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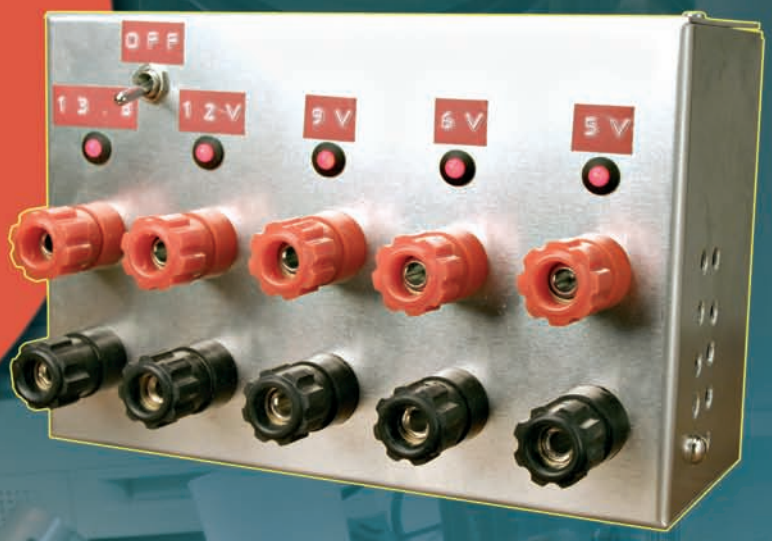
# pw

www.pwpublishing.ltd.uk

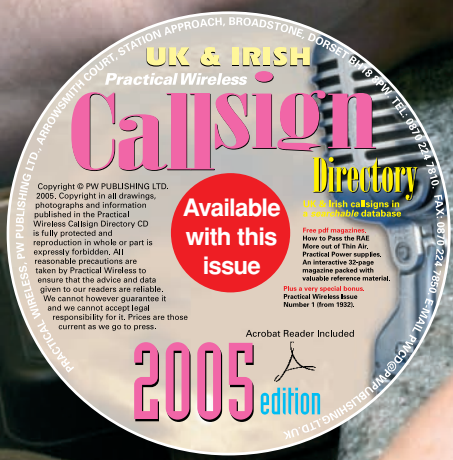
## Generating Power

Build a Multi-voltage PSU




# Setting Up Your Workshop

## Specialist component sourcing




## Technical for Terrified

G4CFY takes the fear out of maths!

## Classic Project

A 144MHz VSWR bridge

April 2005 £3.00

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# WATERS & STANTON

# UK'S L

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### 330 YEARS WORTH OF EXPERIENCE!

One of our strengths at Waters & Stanton is in the fact our staff have many years experience over 330 years altogether! not only in amateur radio, but also in general communications & electronics. This knowledge is shared on a daily basis with our cus tomers providing helpful professional advice.

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Get free entry to any rally we attend up until 31st May 2005. Simply pay your admission then come to the W&S stand and show us your ClubCard and we will reimburse your money!

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## New Magic Loop

**MFJ-935**
**MFJ-936**

*The most amazing antenna we have seen in years! We worked VK & W stations on SSB from indoors!!*

*The Flat Dwellers Dream*

*Full details opposit Page & www.wsplc.com*


## Icom HF Transceivers

### ICOM IC-756 PRO III

Top of its range of HF transceivers. HF & 50MHz, features large colour LCD with spectrum scope, auto ATU and 32-bit floating point DSP unit. **£2099 C**

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

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

**IC-756 PRO MkII** £1699 C
Last few of this model at knock-down price. If you don't want the latest model - then save £600!!

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

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

**IC-718** £449 C
This is a budget class radio HF 16 - 10m at a price that belies its performance. Beautiful display.

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

### Going HF Mobile?

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

## Kenwood HF Transceivers

### KENWOOD TS-2000

Top-of-the-range Kenwood transceiver. HF/VHF/UHF or up to 23cm with the optional module. Built-in auto ATU, DSP and its unique TNC. **£1389 C**

**TS-2000**
The station in a box. 160m - 70cm with every feature imaginable inc. DX cluster. Kenwood fans dream rig.

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

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

**TS-870S** £1249 C
Kenwoods great HF radio that uses phasing for SSB. No more filters to buy - they are all inside the box!

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

**TS-50S** £595 C
A great rugged mobile for 160m to 10m with up to 100W output. Also a great price.

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

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

## Yaesu HF Transceivers

### YAESU FT-1000 MKV

200W HF transceiver, EDSP, Collins filter, auto ATU, 220V AC PSU-Acknowledged as one of the finest DX rigs on the market. Superb tailored audio and the ability to select Class A bias for dramatic signal purity. **£2099 C**

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

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

**FT-897D** £759 C
160m - 70cm self-contained portable. 100W and up to 20W from optional internal batts.

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

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

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

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

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

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

## Carriage Charges: A=£2.75, B=£6, C=£10

# OWEST PRICES

## ZERO DEPOSIT ZERO INTEREST

Freephone Orderline 0800 73 73 88

### Icom
**VHF/UHF Mobile/Base**

**ICOM IC-E208**

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

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

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

**IC-2100H** £189 C
2m 55W FM mobile with rugged construction and all-in one die-cast chassis.

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

### Kenwood
**VHF/UHF Mobile/Base**

**KENWOOD TMD-700E**

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

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

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

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

### Yaesu
**VHF/UHF Mobile/Base**

**YAESU FT-7800E** *SPECIAL OFFER*

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

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

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

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

### Watson
**On-Glass Antenna**

**WSM-270** **£29.95 B**

Dual Band 2m/70cm mobile whip. 2.5dB gain and 1.5:1 VSWR. 0.8m long. Complete system including 3.5m cable. No drilling involved. Antenna sticks on glass and interface assembly sticks on inside. Simple and very effective.

### Icom
**VHF/UHF Handhelds**

**ICOM IC-E90**

The new E-90 offers triple band coverage of 6m, 2m and 70cms. Up to 5W output and rx coverage from 495kHz - 999MHz makes this a very attractive rig. **£269 B**

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

**IC-T22A** £149 C
2mFM 5W handheld transceiver

### Kenwood
**VHF/UHF Handhelds**

**KENWOOD TH-F7E**

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

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

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

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

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

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

### Yaesu
**VHF/UHF Handhelds**

**YAESU VX-7R**
*SPECIAL OFFER*

Totally waterproof, wide frequency coverage 500kHz-900MHz AM/FM. 132x64 dot matrix display providing easy-to-read frequencies and information plus pictorial graphics.
*FREE VC-27 EAPHONE/MIC*
**£249 C**

**VX-2E** £119 C
2m/70cm miniature handheld transceiver with LiON battery/charger

**VX-110** £94 C
2m handheld transceiver with 8-key keypad NiCd & charger

**VX-150** £99 C
2m handheld transceiver with 16-key keypad NiCd & charger

### Alinco
**VHF/UHF Handhelds**

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

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

**DJ-195E** £99 C
2mFM transceiver withkeypad Ni-Cds & charger

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

### Linear Amp UK
**HF Linear Amplifiers**

**RANGER 811H**

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

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

### Ameritron
**HF Linear Amplifiers**

**AL-811XCE** £699.95 C
HF linear amp 10-160m 600W

**AL-1200XCE** £2499.95 C
HF linear amp 10-160m 1.5kW

**AL-1500XCE** £2799.95 C
HF linear amp 10-160m 1.5kW

**AL-82XCE** £2399.95 C
HF linear amp 10-160m 1.5kW

**AL-80B** £1399.95 C
HF linear amp 10-160m 1.5kW

**AL-811HXCE** £849.95 C
HF linear amp 10-160m 500W (3x811A)

**AL-500MXCE** £849.95 C
HF linear amp 10-160m 500W solid state

**AL-600X** £1299.95 C
HF linear amp 10-160m 600W (export only)

### SGC
**HF Linear Amplifiers**

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

### Yaesu
**HF Linear Amplifiers**

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

### Tokyo Hy-Power
**HF Linear Amplifiers**

**HL-1FKX** £1399.95 C
HF linear amp. 1.8-29.7MHz 500W PEP max, solid state

**HL-2FKX** £2699.95 C
HF +6m linear amp 1.8-29.7MHz + 50MHz 1kW PEP max, solid state

**HL-100BDX** £429.95 C
HF+ 6m linear amp 3.5-29.7MHz & 50MHz 1-10W in 100W PEP solid state

### NEW STOCK & OFFERS

**W&S European Locator Map** *NEW*

Full colour European Locator Map with new countries and callsign prefixes. Available in high gloss finish with a choice of three sizes. These maps will grace any shack, charts are provided to show how to calculate your locator from latitude and longitude.

A2 Size (LOCW MAP) £4.99 A
A3 Size (LOCD MAP) £2.99 A
A4 Size (LOCS MAP) £1.99 A

**YAESU FT-60E** *NEW*

**Wide band Reception 108-520MHz & 700-999.990MHz (Cellular blocked) *New Emergency Automatic ID System *High 5W Power Output *Ni-MH Long-Life Battery FNB-83 (7.2V,1400mAh) *Programmable Keys for user convenience *Split CTCSS/DCS and DCS Encode-Only Capability.*
**£179.95 B**

The FT-60E is a new dual-band FM handheld transceiver from Yaesu. It provides versatile 2-way comms with unmatched monitoring. This is a rugged design that is happy in all weathers. And its wide receiver range makes it an ideal companion for the traveller.

**MFJ-935 "Magic Circle" Loop Tuner** *NEW*

This is the most amazing antenna we have seen in years. For optimum results take a wire around 1/5th wave long, bend into square loop (14ft on 20m = 3.5ft square) and attach to MFJ-935. 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. Available March. Great for and portable as well.
**£179.95 B**

### 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 | B |
| 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 | £34.95 | B |
| WSM-270 | Dual band mini magnetic | £19.95 | B |

**BASES**

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

NOTE: All antennas have PL-29 ends. Mag mounts have cable attached. Hatch mount needs ECH cable.

**Carriage Charges: A=£2.75, B=£6, C=£10**

# WATERS & STANTON

**Freephone Orderline**
**08000 73 73 88**
**WWW.WSPLC.COM**

# UK'S LOWEST PRICES!

## NEW STOCK & OFFERS

### MANSON SDC-2010

NEW

**£9.95 A**

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

### POCKET MORSE READER

**MFJ-461**

Reads CW
Just hold near receiver speaker

**£84.95 B**

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

### SG-2020ADSP QRP 20W HF Radio

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

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

**£589.95 B**

## Antenna Accessories

**Dipole Bits**

| | | | |
|---|---|---|---|
| Kevlar | Strong 400lb strain line 200ft | £22.95 | A |
| FW-PVC | 50m clear PVC 2mm nt 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 | £4.99 | A |

**Diamond 50 Ohm Balunas**

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

**Antenna Traps (pairs)**

| | | | |
|---|---|---|---|
| TR-200 | 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 | 1kW bands 10m - 20m | £59.95 | B |
| TR-1000 | 1kW 30m | £61.95 | B |
| TR-1000 | 1kW 40m | £64.95 | B |
| TR-1000 | 1kW 80m | £73.95 | B |

**German Made High Quality Baluns**

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

**Remote 4:1 1.5kW Balun**

| | | | |
|---|---|---|---|
| REM-BAL | For coax to ladder line match | £45.95 | 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

## Icom External Auto ATU's

**AH-3** £479.95 C
1.8 - 28MHz. A hunky 120W PEP tuner that handles whips or wire longer than 2.5m. Waterproof.

**SG-235** £749.95 C
3.5 - 54MHz. A hunky 120W PEP tuner that handles long wires. Great outdoor design. Waterproof.

## Alinco External Auto ATU's

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

## MFJ Internal Auto ATU's

### MFJ-993

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

**£249.95 C**

**MFJ-991** £209.95 C
1.8 - 30MHz auto ATU. Similar to MFJ-993 but no digital display. Works with any HF transceiver. 150W PEP

**MFJ-994** £349.95 C
1.8 - 30MHz high power auto ATU. 600W PEP / 300W CW. Tunes wire, coax and balanced feed.

## SGC Internal Auto ATU's

**MAC-200** £339.95 C
1.8 - 60MHz 200W PEP. Wire, coax and balanced feeder. Features auto antenna switching.

**SGC-237PCB** £299.95 C
1.8 - 60MHz 100W PEP. Same as SG-237 but without housing for building into your own housing.

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

## Yaesu Internal Auto ATU's

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

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

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

## Icom Internal Auto ATU's

**AT-180** £349.95 C
1.8 - 54 MHZ ATU designed for IC-708. Plugs directly into transceiver for seamless operation. Coax only.

## Kenwood Internal Auto ATU's

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

## Cushcraft HF Antennas

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

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

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

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

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

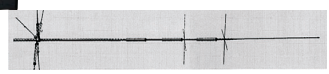
**R-6000** £329.95 C
6-band vertical 20m - 6m. No separate radials needed. 1.5kW. Height 5.8m. Great small garden ant.

**MA5V**
**£239.95 C**

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

## Diamond HF Antennas

### DIAMOND CP6



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

*Bands: 3.5 -50MHz *Power: 200W *VSWR: Better than 1.5:1 *Socket: SO-239 *Height: 4.6m *Radials: 1.8m rigid adjustable **£239.95 C**

## Radio Works HF Antennas

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

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

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

**CWS-80** £109.95 C


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

**G5RV Plus** £59.95 C

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

## Hustler Base Antennas

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

**5-BTV** £199.95 C
80 - 10m 6-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 6-band vert. 6.52m tall 1kW. Can be used at ground level with earth stake. Ideal small gardens

## Butternut Antennas

**HF2V** £229.95 C
80 / 40m high performance vertical. 1kW PEP 9.75m tall. Self supporting for ground mount use.

**HF6V-X** £299.95 C
6 band vertical 80-40-30-20-15-10m. 2kW. 7.9m tall. Use own radials or ground mount.

**HF9V-X** £349.95 C
9-band 80 40 30 20 17 15 12 10 6m vertical 1kW 7.9m tall. Use radials or ground mount

## Buddipole Products

HF Portable at its Best

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

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

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

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

## Super Antennas

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

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

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

## High Sierra Mobile Whips

**HS-1800/PRO**
**£379.95 C**

The ultimate mobile whip. Electrically tuneable 80m - 6m 1kW PEP Includes switch box and 12V cable. Massive 2" coil. Made in USA. Superb!!

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**£249.95 C**

Get mobile on all bands from 80m to 6m in minutes. This compact screwdrive 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!

**Carriage Charges: A=£2.75, B=£6, C=£10**

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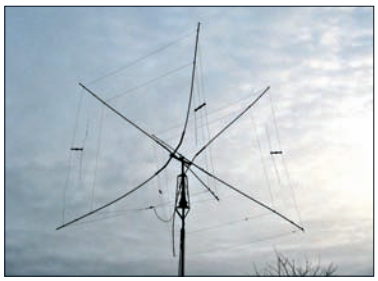
**Cover subject**

Now that **Rob G3XFD** has settled into his new workshop he's been busy 'fooling' around with lots of rad o applicat ons, as well as kitting it out w th all sorts of handy' bits and pieces. To help you get the most out of your hobby we hope you enjoy reading this month's varied issue.

**Design:** Steve Hunt
**Photograph:**
Tex Swann G1TEX/M3NGS

# april features



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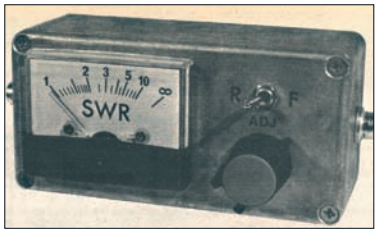


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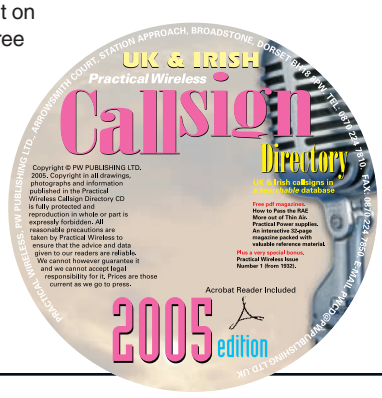

# april regulars



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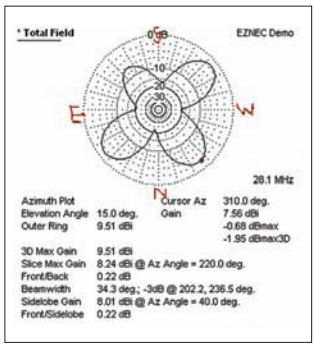


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### Components For *PW* Projects

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

### Photocopies & Back Issues

We have a selection of back issues, covering the past three years of *PW*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. See page 61 for details.

### Placing An Order

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### Technical Help

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

# rob mannion's keylines

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

The newly extended 7MHz band seems to be attracting Radio Amateurs who enjoy using amplitude modulation (a.m.). I've found this activity to be fascinating, and I totally agree with **Andy Foad G0FTD** (letters this month) that our activities will attract newcomers to our hobby.

My first introduction to Amateur Radio came when I first heard the late **Tom Martin G3CTM** on 7MHz, while using my father's Telefunken broadcast receiver. A strawberry grower, Tom lived not far from my home and became a great friend. I enjoyed listening to him, and he avoided jargon, enabling me to understand much more. So, with this in mind I suggest that (as there's bound to be someone listening in) we avoid the use of jargon during a contact, especially on 7MHz. Let listeners know who we are, and you never know an interest could be sparked. Many Radio Amateurs came into the hobby via short wave broadcast listening and it could be a useful route again as there are very many receivers available to cover the band.

**Rob G3XFD is proud of his new shack. It's fully insulated and he's been busy over the winter working on new projects. He's also managed to find time to develop some very specialised construction work, which is proving to be of very great personal benefit and as he says "Very handy indeed"!**

### Projects For 70MHz

The letter from **John Carline G4JJY** (letters pages) sums up his interest for possible projects. And from the editorial standpoint I need to know if readers would be keen on the idea of printed circuit boards for any *PW* design.

To help, I would ask readers to write or to E-mail me so I can evaluate the possible needs. So, if you are keen on building v.h.f. projects (particular for 70MHz), let me know your preferences as soon as possible.

### Double Sideband?

Are you switched on by the use of double sideband (d.s.b.) suppressed carrier transmissions? In his letter this month (letters pages), **Andy Small M0DRN** shares the pleasure he's had using this mode. Incidentally, the website Andy mentions in his letter is run by **Peter Parker VK3YE**, who is happy for *PW* readers to try his circuit. However, Peter tells me he's not updating the site nowadays.

I've never been keen on d.s.b. myself. I've always thought it's a lot of effort, and if you've gone that far, why not suppress the other sideband and go for a full blown s.s.b. transmitter? That's my opinion, but what are your thoughts on the subject? Please let me know, and if there's enough interest I've no doubt we can produce a *PW* project.

### Articles Held

Due to unforeseen circumstances, i.e. the lack of editorial space, several articles promoted in the January issue of *PW* had to be held over. My apologies go to **Walter Farrar G3ESP** (Microhenry Meter), **Stephan Niewiadomski** (multi voltage power supply) and **Vince Lear G3TKN** (Making the most of limited space) for forgetting to mention it last month.

### Mystery Valve

I fell into the classic trap in last issue's Radio Basics. I assumed that as I knew the triode-pentode valved used in the One inch oscilloscope project was an ECL80 - readers would guess! My apologies for the error. When the shopping list was typed in I inexplicably put a red line above the valve information and it was left out!

### New Paper Reaction

The reaction from readers regarding *PW*'s new non-glossy paper has taken us by surprise. It seems as though the vast majority of readers thoroughly appreciated the easier-to-read pages. And, as I've mentioned to those who contacted us direct, I was very surprised at the response because my own was entirely negative at first!

When the magazine arrived from the printers I was extremely disappointed. Indeed, I felt like going on a very long holiday immediately! But, after a while everyone realised we'd achieved what was intended - to make the pages easier to read. After much discussion here, and also with readers who contacted us, we think that the new paper and slight re-design will end up being perfectly acceptable. All it needs is for some fine tuning at our end on the computers, and some adjustments at the printer's and everyone will be happy. Cheerio for now. **Rob G3XFD**

# amateur radio waves


## Amplitude Modulation On 7MHz

● **Dear Sir**

As I'm sure many of us came to Amateur Radio via s.w.l. and hearing Radio Amateurs using a.m. (such as I once did via an old domestic receiver with 'trawler band') I was wondering if we could encourage the usage of good old a.m. on our new 7MHz allocation so that more listeners can stumble across us?

We have a window of opportunity as the amount of Amateur usage is still low when considering the lack of European countries permitted to use the new segment. It's 100% legal and just think of all of the cheap domestic receivers that cover the 7MHz band ready to showcase Amateur Radio to anyone with genuine minimal cost receivers!

**Andy Foad G0FTD, Whitstable, Kent**

Editor's reply: A great idea Andy! I've already heard stations using a.m. myself and have already had enquiries from puzzled (non technical) journalists regarding 'pirate radio stations' with English voices on 7MHz. Please see Keylines for further comment.

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

## Monitoring VSWR On 144MHz

● **Dear Sir**

Like **John Hoban G3EGC** (letter in March 2005 *PW*), I also made v.s.w.r. meters in the 'good old days' by feeding a sense wire through the airspace of low-loss TV coaxial cable. It used to work quite well and, as G3EGC says, avoided the problem of damaging the enamel coating of the wire. The problem is that this type of coaxial has a characteristic impedance of 75Ω and these days virtually all systems are based round coaxial cable with a 50Ω characteristic impedance.

As described, the line inside the meter is about 0.08 wavelengths long and this, if made out of 75Ω coaxial cable, will create a noticeable discontinuity in a 50Ω system. For instance, if the actual v.s.w.r. on the line is 1:1, the input impedance of the meter will be 57.4+j20.2Ω - in effect, a v.s.w.r. of 1.5:1. If the v.s.w.r. on the line is not 1:1, then insertion of the meter could, under some circumstances, actually make things better for the transmitter, but is more likely to make the situation worse.

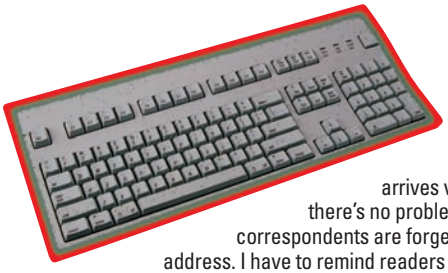
The enamel on modern wires is much tougher than it used to be (or so it seems when trying to remove the confounded stuff) so is likely to survive being fed under the screen, as described in the November 2004 article, without damage.

**Tony Plant G3NXC**
**South Yardley**
**Birmingham**

Editor's comment: Thank you for your letter Tony. And of course you are quite correct, but in practice I've found the error to be small and the benefits of a 144MHz v.s.w.r. monitoring project (as featured on page 31 to 33 in this issue) outweigh the disadvantages.

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

## Letters Received Via E-mail



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

## Australian Antenna Appreciation

● **Dear Sir**

I have been a reader of *PW* for over 25 years and have always enjoyed the practical construction articles. I have built quite a few in years gone by and I would like to thank you for the Antenna article by **Ian MacDonald** in the August 2003 edition, the **MM5WIG** Fat Antenna for 14MHz.

I have been using a 3.5MHz loop and a 14, 21 and 28MHz vertical groundplane with good results, but felt I could get better. I have been looking at the MM5WIG Antenna for a while now, so I finally cut the tubes from conduit and drilled them. I also cut the cables to length then left them in the shack.

The Australia day public holiday was hot but wet and I was pretty bored so I assembled the antenna as per Ian's instructions, all measurements were exact to the article. My only variation was to use 50Ω coaxial cable with a 1:1 coiled coaxial balun. My wife helped me raise the antenna between two trees directed towards Europe.

When I tested the s.w.r. it was less than 1.15:1 across the whole of the 14MHz band without the aid of an a.t.u. I am now receiving reports 3-4 S-points higher than before and I'm getting into UK, France, Spain, Sweden, Brazil and Russia, all with 5/8, 5/9 reports. This is a great improvement on what I have been getting before.

The antenna took about two hours to make and was simple to construct with easily available materials, I would recommend this antenna to others, with an a.t.u. it loads up okay on 21 and 28MHz as well. I may have a go at the cage dipole in the November 2004 edition next as I'm so impressed with this one. Please keep up the good work with this type of article, as even a beginner can make it.

**Mike Little VK4YFL**
**Queensland**
**Australia**

**Editor's comment: Thanks for the feedback Mike. And judging by the photograph of you in your shack, you look so relaxed I doubt somehow you'll be returning to the UK to live!**

## Suggested 70MHz Projects

● **Dear Sir**

Over the last couple of years I have noticed a rise in interest and articles for the 70MHz band. As I would like to try this band I started looking around for suitable equipment to get me going. My operating time is very limited and I spend about 99% of this time

using c.w. The only option seemed to be a transverter but these are relatively expensive and include more circuitry than I really needed.

In the shack already sat a IC-706MK11 with its general coverage receiver (including 70MHz) all that was needed was a transmitter. In the shack I have shelves full of *PW, RadCom, SWM* magazines going back to the early 1970s and also several v.h.f. specialist books. But after looking through all these no suitable design for a transmitter could be found. Then in one of your Topical Talk columns you asked what construction projects readers would like to see in *PW,* so here below is my personnel list of features I would like to see incorporated into a 4m transmitter.

1: VFO control covering from 70.050 to 70.3MHz (up to 70.3 so that if needed a modulator could be added to allow the use of a.m. for local nets, contacts, etc.).

2: Up to about 10W out. Enough for useful barefoot contacts and also suitable for driving a linear.

3: RF sensing change-over.

4: An RX pre-amplifier (as I been told that most of the small multi band transceivers with broadband receive capabilities tent to be a bit deaf outside of the Amateur bands) with moderate gain, good strong signal handling and bandpass filters to help reject out-of-band signals.

5: The above four all built on separate boards to allow users to customise their own transmitters.

6: Everything to fit inside an off the shelf diecast box to provide a rugged unit for portable operation.

Finally, maybe if the project became popular the supply of ready-made p.c.b.s. I know this sounds quite a tall order, but after asking several local Amateurs they agree it would make an interesting project. My first copy of *PW* was bought in April 1973 with my first wage as a paper delivery boy and this is the first time I have ever submitted a letter, so it just goes to show its never too late.

**John Carline G4JJY**
**Scunthorpe**
**North Lincolnshire**

**Editor's comment: Thanks John. I gather you're as keen on 70MHz projects as I am, and I'm hoping we'll soon have something to satisfy your 70MHz needs. Please join me on the Keylines pages, and also see this month's Radio Basics.**

---

**Double Sideband Circuit**

● **Dear Sir**

I do very much enjoy Rob G3XFD's Radio Basics column and I am a keen home-brewer, although my theory is very limited. I've recently discovered the double sideband suppressed carrier mode (d.s.b.). What I have found with d.s.b. is that it's very simple to get on the air, and with good attention paid to the audio circuit, it sounds just like s.s.b. People are surprised when you tell them that you can also resolve them on both sidebands. I know that it may be wide, but at a QRP level is should not cause too many problems. The circuit is also very much less complicated.

In *PW* you could start the project off with d.s.b. and then a later article could upgrade to s.s.b. once the experienced is gained with operating the first circuit. I have recently built a 7MHZ version of the d.s.b circuit on the website **http://www.alphalink.com.au/~parkerp/projects/proj80ds.htm** about a week ago.

With this fed into a small linear producing about 6W. So far I have had about 15 contacts on 40m on 7.478 from various parts of the UK as far as Liverpool, Chester, Wales and Devon. Reports mainly vary from 5/7 to 5/9.

Audio quality reports have also been favourable considering how basic this circuit is. I was wondering if you could feature a d.s.b. transmitter in your Radio Basic column? An exciter and a p.a. delivering about 5W would be a very exciting project and I am sure that your readers would get a lot of excitement from being able to have a 'phone QSO on equipment that they built themselves. I would very much appreciate your views.

**Andy Small M0DRN**
**Capel-le-Ferne**
**Folkestone**

**Editor's comments: Thanks Andy, a very interesting subject! However, as this is the reader's platform, I'll ask you to join me on the Keylines page for further discussion using my own space!**

***Editor's note: The following letter, although rather longer than is preferred for these pages, has been published in its entirety because I consider it to be of supreme importance. We must try to save our heritage radio sites!***

**English Heritage & Radio**

● **Dear Sir**

I read with some dismay the reaction of **Gus Malcolm G8DEC**, (English Heritage & Radio, February 2005 *PW*) to the Star Letter from **Stan Brown G4LU** regarding what is happening, and what has happened, to our radio communication heritage. I regret that Gus G8DEC has shown little understanding of what this is all about and the gross political neglect of this so important aspect of our national heritage. However, perhaps I can help to enlighten readers.

Radio communication, as a technology, dominated the whole of the 20th Century and the UK was in the forefront of research, development and application. We were pioneers in the invention and application of world-wide point-to-point radio communication in the early years of the century and the early and subsequent development of our maritime radio services were second to none. We had a rich and tangible heritage, a reasonable proportion of which we should have been delighted and indeed anxious to preserve, to display and explain to those who come after in the years to come. Gradually it has been destroyed with little protest or official intervention.

In fact despite the efforts of some of us, involved also in many other aspects of our heritage, to draw attention to the need for preservation, they have been largely disregarded by politicians, and organisations such as English Heritage are either uncomprehending or impotent to influence events. The privatisation in the last 20 years or so of many services, however laudable, ignored, or failed to recognise, that they involved the transfer of facilities of historical importance. These should have been afforded a measure of protection as these services evolved and locations of heritage significance became redundant.

To talk of unacceptable remoteness, safety or cost beyond the means of amateurs is nonsense and ignores what has been done elsewhere, or in other contexts. Many of our non-radio heritage sites are remote and expensive to maintain but, by imagination and fairly modest expenditure have been preserved for our education and delight. No doubt Gus Malcolm would consider the preservation of complicated steam locomotives and heritage railways beyond the scope of amateurs?

However, if you want an example of what is possible, and apparently beyond the interest and inclination of officialdom in this Country, attention must be drawn to the 1920s very low frequency (v.l.f.) radio station at Grimeton, located just to the east of Varberg, 70km south of Gothenburg in Sweden. This was the Swedish equivalent of Rugby, being opened in 1924, two years earlier than Rugby. This station has been preserved not only in totality, but is activated from time-to-time as SAQ, although it serves no commercial purpose, other than perhaps commemorating the technological heritage of what seems to be a prouder administration. This is only one, albeit outstanding, example of radio preservation elsewhere, to which reference can be made.

Criggion could have been preserved likewise. It was not remote and contained superb examples of early v.l.f. technology, for example in the coil room, for the benefit of future education and study. Although the 1970s guyed NATO masts perhaps needed removal, the three self-supporting towers dating from the Second World War, of historical importance, and totally unlikely to fall unplanned, could have been preserved and cared for by enthusiasts, perhaps with lottery funding assistance. As with railway preservation, skills amongst enthusiasts are available to undertake such projects. In the event, and perhaps not surprisingly, the 'demolitionists' had difficulty removing such robust

structures. The Grimeton towers look likely to stand far into the future as examples of good heritage practice.

I must not be too critical of English Heritage, except that it seems to lack people with appropriate knowledge and understanding outside of the traditional fields of preservation. When I tried to save Humber Radio as a living museum of our maritime radio heritage, Sir Neil Cossons, the English Heritage Chairman, at least arranged for the Department of Culture Media and Sport to consider listing the building. The Inspector from the Department reported, to my astonishment, that the building was of '... no architectural value and of no historical significance'. In fact, Humber Radio was opened in 1927, during a significant period in radio technology, as a model coast radio station serving the Humber shipping region and was the very first radio station to provide a radio telephone service to shipping.

The Trevithick Trust, likewise failed to save Lands End Radio for similar preservation. Despite my efforts, the Heritage Lottery Fund rejected support for heritage preservation of this kind, apparently on principle, although the buildings were in superb condition and extremely well sited in practically every respect.

Although I had been offered items of equipment from Humber Radio by BT staff, for preservation, before I could take up the offer, the BT wreckers gutted the building to the last washer. Unfortunately, BT seems to have no interest in preservation, only in asset stripping of redundant facilities, whatever may be their heritage value. Reference to the "Connected Earth" project "supporting ten museums in the history of communications", seems, to say the very least, euphemistic. The fact is, BT no longer wished to care for all the heritage communication material left in their care in the London museum following privatisation, which should have been kept together.

In 2003, I wrote a very carefully worded letter to the Secretary for Culture Media and Sport, politely drawing to her attention the concerns of those involved in our radio heritage, including many professionals, about the wholesale destruction and loss of radio installations of all kinds, many of great historical significance, and the loss of our important radio heritage. Although I felt it too much to expect a detailed reply, I did not receive even an acknowledgement of my letter, although one eminent archaeology academic and Peer, to whom I copied the letter, kindly offered advice regarding further action.

A recent visit to the Telecommunications Gallery of the South Kensington Science Museum, London, showed that even this not immune. On previous visits I had felt that it would benefit by some extension of exhibits and the inclusion of hands-on demonstrations. However, what I found was that the display has been decimated! I was informed that this had been part of the new, apparently outside revenue generating, policy of the present Director of the Science Museum. I was left feeling that, far from being an inspiring and informative display of our telecommunications history, I could provide, in many respects, a better display from my own relatively modest museum collection, including explanatory captions.

The whole business is nothing short of a totally disgraceful disregard and neglect of this important part of our technological heritage. I have chosen my words without reservation. Unfortunately, the loss will only become evident in the years to come when the need arises to explain, by exhibition and demonstration, what it was all about. Thanks for the excellent PW. Keep up the good work.

