m FM H/Held with DTMF keypad £1 9
Alinco DJ 580 2m/70cm FM H/Held Full Duplex Airband RX £129
Yaesu FT- 500M 2m FM Mil. Spec. Mobile T ansceiver + CTCSS & DTMF mic 50W £1 9
Yaesu FRG- 00 50kHz 30MHz AM,CW,SSB Receiver 12V £279
Icom IC 821H 2m, 70cm All Mode Base Transceiver 45/40W 12V £799
YAESU FT-897 HF,6m,2m,70cm All Mode + DSP & Gen.Cov.RX 12V £549
YAESU FP 30 13 5V 22A Internal PSU for FT-897 0-240V AC £139
YAESU FC 30 1 8 30,50 54MHz Auto ATU for FT 897 00W 17- 50ohm ..... £ 69
Kenwood TM-V7E 2m,70cm FM Mob le Transceiver 50W,35W Remote Head £249
Yupiteru MVT-8000 800kHz-1300MHz AM,FM,WFM Mobile/Base Receiver 200Ch. 12V ..... £ 89
Kenwood AT 50 1 8-30MHz 00W Matching Automatic ATU £2 9
Icom IC-R3 0 5 2450MHz AM,FM,WFM Receiver 450Ch. + 2" TFT colour TV £299
Yaesu SP 8 Matching Filtered Speaker 3W, 8ohm + 2 inputs £89
Yaesu FT- 000MP AC HF All Mode Transceiver + Gen Cov RX, auto ATU, DSP ilter 00W AC £949
Kenwood TM-D 00E 2m,70cm Mobile T ansceiver 50W,35W Remote Head + TNC & APRS £329
Kenwood TS 870S HF Base T ansceiver with Gen. Cov. + ATU & DSP in the IF, 00W 12V £849
Icom IC-706 Mk II G HF,6m,2m,70cm All Mode + Gen.Cov RX, DSP i ters 12V DC ..£599

Please check our webs te for latest list.
www.wsplc.com

VHF DXER

DAVID BUTLER G4ASR
YEW TREE COTTAGE
LOWER MAESCOED
HEREFORDSHIRE
HR2 0HP
TEL: (01873) 860679
E-MAIL: g4asr@btinternet.com

REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

DAVID BUTLER G4ASR HAS REPORTS OF SPORADIC-E OPENINGS ON THE 50, 70 AND 144MHZ BANDS

It's been another rip-roaring month with nearly every type of propagation mode being reported on the v.h.f. bands during June. The highlights of the month include a number of Sporadic-E (Sp-E) openings on the 50 and 70MHz bands and five days of Sp-E openings that reached the 144MHz band.

Multi-hop Sp-E propagation to North America and the Caribbean Islands was also reported on 50MHz over 14 days during the period. It was noticeable though that Sp-E propagation was less frequent and intense during June than might have been hoped for at this stage in the season.

Other events during June included trans-equatorial propagation (t.e.p.) deep into Africa and South America on the 50MHz band, tropospheric ducting to African stations up to 3000km away on the 144MHz band, a good auroral (Au) back-scatter event, auroral-E (Au-Es) openings, field-aligned irregularities (f.a.i.) propagation, daily meteor scatter (m.s.) contacts and good moonbounce (e.m.e.) conditions.

THE 50MHz BAND

There were openings every day during June on the 50MHz band although some of them were rather weak. As usual single-hop Sp-E paths prevailed but there was real DX to be worked if you were prepared to listen for the weaker stations and use c.w., which every true DXer should do!

Here's some of the DX you may have missed; A45XR (Oman), A61Q (United Arab Emirates), CY9SS (St.Paul Island), FG5FR (Guadeloupe), FJ5DX (St. Barthelemy), FM5JC (Martinique), FP/N6RA (St.Pierre & Miquelon), HI3TEJ (Dominican Republic), J3/K5AND (Grenada), J68AS (St.Lucia), KP3A, KP4EIT, KP4TB, KP4YI, NP3CW, WP4NIX, WP4U (Puerto Rico), PZ5RA (Surinam), TT8M (Chad), 5T5SN (Mauritania) and 9Q0AR (Democratic Republic Congo). Now get out the Morse key and put it to use!

THE 70MHz BAND

The increase in DX activity within the 70MHz band was most noticeable during the summer months. It was to a great extent aided by the occurrence of Sp-E propagation but other modes such as meteor scatter and aurora have also assisted in making this band a very interesting part of the v.h.f. spectrum.

There were 14 days during June when Sp-E reached the 70MHz band with stations such as OZ1BSL, OZ3K, S52AU, S53X, YO2IS, YO4FYQ, YU7EF, ZB3B and 9A1Z being worked by many UK operators. Other operators in countries without 70MHz authorisation such as CT1HZE, EA1DDO, IW0GPN, IK2DHS/3, SP5XMU and 9H1AW were also making QSOs by working crossband to 6m, around 50.185MHz.

Although it's difficult to make inter-UK contacts via E-layer propagation because of the minimum path length of around 1000km it was made possible by the station of **GM4ODA/P** who was operating from Foula (IP80). The island is the furthest west of the Shetland Islands around 1000km from southern England. On June 10 and 15 a few stations in southern England (IO91, JO01) managed to contact GM4ODA/P via c.w. meteor scatter. There's also plenty of DX activity during auroral openings and recent contacts by UK operators have included the stations of EI3IO, OZ1DJJ, OZ2LD, OZ2PBS, OZ3ZW, OZ9DT, OZ9PP and S51DI.

Daran Josey MW3CDJ (IO71) is now active on 70MHz running 7W f.m. telephony into a home-made 5λ/8 vertical antenna. His recent DX contacts made via Sp-E propagation include the stations of ZB3B on May 29, OZ0TE, OZ2M and OZ2LD/M on May 30, S51DI and S59MA on June 1, OZ2PBS, OZ3ZW and ZB2CF on June 3, ZB2/G0JJL on June 10 and OZ1DJJ, OZ2LD, OZ2SYV, OZ8SL, S51DI and ZB2CF on June 11.

Geoffrey Pike GI0GDP has sent in an update regarding the GB3CFG beacon, which is currently operating on 70.027MHz. It transmits simultaneously northeast and southeast running 20W into a 3-element Yagi in each of these directions.

The site is not ideal but it is likely that the beacon will continue to operate from this temporary location in Northern Ireland (IO74) for some time yet. The northeast beam makes an excellent indicator for auroral propagation whilst the southeast beam covers much of Europe via Sp-E and also large areas of the UK via tropospheric propagation. Geoffrey mentions that another GB3CFG beacon unit is licensed for operation on 1296.905MHz but the keying arrangements are not yet finalised.

SPORADIC-E ON 144MHz

It's been a good season so far for 144MHz Sporadic-E openings. It started as early as April 28 with a large scale event to Austria (OE), Bosnia-Herzegovina (T9), Croatia (9A), Czech Republic (OK), Hungary (HA), Italy (I), Malta (9H), Poland (SP), Sardinia (IS0), Sicily (IT9), Slovenia (S5) and Yugoslavia (YU).

In the following month there were seven days of openings with contacts being made on May 19 with stations in Portugal (CT), Spain (EA) and Canary Islands (EA8), on May 21 with Romania (YO), on May 23 to Bulgaria (LZ), Greece (SV) and Macedonia (Z3) and on May 25 with Portugal. The Sp-E openings continued to the end of the month with contacts being made on May 29 into Portugal, Spain, Gibraltar (ZB), Morocco (CN), Canary Islands and Ceuta & Mellila (EA9), on May 30 with Czech Republic, Germany (DL), Italy, Poland, Portugal, Spain and Switzerland (HB9) and on May 31 to Greece and Poland.

Traditionally, the peak of the 144MHz Sp-E season is a relatively short period during the months of June and July. However, only five days of openings were reported in June although some of the events were particularly good and very intense.

A number of openings occurred throughout the UK on June 1 the first between 0815-0850UTC and then others at 1000UTC, 1200-1300UTC, 1520-1540UTC and finally between 1700-1730UTC. Stations in England and Wales reported s.s.b. contacts with operators in Bulgaria, Croatia, Hungary, Italy, Russia (UA), Sicily, Slovakia, Slovenia and Ukraine (UB). During the midday opening stations in Northern Ireland and Scotland reported making 144MHz contacts into France, Germany, Italy and Switzerland.

Earlier in the day around 0825UTC the station of **Colin G0CUZ** (West Midlands IO82) made s.s.b. contacts with IT9JLG

(JM68) and IC8/IK0BZY (JN60). Enrico IK0BZY reports that he was operating from Ischia Island (IC8) running 100W to a 4-element Yagi. During the hour long opening he contacted the stations of EI2EW, EI5FK, EI8GQ, EI9GQ, G0CUZ, G0NFA, G4DBL, G4LOH, G4RRA, G6HIE, G7RAU, G7RNY, G8JVM, GW3HWR, GW3JXN, GW4DGU, GW8ASA and GW8JLY.

The station of GI4OWA (IO64) mentions that the midday opening at his QTH only lasted 10 minutes but signals were very strong during that period. Running an Icom IC-271E transceiver with 80W to a 9-element Yagi he contacted the stations of HB3YIT (JN46), IK1BPL (JN45), IK2GSO (JN45), IW2BNA (JN45) and I4RHP (JN54).

During the afternoon and early evening stations in southern England reported s.s.b. contacts with RK6MC (KN97), RU3EC (KO82), RZ3ZZ (KO80), UT8AL (KO61) and UW6MA (KN97). Two stations G4HGI (IO83) and G8GXP (IO93) mention making a solitary contact with US5WU (KO20) who was heard peaking 59 for 45 minutes.

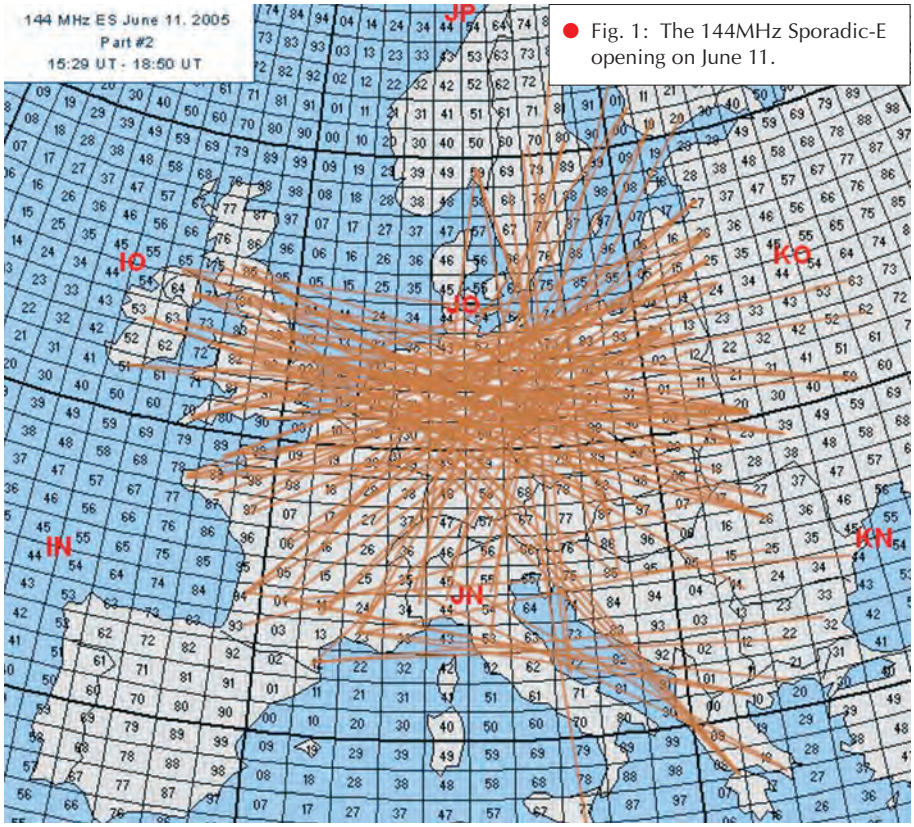
A short 10 minute opening between 1550-1600UTC took place on June 3 with stations in central England and Wales making s.s.b. contacts with operators in southern Spain. The station of Rafa EA7BYM (IM66) consists of an Icom IC-746 transceiver and an 11-element Yagi and he reported making 144MHz contacts with G0CUZ (IO82), G3WCS (IO83), G4DOL (IO80), G4KWQ (IO92), G4TIF (IO92), G8IYG (IO82), G8LHT (IO93), GW0VWD (IO81), MW0AXA (IO81), GW1MCD (IO81), GW4DGU (IO71) and GW8ASA (IO81).

There was an excellent opening on June 11 as shown in the diagram, Fig. 1. The 144MHz band opened up between 1645-1830UTC with UK stations making contacts into Austria, Croatia, Czech Republic, Hungary, Lithuania (LY), Poland, Romania, Slovakia and Ukraine. Towards the end of the event the skip distance shortened considerably with stations in central England making QSOs into Germany. During this period the maximum usable frequency (m.u.f.) peaked over 200MHz.

Frank DL2ALF (JO50) mentions that he had been monitoring the 50-144MHz bands with 'LiveMUF' since 1200UTC. During the evening opening he contacted G4ASR (IO81) over a remarkably short path length of 956km and calculated the maximum usable frequency with *MUF.EXE* (a program written by G4PCS) as being 204MHz!

The Sp-E opening at my QTH (Herefordshire IO81) commenced at 1735UTC and lasted for nearly one hour. In that time I made 38 s.s.b. contacts with stations in the Czech Republic, Germany, Poland, Romania and Ukraine.

Between 1814-1815UTC the skip shortened and contacts were made with DL2ALF and DL3JIN (JO60). Amongst the other DX worked on the 144MHz band were the stations of SO8FH (KO10), SP8MMZ (KO11), SQ8EFK (KN09), US5WU (KO20), UT3BW (KN29) and YO5BEU (KN27).



● Fig. 1: The 144MHz Sporadic-E opening on June 11.

David G8GXP (Yorkshire IO93) heard much DX during the opening but local stations would not move from the s.s.b. calling frequency 144.300MHz and were causing terrible interference. However he did manage to work the stations of HA0DG (KN07), HA0MK (KN08), HG0NBG (KN07), HA8AR (KN06), YO5BWD and YO/OK1CDJ.

Tim Fern G4LOH (Cornwall IO70) reports that the m.u.f. was peaking around 108MHz for much of the morning with Arabic, Italian and Portuguese voices being heard on the f.m. broadcast band. At 1716UTC it finally reached the 144MHz band and a total of 27 s.s.b. contacts were made with stations in Germany, Poland and Ukraine.

Although the Sp-E opening faded out at his QTH at 1820UTC the fun wasn't over as a good field-aligned irregularities (f.a.i.) event commenced a few minutes later. With this propagation mode both stations need to beam towards a specific area of high ionisation. Signals are generally quite weak and the mode produces best results when running high power and a good antenna. By beaming at 70° from his Cornish QTH Tim completed c.w. contacts with the stations of DK5RQ, DF9NP, I6WJB, SP6GWB, S51ZO, S54T and 9A2AE.

