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SDR-1000
software radio
reviewed

radio repairs
Harry G3LLL's Trade Tales

project
Build The Poundbury 9/10MHz IF Module

contesting
Annual 144MHz QRP Contest Rules

antenna workshop
Polar Plotting with G3LDO

Build a sensitive wavemeter

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June 2006
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WATERS & STANTON

UK'S L

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We are now UK Distributors for Miracle Whip Antenna

80m - 70cm
Plugs into FT-817ND
Tunes in seconds
Telescopic whip
Superb Engineering

£99.95 B Rated up to 10 Watts, 80m - 70cm, it plugs directly into the SO-239 antenna socket. Even works without a ground plane radial. Whip telescopes to approx 1.5m. Use with any rig up to 10W output. Single knob tune and low VSWR anywhere in range

New Miracle Free-Style Adaptor

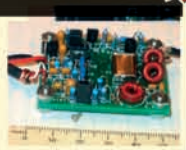
£15.95 A

Now use the Miracle Whip off the radio. You get magnetic mount, Miracle whip adaptor and 33ft radial attachment. Use on desk, car roof, anywhere! Improved radiation efficiency - great performance!

NEW SoftRock V6

80m / 40m Receiver
SSB CW AM inc Software

NEW NEW



Experience the thrill and amazing low cost performance of Software Defined radio. The SoftRock receiver kit builds you a dual-band 80/40m all-mode receiver with Ten IF filters, 6kHz - 25Hz, programmable AGC, Full DSP, Digital display down to 1Hz, Peak/RMS S-meter, IF Shift, Live Panoramic Display, Spectrum Scope, Memory Data Base etc. It takes about an evening to build and comes with all components, circuit board and CD disc with programmes and construction guide. Just take the output into your sound card, load the software and experience performance that would cost you £600 plus for a normal radio!! Don't underestimate it!

£29.95 A

PRICEMATCH!

We 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.

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Waters & Stanton Sixteenth Annual

HOCKLEY OPEN DAY

SUNDAY 28th MAY 2006 FROM 10am

Our Massive Open Day gives you bargains galore! FREE food & drink plus raffle. Support from Yaesu, Icom, Kenwood & Repeater groups.

Then go to see the massive Southend Air Display From 1pm!

www.wsplc.com

FREEPHONE ORDER LINE **08000 73 73 88**

NEW NEW **SOFTWARE DEFINED HF TRANSCEIVER**

SDR-1000 **£649** Computer with Soundcard Required

1W - 100W, 160M - 10M.
Nothing else comes close to its performance. Spectrum display, superb receiver front end, and filter shape factors that were previously just dreams. **Welcome to Software Defined Radio! It simply has no equal.** Call in to Hockley store for a demonstration. www.flex-radio.com

Performs like a £5,000 transceiver but costs 80% less!

100W Version £995 C
QRP 1W Version £649 C

NEW **ICOM IC-7000**

160m - 70cm
Up to 100W (HF-6m) Digital Filtering

£999 C

6" External TFT Screen
£49.95 with built-in TV -
when purchased at same time as IC-7000 radio.

Check out www.wsplc.com
Code: TFT-7000
Normally £99.95

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 D

IC-7800 £6400 D
Icom Flagship HF 200W transceiver. 200W max.

IC-7800-PACK £6995 D
As above plus 17" flat screen, keyboard & SM-20 mic

IC-7400 *Lower Price* £1279 D
HF/VHF 160m-2m 5-100W. SSB CW FM AM. 12V DC.

IC-706 MkIIGDSP £769 D
160m - 70cm (up to 100W HF) Detachable head.

IC-718 £449 D
Quality budget class radio HF 160 - 10m

IC-703 £539 D
160 - 6m of pure QRP joy!! 10W Max

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. 160m-70cm with every feature imaginable inc. DX Cluster. HF/VHF/UHF or up to 23cm with the optional module. Built-in auto ATU, DSP and its unique TNC.

New Lower Price **£1295 D**

TS-2000X *Lower Price* £1789 D
Take the TS-2000 and add a superb 23cm module.

TS-B2000 *Lower Price* £995 D
HF - 70cm with PC software for direct PC control.

TS-570DG *Lower Price* £799 E
Superb Budget Radio 100W from 160m to 10m.

TS-480SAT *Lower Price* £699 D
HF 160m - 6m with remote front panel. Auto ATU

PW Reader Offer

TS-480HX *Lower Price* £799 D

200 Watts 160m - 6m

Get this 45 Amp Supply for £99, when purchased at same time as TS-480HX.

Yaesu HF Transceivers

YAESU FT-857

SPECIAL OFFER!
160m-70cm with up to 100W output, Multi-Mode HF/VHF/UHF Transceiver. With built-in electronic keyer and detachable front.
FREE YSK-857 Seperation Kit AND/OR ATAS-120 Active Tuning Antenna for £189

£579 D

FTV-1000 *Lower Price* £599 C
6m transverter for FT-1000 Mk-V and Field.

FT-897D *See Offer* £649 D
160m-70cm 100W, up to 20W from optional internal batts.

FT-847 £999 D
160m - 70cm - up to 100W (50W 2m/70cm).

FT-840 £399 D
One of our all-time best sellers. 100W 160m - 10m

FT-817ND £429 D
Up to 5W output 160m - 70cm. UK warranty.

FT-817bhiDSP £539 D
FT-817ND with fitted bhi DSP module.

Carriage Charges: A=£3, B=£4, C=£6.95, D=£10, E=£12

OWEST PRICES

ZERO DEPOSIT ZERO INTEREST

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Freephone Orderline 0800 073 73 88

Icom VHF/UHF Mobile/Base

ICOM IC-E208
LIMITED OFFER

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
£215 D

IC-910H *Lower Price* **£1087 D**
2m / 70cm 100W Base station all - modes with option for 23cm module (**UX-910 £359**)

IC-910HX *Lower Price* **£1235 D**
As above but with 23cm module ready fitted and a big saving as well.

IC-2725E **£269 D**
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. Doesn't need extra high cost boards to function. Only extra if required is a compatible GPS receiver.
Lower Price **£418 C**

TM-G707E **£265 D**
Dual Band 2m & 70cm with detachable front
TM-V7E **£359 D**
Dual Band 2m & 70cm with 50/35W output
TM-271E **£187 D**
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 D

FT-2800M *LOW PRICE* **£129 D**
*2m FM Mobile transceiver *High power 65W *Capable of VHF wideband receiver
FT-8800E *LOW PRICE* **£267 D**
*2m/70cm Dualband FM Mobile transceiver *50W 2m, 35W 70cm *Wideband receiver
FT-8900R **£339 D**
*2m, 70cm, 6m & 10m Quadband FM Mobile transceiver *Independent dial for each band
FT-1802E **£129 D**
*2m FM Mobile with up to 50W RF Output

Icom VHF/UHF Handhelds

IC-V82 *NEW* **£159 C**
2m FM Digital Handheld 7W
IC-U82 *NEW* **£159 C**
70cm FM Digital Handheld 5W
IC-E90 *Limited Offer* **£199 C**
6m / 2m / 70cm handheld transceiver
IC-T3H **£129 C**
2m FM handheld 5.5W c/w BC-01 & BC-146
IC-E7 *NEW* **£199 C**
New 2m / 70cm handy wide RX

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.
£199 C

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
LIMITED 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.
£209 C

VX-6E 2m/70cm 5W. **£189 C**
FT-60E *LIMITED OFFER* **£159 C**
2m/70cm 5W Handheld
VX-2E 2m/70cms min **£119 C**
VX-110 2m handheld **£94 C**

Alinco VHF/UHF Handhelds

DJ-C6E *NEW* **£119 C**
2m/70cm FM 300mW handheld transceiver
DJ-V5E **£169 C**
2m/70cm FM 5W dualband handheld transceiver
DJ-193E **£99 C**
2m FM transceiver no keypad, Ni-Cds & charger
DJ-195E **£109 C**
2m FM transceiver with keypad Ni-Cds & charger
DJ-C7E **£129 C**
2m/70cm credit size FM handheld

W3FF NEW Mini Buddipole

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

£189 C
Order as W3-MBP

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 D**
"Power Cube" 1.6-30MHz 500W solid state

Yaesu HF Linear Amplifiers

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

Watson Mobile Antennas

ANTENNAS

W-2LE	1/4 wave 2m 0.48m 200W	£9.95	B
W-285	5/8th 2m 1.33m long 200W	£14.95	A
W-77LS	2m/70cm 0.42m 50W	£14.95	B
W-770HB	2m/70cm 1.1m 200W	£24.95	B
W-7900	2m/70cm 2m/70cm 1.58m	£32.95	B
WSM-270	Dual band mini mag BNC	£19.95	A
WSMA-270	Dual band mini mag SMA *New*	£19.95	A

BASES

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

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

WATSON Low Noise PSUs

WATSON W-25SM

Competitors models get bad press (see Radcom Dec. P66) But "Watson W-25SM stood out from the others."

£79.95 C

NEW STOCK & OFFERS

YAESU VX-120 & VX-170
NEW

< VX-120
A 2m 5W handheld with an 8-key pad, Ni-MH batt & charger
VX-170 >
A 2m 5W handheld with a 16-key pad, Ni-MH batt & charger

£99.95 C **£109.95 C**

YAESU FT-DX9000D
NEW

Top-of-the-range 200W HF + 6m Deluxe Base Station. Auto ATU, 220V AC PSU, Class 'A' operation for AM & SSB, large TFT data management unit and dual analogue meters, Main/Sub receivers, 32-bit IF DSP. Return of the FT-DX series represents the very best in high power DX-ready base stations.
£7299 D

bhi DSP Equipment

bhi NES10-2 MkII

NES10-2 Combined speaker and programmable DSP unit. Offers dramatic noise reduction and reduces annoying hetrodynes. 8 filter settings, 12V 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
ANEM *NEW* **£119.95 B**
"NOISE AWAY" Amplified LS DSP module
NEHM *NEW* **£99.95 B**
"NOISE AWAY" Headphone DSP module
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 WM-S Hands Free

WATSON WM-S

Stay legal. Flexible boom microphone mounts under sun visor. PTT box mounts on gear changer. All powered from rig mic socket! **Includes detachable lead to match your radio.**
£39.95 C
To check compatibility, download PDF "WM-S Compatibility" in leaflets section of www.wsplc.com

FT-897D SPECIAL!

FT-897D	£649
FP-30U Internal PSU	£199.95
Total	£848.95

FOR JUST £749.95!

FT-897D	£649
2x FNB-78 Int Battery	£198
CD-24 Charge Adaptor	£99.95
PA-26U Batt Charger	£69.95
Total	£1016.90

ALL FOR JUST £849.95!

Carriage Charges: A=£3, B=£4, C=£6.95, D=£10, E=£12

WATERS & STANTON

Freephone Orderline
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Enquiries 01702 206835
www.wsplc.com

UK'S LOWEST PRICES!

NEW STOCK & OFFERS

FUJIKON
NOISE CANCELLING HEADPHONES NEW

These Active Noise Cancelling Headphones, from Fujikon, blockout annoying ambient background noise. Powered by an AAA battery noise cancelling is controlled by an on/off switch. NC-4 has a folding design for easy storage.

FUJIKON NC-2 £18.95 B

FUJIKON NC-4 £19.95 B

POCKET MORSE READER

MFJ-461
Reads CW
Just hold near receiver speaker
£69.95 C

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

MFJ-936B Loop Tuner

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.

£219.95 C

Antenna Accessories

Dipole Bits			
Kevlar	Strong 400lb strain line 200ft	£22.95	A
FW-PVC-50	50m clear PVC 2mm wire	£39.95	A
Flexweave	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-m	Medium ceramic egg insulator	£2.15	A
Egg-s	Small ceramic egg insulator	£1.75	A
WS-2580	25pcs 3" ladder line spacers	£9.95	A
Diamond 50 Ohm Baluns			
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	£44.95	B
TR-200-10	200W 10MHz	£47.95	B
TR-200-7	200W 7MHz	£49.95	B
TR-200-3.6	200W 3.6MHz	£53.95	B
TR-1000-14	1kW bands 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 4:11.5kW Balun			
REM-BAL	For coax to ladder line match	£46.95	B
Patch Leads			
WPL-70	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	£14.99	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 £379.99 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 £299.95 C
1.8 - 30MHz 150W long wire tuner designed for use with DX-70 transceiver. Waterproof.

MFJ External Auto ATU's

MFJ-993B

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

£219.95 C

MFJ-991B £189.95 C
1.8 - 30MHz auto ATU. Similar to MFJ-993 but no digital display. Works with any HF transceiver. 150W PEP

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

SGC External 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 External 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 External 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 External 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

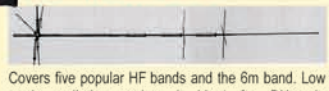
R-6000 £329.95 C
6-band vertical 20m - 6m. No separate radials needed. 1.5kW. Height 5.8m. Great small garden ant.

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 £99.95 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 B

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

LOWER PRICES!

HF Portable at its Best

W3-BP £179.95 C
40m - 2m adjustable dipole. 250W and max length of 4.65m. Packs down to 65cm approx.

W3-MBP £189.95 C
Same as the W3-BP but packs even smaller.

W3-BS £119.95 C
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 Low Price £99.95 C
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 B
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 As used by Peter Waters G3OJV/M
£249.95 C
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=£4, C=£6.95, D=£10, E=£12

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PW practical wireless

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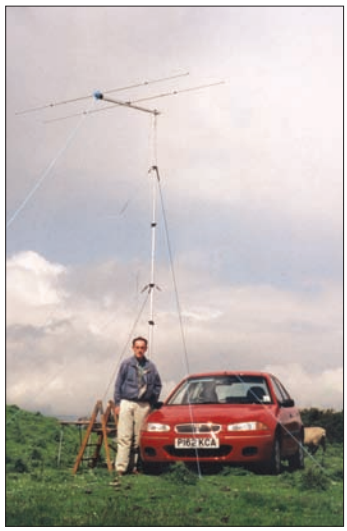
Cover subject

The cover shows an aerial shot of the ever growing village of Poundbury, near Dorchester in Dorset, which **Tony G4CFY** chose as the name of his latest project. The reason for this is that the circuit forms part of a larger item, so is effectively a work in progress, just like Poundbury village. As you will see our Art Editor **Steve Hunt** has cleverly blended the breadboard photo onto the aerial shot in a seemless fashion - clever eh?

Background Photograph: **Commission Air. Copyright of the Duchy of Cornwall and reproduced by kind permission**
SDR Photo: **Robin Trebilcock GW3ZCF**
Poundbury Board: **Tex Swann G1TEX**

june 2006 contents



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rob mannion's keylines

Rob Mannion G3XFD

Over the extended Easter Bank Holiday weekend I thoroughly enjoyed catching up on the 'air time' on the bands I've missed over recent months.

Using my newly-erected 7MHz dipole I worked stations all over the UK (including an Orkney Islands 'Islands on the Air' station), Ireland, Europe and occasionally beyond, using c.w. and s.s.b. It's a long time since I dedicated a long weekend to chatting on the air and the pleasures of this aspect of our hobby soon came flooding back to me!

What I found particularly interesting on 7MHz were the number of c.w. stations to be found over the weekend. Nothing surprising there perhaps - 7MHz always sees some telegraphy action whatever the time of day. However, what proved fascinating to me was that I heard so many M3s using c.w., along with other Amateurs who did not have to do 'Morse as a Must' for their Licence.

Although I'm only active on c.w. and s.s.b., I'm interested in most modes available to the hobby. In fact, during one QSO several years ago my contact actually asked why I didn't operate using PSK31 or RTTY. In answering him I had to be both frank and honest - telling him that I spend all day on the keyboard at the *PW* office - so it's good to get away from the typing mode occasionally!

However, joking apart, it's interesting to hear the various Amateur stations operating on c.w. Listening in to one QSO, between a G8 three letter call and a German station, the DJ station being worked mentioned that the G8 three letter call was the first he'd worked on c.w. on 7MHz. In reply the G8 mentioned that although it had never proved possible for him to pass the old Morse test at 12w.p.m, operating at around eight to 10 words a minutes was enjoyable.

The comment from the G8 was most interesting from my point of view, as it's backed up by many other comments I've received over the air, at club meetings and rallies. Whenever the subject has been discussed, it's obvious to me that many Amateurs, once the Licence conditions changed, were determined to have a go on the Morse Mode themselves - at their own speed. Incidentally, I found most of the keen new c.w. operators were sending good quality Morse, which was easy and comfortable to read and usually better than that provided by my arthritic hand!

The result (perhaps rather odd and unexpected) of the removal of the h.f. Morse requirement, is that - in my opinion - there has been a significant increase of c.w. activity on 7MHz! Have you noticed the increase? Do you agree with my observations? I'd be very interested indeed to hear from other Amateurs on this topic.

However, whether or not my own conclusions drawn from my periods on the air are correct, I'm sure most readers will agree that it's encouraging to know that UK based Amateurs do seem to be trying another of the many modes available. Long may it continue!

Silent Key Announcements

As I've commented on in recent Keylines, it's a fact of life that I often find myself writing or helping to prepare Obituaries to be published in *PW*. I feel honoured to be asked to write an appreciation of someone who has been loved and admired by family and friends. I'm also often astonished at what's been achieved by individuals whose lives we briefly commemorate.

Unfortunately though, we often hear of the death of radio enthusiasts only when the family contacts us to ask for a subscription to be cancelled. This can take place many months after the death has occurred, although of course I can fully understand that there are often profound reasons for the delay. For many years I have, whenever possible, written a personal letter to the family of subscribers. The Subscription Department traditionally pass on the information and very often I know the reader concerned. However, the sympathy and concern extends to all readers because we have much in common as we are all part of the *PW* 'family'.

So, in conclusion this month I'll finish by asking readers to keep us informed regarding 'Silent Key' information. If you contact me, I'll reply and be prepared to offer any help and advice I can to you, and the family involved.

Rob G3XFD

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.

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.

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 **bookstore@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.

A new initiative has been launched which is designed to help you obtain your favourite magazines from newsagents. Called **Just Ask!** its aim is to raise awareness that newsagents can stock, order and in some cases even home deliver magazines.

We will be including the **Just Ask!** logo in the pages of this and future issues and have included a newsagent order form to help you to obtain copies.

So keep a look out for the logo and next time you visit your newsagent remember to **Just Ask!** about obtaining copies of your favourite magazines.

amateur radio waves

A Call For Understanding

● **Dear Editor**

I'm Peter Lewis and I hold the Amateur Radio callsign **MI0RTX** and I write to share a problem with you and your readers. I have been Licensed since 1978 and have always been interested in the radio since an early age. I have had various short wave radios, which I used to listen on. In the year 1979 I took my RAE and passed, receiving the callsign G8MXL and I bought a radio transceiver from a fellow Amateur who told me about the local club in Dover. As a result I received a great deal of knowledge and friendship from the fellow members in the club.

We then moved as a family to a Hampshire village called Four Marks, near Alton. The village is on a very large hill, which was about 600ft above sea level. This was a very good location for v.h.f.

I was then working in the Electronics Industry and on a visit to Northern Ireland I met my future wife and in due course we decided to reside there indefinitely. I became interested in 50MHz operations at this period and operated on a regular basis in the summer. Surprisingly, I found it relatively easy to work on 6 metres.

I always had difficulty with Morse code as I am Dyslexic and used to joke with the club members who used to try to teach me Morse without much success. Finally, I met an Amateur from Antrim who taught me Morse and I eventually passed my Morse exam with some struggle. Despite this, I successfully obtained an Honours Degree In Computing and a Masters in Electronics.

However, I now come to the main reason for writing to ask for readers' help. This is because I've always been aware that some people can be a little 'difficult' from time-to-time in Amateur Radio.

A lot of people take their radio very seriously. In my opinion it goes from being an enjoyable hobby to becoming extremely competitive for some people, who end up forgetting the others on the band. But there is a point where enough is enough, for example where every time you operate, the interfering stations follow or make operating unpleasant to say the least.

In my case where I receive discrimination, which is a form of bullying, because of my difficulty speaking as I now use a Blom Slinger Indwelling Speech Valve due to an operation for Laryngeal Cancer four years ago. However, despite my difficulties my Speech Therapist and Surgeons have stated that my 'special' voice is one of the best that they have experienced using this valve.

I sound like I have a normal voice just a deeper tone, with fewer variations in tone. In fact, I'm told by friends that it sounds similar to an auroral tone heard on v.h.f. radio due to the effects of the propagation!

My sense of humour is also quite quick. The first time someone made the remark they said that I was gargling under water or perhaps there was an auroral promotional effect on the band? In reply I pointing out to the stations I was working that this was not the case - instead I just have an artificial voice. On another occasion someone suggested I was drunk - and actually at that time we did live next to a pub but that was the nearest we came to the alcohol!

Being serious for a moment, what I am talking about is people not understanding the problems involved. Or, what's worse - not taking the time to listen to the explanation, or just talking over the top of me ("Does he take sugar," etc.).

I have been extremely fortunate that my voice is intelligible. There are people that I know who've had the same operation as I had, and their speech isn't so intelligible and they are in poorer health.

So please, the next time you hear someone with what you regard as 'strange audio' think before you criticise. Their audio may be 'different' because they may be disabled and there are lots of us around with differing disabilities. We are as normal as anyone else, but circumstances has given us a disablement. It can happen to anyone at any time.

Incidentally, when I had my operation in the Royal Victoria Hospital Belfast, one of the trainee Doctors who helped assist at my operation was an Indian (VU) Radio Amateur and we used to talk for many hours about the hobby. So, hopefully sometime in the future I may come across him on the DX bands as I was trying to persuade him to take his Morse and get his h.f. Licence. I know he'll be understanding about my 'special voice'. Best wishes to everyone in the hobby and thank you *PW*.

Peter Lewis MI0RTX
County Antrim
Northern Ireland

Editor's reply: Thank you for writing Peter, and it was a pleasure to talk to you when you telephoned the office to explain the situation. Readers may not know that the type of speech Peter now produces what's is often referred to as an 'Esophagical Voice'. I can confirm that his speech is very clear for someone who now lives without a natural 'voice box'. I have several friends who also suffered from the same form of cancer and whose new voices are no where as intelligible as Peter's is, in normal, unhurried use. Originally, Peter telephoned me to share the indignity he's experienced on the DX portion of 3.5MHz and I immediately understood what had happened. I too have been shown impatience by keen DXers, who are always in a hurry! Often only their DX score counts and manners come a poor third! I've experienced it because of my own problems I'm not a slick operator, and on a number of occasions have literally felt the impatience of a contest of DX operator when they realised I was not a "Five & Nine plus serial number" (nine automatically of course) operator type DX competitor. So, perhaps there's a real need for a bit of understanding? The late G3MUM (almost totally paralysed by Poliomyelitis) operated c.w. with a big toe and was admired for his dedication to the hobby. I feel proud that Peter wants to succeed on s.s.b. using his new voice. Let's give him the support he needs to enjoy the hobby in the way he chooses.

Practical Wireless Paints A Picture!

● **Dear Rob**

"A picture paints a thousand words", so the song says, and it certainly did for me when I received my April issue of *Practical Wireless* and it's all due to **Harry Leeming G3LLL**!

When a lad of 15 in 1960 I got a job with Norweb (the former Northwest Electricity Board) as an apprentice electrician in Blackburn, the workshop was just around the corner from Holding's Camera Corner - Harry's shop. During my lunch hour I could often be seen wondering up and down Darwen Street gazing in many of the shop windows.

One shop in particular attracted my attention, not least because of all the knobs and dials, which could be seen through the plate glass. And of course it was Holding's Camera Corner. This window shopping sparked my first interest in Amateur Radio, and although it took until 1989 and some 10,000 miles of separation from Blackburn for me to find enough time and money to take up the hobby! But I never ever forgot those first years of gazing in that window and sometimes drifting into the shop to look in amazement at those fascinating

new fangled Japanese imports.

I never knew Harry Leeming G3LLL personally, and as far as I can remember never spoke to anyone in the shop, but Holding's alone were the incentive in my becoming a very active Radio Amateur in Western Australia. Thanks again Harry and also *PW* for helping to revive such a long forgotten piece of personal history.

David Croasdale VK6YEL
Perth
Western Australia

Editor's comment: Nice to hear from you David! Harry was delighted and has already replied to you himself. However, from this issue Harry's full postal address is printed in his column. He delights in hearing from readers (including Clever Dick! - see this month) and replying Worldwide to them .

Full Licences & 5kW Power?

● **Dear Rob**

I don't hear much mention of the full licences and their 5kW amplifiers, etc! Or is the criticism of M3s just a smoke screen? I don't recall anyone getting a Notice of Variation (NoV) for 37dBW operation recently, did you? No one is allowed to break the law. Read the *BR68* schedule. Maximum power is 26dBW see pages 19 - 21. Now come everybody, let's stop all this moaning, change the record - and for heaven's sake, we need young blood!

Best regards to everyone.

Mike Hall
Worksop
Nottinghamshire

Contesting On HF

● **Dear Sir**

Something has to be done about h.f. contesting! And soon. It is driving me - and I suspect many others - who choose to operate at weekends to manic distraction!

Now, before I begin to maybe bruise any delicate ego's out there, I am not against contesting. Never have been. Besides, it's a case of 'each to their own'. However, whether it is my over-active imagination or not, as Amateur Radio has evolved over the years, those who indulge themselves in the particular pastime of h.f. contesting have taken an ever bigger slice of whatever band or bands they choose to use for this activity. We are now at a point whereby at a weekend virtually every h.f. band is occupied by the ongoing cacophony of "CQ contest" being shouted out from one end of any given band to the other.

As a consequence, it's extremely difficult, if not impossible sometimes, to have a QSO be it s.s.b. or c.w. Even if you do happen upon a reasonably clear frequency and, have what then appears to be divine intervention to be able to hold onto it long enough to call "CQ", sooner rather than later, your frequency will be hijacked by a 'contest junkie'. Of course, this scenario may not be a deliberate act of defiance or even, deliberate jamming. No, it could just be a cause and effect of propagation. They can't hear you – even though you can hear them!

Once upon a time, h.f. contesting appeared to regulate itself to specific portions of any given band, unlike nowadays, where bit by bit, year by year, contesting has proceeded to embrace a bigger portion of them. Just this weekend I'm writing this letter (25/26th March) for example, stations were operating s.s.b. in the c.w. portion of the 40m band – at 7.020MHz! Presumably, the s.s.b. part of the band was choc-a-block (which it was) so, never mind if our signals from our linear amplifiers feeding r.f. into mono-bander antennas on top 100ft towers cause chaos and inconvenience to lesser mortals who might only be able to operate at weekends!

Modern h.f. contesting has become by default, a sporting activity. Where the actual fun of competing and taking part has been superseded by winning at all costs. Even if it means at weekends normal QSO activity is severely disrupted or worse, the art of radio communication has to be abandoned on h.f!

Finally, is the popularity of contesting these days merely a consequence of sheer numbers, or what? After all, what is it that compels some many people to sit at their rigs for hours on end giving out 5 by 9 signal reports via two second length QSOs? Please advise me readers.

Ray Howes G4OWY
Weymouth
Dorset

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.

May 21
The Mid-Ulster Annual Rally
Contact: **Vic MI0AEY**
Tel: **(02838) 331 909**
E-mail: **radiovic@tiscali.co.uk**
The Mid-Ulster Amateur Radio Club will be holding its annual rally at the Lough Neagh Discovery Centre, Oxford Island, Lurgan (off the M1 Lurgan exit), Northern Ireland. Doors open 1200. Admission £2/3 Euros. Talk-in and usual facilities including full disabled access.

June 18
Newbury & District ARS Car Boot Sale
Contact: **Kevin G6FOP**
E-mail: **g5xv@ntlworld.com**
Website: **www.nadars.org.uk**
The Annual Newbury and District Amateur Radio Society Car Boot sale will take place at the Ackland Memorial Hall, Cold Ash near. Newbury, Berkshire. Directions and a map can be found on the Club Website (details above).

June 25
West of England Radio Rally
Contact: **Shaun**
Tel: **(01225) 873098**
E-mail: **rallymanager@westrally.org.uk**
Website: **www.westrally.org.uk**
The West of England Radio Rally will be held at the 'Cheese & Grain', Market Yard, Frome, Somerset BA11 1BE. This is a multi-purpose venue used for exhibitions, markets and concerts. The venue includes both a fully serviced exhibition hall and outside space for market type stalls.

July 9
Cornish Annual Radio & Computing Rally
Contact: **Ken Tarry G0FIC/Ian Williams**
Tel: **(01209) 821073/(01872) 561058**
E-mail: **ken@jtarry.freeserve.co.uk**
The Cornish Radio Amateur Club will be holding their Annual Radio and Computing Rally at the Penair School, Truro, Cornwall TR1 1TN. Starts 10.30. Hot food and drink will be available among all the radio goodies.

July 16
McMichael Amateur Radio & Carboot Rally
Website: **http://go.to/mcmichaelrally**
The McMichael Amateur Radio and Carboot Rally is being held at Reading Rugby Football Club, Sonning Lane, Sonning, Nr. Reading RG4 6ST. There will be Special interest groups, McMichael Radio display, Talk-in station (**GB6MMR**), indoor area, large carboot, bar and food.

July 30
Horncastle Rally
Contact: **Tony Nightingale G3ZPU**
Tel: **(01507) 527835**
E-mail: **Tony@radioman.e7even.com or g3zpu@hotmail.com**
The summer Horncastle Rally will take place at the Horncastle Youth Centre in the centre of Horncastle. Door open at 1030 for visitors and traders will be able to get access at 0800. The cost to traders will be £4 per table or similar space outside. Power is free but bring long extension leads! There will be the usual Horncastle Bacon Butties, as well as other snacks available. All the rally is on one level and full facilities are available for wheelchair users.