**Dr. Ken Jones G3RRN**
**Sudbrooke**
**Lincoln**

**Editor's note: Although Ken G3RRN is a modest person, I feel it's important to note the following; he's President of the Radio Amateur Old Timers' Association, a member of the City of Lincoln Archaeology Panel and Vice Chairman of the Friends of Lincoln Archaeological Research and Education. He's also a member of the Radio Officers' Association.**

# 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.

**March 12**
**Lagan Valley ARS**
**Contact:** Ron McCaughey GI4NTO
**Tel:** 02892 601941
**E-Mail:** ronald@mccaughey6088.fsworld.co.uk
To be held at the Lagan Valley Hospital Recreation Hall, Northern Ireland. Doors open 1100. There will be the usual stalls, a Bring & Buy, talk-in on S22 and refreshments. Ample car parking too, so come and join us!

**March 13**
**The Wythall Radio Club's 20th Annual Radio & Computer Rally**
**Contact:** Chris G0EYO
**Tel:** (07710) 412819
**E-mail:** g0eyo@blueyonder.co.uk
The 20th Annual Radio & Computer Rally is to be held at the Woodrush Sports Centre, Shawhurst Lane, Hollywood, near Wythall, Birmingham. Book early as this is a popular rally!

**March 19**
**The South Normanton Alfreton & District Radio Club's 5th Junction 28 QRP Rally**
**Contact:** Russell Bradley G0OKD
**Tel:** (01773) 783394
**E-mail:** russel.bradley@ntlworld.com
In association with the G-QRP Club, the South Normanton Alfreton & DARC are holding their rally at the Village Hall Community Centre, Market Street, South Normanton, near Alfreton, Derbyshire. Fully signposted and open to the public from 1000. There will be Amateur Radio, electronics and related items, Bring & Buy and special interest group stalls, outdoor flea market (weather permitting) and refreshments. **Note:** *PW* Editor, Rob G3XFD, looks forward to meeting readers at this event.

**March 20**
**The Cambridge & District Amateur Radio Club's Rally**
**Contact:** John Bonner G0GKP
**Tel:** (01954) 200072
**E-mail:** j.bonner@ntlworld.com
The rally is to be held at Britten Arena, Wood Green Animal Shelter, King's Bush Farm, London Road, Godmanchester. Doors open at 1000 and entrance fee is just £2 (concessions for OAP/disabled, children free). There will be free parking for up to 2000 cars, along with a bar and restaurant on site. There will also be a Bring & Buy and a Talk-in on 145.550MHz.

**April 3**
**The Northern Mobile Rally (Harrogate Rally)**
**Contact:** Gerald Brady G0UFI
**Tel:** (07734) 478080
**Website:** www.harrogaterally.co.uk
To be held at the Harrogate Ladies College, Clarence Drive, Harrogate, North Yorkshire. There will be all the usual facilities plus a Bring & Buy, catering and transport for any disabled visitors, etc.

**April 10**
**The Yeovil ARC's 21st QRP Convention**
**E-mail:** george@mudford.fsnet.co.uk
The Yeovil ARC have booked the Digby Hall, Sherbourne, in Dorset, for their 21st QRP Convention, the popular get-together of QRPers from the South and West of England. Doors open at 1000 and car parking is free in the town centre car parks, which adjoin the hall. Follow the black and white Town Centre signs, off the A30 Yeovil to Salisbury Road. There will be two talks in the morning and another after visitors have enjoyed the excellent food available and browsed the many trade stands. Also, the Construction Challenge will be adjudicated and certificates will be presented to winners of the QRP Convention CW Funrun, which takes place prior to the Convention on the evenings 14-18 March, 1900-2100. (Rules available from G3ICO).

**April 10**
**Cambridgeshire Repeater Group's Annual Rally**
**Contact:** Paul Dyke G0LUC
**Tel:** (01462) 683574
To be held at the Bottisham Village College, Bottisham, which is six miles east of Cambridge. Access is via A14 and A1303. There will be a large hall, car boot sale and a Bring & Buy. Doors open at 1000 and admission is £1.50. Refreshments will be available, along with a talk-in on 145.550MHz.

**April 24**
**Aldridge & Barr Beacon Amateur Radio Club's 6th Annual Radio & Electrical Sale**
**Contact:** Doug G4LQY
**Tel:** (01543) 571269
To be held at the Aldridge Community Centre, Anchor Meadow, Middlemore Lane, Aldridge, Staffs. Doors open at 1030 and the entrance fee is just £1 including raffle. There will be a large free car park, refreshments and a talk-in on S22.

**April 24**
**Kempton Rally**
**Website:** www.radiofairs.co.uk
To be held at Kempton Racecourse, near Sunbury-on-Thames. Lots of events are planned throughout the day, along with a v.h.f. talk-in, Bring & Buy sale and Morse assessment (provisional).

**May 2**
**The 21st Dartmoor Radio Rally**
**Contact:** Ron G7LLG
**Tel:** (01822) 852586
To be held at Tavistock College, Tavistock, Devon. This is the same location as last year, with plenty of space for traders to display their wares and for visitors to see them and talk to old friends. There is access for disabled visitors, but due to extensive building work, there will be no dedicated disabled parking. However, there is adequate car parking around the college site. There will be trade stands, a Bring & Buy and refreshments, etc. Doors open 1030 (1015 for disabled visitors), Talk-in on 145.550MHz. Come and visit beautiful Dartmoor, ideal for picnics, so why not bring the family along?

# amateur radio news & products

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


## Bright Idea For The Shack!

*Is your workshop in the garden and are you ever stuck for a torch? And when you find it - has the bulb failed along with the battery? Well, the Compit company, based in Germany suggest that their high power bright l.e.d. Alu Light torches could fit the bill.*

Three versions of the Alu Lights are available; Alu 3 with three high power l.e.d.s, ALu Light 6 with six l.e.d.s and the 12 l.e.d. version the Alu Light 12. All versions are available in either blue or silver cases. All versions are suitable for use with three rechargeable NiCd (NiCad) or NiMH (Nickel Metal Hydride) cells. Further details and UK prices from:

**Compit GmbH,**
**Graf-Zeppelin-Ring 17, D-48346 Ostbevern, Germany**
**Tel: 00 49 25 3296 224 0, FAX: 00 49 25 32 96 224 50**
**E-mail: info@compit.biz**
**Website: www.compit.biz**

## New From Vann Draper

*The latest edition to the digimess® test instrument family from Vann Draper is a the SG100 150MHz microprocessor radio frequency signal generator. It could be most useful in your shack!*


The SG100 is a general purpose r.f. signal generator covering from 100kHz to 150MHz (up to 450MHz on 3rd harmonic). Featuring a built-in four digit light emitting diode (l.e.d.) displays which provides the frequency read-out, the instrument is operated by a combination of selector buttons and rotary controls. The full frequency coverage is provided by six ranges, with precise setting enabled by a 'fine' tune control. The manufacturers state in their press release that "The result is a modern and easy to use instrument for engineers of all levels".

The signal generator includes both built in a.m. and f.m. modulation facilities and can also be fed by external modulation sources. It also provides an audio signal output. It's supplied with a full operating manual, BNC test lead and both UK and European power leads.

Will it fit on your work bench and can your pocket afford it the *PW* Newsdesk asks? Well, as the vital statistics are 293 x 240 x 90mm it's not large, and as it only weighs 3kg this £199 instrument won't bend the bench!

Further details from **Vann Draper Electronics, Stenson House, Derby DE73 1 HL. Tel: (01283) 704706, FAX: (01283) 704707. E-mail: sales@vanndraper.co.uk Website: www.vanndraper.co.uk**

## Your Attention please! Telford Rally; Another New Venue!

*Are you planning to attend the popular Telford Rally? If so, the organisers have some very important advice for you; "Please don't go to RAF Cosford!*

**Mike Street G3JKX**, Hon. Secretary of the **Telford Rally Group** writes: "Due to extensive building works at the RAF Museum Cosford, and problems obtaining permissions/insurance, etc., for our previous alternative venue, the 2005 Telford Rally will now be held on Sunday 4th September at the **Shrewsbury Agricultural Showground**, home of the well-known West-Mid-Show".

So readers - you've been warned! The Telford Rally Group look forward to seeing you on 4 September, at the Shrewsbury venue and nowhere else. Have a good day, and enjoy the show.

**Editor**.

For further details contact:
**Mike Street G3JKX, Hon Sec.**
**Telford Radio Rally Group**
**Tel: (01952) 299677**

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

# Canvey Radio Rally Success

*The South Essex Amateur Radio Society (SEARS) reflect on the success of their February 2005 rally and suggest you mark your diary for the 2006 event!*

This year's rally - their 20th - took place on 6 February and was well attended. Unusually for February the weather kind to everyone involved! The next SEARS club project is a planned voice contact with the International Space Station, which is being run in conjunction with a local school. The school is reported as being very keen on space activities and enthusiastic towards Amateur. The club are also looking forward to a visit from GB4FUN, the RSGB's 'Fun Bus'. New members are always welcome!

Contact details:
**Mrs Betty Maynard G6LUO** (Club Secretary),
**11 Denham Road,**
**Canvey Island, Essex**
**SS8 9HB**
**Tel: (01268) 695474.**
**E-mail: southessex.ars@btinternet.com**
**Club website:**
**www.southessex.ars.btinternet.co.uk**

**The busy main hall at the Canvey Island Rally on Feb 6 2005. Make sure you're in the picture next year!**


**A Happy Trader! Bernie G0ENN not getting cross with his (crossed) Yagi antenna.**

# Kit Radio Company Frequency Counter

*The Kent based Kit Radio Company have released details of their latest products aimed at the keen radio constructor; the KRC-T-2 five digit frequency counter which covers a range from 1kHz to 65MHz.*

The new KRC unit uses PIC microcontroller technology and has four user-selectable frequency offsets available. In use, the counter displays your receiver's tuned frequency by automatically adding or subtracting the selected offset from the oscillator frequency. When ordering your frequency counter from the KRC all you have to do is to state the required offsets, and the company will programme them into the PIC for you!

Using through hole components, the kit comes complete with clear layout markings on the upper (component side) of the p.c.b. Using a pre-programmed 40-pin PIC to drive the high brightness seven segment l.e.d.s reduces the component count, with a resultant reduction in assembly time.

Power is provided by (internally mounted) six AA size cells. Alternatively, an external supply of 8 to 12V can be used. This give the operator the option of using the counter in portable mode for field work.

Frequency range: ±1kHz to 65MHz (1kHz resolution).

Accuracy: Better than 1kHz. Stability: less than 1ppm per degree centigrade change in temperature.

Offsets: Four programmed offsets (A, B, C, D). Switch selectable in the range of ±1kHz to ±35MHz. (please specify all four offsets to 1kHz resolution when placing your order).

Kits costs £59.99, with P&P costing £4 for the UK and Ireland.

Further details from:
**Tony Westbrook,**
**Kit Radio Company,**
**Unit 11 Marlborough Court,**
**Westerham, Kent**
**TN16 1EU**
**Tel: (01959) 563023**

# Transport Of Delight For Tennamast

*Tennamast (Scotland) Ltd. are well known to Radio Amateurs because of their extremely durable range of antenna masts and the support Norrie GM4VHZ and Rose Brown give to the hobby. Newsdesk now has an update on the unfortunate transport problems Tennamast announced in October 2004.*

In his Keylines Editorial in the October 2004 issue of *PW* the Editor drew attention to the severe difficulties Tennamast faced transporting new masts to customers from Ayrshire. **Norrie GM4VHZ** from Tennamast contacted *PW* in desperation to ask for help in finding a transport company who would be able (at reasonable prices!) to deliver the sturdily made products to anywhere in the UK and Ireland.

The problems for Tennamast, based in Beith not far from Glasgow - as highlighted in the Editor's Keylines - is that along with suffering badly from the steep increase in steel prices, the heavily built masts had become impossibly expensive for the company to deliver to customers south of the border. For a while it looked as though yet another UK based manufacturer would be forced from the market.

The Editor had contacted BBC Radio Scotland and the other media - with little success other than replies of sympathy. However, determined to show that *PW* realises Britain doesn't stop north of London, other determined attempts were made to help. But in the end it was Norrie GM4VHZ himself, ably backed by **Rose** his wife, who eventually made contact with a company willing and able to deliver the masts at competitive prices.

Norrie contacted the *PW* Newsdesk in late in February to announce, with more than a sigh of relief, that the new transport contract will be in full operation by **Tuesday 1 March.** Prospective customers are asked to contact the company to arrange delivery of their masts.

Everyone at *Practical Wireless* take this opportunity to congratulate Tennamast on their determination to succeed and wish them well for the future. Just imagine that Tennamast you saw aboard that lorry on the M6 might well be heading towards one of our readers!

**Tennamast (Scotland) Ltd., 81 Mains Road, Beith, Ayrshire KA15 2HT. Tel: (01505) 503824, FAX: (01505) 503246.**

# Irish Silent Keys - A Tribute

*Two well known Irish Radio Amateurs, Ron McGrath EI6GO and Albert Latham EI6AS were noted as becoming Silent Keys in the January/February issue of the Irish Radio Transmitter's Society (IRTS) journal Echo Ireland. Rob Mannion G3XFD/EI5IW pays tribute.*

**Ron McGrath EI6GO** always made me feel truly welcome whenever I visited the Tipperary Amateur Radio Group. I first met him when I visited the club at Cashel in County Tipperary, and was pleased to become a good friend on subsequent visits at club headquarters in Clonmel.

An enthusiastic, effusive man, Ron was one of those rare people who would make anyone feel welcome, whatever the occasion and whatever the weather! On occasions from my v.h.f. portable site high on the Dorset downs near Shaftesbury I was privileged to hear the Tipperary group working on their local 144MHz f.m. net. But so busy were they that it was only rarely I could get their attention! My sympathies and best wishes go to Ron's family. Ireland has lost a great Ambassador via Amateur Radio and the hobby has also lot a great friend. I'll always remember his voice, whether it be on the radio or greeting me as I arrived at the club. **G3XFD/EI5IW**.
(With thanks to *Echo Ireland* for the news story).

**Albert Latham EI6AS - VHF Pioneer and Enthusiast**.

The report of the passing of **Albert Latham EI6AS** after a long illness in Dublin, has meant the loss of both a keen v.h.f. operator and the Irish Representative of the much respected *Dubus* v.h.f. magazine. Originally from London, Albert had lived in Ireland for many years, having worked in Irish industry, before joining the telecommunications world. Until his illness took hold was often heard on 144MHz from his Dublin QTH. Occasionally, when 'lifts' were present on 144MHz his IRTS news transmissions on s.s.b. could be received in the UK. At first the accent was puzzling, but when you learned of Albert's background you realised why!

A keen Experimenter (the official term for a Radio Amateur in EI) Albert was also a pioneer in ATV and u.h.f work. In fact Albert was greatly respected by anyone who had the pleasant experience of working into EI from the UK on v.h.f. My challenge was to work him on u.h.f. but it wasn't to be. The last time I worked Albert was as EI5IW mobile from a less than glamorous location on a motorway, when I was approaching a toll booth on the outskirts of Dublin waiting to cross the River Liffey. My sympathies and admiration go to his family. I was proud to have worked him on the air.

**Rob G3XFD/EI5IW.**

(With thanks to *Echo Ireland* for the original news story).

# New Club Secretary For Chester & District ARS

The Chester & District Amateur Radio Society have asked the *PW* Newsdesk to announce that their new Hon. Secretary from January 2005 until 2006 is **Derrick Sumner M1SUM**. (What's the betting he stays on past 2006 readers? Club committees are never keen to let a good Hon. Sec go. So, let's wish him luck. **Editor)**.

New Members are always made very welcome at the Chester Club.
**Derrick Sumner M1SUM,**
**30e Malvern Avenue,**
**Ellesmere Port,**
**Cheshire**
**CH65 5AD.**
**Tel: 0151-356 1572**

# The 8th Annual GMDX Convention and Dinner

*Saturday, 23 April 2005 at the King Robert Hotel, Stirling is where it's all happening in Scotland as keen DXers meet to enjoy each other's company and to concentrate on everything involved in chasing the DX!*

Once again the GMDX Committee welcomes DXers to their convention, which will be held at the **King Robert Hotel**, Whins of Milton, Stirling, on Saturday, 23 April 2005. Starting at 1230, (Bar lunches will be available from 1130).

The main raffle prize is a Yaesu FT-817 plus c.w. filter, carry case and ATAS25 h.f. antenna, generously donated by Yaesu UK Ltd.

This year's provisional programme is as follows:
**1230:** Registration and Welcome.
**1300:** talk entitled Modern DXpeditioning by **Roger G3SXW**.
**1400:** Ragchew Break.
**1430:** talk entitled HF Radios for Successful DXing by **Peter G3SJX**.
**1545:** Coffee/Tea Break.
**1615:** Talk entitled Kerguelen Island DXpedition by **Mark M0DXR**.
**1715:** Convention wrap up, and Raffle Draw.
**1930:** DX Dinner - please book (details below).
**2130:** Hotel bar open!

Card checking for DXCC, WAZ and The RSGB Award schemes will be available.

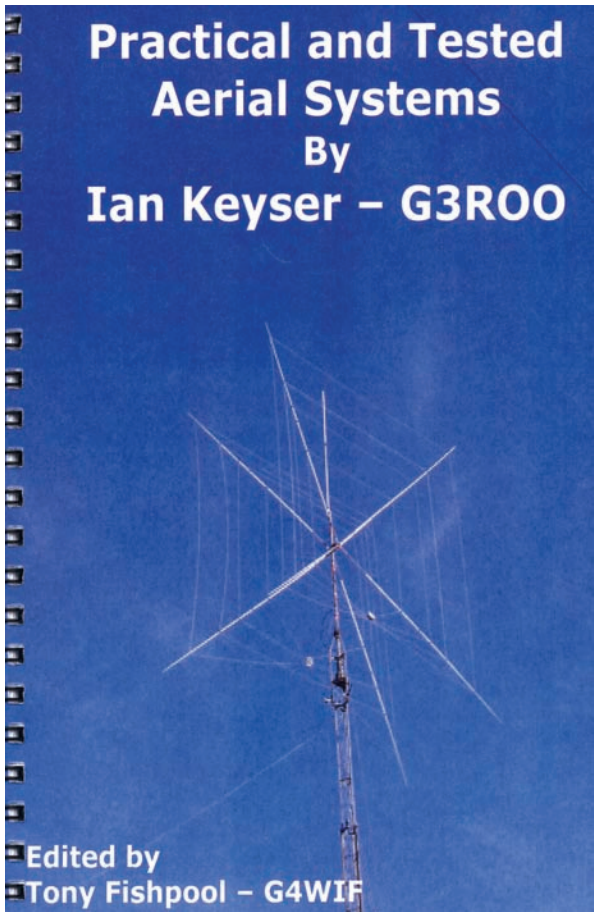
The cost of the afternoon's convention is £7 which includes tea or coffee, whilst the dinner is priced at £17 per person. Booking for the dinner tickets is particularly important as numbers are limited. (Booking forms are available from **Rob GM3YTS** E-mail **gm3yts@btinternet.com**

The King Robert Hotel has a special rate for convention delegates: £25 per person B&B for a double room and £35 per person B&B for a single room. If you would like to stay at the hotel please contact them direct and mention that you are attending the GMDX Convention to get the special rates.

The convention organisers suggest that those who plan to attend arrange accommodation as early as possible to avoid disappointment. The King Robert Hotel telephone number is **(01786) 811666.**

Alternative accommodation is available at the **Pirnhall Inn** which is one mile from the Convention Hotel. Rates there are £46.95 for a room and their telephone number is **(01786) 811256**.

# Practical & Tested Aerial Systems by Ian Keyser G3ROO




*The Editor, Rob Mannion G3XFD, had a thoroughly practical little booklet from keen antenna experimenter Ian Keyser G3ROO land on his desk recently. After enjoying reading it Rob considers the booklet will be of much interest to PW readers.*

**Ian Keyser G3ROO** is very well known in the Amateur Radio fraternity. Many Amateurs know of his long association with the QRP movement, writing for *PW* and the famous Kanga Kits. Ever a traditional, practical man, Ian has also been a very keen and busy antenna constructor, experimenter and innovator. And I can also say that the various projects published in *PW* by G3ROO have always been well received.

Ian's booklet, edited by his friend and colleague **Tony Fishpool G4WIF**, is in a convenient, spirally bound format with varnished covers (hard wearing for continual reference!). It has 84 editorial pages (of very good, hard-wearing paper), and includes subjects such as: insulators, radials (their uses), terminated aerial systems, transmission lines, characteristic impedance, the aerial analyser, current detector, noise bridge.

Knowing the insatiable appetite that *PW* readers have for 'all things antennas' I know that our readers will appreciate that Ian proceeds onwards from the theory side (which he presents in a chatty, informal style) to some really practical projects. Incidentally, the massive cubical quad antenna on the front cover, and also on the heading page (7), clearly demonstrate that Ian's a man of his own practical words and advice!

The book's first practical projects include a group of vertical antennas covering the h.f. bands. Ian then discusses horizontal antenna projects and discusses and describes all the favourite including the G5RV, the Zepp, doublet, dipole and trapped dipole. Next he ventures onto beam antennas before looking at antenna supports, baluns and other antenna related topics.

Altogether I think Ian's little booklet is a superb collection of theory, ideas, suggestions and projects, it's thoroughly practical and the various line drawings are helpful. One or two of the black and white photographs are a little too dark, with several also being slightly 'fuzzy'. But despite this very minor problem, I can thoroughly recommend this book to any *PW* reader - it's excellent. Well done Ian and Tony - your book is just what small scale, specialised publishing is all about and I applaud the result!

The *Practical & Tested Aerial Systems* booklet is available direct from the author for £7.50 including postage and packing. For further details contact:

**Ian Keyser G3ROO,**
***Rosemount,***
**Church Whitfield,**
**Dover,**
**Kent**
**CT16 3HZ**
**Tel: (01304) 821588**
**Website: www.g3roo.org.uk/**

## amateur radio clubs

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

**BUCKINGHAMSHIRE**
**Aylesbury Vale Radio Society - G4VRS**
**Contact:** Roger Piper G3MEH
**Tel:** (01442) 826651
**Website:** www.avrs.mandarinsolutions.co.uk
Covering Aylesbury Vale and the surrounding areas, the Society meets on the second Wednesday of each month at the home of Roger Piper G3MEH in Wigginton, near Tring, Hertfordshire. Meetings usually start at 2000 and non members are most welcome but please telephone before travelling any distance to check times and space availability. If Morse practice is detailed in the events column on the website, this normally starts at 1930 and lasts for 30 minutes.

**DORSET**
**Flight Refuelling ARS**
**Contact:** Tony G3PFM
**Tel:** (01202) 622262
The Flight Refuelling Amateur Radio Society meet on Wednesdays and Sundays at the clubhouse, in Merley (near Wimborne), Dorset, from 1930. Visitors are always most welcome to attend. The club will be active on h.f., v.h.f./u.h.f. and microwave contests this year. Some of these will be portable, others will take place at the clubhouse. A foundation licence course is also organised for two Saturdays in May (14/21st) - the list for this is filling up, but the club are keen to run more courses if the demand is there. Anyone interested in getting a Foundation Licence can contact the club at training@frars.org.uk or via Tony G3PFM as above.

**ESSEX**
**Chelmsford ARS**
**Contact:** Martyn Medcalf G1EFL
**Tel:** (01245) 469008
**Website:** www.g0mwt.org.uk
Members of the Chelmsford Amateur Radio Society meet on the 1st Tuesday of each month at the Marconi Sports & Social Club, Beehive Lane, Chelmsford, Essex. Members meet at 1900 and the meeting commences from 1930 to 2000. There is a bar available during the break at reduced prices. Log on to the above website for more club information.

**HAMPSHIRE**
**Waterside (New Forest) ARS**
**Contact:** Bob G0WNV
**Tel:** (02380) 435398
Members of the Waterside (New Forest) ARS are celebrating 25 years as a club. They still have a few founder members and the club meet on the 1st and 3rd Tuesday of each month at 2000 at The Scout Hut, Applemore College, Dibden, near Hythe, Hampshire. The committee are arranging many activities, namely Fox Hunts, visits to various rallies, competitions, h.f. and v.h.f., as well as the popular Annual Picnic, as well as talks and demonstrations and surplus equipment sales. Please contact Bob as above regarding more club details.

**WARRINGTON**
**Warrington Amateur Radio Club**
**Contact:** John Riley G0RPG
**Tel:** (01925) 762722
**Website:** www.warc.org.uk
Members of the Warrington Amateur Radio Club meet every Tuesday at 2000 at the Grappenhall Youth & Community Association, Bellhouse Lane, Grappenhall, Warrington. At the recent AGM, the existing committee received a vote of confidence when almost all were re-elected to serve a further year in office. Chairman is again Nike Isherwood G4VSS and Secretary is John Riley G0RPG. John Blakeley M0ANM took over the Treasurer's post from Carmel Watson M3CFI. There was also feedback to the membership present on the vital part played by Radio Amateurs in the Indian Ocean area immediately after the disaster when they provided emergency communications to replace public services disrupted by the big waves. Visit the above website for information on the club and its activities.

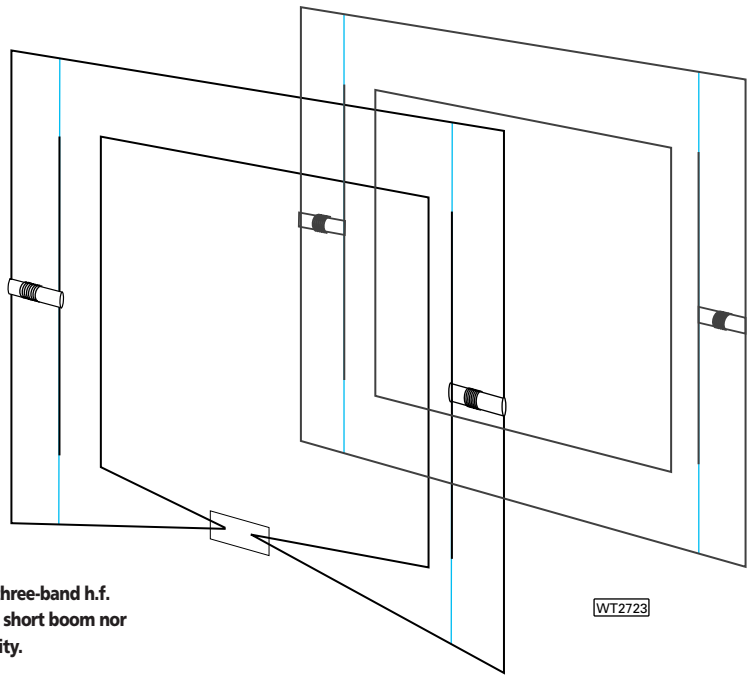
# Antenna Workshop

Len Paget GM0ONX has developed a taste for chasing DX, but having a small garden limits his options for beam antennas. Like many readers a full sized tri-bander will not fit in without hanging over his neighbour's garden.

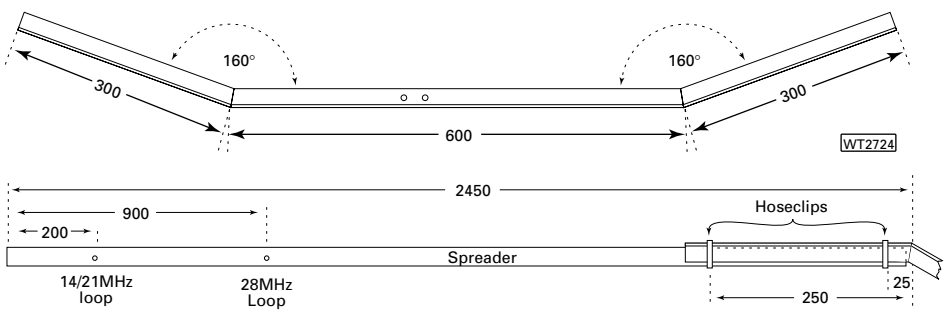
Now although I'm fortunate enough to have really understanding neighbours who are generally uncomplaining and even supportive of the activates of the 'radio nutter' next door, I didn't really wish to impose further on their goodwill by asking for 'over-flight rights' for an antenna. One solution I've tried was a mini beam, of which there are a number of descent ones on the market these days.

Most of the mini beams I tried had problems with mediocre performance, a narrow standing wave ratio (s.w.r.) bandwidth, poor front/back ratios and nasty tendencies to change resonant frequency during heavy rain. I felt that, surely a better solution had to exist!

Now the term 'small' is not usually associated with a quad-loop antenna, but what is generally overlooked is that a full size two-element h.f. quad only requires about five metres of horizontal space - about the same space as most mini beams. Unfortunately, for me such antennas also require the same amount of vertical space, which leads to my undoing. There's no way I could tilt over my mast with such a tall 'rotary washing line' on the top.




● **Fig. 1: The skeleton layout of the three-band h.f. cubical quad antenna. Neither the short boom nor the spider are shown here for clarity.**




● **Fig. 2: Each end of the spider consists of two crossed arms (above) and four spreaders made as described in text.**

## Trawling A Solution

Trawling through the Internet for a solution to my problem I eventually found a reference to design for a compact quad by **J. M. Hawkes 9H1GL** originally published in *Radcom* in April 1984. This antenna is a fairly standard spider quad loop antenna with full wavelength loops on 21 and 28MHz, but on 14MHz the 21MHz element also acts 2λ/3 loop and is linear loaded via a coaxial trap. With sides of about 3.6m, it looked as if it would be possible to fit it and its tilted-over mast into the garden with millimetres to spare.

The simplified general layout of the antenna is shown in **Fig. 1**, the elements are constructed from 1mm pvc covered wire for no other reason than that's what I had to hand. The standard formula of (306.32/f)m is a good

starting point for construction calculation. This formula, gives a loop length of 14.43m for the 21MHz driven loop and 10.75m for the 28MHz one.

The reflector uses the standard (313.94/f)m formula as its starting point, which gives a length of 14.79m for the 21MHz element and 11.02m for the 28MHz element. The final length after trimming for resonance will be dependent on the wire type, diameter and whether it's insulated or bare.

The spider for the quad-loop is constructed from four pieces of 1.2m long 25x25mm (5mm thick) angle iron formed as shown in **Fig. 2** and the photograph of **Fig. 3**. This is the key component of the antenna and must be constructed correctly, so it's worth getting a blacksmith to manufacture it if you don't have the skills yourself. (But I've found that most radio clubs have someone with the necessary skills and equipment to do the job).

● **Fig. 4: The completed spider and boom assembled with only the spreaders needing to be fitted (see text).**

● **Fig. 5: When making the spreaders from plastic water pipe, each is reinforced with a suitable bamboo 'cane'. (See text for more details).**

Two sets of holes are drilled in each bracket offset so that the boom will sit in the centre of the spider. The brackets are fixed 90° to each other and attached to a 760 by 50mm aluminium boom by four 50mm car exhaust clamps as shown in **Fig. 4**. The whole assembly is then painted with Hammerite paint to protect it from the weather.

## Suitable Spreaders

The biggest problem with making any quad antenna is sourcing suitable spreaders. The usual glass fibre reinforced material (g.r.p.) poles are expensive when you have to buy eight of them and dowelling and bamboo canes are difficult to waterproof.

The solution that I came up with, was to use 2.45m lengths of 21mm pvc conduit obtained from the local d.i.y. centre for less than £2 for a three metre length. Then I fitted a bamboo cane down the middle to provide extra strength (**Fig. 5**).

● **Fig. 3: Shown here (on a picnic table) are the four metal bracers that form part of the spider (see text).**

Obviously , you have to select as straight a bamboo cane as you can find. You should also purchase them longer than you require and cut them to length. This is so that you get a decent diameter at the top end of the spreader.

It will usually be necessary to slightly sand down the 'knuckles' of each cane to get them to fit snugly inside the tubing. This must be done with care, as excessive sanding will weaken the cane. An additional 300m length of 25mm pvc conduit should be bonded to the end of the 21mm conduit that has the thicker of the bamboo cane using plumber's pvc solvent cement to provide additional strength. Seal both ends of the spreaders using silicon sealant to prevent water getting in. The spreaders are fitted to the arms using two 35mm hose clips as shown **Fig. 6**.

Assemble the antenna as a conventional quad antennas at first without adding the traps or the linear loading wires. Make temporary attachments for the wires on the spreaders using insulating tape. Both of the driven elements are fed from the same point via a 'quarter-wave' matching stub constructed from 3.5m RG59 (75Ω coaxial cable). The rest of the feeder is standard 50Ω coaxial cable down to the transceiver.

Trim the length of the loops of the driven elements for the lowest s.w.r. you can achieve. I managed to get 1.1:1 at the middle of the band and 1.3:1 at the band edges on the 21MHz band and 1.5:1 over most of the 28MHz band. A lower s.w.r. on this band could probably be achieved by separately feeding the element via a matching stub for 28MHz, but I preferred to sacrifice this for the convenience of a single feed.

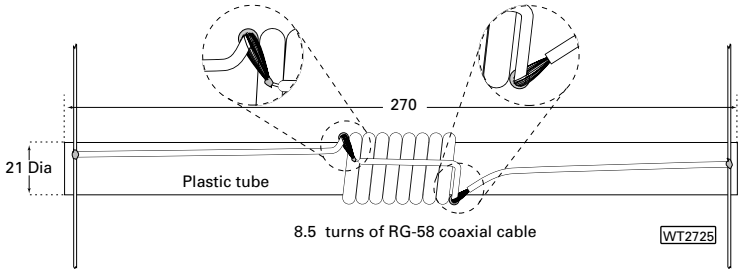
Once you are satisfied with the readings, permanently fix the loops to the spreader by drilling a 1mm hole through the spreader. Then feed a piece of wire through the hole and twist it to the elements. Remember to seal the holes with sealant or waterproof tape to prevent water getting in and damaging the bamboo supports.

## Tricky Part

Now comes the potentially tricky part, the reflector. There are two ways to do this, the correct way - or the sane (lazy) way. The correct way requires a reference signal that can be heard by ground wave only and is sufficient strength that it can be nulled-out to some extent by rotating the beam. Then trim the overall length of the reflector bit by bit until the greatest null is

**Fig. 6 (left): Each spreader is simply clamped to the spider with two 'Jubilee' clips as shown in Fig. 2.**

**Fig. 7 (below): The linear loading traps are made from eight and a half turns of RG-58 coaxial cable and a short length of 22mm diameter plastic piping.**




achieved. This will inevitably involves re-attaching a short length of wire to the trimmed element that you've cut off. As the only way you know you've reached the bottom of the null is when you've passed it.