On the following day between 1800-2300UTC there was a large auroral back-scatter event to Denmark, Sweden, Czech Republic and Slovenia. This event may possibly have contributed to the lack of any further 144MHz Sp-E for the following 11 days. Incidentally, John GM4WJA mentions that during the auroral opening on June 12 he was called at 2249UTC by the Canadian station VE5UF (Saskatchewan DO61) and they exchanged 55A and 44A reports. Both were very surprised at the contact and John mentions that no other North American station was heard other than the VE8BY beacon which peaked 599 via auroral-E at 2300UTC.

A Sp-E opening around 1650UTC on June 22 was quite brief as UK operators were right on the edge of the opening, which was to Malta. At the QTH of G7RAU a total of three 9H stations were heard but only 9H1TX (JM75) was worked at 55 both ways. One week later on June 29 between 1500-1600UTC a 144MHz opening was reported by stations in southern England to CT1HZE, CT4RK (Portugal) and EA4ANW, EA4BDL, EA7HG, EB7HNJ (Spain). The station of G0CHE (IO90) using 100W to a vertical antenna heard EA4BDL and managed to work CT1HZE (IM57) with 59 reports both ways.

Although 144MHz openings during June didn't quite match expectations a total of 27 countries have been worked at Sporadic-E distances (1000-2000km) from the UK so far this season and next time around I'll be reporting on what could be the final month (July) of the summer Sp-E season.

DEADLINES

The summer Sporadic-E season should now be over but there may still be occasional openings on the 50MHz band. The Perseids meteor shower peaks around August 13 so why not take a listen on the m.s. calling frequencies to see what is happening?

Good luck with your DX contacts and please let me know what you managed to work or hear. Send any reports or news, preferably by e-mail, to reach me by the last weekend of the month.

73, David G4ASR

HF HIGHLIGHTS

CARL MASON GW0VSW
12 LLWYN-Y-BRYN
CRYMLYN PARC
SKEWEN
WEST GLAMORGAN
SA10 6DZ
Tel: (01792) 817321
E-MAIL: carl@gw0vsw.freeserve.co.uk

REPORTS, INFORMATION AND PHOTOGRAPHS TO ME PLEASE BY THE 15TH OF EACH MONTH.

It is always nice to hear from readers outside the UK and **Henry 'Hank' Borawski K2HJB** from Pearl River, New York sent in details of a special event station he thought we may like to listen out for. Henry is the president of the **Pearl River DX Association** who operate the call **W2WTC** (World Trade Centre) every September.

The call, W2WTC, is dedicated to those who perished on 9/11/01 at the Port Authority World Trade Centre, especially the 75 Port Authority of New York & New Jersey employees. Of the 75, 37 were Port Authority Police Officers, including Hank's friend **Bob Cirri KA2OTD**. This was the largest single loss of life to any Police Department in the United States.

The officers were in the Towers effecting the greatest evacuation in history. Over 20,000 people were successfully evacuated from the towers before they collapsed. As a fellow Port Authority Police Officer who was at the scene when the towers collapsed, Hank can attest to their heroic actions that day. The W2WTC call will be heard on most h.f. bands and the operators always keep an ear open for UK stations. (QSL cards are available either via the bureau or direct via K2HJB at **112 Lois Dr, Pearl River, NY 10965, USA.)**

DX NEWS

On to some DX news now and an operation for IOTA enthusiasts as **Mike McGirr K9AJ** and **Bruce Lee KD6WW** plan to activate the Nunavut West Group (Kitimeot region) and the West Central Group (NA-175) sometime between the 1 and 7 September. The exact dates for each island group will depend on the weather and solar conditions. Both operators will sign VY0/homecall with QSLs going via their home callsigns.

Continuing with IOTA the Greek Islands are the chosen destination for **Antonio Bosso IK8VRH** from Italy who has announced his '2005 IOTA SV Tour'. Activity will be on 14, 18 and 21MHz using c.w., s.s.b., and RTTY.

Antonio's proposed schedule starts between the 12-14 August on Spetses Island EU-075. Then from the 16-18 August he will be on Dokos Island EU-075 and then from the 20 - 2 on Kityra Island EU-113 using the callsign **J48RH/P**.

Next stop will be Sapientia Island EU-158 from the 24-26 August or maybe Elofonnisos or Skiza Island operating with the call **J43RH/P**. It is possible that some other h.f. operators may join Antonio and all QSLs will go via IK8VRH.

If you want to look out for these and other island activities try listening on the **IOTA Meeting Frequencies,** which are 3.530, 3.755, 7.055, 10.115, 14.040, 14.260 (the main frequency) 18.098, 18.128, 21.040, 21.260, 24.920, 24.950, 28.040, 28.460 and 28.560MHz.

In Benin **Luc F6FVX** will be active as **TY/F6FVX** from Azove, northwest Cotonou between 13 August and 6 September. He will be on the air with a Kenwood TS-50 and dipole antenna on h.f. and will be speaking the French language only! Listen to Luc's instructions for the QSL information.

Recovering from the effects of Hurricane Ivan is **Graeme Stratton J39BW** who says that he is now in the process of recovering his logbooks that were partially ruined by the storm. If you have worked him and want to confirm the contact with J39BW please QSL direct to his manager **Kash Kashdin WB2RAJ, 4591 West Overlook Drive; Williamsville, NY 14221, USA**. The hurricane also destroyed the roof of his home and much of his equipment so he may not be active again for some time!

CARL GW0VSW SAYS ALTHOUGH THE HF BANDS HAVE BEEN GENERALLY POOR, OCCASIONAL LIFTS HAVE ALLOWED A FEW INTERESTING COUNTRIES TO BE WORKED!

INTERNATIONAL LIGHTHOUSE/LIGHT-SHIP WEEKEND

The International Lighthouse and Lightship weekend is always held on the third full weekend in August beginning at 0001UTC on Saturday and finishing at 2359UTC on Sunday. It also now coincides with the International Lighthouse Day on the Sunday, which is an event organised by the International Association of Lighthouse keepers with as many world lighthouses being open to the public on that day. For information on this try **www.lighthouse.fsnet.co.uk/events/ilhd05.html**

The basic objective of the event is to promote public awareness of lighthouses and lightships and the need to preserve and restore them. It also helps to promote Amateur Radio and foster International goodwill.

Mike Dalrymple GM4SUC has said that as of Sunday 19 June there are already 164 stations in 31 countries that have confirmed their participation in this year's event. A list of the stations with QTH and QSL information can be found at **http://illw.net/2005_list.htm**

If you are planning to operate from either a lighthouse or lightship, remember that non-US c.w. stations should try and operate above 14.025MHz to allow access by Advanced Class US Amateurs. With operations below 14.225MHz you will eliminate the potential for some US Amateurs to work you! Last year there were 376 lighthouse/lightship stations active so try and join in the fun for this weekend and make this years total 400 plus!

YOUR REPORTS

On to your reports now and first off again is **Ted Trowell G2HKU** on the Isle of Sheppy, Kent who seems to be the only reporter who operates on the lower bands consistently! Contacts using c.w. at 2100UTC on 1.8MHz were HB0/DK3KD (Switzerland) and TM9C (France) using a Ten Tec Omni V at 70W to a Butternut HF-6 vertical antenna.

A change to 3.5MHz found OY/OK2PAE (Faroe Islands) EU-018 and LY2PX (Lithuania) once again around 2100UTC. And on 7MHz Ted worked EA9EU (Ceuta & Melilla) and EA6AF (Balearic Islands) EU-004 at 2000UTC.

As Commodore of St Andrews Sailing Club **Colin Topping GM6HGW** had a busy month organising a 'Mid-Summer Madness' 24 hour dinghy relay race. Thinking that acting as guard ship for the event would allow plenty of time to operate maritime mobile on the h.f. bands while at anchor, he took along his Icom IC-706, portable MFJ tuner, long wire and Watson h.f. mobile whip antennas.

Initially, Colin tried out a simple long wire rigged from the forward guardrail to the after horse rail via the signal halyard with 50m of anchor cable (chain) as a ground after the Danforth anchor had dug into the sandy bottom! He found difficulty tuning up on a couple of bands and decided to change over to a 7MHz Watson whip again mounted on the forward guardrail. Calling "CQ" he was surprised to find me!

I knew that Colin would be operating and

● Listen out for the callsign W2WTC says Henry 'Hank' Borawski K2HJB.

even though conditions were far from ideal we exchanged 44 reports both ways around 1200UTC. Shortly after this GW4IGG called in though conditions were difficult and several French stations followed before Colin had to close down and concentrate on the race.

Welcome now to new reporter **Martin Addison M3JUQ** in East Finchely, London who has been active on the h.f. bands since May this year. He was also on 7MHz running 10W s.s.b. and contacts included 8S6KOS (Sweden) on Koster Island EU-043 at 1542, OZ5MJ/P (Denmark) on Avernakoe Island EU-172 at 1406, TM5B (France) from Fort Brescou EU-148 at 2137, MM/DG3OW/P (Scotland) on the Isle of Skye EU-008 at 2148 followed by C37JPE (Andorra) with a special call for 'The Small States of Europe' at 2214UTC. Martin's equipment is a Yaesu FT-840 and a half-size G5RV suspended about 5m above ground with the ends folded to fit in the space available.

THE 14 & 18MHz BANDS

Moving to 14MHz where Martin had QSOs with UR3GJ (Ukraine) 0402, 7X4AN (Algeria) 0708, CN8SG (Morocco) 0710, J48SI (Greece) in Sapientza Lighthouse at 0746, II7PAX (Italy) a special call celebrating Pope Benedict's first public engagement outside the Vatican at 1355, ZA/DM5TI (Albania) 1452 and Z37FAD (Macedonia) at 2016UTC. In Middlesbrough **Keith 'Trukka' Winwood M3KWI** used s.s.b. once again finding S51CK (Slovenia) 0100, KC2MIB (U.S.A.) in Brooklyn, New York at 0540, UA6UDV (European Russia) at 0559, LA9VK (Norway) 1035, YT1BB (Serbia & Montenegro) 1917 and UX2IO (Ukraine) at 2010UTC. His rig is now a Kenwood TS-570DG with a Heil HM-10 insert in his microphone and the antenna a Carolina Windom 80, which Keith says "Performs much better than my old half-size G5RV as it is superior on both receive and transmit".

In Chelmsford Essex **Martin Medcalf M3VAM** had a quiet month but still found time to log EA7FTR (Spain) 1126, II8SRM (Italy) 3A0CE (Monaco) 1750, AP2DKH (Pakistan) 1859, OO4IA (Belgium) 2113, 8P6RC Barbados) NA-021 2150, V44KMC (St. Kitts & Nevis) NA-104 at 2201, ZP6VLA (Paraguay) 2305, CG1FO (Canada) on Grand Manan Island NA-014 at 2328UTC all made using his Yaesu FT-897, Ranger 811H amplifier running at 400W and Cushcraft MA5B beam. On 18MHz Chris logged S79GG (Seychelles Islands) AF-024 1751, EY6OV (Tajikistan) 1837, LZ05KM (Bulgaria) at 1843UTC

Mark Taylor G0LGJ in Dereham was also on this band using a Kenwood TS-480 and his DK3 Screwdriver antenna. Mobile contacts using 100W s.s.b. included WL7NK (USA) in North Pole, Alaska at 0716 and a new country followed at 1353 in the shape of TZ9A (Mali). This was followed by ST2KSS (Sudan) at 1500UTC.

THE 21MHz BAND

Moving to 21MHz now and Chris G1VDP found TY3V (Benin) 1645, V51AS (Namibia) 1650, SO1MZ (Western Sahara) 1720 followed by ZD7FT (Saint Helena) AF-022 at 2059UTC. There were just two QRP contacts here for Martin M3VAM, ZC4DG (UK Sovereign Bases on Cyprus) AS-004 at 1349 and RK3FWA (European Russia) at 1808UTC. 1213, Z37HWK (Macedonia) 1339, EW6GF (Ukraine) 1834, SP8NTU (Poland) at 1842UTC using an Icom IC-746 and long wire antenna with auto tuner.

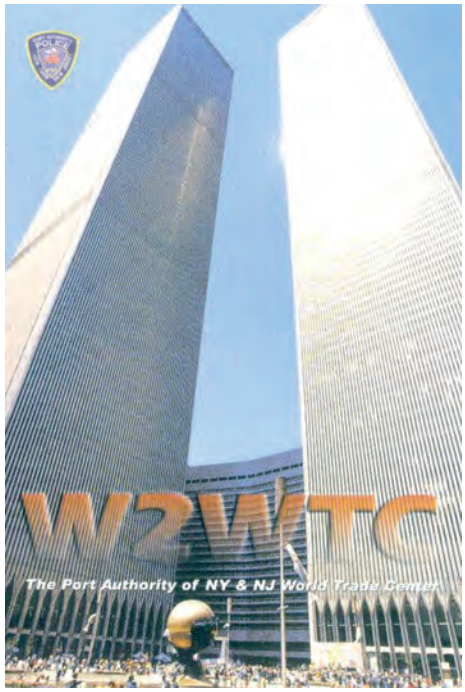
Also active on the band was **Chris Colclough G1VDP** in Nuneaton who made voice contacts with 8S6KOS (Sweden) on Sydkoster Island EU-043 at 0749, 9A8DST (Croatia) 1640, 3Z6VD (Poland) 1734,

THE 28MHz BAND

It was a change of mode this month for **Peter Lowrie MI5JYK** in Newtonabbey, Northern Ireland who decided to try 10m f.m. for a change using an Albrecht AE-485S and dipole antenna at 7m above ground. Simplex contacts included F5VIG (France) Mike in Brittany who is an ex-pat from Bristol at 1145, DF4WQ (Germany) 1540, PA3FAO (Netherlands) 1603, ON5BW (Belgium) 1606 as well as a string of UK stations.

Peter said "It was not a bad afternoon's operating and it was nice to see that QRA locators were being used by the European stations. After a recent talk by me here in Northern Ireland there appears to be a lot more local activity now and I just hope that this year's Es season is better than the last!"

Back in Kent Ted G2HKU 'bashed the key' once again working in the afternoon around 1500UTC finding PY2XC (Brazil), AN5FU (Spain), 4X1VF (Israel), LU1HF (Argentina) and TS3B (Tunisia) QSL via YT1AB.



● Colin Topping GM6HGW taking part in the 'Mid-Summer Madness' 24 hour dinghy relay race (see text).

SIGNING OFF

I must apologise to **Ray Webb G3EKL** Vice President of the **Royal Signals Amateur Radio Society** and its members for calling the society an 'association' in the July column. This was based on information received at the time! That's it for another month and a rather poor h.f. one it has been, though the occasional lift in conditions has allowed a few interesting countries to be worked!

It does seem that we here in the UK are missing out on some of the DXpeditions and special event stations that have been running outside of Europe. Fingers crossed the bands will improve quickly!

As usual my thanks go to all our reporters and to **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* for the DX information. Until next time have a good DX filled month.

