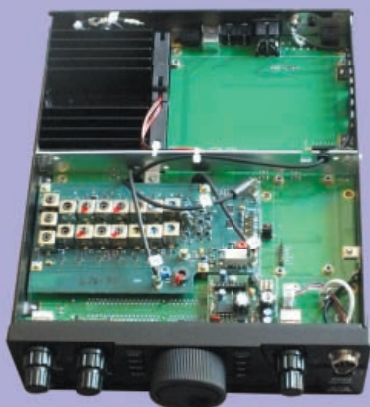


Practical WIRELESS

Britain's Best Selling Amateur Radio Magazine



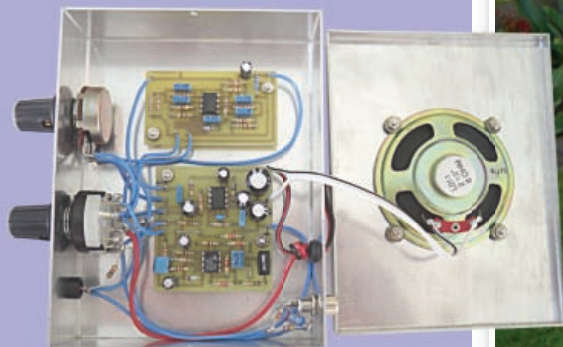
The Eagle

Latest transceiver from
Ten-Tec reviewed



Practical Way

Building a Z-match tuner



Design Peak

Peak and band-pass filters



Reviewed

The I-Pro Home

Multi-band antenna



A Practical PIC Project

The PW PIC Battery Voltage Monitor



9 770141 085105



01



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HF - UHF Antennas

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1.2m vswr 1.3:1	£99

VHF-UHF Linear Amplifiers



Discovery-2-35 2m Linear Amplifier

* 144 - 146MHz * Input 100W * Output 1.5kW * Valve: GS-35
* Tuned cavity * Supply 230V AC 50Hz @ 8A
* Size 330 x 222 x 406mm * Weight 23kg
Another great British product - **IN STOCK £1889.95 D**

Discovery-70-31 70cm 700W Linear Amp

This is identical externally to the 2m model above. Here we show you the high standard of inside engineering used to achieve a massive 700 Watts output. It uses a single h tube and requires around 50 Watts of drive. A fine British product. - **IN STOCK £1889.95 D**

Discovery-64-35 Dual 6m-4m 1.5kW Linear

Here is an exciting dual band 2m and 6m amplifier capable of a full 1.5kW output for just 100 Watts input. A single GS-35 tube gives superb efficient and would make a great partner for our new range of dual band 6/4m Yagis from the InnovAntenna range. - **IN STOCK £1989.95 D**

HF - UHF in One Box!



FT-897D base or portable, this 1.8 - 440MHz transceiver is great value. 1.8 - 50MHz 100W 2m 50W 70cm 20W. **IN STOCK £819.95 D**

FT-857D The great value mobile or base 1.8 - 440MHz HF-6m 100W, 2m 50W 70cm 20W. **IN STOCK £714.95 D**

KENWOOD

The **TS-2000E** is a firm favourite for those wanting ultimate all-mode performance on all bands. 1.8-144MHz 100W 70cm 50W. It has the highest power on 2m & 70cms and the TS-2000X version adds 23 cms! Includes auto ATU, DX cluster facility and digital IF for superb weak signal performance. **IN STOCK £1549.95 D**

ICOM IC-7000

The most compact, high spec. HF-UHF transceiver available. With its lovely display and digital IF filters, it can handle all your needs - SSB CW and data. HF-6m 100W, 2m 50W and 70cms 35W. All in one lovely box. **IN STOCK £1189.95 D**

HF on a BUDGET!



FT-450D transceiver comes with the extra IF filter & an Auto ATU built in. 100W 160m - 6m with 3 IF filters 300Hz, 500Hz & 2.4kHz. **IN STOCK £839.95 D**



IC-718 SSB CW up to 100W from 160m-10m. You won't find a more cost effective HF radio! **IN STOCK £594.95 D**



IC-7200 this 100 Watt radio covers 160m-6m and includes digital IF filters. **IN STOCK £839.95 D**

KENWOOD

TS-480SAT A very compact HF transceiver that delivers 100 Watts from 160 - 6m and includes auto ATU. **IN STOCK £779.95 D**



Jupiter-538B 160m - 10m 100 Watts SSB CW AM FM with on-screen CW reader and socket for PC keyboard. **IN STOCK £1599.95 D**

HF High Performance Transceivers



FT-950 HF & 6m Transceiver



Step up to the FT-950 and you enter the world of advanced £1000+ class design. You get 30kHz - 56MHz Rx, Auto ATU, triple conversion Rx with 3 roofing filters, 32 bit floating point DSP, Superb dynamic range, Tx variable bandwidth and Mic EQ adjust, plus CW zero/spot feature, CW message storage etc. **IN STOCK £1264.95 D**

FT-2000 160 - 6m Transceiver

This radio is a DXers favourite and widely used for DXpeditions and contests. Covering 160m to 6m. It has all the digital features and auto ATU. Available as 100 Watt or 200 Watt version. **IN STOCK 100W £2259 D 200W £2899 D**



FT-DX5000 160 - 6m Transceiver

The current Yaesu "flagship" radio, covering 160m to 6m delivering 200 Watts. **ALL IN STOCK**
FT-DX5000 Standard radio **£4635.95 D**
FT-DX5000D + SM-5000 monitor **£4939.95 D**
FT-DX5000MP + monitor & filters **£5369.95 D**

KENWOOD TS-590S

160m - 6m with superb receiver inc. dual roofing filters, Auto ATU, 32 bit f/p DSP & USB PC connection.



This radio has won the admiration of the radio press and hams all over the world. The best dynamic range in its class, digital IF, narrow roofing filters and auto ATU. Also FREE PC control program that can be downloaded. Exceptional value. **IN STOCK £1329.95 D**

ICOM IC-7410 HF-6m Transceiver

This lovely new HF-6m all-mode 100W transceiver offers superb front end dynamic range, and has a 15kHz roofing filter. It also features a 36kHz DSP razor sharp filter, internal auto ATU, PC control via a USB port and speech synthesizer. **IN STOCK £1695.95 D**



IC-7600 HF Transceiver



The IC-7600 HF/50MHz transceiver is enhanced with some of the main features tried tested on the flagship IC-7700/7800 models. It is highly regarded by Amateur operators world-wide. Features inc a double conversion superheterodyne system, dual DSP units & 3kHz IF (roofing) filter. **IN STOCK £3299.95 D**

IC-7700 HF Transceiver



The IC-7700 HF/50MHz 200W transceiver shares many features with its "big brother", the world famous IC-7800. With two independent DSP units, a +40dBm 3rd order intercept point and ultra wide dynamic range to name but a few of the features. **IN STOCK £6364.95 D**



OMNI-VII HF Transceiver



Fire it up and you immediately know you are driving something different. The receiver is a delight and the transmitted audio is superb. This 100 Watt transceiver that covers 160m - 6m. Ethernet remote control ready. **IN STOCK £2599.95 D**

Software Defined Transceivers

FLEX-1500 HF Transceiver



It works as well as it looks! This 5W transceiver covers 160m - 6m all modes. It uses the same software as the Flex-3000 and just needs a single USB cable to your PC. Software included. Enjoy amazing performance from such a low cost package. Great for SSB CW or data modes. Go portable with a laptop! **IN STOCK £589.95 D**

FLEX-3000 HF Transceiver

The 100 Watt award winning HF-6m transceiver

with auto ATU. It is all you need, apart from a Windows based PC. The plug and play firewire connection makes setting up easy. Just one single FW cable to your PC. Experience a level of performance & feature packed radio, that no hardware design can match at even several times the price! More & more customers are experiencing the ultimate in flexibility, selectivity and usability. Uses Yaesu mic wiring and requires 12v at approx. 20 Amps peak. **IN STOCK £1399.95 D**

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HF Linear Amplifiers

Alpin-100mkII 160m - 6m 1.3kW



The Alpin 100 desktop linear will deliver up to 1.3kW output from this desktop design. It covers 160m - 6m and has full tune up protection. The panel control display tells you exactly what is happening and makes operation simple. If you are looking for something rugged with full safety features at a sensible price - this is it!

£2299.95 D

AMERITRON AL-811XCE 160m - 10m 600W



This Ameritron design gives a sensible power gain for a very reasonable price. It has a hunky built-in power supply with full monitoring of operation conditions. It uses three low cost 811A tubes to achieve the power output running from a 1500volt HT line. This desktop design can easily be accommodated. 350 x 210mm Weight: 14.51kg

£899.95 D

QRP HF Transceivers

YAESU

FT-817

A take anywhere all mode transceiver. 2.5 Watts from 1.8 - 70cms from internal batt. Or 5W from external 12v DC. This radio has stood the test of time and comes with its own battery cell pack and AC charger, plus mic. and telescopic whip. A complete all-mode all-band station.

IN STOCK **£539.95 D**



HB-1B HF

This little CW 80, 40, 30, 20m transceiver runs 6 Watts from ext. 12v or 4W from optional internal lithium cells. Has tunable filter 400Hz-3kHz, electronic keyer, programmable auto CQ, 30 memories, switched tuning speeds. Also receives SSB from 3.4 - 16MHz.

IN STOCK **£249.95 D**

High Performance Receivers

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AR-MINI

This amazing little radio covers 100kHz - 1.3GHz AM FM & WFM. 1000 memories, over 30 programmable features inc. CTCSS & DCS. Alphanumeric memories give meaningful channels and there is a built in bar antenna covering 100kHz - 5MHz. Inc. NiMH pack & charger. FREE software database for PC loading via h.

£169.95 D



AR-8200-MKIII

The famous scanner with the quality performance. 530kHz - 3GHz AM FM FMW & SSB. Inc. batts, charger + cigar lead. If you are looking for a truly wide-band great performer this is the best in its class!

£499.95 D

AR-8600MKII Base or Portable

The AR-8600MKII is a base or portable station receiver covering 530kHz - 3GHz. All modes AM FM FMW & SSB with standard rotary tuning. Requires external 12V or optional internal batt pack. A great station accessory for general listening or extra receiver.

£699.95 D



VHF UHF Mobiles

FT-2900E

75 Watt 2m 3W Audio, CTCSS, DTMF mic & "WIRES" internet.

£142.95 D



FT-7900E

2m/70cms mobile 50/40W CTCSS, DTMF, "WIRES" internet, wide Rx

£239.95 D



FT-8800E

Dualband Mobile 50W / 30W Great Value

£343.95 D



FT-8900R

Quad band 10/6/2m/70cm FM 50W (70cm 35W)

£389.95 D



FTM-10E

2m/70cms Blue Tooth & built-in mic.

£324.95 D



FTM-350E

2m/70cm Mobile Bluetooth GPS APRS

£479.95 D



ID-E880

50 Watt Dual band 2m/70cm with D-Star and airband receive.

£439.95 D



TM-D710E

50 Watts 2m/70cms with APRS

£445.95 D



TM-V71E

2m/70cm Mobile with Echo Link

£299.95 D

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Come and visit our shops in Hockley & Glenrothes, Yaesu will be joining us. Enjoy free food and some great deals. In our usual Christmas spirit, we will have some special offers and great prices for callers only. Treat yourself for Christmas and get a bargain!