July 30
Colchester AR & Computer Rally
Contact: **James M0ZZO**
Tel: **(01255) 242748**
E-mail: **cra2006@m0zzo.com**
The Colchester Amateur Radio and Computer Rally takes place at the St Helena School, Sheepen Road, Colchester CO3 3LE. Gates open 0930 (Traders from 0730). Indoor Traders and Car Boot, Waters & Stanton, IOTA Station, Refreshments, ISWL and Talk-in on 145.550MHz.

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

Look out for representatives from *Practical Wireless* and *RadioUser* at rallies printed in bold.

Important note to rally organisers: Please include the postcode of your rally venue as it can really help readers find you!

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

New Echolink Node M0SIX-L

In the summer of 2005 the **Scout Jamboree** was held at Hylands Park, Chelmsford. This event, which attracted 8,000 young people, served as a dress rehearsal for the **21st World Scout Jamboree** to be held in Scouting's centennial year 2007 at Hylands Park, which will attract over 40,000 participants.

The organisers of the EuroJam 2005 Amateur Radio station GB5EJ approached the **Chelmsford Amateur Radio Society** (CARS) about providing an Echolink facility as, to their surprise, there was no Echolink available in Essex. Regrettably due to the NoV licencing procedure, CARS were unable to provide the Scouts with an Echolink facility. However, several CARS members were determined to make sure that Echolink would be available in Essex for future Scouting events.

An application was then submitted for an Echolink Node NoV for M0SIX. **It took five and a half months before the NoV was finally issued** but now M0SIX-L node 265297 is finally on the air on 144.825MHz using CTCSS tone H (110.9Hz).

As well as Hylands Park, M0SIX-L provides coverage for eight other Essex Scout Camp Sites. This Echolink Node is available for use by all Radio Amateurs, however, it is requested that priority is given to any Scout or Guide stations.

Useful radio links:

Echolink
www.echolink.org

EuroJam 2005
www.eurojam.org.uk

21st World Scout Jamboree:
www.wsj.scouting2007.org/english/index.php

Essex Scout Camp Sites
www.essexscouts.org.uk/campsites/index.php

Chelmsford Amateur Radio Society
www.g0mwt.org.uk

The Pennine Way

Tom and Jimmy at the summit of Pen-y-ghent on the Pennine Way near Horton-in-Ribblesdale. This was taken during a training walk and SOTA expedition.

Licensed Radio Amateurs **Tom Read M1EYP** (35) and son **Jimmy Read M3EYP** (13) will be walking the full length of the Pennine Way in the summer of 2006. Along the route of the 266mile National Trail, they will be setting-up temporary Amateur Radio stations on most or all of the ten 'Marilyn' summits along the route. That's so they can participate in the popular Summits On The Air programme for Radio Amateurs and hillwalkers.

Father and son Tom and Jimmy will be fundraising for local organisation **Friends For Leisure**, who provide support and opportunities for youngsters with disabilities to participate in mainstream activities such as ten-pin bowling, shopping trips, watching the local football team (Macclesfield Town) and various social functions. They have been planning for three years to realise their lifelong ambition to complete the Pennine Way and will do so this summer, hopefully raising much-needed funds to continue the excellent work of Friends For Leisure.

Tom M1EYP and Jimmy M3EYP will set off from Edale in Derbyshire on 25 July and hope to reach Kirk Yetholm in Scotland on 13 August. Their Amateur Radio transmissions are planned from the following SOTA summits en route:

25/7/06 - Kinder Scout G/SP-001 (636m)
26/7/06 - Black Hill G/SP-002 (582m)
31/7/06 - Fountains Fell G/NP-017 (668m) & Pen-y-ghent G/NP-010 (694m)
1/8/06 - Dodd Fell Hill G/NP-016 (668m)
2/8/06 - Great Shunner Fell G/NP-006 (716m) & Kisdon G/NP-026 (499m)
5/8/06 - Dufton Pike G/NP-027 (481m)
6/8/06 - Cross Fell G/NP-001 (893m)
13/8/06 - The Cheviot G/SB-001 (815m)

For more information, please contact Friends For Leisure on **(01625) 613433** or **Tom Read** on **(01625) 612916** or **E-mail: tommyread@hotmail.com** For more information about the Pennine Way, take a look at: **http://www.nationaltrail.co.uk/pennineway**

The picture shows some of the CARS members present at the switch on of M0SIX-L. From left to right are Trevor M5AKA, Murray G6JYB, Clive M0SIX (seated) and Anthony M1FDE.

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

Practical Radio

Practical Radio - Let's Do It is the first CD book to be produced by **Eric Edwards GW8LJJ**, dealing with everything from the simplest of radio receivers to t.r.f. (Tuned Radio Frequency) and Regenerative receivers. Each chapter of *Practical Radio - Let's Do It* describes how these receivers work and how to build them. All the components are 'common or garden' types and the coils are home-made.

This book is not your usual 'E-Book' in that there are no colour pictures and the chapters are laid out as in a paper version. The book is produced in Adobe PDF format for ease of viewing and printing.

Eric GW8LJJ describes his book as being truly practical, containing several examples of each of the radio types, all of which he has built. There are plenty of practical circuits with examples for you to try your hand at building.

The copyright of the book belongs to Eric but he gives permission for the disc to be copied, as long as it is not sold to a third party. The original buyer of the book can get technical support from Eric and he's also offering help with any projects or p.c.b.s.

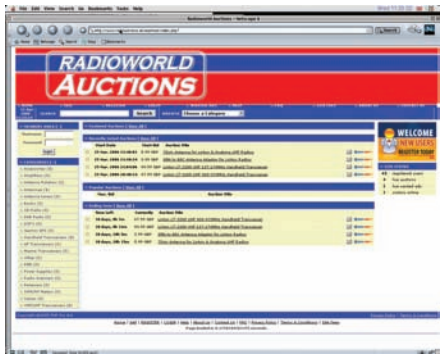
Copies of *Practical Radio - Let's Do It* are available direct from Eric at **11 Old Village Road, Barry, Vale of Glamorgan CF62 6RA** for **£5 plus £1 P&P**.

Can You Help?

I am trying to locate a back issue of *Popular Wireless* Weekly No.37 Vol 2 dated February 10 1923, which featured my grandfather on the cover. Any help in tracking down a copy would be very gratefully received. **Andrew Heath**

If you can help Andrew please contact him direct at **ajheath@ntlworld.com**

On-Line Auction Site



Radioworld Ltd., has had an increasing online presence recently, with its on-line shop drawing more and more interest from the radio community. **David Hayward**, owner of Radioworld says that one thing the Radioworld team felt would benefit the radio community, "was if we could have a way of bringing radio users together so that they could sell their gear online. Using some other online auction sites can be cumbersome, because they cater for huge ranges of products".

David continues "From the onset of this auction site I have worked very closely with my web author to get it to be as fuss-free as possible and also be specifically tailored for the radio community. I think the results talk for themselves with what we have created and the popularity of the auction site, we hope, will be as good as the main online shop which, since its inception in its current format in September 2004, has had over three million hits."

To see what's available, go to **www.radioworld.co.uk/auctions**

Dutch Flea Market

Dutch Radio Amateur, **Ron van der Meij PD2MEY**, tells fellow *PW* readers about one of the biggest events in the Netherlands Amateur Radio calendar. On 18 March 2006, the 31st large radio flea market was held in Rosmalen, the Netherlands. With more than 300 stands and this year another record attendance of 4600, this is one of the largest events in Dutch Amateur Radio. As in previous years there was again a wide variety of things on offer on the market stalls as with many of the shops selling electronic parts having closed as sales dropped, the market has become a favourite haunt of everyone looking for specific parts.

Very popular at this year's Flea Market were the older and hence cheaper h.f. transceivers. Within a few months, the Dutch Novice licence holders will acquire access to part of the 7, 14, and 28MHz bands and therefore a trip to the market was an ideal opportunity to hunt for that 'first' h.f.transceiver.

Every year the event is attended by a representative of the 'Agentschap Telecom', the Dutch equivalent of Ofcom. On their stand, this year they had a selection of measuring equipment, such as spectrum analysers and a telecommunications test set so that equipment that was purchased could be tested.

Other features of the market included a stand of the **VERON**, (Vereniging voor Experimenteel Radio Onderzoek) the Dutch equivalent to the RSGB, where all kinds of books and related materials were on sale. There was also a striking selection of cheap, Chinese hand-held radios that have apparently now also found their way into Holland, as well as a wide range of measurement equipment, old and new, spare parts, army surplus and a lot of old mobile phones and computer equipment, as seen at many rallies these days, offered by Dutch, German and British stand holders.

Anyone wanting to attend and breathe the atmosphere of next year's event should make a note in their diaries for 17 March 2007. Further information, also in English, can be found on the website: **www.radiovlooienmarkt.nl**

Thanks for the news and photograph Ron, **Editor**

Mobile Telephone Services On Aircraft

The *PW* offices receive an un-ending stream of news and spectrum updates from Ofcom, the UK's radio regulator based in London. Most are of interest, but Rob Mannion G3XFD spotted one announcement that he thinks could eventually have major implications for the Amateur Radio fraternity in the UK.

This *PW* news item started off with the arrival of an E-mail from the London headquarters of Ofcom regarding the use of mobile telephones on civil passenger aircraft. And, along with the basic information, the E-mail carried the URL **http://www.ofcom.org.uk/research/telecoms/reports/aircraft/** and immediately I realised there were possible implications for our hobby - especially the introduction of airborne Amateur Radio stations/transponders, test beacons, etc. To me, the possibilities seem fascinating and I've no doubt we'll be hearing much more - eventually (and I must emphasise 'eventually'). After the frenzied business expansion of mobile telephone companies has succeeded!

Even though the document is lengthy, it's worth reproducing in full to enable readers to learn for themselves just what a complicated process will be involved!

The Ofcom Document

The Ofcom document is entitled *Mobile Services on Aircraft* and reads: "Ofcom manages the civil radio spectrum in the UK. Its duties include securing the optimal use of the electromagnetic spectrum, while having regard to the desirability of promoting competition and the development of innovative services.

Ofcom has been approached by stakeholders from the avionic and telecommunications sectors suggesting that it should review the wireless telegraphy licensing regime in order to permit the provision and use of mobile services on aircraft. There are a number of legal, regulatory and technical issues within Ofcom's responsibilities which need to be considered and resolved: this paper opens the discussion among stakeholders about these.

However there are a number of other issues, outside Ofcom's field of responsibility, which must be dealt with before any such services could be provided. Aircraft safety is of primary importance, and ensuring that this is in no way compromised is the responsibility of the Civil Aviation Authority (CAA). The human dimension of ensuring passenger safety and welfare is also the responsibility of the CAA. The proposed services would have to satisfy the CAA's requirements before they could be introduced. Finally, if such services were permitted, it would be a commercial decision for airlines whether to offer them or not, taking into account the needs and preferences of their customers.

This paper covers only the issues relevant to Ofcom's area of responsibility; and focuses exclusively on the specific issues raised by mobile services on aircraft. Its purpose is to generate discussion and invite comment on the issues identified by Ofcom at this stage as being relevant to such services.

Ofcom has been working with colleagues from other European countries towards a common approach to these issues and expects the consideration of the many complex issues raised to be completed within a reasonable timescale. Ofcom therefore believes that it is timely to publish this discussion paper and to seek comment from stakeholders and other interested parties. This paper is not intended to constitute a formal consultation.

The key issues addressed by the paper are of a technical, regulatory and licensing nature.

Regulatory issues raised in the paper are:

* the territorial jurisdiction of Ofcom and other National Regulatory Agencies over airborne systems;
* the legal status of the proposed Network Control Unit under the R&TTE Directive;
* the status of airborne services under the Authorisation Directive;
* the protection of other services from interference
* the regulation of the backhaul from aircraft to ground;
* the arrangements for managing the systems in the air;
* access to numbering resources;
* the range of technologies covered by the current European work.

The main technical issue raised is how to ensure that airborne systems do not create harmful interference to terrestrial systems.

Licensing issues raised are:

* the options for authorising such systems; and
* who should hold such authorisations.

The ubiquity of GSM technology in Europe leads proponents of airborne mobile services to favour 1.8GHz GSM for the initial service. The legal, regulatory and licensing options covered by this paper may also be applicable to other mobile communication standards in due course; although some of the technical details will need to be re-worked in the context of those other standards.

Ofcom looks forward to learning the views of stakeholders on these topics or any others which they believe are relevant to the regulation of airborne systems. Ofcom will provide further opportunities for discussion with stakeholders: the outputs from these and from the European groups working in this area will inform Ofcom in developing specific proposals which will be issued for consultation at a later stage.

The CAA and other regulatory bodies will consider separately the safety and other issues raised by the proposed services. The introduction into use of any services cannot be contemplated until the requirements of those bodies have been satisfied".

Implications For Amateur Radio?

Rob G3XFD summarises: Obviously, at the moment the only thing Ofcom are planning to discuss (with the many different official organisations) is the exteneded use of mobile telephones in commercial civil aircraft. However, as the document makes clear from the very start - a fundamental change will have to take place if the all the organisations/authorities involved can agree to go ahead.

Perhaps, when the 'fundamental changes' are in place - a different attitude will be presented to those in the field Amateur Radio requiring to carry out tests with airborne (balloon mounted) v.h.f./u.h.f. and microwave beacons, transponders and repeaters. There may even be the possibility of hot air balloon aeroDXpeditions! So, watch this space - something interesting might happen - **eventually**.

amateur radio clubs

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

Club Organisers: please include your event's full address, including its postcode, with any news item sent to us for publication.

CHESTER
Chester & District RS
Contact: Chris Wild MW3TWI
Tel: (01244) 683629
The Chester & District Radio Society meet at the Burley Hall, Waverton, Chester at 2000 hours on the first, third and fourth Tuesdays of the month. This month's meetings include: **May 16**: Surplus Equipment sale night and **23rd**: Aerial Demonstration Night.

DEVON
Norman Lockyer Observatory ARG
Contact: Tony Howell-Jones M0THJ
Tel: (01392) 460462
E-mail: m0thj@btinternet.com
The Norman Lockyer Observatory Amateur Radio Group G0AXC and GB2NLO, meet at 1930 hours every Tuesday at the Norman Lockyer Observatory, Slacombe Hill, Sidmouth, Devon. Visitors and new members are always welcome (take your Amateur Radio Licence if you wish to transmit). The Club are pleased to run Foundation Licence courses and examinations on demand.

LONDON
Southgate ARC
Contact: Nick Earl G8DWF
Tel: 0208 886 8935
Website: www.southgatearc.org
The Southgate Amateur Radio Club meet at the Winchmore Hill Cricket Club, The Paulin Ground, Firs Lane, Winchmore Hill, London N21 3ER on the second Thursday of the month. Meetings start at 1930 for an 2000hours start. A guest speaker is usually invited along to give a talk on a subject of interest. Check out the website for the latest updates.

STAFFORD
Stafford & Districts ARS
Contact: Graeme Boull G4NVH
Tel: (01785) 604534.
E-mail: graeme.boull@ntlworld.com
Website: www.g3sbl.org.uk/
The Stafford & Districts Amateur Radio Society meet on Thursdays at 2000hrs. The shack is located in the AREVA T&D UK Ltd. factory, St. Leonards Works, St. Leonards Avenue, Stafford. Forthcoming meetings include: **May 11:** Shack Night; **18**: Spring Intra-Club Challenge - Cannock Chase and **25th**: Basic Transistor Specifications - What do the numbers mean? with **Alan M1LIP**. Why not go along and join in the fun, you'll be very welcome.

SURREY
Wey Valley ARG
Contact: Andrew Vine M0GJH
Tel: (01483) 272456
The Wey Valley Amateur Radio Group of Guildford meet at The Guildford Rowing Club on Shalford Road just outside the town centre on the first and third Friday evenings of the month at 1930 for a 2000hours start. For more details on how to join and club activities contact the secretary, **Andrew M0GJH** (details above).

Keep your club news coming to pwnews@pwpublishing.ltd.uk

BNC Screw type plug (Small entry) **£1.25**
BNC Solder type plug (Small entry) **£1.25**
BNC Solder type plug (Large entry) **£3.00**
N-Type plug (Small entry) **£3.00**
N-Type plug (La ge entry) **£3.00**
SO239 Chassis socket (Round) **£1.00**
SO239 Chassis socket (Square) **£1.00**
N-Type Chassis scoket (Round) **£3.00**
N-Type Chassis scoket (Square) **£3.00**
SO239 Double female adapter **£1.00**
PL259 Double male adapter **£1.00**
N-Type Double female **£2.50**
SO239 to BNC adapter **£2.00**
SO239 to N-Type adapter **£3.00**
SO239 to PL259 adapter (Right angle) **£2.50**
SO239 T-Piece adapter (2xPL 1XSO) **£3.00**
N-Type to PL259 adapter (Female to male) **£3.00**
BNC to PL259 adapter (Female to male) **£2.00**
BNC to N-Type adapter (Female to male) **£3.00**
BNC to N-Type adapter (Male to female) **£2.50**
SMA to BNC adapter (Male to female) **£3.95**
SMA to SO239 adapter (Male to SO239) **£3.95**
SO239 to 3/8 adapter (For antennas) **£3.95**
3/8 Whip stud (For 2.5mm whips) **£2.95**

Please add just £2.00 P&P for connector only orders
PLEASE PHONE FOR LARGE CONNECTOR ORDER DISCOUNTS

5ft Poles Heavy Duty (Swaged)

20ft Heavy Duty Swaged Pole Set
These heavy duty aluminium (1.8mm wall) have a lovely push fit finish to give a very st ong mast set
1.25" set of four 5ft sections **£29.95**
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2.00" set of four 5ft sections **£49.95**

Mounting Hardware (All galvanised)

Tripod-2 *(free standing with 2-OD for use with 2" joiner or 1.5" pole inside)* **£69.95**
Tripod-3 *(free standing with 3" OD for use with 2.5" pole inside)* **£79.95**
6" Stand Off Bracket *(complete with U Bolts)* **£6.00**
9" Stand off bracket *(complete with U Bolts)* **£9.00**
12" Stand off bracket *(complete with U Bolts)* **£12.00**
12" T & K Bracket *(complete with U Bolts)* **£14.95**
18" T & K Bracket *(complete with U Bolts)* **£17.95**
24" T & K Bracket *(complete with U Bolts)* **£19.95**
36" T & K Bracket *(complete with U Bolts)* **£29.95**
Single chimney lashing kit *(suitable up to 2 mast)* **£14.95**
Double chimney lashing kit *(suitable up to 2 mast)* **£19.95**
3-Way Pole Spider for Guy Rope/ wire **£3.95**
4-Way Pole Spider for Guy Rope/wire **£4.95**
Mast Sleeve/Joiner *(for 1" pole)* **£6.95**
Mast Sleeve/Joiner *(for 1.25" pole)* **£7.95**
Mast Sleeve/Joiner *(for 1.5" pole)* **£11.95**
Mast Sleeve/Joiner *(for 2" pole)* **£13.95**
Earth rod including clamp (copper plated) **£9.95**
Earth rod including clamp (solid copper) **£14.95**
Pole to pole clamp 2"-2" **£4.95**
Di-pole centre *(for wire)* **£4.95**
Di-pole centre *(for aluminium rod)* **£4.95**
Di-pole centre *(for wire but with an SO239 socket)* **£6.95**
Dog bone insulator **£1.00**
Dog bone insulator heavy duty **£2.00**
Dog bone *(ceramic type)* **£1.50**
EGG-S *(small porcelain egg insulator)* **£1.95**
EGG-M *(medium porcelain egg insulator)* **£2.50**
CAR PLATE *(drive on plate to suit 1.5 to 2" mast/pole)* **£19.95**

Cable & Coax Cable

RG58 best quality standard per mt **35p**
RG58 best quality military spec per mt **60p**
RGMini 8 best quality military spec per mt **70p**
RG213 best quality military spec per mt **85p**
H100 best quality military coax cable per mt **£1.10**
3-core rotator cable per mt **45p**
7-core rotator cable per mt **£1.00**
10 amp red/black cable 10 amp per mt **40p**
20 amp red/black cable 20 amp per mt **75p**
30 amp red/black cable 30 amp per mt **£1.25**

Please phone for special 100 metre discounted price

Baluns

MB-1 1:1 Balun 400 watts power **£24.95**
MB-4 4:1 Balun 400 watts power **£24.95**
MB-6 6:1 Balun 400 watts power **£24.95**
MB-1X 1:1 Balun 1000 watts power **£29.95**
MB-4X 4:1 Balun 1000 watts power **£29.95**
MB-6X 6:1 Balun 1000 watts power **£29.95**
MB-Y2 Yagi Balun 1.5 to 50MHz 1kW **£24.95**

Tri/Duplex & Antennas Switches

MD-24 HF or VHF/UHF internal duplexer (1.3-225MHz) (350-540MHz) SO239/PL259 fittings **£22.95**
MD-24N same spec as MD-24 but "N-type" fittings **£24.95**
MX2000 HF/VHF/UHF internal Tri-plexer (1.6-60MHz) (110-170MHz) (300-950MHz) **£59.95**
CS201 Two-way di-cast antenna switch. Freq: 0-1000MHz max 2,500 watts SO239 fittings **£14.95**
CS201-N Same spec as CS201 but wi h N-type fittings **£19.95**
CS401 Same spec as CS201 but4-way **£39.95**

Antennas Rotators

AR-300XL Light duty UHF\VHF **£49.95**
YS-130 Medium duty VHF **£79.95**
RC5-1 Heavy duty HF **£329.95**
RC5-3 Heavy Duty HF inc pre set cont ol box **£419.95**
AR26 Alignment Bearing for the AR300XL **£18.95**
RC26 Alignment Bearing for RC5-1/3 ..... **£49.95**
RC5A-3 Serious heavey duty HF **£579.95**

Complete Mobile Mounts

All mounts come complete with 4m RG58 coax terminated in PL259 (different fittings available on request).
3.5" Pigmy magnetic 3/8 fitting **£7.95**
3.5" Pigmy magnetic SO239 fitting **£9.95**
5" Limpet magnetic 3/8 fitting **£9.95**
5" Limpet magnetic SO239 fitting **£12.95**
7" Turbo magnetic 3/8 fitting **£12.95**
7" Turbo magnetic SO239 fitting **£14.95**
Tri-Mag magnetic 3 x 5" 3/8 fitting **£29.95**
Tri-Mag magnetic 3 x 5" SO239 fitting **£29.95**
HKITHD-38 Heavy duty adjustable 3/8 hatch back mount **£29.95**
HKITHD-SO Heavy duty adjustable SO hatch back mount **£29.95**
RKIT 38 Aluminium 3/8 rail mount to suit 1" oof bar or pole **£12.95**
RKIT-SO Aluminium SO rail mount to suit 1" roof bar or pole **£14.95**
RKIT-PR Stainless SO239 rail kit to suit 1" oof bar or pole **£24.95**
PBKIT-SO Right angle SO239 pole kit with 10m cable/PL259 *(ideal for mounting mobile antennas to a 1.25" pole)* **£19.95**

Antenna Wire & Ribbon

Enamelled copper wire 16 gauge (50mtrs) **£11.95**
Hard Drawn copper wire 16 gauge (50mtrs) **£13.95**
Equipment wire Multi Stranded (50mtrs) **£9.95**
Flexweave high quality (50mtrs) **£27.95**
PVC Coated Flexweave high quality (50mtrs) **£37.95**
300Ω Ladder Ribbon heavy duty USA imported (20mtrs) **£14.95**
450Ω Ladder Ribbon heavy duty USA imported (20mtrs) **£17.95**
(Other lengths available, please phone for details)

Miscellaneous Items

CDX Lightening arrestor 500 watts **£19.95**
MDX Lightening arrestor 1000 watts **£24.95**
AKD TV1 filter **£9.95**
Amalgamating tape (10mtrs) **£7.50**
Desoldering pump **£2.99**
Alignment 5pc kit **£1.99**

Telescopic Masts (aluminium/fibreglass opt)

TMA-1 Aluminium mast ★ 4 sections 170cm each ★ 45mm to 30mm ★ App ox 20ft erect 6ft collapsed **£99.95**
TMA-2 Aluminium mast ★ 8 sections 170cm each ★ 65mm to 30mm ★ App ox 40ft erect 6ft collapsed **£189.95**
TMF-1 Fibreglass mast ★ 4 sections 160cm each ★ 50mm to 30mm ★ App ox 20ft erect 6ft collapsed **£99.95**
TMF-1.5 Fibreglass mast ★ 5 sections 200cm each ★ 60mm to 30mm ★ App ox 30ft erect 8ft collapsed **£179.95**
TMF-2 Fibreglass mast ★ 5 sections 240cm each ★ 60mm to 30mm ★ App ox 40ft erect 9ft collapsed **£189.95**

HF Yagi

HBV-2 2 BAND 2 ELEMENT TRAPPED BEAM FREQ:20-40 Mtrs GAIN:4dBd BOOM:5.00m LONGEST ELEMENT:13.00m POWER:1600 Watts **£399.95**

ADEX-3300 3 BAND 3 ELEMENT TRAPPED BEAM FREQ:10-15-20 Mtrs GAIN:8 dBd BOOM:4.42m LONGEST ELE:8.46m POWER:2000 Watts **£329.95**

ADEX-6400 6 BAND 4 ELEMENT TRAPPED BEAM FREQ:10-12-15-17-20-30 Mtrs GAIN:7.5 dBd BOOM:4.27m LONGEST ELE:10.00m POWER:2000 Watts **£599.95**
40 Mtr RADIAL K T FOR ABOVE **£99.00**

Mini HF Dipoles (Length 11' approx)

MD020 20mt version app ox only 11ft **£39.95**
MD040 40mt version app ox only 11ft **£44.95**
MDO80 80mt version app ox only 11ft **£49.95**
(slimline lightweight aluminium construction)

HF Verticals

VR3000 3 BAND VERTICAL FREQ: 10-15-20 Mtrs GAIN: 3.5dBi HEIGHT: 3.80m POWER: 2000 Watts (wi hout radials) POWER: 500 Watts (with optional radials) **£99.95**
OPTIONAL 10-15-20mtr radial kit **£39.95**

EVX4000 4 BAND VERTICAL FREQ:10-15-20-40 Mtrs GAIN: 3.5dBi HEIGHT: 6.50m POWER: 2000 Watts (wi hout radials) POWER: 500 Watts (with optional radials) **£119.95**
OPTIONAL 10-15-20mtr radial kit **£39.95**
OPTIONAL 40mtr radial kit **£14.95**

EVX5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 7.30m POWER: 2000 Watts (wi hout radials) POWER: 500 Watts (wi h optional radials) **£169.95**
OPTIONAL 10-15-20mtr radial kit **£39.95**
OPTIONAL 40mtr radial kit **£14.95**
OPTIONAL 80mtr radial kit **£16.95**

EVX6000 6 BAND VERTICAL FREQ: 10-15-20-30-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 5.00m RADIAL LENGTH: 1.70m(included) POWER: 800 Watts **£299.95**

EVX8000 8 BAND VERTICAL FREQ:10-12-15-17-20-30-40 Mtrs (80m optional) GAIN: 3.5dBi HEIGHT: 4.90m RADIAL LENGTH: 1.80m (included) POWER: 2000 Watts **£319.95**
80 MTR RADIAL K T FOR ABOVE **£89.00**

(All verticals require grounding if optional radials are not purchased to obtain a good VSWR)

Trapped Wire Di-Pole Antennas
(Hi grade heavy duty Commercial Antennas)

MDT-6 FREQ:40 & 160m LENGTH: 28m POWER:1000 Watts **£59.95**
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MTD-2 (2 BAND) FREQ:40-80 Mtrs LENGTH: 20Mtrs POWER:1000 Watts **£59.95**
MTD-3 (3 BAND) FREQ:40-80-160 Mtrs LENGTH: 32.5m POWER: 1000 Watts **£99.95**
MTD-4 (3 BAND) FREQ: 12-17-30 Mtrs LENGTH: 10.5m POWER: 1000 Watts **£44.95**
MTD-5 (5 BAND) FREQ: 10-15-20-40-80 Mtrs LENGTH: 20m POWER:1000 Watts **£89.95**
(MTD-5 is a crossed di-pole with 4 legs)

ALL PICTURES ARE FOR REFERENCE ONLY

Technical

This month Tony Nailer G4CFY takes a look at amplifiers and the various Classes of Operation. If you've been puzzled by the terms used in the past read on to unravel the mystery!

FOR THE TERRIFIED!

This article is aimed at providing a brief overview of what's meant by the terms Class A, Class B, and Class C. Though there are other classes of amplification now bandied about in audio and Hi-Fi circles, I will focus on the common classes used in traditional radio circuits.

To understand the classifications it's first important to understand fundamental differences in operation of bipolar transistors, dual gate metal oxide field effect transistors (m.o.s.f.e.t.s), and insulated gate f.e.t.s (i.g.f.e.t.s) on the one hand and valves and junction f.e.t.s (j.f.e.t.s) on the other. **Note:** I have grouped them this way because the first group have to be forward biased to pass current, while the second group have to be negatively biased to prevent destructive currents from flowing.

The diagram, **Fig. 1**, shows a conventional circuit for biasing a transistor where the potential divider R1 and R2 apply a voltage to the base. Current flows up through the emitter resistor R4 and through the forward biased diode formed by the base and emitter electrodes and out though the base. This current also opens the path between emitter and collector and allows a much larger current to flow up through the collector. The ratio of these currents is the gain of the device.

Class A Operation

Let's start by looking at Class A operation. In this mode R3 is chosen so the collector current passing through R3 puts the collector voltage half way between the voltage at the top of R4 and the supply rail. The transistor is then able to be 'swung up and down' by an input sinewave, which will produce a correspondingly larger inverted version at the collector. Where the device is so biased that a complete cycle of input signal produces a complete cycle at the output, this is termed Class A.