73. Carl GW0VSW

DATA BURST

JACK WEBER
C/O PW EDITORIAL OFFICES
ARROWSMITH COURT
BROADSTONE
DORSET
BH18 8PW
E-MAIL: databurst@pwpublishing.ltd.uk

As computer chips become ever faster, the range of what they can do continues to expand. At one time, processing low bandwidth text was the limit for a home computer, then came audio and now we're entering an era of being able to process raw r.f. Lately, I've been getting to grips with a rather unusual piece of equipment that does just this. It's called the SDR-14 and is made in America by RFspace Inc.

At its heart the SDR-14 is a very fast Analogue to Digital Converter (ADC) that samples an incoming r.f. signal up to 66 million times per second. This means that it can digitise the whole radio spectrum from almost d.c. up to around 30MHz in real time.

With the aid of a suitable downconverter it could do the same with any other 30MHz of spectrum right up to microwaves. All very clever, but it's what the SDR-14 can do with this data that makes it so useful – it's a bandscope, a test instrument, a receiver, a signal analyser and a spectrum recorder all in one. I'm sure there are a few more uses too.

The hardware side of the SDR-14 is a small rectangular box about 170x140x40mm with just three l.e.d.s and two SMA connectors on the front. One of the SMAs is a 50Ω r.f. input that you could connect to an antenna or a downconverter, the other provides a direct input to the ADC and is intended for more specialised measurements using an external pre-amplifier and filter.

■ Fig. 1: The SDR-14 has no controls, not even a power switch, so it can be mounted out of sight. All the operational controls are in the software (see text).

On the back of the SDR-14 there's a Universal Serial Bus (USB) socket for connection to a PC, as well as a 12V d.c. power input and another serial socket intended for future expansion. The whole thing weighs just 545g so it's perfectly suitable for mobile operation with a laptop.

Apart from the ADC, the box contains a digital downconverter and various buffers and control chips, but that's about it for the hardware because all the complex processing is done inside the PC. The program that handles it all is called *SpectraVue*. This runs under Windows 98SE or above and, in order to work at full spec, requires a processor of at least 1GHz with a fast video card.

SpectraVue's primary role is to perform a Fast Fourier Transform (FFT) for spectrum analysis and then to display the resultant plot. Functionally, the spectrum analyser works very well and produces an excellent display in a clear re-sizable window.

Unfortunately, the control interface is rather clumsy and, to my mind, sometimes gets in the way of using the equipment. There are many parameters to adjust so getting the ergonomics right is particularly important in something like this. Nevertheless it works, so the problems are to do with usability rather than with the final result.

There are seven display modes available including normal 2-D and 3-D spectrum plots, as well as Waterfall displays, a Phase plot that would be useful for analysing some kinds of digital signals and a Continuum plot, which tracks changes over time in either the average or peak power within the whole frequency span. This would be useful for following changing signal strengths or noise levels.

While there are now quite a few computer-based FFT spectrum analysers available, very few of them have the high sampling rate needed to cover such a wide bandwidth. This means that the SDR-14 faces little competition at the moment, but it also complements very nicely such programs as *Spectrum Laboratory* and *Spectran*, which provide greater resolution and speed but at narrower bandwidths.

Basically, any FFT divides a given frequency span into a large number of equal-sized steps, or bins, and measures the amount of energy present in each bin. The resolution, i.e. how much detail you'll be able to see, depends on the width of those bins. This in turn depends on the number of bins (a value known as the length of the FFT), as well as the frequency range over which they're distributed. More bins or a narrower range will result in better resolution and you'll see more detail, but the whole display may become significantly slower.

OVERALL BANDWIDTH

The overall bandwidth that's fed to the SDR-14's FFT can be set to the full 30MHz or any one of a dozen preset values between 5kHz and 4MHz. Within that range, there are three values – 50, 100 and 150kHz, which allow you to use *SpectraVue*'s built-in software demodulator. This can handle a.m., w.f.m., n.f.m., u.s.b., l.s.b., d.s.b. and c.w. signals and it actually makes for quite an impressive receiver. You get 1Hz tuning and digital filters that can be adjusted in 100Hz steps over a wide range.

The performance is certainly on a par with many of the better communications receivers that are around. However, you don't get many of the standard receiver features such as a notch filter, step tuning, sync mode, memories and so on.

Because the demodulator frequency is independent of the display's centre frequency, you can leave the display showing a whole band and tune around within that to check on any signal that looks interesting. As an alternative, if you have a receiver with a 10.7MHz i.f. output, you can feed that into the SDR-14 and use it as a bandscope or as a second demodulator to check nearby frequencies or to receive both sides of a split-frequency contact.

The process will work for any transceiver or receiver with a suitable i.f. output, but if you have an Icom IC-R8500 or an AOR AR5000, you can use either of these to take control of the SDR-14 and track it in step with the receiver as you tune. Of course, feeding the SDR-14 from a fixed i.f. means that you can use it at any frequency that's covered by the main receiver, right up to u.h.f. and beyond.

One of the best features is the ability to record the whole bandwidth that the filter is set

WE WELCOME JACK WEBER BACK TO *PW* AS HE JOINS THE DATABURST TEAM OF AUTHORS

Fig. 2: This waterfall display shows part of the 35MHz band on a busy evening. Most of these are s.s.b. signals, but a few digital modes are visible too. The horizontal lines are lightning interference.

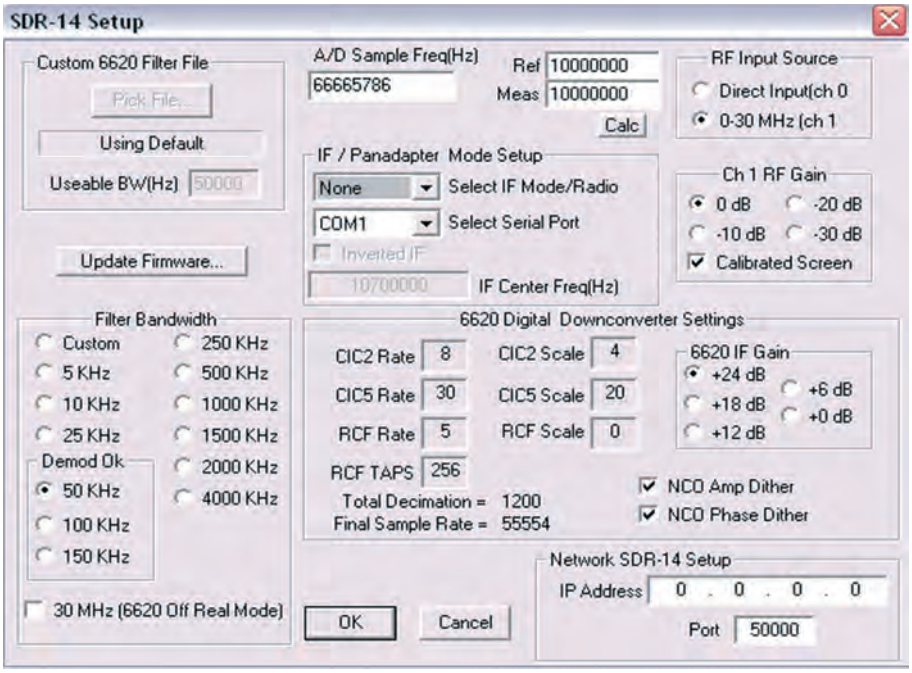


Fig. 3: One of the SDR-14's several set-up screens. This one lets you set the overall bandwidth and various filter and preamplifier parameters. The sampling frequency can also be adjusted to calibrate the frequency readout against a known standard.

to. You could, in fact, record a full 30MHz and then play it back in the spectrum analyser to observe changing band activity over time.

However, it's only the three filter settings mentioned before (50, 100 and 150kHz) that will allow you to use the demodulator when you play back the recording. If you haven't previously experienced spectrum recording like this, it will be a revelation because it means you can go back over the band, changing modes and filter settings and tuning around exactly as if it was being received live.

SPECTRUM RECORDING

Spectrum recording obviously creates large files: a 150kHz band will record at the rate of about 2.2GB/hour or 52GB/day. That's quite a lot if you're using an older PC with a small hard disk, but is entirely manageable on a modern machine, many of which now offer 120 or even 160GB as standard.

Spectrum recording is often used in signals intelligence and other professional monitoring activities, but there are very few examples of amateur kit that provide this facility. Apart from the SDR-14, the only other spectrum recorders I know of are the WiNRADiO G303 and G313 software-defined radios. These have much more sophisticated receiver controls including interactive i.f. filters, a tuneable notch, memories, searching, scanning and so forth, but they're restricted to recording just a 20kHz window as compared to the SDR-14's 150kHz maximum.

Another very welcome feature of the SDR-14 is the ability to save all your settings for the FFT, demodulator and recorder as a named configuration file. With just a bit of effort up front, you could create any number of these files to cover different bands and modes. Then it takes just a few seconds to load one in as required without having to check and adjust lots of different values every time.

There are so many ways of using an instrument like the SDR-14 that there's simply no space to go into them all, but they range from radio astronomy to displaying the ultra-slow Morse of QRSS signals. Take a look at **www.rfspace.com/gallery.html** for a selection of screen images showing various applications of the SDR-14 in Amateur Radio and other fields. They'll provide many useful ideas for how you might use this kind of kit.

One other application of the SDR-14 that's worth mentioning is its ability to perform a wide range of test measurements, both off-air and in the workshop. Of course you'd need to do some calibration first in order to determine and adjust the frequency and amplitude accuracy.

Fortunately, there's a very neat calibration facility built in, which will calculate and set the necessary adjustment to the master oscillator based on the displayed error in any standard frequency transmission.

The SDR-14 isn't currently distributed in the UK, but you can find out about features, applications and availability from RFspace itself or from Universal Radio who sell the SDR-14 in America. Their web pages are at **www.rfspace.com** and **www.universal-radio.com**

OTHER ANALYSERS

Other similar computer-based spectrum analysers are bound to appear before long and, as the chips become faster, we can expect to see the bandwidth rising still higher. The fastest ADCs available at present can sample at over 1GHz, but the number of bits per sample is too low for general radio reception.

You really need 14 or 16-bits for good audio recovery (the SDR-14 uses a 14-bit ADC, hence its name). At present, such devices are limited to a sampling rate of around 170MHz, which would allow a radio bandwidth of up to about 80MHz. But if ADCs follow Moore's Law (speed doubles every 18 months) in the same way that microprocessors seem to, then it won't be very long before the whole of h.f. and v.h.f. can be digitised directly without conversion. It's the beginning of an exciting new era in radio.

See you next time,
Jack

the pwpublishing

RADIO BOOK STORE

Airband

	Pages	Price	Code
AIRBAND RADIO GUIDE (abc) 6th Edition	122	£8.99	ABRG6
AIRBAND RADIO HANDBOOK (Sutton) David Smith	190	£12.95	ABRHB
AIR TRAFFIC CONTROL		£9.99	ATC9
AIRWAVES 2005 (Photavia)	144	£10.95	AIR25
AIRWAVES SELCAL CIVIL & MILITARY DIRECTORY (Photavia)	176	£11.95	AIRSEL
CALLSIGN 2005 (Photavia)	2005	£10.95	CAL25
CIVIL AIRCRAFT MARKINGS 2005 (abc) Alan Wright	368	£7.99	CIVAIR
FLIGHT ROUTINGS 2005 Williams	180	£10.00	FR25
MILITARY AIRCRAFT MARKINGS 2005 (abc) March & Curtis		£7.99	MILAIR
BRITISH ISLES ATLANTIC TRANSITION CHART (AERAD)	1020x520mm	£9.00	UKH6
BRITISH ISLES LOW ALTITUDE CHART (AERAD)	1020x520mm	£9.00	UKL2
NORTH ATLANTIC ROUTE CHART (AERAD)	1020x520mm	£9.00	NATHL1

Frequency Guides

FERRELLS CONFIDENTIAL FREQUENCY LIST 13th Ed.	540	£21.50	FERR13
KLINGENFUSS GUIDE TO UTILITY STATIONS 2005	552	£31.50	KFUTIL
KLINGENFUSS SHORTWAVE FREQUENCY GUIDE 2005	504	£24.50	KFSWFG
KLINGENFUSS SHORTWAVE FREQUENCIES CD 2005		£17.70	KFSWCD
PASSPORT TO WORLD BAND RADIO 2005 (IBS)	592	£17.50	PASS25
RADIO LISTENERS GUIDE 2005	160	£5.45	RLG25
ULTIMATE SCANNING GUIDE & CD Richard Allport	464	£19.99	USG
WORLD RADIO TV HANDBOOK 2005 (WRTH)	688	£22.50	WRTH25

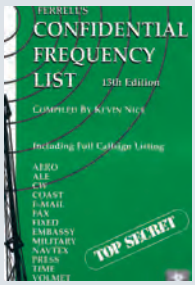
Scanning & Short Wave

BUYING A USED SHORT WAVE RECEIVER 4th Edition F. Osterman	78	£5.95	BUSWRX
RECEIVING (VALUE) STATION LOGBOOK (RSGB)	80	£4.95	RXLOG
SCANNER BUSTERS 3 D.C. Poole (Interproducts)	92	£5.00	SCANB3
SCANNERS 4 SCANNING INTO THE FUTURE Bill Robertson	245	£9.95	SCAN4
SHORT WAVE COMMUNICATIONS 1991. Peter Rouse (PWP) WSL	187	£4.50	SWCOM
THE ESSENTIAL GUIDE TO SCANNING Martin Peters	108	£6.00	EGTS
THE SUPERHET RADIO HANDBOOK I.D. Poole (Babani)	104	£4.95	BP370

Antennas/Transmission Lines/Propagation

25 SIMPLE INDOOR & WINDOW AERIALS E.M. Noll (Babani)	50	£1.75	BP136
25 SIMPLE TROPICAL & MW BAND AERIALS E.M. Noll (Babani)	54	£1.75	BP145
AN INTRODUCTION TO RADIO WAVE PROPAGATION J.G. Lee (Babani)	116	£3.95	BP293
ANTENNA FILE (RSGB)	285	£18.99	ANTFIL
ANTENNA TOOLKIT (inc. CD ROM) Joseph J. Carr	214	£25.00	ANTOOL
ARRL ANTENNA BOOK (inc. CD ROM) 20th Edition	944	£32.00	RRAB20
BACKYARD ANTENNAS Peter Dodd G3LDO (RSGB)	200	£18.95	BYANTS
BASIC RADIO PRINCIPLES & TECHNOLOGY Ian Poole G3YWX	262	£15.99	BRPRIN
EXPERIMENTAL ANTENNA TOPICS H.C. Wright	70	£3.50	BP278
HF ANTENNA COLLECTION Edited by Erwin David G4LQI (RSGB)	233	£19.95	HFANTC
INTERNATIONAL ANTENNA COLLECTION G. Brown M5ACN (RSGB)	250	£11.95	IANTC
INTERNATIONAL ANTENNA COLLECTION 2 G. Brown M5ACN (RSGB)	200	£11.95	IANTC2
MORE WIRE ANTENNA CLASSICS (ARRL)	200	£10.50	MWANTC
PHYSICAL DESIGN OF YAGI ANTENNAS (Hardback) David B. Leeson W6QHS (ARRL)	200	£15.50	PDYAGI
RADIO PROPAGATION PRINCIPLES & DESIGN Ian Poole G3YWX	102	£14.95	PROPPR
RECEIVING ANTENNA HANDBOOK Joe Carr (HighText)	189	£17.50	RXANHB
UNDERSTANDING,BUILDING & USING BALUNS (CQ Publications) Jerry Sevick	125	£18.95	BUBALS
VHF UHF ANTENNAS Ian Poole G3YWX (RSGB)	128	£13.99	VUANTS
WIRE ANTENNA CLASSICS (ARRL)	200	£10.50	WANTC