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Receive
£169.95 D



VX-6E
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handy, 5W
Wideband
Receive
£249.95 C



FT-60E
2m/70cms,
5W handy
Wideband
Receive
£129.95 C



VX-8GE
Dualband
2m/70cm
5W + GPS
Antenna
£349.95 D



VX-7R
Waterproof
dualband
handy
(silver/black)
£299.95 C



VX-8DE
Triple Band
6/2m/70cm
Upgraded
APRS
£369.95 D



IC-E80D
Dual band
2m/70cm
D-Star CTCSS
& DCS
GPS Compat.
£329.95 D



IC-E90
Triple band
2m 6m 70cm
+ wideband
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500kHz-1GHz
£244.95 D



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Rugged radio.
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2m/70cm +
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inc. SSB
£236.95 D



TH-D72E
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2m/70cm
with GPS &
TNC + SIRF
£426.95 D



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Dual band
2m/70cm
with CTCSS
DCS & LED
torch!
£81.95 D

EME Ready Systems

We are pleased to announce that we shall be installing an EME system at Hockley. This will comprise four bays of 6 element 2m LFA Yagis fed by a Discovery 2m Linear and controlled by a Yaesu G5500 Ez/EI rotator system. The system will be used to demonstrate both EME and regular VHF communications. With an estimated gain of around 23dB it should be possible to work the stronger stations. This is just another example of advanced communications system available exclusively from W&S.



2m Discovery 1.5kW



Yaesu G-5500 Rotator



4 x 6 element LFA Yagis

WATSON

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NEW



1:1-BALUN-1.5 1.5kW 1.8-30MHz A 1:1 balun able to handle up to 1.5KW RF power. Used to feed a balanced antenna, or doublet with unbalanced feeder, reduces static on feeding.

£49.95 C

4:1-BALUN-1.5 1.5kW 1.8-30MHz A 4:1 4:1 Extra High Power 1.5KW current balun for Windom, off centre fed or folded dipoles. Reduces 200 - 300 Ohms at feed point of antenna to 50 Ohms enabling the antenna to be fed with 50 Ohm coaxial cable.

£49.95 C



W-LINE
1:1 Line Isolator
400W 1.8-30MHz
Removes RF from
Coax. **£29.95 C**



1:1/4:1-BALUN
400W 1.8-30MHz
Can be used as centre
feed point.
Each model **£29.95 C**

MONO BAND HF DIPOLES

MD-12HP 12m for portable fixed station use 400W CW 1:1 Balun 5.77m **£39.95 C**

MD-17HP 17m for portable fixed station use 400W CW 1:1 Balun 7.95m **£39.95 C**

Carriage Charges: A=£4, B=£5, C=£8.50, D=£11



YouKits FG-01 Antenna Analyser

Graphic Colour Display!

It's what you have been waiting for!
A graphic antenna analyser that covers the complete HF spectrum and gives a clear picture of your antenna resonance and performance. Covers 1.8 - 60MHz with adjustable scan range. Operates from battery or external 12V. Provides dual VSWR and Impedance traces. Includes Lithium cells and AC charger.

£229.95 C

MFJ Automatic HF Antenna Tuners



MFJ-927

Weather protected remote auto tuner for coax / wire ant, includes MFJ-4116 Power Injector. This enables you to power the ATU down the coax lead feeding the tuner. This is a fit and forget item.

£254.95 C

MFJ-928



If you are looking for a simple auto ATU that does the job without fuss and matches all your antennas, whether wire, coax or balanced, then this may be what you have been looking for. It is very similar to the MFJ-929 but minus the LCD readout and the manual tune buttons.

£203.95 C

MFJ-929



IntelliTuner-Compact™ lets you automatically tune any coax fed or random wire antenna 1.8-30 MHz at full 200 Watts SSB/CW. It can match 6-1600 Ohms (SWR up to 32:1) - that's a 50% wider matching range at a higher power level than lesser competing products.

£214.95 C

MFJ-991B



World's First dual power level tuner -- Select 300 Watt SSB/CW and match 6-1600 Ohm antennas Or select 150 Watt SSB/CW and match extra wide-range 6-3200 Ohms. New 10,000 VirtualAntenna™ Memories. Like MFJ-993B, less digital SWR/Wattmeter/ LCD display, audio SWR meter/audio feedback, antenna switch or 4:1 current balun.

£214.95 C

MFJ-994B



600 Watt Intelli-Tuner™ automatic antenna tuner with new 10,000 VirtualAntenna™ Memories. It easily handles 600 Watts SSB/CW, and matches 12-800 Ohms. This is a great companion for lower powered linear amplifiers.

£349.95 C

Wireless Weather Stations

W-8681-SOLAR

This is weather station requires no connecting cable between the LCD monitor and the remote weather sensors. There is a large LCD control panel, solar transmitter, wind speed & direction sensors, temperature sensor, rain gauge and stub mast. All you need are 3x AA batts for the "new" LCD panel, the outside transmitters are solar powered! There is even a USB lead & software to connect to your PC!

£99.95 C

W-8681-MKII



Wireless weather station with LCD monitor and remote weather sensors. It offers amazing value and comes with everything you need to set it up in the garden. All hardware is included and the only items you need to supply are 3x AA cells for the LCD panel and 2x AA cells for the outside transmitter.

£79.95 C

Watson Power Supplies

Power-Mite-NF



Back In Stock! The original Mini 25A PSU. 25A Peak, 22A Cont. with Noise Offset.

£79.95 C

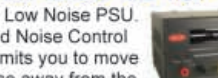
Power-Max-45-NF



38 Amp cont, 45 Amp Peak, Switch Mode PSU with variable voltage, V/A meters, & noise offset.

£129.95 C

Power-Max-65-NF



65 Amp Low Noise PSU. Patented Noise Control that permits you to move any noise away from the operating frequency.

£239.95 D

POWER-MAX-25-NF 22A PSU £89.95 C

W-5A 5A Analogue fixed 13.8V £33.95 C

W-10AM 10A Analogue variable £64.95 D

W-10SM 10A Switched fixed £59.95 D

Watson HF Antennas

Dual Band 2m/70cm

W-300 Base antenna 6.5/9dB

3.1m long **£89.95 D**

W-50 Base antenna 4/5/7.2dB

1.8m long **£59.95 D**

W-30 Base antenna 3/6dB

1.15m long **£49.95 D**

W-627 Triple band 6/2/70cms mobile whip with PL-259 base. 2/4.8/7dB gain. 1.6m long with foldover base. **£39.95 C**

W-7900 A smart, well constructed 2m/70cms whip with foldover base. 5/7.6dB 1.58m long. **£34.95 C**

W-3HM Hatch mount for mobile antenna. Fits all car hatch doors and mounts firmly with full angle adjustment. **£14.95 A**

W-3CK Cable kit 5m long to fit W-3HM. Low loss cable with SO-239 antenna mount & PL-259 to go to radio. **£18.95 A**

Heil Microphones

NEW Genesis HM-12



The HM-12 Genesis mic from Heil is the latest dynamic design with cleverly sculptured frequency response to suit modern radios. If your radio has an EQ adjustment, then this is the mic to use for that distinctive, crisp, Heil sound. Then look at the price!

£69.95 C

NEW Mic Desk Stands

K-601 Foldable Tripod with clip **£9.95 C**

K-701 Gooseneck Desk Stand **£14.95 C**

K-901 Desk stand with Boom **£29.95 C**



Miracle Antennas

MIRACLE-WHIP

A tunable telescopic whip covering 3.5 to 460MHz. Up to 25 Watts PEP, fitted with PL-259 plug. Great for FT-817 & IC-703 or any other QRP radio.

£129.95 C

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All models have 12V backlight and include DC Cable.

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AV-1000 1.8-1300MHz. **£79.95 C**



Cross Needle Models - Even Lower Prices!

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AV-40 15W, 0-150W, 144-470MHz **£39.95 C**

Create Rotators

RC5-1 Medium Duty Rotator



*Rotating torque: 6kg/m

*Braking torque: 80kg/m

*Mast size: 48-63mm

*Vertical load 400kg

*Horizontal load 800kg

*Rotation speed: 60-150sec/50Hz

*Power: 230V AC 80VA

*Weight: 5kg *Cable: 7-core cable (not supplied)

*Requires MC-2 lower mast clamp if mounting on pole

£619.95 D

RC5-3 **£779.95 D**

Same as above but with preset control.

bhi DSP Audio

NEW MINI-SWITCH

2-Way Switch Box, connect 2 radios to your bhi noise cancelling product.

£19.95 A

NES10-2MK3

Speaker & programmable DSP unit. Dramatic noise reduction.

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NEIM-1031MKII **£142.95 C**

Noise Eliminating In-Line Module.

NEDSP-1061-KBD **£101.95 C**

Noise Eliminating DSP module for FT-817

NEDSP-1062-KBD **£106.95 C**

Noise Eliminating DSP module for speaker.

ANEM-MKII **£127.95 C**

In-Line "Noise Away" amplified DSP module.

DSPKR **£154.95 C**

Noise Eliminating DSP Ext. Speaker 10W.

DTNA - NOISE-AWAY **£154.95 C**

Amplified DSP Noise Cancelling Desk Speaker.

RADIOMATE **£89.95 C**

Compact keypad for Yaesu FT-817/857/897.

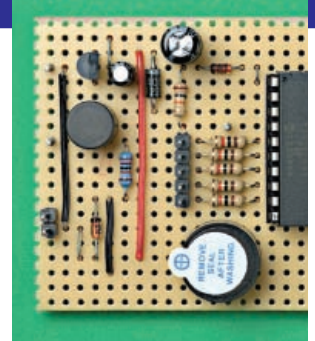
CAT-MATE **£50.95 C**

Electronic Y Splitter for Yaesu CAT Interface



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Front cover Design by Art Editor **Steve Hunt**.



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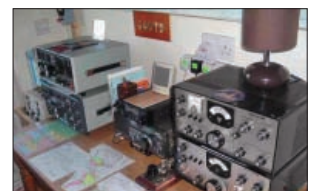
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Rob Mannion G3XFD/EI5IW's

Keylines

Rob has been enjoying testing his new antenna system with the help of WSPR and also suggests how fellow hobbyists could help less physically-able Amateurs erect and maintain their antennas.

I'm continuing to enjoy evaluating my new erected inverted 'V' dipole antenna and I'm also dabbling my two size-15 feet into the fascinating WSPR propagation monitoring system developed by Joe Taylor K1JT. This has been made possible because helpful friends on the WSPR forum web pages located a source of WSPR software that would work on my Apple Mac computer.

I was directed to the web pages operated by Jeremy McDermond NH6Z, where I could download the software for the Apple Mac. Fortunately, I've found that the software works quite well on my Apple Mac laptop, although it 'falls over' after a while.

Unfortunately, I've also discovered that the software won't work at all on my main Apple Mac computer. My friend and colleague, the PW Technical Editor and colleague Tex Swann G1TEX – who is also our IT Manager – has found similar problems on his Apple computers.