Biasing for an i.g.f.e.t. is almost identical to that of the bipolar transistor. However, the forward biasing voltage gate1 to source is over a much wider range than the 0.65-0.75V of the bipolar device.

The corresponding circuit for the dual gate m.o.s.f.e.t. is such that where gate2 provides control of the biasing to fix the quiescent current, while gate1 is usually zero biased and used for signal input only, as shown in the diagram, **Fig. 2**.

Valves and f.e.t.s often use self biasing and the technique is best illustrated using a triode circuit, as shown in **Fig. 3**. In this case there is an electron stream from the cathode up to the anode, which can be limited by applying a voltage on the grid, which is negative with respect to the cathode. The same effect can be achieved by the cathode being positive with respect to the grid.

When cathode and anode current flows a voltage is developed across R3, which makes the cathode positive with respect to the grid. By careful choice of the R3, the cathode and anode current can be set at a desired value to put the voltage at the anode half way between that at the top of R3 and the supply rail (Just as we did with the transistor). The j.f.e.t. is identical in its operation and biasing except that the operating voltages are considerably lower.

Distortion in a Class A amplifier is very low but the penalty is that the quiescent current flow is at least half of the full swing of current under maximum output conditions. This means that depending on the proportion of the full swing, the efficiency is limited to the range 0 to 50%. (Typically it's around 33%).

Class B Operation

On to Class B now and we'll consider the transistor circuit of Fig. 1 again. However, in this case the voltage at the junction of R1 and 2 is only just sufficient to forward bias the base emitter junction, so a only trickle

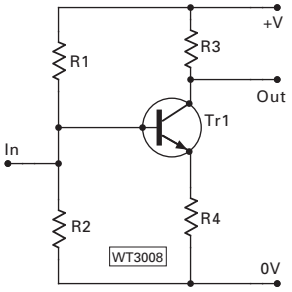

Fig. 1: The diagram shows a conventional circuit for biasing a transistor where the potential divider R1 and R2 apply a voltage to the base (see text).

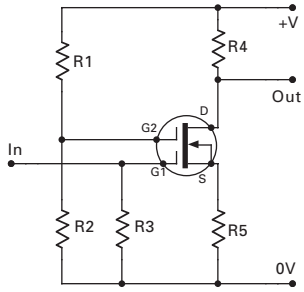

Fig. 2: The corresponding circuit for the dual gate m.o.s.f.e.t. is such that where gate 2 provides control of the biasing to fix the quiescent current, while gate 1 is usually zero biased and used for signal input only, as shown in this diagram (see text).

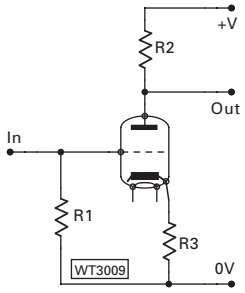

Fig. 3: Valves and f.e.t.s often use self biasing and the technique is best illustrated using a triode circuit, as shown in here (see text).

of emitter and collector current flows.

When the input signal swings positive (+) it will cause the collector current to massively increase, creating a large negative voltage half cycle at the collector. When the input signal swings negative the device is biased off and no current flows.

In the condition where a complete input cycle produces an exact output half cycle it is termed Class B. **Note:** this technique is not normally applied to circuits with resistors, as the load for the collector or drain or anode. Instead it's used where a transformer or a choke or a tuned circuit is placed there. In Class B condition there's only a trickle of quiescent current, and the dissipation due to biasing is small and efficiency is around 50%.

Clearly the penalty for the increased efficiency is that the output signal has lost half a cycle and so it's heavily distorted. This problem is overcome by the use of either a transformer or tuned circuit to provide a 'flywheel effect' to complete the full cycle. This occurs because the collapsing magnetic field of the transformer will produce a 'back' electromotive force (e.m.f.), which is almost 100% as large as that supplied by the first half cycle.

Similarly a tuned circuit with a high '*Q*' will also have circulating radio frequency (r.f.) currents, which will create the missing half cycle. In this way the distortion is minimised and distortion products attenuated.

Class AB Operation

We're making progress and it's on to Class AB operation now. This class had a specific definition in valve days and was chosen as the point where in a valve with two grids (a bit like a dual gate m.o.s.f.e.t) that current would start to flow in the second grid. Nevertheless it can be applied to any device which is biased part way between Class A and Class B, where more than a half cycle, but less than a full cycle, appears at the output for a complete cycle at the input.

In practice, an amplifier operating in Class AB is often carefully adjusted, so that

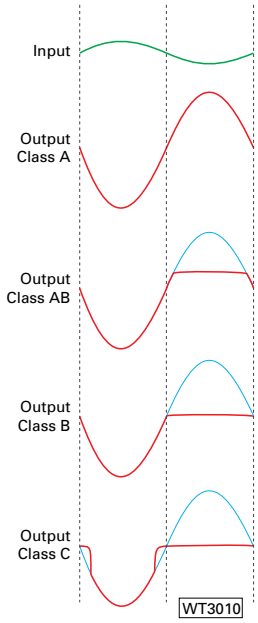

Fig. 4: A graphical representation of the input and output voltages in different classes of operation. See text for more details of these modes.

a significant current flows in the output circuit and that the result is the best compromise between distortion and efficiency. This mode, like Class B, is usually used where the output load is inductive or a tuned circuit and the 'flywheel effect' recreates the full output cycle.

Efficiency in the range 50 to 66% is achievable where the quiescent current is kept reasonably low.

Class C Operation

Now it's time to look at Class C operation. This is the condition where the device is biased well below the point where output current flows. This means that less than a whole cycle of the input signal causes a pulse of current to flow in the output circuit.

In transistor circuits this condition is achieved by removing resistor R1 and allowing the input signal to reach 0.65V before conduction occurs. Valves can be used in class C by either using a large value of R3 or better still by grounding the cathode and applying a negative voltage to the grid from a separate supply rail. Likewise, i.g.f.e.t.s require the gate to be negative with respect to source to put them into class C mode.

Class C operation is a condition for maximum device efficiency as there's no quiescent current without the drive signal. The only dissipation by the device is when the signal is applied and depending how far it's biased 'off', the efficiency will be in the range 60 to 70%. The penalty for this further improvement in efficiency is distortion of the output signal. even with the use of a transformer or tuned circuit the discontinuity between the length of the output pulse and that of a full half cycle is represented by harmonic and intermodulation distortion products.

Control Of Harmonics

The control and reduction of harmonics is the reason why Class AB, B or C r.f. amplifiers were always used in conjunction with Pi networks or harmonic half-wave filters. Nowadays these have been extended to triple or quadruple Pi type networks with Butterworth or Chebychev characteristics.

I hope this brief explanation will be enlightening to those who never quite understood the concept of classes of operation.

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. **PW**

Topics explained within Technical For The Terrified, in previous issues of *PW*.

Part 1: Formulae, algebra and powers and roots of numbers. **February 2005**.
Part 2: Indices of numbers, and series parallel combinations of resistors. **April 2005.**
Part 3: Inductive and capacitive reactance and its application in filters. **June 2005.**
Part 4: Tuned circuits and values of L and C needed for resonance. **August 2005.**
Part 5: Stabilised supply rails using resistors and Zener diodes. **October 2005.**
Part 6: Transistor biassing for audio amplifier and amplifier gain. **December 2005**.
Part 7: The use of the decibel (dB) for cable losses, antenna gains and effective radiated power (e.r.p.) **February 2006**.
Part 8: How to use decibels (dB) when quoting noise figures. **April 2006**.

Photocopies or back issues of these topics are available through the *PW* Bookstore.

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PORTLAND VFO as featured in March 2006 PW. 7-7.2MHz as local oscillator for a direct conversion receiver or transceiver. Otherwise as 7.1-7.6MHz to use in conjunction with a mixer-vfo system as local oscillator for a 4 metre receiver/transmitter with a 9MHz or 10.7MHz IF. The version shown in the article included a PCB for Buffer No 2 with output level to drive diode ring mixers. Also available with Buffer 1 directly compatible with the mixer-vfo in the May issue PW. **VFO PCB with Buffer 1 or Buffer 2 PCB and parts kit with potentiometer £14.50. PCB and parts kit with drilled box £23.50.**

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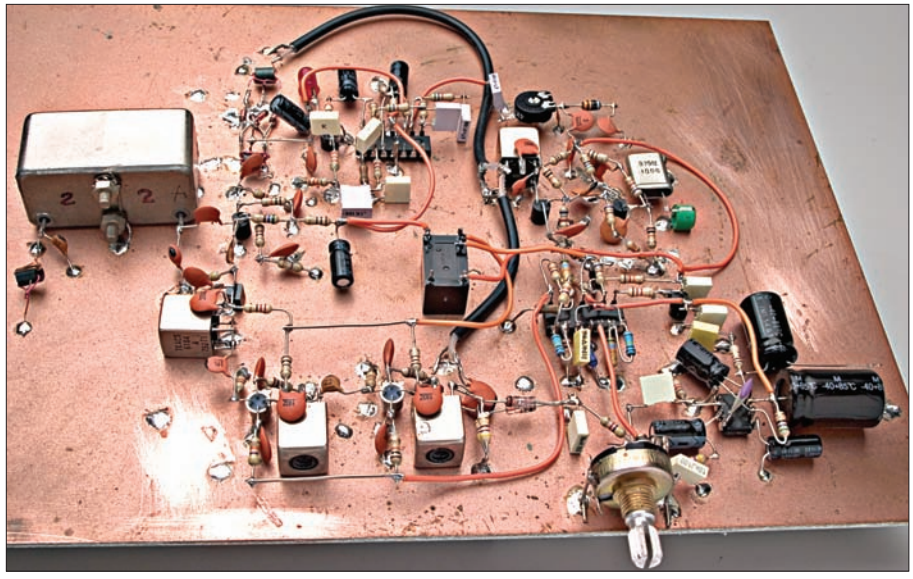
Editorial note: Finding an interesting front cover photograph to illustrate a build as you go project such as the Poundbury, can prove difficult! Then Tony - as is his usual practice - chose a Dorset name. The village of Poundbury on the west side of Dorchester is one of **The HRH Prince of Wales'** favourite projects and when I explained what we were doing they joined in to help our theme and provide an excellent aerial photograph of the village. Our thanks go to the **Duchy of Cornwall** Dorset office and the Press Office at **Clarence House** in London. Finally, for his ingenuity I thank Art Editor **Steve Hunt** for cleverly blending the breadboard prototype unit into the photograph, making the i.f. 'cans' look like buildings! **Rob Mannion G3XFD**

The PW Poundbury

SSB Generator and Receiver IF Part 1

Tony Nailer G4CFY describes the development and circuitry of his latest project. It's aimed at providing you with the heart of a versatile s.s.b. transceiver. Puzzled by the name? If you are - Tony explains the background and we have the Duchy of Cornwall to thank for our front cover photograph!



A 'dead bug' prototype was built to verify the various stages. Not pretty perhaps - but it works.

The name for this project was chosen as the circuit forms part of a larger item. In this case a transceiver, and it's effectively work in progress, a building block even. Much like the new Poundbury village being built on the western outskirts of Dorchester. It is also a blend of modern and traditional techniques in an attempt to obtain the best of both worlds - just the same as Poundbury village does!

The Poundbury circuit is a traditional 9 or 10.7MHz single sideband (s.s.b.) generator using a double balanced mixer to create double sideband and a crystal filter to turn it into single sideband. It unashamedly uses the speech processor previously incorporated in the Mellstock transmitter - because it works well and includes the useful clipping indicator.

Block Diagram

The block diagram, **Fig. 1**, is particularly useful for this project to aid in grouping and classifying the various components with their specific function. For those unfamiliar with functional symbols I have used two or more sinewave symbols with a line through upper and or lower to indicate high-pass, low-pass and bandpass functions. In the middle of the diagram is a block containing an elongated 'S' which is the symbol for an Integrator. This is effectively a peak storage function, provided by a capacitor.

The following explanations of the circuit operation may require reference both to the block diagram, and the circuit diagram, **Fig. 2**.

Transmitter Side

The transmitter side starts with the microphone feeding a gain and clip control VR101 and into IC1d, one part of a quad operational amplifier (Op amp), with C16 and in the feedback path, to create an high pass characteristic with a corner frequency of 600Hz. The signal is amplified and passed through another high-pass filter C15 and R16 and further amplified by IC1c.

Speech consists of high levels of low frequency tones and low levels of high frequency tones. The intelligibility is conveyed generally in the tones between 800 and 1200Hz. Use of the two sections of high-pass filtering reduces the levels of low frequency tones so they are similar in amplitude to the higher frequencies.

Signal levels at the output of IC1c are about 4V p-p, and these are clipped by the base-emitter junction of Tr2 together with D5 to about 1.3V p-p. The clipping level is then 10dB, which is considered optimum between speech quality and increased power output.

Products of clipping will now exist within the audio passband and for several kilohertz beyond. The i.c., IC1b is a second order low-pass filter used to reduce audio harmonics beyond 2.4kHz.

Output from IC1b is at a level of about 650mV p-p and is fed to a port of the double balanced mixer D1-D4, T1 and T2. The Schottky diodes used, BAT42, are produced in large volumes with strictly controlled characteristics, which result in excellent balance.

The carrier insertion oscillator is a Colpitts parallel mode fundamental crystal oscillator with Tr3. Output is taken from a small value resistor in the collector circuit to

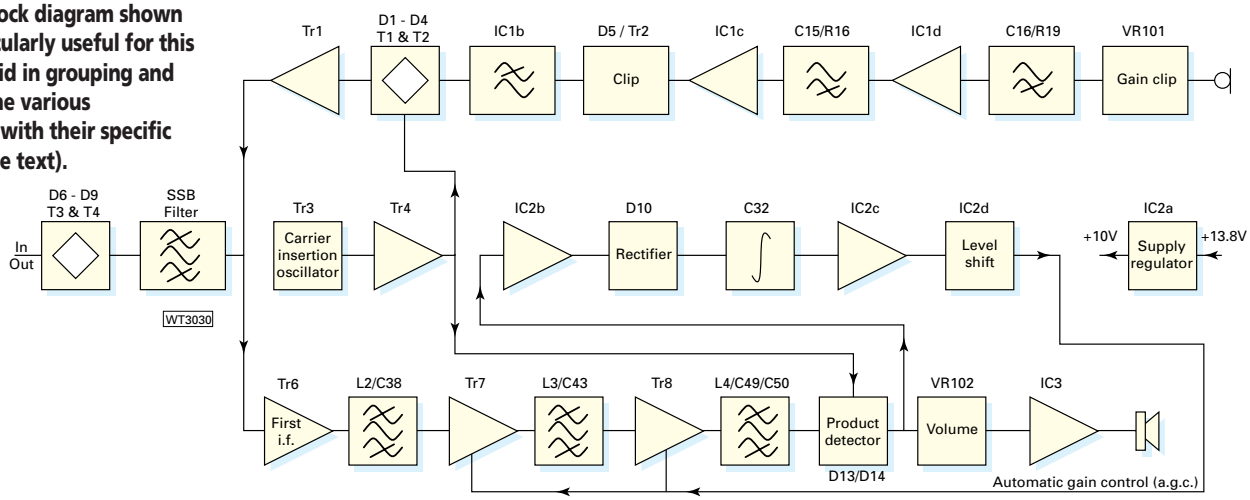


Fig. 1: The block diagram shown here is particularly useful for this project - to aid in grouping and classifying the various components with their specific functions (see text).

reduce loading on the oscillator. The transistor, Tr4 provides gain sufficient to drive the diode mixers with about 1.5V p-p at the carrier frequency.

Although not shown here, the connections from the carrier insertion oscillator to the receive and transmit mixers, are by means of miniature coaxial cables. **Note:** There's really no point in going to much trouble to suppress the carrier in the transmit mixer and in the filter, if the signal is radiated from printed circuit board (p.c.b.) tracks and bypasses these sections.

Similarly, on receive it's vitally important that the 1.5V p-p oscillator **signal is not allowed anywhere near** the input of the first intermediate frequency (i.f.) with its sensitivity in the microvolt region. Otherwise the carrier feed through would be sufficient to generate automatic gain control (a.g.c.) volts and desensitise the receiver.

Carrier Frequencies

Carrier frequencies are 8.9985MHz for upper sideband (u.s.b.,), 9.0015MHz for lower side band (l.s.b.) with a 9MHz i.f., or 10.6985MHz for u.s.b. and 10.7015MHz for l.s.b. with a 10.7MHz i.f. Precise frequency setting is **very important**, as the carrier should normally be set to be 20dB down the slope of the crystal filter passband. To achieve this, a multi-turn Tetfer trimmer capacitor allows correct setting of carrier frequency, and is very stable.

Output from the carrier amplifier, Tr4, is fed to the double balanced modulator. Here it combines with the audio to produce double sideband with suppressed carrier with an amplitude about 200mV p-p. This is amplified by Tr1 to about 2V p-p to feed the crystal filter.

The collector load resistor of Tr1 sets the correct termination resistance for the filter, usually 500Ω. Termination capacitance of the filter is provided by the sum of the value of C21 together with the capacitance of the collector of Tr1 and the input capacitance of Tr6 in the receive section. (The capacitor C21 can be changed to suit most filter types).

On the other side of the filter C20 provides the capacitive loading. Meanwhile, toroid T5 with a 3:1 turns ratio provides a 9:1 resistance transformation down to approximately 50Ω to feed the front-end balanced mixer.

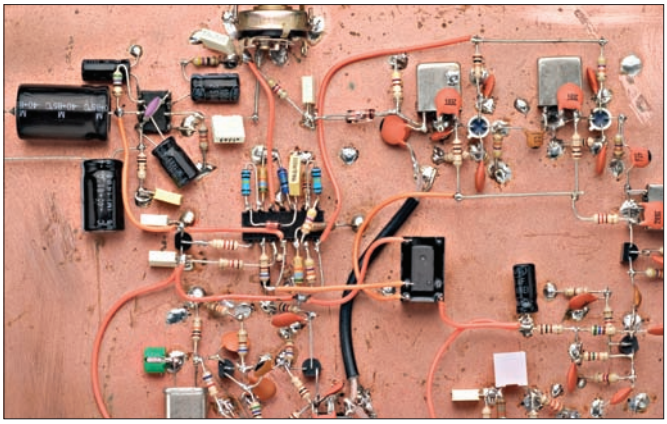
The s.s.b. signal emanating from the filter should be between 1 and 2V with carrier suppression in excess of 50dB. The sideband suppression is better than 60dB down, relative to the wanted sideband.

The front-end mixer can be used efficiently anywhere from 1 to 100MHz, and initially I hope that many readers will use it in conjunction with the **Portland VFO** project and the **Mixer-VFO** project to generate s.s.b. on 70MHz. Otherwise, it can be used with a 9MHz i.f. and a 5.0-5.5MHz v.f.o. to create u.s.b. on 14MHz or l.s.b. on 3.5MHz.

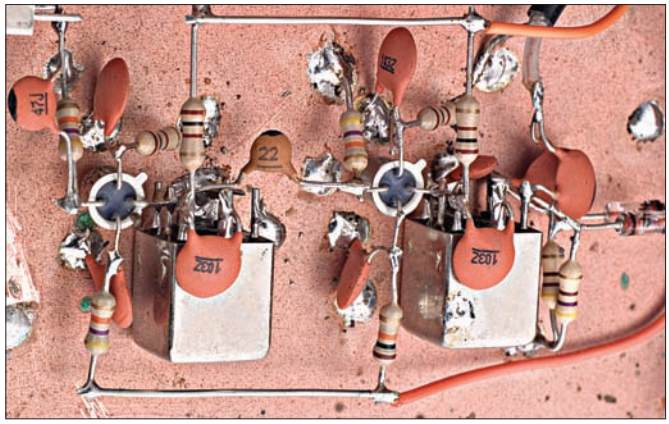
The transmit signal, translated to the required band will have an amplitude of between 0.1 and 0.2V at the mixer **In/Out** terminals. On 70MHz this would require a dual gate metal oxide semiconductor filed effect transistors (m.o.s.f.e.t.s) and two further stages to increase the power to around 500mW, then a two stage power amplifier (p.a.) to get to 25W output. On h.f. a m.o.s.f.e.t., followed by one stage would probably achieve 500mW and just one more stage to get to 25W.

The Receiver

On receive the signal is mixed with the local oscillator and the i.f. signal selected by the crystal filter. It then passes to Tr6, a low noise f.e.t., and then onto Tr7 and 8, each amplifying the signal and filtering out wideband noise by use of tuned circuits at the output of each stage.



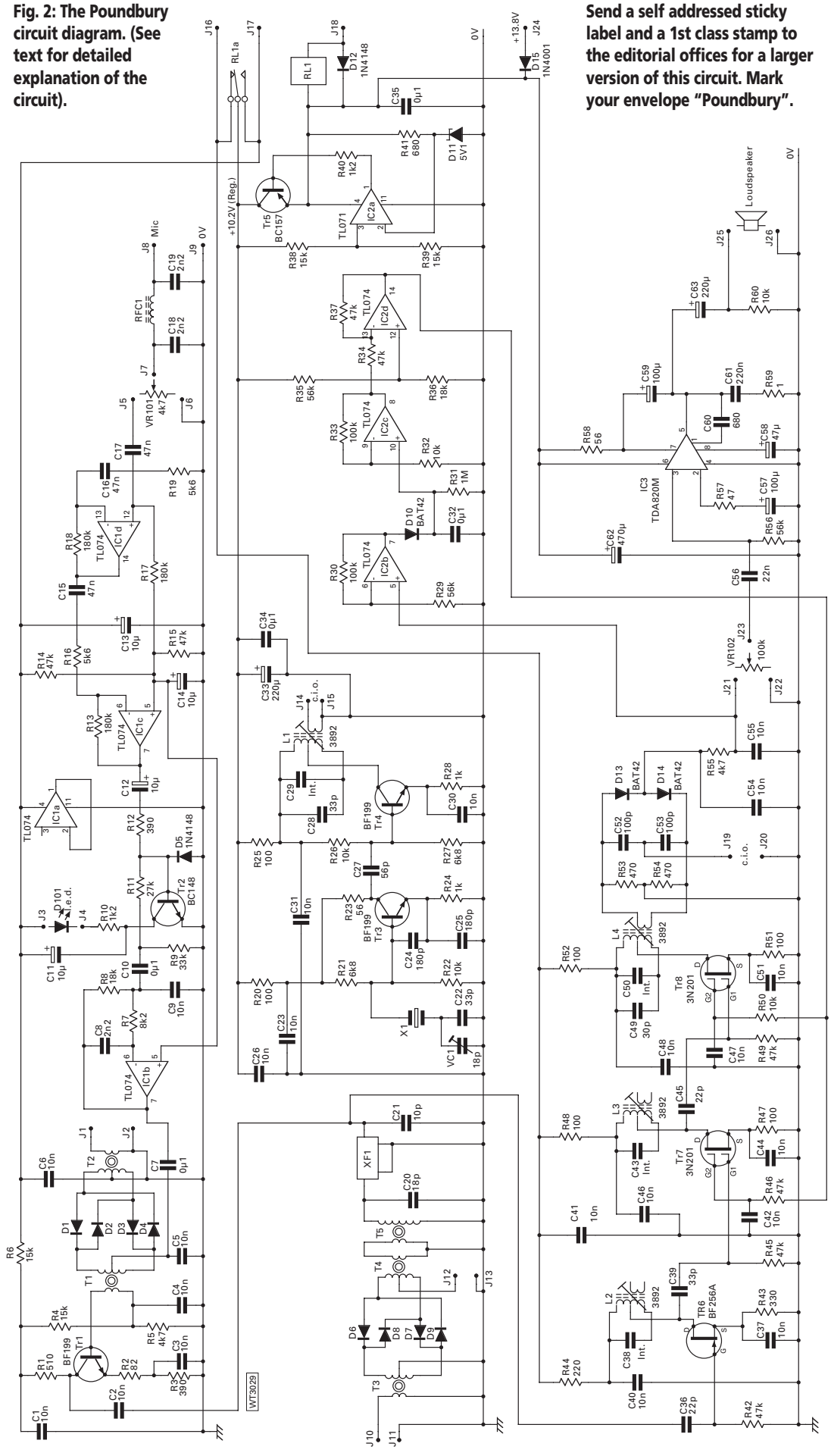
The audio output stage is top left, above the carrier insertion oscillator. In the middle is the T/R relay.



A closer look at the i.f. gain gtages around Tr7 and Tr8.

Fig. 2: The Poundbury circuit diagram. (See text for detailed explanation of the circuit).

Send a self addressed sticky label and a 1st class stamp to the editorial offices for a larger version of this circuit. Mark your envelope "Poundbury".



Output from the third i.f. stage feeds a full-wave product detector which is also driven from the carrier insertion oscillator. The demodulated signal passes through a low-pass filter to the volume control and then to IC3 audio amplifier.

The AGC Generator

The output of the full-wave product detector is also fed to the automatic gain control (a.g.c.) voltage generation circuit. An Op amp, IC2d, sets the a.g.c. voltage. With no signal or very low input levels the output of IC2c is at ground level. The voltage at the positive input of IC2d is 2.4V defined by R35 and 36. As R34 and 37 are equal value, if the junction of them is also 2.4V, then the output of IC2d must be 4.8V.

Audio at the top of the volume control is also passed to the input of IC2b, which has a gain of 2 and amplifies only the positive peaks. These peaks are fed to D10, which passes any positive signal greater than 200mV amplitude to charge capacitor C32. The resistor, R31, is chosen to discharge C32 with a time constant of 100mS.

The i.c., IC2c is also a direct current (d.c.) amplifier, this time with a voltage gain of 10. This means that signals producing a voltage of 720mV across C32 will put the output of IC2c at 7.2V. This is 4.8V higher than the positive input of IC2d so the output of that Op Amp will have to move 4.8V down so both inputs are the same voltage.

Working backwards through the a.g.c. generator 780mV across C32 requires about 920mV at the output of IC2b. This stage has a gain of 2, so it requires an audio half cycle of 460mV peak to drive the a.g.c. generator to full range.

The first i.f. stage has no a.g.c. applied, and is

relatively low gain stage, but with a high dynamic range. Transistors Tr7 and 8 each have a gain range of about 25dB for gate2 voltage between 4V and 0V. Together they achieve a 50dB control range with a very fast attack and a 100mS hold time. This is a very efficient a.g.c. system with a fast recovery that does not suffer from the 'click and whoosh' effect.

The a.g.c. to Tr7 is via R46 (47kΩ), which together with C42 (10nF) slows the a.g.c. action in relation to that of Tr8, which has R50 (10kΩ) and C47 (10nF). What this means is the last stage a.g.c. operates **before the previous stage**.

The Audio Amplifier

The audio amplifier i.c. I've chosen for the Poundbury project is the TBA820M. This lovely little device has already been fully dealt with in Doing It By Design (March 2006 *PW*). For those who have not read that article, it's a low-noise very stable device with up to 46dB gain. It will deliver 1W into an 8Ω load and is ideally suited to hand-held transceivers or shack radios where normal audio levels are typically 250mW.

The audio amplifier is quite simple and in all, the complete circuit uses just 12 other discrete components, which is a lot compared with other audio i.c.s, but none of the other i.c.s seem as tame and quiet as this device. The quiescent current of between 5 and 12mA is also much lower than many other audio i.c.s.

Receive Gain

During the design process, I found that with the a.g.c. disabled the voltage gain of the i.f. strip from the input of Tr6 to the volume control was 71dB. Voltage gain of the audio amplifier stage is 42dB.

The total gain from Tr6 to the speaker is the sum of the i.f. and the audio gain stages and is 113dB. In real terms this means a 2μV signal at the input of Tr6 will produce 1V across the speaker, which is 125mW of audio.

Typically, diode ring mixers have a conversion loss of nearly 10dB, so I assume together with the filter it will be around that figure. In terms of voltage this is a factor of three so this equate to a 6μV signal at the front-end mixer input to produce 125mW audio signal at the speaker.

The use of a tuned r.f. amplifier (either f.e.t. or m.o.s.f.e.t.) at the input is all that's required to produce a really effective receiver with good sensitivity. It has a low noise figure, and good dynamic range.

Supply Regulator

One of the Op amps in the IC2 package, IC2a, is used as a comparator and pass transistor driver. The Op amp will always move its output in a manner to try to keep both inputs at the same voltage. Therefore, if the voltage on the negative input as defined by the Zener is 5.1V then with equal value output sampling resistors R38 and 39, the regulated output will be exactly 10.2V.

If the regulated output drops below 10.2V, the positive input will fall below the negative one and the Op amp output will drop dramatically. This will draw more current through the base emitter junction of Tr5 and cause the device to conduct harder, which will drag the output voltage up again.

The pass transistor, Tr5 (BC157) is rated at 350mW total dissipation. With an input voltage of 13.5V and an output voltage of 10.2V, this means there's 3.3V across the device. The maximum safe current it can then supply is approximately 100mA.

Excluding the audio amplifier and relay, which are powered directly from the 13.5V rail, the receive side consumes about 40mA and the transmit side 30mA. This includes the supply to the carrier insertion oscillator. The audio amplifier consumes between 5 and 10mA quiescent and the relay draws 45mA when it's activated.