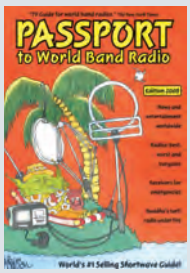
Ferrells Confidential Frequency List



The 13th Edition of 'The Definitive HF Utility Guide' has been updated and includes MIL-STD-PSK modes, high speed HF E-mail services, extensive callsign listing, international call allocations, utility abbreviations and much more. **£21.50**

Klingenfuss 2005 Guide to Utility Radio Stations

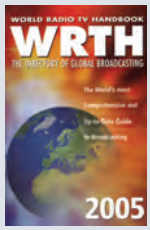
One of the most comprehensive, reliable and up-to-date manuals containing over 11,200 frequencies, 1900 stations, meteo radiofax, radiotelex and NAVTEX schedules, abbreviations, frequency allocations and radio regulations. **£31.50**



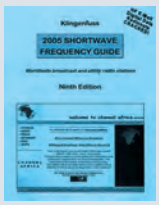
Passport to World Band Radio 2005

This book includes what's on world band radio, what to buy, how to get started and is written to make interesting reading. It contains a mix of articles, from an idiot's guide, to a five-minute start and ten easy catches to best times to listen. It also has a channel by channel guide to what's on the air. Everything the short wave broadcast listener needs to know. **£17.50**

World Radio TV Handbook 2005



A handy reference book that contains the names, addresses, programmes and frequency details of radio stations all round the world. Radio stations are listed under the country and all countries are split up into continents making it much easier to turn to the station you need. Also included are articles on HF broadcasting conditions, radio reviews and a section on how to use the book. **£22.50**



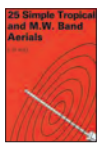
Klingenfuss Shortwave Frequency Guide

This 2005 edition contains a new, clearly arranged alphabetical list of stations and user friendly listings in convenient frequency order. There are over 10,000 entries covering broadcast stations world-wide and 11,000 entries covering utility stations world-wide. **£24.50**

Radio Listeners Guide

This handy annual publication contains radio product reviews and general information for listeners. Frequencies and locations of radio stations all over the UK and Ireland are given for BBC and commercial radio stations, as well as DAB services. All-in-all a very handy reference guide. **£5.45**

25 Simple Tropical & MW Band Aerials



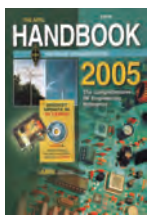
This concise book describes how to build 25 simple and inexpensive antennas for operation on the medium wave broadcast band (550 - 1600kHz) and on the 60, 75, 90 and 120 metre tropical bands. There are also designs for the 49m band. **£1.75**

An Introduction to Radio Wave Propagation

This book provides a broad, yet clear picture of radio wave propagation in a consise way without the use of too much technical language or mathematics. Included are explanations of the phenomena that is propagation dealing with everything from the Sun, through the ionosphere to noise. **£3.95**

ARRL Handbook

Radio amateurs and professionals rely on The ARRL Handbook for current antenna theory and a wealth of practical, how-to construction projects. This 20th edition is extensively revised and includes contributions from leading antenna experts. Many designs are the result of the latest advances in computer modelling. **£32.00**



Antenna Toolkit

This book acts as a miniature antenna manual with very good technical explanations without ever over-doing the maths for the not-so-keen mathematicians! The drawings and illustrations are very clear and the section on instrumentation is very helpful. **£25.00**

RSGB Yearbook

There are almost 500 pages in the 2005 Yearbook, eight more than last year, but only a very small handful are the same. Everything you need is covered within its pages: contact names, addresses, phone numbers, websites and E-mail addresses. A major new feature for this Yearbook is the RSGB Contesting Guide, which was formerly published in RadCom. **£16.95**

Receiving Antenna Handbook

Your receiver is only as good as your antenna or so says the author of this book. It is a complete guide to high performance receiving antennas for long wave all the way to the upper end of the short wave spectrum. The designs aren't slightly modified amateur transmitting antennas but ones intended specifically for receiving purposes. **£17.50**

The Amateur Radio Operating Manual

This new edition of the RSGB Operating Manual reflects the huge impact in the past few years of licensing changes and the ubiquity of PCs and the internet. To deal with these, the author has taken a completely new look at the content and approach. For example, some of the traditional demarcations between HF and VHF and between the various operating modes have been overturned, but new and comprehensive chapters on topics such as PCs in the shack and Operating Modes added. **£19.95**

VHF/UHF Antennas

With both the basic theory and constructional details for many antenna designs, the reader is taken through the essentials in an easy-to-understand way. All kinds of antennas are described from dipoles to Yagis and verticals to log periodic designs. **£13.99**

mail order...huge range in stock...fast delivery...

Beginners/Licence/Manuals

ADVANCE! THE FULL LICENCE MANUAL Alan Betts GOHIQ & Steve Hartley GOFUW (RSGB)	104	£11.99	ADCFLM
AMATEUR RADIO EXPLAINED. Ian Poole G3YWX (RSGB)	150	£9.90	AREXPL
AN INTRODUCTION TO AMATEUR RADIO I.D. Poole (Babani)	150	£4.99	BP257
FOUNDATION LICENCE NOW! Alan Betts GOHIQ (RSGB)	32	£4.99	FLNOW
HF AMATEUR RADIO Ian Poole G3YWX (RSGB)	120	£13.99	HFAR
INTERMEDIATE LICENCE BUILDING ON THE FOUNDATION Steve Hartley GOFUW (RSGB)	76	£6.99	INTLIC
SECRET OF LEARNING MORSE CODE Mark Francis (Spa)	84	£6.95	SOLMC

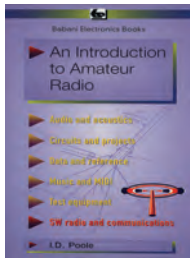
Foundation Licence Now!
A 32-page soft-covered book that takes you through the syllabus, reinforcing what you will learn on the Foundation Course. The Course has been designed and introduced for people of all ages and abilities. To take the course you need no formal qualifications. **£4.99**

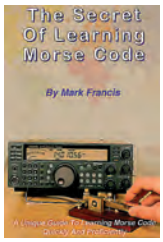
Intermediate Licence Building on the Foundation
The second course book in the RSGB's series, which is structured to progressively obtaining an Amateur Intermediate Licence, this book contains practical exercises, broken down into half-hour worksheets. The ideal companion book for all Amateur Radio Intermediate Licence students. **£6.99**

Advance! The Full Licence Manual
This is the third course structured to obtain an Amateur Radio Licence. Advance is the final stage in gaining the full licence and has been updated to suit the new syllabus structure. Broken down into logical sections, it's presented in an easy-to-understand way, making it perfect for home study. **£11.99**

HF Amateur Radio
This could be the considered as the natural 'follow-on' volume to accompany Basic Radio Principles & Technology. Aimed at the more active radio amateur who is just beginning to get to grips with their new HF transmitting station, it will also appeal to the newcomer. **£13.99**

An Introduction to Amateur Radio
Amateur radio can be a fascinating hobby that has attracted many people all around the world. It encompasses a wide range of subjects from the historical to the latest technology and from operating to construction. Perfect for the fledgling enthusiast. **£4.99**





Secret of Learning Morse Code
Don't be fooled, the requirement for Morse may have been removed, but Morse code still has a place in the scheme of things for the radio amateur. It can consistently be used to 'talk' to others around the world, you don't even need to speak their language to hold a conversation. **£6.95**

Binders

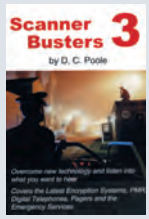
PW	£6.50	BINDPW
SWM	£6.50	BINDSW

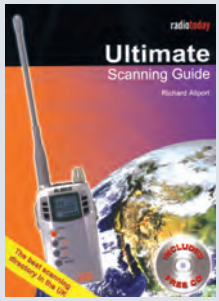
Design & Construction

COIL DESIGN & CONSTRUCTION MANUAL (Babani)	106	£3.95	BP160
LF EXPERIMENTERS HANDBOOK (RSGB)	112	£18.99	LFEXHB
PRACTICAL PROJECTS G. Brown M5ACN (RSGB)	208	£13.95	PRPROJ
PROJECTS FOR RADIO AMATEURS & SWL. R.A. Penfold (Babani)	92	£3.95	BP304
RADIO & ELECTRONICS COOKBOOK (RSGB Newnes)	319	£16.99	RECOOK
RF COMPONENTS & CIRCUITS Joe Carr (RSGB Newnes)	398	£22.50	RFCOMP
TECHNICAL COMPENDIUM (RSGB)	288	£17.99	RSTECO
THE ART OF SOLDERING R. Brewster (Babani)	84	£3.99	BP324
UNDERSTANDING BASIC ELECTRONICS (ARRL)	314	£15.50	UNDBEL

Buying a Used Shortwave Receiver
Buying a second-hand radio can provide great savings if you have the facts. This book provides the information you need to intelligently select the right short wave receiver at the right price. It contains information on the 100 most commonly traded short wave radios both portable and table top models. **£5.95**

Scanner Busters 3
Scanner Busters 3 guides you through the maze, showing you how to deal with trunking systems so you can tune into the things you really want to hear. There is no techincal jargon used in the explanations and PMR, digital telephones, encrytption systems, paging and TETRA are explained in simple terms. **£5.00**





Ultimate Scanning Guide & CD
For those not familiar with Scanning directories, this book provides a simple way to work out exactly who is broadcasting on a given frequency. The reader is provided with clear guidance as to what is available to listen to and what should be avoided. This makes the Radio Today Ultimate Scanning Guide the most accurate and useable directory available. The book also contains a free searchable frequency CD. If you are a long standing scanning enthusiast or new to the hobby then you will find this book a 'must have' for your book shelf . **£19.95**

The Essential Guide To Scanning
Aimed at beginners to scanning this 108 page publication should help you to get the most out of hobby listening. Topics covered include: Choosing a scanner and understanding its features, antennas, accessories, what to listen for and where and much more. **£6.00**

Scanners 4 Scanning into the future
Changes to the radio spectrum as well as new frequency allocations are in this book so the scanning enthusiast will know where to look. Sections on trunked radio systems and pagers and their frequency allocations has been included. Other chapters include understanding radio, antennas, radio systems explained, UK frequency allocations and satellites on your scanner. **£9.95**

to order, telephone:

0870 224 7830

BY FAX -

0870 224 7850

BY FAX -
Send cheque, credit card details, or POs made payable to: PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

POSTAL CHARGES:
UK: £1.75 for one item, £2.75 for two or more items.
Overseas surface: £2.75 for one item, £4.25 for two items, three or more add an additional 75p per item. Airmail prices on application.

If it's ordered before midday and it's in stock, we'll post it that day.* (Royal Mail 2nd class - enquire about 1st class prices).
*UK only

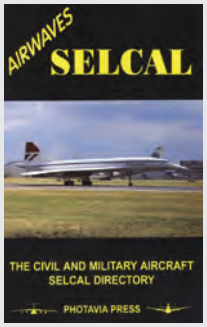
THE QUICKEST AND MOST COMPREHENSIVE RADIO BOOK SERVICE IN THE UK!

RADIOBOOKSTORE

Shack Essentials

AMATEUR RADIO MOBILE HB. P. Dodd. (RSGB)	114	£14.99	MOBHB
AMATEUR RADIO (VALUE) LOGBOOK (RSGB)	80	£4.95	TXLOG
AMATEUR RADIO WORLD ATLAS (A4 size) (DARC)	20	£8.00	ARWAT
ARRL HANDBOOK 2005 inc CD	1152	£32.00	RRHB25
ARRL OPERATING MANUAL 7th Edition (WSL)	420	£18.50	RROPM
DIGITAL MODES FOR ALL OCCASIONS M. Greenman. (RSGB)	208	£16.95	DMFAO
GREAT CIRCLE MAP (PWP)	400 x 400mm	£1.50	GCMAP
LF TODAY GUIDE TO SUCCESS 136kHz M Dennison (RSGB)	128	£11.95	LFTOD
RADIO AMATEUR MAP OF THE WORLD		£8.00	ARMAPW
RSGB AMATEUR RADIO OPERATING MANUAL (RSGB)	224	£19.95	OPMAN
RSGB PREFIX GUIDE (RSGB)	34	£8.95	PFXGDE
RSGB YEARBOOK. 2005 Edition (RSGB)	488	£16.95	RSYB25

Air Traffic Control 9th edition
Apart from visits to airports, the only contact point between the enthusiast and the actual world of air traffic control is through an airband radio. This book has been written to give the reader an understanding of the voice messages you hear. **£9.99**



Airwaves Selcal
Containing over 13000 civil and military aircraft Selcals this publication is a must for all aviation listening enthusiasts. The information is provided in three different ways: Selcal order, Airline/Operator then registration order and airline or Operator Decode. A handy reference book that should be sitting next to your HF receiver - order yours today! **£11.95**

Air Band Radio Guide 6th Edition
Fully updated, this is a comprehensive handbook for the well-informed aviation enthusiast on the subject of air to ground radio. The subjects covered include the legal position of the listener, airband receivers, antenna systems, HF radio, an airfield directory, en route frequencies weather broadcasts and 8.33kHz channel spacing. **£8.99**

Military Aircraft Markings 2005
This annual pocket favourite has been revised with a huge number of changes that have affected military serials over the past year. If you can see it or hear it, MAR 2005 will tell you who runs it or owns it! The accuracy of the contents can be relied on. **£7.99**

Callsign 2005 9th Edition
Civil and military aviation callsign directory, fully updated with over 3000 additions and changes. It's A5 and spiral bound for ease of use and contains over 8000 aviation callsigns. **£10.95**

Civil Aircraft Markings 2005
Now fully revised for 2005 this book lists the UK civil aircraft callsigns alphabetically as well as overseas aircraft too. Details such as the callsign, type of aircraft, the owner or operator and any extra notes that are applicable. **£7.99**

Airwaves 2005 11th Edition
This A5, spiral bound book has been updated with all the latest airband information for the civil and military aviation enthusiast. It contains frequency information, airfield information as well as military frequencies and VOLMET information. **£10.95**

Air Band Radio Handbook
For over 15 years The Air Band Radio Handbook has been regarded as the essential reference source for ground-based air band listeners and flyers. Now fully updated this book is an indispensable guide to every air band enthusiast. **£12.95**

Flight Routings 2005
The A to Z guide to airline flights within the UK. Now in its 15th edition, this book continues to pack its pages with all the information air band listeners could ever wish for. Flight details for airlines including schedules, charter and freight flights. **£10.00**

Photocopies & Back Issues

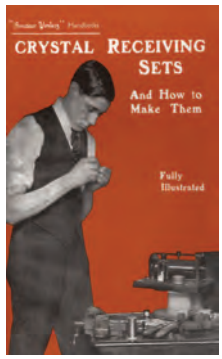
We have a selection of back issues, covering the past four years of *RA*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article.