I E-mailed Jeremy NH6Z to thank him for his obvious hard work developing the Mac software for WSPR and he told me it was a "Work in progress" and he doesn't have too many "Amateur Radio Time Units" to spare at the moment (very apt!). Hopefully though, he'll eventually get round to putting the final polish on his already magnificent work on behalf of Amateurs using Apple Macs.

Operating WSPR & L-Plates!

I was soon able to get on

to the WSPR frequencies – but obviously still wearing L-plates! I became confused with the (very simple) split frequency system used for WSPR transmission and reception. However, after one or two false starts – including a lucky break where I transmitted on the correct frequency and listened on the same frequency.

Despite my mistakes I soon found my callsign appearing on the relevant band's map on the website. I had two remarkable results – my activity was spotted by a friend I had lost contact with – and my WSPR signal was received in Australia. What was remarkable about my 7MHz transmission was that I was transmitting at a level of 1W during the early evening UK time.

The WSPR system has allowed me to evaluate my new antenna very effectively and I'm confident that – with patience – I'll soon be successful in working VK on 7MHz using c.w, s.s.b. or PSK31. I've just got to find more 'Amateur Radio Time Units' to keep listening in my shack!

I urge PW readers to visit the WSPR website where, I'm sure many of you will be fascinated at the (regularly up-dated) maps showing successful WSPR reception reports. I'm equally confident that our readers – who always seem to be keen on getting the most out of relatively low power, will be intrigued at the very low power levels used. Our dedicated *Antenna Workshop* author Peters Dodds G3LDO has shown us (December 2011 PW)

how we can use WSPR to evaluate our antennas. We should all follow his lead!

Difficulties Erecting Antennas

Following my mention of the difficulties I have erecting antennas nowadays, a number of disabled readers have contacted me describing their own problems. And from some of the E-mails that have come my way my own small problems seem minute indeed!

As I expected, most of the disabled Amateurs who contacted me have had willing help from their local clubs. And, of course, this is where our clubs come in action in a most effective way – and for me it meant that Dave Mason G3ZPR made my antenna base. Dave is a very practical Engineer!

But what if the the person who is unable to erect their own antennas doesn't have a 'practical friend' or isn't a member of a club? Even the excellent **Radio Amateurs' Invalid & Blind Club** – the Charity for disabled radio enthusiasts – clearly state in their club journal *Radial* that they aren't able to provide antenna erection services.

So, perhaps we need to have an informal dispersed group of radio enthusiasts who would be willing to help erect and maintain antennas for those who can't. I fully realise that 'health and safety' and insurance will intrude in their usual way – but I still think by grouping together, and perhaps supplementing the RAIBC's work, we could fill the gap. What do you think readers?

Rob Mannion G3XFD/EI5IW

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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 the Book Store page for details.

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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.



Readers' Letters

Send your letters to:

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

Please note that the opinions expressed in any letter published in *PW* are those of the named correspondent whose letter has been published and they don't necessarily reflect the opinions of the Editorial staff or PW Publishing Ltd. **Editor.**

The PME Problem Again!

Dear Rob,

I see that PME has raised its ugly head once more. I first came across it in early 2006 when having returned to Amateur Radio after a nine year gap, I felt it prudent to read up on the current RSGB's *Operating Manual* – and there it was on page 33!

I tried to find out from EDF – my then supplier – as to my exact set-up at the current QTH but they were less than helpful. I was eventually able to confirm that I was not a PME user with the kind assistance of **Godfrey Manning G4GLM**, fellow local Amateur and *Radio User* author.

There's a paper issued by the RSGB – EMC 07 which goes into the subject in some detail. But for me a 'non-techie' (Marketing was my game) it seemed to pose more questions than it answered. However, I wouldn't have thought it mattered for most of us with modern gear, which is all low voltage driven via an independent power supply.

Accordingly none of my gear has a mains earth except the power supply itself and I note that it's negative – minus output connection, is isolated from the mains neutral. It's an old fashioned 30A linear transformer-equipped unit.

The main worry with PME of course is that if there should be a neutral discontinuity in the street supply, then my own r.f. earth could be carrying the whole street's neutral load to earth. The earth wire would I suppose get 'rather warm' or worse. I would have thought that a 30A or similar cooker fuse, in line with the shack's common r.f. connection (All my gear is connected to a common r.f. earth) would protect one against this very minimal risk. No doubt the 'Experts' will tell me differently.

Mike Stewart G4RNW
Bushey Heath
Hertfordshire

£20 Star Letter

A Real Welcome At The Grimsby ARS

Dear Rob,

As a 'newbie' to Amateur Radio and also a new subscriber to *PW*, I felt compelled to write and give my side of the story on prejudices between new and old and also towards the different levels of licence holder.

At present I'm not the holder of any licence but I'll be doing my Foundation Course shortly. As a prequel to this I signed up with a local club – the **Grimsby Amateur Radio Society** (GARS) – website www.gars.org.uk – in an effort to learn a bit more before I get to the exam.

The group has members of all ages and qualifications and meet at a local social club. But to walk into an upstairs meeting room hardly knowing anyone was slightly daunting! However, I needn't have had any worries. As I've never met such a great bunch – and there was no prejudice whatsoever and everyone was willing to help with any questions I asked.

So, I would heartily recommend this club to anyone in our area who wants to get into amateur radio or indeed present users who want to join a club to give them a look up. Thank you for the chance to air my views. Best wishes.

Rik Page
Cleethorpes
North East Lincolnshire

***Editor's comment:** Thanks for your letter Rik – I was delighted to hear of your good news. Please join me on the Topical Talk page for further comment.*

***Editor's comment:** Thank you for your letter Mike. Godfrey G4GLM has also 'vented his spleen' in his PW letter. I don't think this problem will ever leave us alone – but my earthing system is the same as yours and I will continue to use it unless I have definitive instructions from an official source to do otherwise.*

Bad Behaviour On The Air & DXpeditions

Dear Rob,

I hope my letter finds you well? I'm writing to offer a contribution to your letters page, in reply to your comments in your Editorial about conduct on the bands and specifically that surrounding DXpeditions.

I think that I would have to be a sociologist to try to explain the human behaviour that occurs on the Amateur

bands when a DXpedition hits town! It's perhaps the nature of the beast and is akin to a feeding frenzy.

Personally, I think that there's no single explanation – but generally I think it's fuelled by the obsessive need to 'acquire'. In the case of Amateur Radio it's the desire to gain another country towards whatever goal the individual is aiming for.

Some would say that by removing the Morse test and 'dumbing down' the test requirements has increased the problem of poor operating. That's too simple and I don't think this is the real cause.

I suggest that – in the case of DX operations – there are a number of people who don't actually bother to listen. Neither do they bother to obtain their information from one of the numerous websites, which give time and frequency of such activity. They then start bawling their callsign – even if

they can't hear the DX station.

I also think that there are also a number of people who just want to cause deliberate interference to the rest of the Amateur Radio community. They have the attitude that if they can't work the DX – then nobody else will. Most of these people don't give their call signs.

The nuisance stations aren't limited to s.s.b. either! I can say this because nowadays I mostly listen for DX operations on Morse these days and have often heard deliberate QRM, and bad language. I must also admit that I've sometimes told the idiots to clear off (in Morse) and joined the 'DX Police' on occasions.

There has been much debate as to what to do about the situation, but in truth there is nothing that can be done. We can only conduct ourselves in a courteous manner and hope that it might catch on.

The best way is to enjoy the enhanced propagation conditions while they last and stop moaning. The other way is to spin the dial and work somebody else or hit the off button and go and build another model steam locomotive. This works for me. Best 73.

**Peter Lewis G4VFG (ISWL Hon. Sec.)
Bittaford Wood
Ivybridge
Devon**

Editor's comments: I fully agree with your approach suggesting we must act properly on the bands ourselves. Personally, I feel that the recent Christmas Island DXpedition's operators were first class. They were – at times – operating under very difficult conditions with severe QRM and offensive behaviour. My congratulations go to everyone involved with the DXpedition.

An Experienced Instructor's Views On The RAE & Its Successors

Dear Rob,
Just a point about the correspondent comments on the RAE and the comments made. Also the comments that have been made in recent months in the *Radio User*, on the subject of the RAE.

I have been teaching the RAE syllabus for over 48 years now, the days from when it was an equivalent level to an HNC with some slightly different subjects i.e., No 3-phase motors or generators, power factors, etc. But including antennas, propagation and r.f. signal generation, control and measurement. There is also licensing law and operating procedures.

Difficulties Erecting Antennas

Dear Rob,

I was interested to read your Keylines in *PW* about your experiences in staying upright when you were erecting your new antenna. I suffer from MS and I've adopted the same method as you – by sitting in a chair to affect antenna repairs.

My own battery buggy is too heavy for my lawn so I don't risk it when my mast or antenna requires repairs, etc. Instead, my kind son-in-law lowers it when required. Our local TV antenna erector charges me a reasonable sum to look after the chimney stack end.

But what we really need is a group of 'Antenna Amateurs' to help us. Can *PW* perhaps organise help? As I live alone nowadays, I appreciate you agreeing not to publish my address details.

Steve, Northamptonshire

Editor's comment: Thanks for your letter Steve and I've started the ball rolling – see Keylines this issue.

Remember then it was a question and answer paper – you had to select 8 out of 10 with both in part one of the paper to be completed and you provided the written answer. With questions like "Describe, with the aid of diagrams an antenna system that will operate on more than one of the Amateur bands with methods of connection and feeding this antenna from a transmitter". Or "Describe and draw a power amplification stage capable of producing 150W RF output, matching a wide range of aerial impedances on frequencies from 1.8 to 30MHz"

I think the new three exam system is set at the correct levels. Remember we are being given a licence to transmit with powers of 400W p.e.p. on a wide range of modes and frequencies. All in all it allows a wide range of privileges to an Amateur operator.

Just because many Amateurs passing the exam these days go out and spend up to and over £1000 on a transceiver and £300 on a ready made antenna and have the local TV antenna erector put it up. Plug it in and they'll be on the air! However, how many operators have an absorption wavemeter for the bands used – including h.f., v.h.f. and u.h.f., or even know what it's for? When asked about the wavemeter we can get the reply "I have spent £1000 on the set with digital readout! it must be on the right band!"

Remember: The **Foundation Licence** course teaches the rules and regulations, the frequencies allowed for operation and the powers allowed

in each section, also including and demonstrating operational procedure and practice. Not to mention Health and Safety during operation.

The **Intermediate Licence** provides information on components used in relevant Amateur Radio equipment, on circuits and construction, building techniques plus soldering techniques and health and safety subjects. Also, it covers simple test equipment used to determine what band you are on, and calibration procedures that can be used to determine what frequency you are on and bandwidth you are occupying. Also covered are methods of detecting if the signal being generated is clean and correct.

The **Full Licence** covers the handling and safety aspects of the higher powers that are permitted. Also covered are the resulting problems from interference that can result from the use of high power and some modes of transmission. The saying "With more power comes more responsibility" springs to mind here.