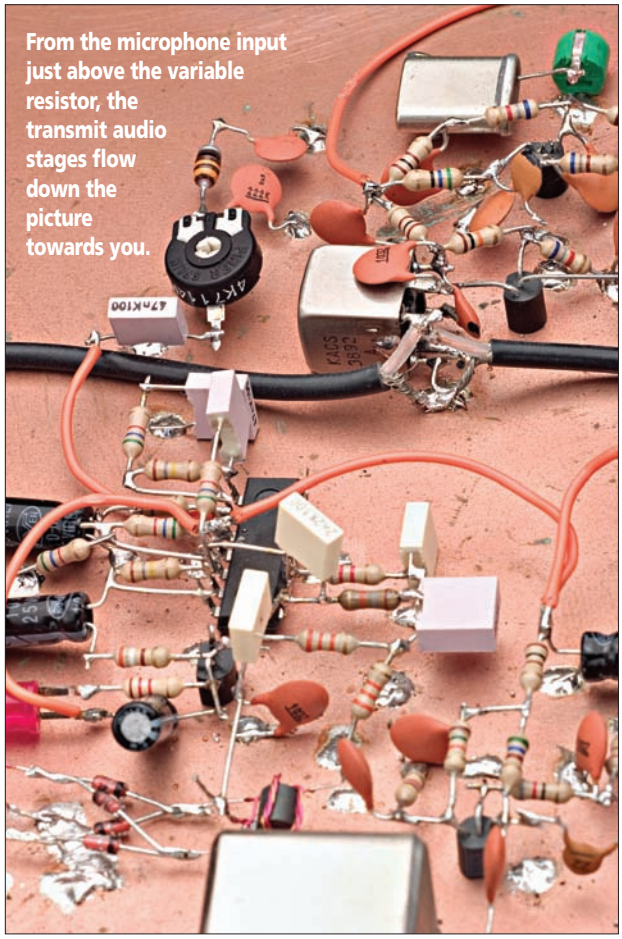
On the p.c.b. design I have provided outputs of receive 10V and transmit 10V on pins J16 and J17 respectively. These can be used to power receive and transmit r.f. stages.

Inefficient Relay

The relay is not very efficient in terms of its power consumption and I spent many hours developing a circuit to achieve make-before-break switching of receive and transmit. The circuit is quite elegant but requires nine resistors, two capacitors, two diodes, two i.c. comparators, and two transistors!

The circuit would only waste about 3mA on receive and 6mA when on transmit, driven from the 10V rail. Unfortunately, I decided the complexity did not justify its use!

In Part 2, we'll look at the constructional stage. In the meantime, don't forget you can contact me via the Technical for the Terrified link (see page 16) to discuss points arising from the projects. **PW**



From the microphone input just above the variable resistor, the transmit audio stages flow down the picture towards you.

Direct Replacements for The 40673

Editorial note: The 40673 m.o.s.f.e.t. has long been a favourite with the home constructors, particularly by the QRP fraternity (The **Rev. George Dobbs G3RJV** discusses the device in Carrying On The Practical Way this month on page 48). In fact, several of Tony G4CFY's projects published in *PW* in the past also used the device.

However, I'm pleased to announce that following a suggestion from me - Tony G4CFY at Spectrum Communications now has a moderate stock of the 3N201 - a direct equivalent of the 40673 dual gate m.o.s.f.e.t. (they are directly interchangeable).

Price is £2.25 each any quantity, postage is 50p regardless however many are ordered **(cheques payable to A.J. and J.R. Nailer**). Please contact **Spectrum Communications, 12 Weatherbury Way, Dorchester, Dorset DT1 2EF**. Telephone and FAX: **(01305) 262250.** I thank Tony for sourcing the replacements on behalf of *PW* readers - he had quite an involved oriental quest getting them!

Rob Mannion G3XFD

144MHz Sideband?

Go on - try it for yourself!

Joe Butt G0JJG encourages readers to enjoy using 144MHz s.s.b. And as he explains - it can be great fun. You could even start the process by joining in the PW QRP contest with low power s.s.b. transmissions!

As I sat down to write this article, I'd spent yet another evening listening to the same regulars chatting on 144MHz s.s.b., bemoaning the fact that v.h.f. activity has dropped. The regulars were chatting over the topic, that "outside contest times, the best of tropospheric openings provides some activity, but nothing compared to that of the late 1970s and early 1980s", the period when I first operated on the band.

I've noticed myself that even the QSO (contacts) counts of the big contest stations seem to have dropped from the 1000 plus rate of the 24 hour events achieved a few years ago, back to the 600 region. This can only be due to the fact that there aren't as many active stations.

Perhaps everyone is using the digital modes now? There must be some reason for the drop in activity. Perhaps also, the general release of the h.f. bands to all Licensed Amateurs has made the band less appealing?

Either way, from my home in Suffolk on the East Coast of England, I've worked (and confirmed!) the following countries; SP (Poland), OZ (Denmark), US5 (Ukraine), EA (Spain), 9A (Croatia), SM (Sweden), LA (Norway, HB9 (Switzerland) to name a few. And of course I should also mention the 'more local' PA (the Netherlands - Holland), DL (Germany), F (France), ON (Belgium), the list goes on with all parts of the UK and associated Islands - and these contacts were all achieved in the last two years!

Newcomers To The Band

I think that nowadays, newcomers to the band probably take a listen on s.s.b. - hear very little and consequently don't discover the many plus sides of the mode. So, for those who really haven't discovered the band, this article is intended as a basic guide and incentive for those who might like to give this excellent s.s.b. mode a try out on v.h.f. So, let's now look beyond the local chat on narrow band f.m. (n.b.f.m.).

First, you don't need to be a 'big gun' to survive – you can have a lot of success with a small horizontal Yagi and a few watts. Second, as with many modes, experience of where and when to listen (time and direction) is beneficial. Additionally, the desire to make contacts to the best of your stations capability is a great incentive!

Also, s.s.b. is an efficient mode and you can work more miles per watt while taking up less bandwidth than any of the other voice modes. During the cooling of a warm summer evening the band would be alive with plenty of QSOs. I particularly remember one opening in November 1979 where there was so much activity it was almost impossible to find a clear space, and even a CQ call on 3W generated a small pile-up!

I recently heard a fairly well established local on 144MHz f.m. complain that he couldn't work anyone because of all the 'lift' QRM! He was missing a great opportunity to work across to the near continent on another mode, I still find it exciting when the band 'opens'.

When I was first licensed as G8OYW, back in 1978, I had no real intention of staying on v.h.f., I wanted to progress to h.f. quickly, having spent several years as an s.w.l. But 2m opened up a whole new arena and delayed the 'upgrade' to h.f. for 10 years! Square hunting – looking for new QTH locators – became quite an obsession.

Suitable Equipment

So, how about suitable equipment? Well, really, you need the rig, some kind of antenna, and ideally a means to rotate the array. As the antenna is the most important thing, I'll talk about that first.

Horizontal polarisation is a must, as s.s.b. and c.w. operation has historically evolved using this orientation, and the cross polarisation losses with vertical stations are surprisingly great. Use a small 8-element Yagi mounted on the gable end of the house about 10 metres (30ft) high – just above the apex of the house roof, (heading photograph). Switching between this and a vertical for f.m. the GB3VHF beacon at Wrotham in Kent, on 144.430MHz drops from S9+ to S1 here in Suffolk!

Even the tiny 2-element HB9CV Yagis can produce surprising results. The smaller TV type rotators are sufficient for modest Yagi antennas (up to about 12 elements), and can be found advertised (new) for about £40.

Many 144MHz multi-mode transceivers can run 10W peak envelope power (p.e.p.) output on s.s.b., this is enough much of the time and I enjoy using my older 3W output Icom IC-202. More power is useful, but does of course run the risk of creating TVI for those of us with lots of neighbours.

I recently bought a Yaesu FT-290R (this is a 2.5W portable rig) for £20 at a rally. It was tatty and needed a small repair, but proves that you can get on the air for a very modest cost!

Calling Channel

Consultation of the band plan reveals the calling frequency on 144.300. For newcomers, the idea is to call "CQ" on 144.300MHz, during which time it's a good

idea to announce your locator, or county, as well the direction in which you are beaming. This allows stations hearing your CQ to ensure they are beaming toward you.

Such a call tends to be along the lines of "CQ CQ CQ, beaming south west from Suffolk this is Golf Zero Juliet Juliet Golf" and so on. Make your calls reasonably short but frequently over a few minutes until you receive a reply. This will allow stations hearing you weakly to 'peak' their antenna direction.

When you establish a QSO, you should agree to QSY to a clear frequency (don't forget to check that the frequency is clear at both ends) to allow the calling frequency to be used by others. Avoid the area around 144.370MHz as this is used for the digital WSJT mode. Operating on s.s.b. should be between 144.150 and 144.360MHz to avoid disturbing the digital operators.

And it really is that simple! Location is a factor, but the average station should expect to be able to work perhaps as far as 160km (100 miles) under flat band conditions.

Propagation On VHF

Let's now look at propagation on v.h.f. and what follows is most definitely not a comprehensive list, but it should give a feel for the basics. Troposphere propagation, or 'Tropo' for short, extends propagation ranges by refracting or bending signals.

Good Tropo openings occur when there is a temperature inversion – the temperature of the air at ground level is actually cooler than that above it. This is associated with high pressure and the best openings seem to occur when you are on the periphery of a collapsing anticyclone.

The effect often occurs on hot days when the temperature drops rapidly in the evening. Generally a 10°C drop is regarded as being the minimum to trigger an inversion. For this reason the propagation often peaks around sunset and dawn, but don't confuse this with h.f. grey line propagation enhancements, which are a different phenomenon entirely.

If the band is quiet it's useful to monitor some of the beacons – they'll always increase their signal strength when there's an enhancement, and in really good openings they can become extremely loud. Recently, I came home one night to find EA4VHF/B at S9+ for several hours. It is normally inaudible at my location.

You'll often hear longer 'rag chew' type contacts going on and as the propagation tends to be quite stable this is usually acceptable practice should this be your desire. However, be mindful of the fact that some DX will be in demand by many others waiting.

Sporadic-E is probably the most exciting type of opening. Short openings occasionally occur generally during the period from late May until late July, resulting from ionisation of the E layer of the ionosphere (hence the term). Stations from around 1000km (600 miles plus) will appear, often at huge strength, and within minutes vanish again as the ionised cloud moves.

Joe G0JJG enjoys using his 3W output Icom IC-202 and has recently bought a Yaesu FT-290 transceiver (see text).

Sporadic-E QSOs should consist of callsigns, report and locator, and nothing more! This maximises the chance of success and also gives everyone a fair chance of a contact. If you start to give name, town, weather, relative humidity and what you had for breakfast, the propagation will invariably have gone before the end of the over. The unstable nature of Sporadic-E also makes it very geographically selective – you may be unable to hear stations worked by Fred 16km (10 miles) away and vice-versa.

Aurora (often referred to as the 'Northern Lights') can produce v.h.f. and u.h.f. DX. The auroral curtain reflects signals, but the movement distorts signals making them sound like distorted whispering. The further north you are, the more likely you will regularly be able to participate. (The south of England may see only a handful of openings in a year).

The most unique requirement with auroral propagation is that **you don't point the antenna** at the other station. Instead, you direct the antenna north (or at least somewhere between NW and NE) to find the point of reflection. (Visual and radio auroras can occur independently).

There are other propagation modes. However, some of these need high power, large antenna arrays and specialist operating techniques, these include Moon Bounce (bouncing signals off the moon), Meteor Scatter (bouncing signals of meteor trails), and FAI (Field Aligned Irregularities). These are all advanced techniques but remember, this is Amateur Radio, and we are all developing our own communication skills to the best of our abilities!

Activity Times

Obviously there is more activity at weekends or in the evenings and there is often a lot of extra activity prior to contests. The first Tuesday evening of each month sports both the Scandinavian activity contest, during which stations in the east of the UK can often make contacts with some of the large Danish and Swedish contest stations. This is timed to coincide with the RSGB activity contests, so even those limited to vertical antennas should be able to make some contacts.

It's worth keeping an eye on the Weather forecasts, if there is high pressure moving over then look out for tropo openings. Even when low pressure is dominant there can be short openings along the plane of a weather front. Even aircraft can enhance signals for a few minutes over paths of several hundred kilometres (you've probably already noticed 'aircraft flutter on Band II v.h.f. f.m. broadcast radio at times).

Feel Encouraged?

Hopefully, this will encourage a few more *PW* readers to try 144MHz s.s.b. for themselves, newer Licensees do of course have immediate access to the h.f. bands. They may not even realise what can be achieved on v.h.f. and up and perhaps the declining sunspot numbers over the next few years may tempt a few more operators back as well. **PW**

Editorial note: Now that you've read Joe's own enthusiastic article on 144MHz s s.b. operations - why not join in the activity yourself? Once you're active our regular specialist v.h.f. DXing column - VHF DXer, hosted by **David Butler G4ASR**, would welcome your activity reports. David G4ASR regularly explains the various propagation mediums and provides plenty of warning to (hopefully) expected special events such as the regular meteor showers. It's a truly fascinating World of Amateur Radio up on v.h.f! **G3XFD**

In The Shop

with Harry Leeming

We welcome Harry Leeming G3LLL to the regular team of PW authors. In his bi-monthly series of articles he'll discussing repairs from his days in the radio trade and passing on some useful hints and tips along the way.

In any business your best advert is to make a customer's visit a pleasant experience so that they'll want to return. Occasionally though, you'll meet the kind of customer who you never wish to see again, such as the 'Clever Dick' type who tries to embarrass staff in front of a shop full of customers!

'Dick' arrived in my shop on a busy Saturday afternoon with his faulty FT-102 and proceeded to berate Yaesu, myself and the Amateur Radio trade in general. Why did we sell such rubbish he wanted to know? His rig had packed up again and this was the second time the mains transformer had burnt out.

While 'Dick' carried on ranting and raving, and the other customers pressed round wondering what was going to happen, I quietly unscrewed the fuse at the rear of the rig. I then held it up in triumph, for everyone to see. It was shorted out with metal foil.

Not my idea of a fuse!

To complete the job I took the cover off and there, in addition to a well toasted mains transformer, were three Power Amplifier (p.a.) valves with the glass melted, and a blackened p.a. anode High Tension (HT) feed choke. I informed 'Dick' that the cost of a repair would be something in the range of £400 and that he had better take great care of the piece of metal foil, as it would probably be the most expensive bit of foil he was ever likely to own. At this, 'Dick' grabbed hold of his rig and decided to beat a hasty retreat, much to the amusement of everyone present.

Whilst I have replaced dozens and have also condemned loads of equipment as 'beyond economic repair' due to a burnt out transformer, mains transformers are basically reliable devices. I can only remember one or two occasions where the trouble was actually caused by the transformer, in all the other cases the burn out had been caused by some minor fault, which should have blown a fuse - had the correct one been fitted!

Amateur Radio equipment is now made for the world market and is often supplied with a spare set of fuses. Equipment set to operate from 115V, as used by more than half the World's Radio Amateurs, takes twice the current and needs double the size of mains fuse, compared with equipment that runs from 230/240V. The correct fuse for rigs like the FT-102, FT-101 FT-101ZD and FT-902 etc., with valves in the p.a. stage, running an input power of around 200-250W and used on a UK supply, is 2.5 or 3A 'quick blow'.

If you fit the 'spare' 5 or 6A fuse intended for 115V operation, a 'slow blow' fuse, or short it out, you are running a terrible risk and should some minor fault develop, such as a short circuit rectifier or p.a. valve, your rig is likely to end up as scrap. So, do yourself a favour, and have a look as to what fuse is fitted now, as the last quote I had for a transformer for an FT-101ZD was well over £200. (If anyone knows of a good cheap transformer rewind service, I would be interested to hear about it).

A Jammed Tuning Control

When I was in the radio repair business, how much to charge an hour was a question that I never gave a straight answer to. I always expected a customer to pay what a job was worth and not by time. The amount of time spent on a repair tends to be in inverse proportion to the skill and the amount of experience the repairer has with the equipment.

John took his FT-757, which was a few hundred Hz off frequency and on which the tuning control had jammed up solid, to a competitor to ask for a quote. The engineer reckoned that the work would take about two to three hours at £30 per hour, plus the cost of a new photo interrupter control and said that at a rough estimate the cost would be £100. He stated that the small frequency discrepancy was best left alone. Fair enough? Well certainly, as some importers now charge as much as £50 an hour for servicing their equipment, this does not sound too bad.

If however, another engineer knows of a short cut and can cure the jammed tuning and the frequency discrepancy in around 30 minutes, without the need to replace the control, would you not be happier to pay him say £30, (i.e. £60 per hour), rather than £100? Even better, what if after investing in a subscription to *Practical Wireless*, see page 64, you find that you can cure both the faults yourself at no cost at all? (Sorry about the 'plug', but I have been flogging things almost all my working life and old habits die hard).

Yaesu photo interrupter tuning controls (sometimes called 'chopper' encoders), going back as far as the external digital variable frequency oscillator (v.f.o.) for the FT-901, have tended to jam. You would think that running out of lubricant would just make the control become stiff, but on some pieces of Yaesu equipment they just lock up solid.

When undertaking the repair of any of these items of equipment the first move is to remove the control knob. Sometimes there is a 'rubber tyre' on the knob, if so remove this and then see if there is hole for inserting a screwdriver or Allen key to loosen it. Often the knob is just a push fit and if this is the case you will need a really strong pull. It is best to get someone else to hold onto the rig, whilst you grab the knob with something like a towel and heave like mad to release the knob.

Once you have removed the knob (and recovered!), lay the equipment on its back with the spindle pointing upwards. Run a little WD40 lubricant down the spindle and grab it with a pair of pliers. Now pull, push, and twist the spindle until it eventually moves. Add more WD40 as necessary and work at the spindle until it becomes freer. At this stage clamp the jaws of a hand drill, (not an electric one!) on to the spindle and gradually work it backwards and forward until, with the help of more WD40, it becomes completely free.

All that remains is to wipe off the WD40 from the front, replace the knob, and then

Harry has seen plenty of Yaesu FT-102's with burnt out transformers often due to the incorrect fuse being fitted.

Repairing rigs like the FT-757 can be costly business so make sure you shop around for the best price and workmanship.

adjust the friction screw under the rig for the desired amount of freedom of spin on the control. Easy when you know how!

Cracked Valves

Quite a few years ago one of my hi-fi customers appeared with his Rogers hi-fi stereo amplifier, which was weak and distorted on one channel. A quick examination soon showed that the glass on one of the ECL86 output valves was cracked and so I plugged a new valve in, checked it out, and sent it back home.

A couple of months later it was back again, but this time an ECL86 in the other channel was cracked; a strange coincidence? I checked the voltages, gave it a full 'MOT' but could find no other fault, and so sent it home.

Six months later another cracked ECL86 appeared, what on earth was going on? I knew its owner Tony quite well and quizzed him about the obvious things, such as ventilation, but to no avail. In our general discussion he happened to comment that perhaps things were just getting more unreliable.

Why are we always having to fit new electric lamp bulbs now, when they used to last for years? Now valves and electric light bulbs are not that far apart in technology, and a thought suddenly struck me, 'what about his mains voltage'? He lived in a small village, and so this seemed a distinct possibility. Tony did not seem the type of person who would electrocute himself, or wreck a test meter so, I sent him home with an AVO.

Tony came back next week; his 240V mains supply, which at that time was guaranteed to be within ± 6%, approx 254-225V varied between 250 and 265V, hence the problem with the cracked valves. He phoned up his electricity supply company to complain and they then installed a mains voltage monitor in his house; this confirmed that the village supply was way outside of the legal limits. The supply company's engineers then adjusted the tap on the village transformer to bring the supply within tolerance and everyone was happy? Well no, not everyone!

Several viewers with older TV sets found that their sets were now a little short of height and width, and the village store, which previously had been doing a roaring trade in replacement electric light bulbs, found that sales suddenly stopped, leaving them with excess stock. Tony asked me for copy invoices for the repair work that had been carried out, saying that he was going to try and get some compensation. No doubt, as with any small Lancashire village, news would soon get round as to what had happened and the electrical supply company would be besieged with requests for compensation for actual, and imagined, damaged to the villager's electrical equipment.

Checking Mains Voltage

Checking the mains voltage, or the equipment's mains voltage setting, is not only applicable to hi-fi equipment. In the 1970s and 80s Yaesu made quite a lot of equipment for the continental company Sommerkamp, some of which was re-exported to the UK. Much of this equipment was imported still set at 220V and often turns up for repair, with blown high voltage components.

Not long ago an FT-101ZD was brought to me for servicing, and when I eventually got it going I noticed that the power output was much higher than normal. A quick look at the connections to the primary of the mains transformer showed why, it was set at 220V. The owner was lucky, if his mains had surged to above the 250V mark, the 900V HT line would have gone way above 1000V and the main smoothing capacitors would probably have exploded.

The mains in the UK at the moment is normally something in the region of 230-240V, as despite the fact that we have 'harmonised with Europe at 230 volts', the actual voltage has not changed. The official 'harmonised' mains voltage is now 230V ± 10%, which means that it can be anywhere between 207 and 253V. You don't understand? No neither do I; perhaps the next time someone comes knocking our doors looking for votes for our Euro MPs we could ask for an explanation!

PW

Harry's waiting to hear from You!

As I am now retired and like to hear about problems with older equipment, particularly pre-1990 Yaesu rigs so, I look forward to hearing from you. Send me an E-mail with your return address or enclose a stamped addressed envelope, if you want a direct reply. Send your queries to: **The Cedars, 3A Wilson Grove, Heysham, Morecambe LA3 2PQ Tel: (07901) 932763, E-mail: harryleeming@tiscali.co.uk**

Remember the mains supply is potentially lethal. Unless you really know what you are doing, always pull the mains plug out, do not just switch off at the wall socket, when working on equipment.

Please note: Everything published in this column is based on fact. All characters and events are the product of the author's experience, and any resemblance to real persons living or dead is purely intentional.

Only the names have been changed to protect the publisher!

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Weight: 12 lbs (5.4 kg)
Impedance: Nom 50 ohms
VSWR: 1.5:1 or less
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Speech Compressor for the Yaesu MH-31 mic and FT817 FT857, FT897. Improve the TALK POWER.

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You can also enjoy the "MAX PUNCH" option that features the HC-4 with the OBP and the HC-5 (w/o OBP). The TONE switch is used to select which element is operational.

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The One BIG Punch is an AF-based speech compressor specifically configured to provide remarkable increase in talk power while maintaining good audio quality. The OBP is NOT a clipper, but a compressor providing great voice compression, high-level limiting, and noise gating. The unit can be mounted inside the MH-31, requires no additional electrical power, and can be turned on or off by using the MH-31's TONE switch.

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OBF £229.95

Replace two filters in the space of one. OBF includes the two optional filters and fitting.

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for the Yaesu FT-817, 857 & 897.

500 Hz CW - £94.95 ***2.3kHz SSB - £94.95***

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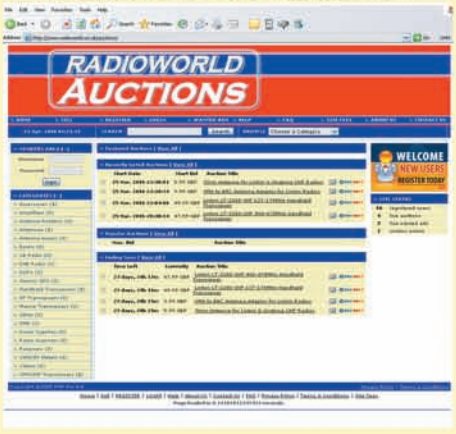

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A Sensitive Wavemeter

James Brett G0TFP shows you how to make a sensitive wavemeter, covering from 1.7 to 160MHz - making it ideal for an h.f. to v.h.f. project. It can be used to find out band signals, relative signal strengths from antennas or for tuning up multiplier amplifier stages to name but three uses!

A simple tuned circuit absorption wavemeter is a great tool for finding out-of-band spurious transmissions. Such an instrument is essentially just a simple variable tuned circuit and a diode detector feeding a meter circuit. But the problem with this form of the conventional wavemeter circuit (in effect a crystal radio) is its lack of sensitivity. In this article, I'll describe a much more sensitive version whilst still keeping the essential absorption wavemeter principles.

Until recent years the Amateur Radio licence regulations booklet *BR68* required the Licensee to have a wavemeter. The regulations then in force, made it desirable to be able detect up to the second and preferably the third harmonic of the transmitted frequency. There is no longer a statement, to that effect in the current *BR68,* but there's still the requirement to ensure that the Licensee is not transmitting out of band - harmonically related, or otherwise interfering signals.

However, the simple wavemeter is still a satisfactory tool to use for checking for unwanted spurii. It's also always a useful piece of equipment for the home constructor to have to hand.

Conventional Wavemeter

The conventional wavemeter circuit, shown in **Fig. 1**, lacks sensitivity for two reasons. Firstly, sufficient energy has to be 'pumped' (induced) into the tuned circuit to overcome the forward voltage drop of the diode acting as the detector.

Secondly, the loading of the meter circuit has the unfortunate side effect of dampening the overall *Q* of the tuned circuit. Any reduction of the circuit's *Q*, reduces the voltage that could have been developed across it. The reduction of the circuit's *Q* also makes frequency determination less accurate.

To get over the shortcomings, my mind went back to the days of valve radio and the workhorse of old valved t.r.f. (tuned radio frequency) receivers. In many of the circuits, the detector was the grid leak detector.

A typical valved part-circuit is shown in

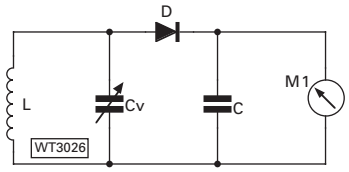


Fig. 1: The simple tuned circuit wavemeter is in reality a modified 'crystal radio'. But it can be improved upon.

Fig 2: Improving the sensitivity and accuracy was originally carried out by using a valve as the detector and amplifier, though the circuit shown here was part of a radio rather than a wavemeter.

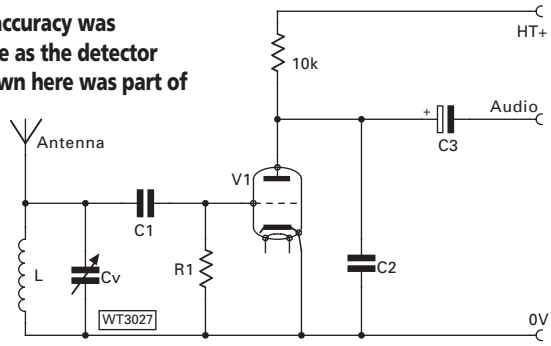


Fig. 2. If we look at the principle characteristics of the *n*-channel field effect transistor (f.e.t.) there are functional similarities. As a negative voltage is applied to the grid of the valve (or the gate of the f.e.t.) the current through the device is reduced.

Both the grid-to-cathode and gate-to-source exhibit the rectification properties needed for this type of detector. It was these properties that led to the design of the circuit shown in **Fig. 3**. A circuit, which, because of its high input impedance, overcomes many of the disadvantages of the basic diode wavemeter and also gives the advantage of the gain due to the valve or f.e.t.

The potentiometer, R3, is used to set the meter reading to zero with no signal present. When a signal voltage is developed across the tuned circuit the f.e.t. gate-source behave like a diode as the signal's level rises.

Rectification, due to the positive going signal at the gate-source junction, causes a d.c. voltage to build up across C1. The resulting voltage that's 'created' will have its negative side (with respect of the 0V line) being offered to the gate of the f.e.t.

So, when a signal is detected and the the gate-source voltage is made more negative the drain current will fall and with less current through R2 the voltage on the drain will rise. This rise is detected by the meter, which is acting as a voltmeter. When the signal is removed the charge on C1 is dissipated through R1 and the meter will return to zero. Diode D1 and D2 prevent the meter being overloaded should the potentiometer be incorrectly set.

Determined By Size

The actual size of the enclosure will be largely determined by the size of C_V and the meter but a suggested layout is as shown in the photograph of my prototype, **Fig. 4**. Holes for the coil sockets should not be drilled until the first coil has been made and the exact pitch of the pins known.

The most important points are to keep the tuned circuit and wiring to the f.e.t. gate as short as possible. The f.e.t., the two resistors R1/R2 and capacitors C2 and C3 are mounted on the piece of stripboard. The diodes D1 and D2 can be mounted directly across the meter terminals and C_V between the sockets. Plug-in coil formers are no longer easily available except at the odd rally so it's d.i.y. time again.

Coil	Dia (mm)	Turns	Inductance (µH)	Range (MHz)
L1	20	100	69.0	1.7 - 6.5
L2	20	17	7.2	5.25 - 22
L3	20	3	2.1	17 - 77
L4	10	1.5	0.3	40 - 160

Table 1: If you use a 200pF variable capacitor, then coils made to these dimensions should give the coverage as shown. Other variable capacitors, may need some adjustments of the values shown.

Plastic Conduit

The coils are wound on short lengths of 20mm plastic conduit. I've put some suggestions for coils in **Table 1**, which should give the coverage shown with a 200pF capacitor for C_V. If you use a different value variable capacitor then the ranges covered will be different, or you'll have to create other values for your coils.

The four coils in the photograph of **Fig. 5** show that I've made my own 'pins' for the various coils. The pins are formed with 1mm bare copper wire obtained by stripping the main conductors from 1mm mains lighting cable. The fitting of these pins is as shown with the shake-proof washer between the conduit and the loop formed with the 1mm wire.

I use 10mm 6BA bolts to hold the pins in place as I had them to hand. You could also use similar 3mm diameter bolts for the task. The bolts are inserted from the inside of the plastic tube. And the pin is then placed on the bolt. With the first nut done up tightly, the short pins are quite rigid.

For the three lower-range coils I used 0.38mm (28s.w.g.) diameter enamelled copper wire. The v.h.f. coil was made from a length of the 1mm copper wire used to make the pins. The windings are made tightly on the plastic former, with the wire ends passed through to the solder tags on the bolt. The ends of winding are kept in place by passing the wire into and out of the conduit former, through suitable small holes.