With the correct method a null of about 25dB can be achieved in theory however, only over a small bandwidth either side of frequency you set it up on. This null flattens to more modest values away from this frequency. The correct method as described, is only really practical if you can reach the bottom of the reflector loops while in its its operating position.

If however, you have a mast or support that's too high to do the work safely, then you'll end up with muscles like 'He Man' by repeatedly winding the mast up and down. You'll probably have a nervous twitch to boot too!

Alternatively you can go for the lazy (or sane) way as I did, by measuring the final length of the driven elements and adding 3% to the length for the reflector. This will give you an acceptable performance and is liable to be kinder to your sanity.

The final lengths in my version were 13.75 and 14.165m for the 21MHz driven and reflector elements respectively and 10.450 and 10.765m for the 28MHz elements. However, the final value on your antenna will be dependant the wire type as previously indicated.

Once you're happy with the s.w.r. on both of these bands and perhaps worked a little DX on these bands, it's time to move on to 14MHz. You will need to construct four coaxial traps, these follow a similar construction to my inverted L antenna previously published in *Practical Wireless* and are constructed from eight and half turns of RG58 wound on a 270mm length of 21mm diameter pvc conduit as shown in **Fig. 7** and **Fig. 8**.

**Important note:** It is important to follow the construction exactly as shown as variations will affect the resonant frequency, which may be checked by placing a grid dip oscillator (g.d.o.) near the trap and checking for a dip around 20.2MHz. Check it is the correct frequency by finding the g.d.o.' signal as a carrier on your radio, as g.d.o. scales are not always accurate.

If the trap's resonance isn't near to 20.2MHz, try altering the angle that the interconnecting wire crosses the trap or opening or closing the gap between turns. Once you have determined that each of the four traps is resonant at the correct frequency, secure it in place with pvc tape and then cover it completely with 'Denso' or other waterproof tape.

## Mid-Points

Next you should determine the mid-points on the vertical sides of the 21MHz elements on both driven and reflector elements and solder one end of each of the four traps to the element as shown in Fig. 1. Then run a monofilament nylon line parallel to the sides of each elements offset by 270mm. Then you should solder the mid-point of a 1.65m length of 1mm wire to the other side of each trap and attach it to the monofilament line using insulating tape and small cable ties.

To sort out the 14MHz matching once all four traps have been attached, trim equal amounts 10mm at a time from top and bottom of the two loading wires on the driven elements until the lowest s.w.r. reading is obtained on 14MHz. The final length of the loading wires on my antenna were about 1.54m long and I found s.w.r. readings of about 1.5:1 over most of the band. Once you are happy with the s.w.r. cut the linear loading wires of the reflector to the same length and the antenna is complete.

It's difficult to be definitive about performance figures for any home made antenna, especially as few have us calibrated instruments to prove the figures anyway. I've long come to the conclusion, to paraphrase a old saying about statistics, there are lies, damn lies and antenna gain figures. What I can say, is that on average, there is a two to four S-point improvement on marginal signals, when compared to my inverted L. And to confirm that, I'm working a lot more DX.

The first weekend the antenna was up, I managed a contact with the 3B9C Rodriguez Island DXpedition on 28MHz - first call. The station was on-air on 28MHz and most other bands over the following weeks. Although the antenna isn't designed for 18MHz and 24MHz it will 'accommodate' these bands (to quote one commercial manufacturer) when used with the internal tuning units of most rigs. (Just don't expect the same performance as the bands it was designed for).

**Fig. 8: After the traps are held in place with tightly wrapped pvc insulating tape, they are ready to have the heavy duty waterproofing Denso tape wrapped around them.**

Through judicious scrounging I managed to build my antenna for less than £30 and it knocks the spots of any previous antenna I've owned. So, if you've got a small garden, understanding neighbours and a hankering for your share of the DX then have a go at building this compact quad! **PW**

# The Oscope

## Part 4 - Dual Trace Principles and XY Applications

This month Gordon King G4VFV takes the mystery out of double beam 'scope and dual trace instruments as we learn more about these wonderfully versatile items of test equipment.

Last time I concluded the March instalment with a peep back at the early way in which the timebase was synchronised to the signal under examination; where a sync control was used in conjunction with the timebase frequency control to achieve a stabilised display. However, nowadays, even rally-acquired second-hand 'scopes are unlikely to feature just such a basic sync control.

Unless you come up against a pretty ancient member of the 'scope species, the instrument will be of the kind possessing a timebase that in one mode, anyway, remains quiescent until triggered by the Y signal. When the Y signal is recurring, then, of course, there will be successive sweeps, resulting in a steady screen display - much steadier than achieved with the early 'sync' system.

### Trigger Level

It's most likely that the front panel of your 'scope will feature a control for adjusting the trigger level and most likely a means of selecting positive or negative polarity. This will allow the timebase to be triggered from pulses derived either from positive or negative-going Y input signals.

To ensure that the leading edge of a fast-occurring signal under examination is fully displayed, there will probably be a delay line in the Y amplifier channel. The idea of this is to delay the Y signal fractionally so that the sweep starts a trifle before the Y signal arrives at the c.r.t.

Some 'scopes also have an **Auto Sweep** function, which triggers the timebase automatically at a relatively low sweep rate, even when there's no Y input signal. Otherwise, without the application of a Y input signal, the screen remains blank, which has led inexperienced users incorrectly to suspect that the 'scope is at fault. This is a point worth having in mind when becoming acquainted with the operation of that rally acquisition!

When the trigger switch is set to **External**, the trigger circuit is disconnected from the internal pulse-forming circuit. It then becomes possible for the timebase to be triggered from an external source, such as from a functions generator.

### Second Timebase

Some 'scopes will be found equipped with a second timebase, with its own **time/div** control, and probably with an additional control labelled **delay sweep**. Oscilloscopes of this kind allow parts of the trace to be increased in brightness and positioned against the graticule for the most effective measurement.

The main timebase is generally labelled **A sweep**, and the second timebase **B sweep**. Either one of the timebases, or the two in combination, can be selected. The sweep delay function, activated by a separate switch, works in conjunction with a multi-turn delay time control.

Basically speaking, the B sweep is triggered from the A sweep at a precise point on the display (as established by the setting of the delay control), which then makes it possible to measure time intervals and pulses with enhanced accuracy. While this might be an important requirement for professional applications, it's unlikely to be viewed in a similar light by the practical amateur.

### Dual Channel

Let's now take a look at the type of 'scope that provides two simultaneous displays. We've already learned that 'scopes of this kind use either a c.r.t. with two beams and two deflection systems (the true dual-beam 'scope) or an electronic means of obtaining two beams from a single-beam c.r.t. (the dual-trace scope).

The block diagram, **Fig. 1** (on page 22), shows the basic arrangement of a dual-trace version, which is the kind most likely to represent a rally purchase. While having some duplicated features of its single-channel counterpart (see Part 3), the configuration has now expanded into two Y input channels, called channel 1 (**Ch1**) and channel 2 (**Ch2**), whose signals for examination pass to the Y deflection plates of the c.r.t. through an electronic beam switching circuit.

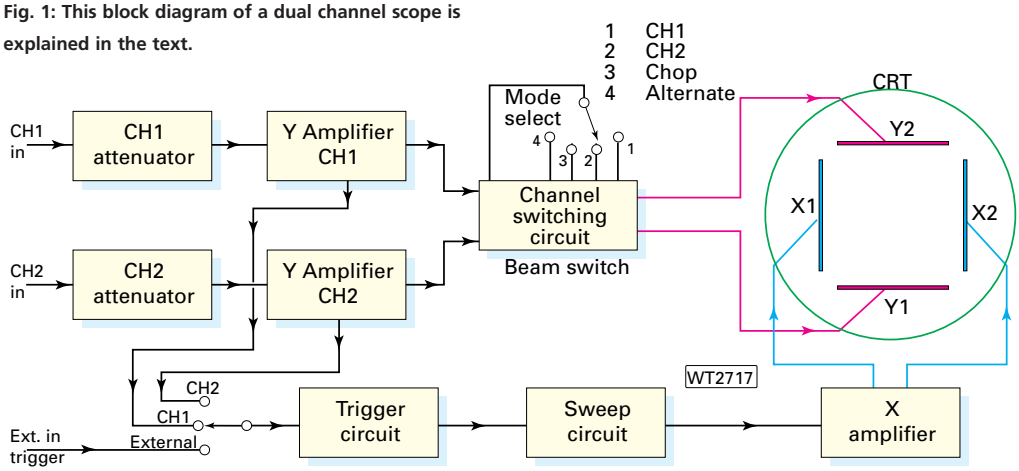



**Fig. 1: This block diagram of a dual channel scope is explained in the text.**

There are two dual-trace modes of operation. One, called the alternate mode, sweeps Ch1 and Ch2 alternately, and works in the following manner: At the conclusion of, let's say, a Ch1 sweep, a pulse from the timebase operates the beam switch and instigates Ch2 sweep, while at the same time cutting off Ch1. At the conclusion of Ch2 sweep, the sweep of Ch1 is instigated and Ch2 is cut off, and so on. (**Note:** The alternate sweeps only become apparent when the 'scope is operating at very low sweep speeds).

The other way, often referred to as the 'the chopped mode', switches between the two channels at a much higher rate, under the control of an built-in multivibrator. This means that each trace then consists of many closely adjacent alternate segments, corresponding to the switching rate.

The chopped mode suffers less from flicker at low sweep speeds, and boasts better phase integrity between the two channels than the alternate mode. But the separate segments do tend to become more apparent as the sweep speed is increased.

The block diagram shows that the mode selecting switch also has positions for independent operation of Ch1 or Ch2. A fifth position labelled **Add** might also be included. On this setting the two channels are added so that the display then becomes a combination of the Ch1 and Ch2 input signals.

It's possible, of course, to make vertical adjustments to each trace by its own shift control. The timebase can usually be triggered from either the Ch1 or Ch2 signal, or from an external source, as the block diagram shows.

## The X & Y Inputs

At this juncture let's change tack a bit and look at one application of the 'scope where external signals are applied to both the X and Y inputs. On some 'scopes the X deflection circuit can be disconnected from the sweep generator by setting the time/div switch of the main timebase to a position marked **external**.

The display will then consist either of a vertical trace (if a signal is being applied to the Y input) or merely a bright, luminescent spot somewhere on the screen, as dictated by the setting of the shift controls. To obtain horizontal deflection a signal must somehow be applied to the X plates, which on some 'scopes may be by way of an external X input.

However, the deflection sensitivity of the c.r.t. alone is pretty dismal! It's expressed in terms of mere millimetres of deflection per volt, and there are very few applications where an external X signal could be connected directly to the X plates of the c.r.t. Realistic horizontal deflection from small signals, therefore, generally calls for a fair degree of amplification between the external X source and the X plates, and it's useful if this can be adjusted by a calibrated control in the same way as the Y signal.

Dual-trace 'scopes often satisfy this requirement by adopting one of the Y channels for amplifying and setting the level of the signal destined to provide the X deflection. This, known as X-Y operation, is a neat way of achieving well-balanced and controlled horizontal and vertical deflection from external X and Y signals.

Accuracy of display requires a high degree of linearity to be retained through the amplifiers over their full dynamic range. The bandwidth, too, must be adequate for the task in hand, a factor that will be considered as we continue on our way.

## Phase Shifts & Angles

Let's now switch our attention to diagram (**a**) in **Fig. 2**. Here is shown an oscillator feeding a sinewave signal to the input of a device under test (it could be an amplifier, filter, simple or complicated network, etc.).

You'll be able to see that the same signal is simultaneously applied to the Y input of the 'scope, while the X input is receiving output signal from the device under test. Depending upon the nature of the device it may be necessary to connect a load resistor across its output, as shown. (This requirement would apply particularly to an audio amplifier).

The plan initially is to obtain equal deflection vertically and horizontally by adjusting the controls and signal levels. This is easy if the 'scope is equipped with an X level control, as just explained; otherwise it will be necessary to employ some other method of external adjustment, such as the **adjust X** potentiometer shown in the diagram.

When the X and Y signals are applied to the 'scope simultaneously any phase shift between the input and output of the device under test will be revealed by the display. A forward sloping diagonal line indicates zero phase (or 180° when sloping in the opposite direction), a perfect circle (assuming correctly balanced X and Y signals), as distinct from an ellipse, indicates a phase shift of 90°, while forward or backward sloping elliptical displays indicate intermediate phase shifts.

By aligning the display centrally against the graticule lines, as at **(b)** in the diagram, the sine of the phase angle can be calculated by dividing distance A by distance B. For example, if A corresponds to one graticule division and B to two divisions, then the A/B ratio is equal to 0.5.

By using a scientific calculator or a table of trigonometric functions there's no trouble in finding the angle, which, of course, is 30° (e.g., the sine of 30° equals 0.5). The forward sloping ellipse shown on the 'scope in diagram (a) indicates a

**Fig. 3: This indicates a phase angle of around 55° (see text).**

phase angle of around 35°.

There are times when servicing or optimising an item of electronics that an idea of its overall phase shift could be useful. An audio amplifier, for example, may be found to go unstable and generate its own signals owing to an abnormal shift of phase at the extremes of its pass band.

Under normal conditions a well-designed amplifier would probably indicate a reasonably steady 180° phase difference when a signal generator is used to swing the input signal over its designed-for range of frequencies. This would be shown on the display as a diagonal line, though a shift of a few degrees, indicated by the diagonal line display tending to break into elliptical formation, could possibly be tolerated!

Application of the 'scope's facilities can also be very useful when designing filters (which will invariably reveal phase shift), balanced push-pull drivers and so forth. It can also be revealing when examining an audio amplifier in this way to see how much the tone controls and filters impair its overall phase integrity. Additionally, in the case in mind this case, possibly also affect the performance of the negative feedback, sometimes tending to make it more positive than negative, but that's another story!

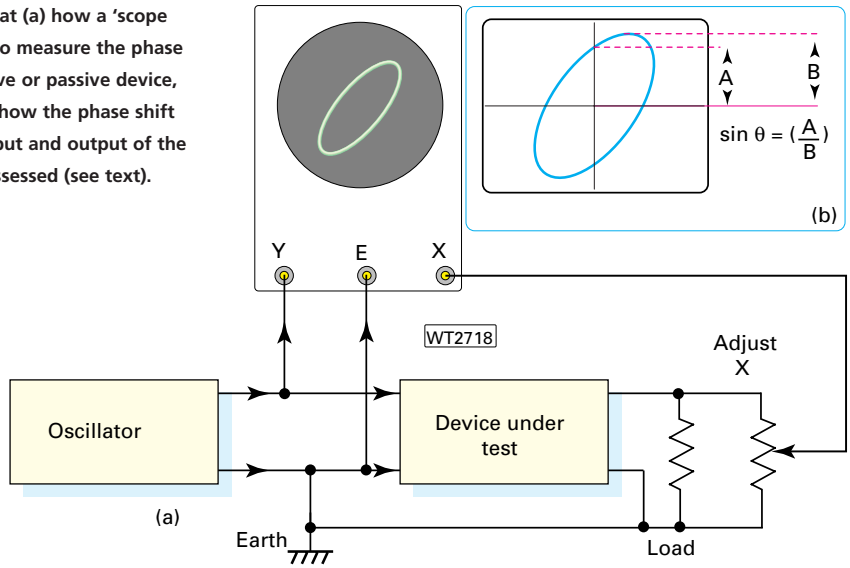



**Fig. 2: Showing at (a) how a 'scope can be applied to measure the phase angle of an active or passive device, and inset at (b) how the phase shift between the input and output of the device can be assessed (see text).**

## Lissajous Figures

Now it's time to look at Lissajous figures. To start, an off-screen shot of a phasing display is given in **Fig. 3**, where the phase angle works out to about 5°, calculated from its A/B ratio, whose value is approaching 0.82 (e.g., the sine of 5° equals 0.819). Displays of this kind are known as Lissajous figures, a technique named after the French physicist **Jules Lissajous** (1822-80).

In practice Lissajous figures can take on numerous and complicated configurations when signals of different frequencies are applied simultaneously to the X and Y inputs. We've already seen that when two signals of the same frequency (e.g., a frequency ratio of 1:1) are applied simultaneously to the X and Y inputs the display takes the form of a circle, an ellipse or a diagonal line, depending upon how they differ in phase.

When sine waves of different frequencies are applied simultaneously to the X and Y inputs, displays such as illustrated in **Fig. 4** are obtained. The frequency ratio between the two signals is indicated on this kind of Lissajous figure by the number of loops occurring along the horizontal and vertical sides.

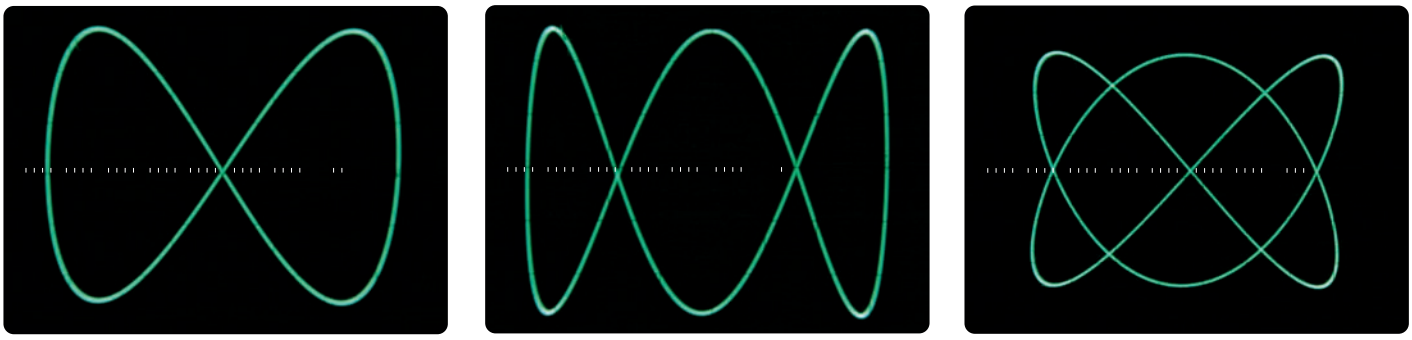
Looking at Fig. 4, at (**a**) the two loops along the horizontal side and the one loop along the vertical side indicate a frequency ratio of 2:1. For example, a figure like this would result from inputs of 50Hz and 100Hz. Similarly, the figure at (**b**) indicates a frequency ratio of 3:1. The more complicated figure at (**c**) has three loops horizontally and two vertically, indicating a 3:2 ratio.

Displays in the orientation shown are obtained when the X input corresponds to the lower frequency signal and the Y input the higher frequency signal. When the frequency of, say, the X signal is known it then becomes possible to find the frequency of the Y signal simply by dividing the number of horizontal loops by the number of vertical loops, and multiplying the result by the known frequency.

Distorted displays occur when the inputs differ from a sinewave, and for the display to hold steady the frequency of one wave needs to be a simple multiple or fraction of the other. Drifting frequencies cause the display to change and move erratically, making loop counting difficult, especially on the more complicated figures.

Well, once again, this just about ties up this month's instalment. There are still plenty of interesting things to discover about 'scopes, so don't forget to focus on next month's story. Cheerio for this time.

**PW**



(a) (b) (c)

**Fig. 4: These examples of Lissajous figures illustrate the ratios of two sine waves applied to the X and Y inputs of a 'scope when adjusted for suitable X and Y deflections (see text).**

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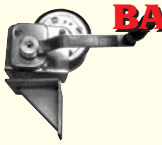

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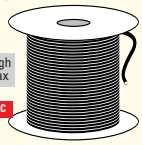

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| PLT-40 | 40m mobile whip (64" long) | £24.95 |
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# Technical FOR THE TERRIFIED!

**In the second of his articles aimed at removing the fear of maths, Tony Nailer G4CFY looks at the manipulation of numbers with power, or indices.**

In the first article of this series I dealt with a basic introduction to algebra including rules of changing sides and changing signs, how to transpose formula, dealing with roots and powers, and finishing by listing the commonly used powers of 10.

Continuing on from the table of powers of 10, shown again here in **Table 1**, it's very important to understand how to manipulate numbers that have powers, or indices.

## Using Indices

**Rule 1:** Numbers with indices can be moved between bottom and top of an equation by changing the sign of the indice. This is only allowed if the various numbers involved are multiplied by each other. You can apply it to $1/(A*B^2)$ but not to $1/(A+B^2)$. The first equation $1/(A*B^2)$ can be rearranged, to become $B^{-2}/A$. The second equation cannot be changed in this manner.

Consider the value one millionth. By definition this is (1/1000 000), but using indices it becomes $(1/10^6)$ and from Rule 1 above, one millionth is the same as $10^{-6}$.

**Rule 2:** When multiplying together two algebraic numbers, each with an indice, their indices are merely added together.

So, multiply $R^2$ by $R^3$ and the result is $R^{(2+3)}$ or $R^5$.

Similarly $10^6*10^{-3} = 10^{(6-3)} = 10^3$.

**Rule 3:** When one algebraic number with an indice, is divided by a similar number with an indice, their indices are subtracted.

So, $R^4/R^2 = R^4 \times R^{-2} = R^{(4-2)} = R^2$.

**Rule 4:** When you need to find the square root of a number with an indice, take the square root of the number and halve the indice.

So, $Sqrt(4 \times 10^6) = SqRt(4)*SqRt(10^6) = 2*10^3$. This proves the square root of four million, is 2000.

In the case where the indice is an odd number, take out one of the tens from the indice (reduce the indice number by one) and include it with the number, (multiply the number by ten), then try again.

So, $SqRt(4*10^5) = SqRt(40*10^4) = 6.32*10^2$.

In the case where the indice is negative, the rule is to multiply the number by 10 and increase the negative value of the indice by 1.

So, $SqRt(8.1*10^{-5}) = SqRt(81*10^{-6}) = 9*10^{-3}$.

Before moving on to the use of formula with powers of ten, I will return quickly to the application of basic formula as used in Ohm's Law.

## Resistors in Series

Look at the circuit shown in **Fig. 1** here. A resistor R1 of 22k ohms and another R2 of 10k ohms are connected between a supply rail of +12V and 0V. The 22k ohms resistor is at the top. What's the current flowing through them? And what is the voltage across the 10k ohms resistor?

The total resistance $R_t$ will be R1+R2 = 22k + 10k = 32k .

Then by Ohm's Law the current, $I_t = V/R_t = 12V/32k$.

So, $I_t = 12/(32*10^3)$. Applying Indice Rule 1, $It = (12/32)*10^{-3} = (0.375*10^{-3})A$.

This may be written as 0.375mA or 375µA.

To calculate the voltage across the 10k ohms resistor use the formula V = I*R.

Then $V = I_t*R2 = 0.375mA*10k$ ohms.

$V = (0.375*10^{-3})*(10*10^3)$.

This is now an application of Indice Rule 2.

$V = 0.375*10*10^{(-3+3)}$.

$V = 3.75*10^0$. Now $10^0 = 1$ so, $V = 3.75*1$ which is 3.75V.

## Resistors in Parallel

The circuit of two resistors in parallel is shown in **Fig. 2**. In the case of resistor R1 22k ohms and R2 10k ohms each connected between a supply rail of +12V and 0V, what current flows in each and what is the total equivalent resistance?

Applying Ohm's Law again,

$I_1 = V/R1 = 12/22k$

$= 12/(22*10^3) = (12/22)*10^{-3}$

Therefore $I_1 = 0.545*10^{-3}A = 0.545mA$.

For the current flowing through R2, $I_2 = V/R2 = 12/10k$

$= 12/(10*10^3) = (12/10)*10^{-3} = 1.2mA$.

The total current $I_t = (I_1 + I_{2)} = (0.545 + 1.2)mA = 1.745mA$.

Now using Ohm's Law again the total resistance can be calculated,

$Rt = V/I_t = 12/1.745mA = 12/(1.745*10^{-3})$

$= (12/1.745)*10^3 = 6.876*10^3$

(This can be written as 6876 ohms, or 6.876k ohms).

Returning to the formula for total current $I_t = I_1 + I_2$, it is allowed that the equivalent equations from Ohm's Law be substituted for each of the I symbols;-

then $(V/R_t) = (V/R1) + (V/R2)$.

The next trick is to divide each term by V,

$V/(V*Rt) = (V/(V*R1)) + (V/(V*R2))$

The introduced Vs in the dividing term cancel with the Vs on top as V/V = 1 and the result becomes:

$1/Rt = (1/R1)+(1/R2)$

Now I'm sure this has been presented to you previously as the formula for calculating resistors in parallel. So, let's try it.

$1/Rt = (1/22k) + (1/10k)$.

$1/R_t = 1/(22*10^3)+1/(10*10^3)$.

The 1/(x) terms are called reciprocals and cannot be just added together. The number in the bracket is first divided into the 1 on top and the power of ten taken from the bottom to the top with a change of sign for the indice'.

$1/R_t = (0.04545*10^{-3})+(0.1*10^{-3})$

Now as the powers of ten of each term are the same the numbers can be added together, so $1/R_t = (0.14545*10^{-3})$

Making $R_t$ the subject of the formula: Change the Rt divided on the left to multiplied on the right.

$1 = (0.14545*10^{-3})*R_t$.

The term in brackets being multiplied on the right becomes divided on the left.

$1/(0.14545*10\text{-}3) = R_t$

Then swap the sides around so,

$R_t = 1/(0.14545*10^{-3})$

Using Rule 1 this becomes:

$R_t = (1*10^{3)} / 0.14545$

$= 1000 / 0.14545 = 6875$ ohms.

This result is only slightly different from that previously calculated value 6876 ohms

| Value | Power | Name | Symbol |
|---|---|---|---|
| Million Million | $10^{12}$ | Tera | T |
| Thousand Million | $10^{9}$ | Giga | G |
| Million | $10^{6}$ | Mega | M |
| Thousand | $10^{3}$ | Kilo | k |
| One | $10^{0}$ | Unity | |
| Thousandth | $10^{-3}$ | milli | m |
| Millionth | $10^{-6}$ | micro | u |
| Thousand Millionth | $10^{-9}$ | nano | n |
| Million Millionth | $10^{-12}$ | pico | p |

**Table 1: Powers of ten and names used to signify them.**

**Fig. 1.**

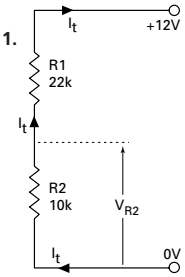


**Fig. 2.**

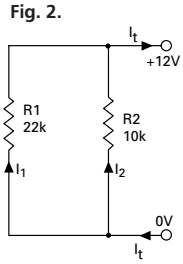


**Fig. 1: Resistors in series have the same current flowing through them. (See text for details)**

**Fig. 2: Resistors in parallel have the same voltage across their ends. (See text for details).**

due to the slight inaccuracies of rounding up or down.

## Secondary School Maths

Now we'll look back to the early days of Secondary School where you may remember the mention of **fractions**, **numerators** and **common denominators**. But I ask you - please don't panic!

Instead, I ask that you take the formula for parallel resistance again and do the common denominator trick.

1/Rt = (1/R1)+(1/R2)

The common denominator for R1 and R2 is (R1*R2).

Then, when R1 is divided into the common denominator, R2 results, and when R2 is divided into it R1 results. I'll place brackets around them so that they are now treated as mini groups.

1/Rt = (R1+R2) / (R1*R2)

and by inverting both sides this becomes;

$R_t$ = (R1*R2) / (R1+R2).

Now you may wonder why I have gone to this trouble to produce a formula, which looks worse than before? Well in fact it's easier to use. To demonstrate I'll use this formula with the previous values of resistors,

$R_t = (22*10^3)*(10*10^3) / ((22*10^3)+(10*10^3))$

$R_t = (22*10*10^{3*103}) / ((22+10)*10^3)$

$R_t = (220*10^{6)} / (32*10^3)$

$R_t = (220/32)*10^3 = 6.875*10^3$

Rt = 6.875k ohms or 6875 ohms.

I hope all the long equations and terms with many brackets didn't frighten anyone away. In the next article I will continue the theme of using the maths in practical applications and hopefully you might even come to enjoy it.

**PW**

# Mystified By Maths?

**Are you frightened of Fractions, or Mystified by Maths? If so, Rob Mannion G3XFD passes on some advice on how to discover the magic in maths. You could enjoy those numbers rather than being frightened by them!**

I've often mentioned to readers that I never enjoyed maths at school, whereas I thoroughly enjoyed virtually every other subject (apart from the dreaded sports. I never did understand the offside rule and how it applied to a line fault!).

However, although I look back almost 50 years at my own wasted hours in the maths classes - I realise that other people are also suffering needlessly when they could, with some extra help - achieve a great deal with mathematics, open a new world and gain a great deal of satisfaction.

Many people come into the radio hobby with only a basic education and enjoy building their own equipment and enjoy the process. The problems start to show themselves when the technical mountains approach. It's then you realise that the knowledge provided by the basic mathematics will help you over the hill. It's amazing how little extra information can help you, and almost certainly lead you on to other discoveries.

## Maths Foundation Course

My lack of enthusiasm in mathematics caused me to struggle for many years. Yes, I managed the calculations but didn't enjoy the work. Additionally, when faced with a page of mathematics in a scientific journal or book - I would skip over them. In doing so I missed a great deal, especially the opportunity to improve y knowledge.

Eventually, over 25 years ago, I began to think that a Maths Foundation Course from the Open University (OU) might be worthwhile trying. It certainly couldn't do me any harm. Unfortunately, though, it was obvious that my just-about-A level maths would leave me struggling through the OU course, which was then, as it is now I understand, based mainly on abstract maths, rather than applied 'practical' mathemtatics needed for hobby radio purposes.

Not being the type to find abstract concepts easy to digest (or work with) I took the advice of tutors in the OU and looked carefully at what was on offer from the **National Extension College**. I quickly discovered there were some excellent courses available and some seemed to be especially aimed at me!

## National Extension College

Despite its superb work, very few people know of the National Extension College, based in Cambridge. This is a great shame because the NEC, a charitable trust set up to help people of all ages and abilities to fit learning into their lives. A forerunner of the OU itself (the NEC and OU originally worked very closely together) the NEC offered some very reasonably priced course with subjects and educational levels to suit most academic abilities.

In the old days when the student had to rely on postal correspondence, I found the NEC service to be first class. Unusually (fully commercial correspondence colleges rarely offer this personal contact) my completed assignments were posted directly to the Tutor. I found that his help was excellent indeed and it's without exaggeration I can say - even years afterwards - that at times I felt he was standing behind me, offering encouragement over my shoulder.

Any form of distance learning demands application from the student. It's all too easy to wander off to the shack or to turn on the TV. Until you experience it yourself, it's difficult to convey the dedication required to try a correspondence course. But if you do try this method yourself, I feel that there aren't many people who wouldn't benefit from their effort. And strangely perhaps, I never felt alone when doing the various courses I completed with both the NEC and the OU.

Finally, if you think you could befit from a real 'kick start' maths course I suggest you look at the NEC's Develop Your Maths course, which has several different modules (they can all be undertaken individually, or as a complete course). In a nutshell the NEC states that the course "helps develop your maths skills, apply your skills to a range of practical, maths related tasks and get ready for the Level 2 Certificate in Adult Numeracy". Complete course £195, separate units £75 each)

Interested? If you are, please contact the NEC to discuss your options and get advice. Once you've seen the NEC catalogue I, from my own experiences, feel sure you'll find a course to suit you. Education doesn't come cheap nowadays but what price can be put on the skills to help you in your radio hobby and everyday life?

## Contact Details

For course details and prices contact the:
**National Extension College, The Michael Young Centre, Purbeck Road, Cambridge CB2 2HN.**
**Website:** www.nec.ac.uk/
**Tel:** 0800 389 2839 for enrolment advice
**FAX:** (01223) 400 325
**E-mail:** courses@nec.ac.uk

# Radio Basics

This month Rob Mannion G3XFD introduces the first of the promised 70MHz 'fun' projects. Rob also explains how he intends to present projects on alternative months. Intrigued? - Read on!