Subscriptions

Subscriptions are available at £33 per annum to UK addresses, £41 Europe Airmail and £50 RoW Airmail. Joint subscriptions to *Practical Wireless* and *Radio Active* are available at £58 (UK) £71 Europe Airmail and £87 RoW Airmail. Joint subscriptions to *Practical Wireless* and *Short Wave Magazine* are available at £62 (UK) £76 Europe Airmail and £93 RoW Airmail. Subscriptions to *Practical Wireless, Short Wave Magazine and Radio Active* are available at £90 (UK), £111 Europe Airmail and £135 RoW Airmail.

Getting the Most from Your Multimeter
The multimeter's capabilities are often overlooked by many owners, there's much they can do other than continuity testing! The book discusses how you can choose a meter, the advantages and disadvantages of analogue and digital types and then leads you through the many tests they can perform. **£4.99**

Pop Went the Pirates
This book sets out to produce the definitive history of pirate radio ships, with a comprehensive account from the earliest pirates in the 1930s to the present day. The text is illustrated with 230 black and white photographs, many of which have never been published before. You can find out about the ships and forts that played such important roles in changing radio broadcasting into the format that exists today. **£14.99**



Crystal Receiving Sets
This handbook deals, in a simple, straightforward manner, with the making of a number of different kinds of crystal sets representative of those in present-day use. Basically, everything you need to know regarding valve and crystal sets and how to make components. **£7.95**

Microwaves

AN INTRODUCTION TO MICROWAVES F.A. Wilson (Babani)	134	£3.95	BP312
INTERNATIONAL MICROWAVE HANDBOOK A. Barter (RSGB ARRL)	474	£24.95	IMWHB

QRP

LOW POWER COMMUNICATIONS (ARRL)	240	£19.95	LPCOM
LOW POWER SCRAPBOOK (RSGB)	320	£12.99	LPSCRA
QRP BASICS. George Dobbs G3RJV (RSGB)	204	£14.95	QRPBAS

VHF & Higher

ALL ABOUT VHF AMATEUR RADIO W. I. Orr W6SAI. (ARRL)	163	£8.95	AAVHF
GUIDE TO VHF/UHF AMATEUR RADIO Ian Poole G3YWX (RSGB)	180	£8.99	GTVUHF
VHF/UHF HANDBOOK Dick Biddulph G8DPS (RSGB)	180	£22.00	VUHFHB

Crystal Sets

THE XTAL SET SOCIETY NEWSLETTER Volume 1 & 2 Combined. Phil Anderson W0XI	96	£14.00	XTNL12
THE XTAL SET SOCIETY NEWSLETTER Volume 4. Phil Anderson W0XI	88	£7.00	XTNL4
CRYSTAL RECEIVING SETS & HOW TO MAKE THEM (Lindsay)	124	£7.95	XTHTM
CRYSTAL SETS. The Xtal Set Society Newsletter. Volume 5. Phil Anderson W0XI	88	£7.00	XTNL5
CRYSTAL SET BONANZA Vol 9, 10 & 11 Xtal Set Society Newsletter	226	£15.00	XTBONZ
CRYSTAL SET LOOPERS, A THREE TUBER & MORE Volume 8 Xtal Set Society Newsletter	128	£10.50	XTLOOP

Historical

100 RADIO HOOK UPS 2nd Edition (reprinted)	48	£3.35	100RHU
1934 OFFICIAL SHORT WAVE RADIO MANUAL Edited by Hugo Gernsback (Lindsay Publications) (WSL)	260	£11.85	1934SW
AMATEUR RADIO A BEGINNERS GUIDE (1940 REPRINT) (Lindsay Publications) Douglas Fortune W9UVC	156	£7.70	ARABG
COMMUNICATIONS RECEIVERS THE VACUUM TUBE ERA R.S. Moore	141	£17.95	COMRXV
MARCONI'S ATLANTIC LEAP (H/B) Gordon Bussey (Marconi)	96	£6.99	MALEAP
POP WENT THE PIRATES Keith Skues	568	£14.99	POPPIR
SAGA OF MARCONI OSRAM VALVE (Paperback) B.Vyse & George Jessop	346	£25.00	SMOV

Valves

HOW TO BUILD THE TWINPLEX REGENERATIVE RECEIVER T.J. Lindsay	63	£6.75	HTBTRR
HOW TO BUILD YOUR FIRST VACUUM TUBE REGENERATIVE RECEIVER T.J. Lindsay	127	£8.25	HTBFVA
HOW TO BUILD YOUR RADIO RECEIVER (A4) (Popular Radio Handbook No. 1)	100	£6.70	HTBYRR
HOW TO MAKE A NEUTRODYNE RECEIVER Webb	63	£5.95	HTMNRX
SECRETS OF HOMEBUILT REGENERATIVE RECEIVERS C.F. Rockey	127	£8.75	SHBRRX

the pwpublishing

RADIO BOOK STORE

Airband

	Pages	Price	Code
AIRBAND RADIO GUIDE (abc) 6th Edition	122	£8.99	ABRG6
AIRBAND RADIO HANDBOOK (Sutton) David Smith	190	£12.95	ABRHB
AIR TRAFFIC CONTROL		£9.99	ATC9
AIRWAVES 2005 (Photavia)	144	£10.95	AIR25
AIRWAVES SELCAL CIVIL & MILITARY DIRECTORY (Photavia)	176	£11.95	AIRSEL
CALLSIGN 2005 (Photavia)	2005	£10.95	CAL25
CIVIL AIRCRAFT MARKINGS 2005 (abc) Alan Wright	368	£7.99	CIVAIR
FLIGHT ROUTINGS 2005 Williams	180	£10.00	FR25
MILITARY AIRCRAFT MARKINGS 2005 (abc) March & Curtis		£7.99	MILAIR
BRITISH ISLES ATLANTIC TRANSITION CHART (AERAD)	1020x520mm	£9.00	UKH6
BRITISH ISLES LOW ALTITUDE CHART (AERAD)	1020x520mm	£9.00	UKL2
NORTH ATLANTIC ROUTE CHART (AERAD)	1020x520mm	£9.00	NATHL1

Frequency Guides

FERRELLS CONFIDENTIAL FREQUENCY LIST 13th Ed.	540	£21.50	FERR13
KLINGENFUSS GUIDE TO UTILITY STATIONS 2005	552	£31.50	KFUTIL
KLINGENFUSS SHORTWAVE FREQUENCY GUIDE 2005	504	£24.50	KFSWFG
KLINGENFUSS SHORTWAVE FREQUENCIES CD 2005		£17.70	KFSWCD
PASSPORT TO WORLD BAND RADIO 2005 (IBS)	592	£17.50	PASS25
RADIO LISTENERS GUIDE 2005	160	£5.45	RLG25
ULTIMATE SCANNING GUIDE & CD Richard Allport	464	£19.99	USG
WORLD RADIO TV HANDBOOK 2005 (WRTH)	688	£22.50	WRTH25

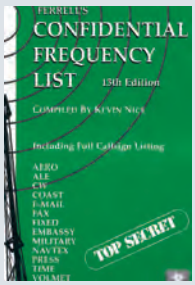
Scanning & Short Wave

BUYING A USED SHORT WAVE RECEIVER 4th Edition F. Osterman	78	£5.95	BUSWRX
RECEIVING (VALUE) STATION LOGBOOK (RSGB)	80	£4.95	RXLOG
SCANNER BUSTERS 3 D.C. Poole (Interproducts)	92	£5.00	SCANB3
SCANNERS 4 SCANNING INTO THE FUTURE Bill Robertson	245	£9.95	SCAN4
SHORT WAVE COMMUNICATIONS 1991. Peter Rouse (PWP) WSL	187	£4.50	SWCOM
THE ESSENTIAL GUIDE TO SCANNING Martin Peters	108	£6.00	EGTS
THE SUPERHET RADIO HANDBOOK I.D. Poole (Babani)	104	£4.95	BP370

Antennas/Transmission Lines/Propagation

25 SIMPLE INDOOR & WINDOW AERIALS E.M. Noll (Babani)	50	£1.75	BP136
25 SIMPLE TROPICAL & MW BAND AERIALS E.M. Noll (Babani)	54	£1.75	BP145
AN INTRODUCTION TO RADIO WAVE PROPAGATION J.G. Lee (Babani)	116	£3.95	BP293
ANTENNA FILE (RSGB)	285	£18.99	ANTFIL
ANTENNA TOOLKIT (inc. CD ROM) Joseph J. Carr	214	£25.00	ANTOOL
ARRL ANTENNA BOOK (inc. CD ROM) 20th Edition	944	£32.00	RRAB20
BACKYARD ANTENNAS Peter Dodd G3LDO (RSGB)	200	£18.95	BYANTS
BASIC RADIO PRINCIPLES & TECHNOLOGY Ian Poole G3YWX	262	£15.99	BRPRIN
EXPERIMENTAL ANTENNA TOPICS H.C. Wright	70	£3.50	BP278
HF ANTENNA COLLECTION Edited by Erwin David G4LQI (RSGB)	233	£19.95	HFANTC
INTERNATIONAL ANTENNA COLLECTION G. Brown M5ACN (RSGB)	250	£11.95	IANTC
INTERNATIONAL ANTENNA COLLECTION 2 G. Brown M5ACN (RSGB)	200	£11.95	IANTC2
MORE WIRE ANTENNA CLASSICS (ARRL)	200	£10.50	MWANTC
PHYSICAL DESIGN OF YAGI ANTENNAS (Hardback) David B. Leeson W6QHS (ARRL)	200	£15.50	PDYAGI
RADIO PROPAGATION PRINCIPLES & DESIGN Ian Poole G3YWX	102	£14.95	PROPPR
RECEIVING ANTENNA HANDBOOK Joe Carr (HighText)	189	£17.50	RXANHB
UNDERSTANDING,BUILDING & USING BALUNS (CQ Publications) Jerry Sevick	125	£18.95	BUBALS
VHF UHF ANTENNAS Ian Poole G3YWX (RSGB)	128	£13.99	VUANTS
WIRE ANTENNA CLASSICS (ARRL)	200	£10.50	WANTC

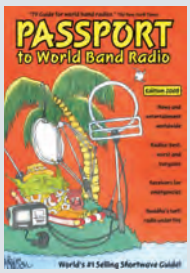
Ferrells Confidential Frequency List



The 13th Edition of 'The Definitive HF Utility Guide' has been updated and includes MIL-STD-PSK modes, high speed HF E-mail services, extensive callsign listing, international call allocations, utility abbreviations and much more. **£21.50**

Klingenfuss 2005 Guide to Utility Radio Stations

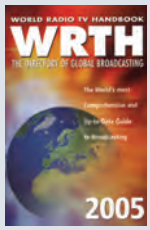
One of the most comprehensive, reliable and up-to-date manuals containing over 11,200 frequencies, 1900 stations, meteo radiofax, radiotelex and NAVTEX schedules, abbreviations, frequency allocations and radio regulations. **£31.50**



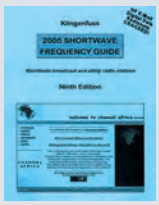
Passport to World Band Radio 2005

This book includes what's on world band radio, what to buy, how to get started and is written to make interesting reading. It contains a mix of articles, from an idiot's guide, to a five-minute start and ten easy catches to best times to listen. It also has a channel by channel guide to what's on the air. Everything the short wave broadcast listener needs to know. **£17.50**

World Radio TV Handbook 2005



A handy reference book that contains the names, addresses, programmes and frequency details of radio stations all round the world. Radio stations are listed under the country and all countries are split up into continents making it much easier to turn to the station you need. Also included are articles on HF broadcasting conditions, radio reviews and a section on how to use the book. **£22.50**



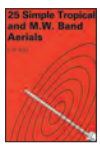
Klingenfuss Shortwave Frequency Guide

This 2005 edition contains a new, clearly arranged alphabetical list of stations and user friendly listings in convenient frequency order. There are over 10,000 entries covering broadcast stations world-wide and 11,000 entries covering utility stations world-wide. **£24.50**

Radio Listeners Guide

This handy annual publication contains radio product reviews and general information for listeners. Frequencies and locations of radio stations all over the UK and Ireland are given for BBC and commercial radio stations, as well as DAB services. All-in-all a very handy reference guide. **£5.45**

25 Simple Tropical & MW Band Aerials



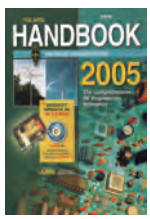
This concise book describes how to build 25 simple and inexpensive antennas for operation on the medium wave broadcast band (550 - 1600kHz) and on the 60, 75, 90 and 120 metre tropical bands. There are also designs for the 49m band. **£1.75**

An Introduction to Radio Wave Propagation

This book provides a broad, yet clear picture of radio wave propagation in a consise way without the use of too much technical language or mathematics. Included are explanations of the phenomena that is propagation dealing with everything from the Sun, through the ionosphere to noise. **£3.95**

ARRL Handbook

Radio amateurs and professionals rely on The ARRL Handbook for current antenna theory and a wealth of practical, how-to construction projects. This 20th edition is extensively revised and includes contributions from leading antenna experts. Many designs are the result of the latest advances in computer modelling. **£32.00**



Antenna Toolkit

This book acts as a miniature antenna manual with very good technical explanations without ever over-doing the maths for the not-so-keen mathematicians! The drawings and illustrations are very clear and the section on instrumentation is very helpful. **£25.00**

RSGB Yearbook

There are almost 500 pages in the 2005 Yearbook, eight more than last year, but only a very small handful are the same. Everything you need is covered within its pages: contact names, addresses, phone numbers, websites and E-mail addresses. A major new feature for this Yearbook is the RSGB Contesting Guide, which was formerly published in RadCom. **£16.95**

Receiving Antenna Handbook

Your receiver is only as good as your antenna or so says the author of this book. It is a complete guide to high performance receiving antennas for long wave all the way to the upper end of the short wave spectrum. The designs aren't slightly modified amateur transmitting antennas but ones intended specifically for receiving purposes. **£17.50**

The Amateur Radio Operating Manual

This new edition of the RSGB Operating Manual reflects the huge impact in the past few years of licensing changes and the ubiquity of PCs and the internet. To deal with these, the author has taken a completely new look at the content and approach. For example, some of the traditional demarcations between HF and VHF and between the various operating modes have been overturned, but new and comprehensive chapters on topics such as PCs in the shack and Operating Modes added. **£19.95**

VHF/UHF Antennas

With both the basic theory and constructional details for many antenna designs, the reader is taken through the essentials in an easy-to-understand way. All kinds of antennas are described from dipoles to Yagis and verticals to log periodic designs. **£13.99**

mail order...huge range in stock...fast delivery...