When the coil is finally finished and tried, then it may be varnished by dipping it in a normal oil based varnish. Be careful not to dip the end of the pins.

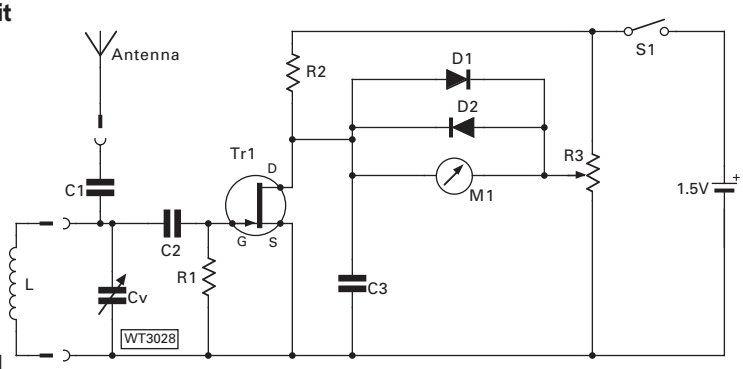
The suggested table of coil turns is given as a guide. If however, a different value of capacitor C_V is used, trial and error will have to be used when creating the coils.

Testing & Calibration

After a careful wiring check, fit the battery and set the potentiometer, R3, to mid position and switch on. If the meter reads below zero turn the potentiometer clockwise to bring the reading to zero or anticlockwise if the reading is above zero.

Fig. 3: The modern variant of the circuit of Fig. 2 and translated into a fully functional wavemeter.

R1	**5.6MΩ**
R2	**470Ω**
R3	**500Ω**
C1	**10pF**
C2	**10pF**
C3	**100nF**
D1, D2	**1N4148**
M1	**100µA f.s.d.**



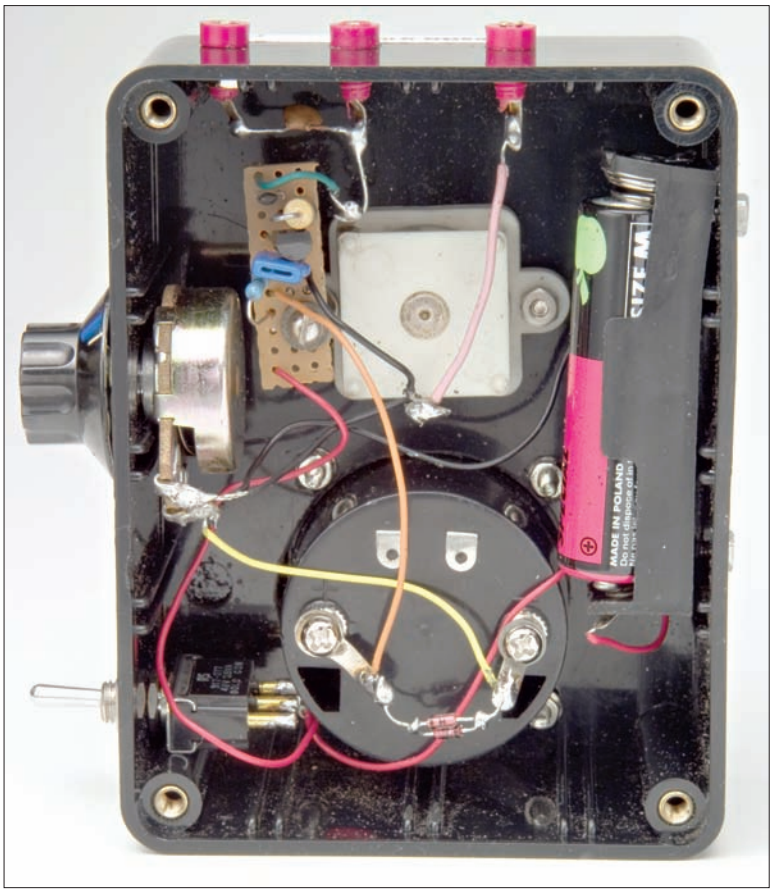


Fig. 4: Inside James' prototype sensitive wavemeter. The small sockets used for the coil and antenna are 1mm diameter types that were available.

Fig. 5: The four coils shown allow measurement to be made from the 'Top-band' (1.8MHz) to 'two metres' (144MHz). See text for details of the pins.

To calibrate the unit, you'll need a signal generator or dip oscillator. If you're using a signal generator feed this into a coil of a few turns and offer this coil up to the wavemeter. Once the signal has been detected, separate the two coils as far as possible whilst still keeping a small meter deflection. (This ensures that the inductance of the test coil does not affect the calibration of the wavemeter).

The same process applies when using a dip oscillator for calibration, since close proximity of the wavemeter coil can also alter the calibration of the dip oscillator.

Tabulate the values for each coil and draw a simple graph as I've shown in **Fig. 6**.

This design can easily be modified to cover v.h.f. Change C_V to a small air spaced capacitor, of say 30pF, and keep the wiring between the capacitor and coil sockets extremely short. The coils of half a turn up to two and a half turns are made self supporting using 1mm wire at a diameter of 10mm.

Constructing this piece of test gear should prove useful in more ways than one. Not only will it satisfy any Government Inspecting Officer but give you the satisfaction of knowing that you are doing things properly. Additionally, the wavemeter can be very useful round the work bench checking oscillators and generally using the antenna input for signal tracing.

So, there you have it, a simple, yet useful piece of test equipment. **PW**

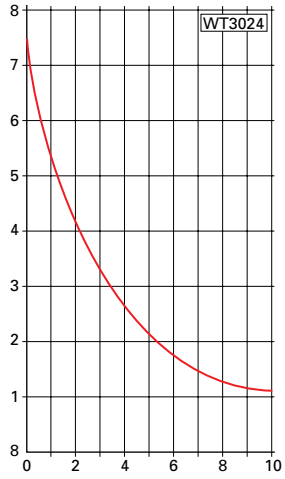
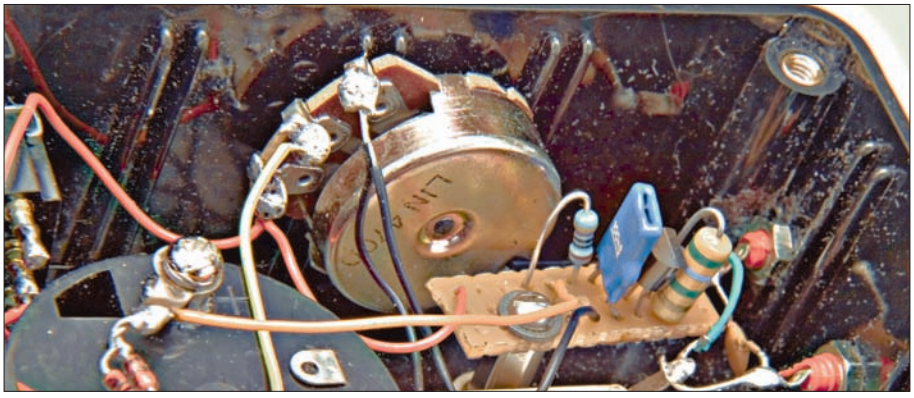


Fig. 6: This is the general form of a calibration chart. You will have to create a chart for each of the coils used.



An oblique view inside, showing more detail of the small piece of matrix board holding the few components.

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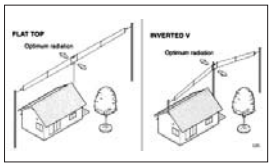

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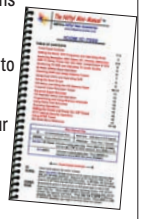

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Flex-Radio SDR-1000 R

Robin Trebilcock GW3ZCF was cheered up by a telephone call on a dark winter's day. He was being offered the opportunity to try out a software based radio system - and wasn't disappointed with the experience!

Fig. 1: The Flex-Radio is completely different. The radio itself consists of a black box measuring 100 x 250 x 240mm. On the front panel there's only an On/Off switch, microphone socket and a cooling fan (see text).

It was a dark, cheerless day in early December, grey clouds overhead and a chill in the air. Then the telephone rang, the caller was *PW* Editor **Rob Mannion G3XFD**.

After an exchange of pleasantries Rob said "Robin - would you like to review the Flex-Radio SDR-1000, a new software radio, which is shortly to be imported into the UK"? Would I just! Suddenly the clouds broke, the sun started shining and I thought Christmas had arrived early!

I had often read about the early developments in software defined radio, but had never seen or heard an example, let alone had the chance to try one out. Thus began one of the most interesting tasks I've ever undertaken in Amateur Radio, and as the following will show, I was not disappointed.

Software Defined Radio?

So, just what is software defined radio? To answer the question let's start from the basics many of us are already familiar with.

Many modern radios have some of their functions controlled digitally, notably digital signal processing (DSP), which can be performed at audio frequency (a.f.) or, preferably, at an intermediate frequency (i.f.).

The software to control these functions is incorporated in the radio and in some cases the instructions can be updated. Some of the latest TenTec transceivers are good examples of this design approach. However, the so-called firmware updates are limited in what they can do because ultimately the components that perform the functions are hard-wired into the radio and changes to the firmware only fine-tune the performance, which is predetermined by the hardware.

The Flex-Radio is completely different. The radio itself consists of a black box measuring 100 x 250 x 240mm, **Fig 1**. On the front panel there's only an **On/Off** switch, microphone socket and a cooling fan. The back panel, **Fig. 2**, has a collection of 3.5mm jack sockets and multi-pin connections to link to the computer, together with antenna, earth and power connections.

Inside, the box is also rather deceptively basic looking, **Fig. 3**. The largest printed circuit board (p.c.b.) is the optional 100W power amplifier (p.a.) stage. **Note:** The basic version of the SDR-1000 has only 1W radio frequency (r.f.) output.

On closer inspection I could also see a smaller board, which contains a number of miniature relays and 'roofing' filters for each band. There's also a board, which converts the incoming r.f. directly to an i.f. of 12kHz and provides separate in-phase and quadrature components to the computer for subsequent processing.

All Other Functions

All the other functions including; i.f. filtering, single sideband (s.s.b.), amplitude modulation (a.m.) and frequency modulation (f.m.) generation, digital signal processing, automatic gain control (a.g.c.), automatic level control (ALC), demodulation and adjustment of transmit and receive audio characteristics are carried out within the computer.

To perform all these functions a fairly powerful computer is required. Flex-Radio say that the minimum is an 800MHz Pentium, but the UK importers of the equipment, **Waters & Stanton PLC**, recommend a Pentium 4 at 2.8GHz. My own PC uses an AMD Athlon 2600+ and seemed able to cope well with the Flex-Radio, while also performing other computational tasks.

Other requirements: If you're considering the Flex-Radio, You'll also need to have *Windows XP* (Note, the software is open source and a group of enthusiasts produce versions, which run on Linux. I have not tried these, but they are reported to have identical functionality)

The critical link between the computer and the radio is the soundcard and it's most unlikely that the soundcard pre-installed on a home computer will be up to the job. To assist, Flex-Radio support a couple of makes of professional quality soundcards, of 4-in/4-out design with linear response up to 96kHz. The one I used was the recommended M-Audio Delta-44, which will cost you another £100 on top of the basic cost of the radio.

eviewed

Installation & Preparatory Work

The Flex-Radio cannot just be taken out of the box and switched on! A certain amount of preparatory work needs to be carried out first and the set comes with a CDROM, which contains the basic software to control the radio functions (called PowerSDR). It also has the manual, a very clear *Quick Start* guide and some useful release notes.

Robin's recommendations: I cannot emphasise too strongly the need to read and re-read all of these documents before doing anything else! You may also find it useful to print out some of the pages of installation instructions.

Let's start! First, I had to install the soundcard on my computer (the current soundcard can be left in place to continue being used for all other applications). You'll need a vacant PCI slot in the computer's rear. Remove the blanking plate, which usually has a single screw on the plate that has to be removed first.

Then I carefully inserted the soundcard, rocking it slightly to ensure that it slotted completely home, and secured it with the supplied screw. Helpfully, to avoid the need to keep going to the back of the computer, the soundcard is supplied with a breakout box, **Fig. 4**, coupled to the PC with a multi-way cable. The breakout box itself has four pairs of jack sockets for connection to the transceiver and speaker.

Before the soundcard will work the driver needs to be installed, and this is contained on a separate CDROM. I just followed the on-screen instructions and allowed it to install in the default location. Finally, the soundcard settings had to be set to the values described in the *Quick Start* guide. This guide contains pictures of all the set up pages and **it's essential** that the user matches the values exactly to those shown in the pictures. Failure to do so might lead to overdriving the p.a., with serious results!

Next, I needed to use the supplied leads to connect the breakout box to the transceiver. There are four pairs of cables and these were connected to the **Line In**, **Line Out** and **Microphone In** jack sockets at the back of the transceiver and to the loudspeaker or headphones. Please note that the system can only drive a high impedance speaker. (I actually used my computer speakers and the results were acceptable).

Fig. 2: The SDR-1000's back panel, has a collection of 3.5mm jack sockets and multi-pin connections to link to the computer, together with antenna, earth and power connections (see text).

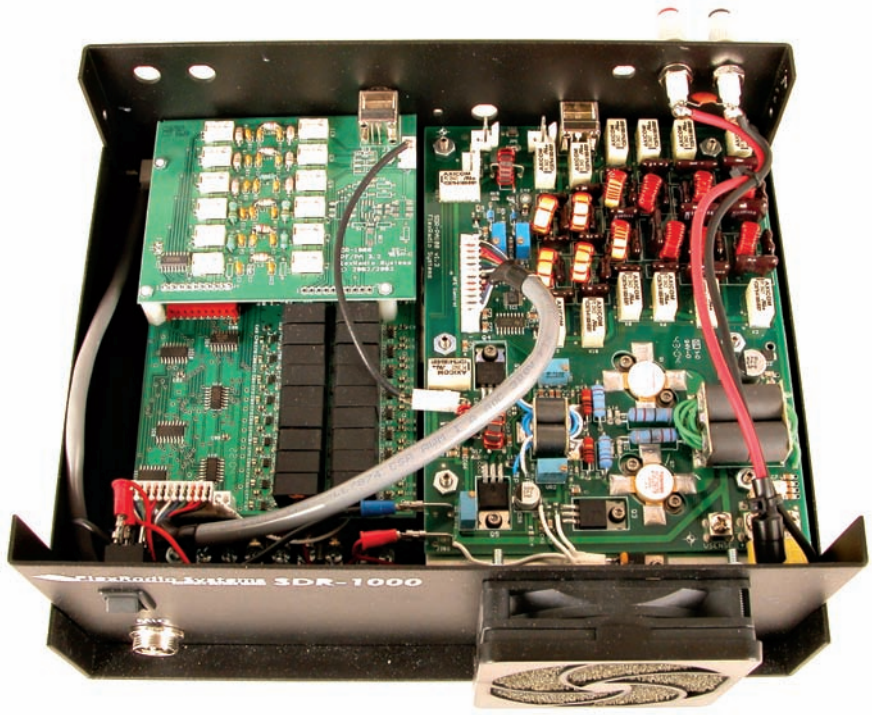

Fig. 3: Inside, the box is also rather deceptively basic looking! The largest printed circuit board (p.c.b.) is the optional 100W power amplifier (p.a.) stage. Note: The basic version of the SDR-1000 has only 1W radio frequency (r.f.) output (see text).

The next connection was provided by a multiway cable from a **Parallel Com** port at the back of my PC to the corresponding socket at the back of the radio. Finally, I had to connect a 12V power supply to the terminals on the back of the box, and connect the antenna and ground. That completed the hardware connections!

All that then remained for me to do was to install the PowerSDR program, which is on the main CDROM (you can download more recent versions free of charge from **www.flex-radio.com** but until you are more familar with the radio I would advise against using beta versions, as there may be bugs in the newer versions).

I then followed the on screen instructions. (Incidentally, if it's not already on your computer, you'll be invited to download .NET from Microsoft. Click to agree - you must have an Internet connection to download of course. The Flex-Radio software will then install automatically, and if you are opening PowerSDR for the first time you should be confronted by a Setup Wizard.

Fig. 4: To avoid the need to keep going to the back of the computer, the soundcard is supplied with a breakout box, coupled to the PC with a multi-way cable. The breakout box itself has four pairs of jack sockets for connection to the transceiver and speaker (see text).

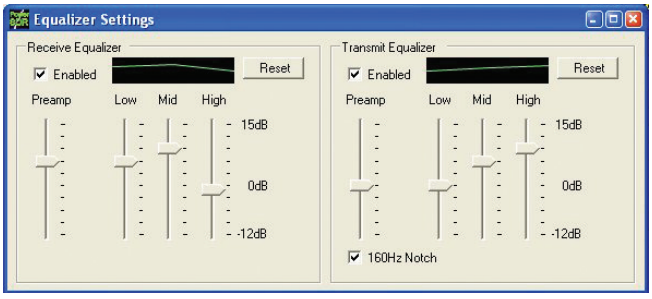

Fig. 5: There's no r.f. gain control as such, but three different pre-amplifiers can be selected. Also, by clicking on Equaliser (on the menu bar) Robin found that it brought up a three channel graphic equaliser to tailor the receive audio characteristics. There's a further pre-amplifier which can be controlled from within this window with a slider (see text).

You'll then have to select the soundcard you have installed from a drop-down list, and answer a few other straightforward questions about the options included in your radio. Click on **Set up** on the menu bar and you will see a series of tabs, starting with **General**. Make sure that all the settings on each page are the same as the default values in the *Quick Start* guide.

Under **PA** a series of p.a. gain settings will be seen. If you have a dummy load, ignore this for the moment, but if you don't, enter the values from the paper, which will be stuck to the case of the transceiver when you buy it.

Having set up the soundcard and PowerSDR module, I was then in a position to test what I'd done so far. (I had to ensure the power to the transceiver wasn't switched on at this stage).

On the CDROM I found a **.wav** ('wave file'), which simulates a QSO on 3.5MHz. I copied this into the directory into which I had installed Power SDR, and clicked **Wave** and then **Add**. Next I clicked on the Wave file in the window which appeared, before I clicked **Play** and **Loop**. Then I switched the software on, and it performed exactly as if it were really connected to the radio! Then I selected 3.5MHz l.s.b., selected the **Panadapter** display (more about this later) and just played with the controls until I felt reasonably familiar with them.

When I heard the recorded QSO on 80m, I knew I had set everything up correctly. If I had a dummy load, I could then connect it to the antenna socket and switched the radio on using the power switch on the front panel.

Next, I could have gone into the Setup menu, selected **PA** and then **Calibrate**. The program would have then automatically optimised the p.a. gain for each band in sequence. Incidentally, it could be that the values chosen are slightly different from those supplied with the transceiver. The process only takes a minute or so and is completely automated.

Ready To Go!

I was then ready to go and of course the first obvious thing to do was to spend some time listening on different bands and modes to familiarise myself with all the controls. The first job was to reconnect the antenna, switch on the power supply, then the transceiver and open the PowerSDR software (this is the recommended sequence, the operator just reverses these actions when switching off).

Clicking the **On** button on the console I heard some relays click in the transceiver box. I then selected a band and mode from the right hand side of the screen and the receiver sprang into life. The best display mode to select is the Panadapter, and I chose the **Average** (**AVG**) button the display will look less 'busy'. A spectrum display - showing a 20kHz segment of the band and all the stations within that segment - was clearly visible on the screen.

Using the system, I soon discovered that the bandwidth, which the receiver is 'hearing' is displayed as a green sector near the centre of the display. A number of preset filters (all created digitally by the software, not by any crystals or tuned circuits) can be selected by clicking on buttons on the console. The preset values are 6, 2.6, 2.1, and 1kHz. Then 500, 200, 100, 50 and 25Hz. If these are not enough to satisfy the operator, there are also two user selectable filters whose width and centre frequencies can be adjusted by slider controls on the front panel!

Stunningly Effective

The filters were stunning in their effectiveness and I could see very strong signals just outside the pass band, which were totally inaudible. The most astonishing thing to me was the performance of the very narrow c.w. filters. Even when set to a pass band of 25Hz there was no trace of ringing, and signals of reasonable strength sounded just like an audio oscillator. I've not heard filter performance like this on any rig I have ever handled (and my own stable includes the Icom IC-775DSP, an IC-756PRO and an IC-7000).

I found that tuning the Flex-Radio takes a little getting used to! The main frequency display is at the top of the screen on the left. **Note:** there is also a second variable frequency oscillator (v.f.o.) to the right which has all the normal functions for split operation. From my experience, the easiest tuning method is to hover the mouse arrow over the number on the frequency display, which you wish to change, and then use the mouse wheel to increase or decrease it.

My favourite method for general purposes was to scan the band using **Ctrl** and the **Up** or **Down** arrows and to 'fine tune' by placing the mouse arrow anywhere on the console except the frequency display panel and use the mouse wheel to fine tune up or down. The tuning step can be adjusted using Ctrl and **left** or

right arrows, step sizes from 1Hz to 10MHz being available. I was most comfortable with 100Hz for s.s.b. and 10Hz for c.w.

There's another method of tuning, which I also found useful, particularly for c.w. With a Right click in the Panadapter window a pair of yellow cross wires appears. Next I had to centre these up on a station of interest, provide a left click and the station was then exactly within the selected pass band. Incidentally, I discovered that when using very narrow c.w. filters, this is much better than scanning across the band, when signals can easily be missed. I also found the method very useful for s.s.b. stations by centring the cross wires at the upper or lower side of the transmitted signal (for l.s.b. or u.s.b. respectively), left click and fine tune with the mouse wheel for greatest clarity.

Note: It's surprising how many s.s.b. stations transmit a residual carrier, which gives you a good aiming point for the cross wires!

Manufacturer's Specifications SDR-1000

Receiver frequency range	12kHz to 60MHz
Transmit frequency range	160 to 6m bands (2m transverter optional)
IP3 3rd order intercept	+26dBm (2kHz tone spacing, 14MHz, 500Hz bandwidth)
Two tone 3rd order dynamic range	99 dB
MDS	-130dBm High preamp -121dBm Medium preamp
Minimum tuning step	1Hz
Direct Digital Synthesiser (DDS) clock	200MHz, < 1ps RMS jitter
Max receive bandwidth	48kHz
Transmit power (with optional PA)	100W h.f. 1.8-28MHz (25W continuous carrier) 500mW on 50MHz
Supported PC configuration	
Operating system	*Windows XP* or 2000 (Linux version available)
Processor	800MHz minimum (more is better)
Memory	500Mb minimum RAM

All The Usual Controls

All the usual controls found on a 'hardware radio' are available on the SDR-1000. For example, the a.g.c. settings of **Fast**, **Medium**, **Slow** or **Long** are selected from a drop down menu box and the **AF** gain is adjusted by (rather small) up/down arrows to the left of the screen.

The same method is used to adjust receiver incremental tuning (**RIT**) and transmitter incremental tuning (**XIT**). There's also **DSP Noise Reduction**, two different user configurable noise blankers and a very effective **Automatic Notch** filter, which completely removes stray carriers from within the pass band.

There's no r.f. gain control as such, but three different pre-amplifiers can be selected. Also, by clicking on **Equaliser** (on the menu bar) I found that it brought up a three channel graphic equaliser to tailor the receive audio characteristics. There's a further pre-amplifier, which can be controlled from within this window with a slider, **Fig. 5**.

I soon got used to controlling the radio using the mouse and keyboard, but if an individual doesn't feel comfortable with this method, there's an optional v.f.o. tuning knob or shuttle control knob. This can be plugged into a USB port on the computer and costs £60 and £99 respectively for either unit.

Modes Provided

At present the modes provided on the h.f. bands (1.8 to 28MHz) include c.w., a.m. (not tested) and s.s.b. In the USA there's an optional 144MHz transverter and narrow band frequency modulation (n.b.f.m.) is also generated for this. The review unit's p.a. is rated for a peak output power of 100W or, for a.m. and digital modes, a continuous power of 25W. There's also coverage of 50MHz, but here the power output is limited to 500mW.

As with the receiver, the transmitter has a three channel graphic equaliser on the transmitted audio, but there's also independent adjustment of the minimum and maximum audio pass band frequencies. A very nice feature is the ability to monitor the transmitted audio after all the filtration and tailoring has taken place (using headphones).

When monitoring the output - what the operator hears is exactly what's being transmitted. It was then that I experienced one of the strange quirks of digital radio - the delay! All the signal generation and processing takes a finite time to accomplish, and the monitored speech is heard a fraction of a second after you speak - this effect is called latency.

When monitoring my transmitted speech I found it quite difficult to continue talking normally when my delayed voice was coming back through my headphones! However, the faster the computer, is, the less pronounced is the effect. Additionally, the explanatory notes on the CDROM contain some useful advice on reducing buffer size on the soundcard and PowerSDR modules to minimise latency. (I found this easy to follow).

Effective Speech Compressor

There's a very effective speech compressor built into the Flex-Radio, which uses a feed forward algorithm. To quote from the manual; "it allows the required gain to anticipate the level before application, rather than simply following the signal around". This is a degree of sophistication only possible with DSP, and is one of the by products of the latency referred to above.

There's a second form of compressor called a compander. This provides maximum gain at low signal levels, falling off exponentially as the signal level increases. The result is a very effective degree of compression with minimum degradation of audio quality.

The Morse Mode

Let's now look at c.w. operation, which is controlled by means of a keyer panel. The original c.w. keyer has many functions built in and can be used with straight, paddle or iambic keys. There's also a memory keyer function, enabling up to five pre-programmed phrases to be sent. It's also possible to type text into a box and it will automatically be sent at, whatever keying speed you have selected. As with almost all functions on the SDR-1000, most of the keying parameters, such as weight (dot/dash ratio) and rise time, can be adjusted.

It's in the c.w. mode that the latency, mentioned earlier, is the greatest problem. Even the slightest delay in receiving the monitor output in headphones or

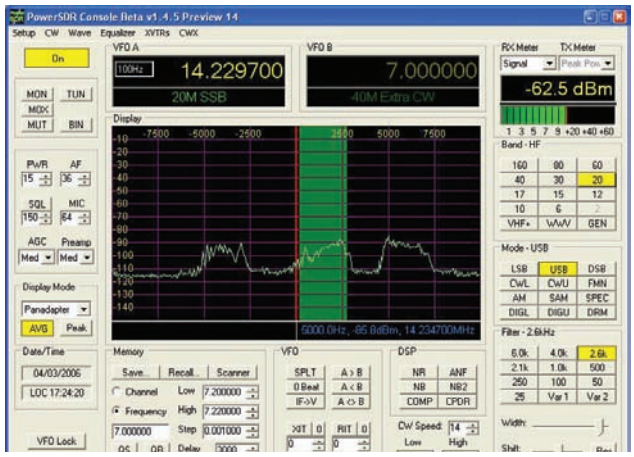

Fig. 6: Robin GW3ZCF reports he had many s.s.b. QSOs on various bands and was very impressed with the performance of the rig. The photograph shows a screen shot during an s.s.b. contest. The Panadapter screen is full of stations, yet each could be copied without a hint of QRM (see text).

loudspeaker can make it very difficult to send accurate Morse. For this reason a second keyer has been added with fewer 'bells and whistles' but a more rapid response, and I recommend the use the new keyer for speeds above about 25w.p.m.

Note: Because of the latency issue, neither keyer offers full break-in operation, but semi break-in can be selected with delays adjustable from 150ms upwards.

On The Bands

My first foray onto the bands was using the s.s.b. mode. All my initial settings were correct and the receiver immediately started when I switched it on. Band conditions were not very exciting during the test period but a good range of signals was heard on 14 and 18MHz.

I spent some time listening in order to familiarise myself with the controls and soon got used to the various methods of tuning. I was very impressed with the performance of the filters - they seemed to provide brick wall characteristics without any of the unpleasant audio normally associated with very sharp pass band edges.

Strong adjacent signals were totally inaudible (though clearly visible on the Panadapter display) and there was no hint of a.g.c. pumping. I used the amplified loudspeakers from my computer most of the time, but a pair of high impedance headphones provided even better audio quality.

The DSP noise reduction was very effective at cutting out band noise, but to my ear the default settings were a little too fierce. However, all the filter settings can be adjusted from within the menus, and I reduced **Noise Reduction** gain and delay until the result was nearer to my preference. As with all the other parameters in this rig, adjustment is simplicity itself and if you don't like the result you can quickly revert to the default values. Just try doing that with a soldering iron on a traditional radio!

I was able to switch between the SDR-1000 and my own Icom IC-775DSP, and my initial reaction was that the software radio was a little 'deaf' when trying to copy weak signals. However, an E-mail to Flex-Radio, which was answered by **Gerald Youngblood K5SDR** within a couple of hours, revealed that the a.g.c. gain can be increased from within the DSP menu. This was not mentioned in the version of the manual on my CDROM (though it was in the more recent version, which I later downloaded from the web).

The effect of adjusting this control was dramatic, and I was able to achieve a value at which there was very little to choose between the sensitivity of the software radio and the IC-775. Not bad, considering that, when new, the '775 sold for more than double the price of the SDR-1000!

Transmit Performance

It was then time to try the transmit performance. Pressing the **Tune** control produces a signal of about 10W (adjustable) and the meter has a drop down menu allowing forward, reverse and peak powers and s.w.r. to be measured. After matching my antenna I adjusted the power to about 75W and one of my first QSOs was on 18MHz (17m) with **Bert W2QN**.

Bert was familiar with the SDR-1000 and was able to give me some useful advice on setting it up. After a few more contacts on 18MHz I moved to 7MHz. I reduced the power to 10W, intending to listen to my transmission on the IC-775 to optimise the equaliser settings, but after sending out a test transmission giving my callsign, I had an immediate response from **Bob GM4FDT**.