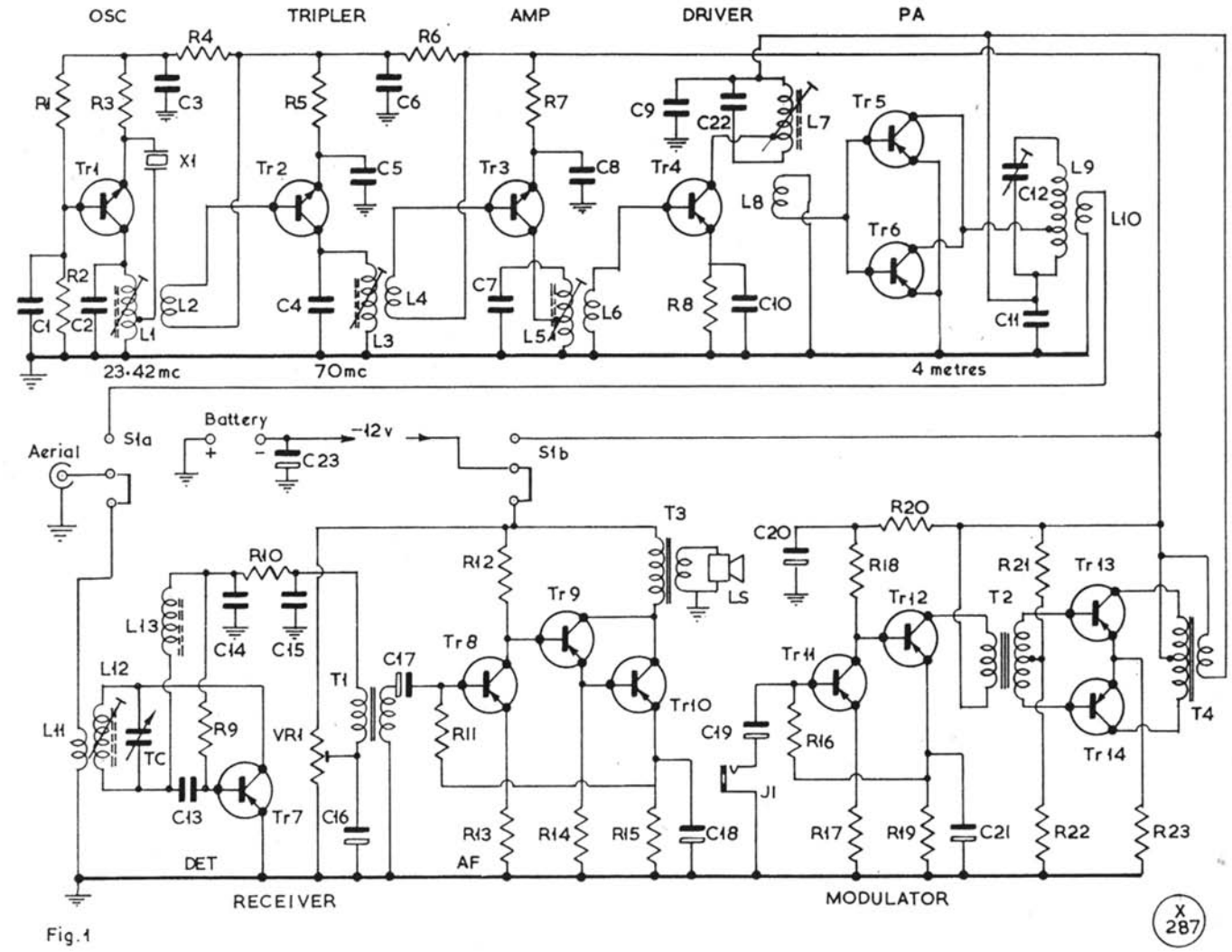


Fig. 1

**Table of Values**

Fig. 1. Circuit of Tx, Rx and Modulator

C1, C9, C11 = ·002 μF, disc
C2 = 56 μμF, tub.
C3, C5 = ·01 μF, min. foil
C4, C7, C22 = 15 μμF, tub.
C6, C8 = ·022 μF, min. foil
C10, C14, C15 = ·047 μF, min. foil
C12 = 30 μμF, trimmer
C13 = ·0015 μF (for 4m.) 470 μμF (for 2m.)
C16, C20 = 15/80 μF, 16v. elect.
C17, C19, C21 = 10 μF, elect.
C18 = 25/50 μF, elect.
C23 = 500 μF, 16v.
R1 = 15,000 ohms
R2 = 100,000 ohms
R3 = 680 ohms
R4 = 100 ohms
R5, R6 = 47 ohms
R7 = 15 ohms
R8 = 4·7 ohms
R9 = 680,000 ohms (for 4m.), 390,000 ohms (for 2m.)
R10 = 220 ohms
R11, R16 = 330,000 ohms
R12 = 8,200 ohms
R13 = 120 ohms
R14 = 3,900 ohms
R15 = 560 ohms
R17 = 270 ohms
R18 = 6,800 ohms
R19 = 1,000 ohms
R20, R21 = 2,200 ohms
R22 = 22 ohms
R23 = 3·3 ohms
VR1 = 10K min. pre-set potentiometer
Xtal = 7806 kc (*see text*)
T1, T2 = Driver xformers (ex-Jap portable) *see text*
T3 = Speaker o/p type, neglect centre-tap
T4 = Mod xformer, home-wound, 130 turns 30g. by 3, tri-filar (*see text*)
Tr1, Tr2, Tr3 = BC108
Tr4, Tr5, Tr6 = 2N2904
Tr7 = NKT675, OC171, or equiv.
Tr8, Tr11 = OC44
Tr9 = NKT275, OC75
Tr10, Tr12, Tr13, Tr14 = AC128 or NKT281

*Notes:* All resistors rated half-watt. TC, small capacitor, one moving and two fixed vanes, ex-TV tuner. Modulator transistors Tr13, Tr14 should be fitted with heat dissipating clips. Crystal can be FT-243 type for easy starting in third harmonic mode.

TABLE OF COIL DATA

L1 — 16 turns 30g. enam., tapped 1½t. from cold end, close-wound on 0·2in. diam. former.
L2 — Two turns 22g. p.v.c., wound over L1.
L3 — Seven turns 26g. enam., on 0·2in. diam. former.
L4 — Two turns 22g. p.v.c., loosely wound on L3, and adjustable.
L5 — Seven turns, 26g. enam., centre-tapped, on 0·2in. diam. former.
L6 — Two turns 22g. p.v.c., loosely wound over L5, and adjustable.
L7 — Seven turns, 22g. enam., spaced to 0·6in., 0·25in. diam., tapped 3t. from cold end.
L8 — Two turns p.v.c. link, wound over cold end L7.
L9 — Seven turns 22g. enam., 0·25in. diam., no slug, tapped 3t. from cold end.
L10 — Two turns p.v.c., tightly wound within cold end of L9.
L11 — One turn, link wound over L12 at base end.
L12 — 14 turns, 26g. enam., on 0·2in. diam. slugged former.
L13 — Ferrite rod, half-inch long by 5/32in. diam., filled with 32g enam. wire. (An ex-TV width coil would be suitable.)

Radio Basics (RB) has now become an all embracing part of my Amateur Radio life, and although it's an enjoyable task each month, I'm often left with the feeling that I could do much more for readers. This feeling is often backed up by the readers who patiently wait to chat to me at the Leicester Show, for example. The most often expressed request is that I shouldn't dwell on one topic for too long and vary the projects, ideas and topics as often as possible. Food for thought eh?

The RB series of articles brings me the most correspondence and it's obvious, from the conversations I've enjoyed with readers, that by varying the way I present ideas in RB, we could cover more ground. So, from this issue of *PW*, I'm going to adopt a 'turn and turn about' method of presenting projects.

The idea of concentrating on one project in one particular issue and then returning to it perhaps the next month

(depending on what's featured) is to give both readers and myself time to work on the ideas. In this way I feel that with my experience of working on a project fresh on my mind, I'm more likely to pass on the best advice and tips for success. It will also provide an almost 'live' feel as I hope I can successfully convey the experience of my recent work, almost perhaps as though you're in my workshop with me, chatting to me as I work

The biggest advantage of the turn and turn about method is that it will give me precious time to present the best ideas for you. With less haste I should also be able to reduce the number of errors, which the production line pace that's required to produce *PW* can so easily introduce. So, I think we'll all benefit.

Finally, there's also the major impact that RB readers provide (feedback). Here the alternate month idea will allow me to incorporate your own much appreciated suggestions, comments and ideas.

## Fun On Four

This month's project is designed to provided 'fun on four' (70MHz) and was originally published in *The Short Wave Magazine* in November 1968. My thanks go to my esteemed colleague **Kevin Nice G3UNR** (*SWM* Editor) for his full co-operation with the republishing of the article. Incidentally, although I had full .access to *SWM*'s archives, the circuit reproduced came from my original copy of the magazine itself!

The design came from the skilled hands of **John Hey G3TDZ** who, at that time, had made a name for himself in the Amateur Radio world by designing some clever lightweight transmitter - receiver projects for v.h.f. (Don't forget that in those days the hand-held transmitter for v.h.f. was a novelty - those that were available commercially were very expensive).

John's design, **Fig. 1**, is extremely simple and reliable. I built several and this little rig provided me with my first hand-held for 70MHz. In those days we just used 70.260MHz in the Southampton area where you could almost guarantee a QSO at any time of the day. Nowadays though, I would recommend two crystals, one for the calling channel and another for working use. (see separate information panel for crystal details).

The receiver is simplicity itself and uses an OC171 (or equivalent) in a super-regenerative configuration. It's very sensitive, reliable and simple, with extremely low re-radiation levels. It's main problem is that it lacks selectivity compared to superhet receivers. Despite that it's a very useful receiver indeed. When I built my original, almost 37 years ago, I used the audio amplifier shown in the original circuit. However, the modern version I'm working on now, uses the LM386 i.c. amplifier.

**Note:** The r.f. choke and pi filter (comprising R10 and C14 and 15) must be carefully copied, especially if an audio i.c. is to be used. The filter minimises r.f. getting into the amplifier, reducing distortion and possibilities of instability.

The transmitter line-up include BC108 transistors as oscillator, tripler and as the 70MHz amplifier. Transistors 4, 5 and 6 are 2N2904 types.

The modulator uses a home wound trifiliar transformer. I must admit I had great difficulties with the original project but eventually used a transformer from an scrap receiver a.f. output board. Full details on the winding of the transformer are provided in the photocopy I can provide (see information panel).

However, I'm planning to try a series pass type transmitter modulator in my new version. This type of low power modulation can be thought of as acting in the same way as a regulator transistor. The applied audio then varies the current passing to the p.a. stage via the series pass transistor. Although obviously not as efficient as transformer coupled (because of the inevitable voltage drop through the regulator transistor) modulation - it nevertheless works well enough for low power transmitters such as we're building in this project.

## Setting Up

In the second part of this project I'll share my experiences gained from setting up the receiver (I strongly recommended that constructors build and evaluate a prototype receiver first) and the oscillator, tripler and driver circuits. So far (I've enjoyed several weekends on the project already) I'm confident that if you have access to a good multimeter, a dip meter (capable of working up to v.h.f.) and some patience - you'll enjoy the process.

Finally this month, I would like to suggest that if you have a selection of crystals in your junk or spare box, you spend a little time looking through them. I was surprised to find just how many crystals I had which would (when multiplied) provide a useful frequency within the 70MHz band.

First out of my own collection was a 7.025MHz crystal and a 14.105MHz crystal. You may end up using some rather odd multiplication of harmonics but you'll end up with a useful output and the knowledge on how to set up multiplier chains!

Crystal rule No.1: When visiting rallies and junk sales - sort through the crystals in that pile of junk! Overtone crystals are always useful and can often be bought for 25p or less. Take a calculator with you try to remember the various final frequencies and likely base frequencies required. I've often managed to find very useful crystals in this fashion. Good luck!

Next month I'll be up-dating you on the progress of my 1CP1 1in 'scope tube project. In the meantime I hope you'll enjoy preparing your own 70MHz a.m. transmitter-receiver project. Cheerio until next time. **PW**

## Radio Basics Fun On Four Project

Readers who are keen on building the 70MHz a.m. transmitter-receiver project and who would like a complete photocopy of the original article can obtain one by sending a stamped addressed envelope (50p stamp please) on an A4-sized envelope with a cheque or postal order for £2 to cover photocopying costs. Please mark the incoming envelope as **Radio Basics 70MHz**. The returned s.a.e. will also contain transistor equivalents details on a separate sheet. I will be handling the photocopying myself and will try to send them out by return of post.

**Crystals:** For those constructors not having suitable crystals for 70MHz use, I'm pleased to announce that there is a possibility (I can't guarantee it I'm afraid) of buying them for less then £4 each. If I place a bulk order for 70.260MHz crystal (the calling channel) and one 'working' frequency (frequency to be decided) this purchase could be an option. So, if you're interested, please let me know by letter or E-mail.

**Receiver OC171 transistor:** If you're keen to start on the receiver section as soon as possible and you don't have an OC171, they are available from Birketts in Lincoln for 75p each, plus postage (see advert this issue).

## Radio Basics 'scope project

As noted in this month's Keylines' I had a lapse of memory last month and I apologised to those who were puzzled at the lack of information on the triode pentode valve used. The valve is an ECL80. Photocopies (an A5 sized - half A4 -, 50p s.a.e. please) of the complete Mullard project, including the transistorised h.t. inverter can be obtained from me at the *PW* offices. Please mark your incoming envelope clearly as **Scope Project**. .

**Rob G3XFD**

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Command software

KENWOOD

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200W

HF/50MHz ALL-MODE TRANSCEIVER

# DX Deluxe

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200W Model

## TS-480SAT
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- 200W output (50MHz: 100W) DC 13.8V operation
- 100W model available with built-in antenna tuner
- TX/RX AF DSP
- Compact construction for easy carrying
- Separate LCD control panel with speaker
- Continuous RX: 500kHz (VFO: 30kHz) to 60MHz
- TX: covers all Amateur bands 1.8MHz to 50MHz

Unique concept, brilliant execution. Kenwood's compact TS-480HX/480SAT is tailor-made for DX'ing. But its smartly designed standalone LCD control panel — featuring backlit keys to enhance operating ease — is equally at home on your desk, with the main unit up to 4 metres away. And wherever it is, this HF transceiver delivers an astonishing punch: 200W. Performance is equally impressive. For example, a quad-mixer provides RX dynamic range in the TS-950 class, while AF DSP processing offers many powerful features, including noise reduction, a speech processor, and AF filters. And of course you can enjoy all of the convenience of PC-based control. The TS-480HX/480SAT lets you enjoy the best of both worlds.

■ Built-in automatic antenna tuner (100W model) ■ Terminals for external antenna tuner, linear amp, PC ■ Electronic memory keyer ■ AF DSP features: • AF DSP filters • Beat-cancel, noise reduction • TX/RX equalizer • CW auto-tune • Speech processor ■ Optional 500Hz/270Hz band CW narrow IF filters, 1.8kHz band SSB narrow IF filter ■ PSK31 compatible ■ 5W minimum RF output, QRP compatible ■ Electronic keyer ■ Plug-in voice recording/synthesis unit available ■ Packet cluster tune with TM-D700E ■ Supplied with mobile panel bracket, tabletop panel bracket and carrying brackets

*Available from all official Kenwood amateur radio dealers. For full details of our dealer network and all Kenwood amateur products contact your local dealer or Kenwood Electronics Ltd. 01923 655284 e-mail comms@kenwood-electronics.co.uk website: www.kenwood-electronics.co.uk*

# A 144MHz VSWR Bridge

**Introduction:** This project was originally published in the May 1978 issue of *PW*. However, despite the fact I have built many of the projects chosen for this series, I have to be honest and tell readers that the 144MHz bridge used by G3XFD came via the RAIBC 'Junk' stand at the Longleat rally! It provided good service and although I don't know exactly where it is nowadays it's somewhere in my stored boxes in the garage! Readers should find this useful instrument easy to build, especially as the technique used for r.f. sampling was discussed by **John Hoban G3EGC** in his letter and photographs on page 9 of the March 2005 issue of the magazine. In his letter John, along with describing the technique he used to insert the sampling lines, also kindly offered to provide the not-so-common air dielectric coaxial cable to readers (see March issue). So, you've no excuse for not trying this project yourself now have you? Good luck! **Editor**.

Continuing the republishing of PW v.h.f. and u.h.f. classic projects Rob Mannion G3XFD introduces a useful 144MHz v.s.w.r. bridge.


● **Original photograph from the May 1978 project (see text).**

## The 1978 Article

Matching the antenna to the transmitter, in order to obtain maximum radiated power, is an important consideration for any Radio Amateur hoping to obtain the best results from their equipment. Fortunately, this can be easily achieved by using some form of standing wave meter in the tuning up procedure.

The voltage standing wave ratio (v.s.w.r.) is a measure of the efficiency of an antenna system. The closer the v.s.w.r. is to unity, the greater the proportion of transmitter power actually radiated. Although the v.s.w.r. only approaches unity under ideal conditions, in practical situations its use will provide a very useful evaluation of the system's performance.

The instrument described here is v.s.w.r. bridge, which will provide a constant on-air reading, whilst allowing meaningful measurements to be made on the relative merits of different antennas and sites. It's suitable for use in the feeders of v.h.f. transmitters having outputs of between 1 and 100W.

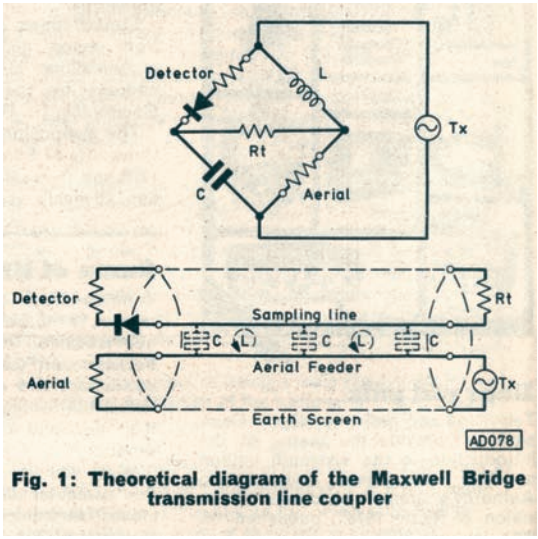


**Fig. 1: Theoretical diagram of the Maxwell Bridge transmission line coupler**

● **Fig. 1: Theoretical circuit diagram of the Maxwell Bridge transmission line coupler (see text).**

## Sampling Power

A v.s.w.r. bridge works by sampling the amount of power flowing in each direction along the antenna feeder. This is achieved by the use of a Maxwell bridge transmission line coupler, as shown in **Fig. 1**.

The reactive arms of the bridge are formed by the distributed capacitance and mutual inductance of the coupled lines. The two sampling lines, L1 and L2, shown in the circuit diagram of **Fig. 2**, are coupled to the main antenna feeder and respectively terminated at opposite ends by R1 and R2.

The sampling lines provide two outputs which are proportional to the forward and reflected signals present. Diodes D1 and D2 and capacitors C1 and C2 convert the sampled signals to d.c. for measurement on a conventional meter, M1. Potentiometer VR1 adjusts the sensitivity of the

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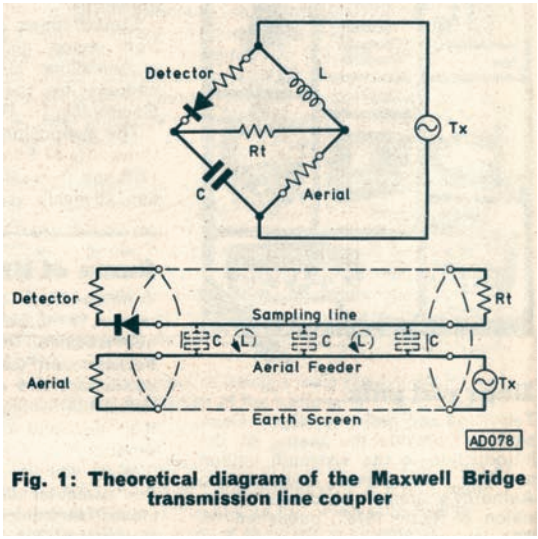


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● **Fig. 2: Full circuit diagram of the 144MHz v.s.w.r. bridge (see text).**

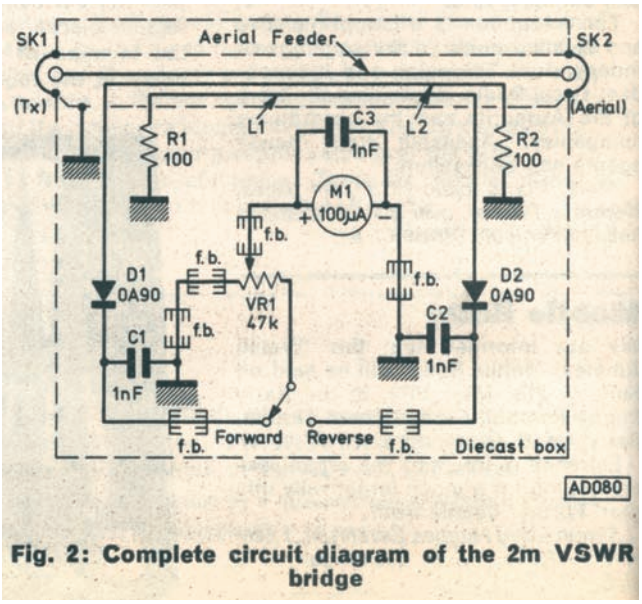



**Fig. 2: Complete circuit diagram of the 2m VSWR bridge**

circuit and ferrite beads prevent stray r.f. pick up in the wiring.

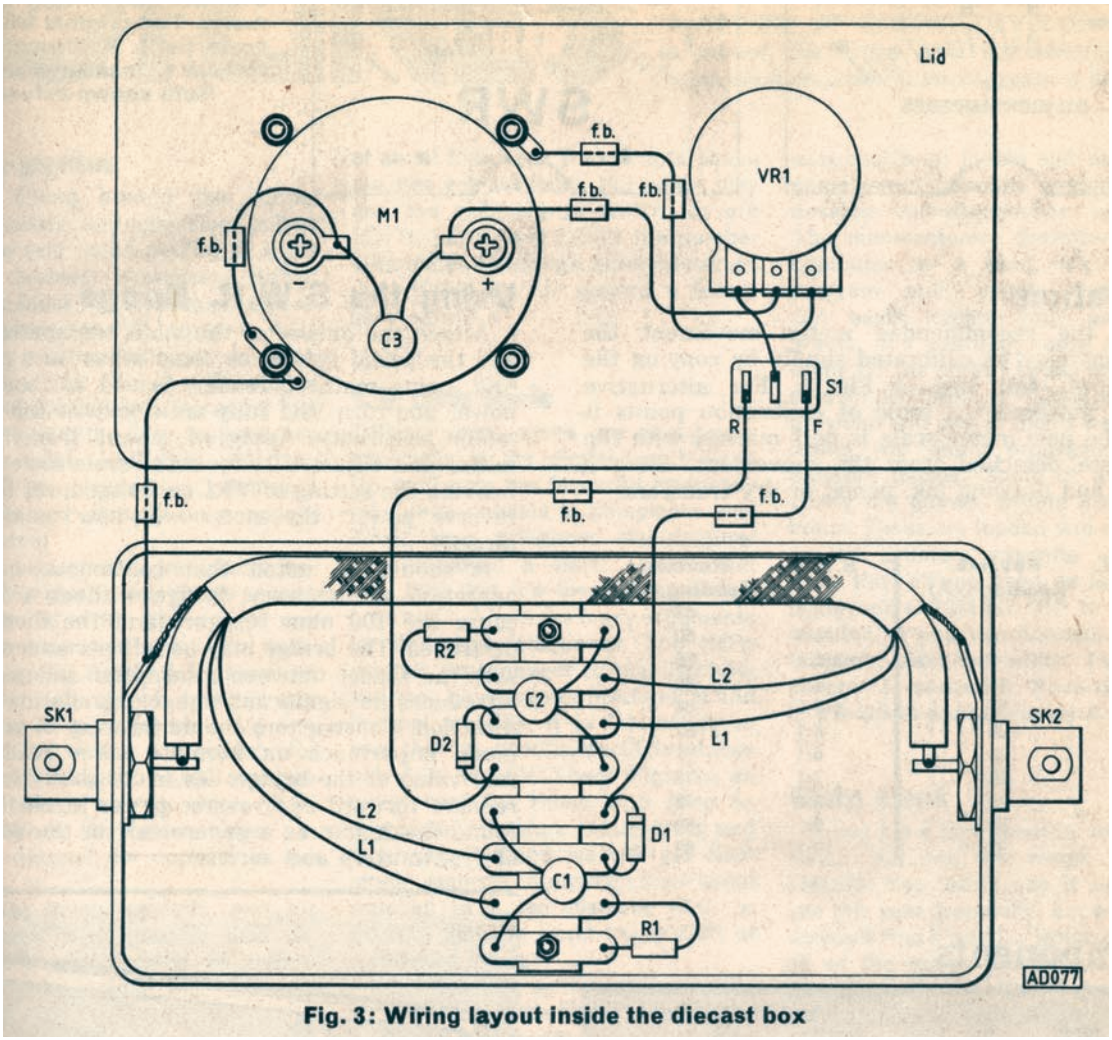
In practice, the bridge can be used either way round due to the symmetry of the circuit, but for convenience, SK1 is assigned to the transmitter and SK2 to the load, this allows S1 to be designated Forward and Reflected.

## Diecast Aluminium Box

The instrument is built into a small diecast box, which also acts as a screen. Important note: When obtaining a suitable box please remember it's important to ensure that the depth is sufficient to provide adequate clearance for the meter movement.

The component layout is shown in **Fig. 3**. A tag strip is mounted so that the end connections are earthed via fixing screws, whilst the

● **Fig. 3: Wiring layout inside the diecast box. Note that a symmetrical approach is necessary for efficient operation (see text for guidance).**

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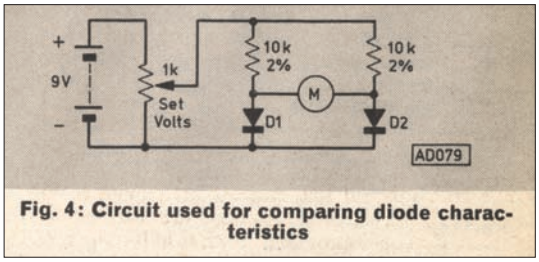


**Fig. 4: Circuit used for comparing diode characteristics**

● **Fig. 4: Circuit used for comparing germanium diode characteristics (see text).**

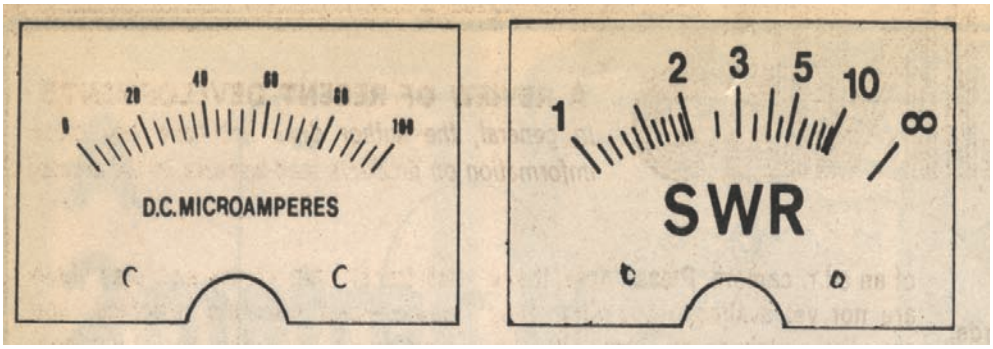


**Fig 5: Original scale suggested for use with a meter movement available from Maplin Electronics (see text for advice on other movements).**

remaining tags are isolated. This is best done by using additional 8BA nuts to space the tag strip from the case.

Constructional tip: It's important that the physical placement of the diodes, resistors and pick up lines is symmetrical; the better the symmetry, the better will be the electrical balance of the bridge. If matched resistors, diodes and capacitors are used, electrical balance will be even better than is possible with random selected components. However, since the bridge essentially provides relative readings, the ideal condition and components, while highly desirable, aren't vital for satisfactory results.

The germanium detector diodes should be matched for similar characteristics using the circuit of **Fig. 4.** A pair of diodes should be chosen such that (while on test using the circuit in Fig. 4) there's no appreciable meter deflection as the applied voltage is varied from 0 to 9V. The meter used for evaluating the diodes should be as sensitive as possible, e.g. an AVO model 8 on its 50µA range.

## Coaxial Line

The coaxial line* is made from a 140mm length of low loss coaxial cable (see component list). Its outer-pvc sheath should first be carefully removed and the copper braid 'bunched' to allow the two sampling lines to be introduced under it. The lines should be of equal length and should be run inside the braid, with care being taken to keep them close together with no kinking. They should come out about 20mm from each end of the cable.

The accuracy of the instrument is dependent on the matching of the terminating resistors to the impedance of the sampling lines, thus the constructional details for the coaxial line should be closely followed.

**Readers who don't have access to suitable coaxial cable should refer to John Hoban G3EGC's letter, page 9 March 2005 issue of PW. Editor.*

**Table 1: Calibration chart (see text).**

| SWR | Reverse Reading (µA) | SWR | Reverse Reading (µA) |
|---|---|---|---|
| 1.1 | 0 | 2.5:1 | 43 |
| 1.1:1 | 5 | 3:1 | 50 |
| 1.2:1 | 9 | 3.5:1 | 56 |
| 1.3:1 | 13 | 4:1 | 60 |
| 1.4:1 | 17 | 4.5:1 | 64 |
| 1.5:1 | 20 | 5:1 | 67 |
| 1.6:1 | 23 | 6:1 | 71 |
| 1.7:1 | 26 | 7:1 | 75 |
| 1.8:1 | 29 | 8:1 | 78 |
| 1.9:1 | 31 | 9:1 | 80 |
| 2:1 | 33 | 10:1 | 82 |

## Instrument Calibration

Using the recommended meter movement the instrument may be calibrated simply by copying the scale shown full size in Table 1. For alternative types of movement a table of calibration points is provided.

Note: The new meter scale is best marked with the scale plate detached from the movement, using a fine pen and drawing ink, pencil or dry transfers.

## Using The Bridge

Using the bridge is simplicity itself. Firstly, you should attach the output of the v.h.f. transmitter to SK1 and the antenna system (or some other form of r.f. load) to SK2, using matched feeder.

Next, you should set S1 to read forward power and turn VR1 fully anti-clockwise for minimum meter sensitivity. Apply r.f. power from the transmitter and adjust VR1 for a full scale meter reading. Then, leaving the setting of VR1 unchanged, set S1 to read reverse power, the meter will now indicate v.s.w.r. directly.

Warning: It should be noted that continuous high power operation of the s.w.r. bridge without a load may cause the 100Ω resistors and the diodes to be destroyed. However, the bridge may be left permanently in-line with the feeder between transmitter and antenna as it introduces no significant signal degradation in either direction.

Constructors should be wary of placing too much importance on absolute v.s.w.r. readings, the real value of the bridge lies in its ability to indicate relative forward and reverse power levels. Despite the proviso, the instrument will be found invaluable as a general aid in the adjustment of transmitters and antennas.

**PW**

### Component Listing

**Capacitors**

C1 1nF disc ceramic
C2 1nF disc ceramic
C3 1nF disc ceramic

**Resistors**

R1 100Ω 0.25W 2%
R2 100Ω 0.25W 2%
VR1 47kΩ linear carbon

**Diodes**

D1 OA90
D2 OA90 (see text)

**Sockets**

SK1 50Ω BNC
SK2 50Ω BNC

**Lines**

L1 250mm 26s.w.g. enamelled copper wire
L2 250mm 26s.w.g. enamelled copper wire
140mm low-loss 50Ω coaxial cable or capacitance 56pF/m (UR203)

**Miscellaneous**

Diecast box, approx. 120 x 60 x 44mm
100µA 2in panel meter
Miniature single pole c/o toggle switch. Control knob with position indicator. Miniature 8-way horizontal tag strip. Earth tags, five required. Ferrite beads, six required.

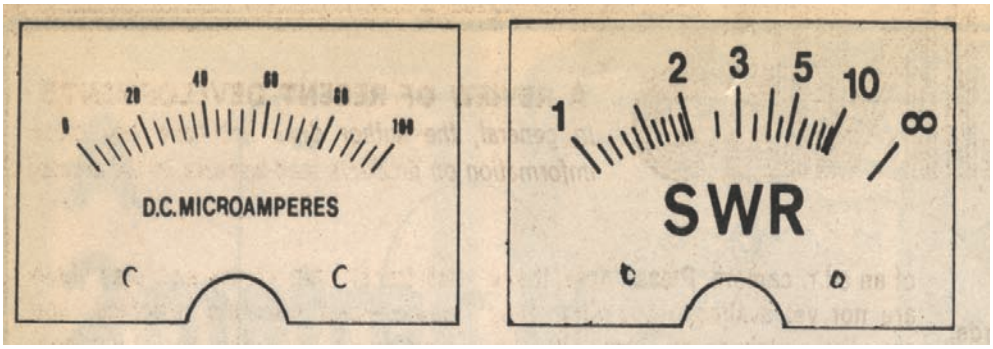


**Fig 5: Original scale suggested for use with a meter movement available from Maplin Electronics (see text for advice on other movements).**

remaining tags are isolated. This is best done by using additional 8BA nuts to space the tag strip from the case.

Constructional tip: It's important that the physical placement of the diodes, resistors and pick up lines is symmetrical; the better the symmetry, the better will be the electrical balance of the bridge. If matched resistors, diodes and capacitors are used, electrical balance will be even better than is possible with random selected components. However, since the bridge essentially provides relative readings, the ideal condition and components, while highly desirable, aren't vital for satisfactory results.

The germanium detector diodes should be matched for similar characteristics using the circuit of **Fig. 4.** A pair of diodes should be chosen such that (while on test using the circuit in Fig. 4) there's no appreciable meter deflection as the applied voltage is varied from 0 to 9V. The meter used for evaluating the diodes should be as sensitive as possible, e.g. an AVO model 8 on its 50µA range.

## Coaxial Line

The coaxial line* is made from a 140mm length of low loss coaxial cable (see component list). Its outer-pvc sheath should first be carefully removed and the copper braid 'bunched' to allow the two sampling lines to be introduced under it. The lines should be of equal length and should be run inside the braid, with care being taken to keep them close together with no kinking. They should come out about 20mm from each end of the cable.

The accuracy of the instrument is dependent on the matching of the terminating resistors to the impedance of the sampling lines, thus the constructional details for the coaxial line should be closely followed.

**Readers who don't have access to suitable coaxial cable should refer to John Hoban G3EGC's letter, page 9 March 2005 issue of PW. Editor.*

**Table 1: Calibration chart (see text).**

| SWR | Reverse Reading (µA) | SWR | Reverse Reading (µA) |
|---|---|---|---|
| 1.1 | 0 | 2.5:1 | 43 |
| 1.1:1 | 5 | 3:1 | 50 |
| 1.2:1 | 9 | 3.5:1 | 56 |
| 1.3:1 | 13 | 4:1 | 60 |
| 1.4:1 | 17 | 4.5:1 | 64 |
| 1.5:1 | 20 | 5:1 | 67 |
| 1.6:1 | 23 | 6:1 | 71 |
| 1.7:1 | 26 | 7:1 | 75 |
| 1.8:1 | 29 | 8:1 | 78 |
| 1.9:1 | 31 | 9:1 | 80 |
| 2:1 | 33 | 10:1 | 82 |

## Instrument Calibration

Using the recommended meter movement the instrument may be calibrated simply by copying the scale shown full size in Table 1. For alternative types of movement a table of calibration points is provided.