Beginners/Licence/Manuals

ADVANCE! THE FULL LICENCE MANUAL Alan Betts GOHIQ & Steve Hartley GOFUW (RSGB)	104	£11.99	ADCFLM
AMATEUR RADIO EXPLAINED. Ian Poole G3YWX (RSGB)	150	£9.90	AREXPL
AN INTRODUCTION TO AMATEUR RADIO I.D. Poole (Babani)	150	£4.99	BP257
FOUNDATION LICENCE NOW! Alan Betts GOHIQ (RSGB)	32	£4.99	FLNOW
HF AMATEUR RADIO Ian Poole G3YWX (RSGB)	120	£13.99	HFAR
INTERMEDIATE LICENCE BUILDING ON THE FOUNDATION Steve Hartley GOFUW (RSGB)	76	£6.99	INTLIC
SECRET OF LEARNING MORSE CODE Mark Francis (Spa)	84	£6.95	SOLMC

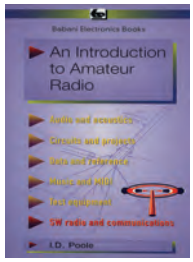
Foundation Licence Now!
A 32-page soft-covered book that takes you through the syllabus, reinforcing what you will learn on the Foundation Course. The Course has been designed and introduced for people of all ages and abilities. To take the course you need no formal qualifications. **£4.99**

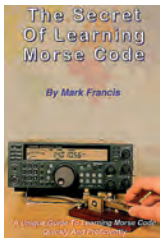
Intermediate Licence Building on the Foundation
The second course book in the RSGB's series, which is structured to progressively obtaining an Amateur Intermediate Licence, this book contains practical exercises, broken down into half-hour worksheets. The ideal companion book for all Amateur Radio Intermediate Licence students. **£6.99**

Advance! The Full Licence Manual
This is the third course structured to obtain an Amateur Radio Licence. Advance is the final stage in gaining the full licence and has been updated to suit the new syllabus structure. Broken down into logical sections, it's presented in an easy-to-understand way, making it perfect for home study. **£11.99**

HF Amateur Radio
This could be the considered as the natural 'follow-on' volume to accompany Basic Radio Principles & Technology. Aimed at the more active radio amateur who is just beginning to get to grips with their new HF transmitting station, it will also appeal to the newcomer. **£13.99**

An Introduction to Amateur Radio
Amateur radio can be a fascinating hobby that has attracted many people all around the world. It encompasses a wide range of subjects from the historical to the latest technology and from operating to construction. Perfect for the fledgling enthusiast. **£4.99**





Secret of Learning Morse Code
Don't be fooled, the requirement for Morse may have been removed, but Morse code still has a place in the scheme of things for the radio amateur. It can consistently be used to 'talk' to others around the world, you don't even need to speak their language to hold a conversation. **£6.95**

Binders

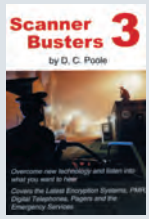
PW	£6.50	BINDPW
SWM	£6.50	BINDSW

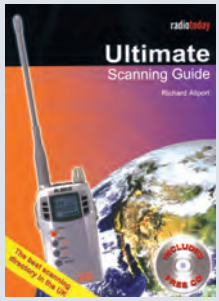
Design & Construction

COIL DESIGN & CONSTRUCTION MANUAL (Babani)	106	£3.95	BP160
LF EXPERIMENTERS HANDBOOK (RSGB)	112	£18.99	LFEXHB
PRACTICAL PROJECTS G. Brown M5ACN (RSGB)	208	£13.95	PRPROJ
PROJECTS FOR RADIO AMATEURS & SWL. R.A. Penfold (Babani)	92	£3.95	BP304
RADIO & ELECTRONICS COOKBOOK (RSGB Newnes)	319	£16.99	RECOOK
RF COMPONENTS & CIRCUITS Joe Carr (RSGB Newnes)	398	£22.50	RFCOMP
TECHNICAL COMPENDIUM (RSGB)	288	£17.99	RSTECO
THE ART OF SOLDERING R. Brewster (Babani)	84	£3.99	BP324
UNDERSTANDING BASIC ELECTRONICS (ARRL)	314	£15.50	UNDBEL

Buying a Used Shortwave Receiver
Buying a second-hand radio can provide great savings if you have the facts. This book provides the information you need to intelligently select the right short wave receiver at the right price. It contains information on the 100 most commonly traded short wave radios both portable and table top models. **£5.95**

Scanner Busters 3
Scanner Busters 3 guides you through the maze, showing you how to deal with trunking systems so you can tune into the things you really want to hear. There is no techincal jargon used in the explanations and PMR, digital telephones, encrytption systems, paging and TETRA are explained in simple terms. **£5.00**





Ultimate Scanning Guide & CD
For those not familiar with Scanning directories, this book provides a simple way to work out exactly who is broadcasting on a given frequency. The reader is provided with clear guidance as to what is available to listen to and what should be avoided. This makes the Radio Today Ultimate Scanning Guide the most accurate and useable directory available. The book also contains a free searchable frequency CD. If you are a long standing scanning enthusiast or new to the hobby then you will find this book a 'must have' for your book shelf . **£19.95**

The Essential Guide To Scanning
Aimed at beginners to scanning this 108 page publication should help you to get the most out of hobby listening. Topics covered include: Choosing a scanner and understanding its features, antennas, accessories, what to listen for and where and much more. **£6.00**

Scanners 4 Scanning into the future
Changes to the radio spectrum as well as new frequency allocations are in this book so the scanning enthusiast will know where to look. Sections on trunked radio systems and pagers and their frequency allocations has been included. Other chapters include understanding radio, antennas, radio systems explained, UK frequency allocations and satellites on your scanner. **£9.95**

to order, telephone:

0870 224 7830

BY FAX -

0870 224 7850

BY FAX -
Send cheque, credit card details, or POs made payable to: PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

POSTAL CHARGES:
UK: £1.75 for one item, £2.75 for two or more items.
Overseas surface: £2.75 for one item, £4.25 for two items, three or more add an additional 75p per item. Airmail prices on application.

If it's ordered before midday and it's in stock, we'll post it that day.* (Royal Mail 2nd class - enquire about 1st class prices).
*UK only

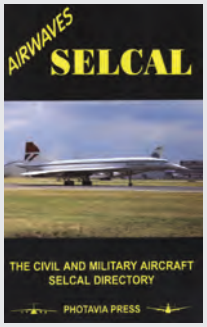
THE QUICKEST AND MOST COMPREHENSIVE RADIO BOOK SERVICE IN THE UK!

RADIOBOOKSTORE

Shack Essentials

AMATEUR RADIO MOBILE HB. P. Dodd. (RSGB)	114	£14.99	MOBHB
AMATEUR RADIO (VALUE) LOGBOOK (RSGB)	80	£4.95	TXLOG
AMATEUR RADIO WORLD ATLAS (A4 size) (DARC)	20	£8.00	ARWAT
ARRL HANDBOOK 2005 inc CD	1152	£32.00	RRHB25
ARRL OPERATING MANUAL 7th Edition (WSL)	420	£18.50	RROPM
DIGITAL MODES FOR ALL OCCASIONS M. Greenman. (RSGB)	208	£16.95	DMFAO
GREAT CIRCLE MAP (PWP)	400 x 400mm	£1.50	GCMAP
LF TODAY GUIDE TO SUCCESS 136kHz M Dennison (RSGB)	128	£11.95	LFTOD
RADIO AMATEUR MAP OF THE WORLD		£8.00	ARMAPW
RSGB AMATEUR RADIO OPERATING MANUAL (RSGB)	224	£19.95	OPMAN
RSGB PREFIX GUIDE (RSGB)	34	£8.95	PFXGDE
RSGB YEARBOOK. 2005 Edition (RSGB)	488	£16.95	RSYB25

Air Traffic Control 9th edition
Apart from visits to airports, the only contact point between the enthusiast and the actual world of air traffic control is through an airband radio. This book has been written to give the reader an understanding of the voice messages you hear. **£9.99**



Airwaves Selcal
Containing over 13000 civil and military aircraft Selcals this publication is a must for all aviation listening enthusiasts. The information is provided in three different ways: Selcal order, Airline/Operator then registration order and airline or Operator Decode. A handy reference book that should be sitting next to your HF receiver - order yours today! **£11.95**

Air Band Radio Guide 6th Edition
Fully updated, this is a comprehensive handbook for the well-informed aviation enthusiast on the subject of air to ground radio. The subjects covered include the legal position of the listener, airband receivers, antenna systems, HF radio, an airfield directory, en route frequencies weather broadcasts and 8.33kHz channel spacing. **£8.99**

Military Aircraft Markings 2005
This annual pocket favourite has been revised with a huge number of changes that have affected military serials over the past year. If you can see it or hear it, MAR 2005 will tell you who runs it or owns it! The accuracy of the contents can be relied on. **£7.99**

Callsign 2005 9th Edition
Civil and military aviation callsign directory, fully updated with over 3000 additions and changes. It's A5 and spiral bound for ease of use and contains over 8000 aviation callsigns. **£10.95**

Civil Aircraft Markings 2005
Now fully revised for 2005 this book lists the UK civil aircraft callsigns alphabetically as well as overseas aircraft too. Details such as the callsign, type of aircraft, the owner or operator and any extra notes that are applicable. **£7.99**

Airwaves 2005 11th Edition
This A5, spiral bound book has been updated with all the latest airband information for the civil and military aviation enthusiast. It contains frequency information, airfield information as well as military frequencies and VOLMET information. **£10.95**

Air Band Radio Handbook
For over 15 years The Air Band Radio Handbook has been regarded as the essential reference source for ground-based air band listeners and flyers. Now fully updated this book is an indispensable guide to every air band enthusiast. **£12.95**

Flight Routings 2005
The A to Z guide to airline flights within the UK. Now in its 15th edition, this book continues to pack its pages with all the information air band listeners could ever wish for. Flight details for airlines including schedules, charter and freight flights. **£10.00**

Photocopies & Back Issues

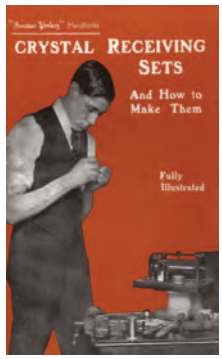
We have a selection of back issues, covering the past four years of *RA*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article.

Subscriptions

Subscriptions are available at £33 per annum to UK addresses, £41 Europe Airmail and £50 RoW Airmail. Joint subscriptions to *Practical Wireless* and *Radio Active* are available at £58 (UK) £71 Europe Airmail and £87 RoW Airmail. Joint subscriptions to *Practical Wireless* and *Short Wave Magazine* are available at £62 (UK) £76 Europe Airmail and £93 RoW Airmail. Subscriptions to *Practical Wireless, Short Wave Magazine and Radio Active* are available at £90 (UK), £111 Europe Airmail and £135 RoW Airmail.

Getting the Most from Your Multimeter
The multimeter's capabilities are often overlooked by many owners, there's much they can do other than continuity testing! The book discusses how you can choose a meter, the advantages and disadvantages of analogue and digital types and then leads you through the many tests they can perform. **£4.99**

Pop Went the Pirates
This book sets out to produce the definitive history of pirate radio ships, with a comprehensive account from the earliest pirates in the 1930s to the present day. The text is illustrated with 230 black and white photographs, many of which have never been published before. You can find out about the ships and forts that played such important roles in changing radio broadcasting into the format that exists today. **£14.99**



Crystal Receiving Sets
This handbook deals, in a simple, straightforward manner, with the making of a number of different kinds of crystal sets representative of those in present-day use. Basically, everything you need to know regarding valve and crystal sets and how to make components. **£7.95**

Microwaves

AN INTRODUCTION TO MICROWAVES F.A. Wilson (Babani)	134	£3.95	BP312
INTERNATIONAL MICROWAVE HANDBOOK A. Barter (RSGB ARRL)	474	£24.95	IMWHB

QRP

LOW POWER COMMUNICATIONS (ARRL)	240	£19.95	LPCOM
LOW POWER SCRAPBOOK (RSGB)	320	£12.99	LPSCRA
QRP BASICS. George Dobbs G3RJV (RSGB)	204	£14.95	QRPBAS

VHF & Higher

ALL ABOUT VHF AMATEUR RADIO W. I. Orr W6SAI. (ARRL)	163	£8.95	AAVHF
GUIDE TO VHF/UHF AMATEUR RADIO Ian Poole G3YWX (RSGB)	180	£8.99	GTVUHF
VHF/UHF HANDBOOK Dick Biddulph G8DPS (RSGB)	180	£22.00	VUHFHB

Crystal Sets

THE XTAL SET SOCIETY NEWSLETTER Volume 1 & 2 Combined. Phil Anderson W0XI	96	£14.00	XTNL12
THE XTAL SET SOCIETY NEWSLETTER Volume 4. Phil Anderson W0XI	88	£7.00	XTNL4
CRYSTAL RECEIVING SETS & HOW TO MAKE THEM (Lindsay)	124	£7.95	XTHTM
CRYSTAL SETS. The Xtal Set Society Newsletter. Volume 5. Phil Anderson W0XI	88	£7.00	XTNL5
CRYSTAL SET BONANZA Vol 9, 10 & 11 Xtal Set Society Newsletter	226	£15.00	XTBONZ
CRYSTAL SET LOOPERS, A THREE TUBER & MORE Volume 8 Xtal Set Society Newsletter	128	£10.50	XTLOOP

Historical

100 RADIO HOOK UPS 2nd Edition (reprinted)	48	£3.35	100RHU
1934 OFFICIAL SHORT WAVE RADIO MANUAL Edited by Hugo Gernsback (Lindsay Publications) (WSL)	260	£11.85	1934SW
AMATEUR RADIO A BEGINNERS GUIDE (1940 REPRINT) (Lindsay Publications) Douglas Fortune W9UVC	156	£7.70	ARABG
COMMUNICATIONS RECEIVERS THE VACUUM TUBE ERA R.S. Moore	141	£17.95	COMRXV
MARCONI'S ATLANTIC LEAP (H/B) Gordon Bussey (Marconi)	96	£6.99	MALEAP
POP WENT THE PIRATES Keith Skues	568	£14.99	POPPIR
SAGA OF MARCONI OSRAM VALVE (Paperback) B.Vyse & George Jessop	346	£25.00	SMOV

Valves

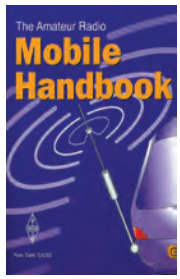
HOW TO BUILD THE TWINPLEX REGENERATIVE RECEIVER T.J. Lindsay	63	£6.75	HTBTRR
HOW TO BUILD YOUR FIRST VACUUM TUBE REGENERATIVE RECEIVER T.J. Lindsay	127	£8.25	HTBFVA
HOW TO BUILD YOUR RADIO RECEIVER (A4) (Popular Radio Handbook No. 1)	100	£6.70	HTBYRR
HOW TO MAKE A NEUTRODYNE RECEIVER Webb	63	£5.95	HTMNRX
SECRETS OF HOMEBUILT REGENERATIVE RECEIVERS C.F. Rockey	127	£8.75	SHBRRX

mail order...huge range in stock...fast delivery...