As the band seemed very flat I was surprised that Bob heard me, but he was very complimentary about the audio quality. I then had a series of QSOs with **Roger GW4HSH**, a fellow member of the Swansea ARS. We first met on 28MHz, but later had QSOs on 14MHz. I was 20dB over 9 with him, so we had ample opportunity to tweak the audio settings, and when we had finished Roger said that the quality compared well with any high end hardware radio. In particular, Roger preferred the use of the Compand processor to the standard speech compressor.

I had many more s.s.b. QSOs on various bands and I was very impressed with the performance of the rig. The photograph, **Fig. 6**, shows a screen shot during an s.s.b. contest. The Panadapter screen is full of stations, yet each could be copied without a hint of QRM.

I next turned my attention to c.w., and as mentioned earlier, the receive performance on the Morse mode is sensational. The filters can be brought right down to 25Hz bandwidth without a trace of ringing. On transmit I found the latency of the old c.w. keyer to be rather unsettling, and I made frequent errors when trying to use the keyer because the monitored signal was always a fraction behind what my hand was doing!

Things were improved somewhat when I used the new c.w. keyer and I had no problem up to about 25w.p.m., but above this I started to make more mistakes than usual. Incidentally, there's a recent modification, which enables direct connection of the key through a serial port, enabling instant response. I didn't try this, but I have read on the Flex-Radio E-mail reflector that it works, so I think this would be a must for the serious c.w. operator.

Note: The radio is not yet fully configured for digital modes. However, assuming your original soundcard is still operational in your computer, there is a 'workaround' using a free program by **Phil Covington N8VB**, which enables the two soundcards to 'talk to each other', and generate and decode PSK, RTTY and other digital modes. Full details of how to set this up are given in the manual. Flex-Radio are working on an update that will integrate digital operation with the main SDR-1000 without the need for a second soundcard, and this will be a much neater solution when it becomes available.

The Trebilcock Verdict

So, what's the Trebilcock verdict on the SDR-1000? In answering, it's important to remember that because it's under constant development, with an active team of software engineers and enthusiastic users

producing new features all the time, the SDR-1000 will always be 'work in progress'. But at its present stage of development it's already a fine radio!

What makes the Flex-Radio unique is the ability to go into the menus and play around with the characteristics of almost all the major functions - and without risk, because it is simple to restore the default values if it all goes pear-shaped! When I was first licensed I used to build and modify radios in a small way, but in these days of high density surface mounted components that's now beyond my capabilities. Yet I got something of the same buzz by playing with the inner workings of the SDR-1000 and in several cases I felt that I had improved upon the default settings.

Is it perfect? Of course not! If I were to produce a wish list it might include the following; Larger control for a.f. gain, bring a.g.c. gain control to front panel and enable a normal loudspeaker to be used. I'd also incorporate PSK31 and other digimodes and bring the simple NR control to front panel. However, by the time you read this, some of these features might already have been incorporated. The company's slogan is "The radio that keeps getting better", and several improvements appeared even during the review period.

Active Forum & Reflector

On Flex-Radio's website (**www.flex-radio.com**) there's an active forum and reflector, used by 'newbies' (English translation from the American is 'newcomers') seeking help in setting up and by experienced users at the cutting edge of developing new features. Additionally, the company itself is very responsive.

At the beginning I had a problem after the first few hours of operation and a query to Flex-Radio got an almost immediate response from **Eric Wachsmann KE5DTO**, their chief software engineer. Eric diagnosed that I had a faulty IC2 (they had a batch of radios in December exhibiting similar faults). This was replaced by Waters & Stanton, the UK importers, and the radio performed flawlessly from then on.

Assuming reasonable familiarity with computers, SDR-1000 could be an excellent addition to any radio shack. It brings back the feeling of experimental radio, but makes no compromise in performance. I found it an exciting experience and will miss the SDR-1000 when it has gone from my shack.

My thanks are due to **Peter Waters** and **Jeff Stanton**, from the UK importers Waters & Stanton. In addition to lending the review radio, soundcard and microphone, I had numerous discussions with them during the review period and had a great deal of practical help. **PW**

Product

Flex-Radio SDR-1000

Company

Waters & Stanton PLC (UK Importers)

Contact

Tel: (01702) 206835/204965. FAX: (01702) 205843.

Pros & Cons

Pros

Assuming reasonable familiarity with computers, SDR-1000 could be an excellent addition to any radio shack. It brings back the feeling of experimental radio, but makes no compromise in performance. I found it an exciting experience and will miss the SDR-1000 when it has gone from my shack

Cons

An optional v.f.o. tuning knob or shuttle control knob unit is required if the operator wants 'traditional' tuning control.

Price: £995 plus £10 p&p.

Supplier

Waters & Stanton PLC, Spa House, 22 Main Road, Hockley, Essex SS5 4QS.

Reply Panel from Waters & Stanton

Peter Waters G3OJV comments: Thank you for the courtesy copy of Robin GW3ZCF's review. There is now a new version of the software V1.6 (Robin was using 1.4). There are a number of refinements, but probably the biggest is the virtual audio input. This enables data programs to integrate with the SDR software without the need for extra cables or disconnecting the microphone. Simply select microphone or data input.

I think that Robin's mention that he wished he could plug a speaker in needs explaining more. Of course you can use a speaker but as neither the PC nor the soundcard have any audio power amplification, a powered speaker as supplied with most PCs is necessary - a visit to PC World!

We recommended 2.8GHz PCs for multi-tasking, but a slower PC is fine if you are unlikely to want to run several other programs at the same time. Anything 800MHz or over will work.

The c.w. latency can be reduced to a level that is unnoticeable until you reach speeds of 25w.p.m. (this is a soundcard buffer setting) For faster sending, as Robin points out, you can connect directly to the serial port. Another alternative is to switch to "keyboard keying" which lets you type out the c.w. on the PC keyboard and also offers four memory banks.I don't think Robin mentioned the unlimited database whereby frequencies and station details can be entered and immediately be recalled. And of course the radio makes a wonderful receiver, tuning from 12kHz to 60MHz in steps down to 1Hz.

We hope the SDR-1000 will offer benefits to poorly sighted operators because a large PC screen is easier to see and *Windows* offers speech facilities for those who are blind - but we have not yet tested this out. Finally, I am not sure that Robin realises that there is a v.f.o. knob controller available for the radio as an option. This is known as the 'Shuttle-Pro' and enables you to tune enjoy v.f.o. knob control with an outer shuttle control for faster tuning and a selection of programmable buttons to permit band, filter and mode changes without the need for a mouse. This item costs £99.95.

Regards, Peter G3OJV

The 23rd Annual 144MHz QRP Contest

0900-1600UTC, 11 June 2006

Editor's thank you: As usual Neill G4HLX is putting much effort into organising and preparing for the great day. However, this year he's having to put much more effort than usual in his determination to join us on the band because he's working on the latest joint European Nuclear Fusion project in the south of France. And even though the weather is usually much better than the UK's - he was snowed in for a short while earlier in the year! Thanks for everything Neill, and we'll all be listening out for **F5VLD/P** and be hoping for good DX so many entrants can work you! Good luck everyone. **Rob G3XFD**

Once again, Dr Neill Taylor G4HLX our dedicated, enthusiastic long serving Content Adjudicator presents the rules for the annual *PW* v.h.f. 'fun contest. This year however, we can guarantee there'll be one French stations - Neill himself - on the air and we can also guarantee he'll be really 'radio active' on the day!

The 2006 Contest

Mid-June brings long days, the start of Summer, warm sunny weather (with a bit of luck), and above all, the day of low power v.h.f. activity known as the *Practical Wireless* 144MHz QRP Contest. This is more than just a contest - it's a day when anyone with even a simple 2m station can enjoy making contacts over distances that normally seem difficult. This is because a lot of QRP stations will be taking to the hills to operate from good locations around the UK, Ireland, the low countries and France! (see details later).

All you need to take part is a 3W transceiver, so why not dust off that portable antenna and set up station on your nearest high spot? You might like to get together with friends to make a group, or if you prefer, operate from home as a fixed station.

Those who have entered this contest before will need no encouragement - they know how much fun is to be had. But newcomers are always welcomed, and most find that this day is an ideal introduction to the world of v.h.f. contesting, and are often amazed by what they can achieve with just 3W.

For the really high performers, there are rich rewards, the coveted ***PW* QRP Contest Winner's Cup** for the overall winners, the **Tennamast Trophy in Memoriam to Frank Hall GM8BZX** for the leading Scottish station, and the **PW EI/GI Trophy Clock** to the leading station in Eire or Northern Ireland, provided personally by **Rob G3XFD**.

Other trophies, such as to the Leading Single Operator, may also be awarded, and there are certificates for special achievements such as the leading station in each locator square. And here's the good news: it's taking part that matters, so every entrant is awarded with a certificate to record their position in the results table. Once again these certificates are sponsored by **Chris Rees GU3TUX** - to obtain yours just send by post the corner-flash coupon printed here (see the rules for the postal address).

Electronic Logs

Last year I appealed for entrants to send in their logs electronically, by E-mail, if at all possible. Most people responded and it made my job as Adjudicator a lot easier. Of course, I will continue to gladly accept handwritten logs (written clearly please), but since most people use a computer at some stage, whether using logging software or just typing up the log in a spreadsheet or word processor afterwards, it should be easy to send me a computer file.

If your log is in such a file, whatever the format, please do send me that. Full advice on sending electronic logs is on the contest website **www.contest.org.uk**

The rules follow the familiar format of the contest that has proved popular throughout its 24 year history. But even if you are a veteran entrant, please be sure to read the rules again before the contest, and once more when preparing your entry.

Many people treat the contest not so much as a competitive event, but more as an activity day, taking advantage of the many well-sited stations to get some good contacts. So, in this spirit, I was contacted by **Andy Foad G0FTD**, who thought this might be an opportunity to stimulate

The 2006 Rules

1. General: The contest is open to all licensed Radio Amateurs, fixed stations or portable, using s.s.b., c.w., a.m. or narrow band f.m. (n.b.f.m.) in the 144 MHz(2m) band. Entries may be from individuals or from groups, clubs, etc. The duration will be from 0900 to 1600UTC on June 11 2006.

All stations must operate within the terms of the Licence. Entrants must observe the band plan and must keep clear of normal calling frequencies (144.300MHz and 145.500MHz) even for "CQ: calls. Avoid frequencies used by GB2RS during the morning (144.250MHz and 145.525MHz) and any other frequency that's obviously in use for non-contest purposes. Contest stations must allow other users of the band to carry out their activities without hindrance.

The station must use the same callsign throughout the contest and may not change its location. Special event callsigns may not be used.

2. Contacts: Contacts will consist of the exchange of the following minimum information:

(i) callsigns of both stations
(ii) signal report, standard RS(T) system
(iii) serial number: a three digit number incremented by one for each contact, starting at 001 for the first
(iv) locator (i.e. full six character IARU Universal Locator for the location of the station).

Information must be sent to, and received from, each station individually, and contact may not be established with more than one station at a time. Simultaneous operation on more than one frequency is not permitted.

If a non-competing station is worked and is unable to send their full universal locator, their location may be logged instead. However, for a square to count as a multiplier (see rule 4), a full 6-character IARU universal locator must have been received in at least one contact with a station in the square.

Contacts via repeaters or satellites are not permitted.

3. Power: The output power of the transmitter final stage shall not exceed 3W p.e.p. If the equipment in use is usually capable of a higher power, the power shall be reduced and measured by satisfactory means. The simplest way is often to apply a (variable) negative voltage to the transmitter a.l.c. line, reached via the accessory socket.

The output power can be accurately measured using the simple circuit of **Fig. 1**. Connect this to the 50Ω output of the transmitter and adjust the power so that the voltmeter does not exceed 16.7V on a good 'whistle' into the microphone.

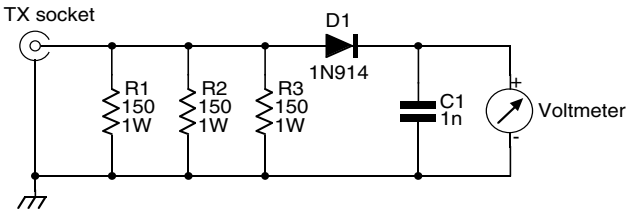

Fig.1: A simple power measurement circuit (please see text).

4. Scoring: Each contact will score one point. The total number of points gained in the seven-hour period will then be multiplied by the number of different locator squares in which contacts were made (a "square" here is the area defined by the first four characters of a universal locator).

Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = 5 x 52 = 260.

Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log, and clearly marked as a duplicate (not necessary in computer logs submitted by E-mail).

5. The Log: Logs may be submitted by E-mail or by post. In either case the log must contain the following information for each contact.

(i) time GMT
(ii) callsign of station worked
(iii) report and serial number sent
(iv) report and serial number received
(v) locator received (or location).

The preferred form of log is a computer file sent by E-mail. This may be a file generated by logging software, provided it contains all the information listed above, or a file in any other suitable format (plain text is fine). Preferably, give the file a name including the station callsign (e.g. g4hlx.log), and send as a standard E-mail attachment to **entry@contest.org.uk**

Most formats of log are acceptable - if there is any problem with your entry you will be contacted by E-mail.

If a computer log file is not available, a paper log may be sent by post. This must be clearly written on one side only of A4 sized paper, ruled into columns for the each of the items listed above. Underline or highlight the first contact in each of the locator squares worked. At the top of each sheet, write:

(a) callsign of your station
(b) your locator as sent
(c) sheet number and total number of sheets (e.g. "sheet no. 3 of 5").

Log sheets and covering-information sheets which may be used for paper-based entries are available for downloading from the contest website **www.contest.org.uk**

6. Entries: The covering information listed below must be provided with each entry. The preferred method of submitting this is by use of the online facility on the website www.contest.org.uk

Alternatively, the information may be written in the E-mail message to which the log file is attached. For entries sent by post, it should be written on a separate sheet of A4-sized paper.

The required information for every entry is:

(a) name of entrant (or of club etc. in a group entry) as it is to appear in the results table and on the certificate
(b) callsign used during contest (including any suffix)
(c) name and address for correspondence

Continued...

some amplitude modulation (a.m.) activity on 144MHz, in view of the recent resurgence of interest in this mode.

Well, I admitted to Andy that the last 144MHz a.m. contact in my log was in 1975, but agreed that we should give the a.m. enthusiasts like Andy a chance to make some QSOs. In order to concentrate activity on this mode, we propose that a.m. activity is centred in the sub-band 144.500-144.550MHz, and that the last hour of the contest, 1500-1600UTC, should be the main period for a.m. contacts.

It's during the latter hour that everyone is finding that the contact rate is drying up, so perhaps s.s.b. operators may like to tune up to this a.m. sector and look for extra QSOs. And I'm sure that even cross-mode contacts will be welcomed by the a.m. enthusiasts.

French Fusion Project

For most of this year I am working abroad, in Provence, France (on the ITER nuclear fusion project). This has two consequences: firstly, entries sent by post must be sent on time, postmarked no later than June 26, as they will then have to be forwarded to me.

In the past, I have accepted slightly late postal entries, imposing a points penalty on them, but this year they will simply be disallowed. To be fair this also applies to E-mail entries.

The second consequence is that it seems unlikely that I myself will be back in the UK to be on air during the contest. As a result, there'll be much kudos (but no bonus points I'm afraid) for anyone who contacts me operating as **F5VLD/P**. The site I have in mind is in JN24 square, but it will take some good conditions to open the path to the UK. However, I am an optimist and I'll spend all day looking for contest stations!

It now only remains for me to wish all contestants good luck and much fun during this year's contest. Let's hope we get some really good propagation conditions and weather that is suitable for everyone who has taken to the hilltops. 73 et bonne chance!

Neill Taylor G4HLX

(d) location of station during contest
(e) locator as sent
(f) whether single - or multi-operator (a single-operator is an individual who received no assistance from any person in operating the station, which is either his/her permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
(g) total number of contacts and locator squares worked (not required for a log sent as a computer file)
(h) list of the locator squares worked (not required for a log sent as a computer file)
(i) a full description of the equipment used including transmitter p.e.p. output power
(j) if the transmitting equipment is capable of more than 3W p.e.p. output, a description of the methods used (i) to reduce and (ii) to measure the output power
(k) antenna used and approximate station height a.s.l.

Failure to supply the required information may lead to loss of points or disqualification. The following declaration must be included in the E-mail text or written and signed by the entrant: "I confirm that the station was operated within the rules and spirit of the event, and that the information provided is correct". Entries by E-mail must be sent to **entry@contest.org.uk** Paper entries should be sent by post to: ***Practical Wireless* Contest, c/o Neill Taylor G4HLX, 46 Hunters Field, Stanford in the Vale, Faringdon, Oxfordshire SN7 8LX**. Entries must be sent by E-mail or postmarked no later than **26 June 2006.** Late entries will be disallowed. Any other general comments about the station, the contest and conditions during it are welcome, (written on a separate sheet of paper in the case of entries sent by post). Photographs of the station are also invited (**but please note that these cannot be returned**); if these are not available by the time the entry is submitted they may be sent later, by E-mail or post, to arrive by **12 August 2006.**

Results Summary: A summary of the results will be published later this year in *Practical Wireless*. The full detailed results list will be available on the contest web site soon after publication in *PW*; if you would like to receive this list by post, please send a s.a.e. to the contest address I've already provided.
A certificate will be sent to every entrant who submits the corner flash coupon on this page (**photocopies will not be accepted**). Send the coupon, clearly marked with your station callsign (exactly as used in the contest), to the contest address given above. Unless you advise otherwise, your certificate will be posted to the address given in your contest entry. Coupons may be submitted at any time up to the publication of the results.

7. Miscellaneous: Note that the conditions of the Foundation and Intermediate Class licences permit only the Licensee personally to operate the station. Thus only single-operator entries are possible under Foundation or Intermediate callsigns. Of course, Foundation and Intermediate licence-holders may be operators of Full licence multi-operator stations (including club stations) when supervised by a Full licence holder.

When operating portable, obtain permission from the owner of the land before using a site. Always leave the site clean and tidy, removing all litter. **Observe the Country Code**.
Take reasonable precautions to avoid choosing a site which another group is also planning to use. It's wise to have an alternative site available in case this problem does arise.
Make sure your transmitter is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by over-driving or excessive speech compression. On the other hand, be aware that your receiver may experience problems due to the numerous very strong signals it will have to handle, and that this may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the receiver input. The use of a high gain radio frequency (r.f.) pre-amplifier is likely to worsen strong signal problems. So if you do use one, it's best to be able to switch it off when necessary.

8. Adjudication: Points will be deducted for errors in the information sent or received as shown by the logs. Unmarked duplicate contacts in paper-based logs will carry a heavy points penalty. Failure to supply the complete information required by rule 6 may also lead to deduction of points. A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicator will be final.

PW

The May 2006 issue of radiouser is filled to the brim with radio, radio and more radio! With more regular columns, more features and more pages, it's everything the radio listener could possibly want - all in one great new magazine.

- **Reviews**: Mike Richards tests the high quality, no-nonsense **Palstar R30 Communications Receiver**. It has Collins mechanical filters fitted giving it a performance that belies its looks. Simon Parker tries out the **President Waker CB mobile radio**. It's a multi-standard rig aimed at the pan-European market.
- **Military Matters**: Kevin Paterson attends the retirement of the Sea Harrier aircraft from service with the Royal Navy and has all the details of this historic occasion.
- **Scanning Scene**: Bill Robertson shows how you can easily improve your scanner's performance with the right antenna as well as answers your Shopwatch queries and gives you more frequencies for your collection.
- **The SBS Files**: Kevin Paterson has some time experimenting with the SBS-1 and found it could add a whole new dimension to your airband listening activities.
- **Sky High**: Godfrey Manning gives some hints on choosing your airband receiver and tells you what you can expect to hear with it..
- **Scanning in Action**: We take a look at TrafficMaster. We all know they are there, but opinion on what those blue cameras do varies. What's behind those silent blue guardians of the roads?
- **Decode**: Mike Richards looks at a couple of new software packages from the programming team at COAA. SondeMonitor gives you the opportunity to eavesdrop on these meteorological tools when they are launched at around midday and midnight every day. PlanePlotter is a fairly simple ACARS decoder able to take ACARS messages off-air and either display the raw message or provide a location map on a chart.
- **Improve Your Reception with a Long Wire**: Steve Telenius-Lowe discusses the benefits of long wire antennas and shows how they can be excellent directional receiving antennas too.
- **The Waves Above Us**: Just for the beginners. Brian Kendal starts back at the beginning and explains radio waves and polarisation to show just how they work for, or against, the radio listener.
- **Wireless on Wheels**: Mark Savage and Chris Brand finish charting the history of radio in the car, a partnership we now take for granted.
- **Quick & Easy Mod for the Sony SW7600GR**: Andrew Howlett found a bargain when he acquired a Sony SW7600GR but it failed to live up to expectations on Top Band. He tells us how he solved the problem.
- **Radio Questions and Answers**: We have two questions for our resident expert on interference and listening to air traffic control. His answers will, no doubt, help more than just two readers. **Have you a question you'd like answered?**
- **Pirates**: A regular look at 'non-licensed' and underground radio broadcasts.
- **Looking Back**: Snippets from the archives of *Short Wave Magazine* and *Practical Wireless*.
- **New Products**: All the latest news about radios and accessories to interest the scanning, airband and broadcast listener, including a personal locator beacon, a Roberts Sound 39 DAB radio and PMR 446 radios built into a hard hat.
- **Airband News**: David Smith has details on callsigns, civil and military ATC and airspace changes.
- **Comms from Europe**: Bavaria based Simon Parker starts making preparations for the PMR 446 DX season by checking the equipment and preparing for the first weekend.
- **Digital Radio through your TV**: Sometimes, even DXers listen to the radio for entertainment. Are you missing out on all those digital signals, Rob Mannion suggests you try Freeview radio for very high quality reception.
- **Solar Cycle Mystery**: NASA helps resolve a long-standing solar cycle mystery.
- **On the Road**: Len Over is back with details of Jubilee celebrations for CB and some information about radar detection.
- **Info in Orbit**: Howard Long, AMSAT-UK committee member, uses his newly built weather satellite antenna for the first time and gives us the latest news form the International Space Station.

● **Radio Websites** ● **Software Spot** ● **DXTV** ● **Maritime Matters** ● **LM&S Broadcast Matters**

- **You can contact other readers by joining the RadioUser e-mail forum. http://uk.groups.yahoo.com/group/RadioUser_Readers/join**

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Coming up in the June Issue

- **Reviewed**: The **Icom IC-R1500** is a wideband computer receiver that connects externally to your PC via a USB cable. The radio can also be controlled via the supplied control head (with not all functions supported). The USB port provides compatibility with many computer models, even laptops. Incredible coverage is yours with reception from 10kHz to 3300MHz. **Also reviewed** are the **President Harry** CB radio, **éton e100** short wave radio and a **wind-up** radio from Europe.
- **Scanning in Action**: ACARS is a digital data link system transmitted via VHF that lets airline departments to communicate with the various aircraft in their fleet. We give you more information on decoding this information.
- **Radio Questions & Answers**: We have some tips for listening to Medium Wave stations from America and what to do if you suffer more interference on one receiver than another.
- **Build Your Own**: How about building your own short wave receiver? It's not as difficult as you think. We take you, step-by-step, through the process.
- **Win**: Tickets for the Yeovilton Airday are up for grabs, don't miss out on the chance to win tickets for this popular day out.
- **American Forces Network**: We look back at the first broadcasts of this radio network back in wartime Britain.

The June issue is on sale at your newsagent on 25 May...order yours today!

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Valve & Vintage

It's Phil Cadman G4JCP's turn to look after the vintage shop this month and our Dudley based author chats about an unusual valve he's identified, together with other fascinating things hidden in his Aladdin's Cave.

Hello and welcome to the Valve and Vintage 'shop'. As I promised in my March column, this time I'm featuring a couple of simple circuits, which you may like to try. But first there are a few items from last time I'd like to mention.

Firstly, *PW's* very own **Tex Swann G1TEX** recognised the CV359 microwave power indicator tube. Describing it as a 'glass nail' valve, Tex tells me it was used in the Radar Set 4 Mk7.

Several of the tubes were spaced about 15mm apart down a wave guide, and when inserted into the wave guide, each tube indicated the mean power level at that point. Any variation in power from one tube to the next showed that there was a mismatch between the wave guide and the radiating horn antenna. So, not only did the tube measure power, but it could be used to measure s.w.r. as well! Thanks Tex.

Now to those rather interesting CV72 and CV73 series modulator valves, which are capable of switching 3.5A at 3,500V. I suggested that they may have been used in airborne radar, and this time **Rob Mannion G3XFD** himself confirmed my suspicions.

Rob feels sure they were used in Airborne Early Warning, particularly the anti-submarine version of the turboprop (with contra-rotating airscrews) Fairey *Gannet* AEW aircraft. He also remembers them being used in tail mounted Identification: Friend or Foe (IFF) transponders.

Rod Burman G4RSN contacted me saying that the valves were used as a driver for the CV85 trigatron in Modulator Type 64, which was part of the H2S MkII (airborne radar) and ASV MkIIIA and MkIIIB (airborne surface vessel radar, for maritime patrol aircraft). They were also used in Modulator Unit Type 169, which was believed to be part of a missile tracking radar. Thanks for that information, Rod.

Finally, **Barry Priestly** says they were definitely used in Second World War radar. He told me that one of each was used in *Monica*, a 200MHz tail warning radar for bombers. Barry also confirmed their use in the Type 64 pulse modulator; a component of several airborne radar sets. My thanks to you too, Barry.

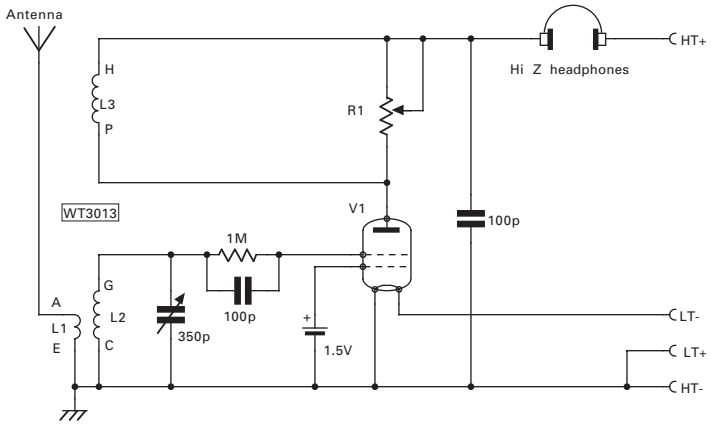

Fig. 1: The diagram show the Improved Hikers One low voltage receiver from 1938. The valve is a type 49, which is the battery version of the mains type 46 (see text).

Quite some valves, then, with a fascinating history! Looking at their specification, there's no reason why they can't be used at more modest anode voltages. Anyone care to try one as the power amplifier (p.a.) stage in a simple c.w. transmitter? They'd make a nice change from an 807 and would be an interesting talking point.

Unwanted Radiation

Last time, I mentioned an IEE paper from a radio communications convention, held in 1947, which dealt with unwanted radiation from receivers. Such radiation might have allowed an enemy to fix the position of a receiver on board ship (for example).

Well, I've had some very interesting responses to my request for information on this subject. So much so, that I now hope to report my findings in a separate article! In the meantime, may I say a sincere 'thank you' to everyone who contacted me.

Kits In 1930s

Back in the 1930s, kit and home-built radio sets were very popular, particularly with youngsters with limited resources (lack of money!). Single valve regenerative receivers were all that many could afford, but even these used expensive h.t. batteries.

However, around 1936, the American magazine *Popular Mechanics* published a design, which used a h.t. supply of only 6V. Called the *Hikers One*, the set was an immediate success. And over the next few years several variations were published, all of which helped make the design one of the most favoured of the period.

The diagram, **Fig. 1**, shows the circuit of one variant: the *Improved Hikers One* from 1938. The valve is a type 49, which is the battery version of the mains type 46.

Although the 46 and 49 are tetrodes (they have four electrodes) they don't operate as screened grid valves. Instead, they are members of a group of four electrode valves known as double grid or bi-grid valves.

However, whether there's a difference between the terms double grid and bi-grid, I don't truthfully know! It all depends on who you're talking to, or what book you're reading. As far as I'm concerned though, both describe a valve in which both grids are used to dynamically control the flow of electrons to the anode. (That's unlike a

screened grid valve, where the second grid is held at a fixed positive potential).

Space charged tetrodes are also four electrode valves, which are operated with a fixed (low) positive potential on the first grid. The positive electric field produced by the first grid tends to neutralise the space charge that surrounds the cathode, and thereby allows a relatively large anode current to flow even at very low anode voltages. The signal to be amplified is then applied to the second grid.

Space charged valves are not strictly double grid valves, as the potential on the first grid is fixed, rather than having any signal voltage applied to it. However, there's some overlap between the two types - as in the case of the *Hikers* - where a 'genuine' double grid valve is used in the space charge mode. And yes, I know it's confusing!

Incidentally, the 46 and 49 are very unusual valves, having been specifically designed for use as both driver and output in class B audio output stages. By connecting the second grid to the anode, the valve behaves as a low-mu triode, suitable for use as a driver. Yet connecting the two grids together produces a triode with a high-mu characteristic, ideal for use in push-pull class B output stages.

The idea behind the 46/49 was to cut down the number of different valves used in a set. However, using three valves to produce a large - though seldom necessary - audio output was costly. Inevitably, designers largely ignored the 46 and 49, although the 46 did find favour with some Radio Amateurs who used it in modulators.

The 49 would probably have disappeared from history if someone hadn't realised that the structure of the 49 made it suitable for use as a space charge valve. The result was the *Hikers One*, and although intended for back packers, the main attraction of the set to young radio enthusiasts was its lack of an expensive h.t. battery.