All in all I think the three tier system is a good introduction because even some Engineers holding a degree have no experience with antenna systems, r.f. matching, propagation, high power r.f. generation and handling. Finally, they must be able to fill out the insurance on their antenna system and the guarantee form on the £1200 rig they've just purchased. Best wishes.

Michael Stott G0NEE/ KB5MPO
(formerly G8BGU)
**Ovingham on Tyne
Northumberland**



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 call sign with your E-Mail. All letters intended for publication must be clearly marked 'For Publication'. **Editor**



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Stoke-on-Trent ARS Visit Woofferton HF Transmitter

Albert Allen G4DHO E-mailed

Newsdesk with some interesting news.

"In the early autumn of 2011, the **Stoke-on-Trent Amateur Radio Society** (SOTARS) travelled to Shropshire to visit in the Woofferton h.f. radio broadcasting station, which transmits the BBC World Service. Our host was **Dave Porter G4OYX**, who wrote an interesting article on the earthing systems in *PW*.

"We all had a very interesting time and Dave G4OYX gave us a wonderful tour and we learned much about the station and how it's been busy since it was built during the Second World War. Our grateful thanks go to the owners **Babcock International Group** and all the staff at Woofferton for making us very welcome. It was a great day out and we all envied the huge masts and QRO transmitters that Dave G4OYX and his colleagues look after!"



Members of the Stoke-on-Trent ARS really enjoyed their visit to the Woofferton transmitter where Dave Porter G4OYX was their welcoming host.

"Our Club meets at 7pm on Mondays and Thursdays at **The '45' Club, 92 Lancaster Road, Newcastle-under-Lyme, Staffordshire ST5 1DS**.

Everyone is welcome! Our website – www.qsl.net/g3gbu/ – is 'off the air' at the moment but will be back soon – so keep an eye open for our club news".

Albert Allen G4DHO

E-mail: g3gbu@qsl.net

Nevada Strengthens Amateur Radio Team For Success!

Mike Devereux G3SED – Managing Director of **Nevada** in Portsmouth, Hampshire called Newsdesk, "We're pleased to announce the appointment of **Tim Johnson G0WBR**, to our Amateur Radio Sales department. Tim has held an Amateur Radio Licence for 19 years and a keen h.f. and v.h.f. contester. I've attached a photo of Tim in action!"

Tim G0WBR says "I'm passionate about Amateur Radio and keen to help newcomers develop and progress. I'm also really excited at the opportunity help Nevada's Amateur Radio department grow and to help fellow enthusiasts."

Mike Devereux G3SED

Managing Director

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Website: www.nevada.co.uk



Tim G0WBR in action at Nevada's Amateur Radio Department.

Jamboree At The Runway's End

The 2011 JOTA station **MX0HBA** at the Runway's End Scout Activity Centre in Hampshire was hailed a great success by organisers from the **Hog's Back Amateur Radio Club** (HBARC).

Chairman **Bob Head M0RHE** commented,

"More than 50 cubs, scouts and their families really enjoyed their visits to the station. In particular we were

so pleased to welcome **Rowena**, wife of **Norman Vickerstaff G0VYR** (Silent Key), son **Peter** and grandchildren **Alex** and **Abbie** (pictured in foreground in the photo by **Paul Le Feuvre G0DBS**) using Norman's FT-1000, generously bequeathed to the club earlier this year. Their wish is that his fine rig is used regularly inspiring newcomers to our hobby, and during the weekend it certainly was."

Meeting are held regularly at the Runway's End Activity Centre at Farnborough in Hampshire, club details can be seen at www.hogsback-arc.org.uk

Simon Lambert M0XIE (Hog's Back ARC Secretary)

E-mail: simes@m0xie.com



British Amateur Radio Teledata Group 2012 Contests

Roger Cooke G3LDI Chairman of **BARTG** contacted Newsdesk, "The dates of the 2012 BARTG RTTY contests for the year and full rules etc., can be obtained from the BARTG website: www.bartg.org.uk/contests.asp Follow the link to the required contest rules.

Contest dates: The BARTG Sprint is to be held on January 28th and 29th 2012. The BARTG HF Contest is to be held over the period March 17th, 18th and 19th March 2012. The SPRINT75 takes place on April 28th 2012 and the next SPRINT75 takes place on September 23rd 2012. I'd also like to wish everybody a Happy Christmas and a fun-filled 2012 contest season".

.73 de Roger G3LDI Chairman BARTG

E-mail: roger@g3ldi.co.uk

The RNARS Support Maltese Radio Circle

The **Royal Naval Amateur Radio Society** (RNARS) have announced that they have been supporting the **Mellieha Amateur Radio Circle** (MARC) in Malta by donating a transceiver. The MARC club is an Affiliated Club member of the RNARS and has a history of a number of years in assisting the **Mellieha Scout Group** with radio and communications and operates under the callsign 9H9MSG.

The MARC group has its base in Fort Mellieha in Malta, which is equipped with some antennas and some domestic equipment – but has never had its own radio. Various members of MARC have had to transport their own transceivers up to site to enable the group to operate, especially in **Jamboree on the Air** (JOTA) and whenever they operate 'field days' at local high profile events.

The RNARS heard of their plight and donated a **Yaesu FT-747GX** transceiver which was surplus to their requirements. The presentation of the radio was made by **Bill Mahoney**, a Life Member of the RNARS who is also licenced in Malta with the call **9H1BX**. The presentation took place on Saturday November 5th at the MARC site in Mellieha Fort.

The Society can be contacted by post at: **HMS Collingwood, Newgate Lane, Fareham, Hampshire PO14 1AS**. The Society website can be found at www.rnars.org.uk

The contact is **Lt-Cdr. Doug Hotchkiss G4BEQ** and he can be contacted by E-mail at: g4beq@btinternet.com or by post: **Flat 54, Sanderling Lodge, Rope Quays, Gosport, Hampshire PO12 1EN**.

Waters & Stanton Gain New Range of Antennas

Peter Waters G3OJV of Essex-based **Waters & Stanton PLC** E-mailed *Newsdesk*. "We have been appointed sole UK resellers of the **InnovAntennas** range of antennas. It's particularly pleasing that these are a UK-made product by one of our long-term customers **Justin Johnson G0KSC**. Justin is a regular speaker at the RSGB Convention and his antennas are becoming known world-wide. They are becoming a firm favourite for EME use, and because of their extremely low noise characteristics, many v.h.f./u.h.f. DXers are changing to them. The accompanying photograph shows one of the smallest in the range, the 4-element 144MHz model that boasts 9.5dBi gain and a massive 29dBi front-to-back ratio. Models are available for 144 and 430MHz, and also for 10 to 50MHz. Full details can be seen on our website www.wsplc.com.

Regards.

Peter Waters G3OJV

Waters & Stanton PLC

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FAX: **(01702) 205843**

E-mail: sales@wsplc.com



Nevada Announce New Alinco Power Supply

Nevada Radio, based in Portsmouth, Hampshire have announced that Alinco have launched a new MkII Version of their popular DM-330MW 30A switch mode power supply. The press release states that, "The MK11 unit has even more filtering added, placing this power supply in a different class to the cheaper Chinese copies on the market. With it's light weight and high specification, it's an ideal portable or home power supply for expensive h.f. radio equipment, where both low noise and reliability are key issues".

The DM-330MW MK11 will sell for £139.95 and is available from Nevada. Further information from Nevada.



Astronaut Julie Payette Interviewed

In a recent podcast **Chelmsford Amateur Radio Society** (CARS) member **Pete Sipple 2E0PSL** asked NASA Astronaut **Julie Payette** about the Amateur Radio station on the International Space Station (ISS).

Julie Payette was a flight engineer on two ISS missions, STS-96 and STS-127, and her answer can be heard in the ISS Essex Amateur Radio podcast in which Pete 2E0PSL also speaks to the Chair of CARS **John Bowen G8DET**. You can listen to the ISS Essex Amateur Radio podcast at www.essexham.co.uk/audio/essexham_iss.mp3

Read about the interview at www.essexham.co.uk/news/working-the-international-space-station.html



Note: Pete 2E0PSL achieved his Intermediate Licence this year on one of the CARS Amateur Radio training courses. To find out more about the courses please speak to **Clive Ward G1EUC**. Tel: **(01245) 224577**. Mobile Tel: **(07860) 418835**. E-mail: training2011@g0mwt.org.uk

The 'Essex Ham' Website can be found at www.essexham.co.uk/

Sarah Sipple M6PSK with Julie Payette.

It's Quiz Time In Bangor Northern Ireland!

The **Bangor & District Amateur Radio Society** (B&DARS) in Northern Ireland, meet on the 1st Thursday of every month in **The Boathouse, Groomsport BT19 6JP** at 8pm. **Mike Stevenson G14XSF** writes, "At 8pm on Thursday January 5th 2012 we are holding our annual quiz. This is always a great night, with many prizes up for grabs! As always, visitors and visiting teams are most welcome".

Michael Stevenson G14XSF (PRO)
69 Portaferry Road,
Cloughy Newtownards
County Down BT22 1HP
Tel: **(028) 42772383**
E-mail mike@g14xsf.com
Website <http://www.bdars.com>

Martin Lynch & Sons Appointed As Distributors For Alpha Amplifiers

Martin Lynch G4HKS E-mailed *Newsdesk* with his latest news. "ML&S are very pleased to announce their appointment as sole UK & Ireland distributors for the industry standard Alpha range of Linear Amplifiers from RF Concepts in the USA. These superbly engineered amplifiers are all hand-built to a very high standard in Longmont Colorado, USA. They are a long-established company – 40 years ago, under the original company name, ETO shipped the very first Alpha Model 70. They still build the most reliable power amplifiers in the world. Both the Alpha 8410 and the new Alpha 9500 will be on demonstration at the Chertsey store and are available from stock. Prices start from £4495 for the 8410 and £5995 for the 9500 series".



New Wouxun KG-UV6D Dual-Band Hand-held

Martin continues, "Following on from the best selling KG-UVD1P Dual-Band hand-held in the UK, ML&S are pleased to announce the new enhanced model, the KG-UV6D from Wouxun in China. This new model replaces the UVD1P and sports several upgrades over its predecessor. It has an 8 Group scrambler, DTMF encode and decode, CTCSS can be set discretionarily and 5/2 Tone and 1750Hz tone burst are just some of the few options. First stocks will be available during December – just in time for Christmas. Price to be confirmed but should still be under the £100 mark including base charger, Li-Ion battery pack, antenna. etc."

For images see: www.wouxun.com/Two-Way-Radio/KG-UV6D.htm

Best regards, Martin.



ML&S Martin Lynch & Sons Ltd., Outline House, 73 Guildford Street, Chertsey, Surrey KT16 9AS

Tel: (0345) 2300 599 FAX: (01932) 567222 E-mail: sales@hamradio.co.uk Web: www.MLandS.co.uk

A Busy Amateur Radio Month For The ROC Bunkers!

Busy Young Lady (YL) **Bobby Wadey MI0RYL** contacted *Newsdesk* to provide an up-date. "October was a busy month for ROC Bunkers on the Air and we hope you all enjoyed the first annual event which we will be running again over October 2012. However don't forget we have a number of awards for you 'chasers' and activators. So, if you think you can't wait that long, then complete the activation form at www.roc bunkers.co.uk/activationform.htm and watch the website and Facebook pages for all details.