Electronics

ELECTRONIC PROJECT BUILDING FOR BEGINNERS R.A. Penfold (Babani)	110	£4.95	BP392
GETTING THE MOST FROM YOUR MULTIMETER R.A. Penfold (Babani)	102	£4.99	BP239
TEST EQUIPMENT FOR THE RADIO AMATEUR Clive Smith G4FZH (RSGB)	170	£12.99	TESTEQ

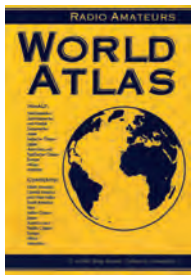
WSL - While Stocks Last - please call to check availability **before** ordering



The Amateur Radio Mobile Handbook
Every aspect of mobile working is covered from basic bicycle mobile to the maritime operations for the keen sailors who abound in amateur radio. Extremely well illustrated with many photographs, diagrams and charts. **£14.99**

Great Circle Map
A Great Circle map based on the UK at the centre of the map. Find direction and distances to any part of the world quickly and efficiently via the shortest hop. **£1.50**

Radio Amateurs World Atlas
Each country has the respective prefix shown on both the map and in an alphabetical list. Sixteen pages of maps from the North to the South Pole! **£8.00**



how to order

By Post: Write to the Book Store, remembering to include your name, address, daytime telephone number and payment details (Sterling, cash not accepted), at:
Book Store, PW Publishing Ltd., Broadstone, Dorset BH18 8PW.
By Telephone: Call **Clive G4SLU** in the Book Store, Monday to Friday 9am to 4pm. Outside these hours your order will be recorded on an answerphone. **Call: 0870 224 7830**
By Fax: If you wish to FAX your order to us please mark it for the attention of the Book Store and send it to: **FAX: 0870 224 7850**
By E-mail: clive@pwpublishing.ltd.uk
Photocopies & Back Issues: To order a Back Issue from the last four years of *PW* please use the order form below or call the Order Line. If you require a photocopy of an article from an older issue, these are also available as is a Review List for *PW* & *SWM* from 1979 onwards.
Postal Charges: (UK) one item £1.75 / Two or more items £2.75.
EUR/RoW: One item £2.75 / two or more items add 75p for every item.
Review List: £2* (* includes P&P - add a further £1 for EUR/RoW)
Photocopies / Reprints: (Articles over 3 years old) £3.00, UK £4.00 overseas
Back Issues (non-current)**:** SWM @ £5.00 (£5.50), PW @ £4.75 (£5.25), RA @ £4.60 (£5.10).

E&OE

order form
PW

Please send me the following books:

.....Code ..... Price (£).....
.....Code ..... Price (£).....
.....Code ..... Price (£).....
.....Code ..... Price (£).....
.....Code ..... Price (£).....
.....Code ..... Price (£).....
.....Code ..... Price (£).....
.....Code ..... Price (£).....

Total cost of Books Ordered: .....Price (£).....

Postage Charges
Please remember to add postage to your order. (£).....

UK
£1.75 P&P for one item, £2.75 for two or more (UK)

Airmail
£2.75 P&P for one, £4.25 for two, 75p extra per item for three or more

Total cost of order including postage.....Price (£).....

Send this completed form to:

PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW

Payment Details

Name .....

Address.....

.....

.....

Telephone (Daytime) .....

Postcode.....

I enclose my Cheque/Postal Order for £.....
(Cheques MUST made payable to PW Publishing Ltd.)

or please debit my Access/Visa/Amex

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expiry Date ..... Security No. ☐☐☐

or please debit my Maestro/Solo

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐

Expiry Date ..... Security No. ☐☐☐

Start date ..... Issue No (if on card).....

Signature.....

Orders are normally despatched by return of post but please allow 28 days for delivery. Prices correct at the time of going to press. Please note: all payments must be made in Sterling, cash not accepted.

bargain basement

YOUR ATTENTION PLEASE!

Bargain Basement rules - £4 per advert

Please write your advert **clearly** in **BLOCK CAPITALS** up to a maximum of **30 words**, plus **12 words f**or your contact details on the form provided and send it together with the dated corner flash and your **payment of £4** (**subscribers** can place their advert **free of charge** as long as they provide their **subs number and corner flash**), cheques should be made payable to **PW Publishing Ltd.**, credit card payments also accepted.

Send your advert to **Bargain Basement, Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW** or E-mail your advert to **peter@pwpublishing.ltd.uk** (If you don't want to include your credit card details on your E-mail, just 'phone us on **0870 224 7820**.

Please help us to help you by preparing your advert carefully. Any advert which contains **??** marks indicates that the advertiseing dept. could not read/interpret the wording.

Please avoid FAXing your advert - it could delay publication.

Advertisements from traders or for equipment that it is illegal to possess, use or which cannot be licensed in the UK, will not be accepted. **No responsibility will be taken for errors and no correspondence will be entered into on any decision taken by the Editor on any of these conditions.**

You should state clearly in your advert whether equipment is professionally built, home-brewed or modified.

The Publishers of *Practical Wireless* also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

FOR SALE

A COLLECTION OF RADIO RECEIVERS from 1930 onwards. Also, instruments, valves and spares. Please phone me for more details. Tel: Ron Isham 01280 703701. 8 Valley Road, Brackley, Northants NN13 7DQ. E-mail ronisham@brackley703.fsnet.co.uk

ALL STEREO 33W PER CHANNEL as shown. Wharfdale speakers, AM/FM tuner, graphic

equalisers, twin tape deck with manuals and leads. Stereo power mic, £100 Ring Bill: 01492 623672 (Conway).

BM100 DUAL BAND CO-LINEAR £15. Four band Howes Rx for your to build, £20. CBM-272, £15, on 10m. TR-7800 for repair or spares, £10. Tel: Tom M3EHA 01606 597342 (Cheshire).

DIAMOND GSV-300012V 30 Amp PSU, £60. AKD HF wave meter, £15. Ascom SE-550 Tx/Rx modified for 4m amateur band, £25. Datong morse tutor D70, £15. Buyer to collect all items. Tel: John 01249 890674 (Wiltshire). E-mail: johng0oid@aol.com

DUAL-TRACE OSCILLOSCOPE, TELEQUIPMENT TYPE D83 50Mhz , dual timebase type-S2A, dual vertical type-V4. and optional TV Vertical Amp-TV1, spare CRT and full set of technical manuals. £190 plus carriage. Tel: Gordon on (01506) 853875 (Livingston)

ICOM IC-R75 1-60MHz fitted DSP, options voice synth, matching MFJ pre-select 1-54MHz. Original boxes, hand books, matching PSU. Original costs over £750. Best offers above £425 ovno. Consider half carriage. Tel: Victor 02838 324855 (Lurgan, N. Ireland).

KENWOOD TS-850S HF TRANSCEIVER in very good condition with fist mic, original box and manual, £550 o.n.o. Buyer to collect (Dorset) or pay postage. Contact Richard G0RSN on 0796 802 6033 or g0rsn@freenet.co.uk

MCR1 SPY SET RECEIVER (working order), complete with power pack and headphone op and maintenance manual, £250. Tel: N Ambridge 01844 353823 (South Oxfordshire).

MOTOROLA HT600E Ex Police 99Channel UHF Handheld Tranceiver, programmed on the 70cm Radio Ham Bands with all the Popular Repeaters including CTCSS Tones, and all Simplex Channels , complete with Battery, Extension Speaker Mike and Charger £85.00 plus £8.50 Postage.

REALISTIC DX-200 £40. Trio R-1000, £90. HW-8 Heathkit, £80. Vibroplex original bug, £95. Ten-Tec 405 linear amp, £90. YH-55 headphones, £15. Heathkit GD-ILL dip meter + coils, book, £15. Tel: Mel 01274 817178 (West Yorkshire).

TEST EQUIPMENT SMPS switch mode power supply (as Eltex) 30 Amp, £50 ono. Kenwood 5MHz oscilloscope CS-1575 A, £10. Hameg 20MGz oscilloscope HM203-6 dual trace, £50 ono. Marconi electronic voltmeter TF-2604, £10. Marconi frequency counter M1 counter/timer TF-2416, offers. BT (Malden Electronics) 180MHz frequency meter, offers. Murphy Earth receiver HF/MF (ex-Royal Navy) comes with power supply and spare valves, offers. This radio is in beautiful condition of ex-military equipment so please sensible offers please. + P&P. Tel: Bryan 01788 860550 (Leicestershire).

TONNA F9FT 144MHz, 9 element crossed Yagi. 18 months old, £55 ono. Tel: Arthur G1KRU 01952 811026 (Shropshire).

TWO MULLARD 510 AMPLIFIERS (mono) plus one 3-3 stereo amplifier. Not used for 30 years so will need checking, £50 ono. Tel: 01591 620747 (Mid Wales).

WONDER WAND set rig mounted QRP antenna. Power handling up to 25W, only goes well with FT-817, £100+ P&P. Tel: Bryan 01788 860550 (Leicestershire).

YAESU FT-290R 2m multi-mode portable/base transceiver, £100+ P&P. Tel: Bryan 01788 860550 (Leicestershire).

YAESU FT-767 GX big base station with modules for 2m and 6m fitted. Room for 70cm module to be fitted. Handbook, £400+ P&P. Tel: Bryan 01788 860550 (Leicestershire).

YAESU FT-77 HF multi-mode transceiver 0-100W out (max 85W on 10m, max 50W FM). Handbook, £200 + P&P. Tel: Bryan 01788 860550 (Leicestershire).

SEND YOUR ADVERT TO PRACTICAL WIRELESS, BARGAIN BASEMENT, ARROWSMITH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW

For your advert in Bargain Basement please remember to include your dated, coloured corner flash from this page along with your entry.

YAESU FT-817ND (new) HF/VHF/UHF multi-mode QRP transceiver (0.5W/1W/2.5W/5W) portable. wonderful for you SOTA fans and really good when used with the Wonder Wand antenna set, £400+ P&P. Tel: Bryan 01788 860550 (Leicestershire).

YAESU FT-847 (new) HF/VHF/UHF all-mode satellite base station with general coverage receiver, £800 + P&P. Tel: Bryan 01788 860550 (Leicestershire).

YAESU TRANSCEIVER FT-DX401B CW/SSB/AM ext. VFO FV-401. Also, original mic and matching SP. VGC, £150 ono (boxed) with op manuals. Tel: N Ambridge 01844 353823 (South Oxfordshire).

YAESU VX-R1 miniature transceiver 2m/70cm, FM with wideband receiver. Boxed, £90+ P&P. Tel: Bryan 01788 860550 (Leicestershire).

WANTED

AVO VALVE TESTER WANTED prefer CT-160 but would consider any other AVO model. Also wanted for my collection, any hi-fi units made by Quad or Leak. Tel: Graeme 01482 887938 (East Yorkshire).

BRITISH MADE AND LABELLED LOUDSPEAKER for a reproduction project, (PW 1962). Can be 5 x 3 or 6 x 4 inches. Also, small number of OC45 transistors. Contact Dan Bedford (Brisbane, Australia). E-mail: toadhall@aanet.com.au

COIL ASSEMBLIES FOR CR-100 (B.28) receiver. Also copies of Short Wave Magazine. Article for this Rx. (I have April 1960). Tel: Ron G4MNB QTHR 01793 331585. (Wiltshire). E-mail: the sharps@ntlworld.com

FRONT PANEL ARGOSY 525D or scrap rig considered. Tel: Mel 01274 817178 (West Yorkshire).

GRUNDIG YACHT BOY RADIO Must be model 210 from between 1970 and 1974. Must be in absolutely mint condition. Will pay very good money for a set in mint condition. Contact Peter Tankard 0114 2231 6327 between 9am and 10pm. (Sheffield).

KW-201 RECEIVER must be in mint condition for my personal fully operational collection. Want other mint KW items, cash available, collect anywhere in the UK. Tel: Steve G8EBM QTHR 07971 805491 (Derbyshire). E-mail: g8ebn@arrl.net

NON FUNCTIONAL HEATHKIT FREQUENCY COUNTER IM 4100 for spare parts. Alternatively can anyone supply 9368PC (decoder driver IC's). Tel: Stan 01670 503525. E-mail:stan@g3mea.fsnet.co.uk

PSION P3C (P3A would do). No broken hinges. No "Jail bars". Fair price paid. Contact Steve G8ARG QTHR (County Durham). E-mail g8agr@aol.com

REMOTE CONTROL SWITCH SYSTEM by Brennenstuhl from Maplin's, replacement handset needed. Also, GL-15 10 inch speakers must be unused mint condition. See last year's catalogue and product clearance price leaflets. Tel: Keith 07974 953018 weekends or after 6pm weekdays. (Stockport). E-mail keith_g0ozk@yahoo.co.uk

TANDBERG SERIES 15 two track tape recorder replacement drive belts and other spares. Can you help please? Contact Brian Harris, Dibdene, The Green, Shamerley Green, Guildford, Surrey GU5 0UA. Telephone 01483 892626.

EXCHANGE

NATIONAL HRO NX RECEIVER complete with seven coils including band spread, spare valves, boxed, manual. Good working order. Swap for HF transceiver or £125. Tel: 01254 831510 (Lancashire).

PHOTOS

Now's your chance to send in a photograph of your equipment (a good idea if it's really unusual) to accompany your advert. Please note that all photos will ony be published at our discretion and are non returnable.

When sending in your advert, please write clearly in BLOCK CAPITALS up to a maximum of 30 words, plus state your contact details. Please use the order form provided.

bargain basement order form

Please insert this advertisement in the next available issue of *Practical Wireless*.

❑ FOR SALE ❑ WANTED ❑ EXCHANGE

Don't forget the corner flash!!

Name .....

Address .....

.....

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

Telephone Number.....

please write in block capitals

CARD NUMBER

	(30)		

CONTACT DETAILS FOR ADVERT.

Please only write in the contact details you wish to be published with your advert, ie. do you want your name & address, or just your telephone number?

Your advert, you decide! ***PLEASE - No FAXed Ads!***

			(12)

Signature.....

Switch issue number (if on card).....

Start date of card .....Expiry date of card .....

My Subs Number is.....*(or mailer label)*.....

VISA AMERICAN EXPRESS SWITCH MasterCard

B.B. Sept '05

To advertise on this page see the booking form below.