By the mid-1940s, supplies of the 49 had effectively dried up. No more were being made and no suitable replacement was available. Fortunately, a few modern battery valves did operate tolerably well at low h.t. voltages without the need to use them as space-charge valves. Sadly then, the reign of the *Hikers One* came to an end.

Worth Trying?

Even today, the *Hikers* is still an interesting circuit and possibly worth trying. But I can't suggest a guaranteed replacement for the 49 valve. This is one of those times when some experimentation is required.

Modern battery output tetrodes such as the DL96 and similar would seem to hold the most promise. (Don't forget mains types too). And then there's the ECC86; a double triode intended for use in car radios working from a 12V h.t. supply. In fact, an ECC86 may well prove successful, just forget the space charge grid in Fig. 1. Either connect the two halves in parallel, or use one half as a regenerative detector and the other half as an audio amplifier.

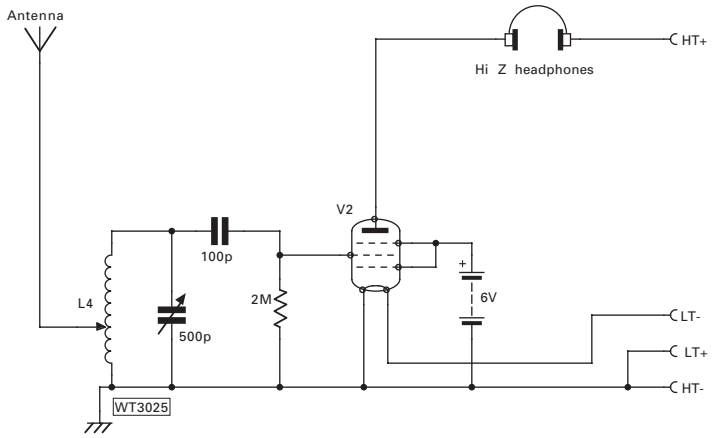

Fig. 2: Phil G4JCP came across a copy of PW from January 1941 where he found a circuit, which bore some resemblance to the Hikers. The circuit, shown here, is a t.r.f. design. Even simpler than the Hikers, it uses a pentode rather than a tetrode (see text).

Regarding Fig. 1., the coil detail shows how L1, L2 and L3 are arranged - the *Hikers* specified 30a.w.g. (American wire gauge - enamelled copper wire). Variable resistor R1 is a crude regeneration control; try a 4.7kΩ variable. Choose the low tension (l.t.) supply to suit the valve, and try a h.t. supply of 9V to 12V. Oh, and here I'd like to express my grateful thanks to **Philip Taylor** for the information about the Hikers sets he kindly provided.

Wartime Practical Wireless

I'd intended to leave the saga of the *Hikers One* there, but while spring cleaning the Valve and Vintage 'shop', I came across a copy of *PW* from January 1941. And, in an article about 'Reversed' Valves, there was a circuit, which bore some resemblance to the *Hikers*.

The circuit, shown in **Fig. 2**, is a t.r.f. design, even simpler than the *Hikers*, using a pentode rather than a tetrode. But the space charge operation is the same. No details for L4 were given in the original article, so I advise anyone to copy L2 from the *Hikers*. Tap every 10 turns up from ground (up to half way) for antenna matching.

What's most curious however, is the connection of g1 (control grid) to g3 (suppressor grid). I've not come across this before. Usually, g3 is connected to the cathode or ground. Although it may sometimes be connected to the anode when the valve is triode connected.

Even more confusing is the text associated with the circuit in the magazine. It says: "It is worth mentioning that when using a l.f. pentode in this manner, a pentode should be chosen, which has the normal control grid connected internally to the outermost grid; in some valves this latter is connected to the filament, and these are not so efficient when used in this way".

The *PW* statement surprised me. I've never come across any pentode with an internal connection between g1 and g3. In my experience, g3 is **always** either brought out to a separate pin, or connected internally to the cathode/filament. What was going on?

A hasty search through some of my valve books revealed more. In a book called *The Practical Radio Reference Book*, edited by **Roy C. Norris** (Odhams Press - date unknown), there are several valve base diagrams, which show the peculiar connection under discussion. Unfortunately, only two valves in the book's valve tables actually refer to these bases, and both are normal pentodes.

Perhaps there are valves missing from the tables, but equally, perhaps the valves never existed in the first place? I'd very much like to know if anyone has actually come across a pentode with g1 internally connected to g3. Or maybe all this is simply a mistake? Either way, it would be interesting to try a modern valve in the *PW* circuit with g1 connected to g3. Of course, any likely pentode must have g3 brought out to a separate pin on the valve base.

Talking of which, I'd better lock-up the V&V 'shop'! So, until next time, best wishes and keep those soldering irons busy. And remember, 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.**

PW

Carrying On The Practical Way

This month, the Rev. George Dobbs G3RJV sets out to confirm that the m.o.s.f.e.t. lives again so, it's time to switch the soldering iron on, after reading the appropriate quotation!

This month's project harks back to the 1970s and a very popular device - the 40673 m.o.s.f.e.t. (see text).

"I find that a great part of the information I have was acquired by looking up something and finding something else on the way".
Franklin P. Adams. American journalist (1881 - 1960)

Welcome to the June Carrying on the Practical Way (COTPW). A few weeks ago I was searching through a copy of the *QRP Quarterly*, the journal of the **QRP Amateur Radio Club International** (QRP ARCI), to find a small item that I knew I had read on measuring tuning diodes.

Flipping through the other pages of the magazine, I found, - like Franklin P. Adam's quotation, "something else on the way"! I discovered that **Steve Hudson AA4BW**, had contributed an article on a Grid Dip Meter, which used a dual-gate metal oxide semiconductor field effect transistor (m.o.s.f.e.t.), but without having a dual-gate m.o.s.f.e.t. Now that was interesting!

In the 1970s I had made extensive use of the dual-gate m.o.s.f.e.t. in many items of equipment. It was a very useful device, and although it can readily be obtain in surface mount device (SMD) format, the leaded versions are now very rare. I tracked down a supplier for the 40672, my preferred device in the past and found one UK supplier offering them at over £12 each!

Two In Series

A dual-gate m.o.s.f.e.t. is really two of the devices in series and as the name implies, it has two gates with one source and one drain termination. The input signal is fed to gate 1. The voltage at gate 2 controls the gain, because it determines the thickness of the channel of the 'top' m.o.s.f.e.t. It's rather like adding a control grid to a triode valve.

An obvious application is a variable gain f.e.t. amplifier; the signal is fed in on gate 1 and the gain of the amplifier is controlled by the voltage on gate 2. Another common application, which I often used, was to configure the dual-gate m.o.s.f.e.t. as a simple mixer. An example of this is shown in **Fig. 1**.

In Fig. 1, the 40673 dual-gate m.o.s.f.e.t. is used as a mixer for the front-end of a direct conversion (DC) receiver. I used variants of this circuit throughout the 1970s and early 1980s. In the circuit, gate 1 (Gl) accepts the input signal with a tuned circuit or band-pass filter. The local variable frequency oscillator (v.f.o.) is fed into gate 2 (G2).

The mixed products appear at the drain (D) across the l.8kΩ resistor. For a DC receiver we use the audio difference product of the two signals and this is fed via the 4.7µF coupling capacitor to an audio amplifier. A nice little circuit if the 40673 didn't cost over £12!

In his article Steve AA4BW, referred to a small note in the book *Experimental Methods in RF Design* (sometimes called EMRFD by fans) by W7Z0I, KK7B and W7UPA. The book is a fountain of ideas for anyone who likes playing with radio circuits and a brief note (page 6.14) suggests that most circuits using a dual-gate m.o.s.f.e.t.s can be built using n-channel j.f.e.t.s in a cascade configuration. A few pages later an example is given in a practical circuit for an i.f. amplifier. The problem of obtaining leaded dual-gate m.o.s.f.e.t.s makes this a very interesting idea. The diagram, **Fig. 2**, shows how this can be done.

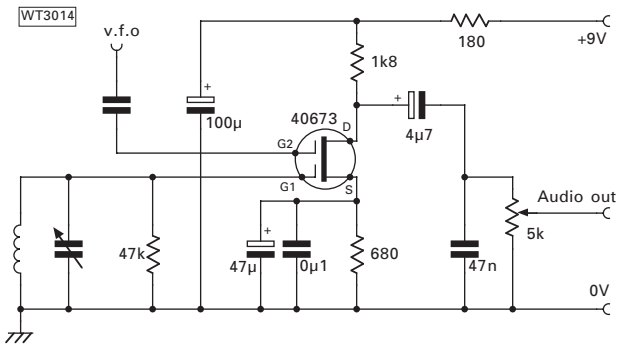

Fig. 1: Another common application, which I often used, was to configure the dual-gate m.o.s.f.e.t. as a simple mixer. An example of this is shown here (see text).

The diagram, Fig. 2 shows the internal circuitry lay-out for a dual-gate m.o.s.f.e.t., with its source, drain and two gates. To the left are two fe.t.s configured to give the same results. The bottom f.e.t. in the drawing is the source for the whole configuration and its gate becomes "gate 1". The drain of this f.e.t. is connected to the source of the uppermost f.e.t. The gate of the upper f.e.t. becomes gate 2 and the drain serves for the total configuration.

The two j.f.e.t.s are now serving as one dual-gate m.o.s.f.e.t. The diagram, Fig. 2 also shows the physical connections using a J310 f.e.t. as an example. Other n-channel j.f.e.t.s could also be used in this arrangement. The J310 is available from; **JAB Electronic Components, PO Box 5774, Birmingham B44 8PJ**.

Armed with the information, I thought I would try a simple circuit to see how the idea works in practice. My initial thoughts were to follow the direct conversion receiver path mentioned above. But when I had been looking into regenerative receivers a couple of months ago, I had come across a nice little receiver idea which used a dual-gate m.o.s.f.e.t. as a regenerative detector.

The circuit came from **Eamon Skelton EI9GQ** (in County Cork) and was offered as a beginner's receiver. I contacted Eamon

and he was happy for me to share the circuit with *PW* readers.

The diagram, **Fig. 3**. shows the circuit of the EI9GQ dual-gate m.o.s.f.e.t. regenerative receiver. The receiver is of the oscillating detector type. In such circuits the detector is an oscillator circuit that can be controlled to slip in and out of its oscillating state. This can be done by controlling the level of positive feedback applied to the input or reducing the gain of the oscillating device to the point where oscillation ceases. The circuit uses a little of both methods.

Looking at Fig. 3, many readers will recognise an f.e.t. series tuned Colpitts oscillator. The feedback path to maintain oscillation is via the capacitive divider network (C4 and C5) on gate 1. The inductor Ll and capacitor Cl provide the tuned circuit to control the oscillator frequency.

Including a potentiometer (P2) in the source of the dual-gate m.o.s.f.e.t. allows the amount of positive feedback to be controlled. This serves as the coarse regeneration control. Another potentiometer (PI) acts as a potential divider, via the 10kΩ resistor (Rl) to control the d.c. voltage on gate 2. This voltage determines the gain of the device and serves as the fine regeneration control. Both potentiometers should have a linear track and should not be wire wound types.

The input signal is introduced to the detector via a link winding (L2) wound over L1. The amount of feedback present in the detector is controlled by the two potentiometers and the detected audio signal appears at the source. After basic filtering by C7, R5 and C8, the signal is coupled to an audio amplifier. A computer soundcard or computer-type amplified speakers can be used to amplify the signals to a comfortable listening level. (Some readers may prefer to add a purpose built audio amplifier to the output).

Tuning Range

The tuning range of the receiver will depend upon the values for Ll and C1. I happened to have a decent 250pF variable capacitor; in fact it is a two-gang 250pF capacitor culled from somewhere or other! The inductor, L1 is 30 turns of pvc insulated single strand wire wound over a 15mm (about half an inch) diameter plastic tube. The inductor L2 is five turns of the same wire wound over L1. This combination gave me the 7MHz Amateur band in approximately the centre of the tuning range.

Readers could try almost any combination for Ll and Cl, probably depending upon the capacitor they can obtain for C1. Polyvaricon capacitors of the sort used in cheap a.m. radios could be used. These usually only have a maximum

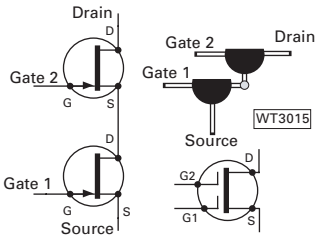

Fig. 2: Backed up by an interesting reference source, G3RJV has found that most circuits using a dual-gate m.o.s.fe.t.s can be built using n-channel j.f.e.t.s in a cascade configuration. The diagram illustrates the idea (see text).

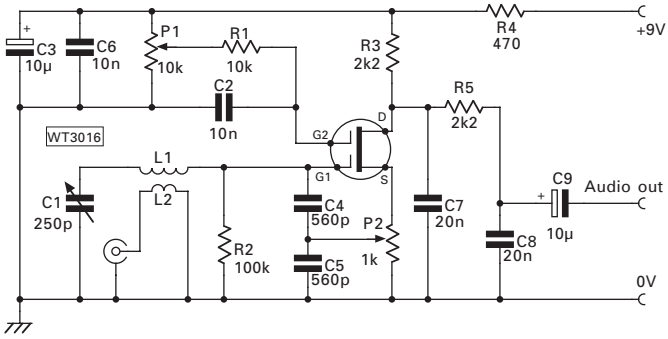

Fig. 3: The diagram shows the circuit of the EI9GQ dual-gate m.o.s.f.e.t. regenerative receiver. The receiver is of the oscillating detector type and is reproduced with kind permission of EI9GQ (see text).

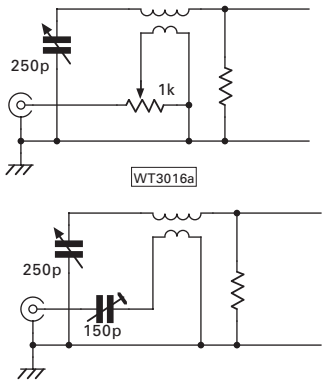

Fig. 4: Two methods to reduce signal overload, one using a series capacitor to reduce the input signal where G3RJV used a 150pF compression trimmer to limit the input. Another approach is to use a basic resistive attenuator (see text).

capacitance in the order of 150 to 200pF. This will reduce the tuning range but greater coverage could be had by adding parallel capacitance or even switching in or out the number of turns on Ll. Any capacitance added to the tuned circuit ought to use capacitors with decent temperature stability such as polystyrene types.

Using the receiver is quite simple, although like any other regenerative receiver, **it does require a little practice**! The best approach is to set the fine regeneration control about mid-way. Then tune in the required station. If it is an a.m. station you should set the coarse regeneration just below the point of oscillation.

Oscillation will sound similar to a rushing sound and bring about a noticeable increase in gain. The station can then be re-tuned and the fine regeneration control used to adjust for best a.m. reception.

In the case of a c.w. or s.s.b. station, the regeneration is set just above the point of oscillation. Re-tuning will mean having to adjust the regeneration with the fine control as there's a lot of interaction between the three controls.

The antenna is fed to the receiver via the link winding (L2) and it is essential to use a metal front panel to prevent hand capacitance affecting the tuning. I used a piece of copper clad board as a front panel and built the receiver on the back of the panel. The ground of the receiver should be connected to an earth or, ideally, the earthy end of a 50Ω input.

Surprisingly Successful

Using the receiver on the 7MHz band, proved to be surprisingly successful, although in the evenings the adjacent broadcast stations overloaded the detector. This requires the addition of some input attenuation.

I then tried the two methods shown in **Fig. 4**. The lower circuit of Fig. 4 shows the use of a series capacitor to reduce the input signal. In my tests I used a 150pF compression trimmer to limit the input. The coupling can be reduced until the Amateur band signals are heard on 40 metres.

The upper circuit of Fig. 4 shows another approach; the use of a basic resistive attenuator. The 1kΩ carbon track potentiometer reduces the input signal until the broadcast signals disappear, and the Amateur band signals can be heard.

What began as a test of the idea to make a dual-gate m.o.s.f.e.t. from two f.e.t.s ended with a very pleasant little receiver! For the few parts involved, the receiver is well worth building. My thanks go to Eamon EI9GQ for his kind co-operation. **PW**

Editorial note: Please see the information panel on page 21 referring to a new source of direct replacements for the 40673 m.o.s.f.e.t. **Rob Mannion G3XFD**.

Antenna Workshop

Peter Dodd G3LDO, explores the use of PolarPlot, a piece of software that can plot the polar diagram of your antenna and display it on your computer screen.

Welcome to the antenna workshop, where I'm looking at antenna evaluation this month. The performance of an antenna is best assessed by plotting the relative field strengths around the antenna when it's energised by a transmitter. This method gives a real plot for a real antenna. But the published polar diagrams for antenna designs are mostly the result of theoretical calculations, often using software such as *EZNEC*.

Generally, when using prediction software the environment of the antennas to be 'tested', is considered as simple and so, free of electromagnetic obstacles and thus simplifying the calculations. However, the real world is rather different as an antenna is often in an environment that's less than ideal. Knowledge of the performance of an antenna in the actual location in which it's being used, rather than relying on published data, is particularly useful.

The time-honoured way of checking an antenna installation is to enlist the help of a friendly local amateur to provide a signal, transmitted on the required band. You then take S-meter readings at various beam headings and plot them on polar-coordinate graph paper to produce a polar diagram (plot) of your antenna. Such a diagram will enable you to understand the operating characteristics of your antenna.

Rather Tedious

Polar diagram plotting, as described above, can be rather tedious though it can be automated using a computer. Now we have a method that takes much of the manual work out of plotting polar diagrams so, speeding up the process considerably. Storage of data and the application of functions for normalisation and conversion from linear to log scales etc., are tasks ideal for computerisation. Additionally, very complex polar diagrams that would otherwise be time consuming when using the manual method, can be plotted quickly.

The method of plotting polar diagrams of antennas, using a PC now exists. It operates by converting the output signal from your receiver to something that can be understood by the computer. The key component is the computer's soundcard. The relative volume of a beat note of a plain unmodulated carrier (received in either s.s.b. or c.w. mode) has good correlation with the r.f. input level. This is provided the receiver is operated in a linear manner.

Testing the test set-up: checking the linearity of both the sound card and receiver.

A computer program, called *PolarPlot,* by **Bob Freeth G4HFQ** is free and can be downloaded from the Internet at **www.g4hfq.co.uk** The program comes with full operating instructions, and can be run on all flavours of *Windows,* with system requirements that are not critical; I can run *PolarPlot* on anything from my *Windows 98*, HP 5700 Omnibook (166MHz 48MB RAM) to the *Windows XP* Toshiba Equium L10-30 (1.6GHz 500MB RAM). The main requirement is the soundcard.

You can use *PolarPlot* to measure the performance of your h.f. beam antenna. It's more convenient to use the station's beam (the antenna under test) on receive because you have control of all the receive parameters at one location. This method gives the same results as when the antenna under test is energised by the transmitter, because of the reciprocal nature of antennas.

Plotting Scales

An example of a polar plot of a 28MHz 3-element Yagi is shown in **Fig. 1** (supplied as an example by G4HFQ). The diagram shows a nice front-to-back ratio plot of relative field strength on a linear scale. It's the sort of diagram you would get if you plotted the field strength using a diode field strength meter. On the other hand if you tried plotting the diagram of the same antenna using the S-meter on your receiver, then you could finish up with a plot similar to that shown in **Fig. 2**, which is plotted on a logarithmic scale.

The advantage of the plot in Fig. 2 is that you can 'see' a far greater range of signal levels than in the plot, Fig. 1. The disadvantage is that the plot of the beam looks so poor. Some years ago the ARRL came up with a plot that is a compromise between Fig. 1 and Fig. 2 and is shown in **Fig. 3**. This method is known as the ARRL Log Co-ordinate scale. These scales are described in the ARRL *Antenna Handbook* (20th edition) and *The Antenna Experimenter's Guide* (second edition).

The *PolarPlot* program can use any of the different scales. You can see in the control panel of the display (right hand side of Fig. 1) a **Plot in dB** box. This box is shown de-selected (no tick in the box) and so, a linear scale plot is displayed.

An example of an h.f. antenna beam plot is shown in **Fig. 4**, the plot of a modified version of the commercial five-band MQ2 beam antenna. The plot shown, illustrates the polar diagram of this antenna on 28MHz using the ARRL Log Co-ordinate scale. (**Plot in dB** selected). The measurements were made by recording the signal levels, while I rotated the antenna, from a station (operated by **Frank James G0LOF**) located about 1km away from me.

There is yet another scale available in *PolarPlot.* Consider the polar diagram of a 144MHz 10-element beam shown in **Fig. 5**. This can also be displayed as a rectangular plot, **Fig. 6**, which is normally used in professional antenna analysis programs for examining the side-lobes of high gain v.h.f./u.h.f. antennas.

Receive Linearity

As described earlier, *PolarPlot* relies upon the combined linearity of the computer's sound card and the receiver, to accurately plot the diagram and measure the gain. The linearity of the average sound card is generally quite good and can be calibrated using an 800Hz signal from an audio signal generator and the use of the software mixer's recording volume sliders.

The linearity of the receiver depends on how it's operated. At a minimum, the receiver must be capable of controlling the r.f. gain to such an extent as to be able to negate the operation of it automatic gain system (a.g.c.). If you can turn the a.g.c. off, as well as control the r.f. gain, then this will be ideal.

Receivers without control of the r.f. gain are usually unsuitable for this application. Also modulated tones, using either a.m. or f.m. cannot be used. Particularly f.m., which is inherently designed to maintain audio level regardless of the r.f. input level.

There is a facility for the received tone calibration. The calibration plot, **Fig. 7,** shows the result of applying various levels of signal to the receiver from a signal generator as shown in the Photo. These levels are 10dB apart, but as you can see the plot is only linear over 25dB of the scale.

Tidying Up The Plot

Sometimes the original readings collected, are irregular for one reason or another, creating a ragged plot. Common problems are caused by noise on the signal, or wind blowing the antenna around during the measurement.

In an attempt to produce a 'cleaner' looking plot, a smoothing facility is provided. It must be stressed that the main objective should be to get a smooth plot in the first place, and that this facility should only be used if the plot itself is very ragged. The routine works as an averaging process on the point being plotted, by comparing its value with the immediately preceding and succeeding points. This rather rudimentary process is performed twice, and the resulting averaged values are then plotted.

It's rare that you can get the maximum part of the main lobe to occur with the same orientation every time you make measurements. *PolarPlot* has a facility to rescale the plot so that the main lobe is made to equal 0dB while at the same time the maximum is re-orientated to face 'north'. This facility has been applied to all the polar plots described.

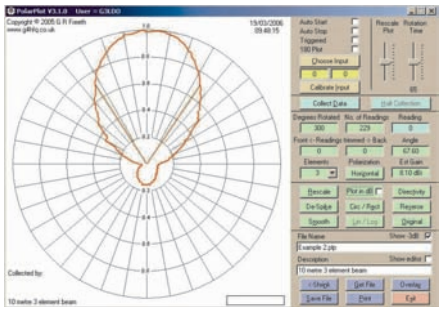

Fig. 1: Polar diagram of a three-element beam using a relative field strength linear plot. Note that in the control panel the 'Plot in dB' box is not ticked

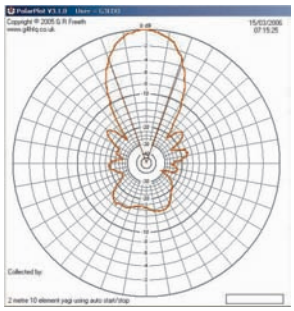

Fig. 5: Polar diagram 144MHz 10-element Yagi, using the ARRL Log Co-ordinate scale.

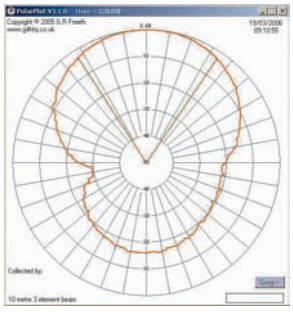

Fig. 2: The same antenna as Fig. 1 but plotted using the Linear dB scale. The control panel switched off in this display.

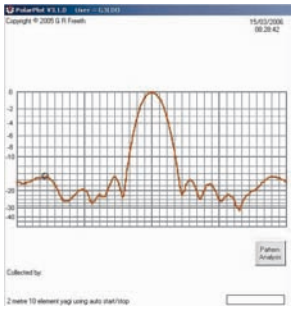

Fig. 6: Field strength diagram 144MHz 10-element Yagi, using a rectangular Co-ordinate scale.

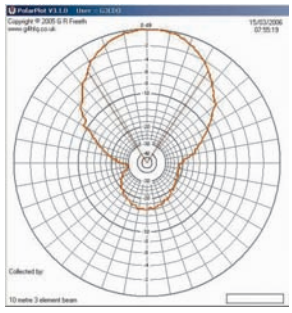

Fig. 3: The same antenna as Fig. 1 but plotted using ARRL Log Co-ordinate scale. The control panel is switched off in this display.

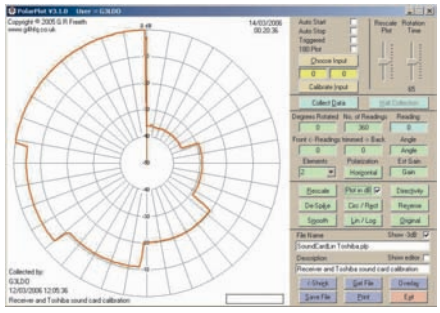

Fig. 7: Calibration plot showing plotted signal levels at 10dB intervals

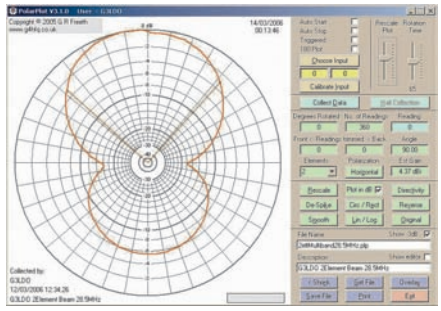

Fig. 4: Polar diagram of a modified version of the commercial five-band MQ2 on 10m using the ARRL Log Co-ordinate scale.

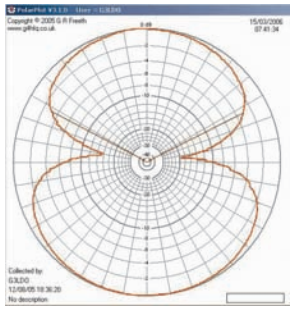

Fig. 8: Polar diagram of a 144MHz dipole.

To Finish

Finally, to finish this stint in the Antenna Workshop, I've shown in **Fig. 8**, the polar diagram of a 144MHz dipole. This was done on my garden 'antenna test range' by energising the dipole antenna with a signal generator. Measurements were made using an FT-817. The a.g.c on the FT-817 receiver has several settings; one of which is **OFF**.

However the S-meter bar still works on this setting (when the a.g.c. is OFF) so, I am not convinced that the a.g.c. has been switched out. The **RF** control is very non-linear; however, with a bit of fiddling the receiver could be made to work in a relatively linear manner although the diagram in Fig. 8 does look a bit squashed.

Well that's all I have for this time. Until the next time, happy plotting! **PW**

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VHF DXer

REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

There was relatively little to report in the way of DX made on the v.h.f. and u.h.f. bands during March. Minor auroral backscatter openings were reported on March 6, 10, 18, 19, 20 and 21 but all were very weak and only reached as high as the 50MHz band. Indeed the only DX station reported during the period was that of LA8HGA (JO59) heard peaking 51A at 0033UTC on March 19 by the station of MM0BSM (IO86). Later that day between 2150-2220UTC the station of MM0AMW (IO75) heard the beacons JX7SIX (Jan Mayen 50.079MHz) and TF3SIX (Iceland 50.057MHz).

No Sporadic-E openings were reported, but this is not surprising as March lies in the period between the minor winter peak and the infinitely larger summer Sp-E season that we will all be enjoying very soon. Tropospheric propagation was virtually non-existent with only one brief opening to Scandinavia being reported during the evening of March 18. Stations in East Anglia reported making s.s.b. contacts on the 144 and 430MHz bands into Denmark and Sweden.

THE GB3VHF 144MHz BEACON

After several decades of excellent service the GB3VHF beacon located at Wrotham, Kent (JO01DH) was replaced in February 2006 with a new state of the art beacon incorporating several new r.f. and digital features. The beacon that operates on 144.430MHz is the result of a year of design and construction by a team of four Radio Amateurs and provides new facilities, some of which have never been used in Amateur Radio beacons before.

Fig. 1: Chris Whitmarsh G0FDZ integrated the various modules and produced the metalwork and housing facilities for the GB3VHF beacon.

At the heart of the beacon is a direct digital synthesiser (d.d.s.) designed, constructed and programmed by **Andy Talbot G4JNT**. This generates a signal directly at 72MHz, which is then filtered and doubled to 144MHz before being passing to the power amplifier. The d.d.s. clock source is locked to a global positioning system (GPS.) module with a short time-constant phase-locked loop that will normally maintain an accuracy to within a few parts in 10^9 over a period of a few tens of seconds and better than 10^{12} long term. The frequency of the c.w. carrier (mark) is exactly 144.430000MHz and therefore makes an excellent reference with which to calibrate your 144MHz receiver.

The most important feature of the new replacement is that by using d.d.s. the beacon can be programmed to transmit new 'digital' modes. Just like the old system the beacon sends its callsign and locator in Morse code but using A1A (on/off) keying rather than frequency shift keying (f.s.k.) previously used. To enable the beacon to be monitored at extreme ranges the beacon additionally transmits its callsign and locator using the new JT65B (wsjt) mode. To decode the JT65B transmission you tune the carrier to obtain a tone of 1500Hz with the receiver set to upper sideband (u.s.b.) and the dial frequency reading 144.4285MHz. Software to decode wsjt is easily obtainable on the Internet at

http://pulsar.princeton.edu/~joe/K1JT/

The GPS system also provides for the precise timing of the keying sequence such that the JT65B sequence will start at every even minute past the hour for 48 seconds duration. The Morse sequence will commence at the start of each odd minute past the hour and last for 13 seconds.