Note: The new meter scale is best marked with the scale plate detached from the movement, using a fine pen and drawing ink, pencil or dry transfers.

## Using The Bridge

Using the bridge is simplicity itself. Firstly, you should attach the output of the v.h.f. transmitter to SK1 and the antenna system (or some other form of r.f. load) to SK2, using matched feeder.

Next, you should set S1 to read forward power and turn VR1 fully anti-clockwise for minimum meter sensitivity. Apply r.f. power from the transmitter and adjust VR1 for a full scale meter reading. Then, leaving the setting of VR1 unchanged, set S1 to read reverse power, the meter will now indicate v.s.w.r. directly.

Warning: It should be noted that continuous high power operation of the s.w.r. bridge without a load may cause the 100Ω resistors and the diodes to be destroyed. However, the bridge may be left permanently in-line with the feeder between transmitter and antenna as it introduces no significant signal degradation in either direction.

Constructors should be wary of placing too much importance on absolute v.s.w.r. readings, the real value of the bridge lies in its ability to indicate relative forward and reverse power levels. Despite the proviso, the instrument will be found invaluable as a general aid in the adjustment of transmitters and antennas.

**PW**

### Component Listing

**Capacitors**

C1 1nF disc ceramic
C2 1nF disc ceramic
C3 1nF disc ceramic

**Resistors**

R1 100Ω 0.25W 2%
R2 100Ω 0.25W 2%
VR1 47kΩ linear carbon

**Diodes**

D1 OA90
D2 OA90 (see text)

**Sockets**

SK1 50Ω BNC
SK2 50Ω BNC

**Lines**

L1 250mm 26s.w.g. enamelled copper wire
L2 250mm 26s.w.g. enamelled copper wire
140mm low-loss 50Ω coaxial cable or capacitance 56pF/m (UR203)

**Miscellaneous**

Diecast box, approx. 120 x 60 x 44mm
100µA 2in panel meter
Miniature single pole c/o toggle switch. Control knob with position indicator. Miniature 8-way horizontal tag strip. Earth tags, five required. Ferrite beads, six required.

# Finding Those Vital Bits & Pieces

This month, in the second article of this occasional series, Rob Mannion G3XFD aims to help you find the vital components we need for our radio hobby. The idea is to help newcomers get their own junk box stock.

Starting off my first article on the dealers and traders specialising in supplying the vital bits and pieces we need for our hobby I feel I have to mentioning the famous **John Birkett** first on the list. I make no apologies for mentioning **John G8OPP** and his well known shop based in the Strait, Lincoln, as I've been a satisfied customer of his for approaching 45 years.

John, a stalwart supporter of the traditional Amateur Radio Rally now has a problem. His staff members are retiring (or have retired) while he continues to work, and this means that he is unable to attend as many rallies as in previous years. This year, for example, the Birkett stand will not be present at any events other than the two **Vintage Communications Fairs** held at the National Exhibition Centre (NEC) in Birmingham, and a specialised Aero Jumble event in Nottingham. (Please telephone John for confirmation of attendance).

Because of the problems John has in getting to events with his large stock of components and really-difficult to get radio bits and pieces, I've come to the conclusion it would be better for readers to visit Lincoln instead!

So, what about it? There's a real treasure trove in store at the shop and although the shop is now closed on Mondays and Wednesdays (due to staff shortages) it could be well worth you, or your club, arranging a joint trip to Lincoln.

Why not make the trip yourself? John's adverts can never do full justice to the enormous stock he has - rumour has it that not only has he filled both sides of the Strait (the quaint name of the street leading to the Cathedral) with radio gear the Cathedral itself is now possibly a store place, after all radio communications antennas are mounted on the Cathedral spire!

For further details please contact John Birkett direct at:
**25 The Strait, Lincoln LN2 1JD. Tel: (01522) 520767**.
Closed Mondays and Wednesdays.

Website (set up on John's Behalf)
**www.zyra.org.uk/birkett.htm**

**Note:** No E-mail address (John won't hear of it - preferring telephone or letters! But the website photographs provide an insight to what the visitor will see at the shop!).

**Fig. 1: A real Aladdin's Cave awaits you at John Birkett's shop in Lincon! (See text).**

## Rally Dealers

Some traders only seem to attend rallies and we never hear much from them apart from the time we get to chat during a rally. Added to this, it's not often that these seemingly anonymous traders let us know who they are. This is a great pity because together we can help each other and I encourage anyone reading this article to ensure such traders keep as up-to-date with what they've got in stock.

However, one trader who attends rallies and who specialises in surplus component **WCN Supplies**, based in Totton near Southampton in Hampshire, does keep customers informed of what's on offer via a small catalogue. I encourage readers to register with WCN Supplies so they can recieve the catalogue (details at the end of this section).

The A5-sized catalogue, **Fig. 2**, sent out by WCN always seems to have items of interest and I recently spent over £20 stocking up on ferrite cores for winding radio frequency chokes! These wire ended (axial) items - well worth buying at £1 for a pack of 10, are absolutely ideals for winding your own chokes with a length of 16mm , and a diameter of 5.3mm. These wire (ref: 150-565A) leads are 25mm. As soon as the catalogue arrived in the office I ordered several hundred - the price seemed very good to me, and it's not often the chance of good quality ferrite come our way.

The WCN website - still under development - provides the latest details on bargains and you can also download latest and previous catalogues using Adobe Acrobat (free version on website itself). I thoroughly recommend this facility to readers. Incidentally, for readers who visit the New Forest on Holiday, Totton is actually on one route into the Forest itself. So, why not pay a visit?

Further details from:
**WCN Supplies,**
**The Old Grain Store,**
**Rear of 62 Rumbridge Street,**
**Totton,**
**Southampton SO40 9DS**.
**Telephone (and FAX): 0238 066 0700**
**E-mail: info@wcnsupplies.fsnet.co.uk**
**Website: www.wcnsupplies.net**

## The PW Regulars

In this first article providing information on specialist dealers, I must take time to make space for the regular *PW* advertisers. I do so not just because they do advertise in *PW* (which everyone appreciates) but also to draw attention to the very personalised service they provide.

The first trader I must mention in the 'special service' category has to be **Robin Sykes G3NFV** of **Sycom** (ably backed up by his wife **Rosemary** at rallies, along with colleague **Geoff G4ECF**). I may be biased - but Robin, long before he was advertising in *PW*, proved he was able to offer a superb service at rallies and over the telephone.

Robin is a very patient man, I'm impressed with the reports for Radio Basics readers that he will often send them samples before he's been paid, and that his service is quick with an extremely reasonably priced post and packing service. However, the most important aspect of this service is that Robin is very approachable. Just ask for what you need, and he'll do his very best to help.

Sycom's speciality is toroids for winding inductors. This will be of great help to readers just starting off in the hobby because Robin will be prepared to offer advice while not making you feel small if you're not sure what's needed.

My advice to readers is that they contact Robin direct to see what rallies he plans to attend, and to check to ensure what you require will be on the stand. This is because even though much stock is taken - they don't have room for everything!
For further details, readers are strongly advised to contact **Sycom** at:
**PO Box 148,**
**Leatherhead,**
**Surrey KT22 9YW**
**Tel: (01372) 372587**
**FAX: (01372) 361421**
**E-mail: robin@syscom.comp.co.uk**
**Website: www.sycomcomp.co.uk**

Next on the list are **Bowood Electronics**, operated by **Will Outram** and his family. This Chesterfield, Derbyshire, based company also provide the personalised service so valued by our readers. Will has his trade stand next to *PW* at the annual **G QRP Club's** Rochdale Rally and I also find it gratifying to see Will and his helpers (usually the family!) advising and serving readers.

Again, I recommend readers contact Bowood Electronics directly for help and information. You can also order a catalogue by post and (unusually for our smaller advertisers) you can also order direct from the website.

Again, I advise readers to check on stock held, and it's well worth asking for something you need which you may regard to be a difficult to get part.
Further details from:
**Will Outram,**
**Bowood Electronics Ltd.,**
**Unit 1 McGregor's Way,**
**Turnoaks Business Park**
**Chesterfield S40 2WB**
**Tele: (01246) 200222**
**E-mail: sales@bowood-electronics.co.uk**
**Website: www.bowood-electronics.co.uk**

## Mystery Treasure Parcel! Can You Help?

During the period I've been preparing the 'junk' articles, which, as you'll realise, have turned into a mini series - I've received much correspondence and advice from readers. You'll also be interested no doubt, to hear that a mystery parcel of radio treasure has also arrived!

Unfortunately, whatever paperwork arrived with the box of goodies (and there was a nice selection!) was either lost or did not arrive with the parcel. So, as the box of bits and pieces was obviously aimed at drawing my attention to a source of supply for readers I'm hoping that this Can You Help? note will attract the attention of the sender!

The parcel contained a great deal of useful bits and pieces, mostly bagged and with the prices marked. I won't go into full details but included were items such as: packet so of nuts, bolts, general hardware, unknown (very old) packs of transistors, packs of components, grommet strips, etc. Altogether the parcel gave a good idea of the extremely useful stock some helpful trader has. Problem is...who is the trader?

If the sender could please contact me as soon as possible (mentioning further details of the box contents), I would be very pleased to include their details in this series of articles. Obviously, the kind person who sent me the samples reads Radio Basics, so I'm confident they'll see this request. They'll be disappointed not to see their efforts rewarded so far, but at least will now realise this *PW* initiative is open to everyone, even those who don't advertise in them magazine. Thank you. **G3XFD**

## Next Time

Next time we have space for this feature, I'll try to include as much other information on specialised bits and pieces traders as possible. Please keep the information coming into to me, and let me know of anything really unusual. **This is not an advertising feature - it really is aimed at helping everyone and it needs your input to succeed**! Cheerio for now.

**PW**

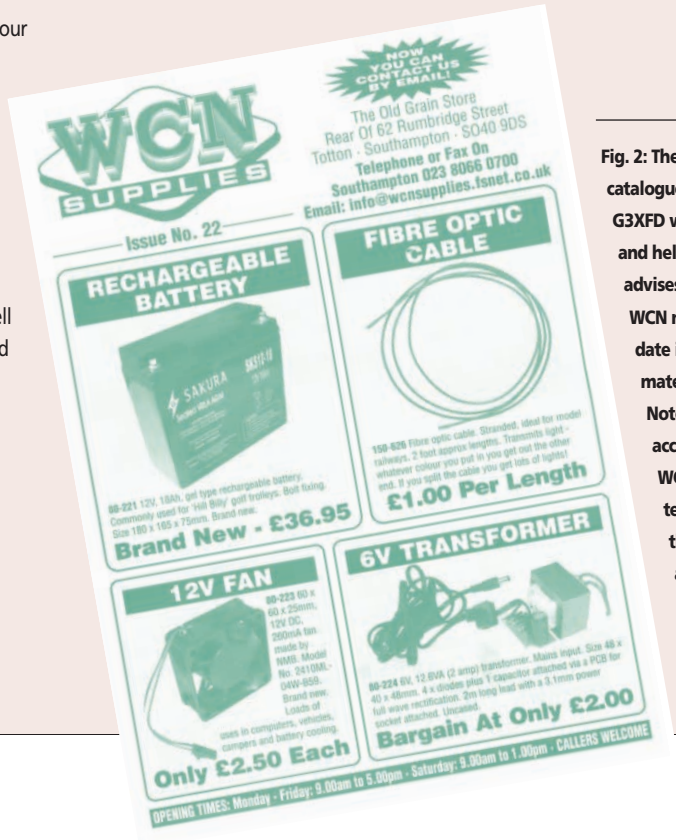


**Fig. 2: The WCN Supplies catalogue has provided Rob G3XFD with some interesting and helpful components. He advises readers to join the WCN mailing list for up to date information on surplus material from this supplier Note: for readers with access to the Internet, the WCN website (details in text) provides access to their current catalogue and previous catalogues via downloads using Adobe Acrobat files.**

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RRP: £1999, ML&S: Call

**No.18** ★★★★★★★★★
**Kenwood TS-480SAT**
The best selling Kenwood H.F. Can be used mobile or base. Includes ATU.
RRP: £1099 ML&S: £CALL

**No.19** ★★★★★★★★★
**Kenwood TS-480HX**
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RRP: £1199, ML&S: £999
or 48 x £29.56 p/m

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

**No.21** ★★★★★★★★★
**Kenwood TMD-700E**
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or 48 x £12.99 p/m

**No.22** ★★★★★★★★★
**Kenwood TH-F7E**
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RRP: £289.95, ML&S: £249

**No.23** ★★★★★★★★★
**Kenwood TH-D7E**
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**No.27** ★★★★★★★★★
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# Multi-Voltage Power Supply

Stefan Niewiadomski shows you how to create regulated multiple outputs in one unit, using another regulated supply as a source supply for the project.


Any newcomer to electronics and Amateur Radio when building and experimenting with circuits, soon realises the usefulness of a power supply with various or variable output voltages. Using batteries, though simple, is also the most expensive way of supplying power. And batteries soon lose their appeal when, as inevitable, they're found to be flat.

One of the first projects newcomers to the hobby often made was a mains-supplied power supply unit (p.s.u.). Most of these early projects often give many years service. Indeed, this was how I began. Recently, I needed to build a power supply for a new project and I realised that many components used in stabilised power supplies are getting more difficult and expensive to obtain.

Transformers are no longer available in the wide range of voltages and currents they used to be. Meters, heatsinks, and even smoothing capacitors, are certainly harder to find. Take my tip, if you come across suitable components at rallies, you should almost certainly snap them up - before someone else does!

Other factors that can make the construction of a power supply difficult, especially for beginners, are the needs for metal-working and the safety factors involved in a mains-driven unit. The project described here overcomes all the above difficulties by deriving several commonly-used voltages from a readily-available 13.8V power supply. This almost completely eliminates all mains voltage safety issues. It also makes the problems of sourcing transformers, meters, heatsinks and large capacitors redundant.

Many 13.8V power supplies are often designed for use with Amateur transmitters and transceivers, and are available to supply upwards of 20A at this voltage. They contain all the voltage stabilisation and current limiting circuitry needed for that task. With one of these units as a start point, the unit described here generates regulated 12, 9, 6 and 5V supplies at up to 1A for each supply.

Should you feel that one, or more, of these voltages is not needed, then all associated components may be omitted without affecting the other voltages. In a similar vein, if another voltage supply is needed, such as for example 8V, then one of the existing circuits can be modified, or an additional supply can be added.

The schematic of the unit is shown in **Fig. 1,** where the

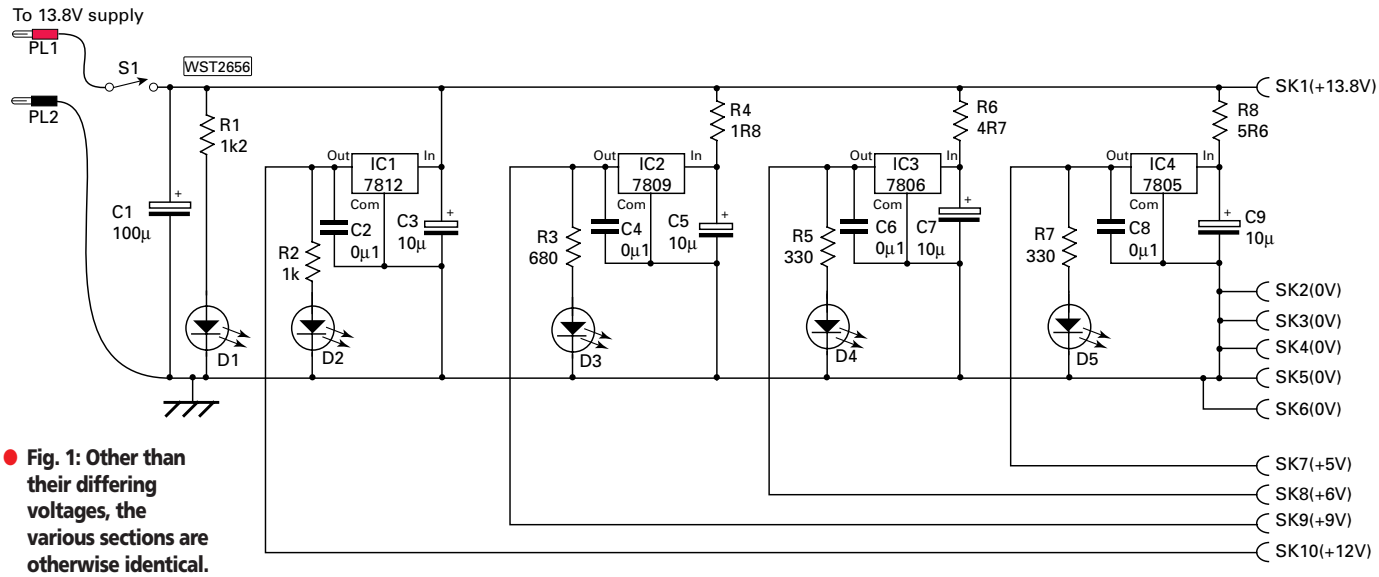


**Fig. 1: Other than their differing voltages, the various sections are otherwise identical.**

simplicity of the design can be seen. The main supply feed of 13.8V to the unit, is switched on and off by S1, this then has extra decoupling by C1, before being fed directly to a pair of screw terminals SK1 and SK5 (Note: sockets SK2-6, carrying the 0V rail, are in parallel). The inclusion of S1 allows the mains unit to be located out of the way (maybe under the work bench) and the derived voltages to be switched on and off without having to search for the mains on/off switch.

The light emitting diode (l.e.d.) D1 and its associated current-limiting resistor R1 indicate when this main supply is on. The limiting resistor R1 is chosen to give about 10mA through the l.e.d.

Regulator i.c. IC1 is a 12V/1A fixed-positive voltage regulator fed directly from the 13.8V supply. Capacitors C3 and C2 decouple the input and output of IC1 respectively. The l.e.d. D2 on its output indicates when the regulated 12V output is active. Since this output is not switched, it's active all the time the 13.8V supply is switched on.

You may consider this to be an unusual step - putting an 'on' indicator on an 'always-on' supply. But it's really to indicate that the 12V (or other supply) output has not been shut-down by the current-limiting feature built into the regulator i.c.s. (This would most likely be due to a short-circuit across the output.)

## Voltage Drop

The nominal minimum voltage drop across IC1 is (13.8-12)V = 1.8V for it still to function. This is a value that's close to the 'drop-out' voltage of the regulator where the regulation become erratic. It's defined as the minimum voltage required across the regulator for it to regulate correctly under the stated condition.

The datasheet for the 7812 specifies it has a drop-out voltage as 1.7V when supplying 500mA and at 25°C. The supply requirement rises to about 1.9V when 1A is drawn and with a temperature of 50°C. So, unless you have an i.c. close to the limit, it should be ok to run slightly under this level! I tested my unit at a range of currents and loadings with no problems encountered with the 1.8V overhead.

Regulators IC2, IC3 and IC4, and their associated components, generate the chosen supplies of 9, 6 and 5V respectively. The only difference here is the addition of resistors R4, R6 and R8 which drop some of the voltage from the 13.8V supply. By dropping some of the voltage across resistors, the regulator's power dissipation is reduced, by reducing their supply voltage with increasing current drawn. This reduction factor is important at higher output currents, especially with the lower output voltage devices.

## Other Outputs

Other fixed voltage outputs can be accommodated from the unit if a voltage regulator for that voltage can be found. For example, a 7808 can be used to give an 8V output, either in addition to the 9V supply, or as well as it. For this voltage, simply use identical component values to those used for the 9V regulator's case.

The specified devices can supply up to a maximum of 1.5A peak current under ideal circumstances, but there's also a range of 'beefier' 2A regulators available, which can be used if more output current is needed. In these cases the values of R4,

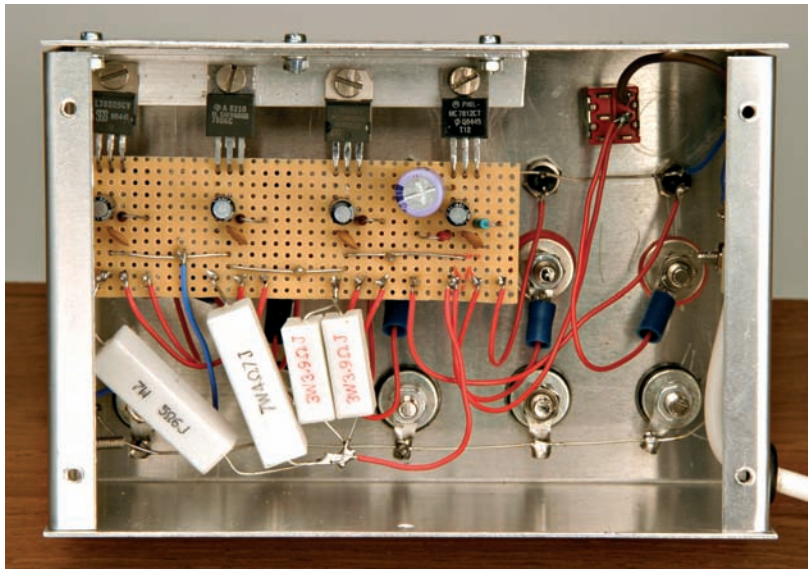

**Fig. 2: Looking into the insides shows the simplicity of layout.**


**Fig. 3: Note the ventilation holes down both sides of the case (and heading photo). These are needed to allow the heat, generated within the unit, to escape.**

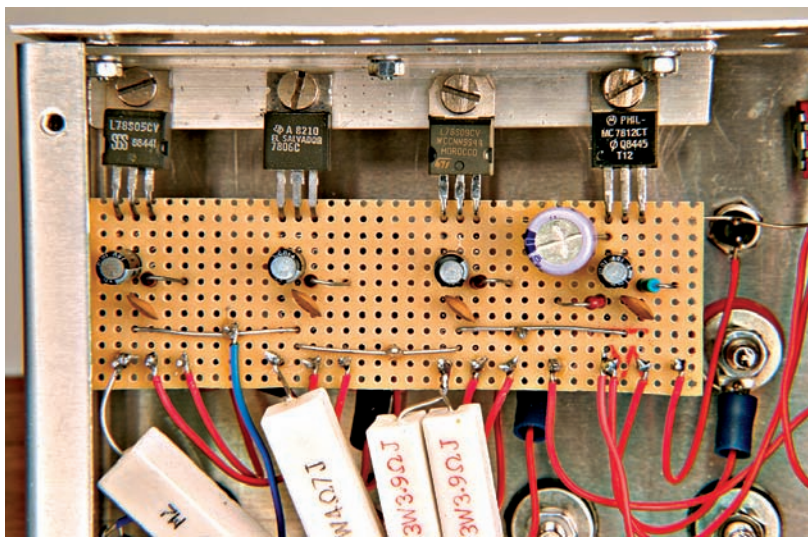


**Fig. 4: A closer (with annotations) look at the stripboard mounted components. As the resistors can run quite hot so, wires shouldn't run too close to them.**

R6 and R8 may need to be re-calculated to keep the various regulators from 'dropping out'. If you have no need for differing output voltages, then you could, for example, have multiple outputs at the same voltage.

Other outputs are simply obtained by replicating the circuitry of one or more of the required regulators. These fixed-voltage regulators contain internal current limiting, thermal shut-down and safe-area protection, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current long term.

Although designed primarily as fixed voltage regulators, they can be used with external components to obtain adjustable voltages, making it possible to set an output at say 7.5V if required. Datasheets and application notes for these regulators can be found on the Internet. Although you can change the output voltage with diodes, this leads to a reduction in the regulation of the circuit and may not be desirable.

## Metal Case

For the construction, almost any metal case can be used for the unit. I used a 152x64x102mm two-piece aluminium case (Maplin code XB56). The stripboard layout, and heatsinking for the regulators and the arrangement of R4, R6 and R8 can be seen in **Fig. 2.** The stripboard size is 36 strips of 11 holes and no cuts to break the strips are required.

A great feature of the regulators that I used, is that the metal tab on the case is internally connected to the ground pin, and therefore can be bolted to the grounded case of the unit so, they don't need an insulating washer. Hence the regulators have both a good 0V connection, as well as good heatsinking capability.

The legs on each regulator are carefully bent through 90° and then it's bolted to an aluminium angle bracket section (again from a d.i.y. centre). This section is then, in its turn, bolted to the case. The stripboard itself does not need to be secured to the case as it's firmly supported relative to the aluminium angle bracket by the legs of the regulators. Should you use a plastic case, then the regulators should be bolted to a heatsink or a hefty piece of aluminium plate.

The layout and drilling details of the front panel can be seen in the heading photograph and **Fig. 3.** You may have to adapt the layout to the case that you have available. The hole diameters for the binding posts are not given and should only be drilled after the actual components have been obtained and measured because they vary from supplier to supplier. Although I've not given any actual dimensions, the photographs show the panels sufficiently well enough for you to work out drilling details. Note the rows of ventilation holes that allow heat generated - especially from the power resistors, to escape from the unit.

The internal layout of the unit can be seen from the photographs an annotated photograph of the layout of my board is shown in **Fig. 4.** When the stripboard/regulator assembly is mounted into the case it obscures several of the output sockets and l.e.d.s. It is therefore easiest to wire flying leads to these components, then fit the stripboard assembly, and finally wire the flying leads to the correct terminal pins on the stripboard.

I used a two metre length of two-core 5A mains cable to connect the unit to the 13.8V supply. The cable enters the left hand side of the aluminium case via a rubber grommet. A cable clamp is used to ensure that the cable cannot be accidentally pulled out and damaged.

## Setting Up

Because the regulators are all fixed-voltage, no setting up is required. Simply check all internal connections carefully, plug the unit into the 13.8V supply and switch on. All the l.e.d.s on the unit should light. If they don't, then don't panic, you've probably connected the l.e.d.s the wrong way round. Check the voltages on the outputs and if they are correct, then the l.e.d.s are certainly reversed. If the voltages are not correct, switch off and re-check the wiring. When all the voltages are correct, a thorough check can be done by connecting high-wattage resistors to the outputs to load them up to full current.

For example a 12Ω resistor connected to the 12V output will draw 1A. It will also dissipate 12W so a hefty resistor is needed. And both 7 and 10W resistors are available from Maplin and these will survive a total power overload for a few minutes at least.

Since all the outputs are independent it is possible to load them all to full current, as long as the total current does not exceed the rating of the 13.8V supply, though this does not seem too likely in a real application.

## Shopping List

**Positive fixed voltage regulator i.c.s**

| | |
|---|---|
| IC1 | 7812 12V/1A |
| IC2 | 7809 9V/1A |
| IC3 | 7806 6V/1A |
| IC4 | 7805 5V/1A |

**Diodes**

| | |
|---|---|
| D1-5 | Panel-mounting type l.e.d.s - colour to suit |

**Resistors**

Wirewound (rating as shown)

| | |
|---|---|
| R4 | 1.8Ω 3W (or use two 3.9Ω in parallel) |
| R6 | 4.7Ω 7W |
| R8 | 5.6Ω 3W |

**Resistors**

Any type 0.25W rating

| | |
|---|---|
| R1 | 1k2Ω |
| R2 | 1kΩ |
| R3 | 680Ω |
| R5 | 390Ω |
| R7 | 390Ω |

**Capacitors (type as shown)**

| | |
|---|---|
| C1 | 100µF 25V electrolytic |
| C2,4,6,8 | 100nF 50V decoupling |
| C3,5,7,9 | 10µF 25V electrolytic |

**Hardware**

Metal Box 152x64x102mm (Maplin code XB56)

| | |
|---|---|
| SK1-10 | Banana sockets, five red, five black. Tags to suit. |
| SW1 | On/Off toggle switch. |
| PL1/2 | Two banana plugs (red and black) or suitable for the connection to the 13.8V supply. |

Stripboard 36 strips of 11 holes. Terminal pins to suit stripboard.

Case: 152.5mm x 63.5mm x 102mm two-piece aluminium case (Maplin code XB56), or to suit. Insulated connecting wire. Two metre length of 2-core 5A (or other suitable current capacity). Grommet and cable clamp to suit cable. Earth tags, screws and nuts.

## The 13.8V supply

So, now to the final part, what should you look for when choosing the 13.8V supply that powers this project? I bought a Palstar PS-06 (6A) from Nevada for about £30 because I wanted a unit with more current capacity for future projects, but the PS-04 (4A) at £20 is ideal for driving this unit. When the cost of new components needed to build such a power supply from scratch is taken into account, this represents very good value for money. The PS-04 and PS-06 have cigarette lighter socket outputs, and two screw terminals/banana sockets, which are what I connected to. The constructor might find a second-hand unit even cheaper.

**PW**

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## GRAHAM G8EMX PROVIDES A ROUND UP OF THE RECENT ATV EVENTS

Welcome to the *PW* column where we focus on ATV. In the February edition of In Vision, I looked at the 10GHz band in some detail but the two pictures had no captions. These showed the **Bob Platts G8OZP** 'GunMod' p.c.b. This is a project that modulates both sound and vision onto the output of a 10GHz Gunn diode. The other photo was of a Gunn diode in position within a microwave cavity, so it wasn't a contest after all!

For the average radio amateur, determining frequency and power at 10GHz is, perhaps, not always as easy as it can be on lower bands, but frequency is, as always, the easier parameter to measure. Prescaler chips are available that can 'divide down' from a 10GHz input to a frequency which can be handled by conventional digital counters. Alternatively a small part of the signal to be measured can be directed into a low noise block with a known local oscillator frequency, the down-converted output being fed to a counter.

Of course, there are still the traditional and more 'mechanical' methods where standing wave points and quarter wavelengths are physically determined and the frequency calculated from these. Remember that we are measuring in the order of ten thousand million cycles per second so, frequency measurement does not have to produce a result accurate to the first place of decimals!

Determining the power output of a 10GHz transmitter is essentially that of calculation from known or theoretical values. The expected output from a Gunn diode cavity (usually only tens of milliwatts) is known, as is the loss of the waveguide feeder and gain of an dish system. Low noise blocks can be 'reversed' to become transmitters, so given the published gain of the r.f. devices, the d.c. power input and the expected efficiency, a good approximation of power out can be derived. If, of course, you happen to have more sophisticated measuring instruments available - so much the better.

### UNUSUAL REQUEST

The British Amateur TV Club (BATC) received an unusual request recently. A ship's bosun sent an E-mail to us from his ship at sea, asking for any ideas to improve TV reception on the vessel. The ship was always within sight of land but navigated a circular course during dredging operations.

The crew was using the traditional 'metal coat hanger and dangling wire' for TV reception. An exchange of E-mails established that the crew was always very close to land, keeping UK ports clear of debris so, signal strength was not really the issue. Their problem was rather that of constant change of direction and the motion of the ship.

Our suggestion was, that short of setting up an expensive motorised satellite dish, there wasn't really another solution other than a caravan 'u.f.o.' style omni-directional antenna mounted high on a mast. I hope they get better reception of the rugby matches, which seemed to be the passion of the ship's cook!

Wavemeter type microwave counter.

As always, here at the BATC, we're looking for simple constructional projects to go into the next issue of its magazine, *CQ-TV*. The request is in response to several recent comments from members that the magazine - and by association the club - is appearing to be 'just for the professional TV engineer' and that the basic hobby of amateur television is becoming marginalised.

Judging by the number of existing ATV repeater groups, and the new applications that continue to arrive, Amateur TV is quite definitely alive and well. But if repeater users and other ATV stations do not send their ideas into the magazine, it can be surprisingly difficult to publish anything.

So, to give a bit of a 'prompt' to the ATV activity out there, I will be writing to all ATV repeater keepers, asking if the request for new circuit ideas can be promoted via their repeaters. All, that is, except for the seven who are 'Particulars Withheld' in the 2005 Yearbook.

### UNUSUAL DX

One keeper who does have his details in the callbook is **Allan Robinson G3TQA** who responded to my appeal around the BATC committee for news of anything about repeaters. Alan replied: "The lift during early September produced some unusual DX through the GB3YX 10GHz (3cm) repeater (Bradford). We're used to seeing odd signals on GB3YT, the '23cm' or 1.2GHz box but it was unusual to see anything on '3cms'. On the evening of 7 September a strong signal appeared on 'YX for most of the evening, peaking at a very watchable P4.

The DX signal turned out to be **PI6ATV**, an ATV repeater installed on a broadcast TV mast in Holland. In fact, PI6ATV is a multi-band repeater and one of the output frequencies is 10.425GHz, which is the same as GB3YX's input. Acording to my calculations, the path was 502km, which isn't bad for 10GHz ATV"!

Alan adds: "Currently, we run two interlinked ATV repeaters, GB3YT and GB3YX from a site at Queensbury near Bradford. There is an application with Ofcom for a third box, GB3YV, on '13cm' (2.4GHz), to join the other two, hopefully by the summer. The repeater site is rather exposed at about 370m a.s.l. and we were a bit worried on the night of 7 January when the anemometer on site measured a windspeed of 160k.p.h. Fortunately the equipment survived"!

With most press reports still assuming a target-date of 2010 for analogue TV switch-off (but still dependent on adequate consumer take-up and Government decision), it's worth thinking about what is yet to come (to the UK anyway) in broadcast television. And that 'next thing' may be high definition television (HDTV). For all sorts of technical reasons, the UK's first (1936) TV standard was 405-lines transmitted at v.h.f. Later in the 1960s the line rate was 'upped' to 625-lines with the coming of u.h.f. transmission and colour.

Now even with the most recent delivery systems of digital terrestrial, satellite and cable, we continue to have 625 as our line standard for broadcast TV. So in my June In Vision column I will explore the possibilities of 720 or 1080 line HDTV as possibly the next 'big thing' for television, as well as all the Amateur TV news.

Cheerio for now.