Classified Ads

DISCLAIMER

Some of the products offered for sale in advertisements in this magazine may have been obtained from abroad or from unauthorised sources. *Practical Wireless* advises readers contemplating mail order to enquire whether the products are suitable for use in the UK and have full after-sales back-up available. The publishers of *Practical Wireless* wish to point out that it is the responsibility of readers to ascertain the legality or otherwise of items offered for sale by advertisers in this magazine.

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.

Valves

VALVES AND ASSOCIATED COMPONENTS Available from stock as well as manuals and service information. Phone or SAE for your requirements. Chevet Book Supplies, 157 Dickson Road, Blackpool FY1 2EU.
Tel: (01253) 751858 or Fax: (01253) 302979.
E-mail: chevet@globalnet.co.uk

VALVES:- OVER 50000 STOCKED Ham, Vintage, Military, Audio. SAE for FREE list to: Wilson Valves, (Jim Fish G4MH), 28 Banks Ave., Golcar, Huddersfield, West Yorks HD7 4LZ.
Tel: 01484 654650/649380/650725.
Mobile:- 07733 283084. Fax: 01484 655699.
E-mail: wilsonv@zoo.co.uk
Visa etc. Fast & personal service.

VALVES AND ELECTRONIC COMPONENTS Large stocks. Send for list to: Stuart Scott, 19 Portway, Steying, W. Sussex BN44 3QF.
Tel/Fax: 01903 815118.
E-mail: triumph.76@btinternet.com

VALVES AND ALLIED COMPONENTS IN STOCK Ring for free list. Valves/books/magazines wanted. Geoff Davies (Radio). Tel: 01788 574774.

TOP PRICES PAID

for all your valves, tubes, semi-conductors and ICs.

Langrex Supplies Ltd.

1 Mayo Road, Croydon, Surrey CR0 2QP.

TEL: 0208-684 1166. FAX: 0208-684 3056.

QSL Cards

FULL COLOUR QSL CARDS for all your QSL needs. For free samples contact Chris M0DOL
qslers@aol.com
P.O. Box 184 Northampton NN3 9JH

Repairs

REPAIRS TO ALL AMATEUR AND VINTAGE Rx/Tx Cost effective service. Phone or call in for details. Medway Aerials, Rear of 14 Luton Road, Chatham, Kent ME4 5AA.
Tel: 01634 845073.

REPAIRS TO ALL AMATEUR EQUIPMENT call for details. G0PGY Electronics, 56 Bassenhally Road, Whittlesey, Cambs PE7 1RR.
01733 351538.

Aerials

GAREX ELECTRONICS VHF/UHF accessories and aerials, PMR equipment and spares.
www.garex.co.uk Tel: 0771 4198 374
PO Box 52, Exeter EX4 5FD.

Antennas

VARGARDA ANTENNAS ARE BACK! All antennas are pre-tuned. NO matching required. UK Distributor, Steve Burrows M5BXB. www.qsl.net/m5bxb
E-mail: steve.m5bxb@ntlworld.com
Tel: 01992 623335

Societies

ROYAL NAVAL AMATEUR RADIO SOCIETY seeks your support and membership. Qualify? Join today!
www.rnars.org.uk

For sale

Qtz x-tals 455.2kHz/£1.75 to 28.060MHz/£1.95. Mtchd 9MHz and 10MHz £12/8, 4MHz £2/8. 1.4MHz USB/LSB fltrs £14.00, 10.7MHz 10kHz fltrs £8.00, P&P £1.75 + VAT. IQ Electro 0208 391 0545. E-mail: vincent@jakomin.fsnet.co.uk

SILENT KEY Now 30% off all books, rest negotiable. See www.rabeng.co.uk or telephone 01872 862575.

Wanted

WANTED: GRUNDIG YACHT BOY RADIO Must be model 210 from 1970–1974. Must be in mint condition.
Contact Peter Tankard on 0114 231 6321.

ALL COMMUNICATIONS AND RADIO RECEIVERS of any age (working or not) wanted for cash. Including Racal, HRO, Marconi, Eddystone, Hallicrafters, Plessey, Watkins Johnson, etc. - what have you? Also RAF/military receivers and transmitters, especially R1155 and T1154, and any items connected, older ham equipment, audio amplifier equipment - particularly valve amps. What have you? Test equipment, AVO and Taylor valve testers, signal generators, scope, unused or unwanted electronics components, unfinished projects, valves etc. - any amount. Anything connected with electronics, so please telephone for a chat if you are unsure. Silent key dispersals handled with care and respect. Let me clear your workshop, shed, loft or garage. Payment in cash if required. Collection anywhere - no problem. Call me last for the best offer. Friendly, family run business. Tel: 0845 6126699 or e-mail: rolendra@aol.com

WANTED FOR CASH

COMMUNICATION RECEIVERS

Valve or solid state – working or not. Older or obsolete amateur radio equipment. Transceivers, station accessories, etc. Ex-Govt. wireless equipment. Radio books and magazines. We can collect anywhere in U.K. We also have a selection of the above items for sale in our shop. Open Tuesday, Thursday, Friday and Saturday 10am-6pm. Prior phone call before visiting appreciated.

Chevet Supplies, 157 Dickson Road, Blackpool FY1 2EU. Tel: 01253 751858. Fax: 01253 302979.

E-mail: chevet@globalnet.co.uk

Please photocopy this form if you prefer

ORDER FORM FOR CLASSIFIED ADS

PLEASE WRITE IN BLOCK CAPITALS

The prepaid rate for classified advertisements is 42 pence per word (minimum 12 words), box number 70p extra. Semi-display setting £13.90 per single column centimetre (minimum 3cm). Please add 17.5% VAT to the total. All cheques, postal orders, etc., to be made payable to PW Publishing Ltd. Advertisements, together with remittance, should be sent to the Classified Advertisement Dept., Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW. Tel: 0870 224 7820, Fax: 0870 224 77850.

Please insert this advertisement in the ..... issue of Practical Wireless (if you do not specify an issue we will insert it in the next available issue of PW) for ..... insertion/s. I enclose Cheque/P.O. for £..... (42p per word, 12 minimum, please add 17.5% VAT to total).

Name:.....

Address:.....

.....

.....

Telephone No.:.....

Box Number @ 70p: Tick if appropriate.....

- *Never miss an issue*
- *Have it delivered to your door*
- *Subscribers get their copies before they reach the shops*
- ***PW** is Britain's best selling amateur radio magazine*
- ***SWM** - The UK's authoritive magazine dedicated to all types of radio spectrum monitoring*
- ***RA** covers all aspects of radio communications, scanners, cb, amateur, 446, sw listening, and more - it's all here!*

PLEASE NOTE NEW SUBSCRIPTION ADDRESS DETAILS

Subscribe Here

to Practical Wireless / Short Wave Magazine / Radio Active

To order a subscription please contact our new subscription agency:

Practical Wireless Subscriptions
PO Box 464
Berkhamsted
Hertfordshire HP4 2UR. UK

Credit Card Orders taken on:
(01442) 879097
between 9am - 5pm. Outside these hours your order will be recorded on an answering machine.

FAX Orders taken on
(01442) 872279

Internet Orders can be placed at:
www.webscribe.co.uk

or **via E-mail** to:
pw@webscribe.co.uk

Please note cheques should be made payable to PW PUBLISHING LTD and CASH is NOT accepted.

Subscription Rates

(Please tick appropriate box)

		PW	SWM	PW+ SWM	RA	RA+ PW	RA+ SWM	PW+ RA+ SWM
1 YEAR	UK	£33 ❑	£36 ❑	£62 ❑	£31 ❑	£58 ❑	£60 ❑	£90 ❑
	Europe Airmail	£41 ❑	£44 ❑	£76 ❑	£38 ❑	£71 ❑	£74 ❑	£111 ❑
	ROW Airmail	£50 ❑	£54 ❑	£93 ❑	£47 ❑	£87 ❑	£91 ❑	£135 ❑
3 YEARS	UK	£89 ❑	£97 ❑	£167 ❑	£84 ❑	£156 ❑	£163 ❑	£243 ❑
	Europe Airmail	£111 ❑	£119 ❑	£205 ❑	£103 ❑	£192 ❑	£200 ❑	£299 ❑
	ROW Aimail	£143 ❑	£154 ❑	£265 ❑	£134 ❑	£248 ❑	£258 ❑	£285 ❑

I wish to order a.....1/3 year.....subscription to.....PW / SWM / RA*.....starting with the.....issue.*

Payment Details

I enclose my Cheque/Postal Order for £.....*

made payable to PW Publishing Ltd.
or please debit my Access/Visa/Amex card No.

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expiry Date.....

or please debit my Switch card No.

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐

Date.....Switch Issue Number (if on card) .....

Switch Expiry Date.....

Signature .....

Name .....

Address .....

.....

.....

.....

.....

Postcode .....

Daytime Tel. No .....

Orders 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. Cash not accepted.

*(*Delete as necessary)*

Photocopies of this page are acceptable

rob mannion's topical talk

As usual Rob G3XFD has drawn some inspiration from this month's letters pages for discussion. This time however, he starts off on a rather shocking topic!

The published letter this month on page 9 from **Walter Farrar G3ESP** raises some interesting points and I should have thought of the testing implications when I originally wrote the article he refers to. Walter however, is a thoroughly practical man himself and I'm pleased he's flagged up the question of safety.

I then sat back and thought about the problems confronting the (perhaps) unwary constructor and the less experienced beginner. The more I thought about it - the more problems came to my mind! Despite this I still want to encourage everyone to 'have a go', even with health and safety in mind - we mustn't be discouraged.

The 'back' electromotive force (e.m.f) encountered and mentioned by Walter G3ESP is a one of the fundamental results of electromagnetism. Very simply stated it occurs when a strong magnetic field is developed around an inductor (look into any textbook to see what I mean). When the current generating the magnetic field is removed, the field collapses, and in doing so induces a current in the windings. The voltage of the 'back e.m.f.' is reversed in flow to the current that produced it - and can be very high indeed.

Because of the 'back e.m.f.' it's possible to get a really nasty shock. In fact, the induced voltage can be enough to damage transistors and even measuring equipment connected in the circuit, along with the human in the circuit!

Many readers will know of the simple induction coil ignition circuitry on cars (remarkably simple and reliable) and remember the capacitor connected across the 'points'. This served the purpose of absorbing much of the energy resulting from the 'back e.m.f.'

The capacitor was particularly important in the automotive application because of the primary current drawn by the 'ignition coil' (actually a transformer, often immersed in insulating and cooling oil). It could be as high as 8A in some vehicles.

Fortunately, (as in radio applications) the lower the current, the lower the resultant 'strength' (the unit of magnetic field strength is the Gauss) of the magnetic field. So, this means that if we are using a (typical) test meter with only around 30µA required for full scale deflection (f.s.d.) of the meter - we're unlikely to damage the meter because the results 'back e.m.f.' will be well within the meter's capabilities.

If you are inexperienced in identifying and testing wound components, coils, radio and audio frequency chokes, I strongly recommend you use a multimeter with the ohmmeter facility (resistance range) selected. Avoid using the battery and 'spark' test once used by G3XFD and many others and you won't get that alarming 'belt'!

Inverter Power Supplies

Ron Davies G0WJX raised another interesting point in his letter published this month. I asked readers to join me on this page because I've actually been busy experimenting with low power high tension (h.t.) low voltage-to-h.t. Inverters myself. The advantages are - as Ron suggests - that the 'scope powered by a low power inverter can actually become independent from the mains supply. This of course was an idea incorporated in the original Mullard (Philips) design. Unfortunately, the cores specified by Mullard aren't so easily obtainable nowadays.

I've been playing around with various inverter circuits. The experiments included single transistor self-oscillating units using 240V a.c. to 12V a.c. transformer in reverse. Using the transformer to step up rather than step down). It works well as the h.t. current drawn by the 'scope tube is low. The only problems I've encountered are harmonics appearing as r.f. in the circuitry and causing visible modulation of the trace.

However, as a number of readers are keen on running the one inch 'scope project away from the mains I'll pursue the idea further. If you can help, provide and advice on a practical 12V (for example) to high h.t. inverter circuit you've used yourself (with components still easily available) please let me know so I can share the information with everyone who is interested.

PW

YOUR SPECIALIST & LOCAL DEALERS

Don't Miss Out!

PW Direct

Did you know that you can buy the current issue of *Practical Wireless* direct from the publishers?

Some readers may be experiencing difficulties in finding copies of *PW* in their local WH Smith stores or independent newsagent. So, as we don't want you to miss out on your favourite radio read, we'd like to remind you that you can buy current issues at cover price direct from us.

Simply send a cheque (payable to **PW Publishing Ltd.**), Postal Order or Credit Card details for the cover price (**£3.00** inclusive of P&P, UK only, overseas customers please add £1.00) with your name and address to **Clive Hardy G4SLU** in the Book Store and your copy will sent out to you (**cash not accepted**).

This service is also available for copies of *Short Wave Magazine* (£3.25) and *Radio Active* (£2.85). Alternatively, you may like to consider a subscription to ensure you don't miss out, see page 78 of this issue for details.

Book Store, PW Publishing Ltd, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW

Tel: 0870 224 7830 Fax: 0870 224 7850

E-mail: clive@pwpublishing.ltd.uk Please check wi h bookstore for p ice and availability of back issues.

Index to Advertisers

ICOM

IC-756PROIII NEW!

The IC-756PRO Series Continues to Grow

Incorporating many of the features that made its predecessors so successful, the IC-756PROIII employs the latest technology used in the IC-7800 to make this new rig the very pinnacle of the IC-756PRO series.

New Features...

- New receiver gives +30dBm* third-order intercept point
- Real time spectrum scope with mini-scope function.
- Low distortion BPF switching
- Fundamental-type 64MHz roofing filter
- Pre-amp changed to a noiseless feedback type to reduce 2nd order distortion
- Saturation characteristics of mixer and surrounding circuits improved
- 8 Channels of RTTY transmit memory
- Adjustable SSB transmit bandwidth
- Clock function has been added. Displays local time, UTC time etc.
- Screensaver function for prolonging LCD life

Features Retained from IC-756PROII...

- 32-bit floating point DSP with 24-bit AD/DA converter
- 51 types of pass band widths can be freely set
- Soft and Sharp filter shapes to suit the user's operation or band conditions
- RTTY demodulator/decoder
- AGC loop management system eliminates blocking by strong adjacent signals
- Real time spectrum scope
- 5-inch colour TFT display

...and many more outstanding features!

Icom UK Ltd

Sea Street, Herne Bay, Kent CT6 8LD. Telephone: 01227 741741

Fax: 01227 741742. e-mail: sales@icomuk.co.uk Website: www.icomuk.co.uk

* in the 14MHz band

PERFECT PARTNERS

FC-40

Automatic Matching 100 Memory Antenna Tuner

Automatic Matching for FT-857/897

Compact Size 236 x 175 x 53mm

Rugged Waterproof Case

100W Power Handling

FT-857

Ultra Compact

Rugged, High Output

High Performance Receiver

High Resolution Display

Wide Frequency Coverage

Enhanced Performance (DSP)

Advanced Features - VHF/UHF

YAESU

Choice of the World's top DX'ers

www.yaesu.co.uk