A quick summary of ROC Month and images of various locations and activators. When starting this new award, we knew it would interest many people, but the level of interest has even surprised us. With over 32 stations on the air, and many activating more than one Bunker throughout the month, there was certainly plenty of opportunity for people to qualify for the available awards.

With this being the 20th anniversary of the stand down of the Royal Observer Corps, we felt it was fitting to add an extra award for the 20th anniversary, which can be applied for through the website.

A wide range of people have been enjoying the first annual ROC Bunkers month, and I have to say one of our most

inventive was perhaps **Ricky Duckhouse MW6GWR**, 12 year-old Ricky has been out, bike portable, activating and making contacts throughout the month. In the attached image he was close to **Domen Ddreiniog**, a medieval Motte (also a location of a bunker) on the



Ricky Duckhouse MW6GWR busy on the air.



bank of the River Dysynni, near Tywyn (Towyn) in Merionethshire, using 5W into a dipole.

So, finally all we can say is thanks for enjoying our event and keep an eye on the calendar at www.roc bunkers.com

Bobby Wadey MI0RYL

E-mail: lamph121@btinternet.com

Radio Amateurs All At Sea With Mike Devereux G3SED!



Mike Devereux G3SED had an exciting weekend afloat on November 19th/20th in his motor cruiser and operated Maritime Mobile. "You might be interested Rob that I spent my weekend out at sea on my 42ft motor cruiser *Marianna* playing radio with my friends **Carl Kidd G4GTW** and **Bob Cornish G0DOK**. We had great fun flying a 185ft vertical with a kite support. Performance on 80 and 160m was spectacular, as you would expect. Amazing



during the day to hear 80 metres full of Europeans and the very low angle take off meant I could not hear the Gs locally! Here are a couple of pictures that give you the flavour of what I was up to and we're going to do it again!" 73 Mike.

KENWOOD

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Handhelds

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Accessories

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Accessories

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Mobiles

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Hand-helds

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YG5-4 4 metre 5 Element (Boom 104") (Gain 10.0dB)	\$79.95
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GSRV-FSF	Half Size Original High Quality Flexwawe Version, 102ft Long, 10-80 Metres	£39.95
GSRV-HSP	Half Size Original PVC Coated Flexwawe Version, 5ft Long, 10-40 Metres	£39.95
GSRV-FSP	Half Size Original PVC Coated Flexwawe Version, 102ft Long, 10-80 Metres	£44.95
GSRV-HSX	Half Size Deluxe Version with 450 Ohm ladder, 5ft Long, 10-40 Metres	£49.95
GSRV-FSX	Half Size Deluxe Version with 450 Ohm ladder, 102ft Long, 10-80 Metres	£54.95

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<i>(MTD-5 is a crossed dipole with 4 legs)</i>	

MTD-300 2-30M Broadband wire dipole antenna.....**£149.95**

The MTD-300 broadband dipole antenna is designed to provide optimum performance over a wide frequency range and is very easy to assemble and use.

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ATOM-AT5	5 Band mobile 40/15/6/2/70cm, Length just 130cm, 200W (2/70) 120W (40-6M) PL259 fitting, (great antenna, great price and no band changing, one antenna, five bands).....	£69.95
ATOM-AT7	7 Band mobile 40/20/15/10/6/2/70cm, Length just 200cm, 200W (2/70) 120W (40-6M) PL259 fitting, (Brilliant antenna HF to UHF with changeable coils)	£79.95

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MR3 POWER ROD	270cm, Gain 2.0/3.5dBd, Length 50cm, PL259 fitting (fiberglass colinear).....	\$32.95
MRQ800	6/270cm Gain 3.0dBd/5/7.5dBdBd, Length 150cm, PL259 fitting (high quality).....	\$39.95
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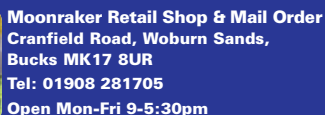
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SQBM500N	2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, N-Type	£79.95
SQBM800N	2/70cm, Gain 8.5/12.5dBd, RX 25-2000MHz, Length 520cm, N-Type	£139.95
SQBM1000P	6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, SO239	£84.95
SQBM1000N	6/2/70cm, Gain 3.0/6.2/8.4dBd, RX 25-2000MHz, Length 250cm, N-Type	£89.95
SQBM223N	2/70/23cm, Gain 4.5/5.7/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type	£74.95

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Hustler 6-BTV	6 Bands 80-10m	1000W	Length 7.30m	Weight 7.5kg		£269.95



Exploring The PIC Micro-controller

Phil Cadman G4JCP begins his new series, which is aimed at providing a comprehensive introduction to using PICs in practical projects.

Welcome to a new series of constructional articles, all of which will use one or more programmable integrated circuits (PICs) micro-controllers. In the May and July 2007 issues of *PW*, I described a Beacon Clock for use when monitoring the 18 beacons of the **Northern California DX Foundation's International Beacon Project** (NCDXF IBP).

The Clock used a PIC micro-controller to greatly simplify what would otherwise have been a relatively complex hardware design. In addition, the micro-controller allowed the option of using a liquid crystal display in place of the 18 l.e.d.s used in the basic clock.

Introduction To PICs

I wrote an introduction to the PIC micro-controller in the May 2007 issue* of *PW*, and I recommend reading that if you have access to a copy. For now, I'll briefly repeat what a micro-controller is, and then describe some of the common features of the MidRange PIC family of micro-controllers.

Since the *PW* IBP Beacon Clock was published, new PICs have been introduced and some older devices have either been updated or reclassified as 'mature' products. In this context, mature implies that these products are still available (and hopefully will be for some time) but are not recommended for new designs.

**Photo-copies can be purchased from the *PW* offices. Editor.*

What's A Micro-Controller?

So what is a micro-controller? To answer, I'll provide a detailed look. In fact, a micro-controller is a microprocessor, which has (on the same piece of silicon) a clock generator, program memory, data memory, various peripheral devices and input

and output ports. The USA-based company **Microchip** manufacture many PIC micro-controllers, from simple 8-bit devices up to powerful 32-bit and digital signal processing (DSP) devices. The 8-bit PICs are still probably the most popular and are now split into four groups: the Baseline family, the MidRange family (which I'll be using), the Enhanced MidRange family and the PIC18 family. The latter is currently the most powerful of Microchip's 8-bit architectures.

Microchip – like other similar manufacturers – produce a large range of devices. These range from the very simple and inexpensive, to complex devices boasting high performance and lots of peripherals. This wide variety allows commercial users of PIC micro-controllers to choose a device which gives them the facilities and performance they require, at the lowest possible cost.

Electronics enthusiasts, on the other hand, aren't quite so financially constrained and we like to experiment. So for us, it makes more sense to concentrate on a few general purpose devices that we can use for most projects.

Literature Reviewed

After reviewing the current PIC literature, I decided not to use any of the older PIC devices such as the one used in the Beacon Clock. Instead, I'll be using more recent PIC devices which have the advantage of better performance, enhanced peripherals, lower power consumption and lower cost. Also, I've had a change of mind regarding programmers and development tools.

I used a text editor to create the program for the Beacon Clock and a Velleman K8048 PIC Programmer

and Experimentation Board kit to transfer the program to the PIC itself. (I reviewed this kit in the April 2007 issue of *PW*.)

The Velleman kit, in common with most DIY programmers, uses the serial port on a computer to send the 'ones and noughts' to the PIC. However, as many computers now don't have serial ports – this immediately poses a problem.

Of course, USB-to-serial adaptors are available but these don't always work properly with the programming software. Additionally, DIY programmers only support a limited range of PICs and may not work on all operating systems. So for anybody who wishes to program their own PICs, I now recommend the **PICKit 2** USB programmer from Microchip.

One advantage of the PICKit 2 is its close integration with Microchip's integrated development environment (IDE) **MPLAB**, which is supplied on CD with the programmer. The CD also contains many datasheets and application notes.

The IDE includes a text editor specifically tailored to the writing of PIC programs, and a very useful and comprehensive simulator. Indeed, using the simulator allowed me to debug much of the code before testing it in the PIC.

Additionally, if you want to try your hand at writing programs for the PIC, there's the **PICKit 2 Starter Kit**. This comprises the PICKit 2 programmer and an experimenter's development and prototyping board which uses the **PIC16F690I/P** chip, the device I shall be using in the first project of this series.

Clearing Up A Point

Let me clear up one point next. The words 'program a PIC' can mean the

process of simply sending a program from a computer to a PIC device. That's very easy to do by anybody with a computer and a suitable programmer.

The phrase can also mean the process of writing a program to run on a PIC device. And that's a totally different thing. Like many electronics enthusiasts who have had prior experience with microprocessors – I prefer to write simple programs in **assembler**. For more complex programs I use the **C** programming language.

Writing in assembler gives the greatest control over how the microprocessor contained within the micro-controller operates. Each line of assembler code (usually) equates to one microprocessor instruction. The list of instructions a microprocessor can execute is called the **instruction set**, and in the case of the MidRange PICs, there are just 35 instructions in the set.

Enthusiasts with prior experience of programming will quickly get used to the instruction set, although those who have only used high level languages will be in for a bit of a culture shock!

For anybody who has no programming experience there are high level (although that's a relative term here) languages for PICs. There is a version of **BASIC**, plus some other languages specifically designed for PICs (and a few other micro-controller families).

Several companies produce C compilers for the entire PIC range, but I'd not recommend C to a beginner. Whether using assembler or a high level language, programming any microprocessor isn't like designing hardware. Some people find it easy and enjoy programming immensely, while others never get to grips with it!

The 16F90

The PIC16F690I/P - I'll call it the 16F690 from now on – is a typical mid-range PIC family member. The illustration in **Fig. 1**, shows a simplified block diagram of what's contained within the device. Remember, all of this is on the same tiny piece of silicon, but each item shown on the diagram can be treated as a separate component.

Indeed, many of the peripherals, once programmed (that over-used word again), operate autonomously and will send a signal (an interrupt) to the PIC's microprocessor only when they need attention.

Working down the left-hand side of the diagram, the first component of the PIC we come to is the microprocessor – or central processing unit (c.p.u.) – itself. This is the part that executes the

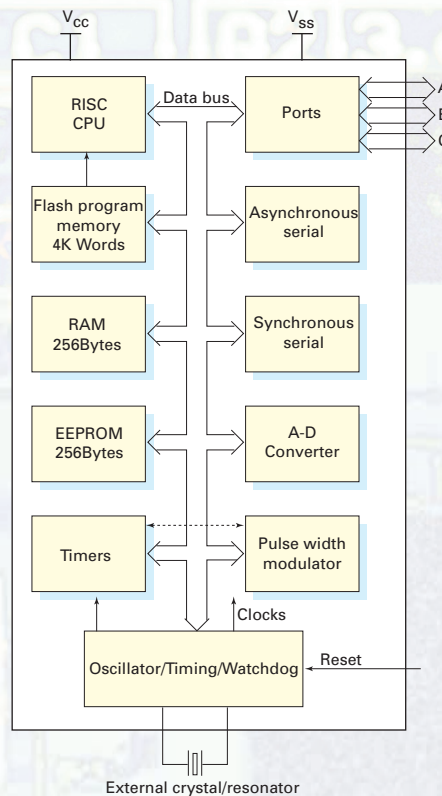


Fig 1: The simplified block diagram of what's contained within the PIC16F690I/P device. The ports are both input and output and with the exception of the two supply pins, take up all the external connections of the device.

assembler instructions I mentioned earlier.