*Graham G8EMX*

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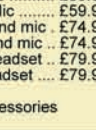
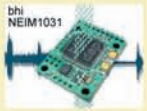
**AM-708E**
Variable Compression
2 Microphone Outputs
**£129.95**



| | |
|---|---|
| Adonis AM-7500E | £Phone |
| Adonis AM-708E | £129.95 |
| Adonis AM-508E | £79.95 |
| Adonis AM-308E | £69.95 |
| Adonis FX-10 | £59.95 |

## bhi DSP



Noise Cancelling Solutions for Amateur Radio & SWL

| | |
|---|---|
| NES10-2 Speaker with dsp | £99.95 |
| NES1031 Inline dsp module | £129.95 |
| NES1061 817 dsp module | £89.95 |
| NES1061 817 brd inc fitting | £115.95 |
| NES1062 dsp module | £89.95 |
| NES1042 Switch Box | £19.95 |

## Watson Supplies

**W30-AM**

0-15VDC
30/35A Peak
**£119.95**

**W25-XM** NEW

13.8VDC
25A Switchmode
**£99.95**

| | |
|---|---|
| W-25AM 25A Supply | £89.95 |
| W-10AM 10A Supply | £59.95 |
| W-5A 5A Supply | £29.95 |
| W-3A 3A Supply | £22.95 |
| W-25SM 25A Supply | £79.95 |
| W-10SM 10A Supply | £49.95 |

## Diamond Supplies

**GZV4000**
5-15 VDC
40A Peak
**£154.95**

| | |
|---|---|
| GZV-6000 60A Supply NEW. | £299.95 |
| GZV-4000 40A Supply | £154.95 |
| GSV-3000 30A Supply | £144.95 |
| GZV-2500 25A Supply | £114.95 |

## Frequency Counters

Will tune AR-8200, AR8000 & IC-R10
***Super Searcher***
**£99.95**

| | |
|---|---|
| FC130 | £79.95 |
| Hunter | £59.95 |

Call for further details

* 10Hz-3GHz
* Imp - 50 Ohms
* LCD readout
* 10-Digit display

***Super Hunter***
**£149.95**

## Daiwa Accessories

Cross-needle meters

| | |
|---|---|
| CN101L HF/VHF | £59.95 |
| CN103N VHF/UHF | £65.95 |
| CN801H HF/VHF | £109.95 |
| CN801V VHF/UHF | £119.95 |

Coax Switches 2/4 Way.

| | |
|---|---|
| CS-201 2-Way | £24.95 |
| CX401 4-Way | £49.95 |
| CS401N 4-Way NType | £Call |

## Avair Meters

AV-200
HF / VHF PWR SWR meter

| | |
|---|---|
| AV-201 HF/VHF | £49.95 |
| AV-400 VHF/UHF | £49.95 |
| AV-601 HF/VHF/UHF | £69.95 |
| AV-1000 HF/VHF/UHF | £89.95 |
| AV-20 HF/VHF | £29.95 |
| AV-40 VHF/UHF | £29.95 |

## CT Keys

*THE NEW CT HAM IAMBIC LEVER PADDLE features the compact and ergonomic new design and approach to the iambic lever paddles*

| | |
|---|---|
| CT1 Mini Hand Key | £55.95 |
| CT2 Mini Hand Key | £61.95 |
| CT3 Mini Hand Key | £69.95 |
| CT4 Camel Back | £129.95 |
| CT4D Deluxe Camel | £139.95 |
| CT6 HQ Straight Key | £139.95 |
| CT9 Iambic Paddle | £69.95 |
| CT11 Single Paddle | £90.95 |
| CT12 Classic Paddle | £97.95 |
| CT12DX DX Paddle | £111.95 |
| CT91Single Paddle | £Phone |

## Watson Antennas

Watson W2000
Bands 6m/2m/70cm
Gain 2.15/6.2/8.4dB
Power 200W (50W 6m)
Type 1/2, 2x5/8, 4x5/8
Length 2.5m
**£69.95**

| | |
|---|---|
| W-30 2/70 Base | £39.95 |
| W-50 2/70 Base | £49.95 |
| W-300 2/70 Base | £64.95 |
| W-2000 6/2/70 Base | £69.95 |
| WBV-70 4m 1/2 Wave Base | £39.95 |

## Bencher Antennas

Butternut HF-6V
Bands: 80/40/30/20/15/10
Height (Adj): 26 ft (7.9 m)
Weight: 12 lbs (5.4 kg)
Impedance: Nom 50 ohms
VSWR: 1.5:1 or less
**£299.95**

| | |
|---|---|
| Butternut HF-2V 40/80m | £229.95 |
| Butternut HF-6V 80-10m | £299.95 |
| Butternut HF-9V 80-6m | £349.95 |
| Butternut HF-5B 20-10m | £319.95 |
| 30-MRK 30m ad for HF2V | £89.95 |
| A-17-12 17&12 ad for HF6V | £49.95 |
| A-6 6m ad for HF6V-X | £14.95 |
| TBR-160S 160m HF2/6/9V | £114.95 |

## Hustler Antennas

Hustler 5-BTV
5 Bands - 80-10m
Height 7.64m - Weight 7.7kg
SWR 1.15:1 - Power 1kW
**£179.95**

| | |
|---|---|
| Hustler 4-BTV 4 Band Vert | £149.95 |
| Hustler 6-BTV 6 Band Vert | £209.95 |

## West Mountain Radio


| | |
|---|---|
| RIGblaster Pro | £209.95 |
| RIGblaster Plus | £119.95 |
| RIGblaster M8 | £89.95 |
| RIGblaster M4 | £89.95 |
| RIGblaster RJ | £89.95 |
| Nomic 8P | £59.95 |
| Nomic 4P | £59.95 |
| Nomic RJ | £59.95 |

## Tonna Antennas

Tonna - 20655
23cms (1296 Mhz) 55 element 21.5 dbi gain "N" 4.64m long.

| | |
|---|---|
| Tonna 20505 6m 5el | £89.95 |
| Tonna 20809 2m 9el | £54.95 |
| Tonna 20811 2m 11el | £79.95 |
| Tonna 20817 2m 17el | £99.95 |
| Tonna 20909 70cm 9el | £45.95 |
| Tonna 20919 70cm 19el | £59.95 |
| Tonna 20921 70cm 21el | £74.95 |
| Tonna 20635 23cm 35el | £64.95 |
| Tonna 20655 23cm 55el | £89.95 |
| Tonna 20745 13cm 25el | £69.95 |

## Diamond Antennas

| | |
|---|---|
| HF10FX 10m Mobile | £39.95 |
| HF15FX 15m Mobile | £39.95 |
| HF20FX 20m Mobile | £39.95 |
| HF40FX 40m Mobile | £39.95 |
| HF80FX 80m Mobile | £42.95 |
| CR8900 10/6/2/70 | £72.95 |
| CP6 Base 6m-80m | £239.95 |
| X50 Base 2/70 | £54.95 |
| X200 Base 2/70 | £84.95 |
| X300 Base 2/70 | £99.95 |
| X510 Base 2/70 | £124.95 |
| X700 Base 2/70 | £249.95 |

## Cushcraft Antennas

| | |
|---|---|
| X-7 - 20/15/10 7el Yagi | £669.95 |
| A3S - 20/15/10 3el Yagi | £499.95 |
| A4S - 20/15/10 Yagi | £569.95 |
| A3WS - 12/17 3el Yagi | £379.95 |
| ASL-2010 13-32MHz Log | £749.95 |
| MA5B - Mini Beam | £369.95 |
| D3 - 20/15/10 Dipole | £249.95 |
| D3W - 30/17/12 Dipole | £249.95 |
| D4 - 40m Rotary Dipole | £349.95 |

## TGM Antennas Mini Beams

* Call for prices on TGM upgrade kits.

| | |
|---|---|
| MQ-24SR 6-20m 2el | £329.95 |
| MQ-34SR 6-20m 3el | £449.95 |
| MQ-3 6-20m 3el | £379.95 |
| MQ-26 6-20m 2el | £389.95 |
| MQ-26SR 6-20m 2el + EH | £419.95 |
| MQ-36SR 6-20m + Dir | £559.95 |

## Radioworks Wire Ants

| | |
|---|---|
| CW-160 160-10m (252ft) | £129.95 |
| CWS-160 160-10m (133ft) | £114.95 |
| CW-80 80-10m (133ft) | £89.95 |
| CWS-80 80-10m (66ft) | £109.95 |
| CW-40 40-10m (66ft) | £84.95 |
| CW-20 20-10m (34ft) | £89.95 |
| G5RV+ 80-10m | £59.95 |
| Radioworld G5RV Fullsize | £29.95 |
| Radioworld G5RV Halfsize | £27.95 |

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## LDG Electronics

### AT-1000

1KW Auto ATU - 1.8-54MHz - 1-8 secs Tune - Approx SWR Rating of 10:1

**£499.95**

### LDG Z-100

100w Auto ATU - 1.8-54MHz - 0.5 - 6 secs

**£129.95** ***BEST SELLER****

### LDG AT-11MP

100w Auto ATU - Covers 1.8-54MHz
1-5 secs Tune - Cross needle meters

**£199.95**

### LDG AT-100Pro *New*

100w Auto ATU - 1.8-54MHz
1-5 seconds Tune - 2 Pos Ant switch

**£169.95** ***New***

### LDG RBA 1:1 & 4:1

1:1 or 4:1 Balun - Covers 1.8 - 30Mhz
Power rating 200w

**£29.95**

### LDG AT-897

100w Auto ATU for FT-897 - 1.8-54MHz

**£199.95**

Accessories:

| | |
|---|---|
| K-OTT Kenwood Interface | £49.95 |
| Y-OTT Yaesu Interface | £54.95 |
| Icom-IC1 Icom Interface | £29.95 |
| Alinco-IC1 Alinco Interface | £29.95 |
| AC-1 Cable | £19.95 |

## W4RT Electronics

### One-Plug-Power

One-Plug Power is the internal FT-817 battery solution you have been waiting for until now.


**OPP-817**
**£54.95**
*NEW!* 2300 mAh Large Capacity FT-817 Internal Battary Solution Still use Internal 817 Charger

**OPP-897**
**£99.95**
One Plug Power for the FT-897 4500 mAh; Fully Compatible with the FT-897 and Yaesu Charger.


One-Plug Power is the internal FT-817 battery solution you have been waiting for until now. One-Plug Power comprises a 1800 mAh NiMH battery pack, both over-temperature and over-current protection, connection to the FT-817 Molex connector, and a modified Yaesu battery cover door featuring a power jack that allows connection of a battery charger such as the Maha MH-C777 or MH-C888.

### One-Big Punch

One BIG Punch (OBP) is a custom add-on accessory for the Yaesu MH-31 microphone commonly used with many Yaesu amateur radios

**OBP**
**£49.95**
Speech Compressor for the Yaesu MH-31 mic and FT817, FT857, FT897. Improve the TALK POWER.

**Hand Mike**
**£57.95**
W4RT Electronics Microphone with One BIG Punch Speech Compressor included.

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.

### One-Board-Filter

The One-Board Filter (OBF) affords you the opportunity to have both the Collins CW and SSB mechanical filters available in your FT-817 together!

**OBF**
**£229.95**
Replace two filters in the space of one. OBF includes the two optional filters and fitting.


**Collins Mechanical Filters**
***for the Yaesu FT-817, 857 & 897.***

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

This is the option that many, many FT-817 owners have requested. The OBF utilizes Collins Mechanical Filters that are the same as used in the optional Yaesu filters for the FT-817. The bandwidth of the 7-pole CW filter is 500 Hz and the 10-pole SSB filter is 2.3 kHz. The One-Board Filter is NOT available for installation by FT-817 owners. This is not a "do-it-yourself" option. The One-Board Filter must be installed by RADIOWORLD, or a competent engineer . If in doubt please call for details.

### One-Touch-Tune

At the touch of a button, you have the carrier needed for tuning. One-Touch Tune (OTT) is totally transparent to the FT-817 and to any external equipment that you have attached to the rig.

**OTT-817**
**£54.95**
It requires no external power and works with both manual and automatic tuners.

| | |
|---|---|
| W4RT OTT-FT817 | £54.95 |
| W4RT OTT-FT100/857/897 | £54.95 |
| W4RT OTT-FT847 | £54.95 |
| W4RT FT817 One Fast Charger | £Call |
| W4RT Antenna Boss | £139.95 |

**NEW* FT-817 Stand**
**£19.95**
Simply snaps into position. Adjust for desired height. Complete with non slip feet and allen wrench.

***Professional-Grade FT-817 Stand***

## W2IHY Technologies

*Available and IN STOCK now**

Finally, professional audio processing technology is applied to the unique requirements of amateur radio operators! The W2IHY 8 Band Audio Equalizer and Noise Gate is an easy-to-use, sophisticated unit loaded with high-performance features.


*W2IHY 8 Band Audio EQ Noisegate*

**£229.95**


If You Are Ready for New Adventures in High-End Transmit Audio Then You're Ready for -- *EQplus by W2IHY*

**£299.95**


iBox is a versatile accessory for amateurs who are serious about their audio.

***£Call for information***

Adapter cables to fit Icom - Kenwood - Yaesu ..... £22.95

## ATX Walkabout

*ATX Walk--about PL-259*

**£47.95**

The ATX Walkabout covers all bands (including WARC bands) from 80-6m, 5W guaranteed, 25W max. When fully telescoped it is about 65 inches long. This makes it ideal for the FT-817 or any other portable HF radio.

| | |
|---|---|
| ATX Walkabout BNC | £47.95 |
| ATX Walkabout PL259 | £47.95 |
| ATX Walkabout Universal | £54.95 |

## The Miracle Whip

RX - 0.6 to 460 Mhz
TX - 40,30,20,17,15,12, 10, 6, 2m & 70cm

Power Limits 25W PEP 10W Cont.

**£127.95**

***In Stock****

* The Miracle Whip will transmit on almost any frequency you are licensed to use including WARC, MARS/CAP, Alaska Emergency, Citizens Band, Marine, and most commercial HF SSB and VHF/UHF channels

** The Miracle Whip is optimized for for best receive rather than lowest swr on 80 and 160, as no short antenna will present good transmitting opportunities at these frequencies

## Portable Masts

Telescopic Masts Inc Guy Rings

| | |
|---|---|
| Small 17' 6" | £55.95 |
| Medium 26' 0" | £65.95 |
| Large 33' 0" | £75.95 |
| Tripods to fit masts | £25.95 |

## Mobile Mounts

Solarcon MAGZ-17 TRI-MAG

**£39.95**

An extremely strong magnet base which actually consists of 3 x 5" chrome magnets that are interconnected with metal strips to form one very large mount. Suitable for very large mobile antennae such as ¼ wave tank whips.

| | |
|---|---|
| Siro MAG125 3/8 | £17.95 |
| Siro MAG125 PL | £17.95 |
| Siro MAG 145 3/8 | £22.95 |
| Siro MAG 145 PL | £22.95 |
| Solarcon Magz-17 | £39.95 |

## RM Amplifiers

RM HLA-150V
HF - 1.5-30MHz
Power Amplifier

**£249.95**

Frequency 1.5 - 30MHz
Input energy/power 24A
Input Power 1-10 W
Output Power 150 W Max
Output Power SSB 250 W Max

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## Linear Amp U.K.

Challenger Mk3
**£1795.95**

| | |
|---|---|
| Challenger MK3 HF | £1795.95 |
| Ranger811H HF | £945.95 |
| Discovery 2-31 2m 1KW | £1395.95 |
| Discovery 2-35 2m 1.5KW | £1595.95 |
| Discovery 6-31 2m 1KW | £1395.95 |
| Discovery 6-35 2m 1.5KW | £1595.95 |
| Discovery70 70cms 700w | £1495.95 |
| LA-STNM Bal Super Tuner | £345.00 |
| LA-STWM Bal Super Tuner | £395.00 |

## SGC. Smartuners

SGC-230 200Watts
**£359.95**

| | |
|---|---|
| SGC-230 HF | £359.95 |
| SGC-231 HF+6m | £359.95 |
| SGC-235 HF-500w | £749.95 |
| SGC-237 HF+6m | £299.95 |
| SGC-237 Porta | £589.95 |
| SGC-237 PCB | £299.95 |
| SGC-239 HF | £185.95 |
| MAC-200 | £339.95 |

## Rotators

YAESU

| | |
|---|---|
| G-2800SDX Rotator | £999.95 |
| G-450C Rotator | £379.00 |
| G-550C Rotator | £309.00 |
| G-650C Rotator | £499.00 |
| G-1000DXC Rotator | £599.00 |
| G-5500C Rotator | £569.00 |

## Feeders & Wire

Military Spec High grade
50 Ohm coaxial Cable
**£69.95** A 100m Drum

| | |
|---|---|
| RG58U | £0.50 per Metre |
| RG8 Super | £0.70 per Metre |
| RG213 | £0.90 per Metre |
| W103 Westflex | £1.20 per Metre |
| RG-8 75 Metre Drum Special | £39.95 |
| Flexweave 50m Flex | £29.95 |
| Flexweave-PVC-50 50m | £39.95 |
| Enamelled Copper Wire 50m | £12.95 |
| Hard Drawn Copper Wire 50m | £14.95 |

Rotator Cable: - Color coded Cable

| | |
|---|---|
| 3 core | £0.45 per Metre |
| 7 core | £0.79 per Metre |
| 8 core | £1.09 per Metre |

DC Connecting Cable

| | |
|---|---|
| 5A DC Cable | £0.50 per Metre |
| 10A DC Cable | £0.75 per Metre |
| 20A DC Cable | £1.00 per Metre |
| 25A DC Cable | £1.10 per Metre |

## Second Hand List

### Second Hand Antennas

Cushcraft X9 10/15/20 9ele....£450.00

| | |
|---|---|
| Cushcraft R-6000 Vertical | £200.00 |
| Cushcraft A3S 10/15/20 3ele | £299.00 |
| Butternut HF6V Vertical | £175.00 |

***PLUS MUCH MORE... CALL FOR DETAILS***

### Second Hand Options

| | |
|---|---|
| Kenwood YG-455CN1 | £100.00 |
| Kenwood YK88CN | £40.00 |
| Kenwood YK88SN | £40.00 |
| Yaesu XF114SN | £60.00 |
| Yaesu XF112C | £40.00 |
| Icom FL-53 | £100.00 |
| Icom FL-101 | £40.00 |
| Kenwood DRU-3 | £70.00 |

***PLUS MUCH MORE... CALL FOR DETAILS***

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## Second Hand List.

*Quality Used Equipment. 3 Month Warranty.*
*Best prices paid on your used equipment.*

Adonis AM-503G Desk Microphone, £30.00
AEA PK-232 MBX TNC £125.00
AEA PK-900 TNC £200.00
AEA PK-96 TNC £90.00
AKD 6001 6m FM Transceiver £135.00
Alan HQ-2000 2kW 26 - 30MHz SWR / Watt Meter £25.00
Alinco DJ-G5EY Dual Band Handheld £199.00
Alinco DJ-V5 Handheld £99.00
Alinco DJ-X2000 Scanner 0.1kHz-2.1GHz £299.00
Alinco DJ-X10 Wide Band Receiver £200.00
Alinco DR-150 2m Transceiver with Air-and Receive £150.00
Alinco DR-605 2m/70cms £175.00
Alinco DR-M10 10 Metre Transceiver £99.00
Alinco DX-70 HF & 6m Transceiver £389.00
Alinco DX-70TH HF & 6m Transceiver (100W Output) £475.00
Alinco DX-77 HF Base £399.00
Ameritron QSK-5 Amplifier Switch / Pre Heat £200.00
AOR 5000 Top Receiver £899.00
AOR 5500 Display As new display model £450.00
AOR AR-3030 HF Receiver, Including PSU £350.00
AOR AR5000+A AR5000+A £1,599.00
AOR AR-7030 Top Receiver £550.00
Bearcat UBC-278XLT RX Scanner £99.00
Bearcat UBC-780XLT RX Trunktrack £220.00
Bearcat UBC-9000 RX Scanner £179.00
BHI BHI Noise Eliminating Module £89.00
Bnos 20AMP PSU 20A PSU £89.00
Bnos LP50-3-50 6M Amp Solid State £89.00
Bnos LPM144/10/100 2m 100w Amp £119.00
Comet CD-270D SWR Power Meter £49.00
Commtel Comm-225 Receiver £150.00
Daiwa CN-103L 2/70cms Cross needle Meter £40.00
Daiwa CN-801H 1.8-200 MHz SWR+PWR Meter £80.00
Daiwa CS-201 2 way Switch £10.00
Daiwa PS120 10A PSU £40.00
Daiwa PS-30 XM II 30A PSU £99.00
Datong FL2 Multimode Filter £69.00
Diamond SX-100 SWR & Power Meter - 1.6 - 60MHz £65.00
Diamond SX-200 SX-200 £69.00
Fairhaven RD-500 Communications Rx £299.00
Fairhaven RD-500VX Communications Rx £399.00
FDK Multi-750 2m Multimode Transceiver £129.00
Fujion F-2000A Radio Direct Finder £99.00
Hal DXP38 TNC £140.00
Hanson FS7 2/70cm Meter £30.00
Heil BM-10-5 Headset £50.00
Icom PCR-1000 PC RX £249.00
Icom 451E 70cms Multimode Transceiver £250.00
Icom A-3E Airband Handie £220.00
Icom IC-207H IC207H £199.00
Icom IC-2100H 2m FM Mobile Transceiver £150.00
Icom IC-2710H Dual Band Mobile £225.00
Icom IC-251E 2m £249.00
Icom IC-271E 2m multimode £299.00
Icom IC-2725E 2/70 mobile £200.00
Icom IC-490E 70cms Mobile Transceiver £250.00
Icom IC-703 HF/6M £450.00
Icom IC-706 HF/6/2 Mk1 £399.00
Icom IC-706 HF/6/2 Mk2 £525.00
Icom IC-706 HF/6/2/70 Mk2G £675.00
Icom IC-718 Hf Moble/Base £375.00
Icom IC-726 Mobile/Base £400.00
Icom IC-735 HF Mobile/Base £299.00
Icom IC-736 HF/6m + ATU Mains Trx £699.00
Icom IC-7400 HF/6/2 Band / All mode Tranciever £949.00
Icom IC-746 HF / 6m / 2m Built In ATU £875.00
Icom IC-756 PRO HF/6 Base £1199.00
Icom IC-756 PRO2 HF/6 DSP Base £1,499.00
Icom IC-901 2m/70cms £175.00
Icom IC-910H 2m/70cms Base £899.00
Icom IC-775 DSP 200w Base £1,499.00
Icom IC-R10 Handheld Scanner £229.00
Icom IC-R3 Handheld Scanner £250.00
Icom IC-R5 Handheld Scanner £125.00
Icom IC-R70 HF Receiver £299.00
Icom IC-R7000 Mint Condition!!! Receiver £550.00
Icom IC-R7100 25mhz - 2Ghz Receiver £425.00
Icom IC-R71E Receiver £325.00
Icom IC-R72 Receiver £350.00
Icom IC-R8500 Receiver £999.00
Icom IC-W31E Dual Bander £160.00
Jil Jil SWR Meter SWR Meter £15.00
JPS NIR-10 Noise / Interference Reduction Unit £99.00
JPS NIR-12 DSP Filter £129.00
Junker Pump Key Pump Key £75.00
Kamtronics KAM Multimode TNC £140.00
Kent RA Morse Paddle Key £40.00
Kenwood AT120 ATU matches TS120 £89.00
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## ROBIN GW3ZCF LOOKS AT ANTENNA MODELLING WITH *EZNEC* AND OTHER COMPUTER PROGRAMS RUNNING UNDER *WINDOWS*.

I'm going to get a bit mathematical this month. But even if you found it hard to cope with GCSE level trigonometry, you should be able to follow this. I have for some years been fascinated by antenna design. In these days of sophisticated s.s.b. transceivers, densely packed with surface mount devices (s.m.d.s) and integrated circuits, home-brew equipment is beyond the capabilities of many licensed Amateurs. My first transmitter was a home made copy of a Codar AT5 for 1.8 and 3.5MHz, but I doubt if it would cut much ice on today's crowded bands!

On the other hand however, antenna design is something that most of us can play with. And it's great fun trying out different configurations to get the best out of antennas in limited space. To give yourself a sporting chance of a decent antenna, it's a good idea to test it out theoretically before climbing up trees and hoisting up wires. You can experiment with different shapes, feed-points and many other parameters without even going outdoors!

There are many antenna modelling programs available, but they all work along similar principles. They break the antenna under investigation into a number of small segments and, after applying an r.f. voltage to the desired point, calculate the resulting r.f. current in each segment. Each short length of wire in the model contributes to the electromagnetic field around the antenna, and by adding each of these field elements vectorially, the resultant pattern of the whole array is calculated and displayed on your computer screen.

### FOURTH EDITION

One of the most respected of the modelling programs is *EZNEC*, now in its fourth edition, written by **Roy Lewallen W7EL**. The full, paid-for version of the program enables you to use 500 current elements in the model, more than enough for complicated directional arrays. However, a free 'demo' version has all the functionality of the full program, but limits you to 20 current elements. It's of little use for multi-element arrays – Yagis, quad loop antennas and the like – but gives quite good results for simpler antennas. The program can work in almost any measurement units, as long as you're consistent.

A friend of mine at the **Swansea Amateur Radio Society**, **Dave Williams GW4BNJ**, has just erected a new doubtlet antenna and, we got to discussing the results that Dave was getting. So, I thought it would be fun to use a model of his antenna to illustrate this article. Dave has an inverted-V doublet, with 15.24m of wire on either side of the feed-point. The centre is 10.67m high and the two ends are each about 2.44m in the air. The antenna is mounted in a line from NNW to SSE.

The way you enter an antenna into *EZNEC* is to calculate the positions in space of the ends of each wire. This is done with reference to a three dimensional set of axes, and, to make the results easier to understand, I let the y direction correspond to due North. The x direction corresponds to due East, and the z direction to height above the ground. This is shown in **Fig . 1**. If the feed point is 10.67m above the ground, and the centre of Dave's antenna is at the origin of the coordinate system, it has the coordinates x = 0, y = 0, z = + 10.67.

Now we need to calculate how far along the ground the end points (which are 2.44m in the

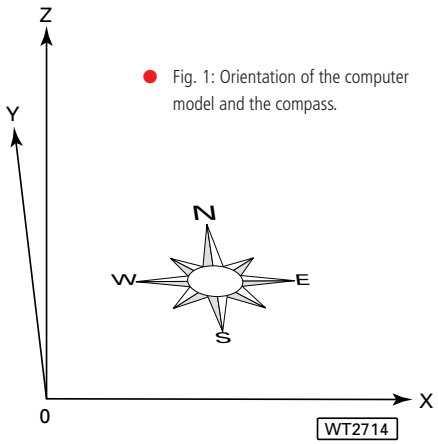



Fig. 1: Orientation of the computer model and the compass.

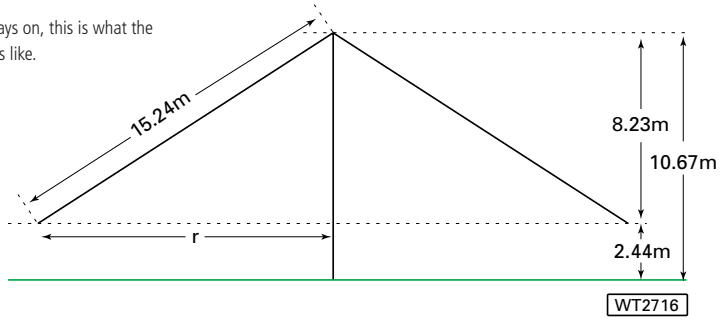



Fig. 2: Sideways on, this is what the antenna looks like.

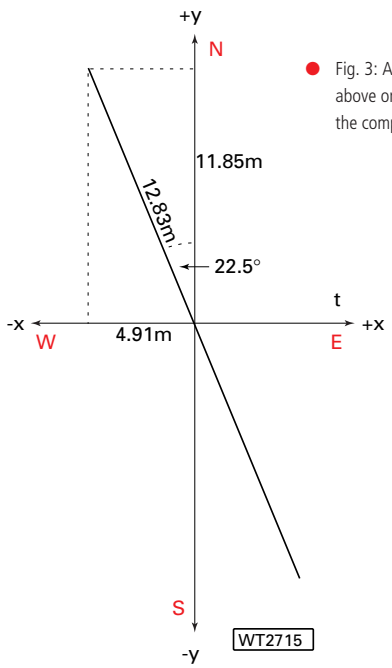



Fig. 3: And from above orientated to the compass.

air) are from the origin. This is where we use our old friend Pythagoras. You can see in **Fig. 2** that, viewed broadside on, each leg forms the hypotenuse of a right angled triangle Fig. 2. The required distance r is given by:

$r^2 + 8.23^2 = 15.24^2$
so, r = 12.83m

## FINAL CALCULATION

The final calculation is to work out the x, y and z coordinates of the two ends of Dave's doublet, remembering that his wire lies from NNW to SSE, that is, along a line 22.5° counter-clockwise from the North-South line. We need to use trigonometry to get this. In **Fig. 3** we can see that the x values are ±12.83*sin(22.5°) (which is ±4.91m) and the y values are ±12.83*cos(22.5°) (or ±11.85m).

So now we can write down the x, y and z coordinates of the centre and ends of the antenna:

| **Point** | **x** | **y** | **z** |
|---|---|---|---|
| Centre | 0 | 0 | + 10.67 |
| N. end | -4.91 | +11.85 | +2.44 |
| S. end | +4.91 | -11.85 | +2.44 |

That's the difficult bit over and done with. You now enter these coordinates into the antenna modelling window of the program (the Help File shows you how). You choose the number of segments to divide each wire into (I selected 10 segments for each wire, thereby using the full quota of 20 available in the Demo version of the program).

When I entered the above antenna coordinates I got a warning window which showed that the segments chosen were slightly larger than optimum. That is, of course, a limitation of the demo program.

Had I been using the full version I could have broken down each leg into many more elements for more accurate calculation. However, I ignored the warning and closed the window by clicking the tab at the top right hand corner.

At this point it's worth pressing the View Antenna button, because if you have dropped a clanger with the trigonometry it can fairly easily be spotted at this stage. But it looked ok, aligned correctly with respect to the North-South line. There are many other variables you can tweak, such as soil conductivity and wire diameter (important if you are using telescopic tubing in a Yagi), but you'll get decent results for most locations if you use the default settings.

Calculating the radiation pattern is simplicity itself. You can display the 3-dimensional polar plot, but it's a little difficult to interpret. I find it's much easier to select a desired elevation angle and produce a two-dimensional picture (called an azimuthal plot) of how much the antenna radiates at that elevation in any given direction. Secondly, you must then choose the frequency for which you require the radiation pattern.

I chose a 15° elevation angle (as this is a useful indication of the DX characteristics of the antenna) and a frequency of 28.5MHz (a very useful DX band in the winter months for modest antennas). Now press the Far Field Plot button (FF Plot) on the screen and you should see the polar diagram for 15° radiation which is shown in **Fig. 4**. You can see that there are some quite useful lobes coinciding with the bearings for USA, New Zealand, Australia, the Middle East and South America, so I hope that if the DX conditions are reasonable this winter Dave is going to make some good contacts on 28MHz

## HORIZONTAL LOOP

The next example I want to show you is based on my 7MHz horizontal loop, which I wrote about in *PW* (Laid Back Loops, p36/37 *PW* Nov 2001). It's still my main antenna, and in my very small back garden I have not yet found anything to surpass it (a beam is out of the question because the garden is surrounded at close proximity by other dwellings, and good relationships with my neighbours are more important than ultimate DX performance!)

The antenna is neither horizontal nor square, as I have to make do with the roof of my bungalow, a conveniently placed tree (for two points) and my garage roof for the fourth. I won't bore you with the mathematics here, but I used much the same methods as described above to calculate the x, y and z coordinates of each of the four corners. The illustration, **Fig. 5**, shows what comes up on my computer screen when I press the View Antenna button. This looks about right, the plane of the antenna is tilting down towards the NW corner.

As before, I plotted two-dimensional polar diagrams for 15° radiation, but this time I will show you the result for 21.3MHz (**Fig. 6**). The north-westerly tilt caused by one corner being lower than the others has the fortuitous result of giving me a massive lobe at a bearing of 310 degrees, pointing at northern California. This is borne out in practice, as I often work W6 and W7 on 21 and 28MHz using 30 or 40W of PSK31. More than once I've been told that I am the biggest (or only) signal coming out of Europe. There are also useful lobes pointing to South America, the Indian Ocean, Australia (short path) and Indonesia.

The interesting thing to notice, though, is that the nulls between the lobes are much deeper than they were for Dave's doublet. This ties in with my observations on the band. I also have a tri-band vertical antenna and, whilst the loop usually out-performs the vertical by two S-points or more, there are certain directions (corresponding to these nulls) where it pays me to switch to the vertical.

This is the case, for example, for QSOs with Antarctica and the South Atlantic. So the knowledge of the radiation pattern from my loop that I've gained, using *EZNEC,* antenna enables me to use it more effectively. I hope that you may be inspired to have a go at antenna modelling for yourself. EZNEC can be downloaded from **www.eznec.com**

The demo, or shareware version is free, whilst the full version costs $89 (payable over the Web by credit card). There is a very comprehensive manual which can also be downloaded free and viewed using *Microsoft Word.*

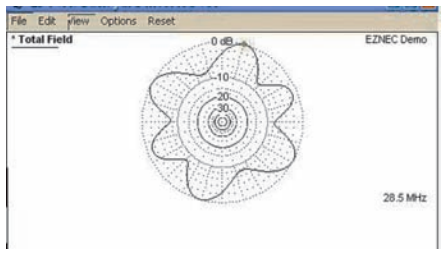



Fig. 4: The approximate polar diagram of the inverted-V antenna.