At the start of each odd minute 30 seconds past the hour, at a precisely timed point, 140 microseconds after the UTC one-second reference as signalled by the GPS receiver, the phase of the carrier is reversed, 28 times in total to fill up the 30 second time slot. The result is a 1bit/second pattern of 101010. This binary phase shift-keying (b.p.s.k.) mode has been incorporated to allow users to become familiar with using precise timing methods to assist in experimentation with coherent signal recovery, to measure time of flight information and propagation testing. In the event of GPS lock being lost the beacon will suspend the JT65B sequence and replace it with the Morse code sequence until such time as the g.p.s. lock is re-established.

The r.f. section of GB3VHF, which was designed by **Sam Jewell G4DDK** uses a Mitsubishi RA30H1317 power amplifier (p.a.) module running 30W of r.f. output power. The use of extensive filtering throughout ensures that the beacon complies with the most stringent CEPT regulations for transmitters operating in the v.h.f. frequency range.

The power supplies delivering both 12 and 24V for the entire beacon have been designed and built by **David Bowman G0MRF** who has ensured that generous component under rating and spare current capacity will help to provide the high reliability needed. Over-sized heatsinks mean that no fan cooling is required whatever the ambient temperature.

Chris Whitmarsh G0FDZ (GB3VHF beacon keeper) integrated the various modules and produced the metalwork and housing facilities for the beacon, as shown in **Fig. 1**. Ease of maintenance was very much in mind when designing the beacon, so as to ensure minimal outage times if any faults occur. This beacon has been financed by the four participants only but the team gratefully acknowledge the donation of some parts for building the replacement from **Russ G4PBP, Derek G3GRO, Dave** at **Quartslab Ltd. and Simon G3LQR**

The new beacon hardware is only the fourth to be employed since the facility first became operational in 1959 at the end of International Geo-physical Year (IGY). The beacon antennas comprise of two 3-element Yagis beaming 288 and 348° and are located approximately 48m above ground level as shown in the **Fig. 2.** This is truly a beacon for the 21st Century and the designers are to be congratulated on their magnificent achievement, which is for the benefit of many v.h.f. operators.

THIS MONTH DAVID BUTLER G4ASR HAS DETAILS OF A STATE-OF-THE-ART 144MHZ BEACON

EVEN MORE ON FOUR!

In recent months I've passed on the good news that Azores (CU) Madeira Islands (CT3), Monaco (3A) and Portugal (CT) have all received authorisation to use the 70MHz band. That was good enough, but now I've received news that a further four DXCC countries have also been granted access to the 70MHz (4m) band.

After many years of negotiation with their national telecommunications authority the Radio Amateur Association of Greece (RAAG) have announced that the 70MHz band will be allocated to Greek Amateurs on a provisional experimental basis. They have been granted a 50kHz wide band between 70.200 -

Fig. 2: The GB4VHF beacon antennas comprise of two 3-element Yagis beaming 288 and 348° and are located approximately 48m above ground level.

70.250MHz. The good news is that stations in Greece (SV), Dodecanese (SV5) and Crete (SV9) can apply for permits.

In March 2005 the national Radio Society of Luxembourg (RL) requested their telecommunications authority to provide a limited access to the 70MHz band. Although the RL v.h.f. manager LX1JX provided the society with information regarding the Four Metre band, as well as details about the licence situation in other countries, the response in 2005 was negative.

However, in my role as RSGB v.h.f. manager I've provided information regarding the Detailed Spectrum Investigation (DSI) that was carried out a few years ago. It was conducted by the European Radiocommunications Office (ERO) on behalf of the European Radiocommunications Committee (ERC), which is part of the European Conference of Postal and Telecommunication Administrations (CEPT). In its review of the 29.7-960MHz part of the spectrum the ERC concluded, "It would therefore seem possible to agree a limited amateur transmitting facility of at least 100kHz centred on 70.200MHz. It is also hoped that the existing beacon network between 70.000 and 70.150MHz can be maintained and extended". This information was indeed very helpful with the result that the Luxembourg authorities on 13 March 2006 granted access to the 70MHz band for LX stations. The usage is on a Secondary basis in the frequency segment 70.150-70.250MHz with 10W e.r.p.

At the beginning of April there were 25 DXCC countries with authorisation to use the 70MHz band. They are Azores (CU), Crete (SV9), Croatia (9A), Cyprus (5B), Denmark (OZ), Dodecanese (SV5), Faroe Islands (OY), Gibraltar (ZB), Greece (SV), Greenland (OX), Ireland (EI), Luxembourg (LX), Monaco (3A), Portugal (CT), Madeira Is (CT3 Africa!), Slovenia (S5), South Africa (ZS), UK Sovereign Base areas on Cyprus (ZC4) and of course England (G), Isle of Man (GD), Northern Ireland (GI), Jersey (GJ), Scotland (GM), Guernsey (GU) and Wales (GW). Incidentally, the time scale for adopting the DSI proposal is relatively soon as the ERC has suggested its recommendations be implemented by 2008. The pace could therefore quicken with further countries gaining access to the 70MHz band on a limited basis in advance of the 2008 date.

50MHz LICENCES IN HUNGARY

In August 2005 a total of 65 Hungarian stations were issued with experimental licences valid for a period of 30 days allowing restricted Amateur Radio access to the 50MHz band. The aim of the experiment was to study whether any interference would be caused to the reception of broadcasting stations. The good news is that the experiment was a success and from March 29 2006 all Radio Amateurs in Hungary now have access to the Six Metre band.

The frequency range permitted is 50.000-52.000MHz and the licence is valid for all operating modes including f.m. and digital modes. The usage conditions will follow the IARU Region 1 band plan recommendations. The Hungarian Ministry decree on the Radio Amateur service will also put an end to the tradition of assigning HG prefixes to v.h.f. licences and HA prefixes to h.f. licences.

SUMMER EXPEDITION

Bob G1ZJP (M1MHZ) has passed on a news release on behalf of **Keith Tatnall G4ODA**, the group leader of the **Five Bells Group**. This year the expedition group will be going to the archipelago of St Kilda, the remotest part of the British Isles lying 66km west of Benbecula in Scotland's Outer Hebrides. The location (**www.kilda.org.uk**) is quite sensitive, as it has a Military presence and is a World Heritage site. After much effort they have been given permission to operate between July 1-8 from a part of the island (IO57) with a first class take off and consent to run on the 50, 70, 144 and 430MHz bands. The group will take equipment to enable full UK licence power to be used on all bands but priority will be given to the 50 and 144MHz bands.

Getting to St Kilda is not easy as the journey is very much dependant on the weather and tide conditions. A chartered boat is required and takes a minimum of 14 hours from Oban. All equipment has to be manhandled off the boat and carried to the site - and back again. The expedition callsign will be **GM4SIV** and the operators are Keith G4ODA, **Paul G1GSN**, **Bob G1ZJP** and **Howard G0VTL**. All QSLs go either direct to G4ODA or via the RSGB bureau to G4SIV (not GM).

DEADLINES

That's it for this month. Tune your receiver to 144.430000MHz and see if you can hear the new GB3VHF beacon. Keep a look out also for all the new countries on the 70MHz band. Good luck with your DX activities and please send your reports to me **g4asr@btinternet.com** by the last weekend of the month.

73, David G4ASR

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HF Highlights

AS USUAL, INFORMATION, REPORTS AND PHOTOGRAPHS TO ME PLEASE BY THE 15TH OF EACH MONTH.

A QSL received by Martin Addison 2E0MCA for a contact with C31JM.

There's a lot to get through this month as we have quite a few reports, so I will go straight into some DX News beginning with Special Event call **LZ80R**, which will be aired through to the end of the year. This celebrates the 80th anniversary of the first Amateur Radio club in Bulgaria. Activity will be on all h.f. bands and you should QSL via bureau to LZ1BJ.

In Serbia and Montenegro **Caslav Milanovic 4N7CC** has said that a few special callsigns will be aired from the City of Senta (Vojvodina) until 31 December to celebrate the 500th anniversary of the city. The following calls will be used, 4N7CC will use 4N500CC, 4N7ZZ - 4N500ZZ, YU7BW - YU500BW, YU7CM - YU500CM, YU7JDE - YU500JDE and YZ7A, which is a contest call, will use YZ500A.

Dr Gavin Roberts plans to be active as **AH8/W9EYE** In American Samoa from 15-21 May. Activity will be limited to his spare-time while working as a medical missionary in Pago Pago, Tutuila Island OC-045. Look for Gavin to be active on all h.f. bands, s.s.b. only as propagation allows.

Incidentally, Gavin began as an s.w.l. in the late 1970s with a surplus AN/GRR-5, which he still owns. He was first licensed in June 1991 as N9LPV with a Technician Class ticket and eventually went on to Extra Class. A period of inactivity followed due to career and family demands but when new vanity callsign rules went into effect in the USA he obtained his current callsign, **W9EYE**, in July 2001. (The callsign reflects his profession as a Paediatric Ophthalmologist.)

THE CQ DX MARATHON

Last run in 1948, the new CQ DX Marathon is a year long DX hunt with participants competing to see who can work the greatest number of countries or entities and CQ zones during the course of year regardless of the band or mode used. This year's Marathon began at 0000UTC on 1 January and will end at 2359UTC on 31 December. A new dedicated website has been set up and can be viewed at **www.dxmarathon.com** and this contains the rules and country/zone lists.

CONTESTING

The QRP Contest Community is a group of enthusiasts set up in 1992 to promote and organise QRP Contests. It currently has members from 12 nations and the group invites everyone to take part in the 7th QRP Minimal Art Session or QRP-MA, which takes place on 25 May from 1900 to 2300UTC on 3.5MHz c.w.

Contacts shall be made with simple home-brew rigs that should be constructed from as few components as possible. This will no doubt be of interest to those of you who enjoy building home-brew equipment. Further information can be found at **www.qrpcc.de/** or from **Hartmut Weber DJ7ST** via E-mail at: **dj7st@darc.de**

CARL GW0VSW SAYS ALTHOUGH IT'S BEEN QUIETER ON THE HIGHER BANDS THE POSTBAG'S STILL OVERFLOWING!

YOUR REPORTS

In Middlesbrough **Keith Winward 2E0JKD** had a complaint about his radio activities causing interference, which resulted in him using low power for a time. It just goes to show how careful we need to be, but an inspection by Ofcom gave him a clean bill of health with both equipment and antennas.

The fault was finally traced back to the complainant! Keith has now built a Marconi loop around his home, which fed against ground with three earth rods 'daisy-chained' together. Initial reports have been very favourable and it has also been checked by a field engineer with fundamental and harmonics given a clean bill of health. Hopefully, it will not be long before Keith starts to enjoy the hobby once again without any further problems!

Leighton Smart GW0LBI in Trelewis, Mid-Glamorgan worked on 1.8MHz using s.s.b. finding VY2ZM (Canada) 0035, CU2AF (Azores) EU-003 at 0038, RK2FWA (Kaliningrad) 0042, 9A15DX (Croatia) 0044, 9H3V (Malta) EU-023 at 0056 and at a more sociable hour DF2PB (Germany) 1805 and PA0WMR (Netherlands) at 2100UTC. Switching to c.w. Leighton's log includes 4J5A (Azerbaijan) 0006 for a new country on this band, TF8GX (Iceland) EU-021 at 0038, HB0/DL2SBY (Lichtenstein) 1900 and 7X0RY (Algeria) another new country bringing his band total to 65 at 2138UTC.

All Leighton's contacts were made using a Yaesu FT-100 with 50W c.w. to a 67m long wire

The Royal Survey Vessel (RSV) *James Clark Ross* mentioned and worked by Geoffrey Powell

antenna tuned against earth with a quarter-wave counterpoise cut for the band. The band conditions were described as "Very good this month with all continents apart from Oceania being heard at this QTH. Europeans and North American signals were particularly strong".

The 3.5MHz s.s.b. log of **Jim Pedley GM7TUD** in Dumfries lists a good deal of Canadian and US stations including Jeffery Briggs VY2ZM, which was established in 2001 in Eastern Kings County, Prince Edward Island and operates in many of the major DX contests and specialises in low-band operations on 160m with state of the art antennas. For this QSO a 4-square vertical array was used that produces 5.68db of gain in four patterns on this band. Next in the log was Jack Schuster W1WEF in Glastonbury, Connecticut at 2348UTC and both contacts were made using a Kenwood TS-450S transceiver.

Also on the band was **Andy Foad G0FTD**, Whitstable, Kent and, who despite the cold weather managed to use his 'shopping trolley' station (See the March 2006 column) in his garden making contacts with several HAs in Hungary and HBs in Switzerland with his vertical antenna 6m high and using 100W from a Icom IC-706. Andy is now working on a MkII trolley with improvements for operations on 1.8MHz band.

There was one PSK31 contact for **Martin Addison 2E0MCA** in East Finchley, North London and that was with PA60LDN, a callsign celebrating the 60th anniversary of VERON Leiden region A28 (QSL-region R28) in the Netherlands at 2018UTC.(VERON, Vereniging voor Experimenteel Radio Onderzoek in Netherlands) is the Dutch Amateur Radio Society.

THE 7 & 10MHz BANDS

Moving to 7MHz and s.s.b. Martin 2E0MCA worked a large number of stations including IO8ANT (Italy) as special Antarctica Week call at 0639, N3RS (USA in Glenmore, Pennsylvania at 0701, TM0TAF (France) 0833, OZ7AEI/P (Denmark) 1209 and OK1WCF (Czech Republic) at 1839UTC using his Yaesu FT-840, 20W and a half-size G5RV. In Nuneaton **Chris Colclough G1VDP** was also on this band using a Yaesu FT-1000 Mark V Field with UK Ranger Linear Amplifier at 400W to a half-size G5RV antenna and found ZL2/G4KHM (New Zealand) OC-134 at 0730 and YZ150T (Serbia and Montenegro) at 2214UTC.

In Worcester Park, Surrey **Eric Masters G0KRT** had c.w. contacts with K3LR (USA) in West Middlesex, Pennsylvania at 0759, CT1/G0CWM (Portugal) for a two-way QRP QSO at 1928 and UA1CEG (European Russia) at 1939UTC. The contacts were all made using a Kenwood TS-570DG and running 100W into a modified W3EDP antenna, and is 25m and has a loading coil attached, is tuned by an SGC230 auto tuner.

Moving on to the 10MHz band Eric worked EA5AIO (Spain) 1036, UR5XCW (Ukraine) 1055, SP6GB (Poland) 1524, OK1DQP (Czech Republic) 1612 and SM7FBJ (Sweden) at 1651UTC. This band is a favourite of **Mark Waldron M0BLT** in Tamworth, Staffordshire who has began using the Elecraft K2 QRP transceiver with 4W into a half-size G5RV. Using the Midlands Contest Group callsign GX2HDF Mark logged SQ9NRY (Poland) 1425, OE5WLL (Austria) 1444, EA3ADV (Spain) who was also using a K2 at 1453, IX1CNR (Italy) 1515, UR5IKN (Ukraine) 1618 and YL2CQ (Latvia) at 1600UTC. Very good going with such modest power!

Also active here was **Geoffrey Powell M1EDF** who lives in Seckington, Staffordshire and uses a Yaesu FT-840 at 100W to a dipole antenna at 15m. Geoff works 'all c.w.' and was pleased to work JA1MCU (Japan) 0741, UN7GN (Kazakhstan) 1420, EK6RL (Armenia) 1440, 3A2LF (Monaco) 1559, IT9VV (Italy) 2035 and FG5RF (Guadeloupe) NA-102 at 2050UTC.

THE 14MHz BAND

The 14MHz band was once again the most popular with our reporters this month. In Cumbria **Roy Walker 2E1RAF** sent in another huge log listing his c.w. QRP contacts, which included UA9CPW (Asiatic Russia) 0839, IZ7GEG (Italy) 0846, YO3AV (Romania) 0857, HA1DK (Hungary) 1006, UN7BBD (Kazakhstan) 1014, 9H3V (Malta) 0924, UA1AT (European Russia) 0947, YU7RA (Serbia & Montenegro) at 1115UTC with all stations worked with a Kenwood TS-570DG and 5W into an 80m wire loop just above ground.

In Biggleswade, Bedfordshire **Owen Williams G0PHY** found TG1T (Guadeloupe) 1620, FR1HZ (Reunion Island) AF-016 at 1627 and J79IX (Dominica) NA-101 at 2011UTC with s.s.b. and using his Yaesu FT-757 and 100W s.s.b. to a dipole antenna.

On to the log of **Martyn Medcalf M3VAM** in Chelmsford, Essex now, who used s.s.b. once again, contacting 4N0W (Serbia & Montenegro) 0852, EA3KT (Spain) 1051, LZ13ARDF (Bulgaria) 1056, IO8ANT (Italy) 1056, VY2TT (Canada) 1158 and W3LPL (USA) in Glenwood, Maryland at 1912UTC using an Icom IC-746 and long wire antenna with SGC-237 auto tuner for his h.f. activities.

A maritime mobile station was heard and worked by Geoff M1EDF who was pleased to have a chat with operator Mike Gloistein GM0HCQ operating as VP8CMH/MM at 2004UTC. Mike has been mentioned in this column before and is working as the Radio Officer onboard the Royal Research Ship *James Clark Ross* in the South Atlantic. He has set up a very interesting website at **www.gm0hcq.com** which has a good deal of information on the vessel's work and schedules for the coming months, as well as the times you can work him on h.f. Other calls to enter Geoff's log were VE2OPB (Canada) 1522, RD3AC (European Russia) 1738 and JW4GHA (Svalbard) EU-026 at 2049UTC.

New reporter **Gary McKelvie G7USC** in Guildon Sutton near Chester, uses a Yaesu FT-857D with DSP fitted and a Tigertronics SL1 soundcard interface for his digital communications. His computer runs the *MixW*, *MMRTTY* and *MMSSTV* software with power usually set at around 30W and all h.f. operating is done using a 40m delta loop antenna, which is about 7.5m above ground. The station works well and "Is more EMC friendly than s.s.b., which was interfering with our baby monitor and the XYL was not too happy about that"! His most memorable contacts recently have been KP4AH (Puerto Rico) NA-099, YB0EIN (Indonesia) and FG5BY (Guadeloupe). Unfortunately, I was unable to open Gary's logbook but look forward to more reports in the coming months.

A QRP report from **Brian Waddel GM4XQJ** in Falkirk lists c.w. calls PJ4/K2NG (Netherlands Antilles) SA-006, PJ7/DL7DF (St Maarten), 3B9FR (Rodriguez Island) AF-017, A71BX (Qatar), KP4SQ (US Virgin Islands) NA-006 and VP2V/G6AY (British Virgin Islands) NA-023 though no times were given. The station used includes an Elecraft K2 at 5W into a 3-element tri-band antenna.

Gary McKelvie G7USC's new QSL card showing a 'Clownfish', as his son jack is currently into the Disney cartoon *Finding Nemo*.

THE 18MHz BAND

On to 18MHz now where Martin 2E0MCA enjoyed an afternoon's operating, using a sloping antenna cut for the band. He found US6IOU (Ukraine) 1303, 9H1ZZ (Malta) 1610 and CX2AQ (Uruguay) at 1650UTC using PSK31 and voice contacts with LZ2KV (Bulgaria) 1314 and C6AMM (Bahamas) NA-001 at 1318UTC.

Chris G1VDP managed ST0RM (Sudan) 1043, EX8AA (Kyrgyzstan) 1105, 3Y0X (Peter 1 Island) AN-004 at 1150, C6AMM ((Bahamas) at 1532, 5R8SB (Madagascar) AF-013 at 1554, PT7/HA9RT (Brazil) 1746 and FS/W3ARS (Saint Martin) NA-105 at 1803UTC using s.s.b. and his Cushcraft MA5B antenna.

THE 21MHz BAND

The 21MHz band was the highest one used by any of our reporters this month and provided Chris with ST2KSS (Sudan) 1159, 3Y0X) again at 1732, VP2MLB (Montserrat) NA-103 at 1747, HR9/N0STL (Honduras) NA-057 at 1080 and CP6XE (Bolivia) at 2029UTC and Jim GM7TUD with FR1HZ (Reunion Island) AF-016 at 1206, J79IX (Dominica) NA-101 at 1506 and CE5JZO (Chile) 1522UTC who was also using a Cushcraft MA5B antenna. Meanwhile, Owen G0PHY managed voice contacts with FM5AM (Martinique) NA-107 at 1414 and FR1AN (Reunion Island) at 1437UTC.

SIGNING OFF

Well that's it for another month and a what busy one it has been, even if the higher bands have not been in such good shape! My thanks to all our reporters and to **Tedd Mirgliotta KB8NW** Editor of the *OPDX Bulletin* and **Mauro Pregliasco I1JQJ/KB2TJM** Editor of the *425 DX Newsletter* for the DX information. Until next time have a good DX filled month. **73, Carl GW0VSW**

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In Vision

From March 2004, proof that the BATC committee actually manages to meet between BGMs!

GRAHAM G8EMX ROUNDS UP THE LATEST NEWS FROM THE ATV SCENE

After months of uncertainty, mainly due to difficulties of finding a suitable venue or a date when most of the officers would be available, the Biennial General Meeting (BGM) of the **British Amateur Television Club** (BATC) will be held in the Village Hall of Stow-cum-Quy on Sunday 24 September 2006. One BATC member, **Ian Waters G6KKD** (Cambridge) made the offer of the venue; Stow-cum-Quy is a few miles east of Cambridge and just off the A14.

The BGM will take place in the afternoon and it's known that some of the committee will be standing down, so this year is a chance for fresh faces to volunteer to help run the BATC. The morning should see a lecture stream, specialist traders, live demonstrations - there's a 24cm ATV repeater in Cambridge. But at the time of writing, end of March, none of this is yet in place!

Before the BGM announcement arrived in a draft copy of the BATC's magazine, *CQ-TV*, the past few months had been a bit quiet for ATV news, even an E-mail to the BATC committee had brought no response - no new repeaters, no applications. So, it was with some relief when a newsletter from the Kent Television Group (KTG) arrived in the post!

The draft copy of *CQ-TV* also contained one big surprise - a 'Bits and Pieces' advertisement from **Bob Platts G8OZP**! Bob seemed to 'disappear' from the ATV scene, quite suddenly, a few years back, so it's great to see him back with his excellent 24cm and 10GHz kits!

KENT TV GROUP

In 2007 the Kent TV Group (KTG) will be celebrating 10 years of existence and running the 24cm ATV repeater **GB3KT,** so its March newsletter takes a look back at the early days. After inaugural meetings, formal committees and encouraging progress in 1990 and 1991, the front page goes on to state that: "The next few years were frustrating as the licensing procedure dragged on". But the licence for GB3KT did eventually come through, clearing the repeater to begin service on 16 May 1997.

Slow Scan TV transmits still images slowly, generating a bandwidth suitable for the v.h.f. and lower bands, so images can be sent great distances and the KTG newsletter includes a piece about SSTV Repeater **MB7TV**. On one of its test cards, MB7TV describes itself as a Replay Station and as: "The UK's first licenced digital node for SSTV".

The MB7TV repeater operates on 144.700MHz vertical and is located at Point Clear near Clacton. Although I'm not quite sure where the 'Digital' bit comes in, but for more information on this SSTV repeater
E-mail **g0pkt@bigfoot.com**.
The Kent Television Group has a new website, take a look at:
http://www.ktg.org.uk

SEVERNSIDE NEWS

The Severnside ATV Group sends out its newsletter by E-mail. In the latest edition, Chairman **Viv Green G1IXE** tells how the Group won the Summer Fun ATV Contest last year - perhaps not surprising as they takes a caravan and tower-mounted multiple antenna farm to a high point on the Mendip Hills, then spend all night working stations! At least, it did when I went down there a few years ago with my caravan! But contest entries were low last year, reports outgoing BATC Contest Manager **Richard Parkes G7MFO**, who extends thanks and encouraging words to a smaller but equally keen contest team, **Jason G7KPM** and **Colin G4PYD** (operating as **G0ATW/P**) who, although taking ATV kit for all bands 70cm to 10GHz, were only able to work stations on 24cm during the International Contest in September due to lack of contest activity. This year's International will take place over the weekend of 9/10th September.

DIGITAL SWITCHOVER AND HDTV

With analogue broadcasts beginning to be switched off in 2008, consumer magazine *Which* gives a map indicating the percentage of viewers surveyed in each region who were aware of the change-over year for their area. This 'awareness figure' varied from a high of 36% in Borders – not surprising as this region will be the first to loose its analogue in 2008 – to lows of 3% for Central and London viewers (2012), with Yorkshire viewers almost completely oblivious to the coming revolution, still five years away for them, at a mere 2%. Hey, wise up out there!

Even before the digital switchover, High Definition Television (HDTV), the **Next Big Thing**, is gaining prominence in High Street retailers. With some huge plasma displays on demonstration, at four-figure prices (somebody must be buying them?) the images on demonstration - usually from in-house High Definition DVDs - are certainly stunning. Take a look at the rear panels too; you will probably see a formidable array of sockets, symbols and abbreviations. Gone are the days of just one coaxial socket labelled 'Antenna In'!

While High Definition TV will bring an even better visual experience for the viewer, its coming is proving a new challenge for TV Production and of concern to some performing artists! The phrase 'warts and all' becomes more of a reality as the television system becomes able to reproduce previously unseen blemishes. Facial imperfections, previously camouflaged by make-up or camera and lighting tricks may now be exposed for all to see! So, as the engineers raise their game, so too must the artists both behind and in the vision of the all-seeing cameras!

Going back to the Radio Amateur in his shack - where will this 'Digital Revolution' and High Definition, plus whatever lies even further beyond, leave Amateur Television? A rhetorical, imponderable question if ever there was one.

The Radio Amateurs who explored ATV 'way back' took their hobby with pride as at least up there with the broadcasters, and occasionally ahead. Perhaps those days, when technical developments were within amateur resources and budgets, are long over. Digital is very expensive for ATV and may prove to be the final development that is possible for the Amateur TV station.

That's all for this time so, until next time stay tuned in and 'in vision'. **Graham G8EMX**

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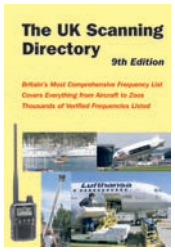

Airband

	Pages	Price
AIRBAND RADIO GUIDE. 6th Edition (abc)	122	£8.99
AIRBAND RADIO HANDBOOK. David Smith (Sutton)	190	£12.95
INTERNATIONAL AIRBAND RADIO HANDBOOK. David Smith (Sutton)	192	£9.99
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rob mannion's topical talk

Following his 'Easter Parade' on 7MHz Rob Mannion G3XFD chats about the antennas used on the band. It seems that over the years he's taken an interest in what's being used at the other end of the QSO.

As I've already mentioned in this month's Keylines, I enjoyed a sustained on the air operating session over the Easter period. During the period I maintained a tradition I've kept since G3XFD first came on the air, by recording the antenna in use by the other station in the QSO.

Looking back over the almost 40 years since I had my first QSO, the log book entries make interesting reading, particularly the equipment in use and the antennas employed by individual stations. There's been tremendous changes in equipment but fewer changes in the type of antennas used on the band.

Antenna Of Choice

Looking back at my log books from the past, along with the notes regarding equipment used, the choice of antenna was always noted in my paper log books. Incidentally, I was always frustrated with the old log books because of the relatively small space allowed for the small 'comments' section where I recorded the other station's details, etc. Nowadays of course, Amateurs using computer logging can tailor their own needs directly on the screen. That's progress!

From my logging records I can see that the majority of 7MHz stations worked were either using the 'long wire' type antenna, or trapped dipoles. Of course, this was in the days when most of us were still using amplitude modulation (a.m.) and c.w. 40 metres.

The trapped antenna was once very popular, but my logs and notes indicate that fewer stations use this design nowadays. In fact, although I've not had as many QSOs this year so far, due to various problems, it was interesting to look back at the 200 or so QSOs I've had up to the Easter weekend.

Most of my QSOs (87%) have been on c.w., the records show that more than 50% (sorry about the statistics - I won't make a habit of that game!) c.w. stations worked were using dipole antennas on 7MHz. The 'long wire' was favoured by 40% of other stations, with the last 10% using a mixture of designs including Windoms, Carolina Windoms and Zepp antennas.

I've chosen the records from c.w. QSOs because invariably the antenna information is supplied by the other station. When we're on s.s.b. other things seem to creep into the conversation!

International Favourites?

When I work Amateurs from neighbouring Continental countries it's interesting to note that the choice of antennas doesn't change much from those used in the UK and Ireland. And of course there's a good reason for this - the antennas mentioned are convenient to use and even a small garden can usually take a 7MHz dipole.

Up on 14MHz, very often I'm struggling for DX contacts because my dipole is competing with stations using beam antennas. However, on 18MHz (another favourite band of mine) fewer stations seem to be equipped with beam antennas.

For DX work I often use my 10m tall fibreglass fishing rod vertical, in conjunction with an extensive radial system. It works well, but the vertical - even though excellent for DX working due to low angle propagation - rarely appears in my comments section.

So, what antennas do you use as a matter of choice or necessity? I'd like to hear from readers on this subject and perhaps my own statistics will be supported. However, in closing, I'll always bear in mind the cartoon I saw in a magazine years ago - it depicted two and a half top hatted and pin stripe suited officials coming out of the Bureau of Statistics office door on their way to lunch! Statistics can be made to represent whatever you want them to be! **PW**

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