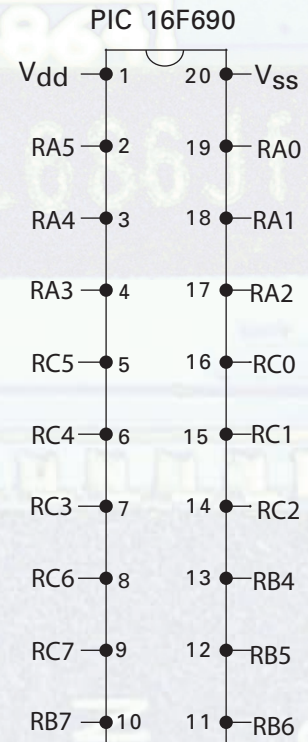
The type of c.p.u. used in the PIC is known as a reduced instruction set computer, or **RISC** processor – RISC processors use a small number of simple, fixed length instructions which execute in short, fixed lengths of time.

In practice RISC processors have a definite advantage over their more complex counterparts – such as the old Z80 and 6800/6502 microprocessors in that they can be implemented with quite small amounts of silicon. This makes them cheap, power efficient and fast.

The program which the c.p.u. executes is held in Flash memory. The c.p.u. has direct access to this memory, and so when fetching instructions does not use the data bus.

As you can see, the data bus connects the c.p.u. to the internal memories and all the PIC's peripherals and input/output (I/O) ports. As most computer users will know, Flash memory is electrically erasable and programmable non-volatile memory. Storing the program in Flash memory means that the same PIC can be reprogrammed many times over. In addition, the PICs which use Flash memory have a simple, two-wire serial programming interface, making them easy to physically program.

The amount of program memory



The 16F690 PIC has 18 multi-operation input/output pins and two fixed supply pins. In the manufacturer's documentation, each pin will be labeled with all of its functions, which can make it rather complex looking.

used in micro-controllers is tiny by computer standards, yet is more than sufficient for the tasks these devices are used for. Similarly, the amount of data memory – random access memory or RAM – provided is also tiny, but is sufficient for the vast majority of micro-controller applications.

Specifically, the 16F690 has 256 bytes of RAM and 4,096 (4K) words of Flash program memory (MidRange PICs use 14bit program words). Note that in the microprocessor and computer world, the suffix 'K' denotes 1,024 (2^{10}).

Many PICs also have another type of non-volatile memory: electrically erasable programmable read-only memory, or e.e.p.r.o.m. for short. The 16F690 has 256 bytes of this type of memory, which is used for storing data which needs to be 'remembered' while the PIC is without power. Then there are the timer/counters, of which the 16F690 has two 8-bit timers and one 16-bit timer.

On the right hand side of the diagram you'll find the input/output ports which connect the peripherals and the c.p.u. to the outside world. Some port pins are only used as simple inputs or outputs, whilst other port pins are shared with those peripherals which need access to external circuits. If the peripheral in question is not used then the port pin

can be used as a simple input or output.

There are many serial data transmission protocols in use whose purpose is to enable communication between different parts of a system. The 16F690 has both synchronous and asynchronous serial interfaces, including specialised hardware to support the I2C (TM) and SPI (TM) protocols.

A 12-channel, 10-bit analogue-to-digital converter is included, and this will be used in the first project. Associated with the timers is a peripheral which can produce a pulse-width modulated output. This is often used to create an adjustable analogue output through the generation of rectangular wave whose frequency and duty cycle can be varied.

The c.p.u. and most of the peripherals need clocks, and the 16F690 has two main internal oscillators: a high speed oscillator running at 8MHz and a slow oscillator running at about 31kHz. If not required, the 8MHz oscillator can be turned off and a separate oscillator circuit, which uses an external crystal or resonator, can be used.

Usefully, the internal 8MHz oscillator

feeds a binary counter, the outputs of which can be selected so as to provide a system clock ranging from 8MHz (no division) down to 125kHz (divide by 64). The 31kHz low speed clock can be used as the main c.p.u. and peripheral clock but its main purpose is to run supervisory circuits like the watchdog. The watchdog, as its name implies, can be used to 'keep an eye' on the c.p.u. and can force a re-set if the program goes astray.

Obtaining PICs & Components

Next, a note about getting hold of PICs and components. Using more modern PICs has advantages, but availability can be a problem as many small component suppliers don't stock them.

All the larger component distributors stock the PICs I shall be using but, of course, they will be un-programmed. As a service to constructors, ready-programmed PICs for this series will be available from **Bowood Electronics**, who advertise regularly in *PW*. Both versions of the PICkit 2 I've mentioned can be bought from any of the major component suppliers. The (free of charge) MPLAB IDE and all PIC data

sheets and application notes are available from the Microchip web site at www.microchip.com

Inevitably, there will be the odd special component used in these projects, so I shall always endeavour to give a source. Enclosures can be something of a problem, and I'd much rather leave it up to the individual constructor than specify an enclosure which may be difficult to get or may become quickly unavailable. A simple plastic box will normally suffice, while some projects can also be fitted into existing equipment.

All the software for these projects will be made freely available on my web site. I'm releasing the source code as 'freeware' which means it will be free to use for all non-commercial purposes. In addition, I encourage anybody who wants to write programs for PICs to freely use all or part of my code for use in their own projects.

Naturally, the HEX files will be available too. That's a type of file (normally produced by the assembler) which PIC programmers like the PICkit 2 can use directly.

Project

The PW PIC Battery Voltage Monitor

Phil Cadman G4JCP presents the first of his occasional series introducing practical PIC projects and this monitor for 12V lead-acid batteries should prove most useful!

I thought I'd begin the series with a simple yet useful project, which should have wide appeal. Most Amateur Radio gear is designed to run from a nominal 13.8V supply. Although 13.8V seems a strange voltage, it is – more or less – the 'float charge' voltage of most lead-acid batteries. This is fine if your radio is being powered from a mains p.s.u. or if you use a float charger to keep your battery topped up. However, when out mobile or portable, very often the only power source is a 12V battery.

If you look carefully at the specification of 13.8V Amateur Radio transceivers, you'll find the power supply voltage range is usually given as $13.8V \pm 15\%$. Now that means an operating range of 11.73V to 15.87V. Well, not many lead-acid batteries give out 15.87V so we can effectively forget that.

Of far more concern is the lower limit: 11.73V. Under discharge, a typical 12V lead-acid battery will still have some capacity available when its terminal voltage reaches this figure. One set of

figures quoted by a well known battery manufacturer specifies the 10hour capacity to a terminal voltage of 10.8V, and the 20hour capacity to a terminal voltage of 10.5V.

Utilising The Full Capacity

Clearly, to utilise the full capacity of your battery then it needs to be discharged to 10.8V, with a cut-off at 10.5V. This cut-off is important, because discharging a battery too much can cause permanent damage.

So, there are two concerns here.

of 14.4V to 15V – hence the yellow colour for LED7 and amber for LED8. Above 15.0V, LED8 flashes, indicating a possible over-voltage charger.

Points To Note

There are just a few points I need to mention. Firstly, fuse F1 is essential. Bearing in mind that the monitor may be connected directly across a lead-acid battery, if REG1 fails then a very large fault current could flow. The rating of the fuse is not critical, but I'd recommend 125mA to 1A maximum. Its purpose is strictly for safety, not to protect the monitor.

Notice that R12 is connected directly to the input. This is not a safety issue as long as the Veroboard track that connects to R12 is well isolated from all other tracks. Diodes D1 and 2 provide protection if the monitor is connected backwards. There's no over-voltage protection – so only use the monitor on 12V batteries and systems.

As the monitor gets its power from the battery it's measuring, it makes sense to reduce the current the monitor draws to a minimum. Choose resistors

R1 to 8 so that the l.e.d.s can be clearly seen but don't draw excessive current.

And remember that different colour l.e.d.s will probably need different value resistors to make them appear the same brightness. The 1k Ω resistors specified are a good starting point, but in any event, don't reduce the resistor values below 330 Ω .

Also, I've found that 78L05 regulators can draw a remarkably high quiescent current, a problem which influenced the hardware design of the PW IBP Beacon Clock. A regulator with a much lower quiescent current is the low drop-out TS2950CT5.0. This can be used as a replacement for the 78L05 in this circuit. But be aware that this (and similar low-dropout regulators) can be unstable and that the output capacitor (C2 in Fig. 2) is critical. Hence my choice of a 10 μ F component.

The Source Code

Looking through the source code – which is available from my web site at www.g4jcp.freemove.co.uk – will give you a detailed insight into how the battery monitor software works. So I'll

only describe the hardware – and how the software relates to it – in this article.

The PIC is programmed to use its internal, 1% accurate, 8MHz oscillator (a highly accurate clock isn't needed for this application). But as 8MHz is far faster than necessary, the program selects the oscillator's divide by eight output. Therefore the PIC behaves as if it's using a 1MHz clock – 1 μ S period – and will execute one instruction every 4 μ S. (All MidRange PICs take four clock cycles to execute one instruction).

One of the PIC's timers – Timer 0 – is used to generate an interrupt every 65,536 clock cycles. That works out to be just over 15 per second and is used to flash both the l.e.d.s and the sounder. Only one analogue-to-digital converter (ADC) channel is needed, and this is on pin 13.

The PIC's 10bit ADC is programmed to use the supply voltage (5V) as its reference. That means it will reach its full scale count of 1,023 when the voltage on pin 13 equals the supply voltage. A full scale reading of only 5V is not much good to us and so the input (battery) voltage is fed through a voltage divider comprising R12, 13 and 14.

Resistor R13 is made variable to compensate for tolerances in both the regulator voltage and resistors R12 and 14. The values of these resistors are chosen so that they divide the input voltage by approximately four.

If the input voltage was divided exactly by four, then the ADC would output 1,023 when the input was 20V. The number 1,023 is a-bit awkward because it makes the maths messy.

However, if R13 is adjusted so that an input voltage of 20V produces an ADC count of 1,000, then things become very easy indeed: each ADC increment represents exactly 20mV. This is a good example of where sympathetic hardware design can make the software much easier.

Writing The Software

While writing the software I wanted to check that the ADC was giving me the correct readings. So I added some de-bug code which transmitted the computed voltage out of the PIC's serial port in ASCII.

Even though this project didn't need a PIC with a serial port, having one available helped confirm the software was working correctly. The debug code is still in the program and so the input voltage is transmitted at 1,200 bits/second out of the serial port on pin 10, every second.