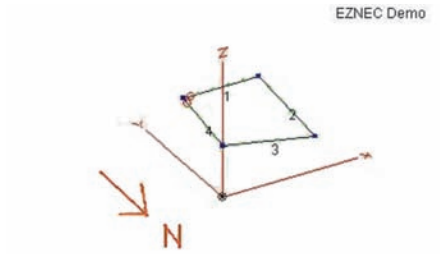



Fig. 5: The plan of my loop antenna modelled into *EZNEC.*

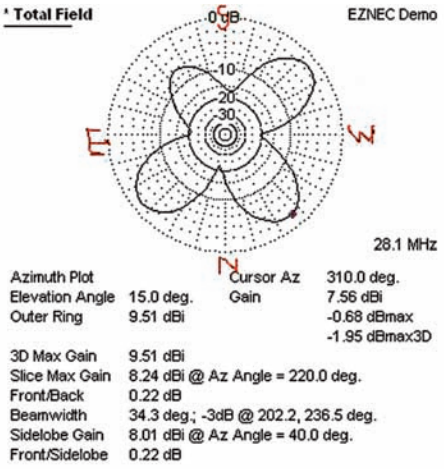



Fig. 6: The four major lobes of the square loop antenna. Note the orientation and the relatively deep nulls.

Screen grab from EZNEC.

## OTHER PROGRAMS

There are numerous other programs available, many of which are intended for professional use and cost several hundred dollars. If you are interested, you can find links to them by typing "antenna modelling software" into Google (it will try to correct your spelling to the American 'modeling', but it will find the sites nevertheless!). Of the antenna modelling software, I will mention *NEC4WIN95,* another capable performer, which you can order ($60 including shipping) on a CDROM from **www.orionmicro.com**

If I've not lost you along the way, try using the doublet figures calculated above, and make sure that you get a similar polar diagram to Fig. 4. If so, try putting in your own design and see if you can come up with a killer antenna to try out. Suitable candidates for this demo program are a delta loop (try the effects of different sizes, heights and feed points) or a simple 2-ele Yagi (experiment with different element spacing or element lengths). Happy modelling!

*Robin GW3ZCF*

# Practical Way

This month the Rev. George Dobbs G3RJV has something unusual on offer - in the form of 'Regenerative Tuner' after you've read his traditional appropriate quotation!

*"Simplicity is making the journey of this life with just baggage enough".*
**Charles Dudley Warner (1829 - 1900)**

In the early 1970s I was a curate at a church on the edge of Lincoln and taught Religious Education at the local Grammar school. It was a lively school with all manner of sports and hobby club meetings after school hours.

It was not surprising in such circumstances that I soon found myself running a school radio club. Many of the enthusiastic young members of this club had no experience of radio or electronic construction so my first task was to design a project for beginners.

Components were easy to obtain, after all **John Birkett's** famous shop was only a few miles from the school, in fact his Mother lived in the parish. What we did lack was enough soldering equipment for a group to work together. This combined with the safety issues of young people using hot soldering irons, which prompted me to devise a non-soldering method of construction.

## Wooden Base Board

After trying several methods, I eventually adopted a system of electronic circuit construction using a wooden base board and fixing, and connecting, the parts using small screws with brass screw cups. The project began with a crystal set to which an audio amplifier was added and finally the crystal set was replaced by a regenerative detector.

The whole project could be built stage-by-stage following the circuit with adjacent layout drawings. Several were made and we managed to get them all working.

I don't recall exactly how, but Ladybird Books based in Loughborough invited me to compile a book for them based upon the school radio project. In 1972 the book *Making A Transistor Radio,* **Fig. 1**, appeared in the Ladybird Books list*. It followed the school project using the screw cup method of construction and germanium transistors.

Oddly, over 30 years after the book first appeared, I still get the occasional letter or E-mail about the book. I was also gratified recently when someone pointed me to a second-hand bookseller on the Internet who had a copy for sale at £38! Another recent E-mail enquiry sent me to a website on simple receivers, which featured the Ladybird radio and had extracts from the book.

** The illustration, Fig. 1, opposite, shows the book mentioned by G3RJV and a second volume he (ever modest) had forgotten about!* ***Editor****.*

## Regenerative Receiver

Among the receivers on the website were versions of the HAC regenerative receiver, which was popular for many years. This receiver used the, now unavailable, Denco plug-in coils and a regenerative detector, which has formed the heart of many a simple receiver.

Derivatives of the circuit have been used in this column. So, I thought it might be fun to devise a very basic regenerative tuner using these ideas and a modern, simple to wind, coil to cover a useful portion of the short wave bands. What follows is about the simplest approach to a regenerative receiver capable of worthwhile results on the short-wave bands.

The diagram, **Fig. 2**, shows the circuit of the basic regenerative tuner. The inductor, inset as **Fig. 2a**, shows that L1 with C1 and C2, form the tuned circuit to select the required signals. It is a tried and tested circuit, having formed the basis of many regenerative receiver designs.

A suitable antenna is coupled to the tuned circuit via a link winding L3. The sensitivity of the detector is such that an r.f. attenuator, R1, is added to the input. This addition is important as a regenerative detector can easily be overloaded by the signals at the antenna.

In fact the receiver will give surprisingly good results using a small length of wire as an antenna. This will present a high impedance to the input circuit and the arrangement shown as **Ant 2** in the circuit can used for a small antenna.

Incidentally, the value of the input coupling capacitor (C [ant]) can be adjusted to suit the required input level. A variable capacitor, or trimmer capacitor, with a maximum value of around 100pF could be used in this position. The individual constructor may like to experiment with the input circuit after the tuner has been built.

## Positive Feedback

The regenerative receiver is based on the use of positive feedback in the detector circuit. The signal from the MPF102 f.e.t. is fed back to the input and the signal, which then appears at the output (drain) of the MPF102 is 180° out of phase with the input.

Feeding an out of phase signal back to the input would reduce the gain of the MPF102 stage. So phase reversal is necessary between the output (drain) and input (gate) of the MPF102 so that the feedback signal is in the same phase as the input signal. This is easily done by having the windings of L1 and L2 180° out of phase. The windings on L2 need to be in the reverse direction from the windings on L1.

In practice the gain produced by the MPF102 will be directly proportional to the amount of feedback, but a limit is reached where the feedback is too great for the transistor to handle. At this point the transistor ceases to work as an amplifier and becomes an oscillator.

Maximum useful gain is achieved by designing the feedback circuit so that the point of oscillation is approached as close as possible, without the transistor breaking into oscillation. The overall obtainable gain can be as great as 100:1, vastly improving the sensitivity of the receiver.

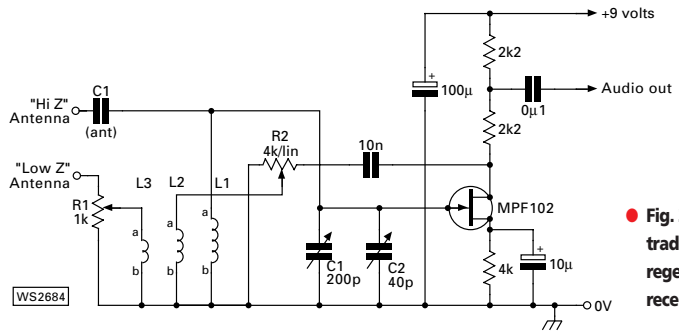
Selectivity of the receiver; the ability to sort out adjacent stations, is governed by the 'goodness' (*Q*) of the tuned circuit. The large increase in the gain of the stage results in a better *Q*, hence greater selectivity. The regenerative detector is really a 'win-win' arrangement. But it's far from being a 'free lunch' as controlling the circuitry is tricky as we shall see later.

## Controlling Feedback

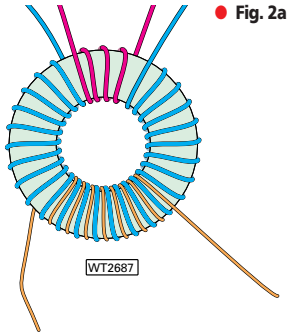
The addition of the potentiometer, R2, provides a means of controlling the amount of feedback reaching the input. By varying this control, the maximum gain possible can be found before sending the transistor into oscillation.

In the circuit, R2 acts as a simple potential divider controlling the voltage of the feedback from the output to the input of the MFP102. **Note:** R2 should be a good quality linear potentiometer as the smooth operation of this control is crucial to the success of the receiver.

Operating the feedback level at just above the point at which oscillation occurs can also provide local oscillation for the resolving of c.w. and s.s.b. signals. The crucial thing with the circuit of Fig. 2. is to get the inductor, L1, L2 and L3 set

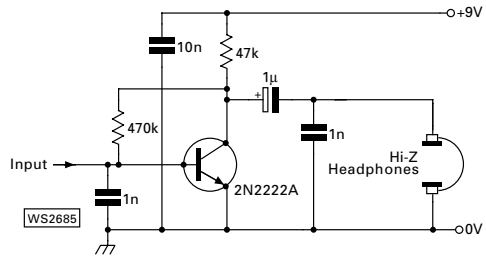



● **Fig. 2: Circuit of the traditional basic regenerative receiver (see text).**

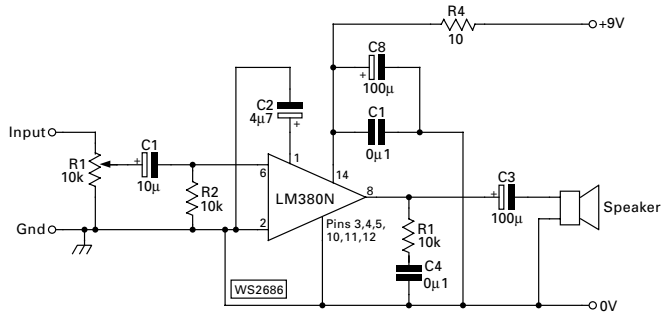



● **Fig. 2a**


● **Fig. 1: The Ladybird book *Making A Transistor Radio* (1972, from G3XFD's collection) and *Learnabout...Simple Electronics*, by the same publisher (1979, from the PW archive collection).**




● **Fig. 3: Audio pre-amplifier stage (see text).**




● **Fig. 4: One of G3RJV's favourites; the LM380N audio amplifier (see text).**

up and correctly adjusted.

In the past, this and similar circuits have used commercial coils, very often from the Denco series but these are no longer available. I still have some of the old Denco plug-in coils, but for most people it is a 'wind it yourself' job and I'll do my best to assist!

What I offer here is a simple to wind inductor covering a useful section of the short wave spectrum, with L1, L2 and L3 being wound on the same T50-2 core. These are readily available from stockists like **JAB Electronics**, **Sycom** and **Bowood Electronics**.

For readers not familiar with toroids, they look like Polo mints! The basic point to remember is that each time a wire passes through the hole, it's counts as one turn, so let's take a look at how we should tackle the job.

## Three Coils

The diagram, Fig. 2(a), shows how the three coils fit onto the core. The first winding to make (L1) is 25 turns of 28s.w.g. enamelled copper wire. This is wound to occupy about three-quarters of the core circumference.

Tuning on this design is shared between two variable capacitors; C1 has a nominal value of 200pF and is a solid dielectric (Polyvaricon) capacitor of the type often used in pocket a.m. radios. Used alone, C1 would provide very coarse tuning and some method of bandspread is required.

A reduction drive could be mounted on the turning shaft of C1, but these can be very expensive. So, in this circuit I've resorted to the practice of using a bandspread (fine tuning) control in parallel with C1.

In fact I just retrieved a small variable capacitor from my junk box, which happened to have the range 2.7pF to 40pF. It would be possible to use an v.h.f. Band II tuning section of another Polyvaricon capacitor designed for an a.m./f.m. radio. With the inductance value of L1 and the total capacitance swing of C1 and C2, a tuning range of about 4.5 to 25MHz is available.

To hold inductor L1 in place, I dripped some beeswax in the winding, melting it with the soldering iron, and then gently ran the hot tip around the winding for it to penetrate between the turns.

Next, L2, eight turns of the same wire, is wound over the centre of L1. This lies over about the central one-third of the L1 winding. Then L3, the input link winding, is four turns of the same wire which fits in the gap between the beginning and end of L1. When completed, all the windings can be given a beeswax coating.

Each end of each winding has been designated as (a) or (b); (a) is the beginning of the winding and (b) is the end of the winding. Comparing Fig. 1. and Fig. 1(a) shows that L2 is connected the opposite way round from L1 and L3. This is to provide the 180° phase shift required for positive feedback. (If feedback does not occur, you have probably wired L2 the wrong way round).

## Audio Amplification

The regenerative tuner now requires audio amplification. I simply added the single stage audio pre-amplifier shown in Fig. 2. I have several bench audio amplifiers, which can follow the pre-amplifier stage.

Incidentally, a powered computer amplifier also worked well. If a pair of high impedance headphones (1 to 2kΩ impedance) are available they can be connected as shown in **Fig. 3.** to give very acceptable results.

For the reader who wants to add extra amplification as a permanent addition, a simple amplifier using an audio chip can be added. There are lots of circuits; the one shown in **Fig. 4**. using an LM380N being an example.

As many readers will know, operating a regenerative receiver is great fun! They really do need 'operating' as the controls all interact.

Switch your receiver on, with C1 and C2 set at the about mid-way, and advance R2 until the typical rushing sound is heard. The point at which this begins is the most sensitive and selective point for the detector.

To resolve c.w. or s.s.b. signals R2 is carefully advanced just beyond the point of oscillation. Re-tuning will require re-adjustment of R2, as will changes in the input signal controlled by R1.

When the detector breaks into oscillation it will radiate a low level r.f. signal at the received frequency. This is ideal for locating the frequency by placing a calibrated receiver alongside the regenerative receiver and listening for the radiation.

All I can add is – have fun! The results will probably be better than you expect for so few parts.

**PW**

# Trader's Table

The equipment for sale on this page is secondhand or ex-demonstration

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YOUR REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH PLEASE.

THIS MONTH DAVID BUTLER G4ASR HAS REPORTS OF RADIO AND VISUAL AURORAS

There were a number of propagation events reported on both the 50 and 144MHz bands during January. Stations reported numerous auroral backscatter (Au) events on the 50 and 144MHz bands, Auroral-E (Au-Es) and Sporadic-E (Sp-E) openings on 50MHz and a few tropospheric openings on the 144MHz band.

Many stations are now using digital modulation techniques (JT6M on 50MHz and FSK441 on 144MHz) and meteor scatter (m.s.) contacts using these modes were reported every day during January. Some adventurous stations used JT65 digital modulation to make world-wide earth-moon-earth (e.m.e.) contacts during January on both the 50 and 144MHz bands.

## CQ AURORA!

A total of eleven auroral backscatter openings were reported on the 50MHz band during January. Most were fairly weak events, Scottish-type auroras where contacts are made between the various UK nations and on occasions into the nearer reaches of Scandinavia.

On 7 January the interplanetary magnetic field (i.m.f.) near Earth tipped south, sparking a brief but strong geomagnetic storm. Stations reported making c.w. and s.s.b. contacts around the UK on the 50MHz band, some also heard the Icelandic beacon TF3SIX (50.057MHz), but unfortunately no other DX activity in that direction. On the 144MHz band the station of GM0HTT (Orkney Islands IO89) reported c.w. contacts with OH2KTL (Finland KP02) and SM5CUI (Sweden JO89).

Over the following days, solar activity declined to low levels with only small C-class solar flares taking place. However, on 10 January a new sunspot region (No.720) appeared on the solar disc initially as a group of three small spots. Within 48-hours Sunspot-720 blossomed from an almost invisible speck into a huge dark blemish five times wider than the Earth.

After several days of rapid growth the group then consisted of 37 spots and produced several major solar flares. Two X-class flares took place on 15 January, one just after midnight and the other just before midnight. Six M-class solar flares also took place that day and several full halo coronal mass ejections (c.m.e.) were observed by the SOHO spacecraft. Two c.m.e.s headed towards Earth and impacted the ionosphere during the afternoon of 17 January sparking a strong geomagnetic storm.

Activity on the 50MHz band was fairly sparse with only a handful of stations making c.w. contacts between central/southern England to stations located in Scotland and Norway. As is so often the case considerably more stations were active on the 144MHz band with c.w. and s.s.b. contacts being made throughout the British Isles and to other parts of Europe. This opening favoured contacts with Scandinavian stations, the most active appearing to be those of LA0BY (JO59), LA2PKA (JO59), LA4YGA (JO48), LA5UF (JO59) and OH1NOR (KP00).

Sunspot-720 proved to be very prolific as during its transit across the visible face of the sun it produced 100 C-class, 24 M-class and five X-class solar flares. On 20 January the giant sunspot exploded. The blast sparked an X7/2B class solar flare, the most powerful kind and hurled a billion-ton cloud of electrified gas into space. This was the third largest solar flare of the present cycle and produced an energetic proton storm, the strongest since 1989 that actually penetrated down to ground level in the Polar Regions. Here on Earth no one suffered. Our planet's thick atmosphere and magnetic field protects us from protons and other forms of solar radiation.

The consequence of all that solar activity was several low-band fadeouts and periods of increased radio noise immediately after the larger flares. When the plodding coronal mass ejection arrived 36 hours later on 21 January and hit Earth's magnetic field it was so intense that it was followed by a magnetopause crossing. In simplistic terms this means that the Earth's magnetic field was compressed in the opposite direction of the Sun to such an extent that orbiting satellites including the *Space Station* were exposed to the full wrath of the Sun. The c.m.e. also created a strong radio aurora and one of the brightest and prettiest visual auroras to be seen over the UK for many years.

**Paul Buglass**, Chairman of the York Astronomical Society (**www.yorkastro.co.uk**) reported on the 'uk.radio.amateur' newsgroup that the visual event started at 1910UTC with a bright green arc at about 10° spanning the Northern sky and deep reds above the arch up to 40° or more. From time to time the reds developed rays and brighter patches. The green arch gradually rose higher over the next 10 minutes until it was 25° above the horizon and the reds were still above it and much deeper.

Then all hell broke loose - red and green rays and patches forming, growing, brightening and fading within 30 or 60 seconds. The green arcs came up to Polaris split and moved as he watched. Lumps appeared in the east and grew in long lines to the west. At one point Paul saw a double arch and many red rays. This high activity level continued for about 10 minutes before fading out.

**Kevin Forster NL7Z** (Wasilla, Alaska) also witnessed the visual event and was kind enough to send me the photograph shown in **Fig. 1**. It was taken on a Sony F-717 Camera with 20mm wide-angle lens. The exposure was around 20 seconds with ISO 100 setting. Some UK 50MHz operators 'incidentally' may know Kevin, as he is active on e.m.e. running 1500W into a pair of 6-element Cushcraft Yagis. One of his recent JT65A digital e.m.e. contacts was with the station of M0BCG whom he worked on 27 January.

The radio aurora on 21 January commenced in the UK around 1730UTC, peaking in intensity between 1830-2300UTC before finally disappearing some hours after midnight. The event on the 50MHz band was quite extensive with contacts mainly on c.w. being made with stations as far away as ES6RQ (Estonia KO28).

Many UK stations also reported an Auroral-E opening on the Six Metre band throughout much of the evening. The main peak appeared to occur between 1830-1930UTC with contacts being made into Iceland, Finland and Norway. The Svalbard beacons JW5SIX (KQ26) and JW7SIX (JQ68) were also heard from southern England peaking 599 over a 3000km path.

Activity on the 144MHz band was quite

intense with many German stations being reported on the DX Cluster. Little was heard of Scandinavian stations as the auroral oval had moved a long way to the south as shown in the photograph, **Fig. 2**. Operators in central/southern England reported that they had to beam between 70-80° to contact stations in the Czech Republic (OK), Hungary (HA), Poland (SP) and Slovakia (OM).

The Doppler shift, which makes auroral signals sound so distinctive, was running at approximately +1kHz high above the transmitted signal on the 144MHz band. Later the same evening German operators on the 430MHz band reported that the Doppler shift was -2.7kHz below the transmitted signal. It is a well known fact that Doppler can change throughout an event.

Sometimes the spread (or wideness) of a signal dominates, sometimes the spread is small but the shift in frequency dominates. During some auroral events the Doppler shift can be in excess of 3kHz, sometimes more than the receiver incremental tuning (r.i.t.) can cope with!

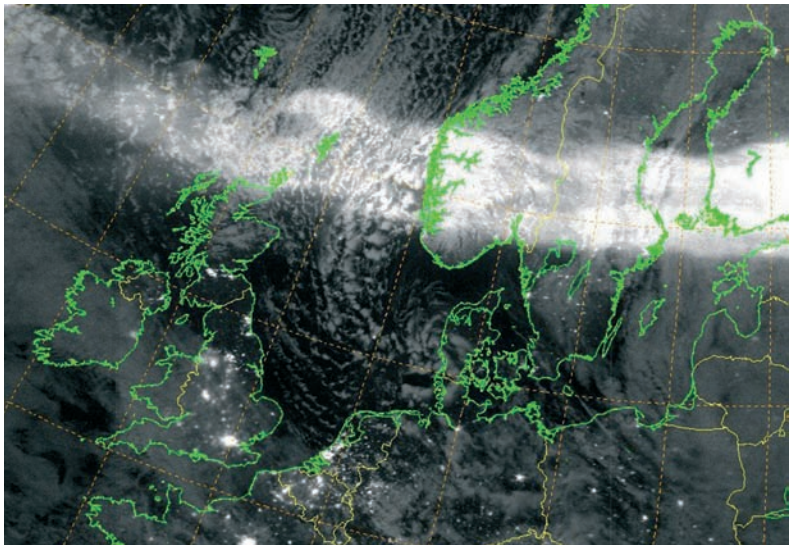

Fig.1

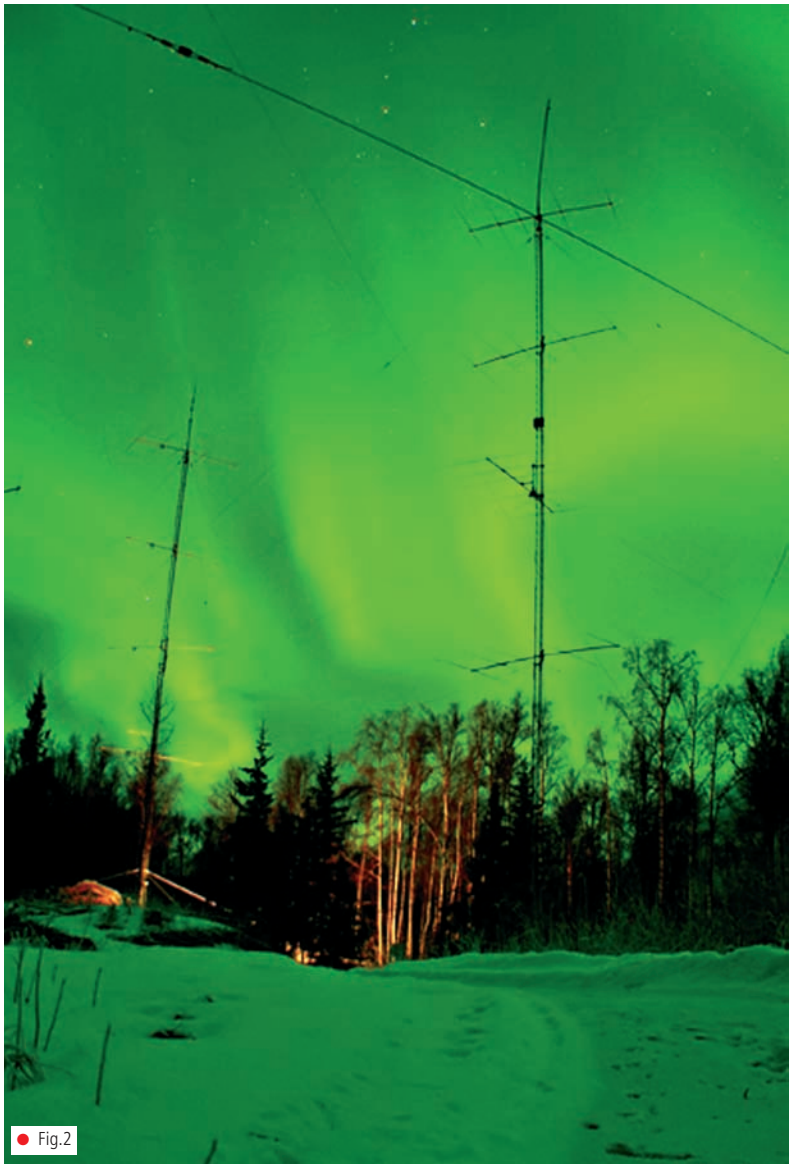

Fig.2

## SPORADIC-E

A total of eight Sporadic-E openings were reported during January on the 50MHz band. Sometimes though it's difficult to distinguish between a Sp-E opening and a meteor shower and I'm discounting two openings, which were reported on 2-3 January. Both occurred during the peak activity of the *Quadrantids* meteor shower and at a time when the shower radiant was well above the horizon.

I'm pretty confident that the other openings on 5, 8, 9, 11, 13 and 19 January were Sporadic-E as all of them occurred well after the shower peak and at times when the shower radiant was very low on the horizon. No startling DX was worked from the UK, but Winter Sp-E always livens the band up!

Among those worked from the UK were the stations of CN8LI (Morocco), DK1MAX (Germany), EH6AE (Balearic Islands), F5JNX (France), HB9LBC (Switzerland), IK0FTA (Italy), LA8AV (Norway), LX2SM (Luxembourg), OE5FDM (Austria), OH1MLZ (Finland), OZ1BNN (Denmark), SM7WOC (Sweden), SP2IJ (Poland), S57AC (Slovenia), UT7UV/A (Ukraine), YT1AU (Yugoslavia), 9A1CCY (Croatia) and 9H1AW (Malta).

## DIGITAL MODULATION

A growing number of stations are now using the WSJT suite of programs written by **Joe Taylor K1JT** to make DX contacts via meteor scatter and moonbounce. Daily m.s. contacts on the 50MHz band using JT6M yields a list of stations very similar to that described in the preceding paragraph.

Results on the 144MHz band using FSK441 are even more impressive! Some of the m.s. contacts made during January with this weak-signal digital modulation technique include the stations of EB1EHO, HA5RL, LA5KO, OE5MPL, OH6KTL, OK1AHO, RX1AS, SM7MXO, SP2JYR, S51AT, T98GTH and YU7KB. More impressive are the results now being made on moonbounce communications.

Until a few years ago most contacts were made using c.w. but nowadays it appears that the majority of e.m.e. contacts are made with JT65 modulation on both the 50 and 144MHz bands. Six metres has always been a very difficult band on which to make e.m.e. contacts, but contacts made during January with the stations of W1JJ, K7BV, W7GJ, NL7Z and ZL3NW (New Zealand!) now prove it is possible.

Activity is much higher on the Two Metre band with UK stations reporting JT65 contacts during January with EA6VQ, JF4TGO/8, RA0FCA, RU1AA, RA3AQ, RN6BN, RV9JD, YO4FNG and ZL3TY. More on this interesting subject next month.

## DEADLINES

That's it again for another month. Good luck with your DX contacts and please let me know what you managed to hear and work on the v.h.f. and u.h.f. bands. Send your reports or news, preferably by E-mail, to reach me by the last weekend of the month. *73 David G4ASR*

# HF HIGHLIGHTS

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**CRYMLYN PARC**
**SKEWEN**
**WEST GLAMORGAN**
**SA10 6DZ**
**Tel: (01792) 817321**
**E-MAIL: carl@gw0vsw.freeserve.co.uk**

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

## CARL GW0VSW EXPLAINS PHONETIC VARIATION AND HAS LOTS OF DX NEWS TOO!

It always amazes me the number of variations of or self-invented phonetics Radio Amateurs use both here and abroad, despite the fact there is an internationally agreed standard as to what should be used when we transmit using voice. I listened to one English operator recently who was working a DX station in South America and never used the same phonetics each time he gave out his callsign. Several times the DX station asked for a repeat of his call and it was obvious he was getting confused by the change in phonetics. I would love to have seen what was finally entered in the DX station's logbook!

It's funny how once our radio examinations are out of the way 'new' phonetics appear to replace the ones that have been taught. One example heard recently was the phonetic 'Kilowatt' for 'K', which could be confused to be 'K what?' Why not use 'Kilo' instead? An Amateur operator can have many problems when using 'voice' communications with things like static noise, interference from other stations, local noise, signals fading and more commonly, unusual accents and improper pronunciation of words! Using a substitute for a standard phonetic could result in confusion and at worst a lost contact, especially when working DXpeditions or in contests where you may lose points entering a corrupt call in your logbook!

### VERBAL COMMUNICATIONS

Phonetic alphabets were used in radio communications as early as the first world war as an aid to clarity of verbal communications. The first internationally recognised alphabet was adopted by the **ITU** in 1927 and was changed several times in the following years.

Police organisations soon followed with their own versions and several of these are still in use today particularly in America. Shortly after World War II, the **International Civil Aviation Organization** (ICAO) designed a phonetic alphabet that would be easy to understand by non-native English speakers and adopted it for use in all aviation voice communications by all those countries that signed up to it. It boasted an intelligible and pronounceable alphabet that consisted of English words with its letters or 'codewords' easily recognised by speakers of languages other than English.

### THE NATO PHONETIC ALPHABET

The standard was adopted by **North Atlantic Treaty Organization** (NATO) and its member countries in the mid-1950s. It replaced other phonetic alphabets like those used by the US military and several versions that were in use with the RAF during and after the Second World War.

For example the phonetics for 'A' and 'B', which at that time were pronounced as 'Able and Baker', would change to what we now know as 'Alpha and Bravo'. It is sometimes incorrectly referred to as the **International Phonetic Alphabet**, which is actually the official name of an alphabet used in linguistics and created in the late nineteenth century.

Standard NATO phonetics as they became known are now recommended by the RSGB and many other national authorities such as the ARRL, International Telecommunication Union and other national Societies and organisations. This standard is now the one most commonly recognised by fellow Amateur operators around the world.

As Radio Amateurs I think we should always try and use the NATO phonetic alphabet whenever phonetics are required. It will help take the guess work out of understanding a callsign or word when it is received by both English and non English speaking Amateurs or short wave listeners! The use of phonetics like 'Denmark' for 'Delta' or 'London' instead of 'Lima' just asks for confusion and could be miss-understood for your actual location. Both these incidentally I heard being used whilst listening on 7MHz earlier this month!

We are now in an age where band privileges are under threat by both government and commercial interests so would it not be better to give a professional edge to our voice operating and give a good impression to those who are more than ready to take our bands off us or worse still, stop us transmitting altogether? I would be interested to hear your views on this subject.

For those of you who are interested or feel the need for non NATO phonetics check out **http://montgomery.cas.muohio.edu/meyersde/PhoneticAlphabets.htm** which contains a huge list of interesting alphabets guaranteed to 'add confusion' if used on our ever crowded bands. For further details and history of the NATO alphabet try **www.wikipedia.org/wiki/NATO_phonetic_alphabet**

### DX NEWS

In Iran **Hamid Reza Rahami EP4HR** has said he will operate on the lower bands every day except Tuesdays and Fridays from 0215-0230UTC on c.w. or PSK31. He will start on 1.8MHz then move to 3.5 and 7MHz and reports say he has been worked 14070kHz between 1300-1630UTC and 7035kHz as late as 0115UTC. You can QSL via **Pietro Ambrosi I2MQP, Via Delle Querce 41, 20090 Rodano, Millepini, Italy.**

On St Lucia NA-108 **Bill Richards WB5ZAM** will once again be active for two weeks from 20 March through to 3 April signing as **J6/WB5ZAM**. Bill states that he is planning to operate on h.f. 'mostly c.w.' around a laid back schedule, as this is a vacation and a QSL is OK via his home callsign at **1815, Webster, San Angelo, TX 76901-2126, USA.**

Closer to home on the island of Guernsey EU-014 will be Chiltern DX Club member **Richard Brokenshaw M5RIC** who will be active as **MU5RIC/P** between 24-28 March. Activity will be on 1.8 to 28MHz using s.s.b. only and will include a Single-Op/All-Band/High-Power T/S entry in the CQ WW WPX SSB Contest which runs from 26-27 March using the call **MU2Z**. QSL to either callsigns via **M5RIC at 12, Channel View Road, Portland, DT5 2AY.**

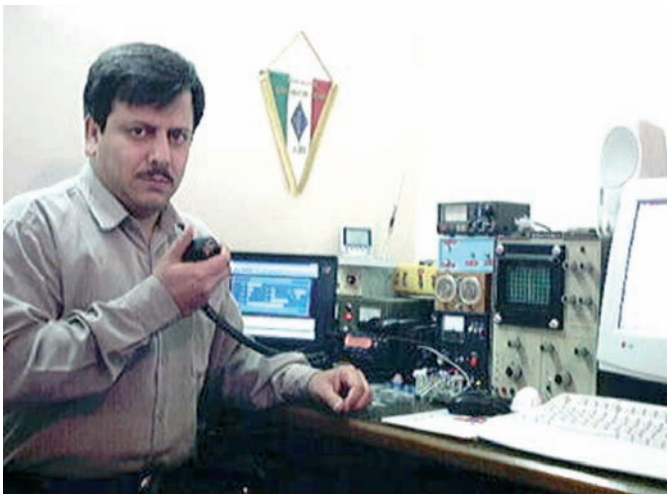
### NEW DXCC LISTING

The latest DXCC listings are now available on the AARL website and now features up-to-date listings of all the DXCC awards earned. The new system shows every issued DXCC award known to ARRL's computerised DXCC system with the exception of individual standings for Five Band DXCC.

The ARRL Membership Services Manager **Wayne Mills N7NG** has said "The website listing is even more complete than the *DXCC Yearbook* ever was because the printed list did not include inactive band-accounts for the previous year. This website will now list everything and everybody". The new system makes available a separate listing for each

DXCC award type, band or mode and even more importantly it essentially renders obsolete the manually generated monthly and yearly reports.

Under the new system listings will be updated daily and the DXCC standings of all ARRL members will remain in dark type. Callsigns of non-members who have not submitted credits for 10 years or more are in greyed-out type. Each listing by band or mode is complete in a separate *Adobe* PDF file. The largest listing (DXCC Mixed) now runs to more than 50 pages, but the size of the PDF file is only about 150 Kilobytes because of file compression. Printing format options include US letter-sized or ISO A4 paper. The DXCC listings can be found at **www.arrl.org/awards/dxcc/#listings**



● Hamid Reza Rahami EP4HR.

## COMPACT ANTENNA

A E-mail from **Keith Handscombe G7DNT** in Ipswich, Suffolk bought a smile to my face as he described a 'Lightning Bolt' 2-element Delta Loop antenna recently purchased from the USA. Kieth said "When the antenna arrived I discovered that the Americans must use the word 'compact' for something different to what we do here, because once it was constructed, I ended up with an antenna measuring 30 feet by about 25 feet in size.

I had to enlist the help of **Roger Bates M0CSQ** and **John Stott G0CJX** to get the beast to the top of my tower which is approximately 60 feet high. I have only been able to use it for a short time, but initial tests on 14MHz are favourable with BF4AF (China), A52HS (Bhutan) and Ali Wilson ZL1BD (New Zealand) in Ngaruawahia with reports of 5/8 and 5/9". Thanks Keith! Readers who would like further information on the antenna can reach Keith on Echolink node 30129.

## YOUR REPORTS

Onto your reports and **Ted Trowell G2HKU** on the Isle of Sheppy in Kent starts us off once again this month and said "I cannot recall a period of such poor conditions with very little DX worked on any band". Ted's 3.5MHz contacts were restricted to European stations around 2200UTC using just 5W c.w. and these included DK7UY/P (Germany) and ON6ZJ (Belgium) using a Ten-Tec Omni 5 and a G5RV. Moving up to 7MHz Ted faired slightly better working LX1KC (Luxembourg) at 1200, CN8PD (Morocco) 1600, VO1MRC (Canada) a Marconi Memorial Station at 2000 and CO8LY (Cuba) around 2100UTC.

In Nuneaton **Chris Colcough G1VDP** used his Yaesu FT-897 and dipole antenna logging s.s.b. stations LX1HD (Luxembourg) 1830 and G1KDU (England) Andre also in Nuneaton for a 'rag chew' at 1839UTC. Chris had to remove his Cushcraft MA5B beam from his tower after it suffered some damage but a new mast is now on its way. The beam obviously worked well throughout 2004, even though it was only 4m (13 feet) high because over 143 DXCC entities were logged of which 89 are already confirmed and 129 Islands for the IOTA Awards of which 69 have now been confirmed. Not bad considering the less than perfect conditions throughout the year!

A move to10MHz now and the log of Ted G2HKU who managed to find T99W (Bosnia & Herzegovina) and SV0XAO (Greece) QSL via DJ5JH at 1900UTC despite the high noise levels on the band.

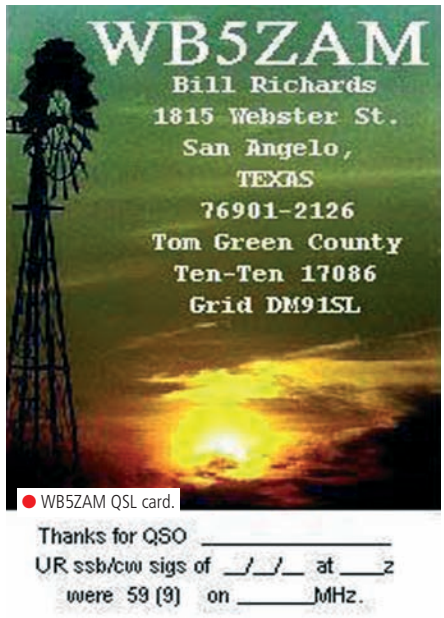
## THE 14 & 18MHz BANDS

Meanwhile on 14MHz **Eric Masters G0KRT** in Worcester Park, Surrey used a Yaesu FT-817 rig at 5W, MFJ-934 tuner and 20m (66 foot) end-fed wire to work all c.w. QRP stations EW6CU (Belarus) 1202, LY3BY (Lithuania) 1224, OH7QR (Finland) 1351, RW1CM (European Russia) 1450, SM5ILE (Sweden) 1443, DL4VAN (Germany) 1629, G3TWG (England) 1651, EA8CN (Canary Islands) AF-004 1716 and I2VUC (Italy) at 1731UTC despite being troubled by heavy band noise for most his operating time.

Also on the band was **Martyn Medcalf M3VAM** who worked YT80AT (Serbia & Montenegro) 0903, LZ1YG (Bulgaria) 1017, EA3BFX (Spain) 1141, IK8XO (Italy) 1318 and S58M (Slovenia) at 1432UTC using a Yaesu FT-897 and Buddipole antenna from his home in Chelmsford, Essex.

Ted G2HKU had a 5W QRP contact with SM5RX (Sweden) at 1200 and 70 watt QSO with TF5EF (Corsica) EU-014 at 210UTC and just one 18MHz DX contact with W2DNO (USA) at 1500UTC in very poor band conditions while the s.s.b. of Martyn M3VAM found SM6JLZ (Sweden) 1411, 9A2YM (Croatia) 1303 and 9H4DX (Malta) EU-023 at 1411UTC

● Keith Handscombe G7DNT's 'Lightening Bolt' 2-element Delta Loop antenna recently purchased from the USA.




● WB5ZAM QSL card.

## THE 21MHz BAND

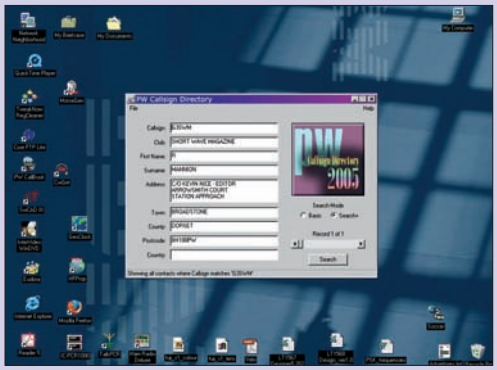
Finally, we move to the 21MHz band where just one reporter found conditions suitable to operate. Martyn M3VAM heard and finally worked 9H4DX again at 1157 followed by YU1ARC (Serbia & Montenegro) at 1229 and US5EVJ (Ukraine) at 1302UTC.

## SIGNING OFF

That's it for another month and a very quiet one it has been! There have been stations to work but these have been few and far between as the bands have been in very poor shape indeed. Let's hope that we see some marked improvement as the summer draws near. My thanks go to all our reporters and to **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* for the DX information. Until next time have a good DX filled month.

*73, Carl GW0VSW*

# PW Callsign Directory 2005



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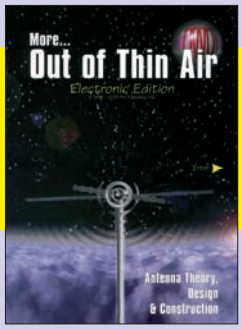


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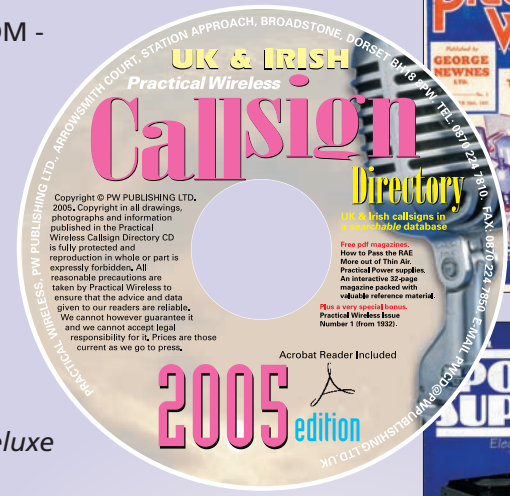
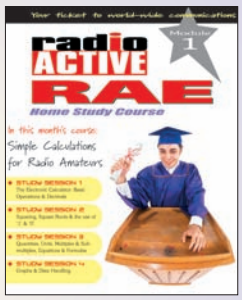





- As well as the UK and Eire callsigns listings in a fully searchable database, there are electronic versions of magazines on the CDROM. You can read the very first issue of *PW* from 1932!
- Build your own power supply as shown in *Practical Power Supplies*, decide which antenna is for you after reading *More Out Of Thin Air* and an electronic 'PDF' version of *PW.*
- Read the complete reprint of the *Radio Active RAE Course* - a source of information to help with your understanding of electronics.

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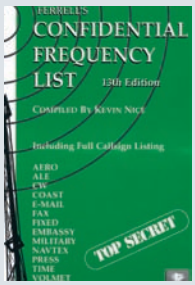


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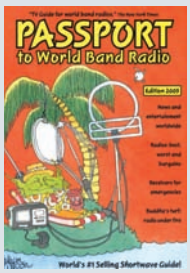
### Klingenfuss 2005 Guide to Utility Radio Stations

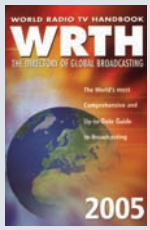
One of the most comprehensive, reliable and up-to-date manuals containing over 11,200 frequencies, 1900 stations, meteo radiofax, radiotelex and NAVTEX schedules, abbreviations, frequency allocations and radio regulations.



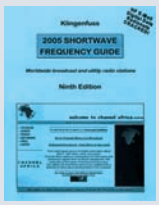

### Passport to World Band Radio 2005

This book includes what's on world band radio, what to buy, how to get started and is written to make interesting reading. It contains a mix of articles from an idiot's guide to a five-minute start and ten easy catches to best times to listen. It also has a channel by channel guide to what's on the air. Everything the short wave broadcast listener needs to know.

### World Radio TV Handbook 2005




A handy reference book that contains the names, addresses, programmes and frequency details of radio stations all round the world. Radio stations are listed under the country and all countries are split up into continents making it much easier to turn to the station you need. Also included are articles on HF broadcasting conditions, radio reviews and a section on how to use the book.




### Klingenfuss Shortwave Frequency Guide

This 2005 edition contains a new, clearly arranged alphabetical list of stations and user friendly listings in convenient frequency order. There are over 10,000 entries covering broadcast stations world-wide and 11,000 entries covering utility stations world-wide.

### Radio Listeners Guide

This handy annual publication contains radio product reviews and general information for listeners. Frequencies and locations of radio stations all over the UK and Ireland are given for BBC and commercial radio stations, as well as DAB services. All-in-all a very handy reference guide.

### 25 Simple Tropical & MW Band Aerials

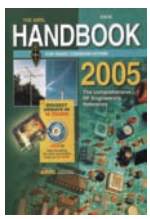

This concise book describes how to build 25 simple and inexpensive antennas for operation on the medium wave broadcast band (550 - 1600kHz) and on the 60, 75, 90 and 120 metre tropical bands. There are also designs for the 49m band.

### An Introduction to Radio Wave Propagation

This book provides a broad, yet clear picture of radio wave propagation in a consise way without the use of too much technical language or mathematics. Included are explanations of the phenomena that is propagation dealing with everything from the Sun, through the ionosphere to noise.

### ARRL Yearbook

Radio amateurs and professionals rely on The ARRL Antenna Book for current antenna theory and a wealth of practical, how-to construction projects. This 20th edition is extensively revised and includes contributions from leqading antenna experts. Many designs are the result of the latest advances in computer modelling.




### Antenna Toolkit

This book acts as a miniature antenna manual with very good technical explanations without ever over-doing the maths for the not-so-keen mathematicians! The drawings and illustrations are very clear and the section on instrumentation is very helpful.

### RSGB Yearbook

There are almost 500 pages in the 2005 Yearbook, eight more than last year, but only a very small handful are the same. Everything you need is covered within it's pages: contact names, addresses, phone numbers, websites and email addresses. A major new feature for this Yearbook is the RSGB Contesting Guide, which was formally published in RadCom.

### Receiving Antenna Handbook


Your receiver is only as good as your antenna or so says the author of this book. It is a complete guide to high performance receiving antennas for long wave all the way to the upper end of the short wave spectrum. The designs aren't slightly modified amateur transmitting antennas but ones intended specifically for receiving purposes.

### The Amateur Radio Operating Manual

This new edition of the RSGB Operating Manual reflects the huge impact in the past few years of licensing changes and the ubiquity of PCs and the internet. To deal with these, the author has taken a completely new look at the content and approach. For example, some of the traditional demarcations between HF and VHF and between the various operating modes have been overturned, but new and comprehensive chapters on topics such as PCs in the shack and OIperating Modes added.


### VHF/UHF Antenna

With both the basic theory and constructional details for many antenna designs, the reader is taken through the essentials in an easy-to-understand way. All kinds of antennas are described from dipoles to Yagis and verticals to log periodic designs.

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## Beginners/Licence/Manuals

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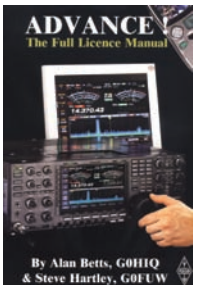
| ADVANCE! THE FULL LICENCE MANUAL (RSGB) | 104 | £9.95 | ADCFLM |
| AMATEUR RADIO EXPLAINED. Ian Poole (RSGB) | 150 | £9.90 | AREXPL |
| AN INTRODUCTION TO AMATEUR RADIO Ian Poole G3YWX (RSGB) | 150 | £4.99 | BP257 |
| AN RAE STUDENTS NOTEBOOK Bob Griffiths G7NHB | 76 | £6.95 | RAESNB |
| FOUNDATION LICENCE NOW! A. Betts (RSGB) | 32 | £3.95 | FLNOW |
| HF AMATEUR RADIO. Ian Poole (RSGB) | 120 | £13.99 | HFAR |
| INTERMEDIATE LICENCE - BUILDING ON THE FOUNDATION | 76 | £5.75 | INTLIC |
| SECRET OF LEARNING MORSE CODE Mark Francis (Spa) | 84 | £6.95 | SOLMC |

### Foundation Licence Now!


A 32-page soft-covered book that takes you through the syllabus, reinforcing what you will learn on the foundation Course. The course has been designed and introduced for people of all ages and abilities. To take the course you need no formal qualifications.

### Intermediate Licence Building on the Foundation

The second course book in the RSGB's series, which is structured to progressively obtaining an Amateur Radio Licence, this book contains practical exercises, broken down into half-hour worksheets. The ideal companion book for all Amateur Radio Intermediate Licence students.



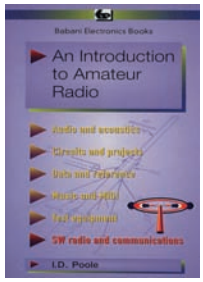

### Advance! The Full Licence Manual

This is the third course structured to obtain an Amateur Radio Licence. Advance is the final stage in gaining the licence and has been updated to suit the new syllabus structure. Broken down into logical sections, it's presented in an easy-to understand way, making it perfect for home study.

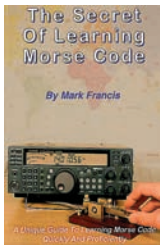
### HF Amateur Radio

This could be the considered as the natural 'follow-on' volume to accompany Basic Radio Principles & Technology. Aimed at the more active radio amateur who is just beginning to get to grips with their new HF transmitting station, it will also appeal to the newcomer.

### An Introduction to Amateur Radio




Amateur radio can be a fascinating hobby that has attracted many people all around the world. It encompasses a wide range of subjects from the historical to the latest technology and from operating to construction. Perfect for the fledgling enthusiast.




### Secret of Learning Morse Code

Don't be fooled, the requirement for Morse may have been removed, but Morse code still has a place in the scheme of things for the radio amateur. It can be consistently be used to 'talk' to others around the world, you don't even need to speak their language to hold a conversation.

## Binders

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| SWM | - | £6.50 | BINDSW |

## Design & Construction

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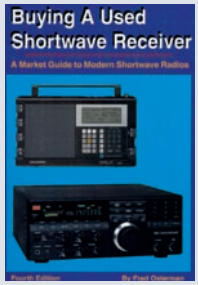
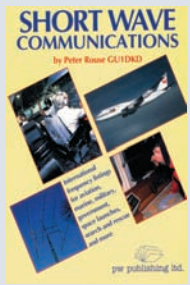
| LF EXPERIMENTERS HANDBOOK (RSGB) | 112 | £18.99 | LFEXHB |
| PRACTICAL PROJECTS G. Brown (RSGB) | 208 | £13.95 | PRPROJ |
| PRACTICAL RECEIVERS FOR BEGINNERS John Case GW4HWR (RSGB) | 165 | £14.99 | PRRXFB |
| PROJECTS FOR RADIO AMATEURS & SWL. R.A. Penfold (Babani) | 92 | £3.95 | BP304 |
| RADIO & ELECTRONICS COOKBOOK (RSGB) | 319 | £16.99 | RECOOK |
| RF COMPONENTS & CIRCUITS Joe Carr (RSGB-Newnes) | 398 | £22.50 | RFCOMP |
| TECHNICAL COMPENDIUM (RSGB) | 288 | £17.99 | RSTECO |
| THE ART OF SOLDERING R. Brewster (Babani) | 84 | £3.99 | BP324 |
| UNDERSTANDING BASIC ELECTRONICS (ARRL) | 314 | £15.50 | UNDBEL |

### Buying a Used Shortwave Receiver




Buying a second-hand radio can provide great savings if you have the facts. This book provides the information you need to intelligently select the right short wave receiver at the right price. It contains information on the 100 most commonly traded short wave radio both portable and table top models.

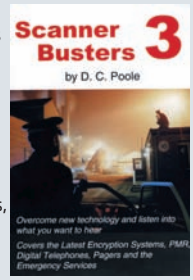



### Short Wave Communications

Amongst the subjects covered in this book are an introduction to radio communications, operating your radio, antennas, international band plans, marine bands, civil aviation, military operations, amateur and CB radio, international callsigns as well as receivers past and present.

### Scanner Busters 3

Scanner Busters 3 guides you through the maze, showing you how to deal with trunking systems so you can tune into the things you really want to hear. There is no techincal jargon used in the explanations and PMR, digital telephones, encrytption systems, paging and TETRA are explained in simple terms.





### The Essential Guide To Scanning

Aimed at beginners to scanning this 108 page publication should will help you to get the most out of hobby listening. Topics covered include: Choosing a scanner and understanding its features, antennas, accessories, what to listen for and where and much more.

### Scanners 4 Scanning into the future

Changes to the radio spectrum as well as new frequency allocations are in this book so the scanning enthusiast will know where to look. Sections on trunked radio systems and pagers and their frequency allocations has been included. other chapters include understanding radio, antennas, radio systems explained, UK frequency allocations and satellites on your scanner.

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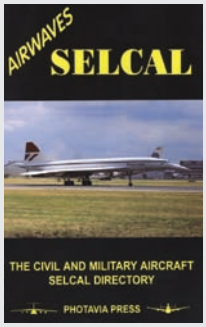
| ARRL OPERATING MANUAL 7th Edition (WSL) | 420 | £18.50 | RROPM |
| ARRL HANDBOOK 2005 inc CD | 1152 | £32.00 | RRHB25 |
| AMATEUR RADIO (VALUE) LOGBOOK (RSGB) | 80 | £4.95 | TXLOG |
| AMATEUR RADIO WORLD ATLAS (A4 size) (DARC) | 20 | £8.00 | ARWAT |
| DIGITAL MODES FOR ALL OCCASIONS M. Greenman. (RSGB) | 208 | £16.95 | DMFAO |
| GREAT CIRCLE MAP (PWP) | 400 x 400mm | £1.50 | GCMAP |
| LF TODAY - GUIDE TO SUCCESS 136kHz M Dennison (RSGB) | 128 | £11.95 | LFTOD |
| RADIO AMATEUR MAP OF THE WORLD | - | £8.00 | ARMAPW |
| RSGB AMATEUR RADIO OPERATING MANUAL | 224 | £19.95 | OPMAN |
| RSGB PREFIX GUIDE | 34 | £8.95 | PFXGDE |
| RSGB YEARBOOK. 2005 Edition | 488 | £16.95 | RSYB25 |

**Air Traffic Control 9th edition**
Apart from visits to airports, the only contact point between the enthusiast and the actual world of air traffic control is through an airband radio. This book has been written to give the reader an understanding of the voice messages you hear.




**Airwaves Selcal**
Containing over 13000 civil and military aircraft Selcals this publication is a must for all aviation listening enthusiasts. The information is provided in three different ways: Selcal order, Airline/Operator then registration order and airline or Operator Decode. A handy reference book that should be sitting next to your HF receiver - order yours today!

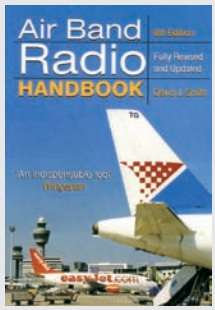
**Air Band Radio Guide 6th Edition**
Fully updated, this is a comprehensive handbook for the well-informed aviation enthusiast on the subject of air to ground radio. The subjects covered include the legal position of the listener, airband receivers, antenna systems, HF radio, an airfield directory, en route frequencies weather broadcasts and 8.33kHz channel spacing.

**Military Aircraft Markings 2005**
This annual pocket favourite has been revised with a huge number of changes that have affected military serials over the past year. If you can see it or hear it, MAR 2004 will tell you who runs it or owns it! The accuracy of the contents can be relied on.


**Callsign 2005 9th Edition**
Civil and military aviation callsign directory, fully updated with over 3000 additions and changes. It's A5 and spiral bound for ease of use and contains over 8000 aviation callsigns.

**Civil Aircraft Markings 2005**
Now fully revised for 2003 this book lists the UK civil aircraft callsigns alphabetically as well as overseas aircraft too. Details such as the callsign, type of aircraft, the owner or operator and any extra notes that are applicable.

**Airwaves 2005 11th Edition**
This A5, spiral bound book has been updated with all the latest airband information for the civil and military aviation enthusiast. It contains frequency information, airfield information as well as military frequencies and VOLMET information.


**Air Band Radio Handbook**
For over 15 years The Air Band Radio Handbook has been regarded as the essential reference source for ground-based air band listeners and flyers. Now fully updated this book is an indispensable guide to every air band enthusiast.

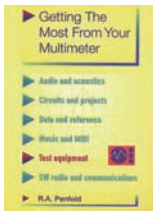
**Flight Routings 2005**
The A to Z guide to airline flights within the UK. Now in its 15th edition, this book continues to pack its pages with all the information air band listeners could ever wish for. Flight details for airlines including schedules, charter and freight flights.

## Photocopies & Back Issues

We have a selection of back issues, covering the past four 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.

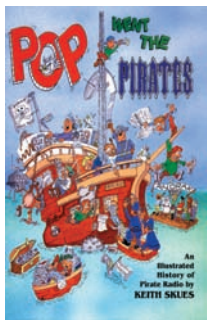
## Subscriptions

Subscriptions are available at £33 per annum to UK addresses, £40 Europe Airmail and £49 RoW Airmail. Joint subscriptions to both *Practical Wireless* and *Short Wave Magazine* are available at £62 (UK) £76 Europe Airmail and £93 RoW Airmail.

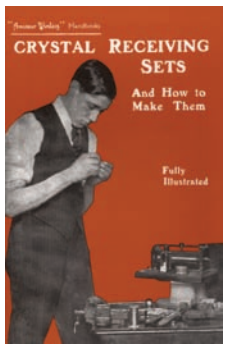



**Getting the Most from Your Multimeter**
The multimeter's capabilities are often overlooked by many owners, there's much they can do other than continuity testing! The book discusses how you can choose a meter, the advantages and disadvantages of analogue and digital type and then leads you through the many tests they can perform.

**Pop Went the Pirates**
This book sets out to produce the definitive history of pirate radio ships, with a comprehensive account from the earliest pirates in the 1930s to the present day. The text is illustrated with 230 black and white photographs, many of which have never been published before. You can find out about the ships and forts that played such important roles in changing radio broadcasting into the format that exists today.




**Crystal Receiving Sets**
This handbook deals, in a simple, straightforward manner, with the making of a number of different kinds of crystal sets representative of those in present-day use. It is uniform in style and price with other members of the "Amateur Wireless" Handbook series, notably with two of them, namely "Wireless Component Parts and How to Make Them" and "Simple Valve Receiving Sets and How to Make Them." Basically, everything you need to know regarding valve and crystal sets and how to make components.




## Microwaves

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| AN INTRODUCTION TO MICROWAVES F.A. Wilson (Babani) | 134 | £3.95 | BP312 |
| INTERNATIONAL MICROWAVE HANDBOOK A. Barter (RSGB-ARRL) IMWHB | 474 | £24.95 | |

## QRP

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| LOW POWER SCRAPBOOK (RSGB) | 320 | £12.99 | LPSCRA |
| QRP BASICS. George Dobbs G3RJV (RSGB) | 204 | £14.95 | QRPBAS |

## VHF & Higher

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| ALL ABOUT VHF AMATEUR RADIO W. I. Orr W6SAI. | 163 | £8.95 | AAVHF |
| GUIDE TO VHF/UHF AMATEUR RADIO Ian Poole G3YWX (RSGB) | 180 | £8.99 | GTVUHF |
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| THE XTAL SET SOCIETY NEWSLETTER Volume 4. Phil Anderson W0XI | 88 | £7.00 | XTNL4 |
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| CRYSTAL SETS. The Xtal Set Society Newsletter. Volume 5. Phil Anderson W0XI | 88 | £7.00 | XTNL5 |
| CRYSTAL SET BONANZA Vol 9, 10 & 11 Xtal Set Society Newsletter | 226 | £15.00 | XTBONZ |
| CRYSTAL SET LOOPERS, A THREE TUBER & MORE Volume 8 Xtal Set Society Newsletter | 128 | £10.50 | XTLOOP |

## Historical

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| 100 RADIO HOOK UPS 2nd Edition (reprinted) | 48 | £3.35 | 100RHU |
| 1934 OFFICIAL SHORT WAVE RADIO MANUAL Edited by Hugo Gernsback (WSL) | 260 | £11.85 | 1934SW |
| AMATEUR RADIO - A BEGINNERS GUIDE (1940 REPRINT) Douglas Fortune W9UVC | 156 | £7.70 | ARABG |
| COMMUNICATIONS RECEIVERS - THE VACUUM TUBE ERA R.S. Moore | 141 | £17.95 | COMRXV |
| MARCONI'S ATLANTIC LEAP (H/B) Gordon Bussey (Marconi) | 96 | £6.99 | MALEAP |
| POP WENT THE PIRATES Keith Skues | 568 | £14.99 | POPPIR |
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| HOW TO BUILD YOUR FIRST VACUUM TUBE REGENERATIVE RECEIVER T.J. Lindsay | 127 | £8.25 | HTBFVA |
| HOW TO BUILD YOUR RADIO RECEIVER (A4) (Popular Radio Handbook No. 1) | 100 | £6.70 | HTBYRR |
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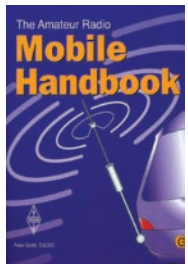
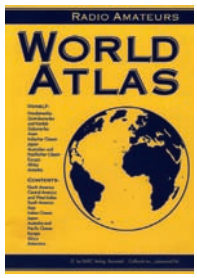



**The Amateur Radio Mobile Handbook**
Every aspect of mobile working is covered from basic bicycle mobile to the maritime operations for the keen sailors who abound in amateur radio. Extremely well illustrated with many photographs, diagrams and charts.

**Great Circle Map**
A Great Circle map based on the UK at the centre of the map. Find direction and distances to any part of the world quickly and efficiently via the shortest hop.

**Radio Amateurs World Atlas**
Each country has the respective prefix shown on both the map and in an alphabetical list. Sixteen pages of maps from the North to the South Pole!

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**HF v.h.f. and much more,** 101E, HRO 5T, TH77E, Comtell scanner, TS-830S (photo below), Hallicrafters FT-290, Morse Key, MFJ-986 and much more. Ring or E-mail for list. GINSV QTHR, E-mail: dave@menheniot.eclipse.co.uk or Tel: (01579) 345740.

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**KW2000B**, £100. KW202, £100. KW204, £100. FT-102 with a.m./f.m., £180. MM 23cm transverter, £50. HRO plus p.s.u. and coils, £40. Cushcraft R7, £60. Buyer collects from Derbys or Worth Wales (Anglesey). GW3RKZ on (01332) 883066 during week or (01248) 722041 weekends.

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**Any Ex-Air ministry radio** or radar units and components wanted by collector, wartime or post war, can collect. Barrie MacDonald, 49 Kirkland Road. Leicester LE3 2JQ. Tel: 0116 2334 487.

**ERA Microreader Morse tutor**. Len G0RKO on (01246) 234885.

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**KW77 receiver**, in good condition, cash waiting for clean model. Tel: (01352) 771520, E-mail: gw3tmp@tiscali.co.uk

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# rob mannion's topical talk

This month the Editor reflects on the interesting variety of topics featured on the letters pages. In particular, Rob picks up again on the preservation of historical radio communications sites.

The *PW* letters pages are always interesting as far as I'm concerned. They're never boring and I always find something of interest. Sometime I note that the topics under discussion seem to ebb and flow like the tide. Occasionally, a particular high tide carrying much criticism arrives, but even when I find that the efforts of myself and my colleagues are being criticised - there are often good reasons for the comment. In other words I've got to take whatever flotsam and jetsam comes up with the tide of letters - good or bad!

The latest correspondence on the topic of historical radio related site preservation is particularly interesting. Both main protagonists (**Stan Brown G4LU** and **Gus Malcom G8DEC**) are good Amateur Radio friends of mine, and although they seem to differ on the printed page - in reality they both believe in the same thing - the preservation of our illustrious historical radio and communication engineering history.

Now, a new correspondent, **Ken Jones G3RRN**, has entered the debating forum provided by the letters pages. Ken has brought with him a slightly different approach than that already under discussion by both G4LU and G8DEC.

In his long and detailed letter Ken draws attention to the way he's been trying to combat the seeming indifference regarding the preservation, or at least paying tribute to, our truly remarkable radio history. And as a result of his letter I've had an idea, which I hope readers will take up themselves. By acting together we might draw attention to the long and important history of our technology and also end up watching an excellent TV programme.

## Dan Cruikshank

I thoroughly enjoy watching the specialised programmes on BBC2 presented by **Dan Cruikshank**. This gentleman has thoroughly entertained and educated me with his obvious (but self-controlled) engaging enthusiasm in various programmes looking at architecture, engineering and railway history.

Although Dan's most enjoyable programmes (for me anyway) were those dealing with the Tower Bridge in London and the Forth Bridge, (see **Fig. 1**) this truly gentle man - his voice seems to caress and care for the subject as he admires it during the programmes - achieves something remarkable with the G3XFD audience! I say this because Dan's programmes are amongst the few where I don't sit in front of the TV without something to read! His work is truly absorbing and the Forth Bridge programme was recorded onto DVD for repeated pleasure by this enthusiast.

As I consider that Dan Cruikshank has the vitally important understanding and 'feeling' required to highlight the plight of historical radio technology I'm planning to write to him, with the aim of seeking his advice. Hopefully, we could even end up with a special programme featuring the heritage sites within our group of Islands. This would include those within the UK and also the equally important stations in the Irish Republic, even though in most cases both those here and in Ireland have been now almost disappeared, some having been reduced to rubble.

However, even rubble has significance! I suggest this because thanks to **John Corless EI7IQ** from County Mayo in Ireland, both **Tex Swann G1TEX** and I have small samples from the Marconi site at Clifden, in the form of small half bricks. These came from the foundations of the station, gathered from those scattered in the peat bog after the site was levelled following 'The troubles'. They may only be half bricks to the uninitiated, but to Tex and I they provide a link with an exceptionally important part of our radio heritage. Thanks John!

**Fig. 1: Rob G3XFD is hoping to interest architectural specialist Dan Cruikshank in making a programme similar to that produced for BBC2 featuring the Forth Bridge. Hopefully, it will draw attention to our rapidly disappearing radio related historical sites (see text).**
Photo courtesy Colin Topping GM6HGW/ZD9HGW

As soon as I've heard from Dan Cruikshank I will of course pass on any news to *PW* readers. In the meantime I ask you all to keep a watchful eye over those precious sites. Although BT must of course look after their shareholders, we as radio enthusiasts must not forget the debt we owe to the pioneering sites, whether they be for broadcast, communications or navigational purposes. It's up to us to watch over them!

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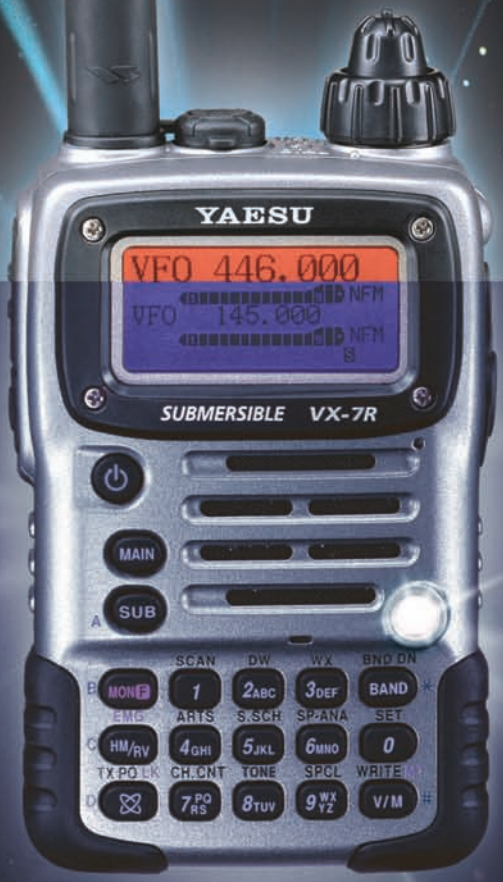
* in the 14MHz band

50/144/430MHz 5W FM Transceiver

# VX-7R

## ULTRA-RUGGED, SUBMERSIBLE TRI-BAND MAGNESIUM HANDIE

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