You can use the de-bug facility to view

Table 1 For LED Allocation

LED No.	Indicated Range	LED colour (Radio)	LED colour (General)
LED1	10.5V-11.0V	Red	Amber
LED2	11.0V-11.5V	Amber	Green
LED3	11.5V-12.0V	Green	Green
LED4	12.0V-13.0V	Green	Green
LED5	13.0V-13.5V	Green	Green
LED6	13.5V-14.0V	Blue	Blue
LED7	14.0V-14.5V	Yellow	Yellow
LED8	14.5V-15.0V	Amber	Amber

The PIC Battery Monitor Component List

IC1	PIC16F690-I/P
IC2	78L05 or TS2950CT-5.0 (see text).
Tr1	BC184 (or similar).
D1	1N4002
D2, 3	1N4148
LED1-8	(See table).
R1-8	1k Ω nominal (See text).
R9,10,11,14	10k Ω
R12	27k Ω
R13	5k Ω variable.
C1	100 μ F 25V
C2	10 μ F 16V
C3	10n
C4	100n
F1	500mA fuse TR5-style (see text).

Momentary push button switch n/o 12V (self-excited) sounder (CPC stock code LS03776) 20-pin i.c. socket. Suitable enclosure.

the input voltage on a visual display unit (v.d.u.) or terminal emulator (Window's Hyperterm, for example). You can then simply adjust R13 so the correct voltage is displayed.

Note: A word of warning, as the serial output on pin 10 is at 5V, you'll need a logic-level to RS232 converter to do this. Otherwise, the way to set R13 reasonably accurately is to put the monitor across an adjustable regulated p.s.u.

Then, for example, set the p.s.u. to exactly 12V and adjust R13 so that LED4 - the 12.0V l.e.d. - just lights. The accuracy of the monitor over time and temperature does depend on the accuracy of the 5V regulator, which isn't terribly good - although it's adequate for our purpose.

If you don't need an audible warning when the voltage falls below 10.5V, simply don't fit the 12V sounder. Resistor R10 and transistor Tr1 can also be omitted. Naturally, the mute button is then superfluous and likewise need not be fitted. However, leave resistor R9 in circuit. If you program the PIC yourself, use the connections shown in Fig. 2 to connect the board to the programmer.

Programmer's Documentation

The programmer's documentation will give full details and programming the PIC yourself does give you the opportunity to change the voltages at which the l.e.d.s illuminate - see the source code. One worthwhile modification would be to activate the sounder below 11.5V, remembering that once below 11.73V, most transceivers will be operating outside their rated voltage limit.

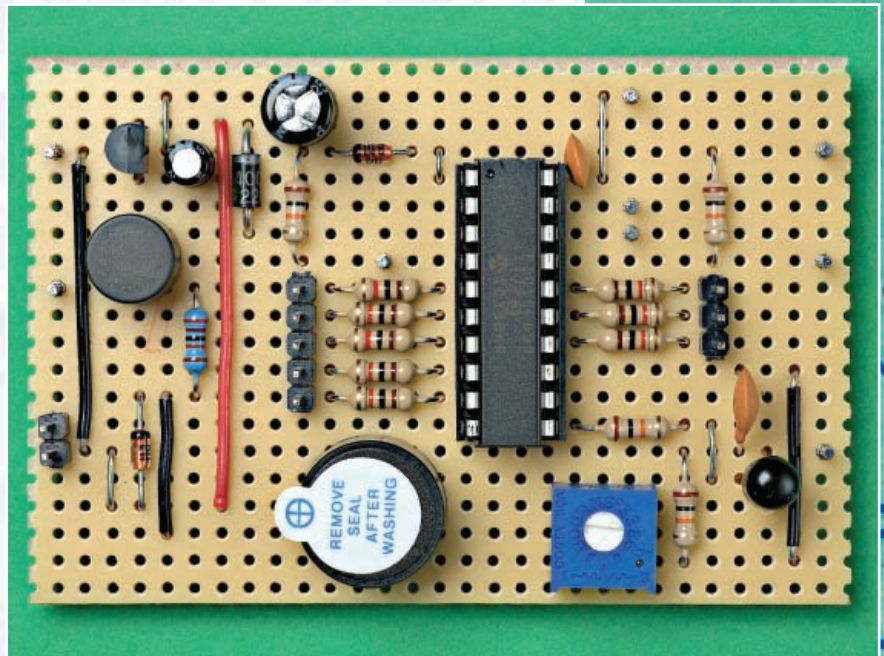
As I mentioned earlier, I added some de-bug code to check the operation of the analogue to digital converter. Using a v.d.u. or computer just to check a few characters did seem to be rather extravagant, so using a spare Velleman kit I made up a 'mini-v.d.u.'.

I'm calling the unit my LCD Serial Data Monitor and it's nothing more than a one line by sixteen character liquid crystal display (l.c.d.) module with a PIC attached. The PIC accepts serial data at various-bit rates and displays the received characters on the display. It also has the ability to display the ASCII values of the received characters in hexadecimal.

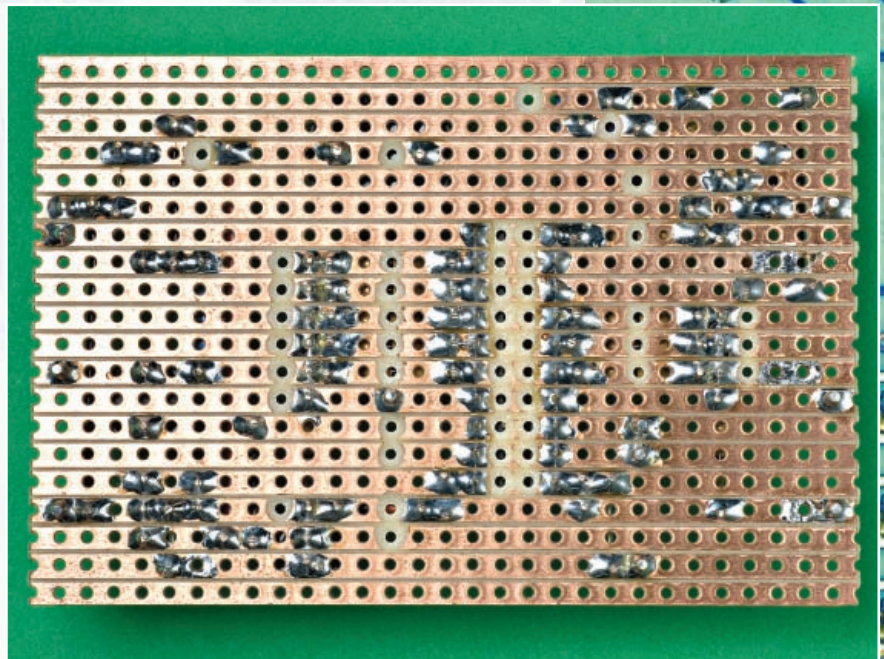
The software is available at www.g4jcp.freemove.co.uk together with the battery monitor software.

A Final Point

One final point - I realised that the sounder and mute switch were only used



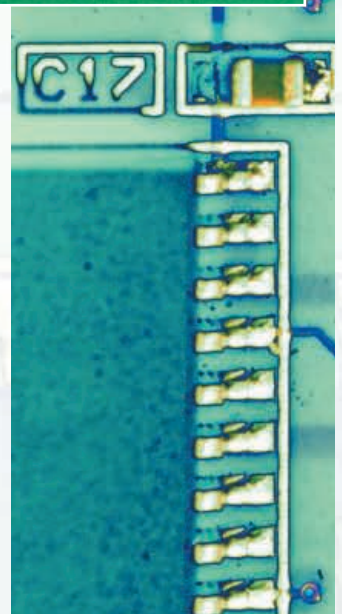
Because the PIC chip carries out all the functions and we're using its internal oscillator, we needn't use a p.c.b. A small piece of Veroboard is adequate for the job.



Turning the project board over (vertically) shows the copper strips and the cuts that need to be made in them.

when the voltage was below 10.5V, which wasn't going to be very often. Never one to waste 'facilities', I added a small routine to enunciate the battery voltage in Morse Code when the mute switch was pressed!

If the sounder is already activated, then the mute switch assumes its normal function. The character speed is about 15w.p.m. with a five dot length inter-character gap. Morse purists may well be upset, but I find the slightly longer than normal gap helps when listening to numbers. Of course, this facility can be used when adjusting R13. Good luck with the project!





Mike Richards G3WNC's Data Modes

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An Introduction To SDR

Mike Richards G4WNC, takes a new direction this month in his *Data Modes* column looking at radio with a digital i.f. path!

Welcome to *Data Modes (DM)* where we're setting off in a new direction this month with an introduction to Software Defined Radio (SDR). As I'm sure you are all aware, SDR is creeping into radio from all angles so, some basic understanding of the technologies and resulting benefits would seem to be in order.

The subject is a large one so I'm planning to deal with this over a couple of months. There's a lot to learn – and it does involved data modes!

What Is SDR?

Firstly, I suppose I should answer the question 'What is SDR?' Well, the answer is that, according to the International Wireless Innovation Forum, Software Defined Radio is: "Radio in which some, or all of the physical layer functions, are software defined".

Perhaps it might be easier to say more simply, SDR is where we replace one or more stages of conventional radio circuitry with computer hardware (PC) and software. This could be as simple as a computer controlled local oscillator or at the other end of the spectrum, digitisation of the entire h.f. bands for subsequent processing in the PC.

Early examples of Amateur SDR, dealt simply with the latter stages of the

receive chain, providing a low frequency digital final i.f. and demodulation.

Technology is moving fast in this area and there are many affordable devices around that can digitise the entire h.f. spectrum! The SDR technique can bring with it, incredible levels of performance that are not possible with conventional circuitry.

One of the more obvious benefits is the quality of digital filtering that can be achieved. Not only can the filters be incredibly steep sided but they can be adjusted over a wide range simply by dragging the shape of the filter on a computer screen.

Modulation and demodulation of just about any mode can also be handled in software and new modulation systems can be added with a simple software upgrade. Programs such as **Simon Brown's** excellent *SDR-Radio* include demodulation of most of the Amateur data modes from within the receiver software, thus creating a completely integrated solution.

Another major benefit of SDR is the extensive use of spectrum analysis and waterfall displays to show an entire band. Such system displays are usually accompanied with 'point-and-click' tuning, where you just put your mouse pointer over the required frequency and click! The system 'tunes' to that incoming signal.

From a wider commercial viewpoint, SDR is critically important and has revolutionised military radio systems. The requirement to interwork between the armed forces of different countries brings about the need for common operating modes and security systems. With SDR based radios, the same equipment can be used for multiple roles simply by updating the software.

The SDR Technologies

So, let's begin this introduction to SDR and to properly understand the subject we need to get to grips with a few fundamental technologies that are found in just about all SDR systems. These are: Analogue to Digital Conversion (ADC), In-phase and Quadrature data (IQ), Fast Fourier Transforms (FFTs), Digital Down Conversion (DDC) and decimation.

Note: *This isn't destruction down to one tenth part, although it is sometimes a large reduction in data. Editor.)*

Please don't panic – this is not going to be a mathematical view of these systems, just sufficient detail so you can see how they work together to create Software Defined Radio. I've shown a block diagram of a modern SDR receiver in **Fig. 1**, so you can see how it all fits together.

Analogue To Digital Conversion

As the name analogue to digital, suggests, this is where we make that initial conversion from analogue (i.e. constantly and infinitely variable) signals to the discrete steps of the digital world. The unit that makes the conversion is called an analogue to digital converter (ADC).

Although some of the devices and associated theory can be quite complex, the basic workings are very simple. As you'll probably know, in the digital world, everything has to be

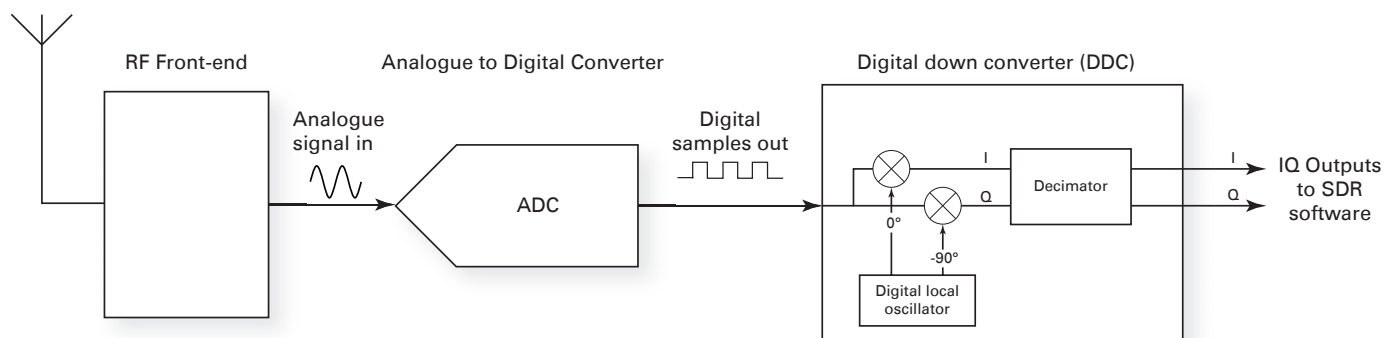


Fig. 1: Block diagram of a modern SDR receiver.

represented as numbers and because computers only respond to on or off signals the numbers need to be in the binary system.

To illustrate the system, I've shown an example of the binary numbering system in **Fig. 2**. (*Note: Unlike the decimal version of the number, where leading '0's aren't normally written down, in the binary version they should be shown. Editor*). As you can see in Fig. 2, any number can be represented by a sequence of '1's and '0's.

Converting an incoming analogue signal to a stream of digital numbers is done by taking voltage measurements of the analogue signal at regular intervals. I've shown a simple sine wave being sampled in **Fig. 3**.

You'll also see that there has to be some way of representing the negative portion of the wave. But don't worry about how we do that – it doesn't make any difference to understanding the basic techniques.

It's easy to see that a decent digital representation of the signal requires lots of measurements or samples as they're more commonly known. Like many seemingly modern developments, the theories for sampling were developed long ago and in this particular case we have Polish engineer **Harry Nyquist** to thank.

Accurate Representation

Harry Nyquist published a paper on the subject back in 1924. He showed, that an accurate representation of an analogue signal requires samples to be taken at a minimum of twice the rate of the highest frequency to be found within the signal.

So, for example, if we wanted to digitise a 455kHz i.f. signal, the analogue to digital converter would need to take measurements at 910kHz or higher. This would normally mean rounding up to 1MHz, or once every microsecond. This could be written as one million samples per second (1MS/s).

For computer sound-cards handling audio signals up to 20kHz the sample rate is usually set to 44kHz (44,000 samples per second or 44kS/s). Although some cards can sample at 96kHz (96kS/s) or even at 192kHz (192kS/s).

In addition to taking the regular measurements, we also need to consider how large a number we are going to use for each sample. This equates to the size of the measurement 'steps', the more steps, the more precise the representation of the signal level.

Decimal Number	128	64	32	16	8	4	2	1
29	0	0	0	1	1	1	0	1
136	1	0	0	0	1	0	0	0
229	1	1	1	0	0	1	0	1
186	1	0	1	1	1	0	1	0
93	0	1	0	1	1	1	0	1

So, the decimal number 29 = '00011101', 136 = '10001000', 229 = '11100101', 186 = '10111010' and 93 = '01011101'. It might help to think of the 'numbers' 1 & 0 as voltage and no-voltage levels.

Fig. 2: Some examples of using binary numbering to represent decimal equivalents.

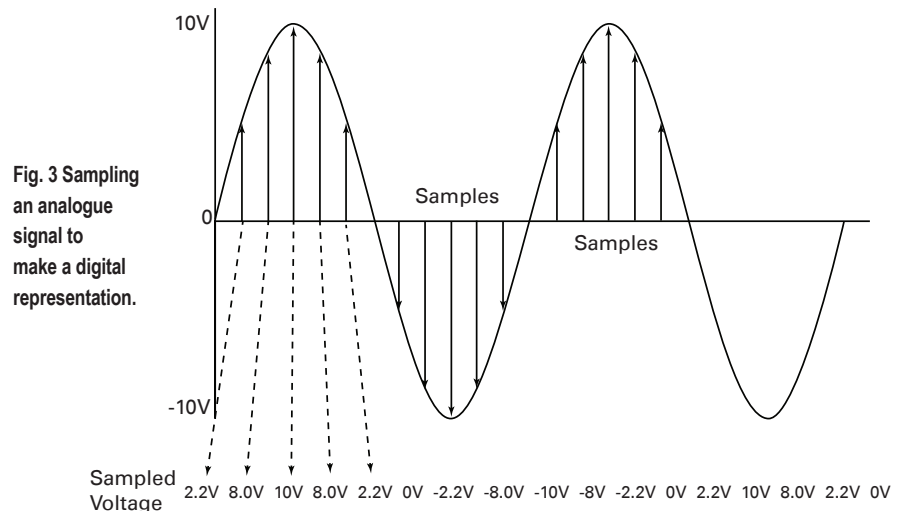


Fig. 3 Sampling an analogue signal to make a digital representation.

Many low frequency ADCs use 16-bit readings that give a total of 65,536 possible values for each measurement. However, in the case of very high speed ADCs (100 million samples or more per second) you will often find 14-bits in common use. This still gives 16,384 possible values per reading, which is still okay.

The final output from the ADC comprises a string of binary numbers flowing at the sample rate – that's a lot of information. There are two ways to get the information from the ADC to the next stage in the process – using parallel or serial data.

Parallel data uses a separate wire for each data bit, so in the examples here there would be 14 or 16 wires. On the completion of each measurement cycle all 14 or 16 bits would be transferred to the next stage.

However, there are a few complications. For reliable data communication from low voltage devices you really need to employ Low Voltage Differential Signaling (LVDS) or balanced outputs. These balanced outputs requires two wires per data line so we now need 28 or 32 tracks on the printed circuit board (p.c.b.) for our 14 or 16 lines, just to connect our ADC to the next stage.

Such a large number of tracks,

would not only make printed circuit boards (p.c.b.s) design more complex but both devices would need to be physically large enough to contain an extra 28/32 pins just for the signaling. In practice, many of the latest ADCs have reverted to using serial data over a single LVDS connection thus reducing the signaling pin count to 2!

Serial data also has a snag and that is the very high data rate. Let's use a 14-bit ADC running at 100MS/s as an example. In this case, each sample produces 14-bits of data that are sent one at a time over the serial connection a bit like binary Morse code! As a result, the data rate becomes 100 million (samples) x 14(bits) = 1.4Gb/s – that's fast and demands special handling in the subsequent stages.

So, to summarise, the ADC takes rapid measurements or samples of the analogue signal. These numerical values produce an output that comprises a high-speed string of binary numbers representing the original signal.

What's IQ Data?

If you've already taken a peep at SDR radio you will doubtless have come across term 'IQ data' and perhaps noted that there aren't many friendly explanations out there. It's my turn to

have a stab at this so – let's see how I get on!

The fundamental operation of SDR is due to the stream of IQ Data, which comprises two signals called 'In-phase' (the 'I' part) and 'Quadrature' (the 'Q' part). These two streams can be used either to control (modulate) or to extract (demodulate) the amplitude and phase information from any signal.

Now my last sentence may seem like a pretty sweeping statement, but IQ information really is that powerful! If we can extract the frequency and phase information from a carrier that means we can see the amplitude, frequency and phase modulation plus any combinations of all three. The combination of amplitude, phase and frequency, will perhaps, explain why IQ data can be used to demodulate any signal and it's why it's at the heart of SDR.

The IQ process also works in reverse for transmit. So, by controlling the I and Q information into a transmitter, we can generate a.m., f.m., phase modulation (p.m.) or any combination thereof.

Extracting IQ Signals

While the theory behind IQ may be complex, extracting IQ signals itself isn't. To extract I and Q signals from an existing analogue source all we need to do is pass the signal into two identical mixers – but offset the local oscillator signal to the Q-mixer by 90° relative to the I.o. signal into the I-mixer. See Fig. 4.

The resulting I and Q signals from the mixers are still analogue but can be applied to a standard PC sound-card for digitisation and demodulation. As an alternative, the conversion to IQ data can also be performed digitally using digital mixers and local oscillators.

Streams of IQ data can also be used to generate modulated r.f. signals

and in this case the process is simply 'run in reverse'. The IQ modulation information is generated in software (usually in the sound-card) and the two IQ baseband signals are applied to a pair of identical mixers as with the receive version. Again the r.f. carrier feeding the Q mixer is again offset by 90° – see Fig. 5.

The term baseband simply means a signal with its base at 0Hz, i.e. an audio signal before modulation is a baseband signal. So, if we were to put a speech signal through this IQ process the microphone output would go into the sound-card which would create two signals one with no phase shift (I signal) and one with a 90° phase shift (Q signal). Both signals would still be audio and so considered baseband.

Modern IQ modulator chips are readily available that can operate up into the GHz region and include a 90° phase shifter so you just connect a local oscillator and the IQ signals and you have a modulated r.f. signal ready for amplification and transmission!

Digital Down Conversion

The process of digital down conversion is used in SDR receivers to select a band of frequencies from the output of a wide-band ADC. If you recall in my analogue to digital conversion explanation, I explained how the data rate leaving the ADC can be extremely fast with 1.4Gb/s being typical for a 100MS/s ADC.

Handling this much data, 1.4GS/s, is beyond the capabilities of any of the standard computer serial interfaces and even if we could get it to the PC, the processor would struggle to deal with it. The solution used by just about all current SDR systems is to employ a dedicated Field Programmable Gate Array (FPGA) to deal with the high speed signal from the ADC.

The special FPGAs contain hundreds of logic blocks that can be programmed to take-on a wide range of functions. The FPGAs are also extremely fast and can happily deal with very high speed data streams. And as we don't actually need the entire spectrum for most receive purposes, we use the digital equivalent of a superhet receiver to select the band we want - this is known as Digital Down Conversion (DDC).

The DDC unit operates by applying the ADC output to two identical mixers and then applying an appropriate carrier to bring the required range of frequencies down to baseband. As we need IQ signals to achieve this translation, the signal to the Q mixer is again offset by 90° . At this point we have shifted our wanted band of frequencies down to baseband but the data rate has not changed, i.e. it is still running at 1.4Gb/s.

Decimation Stage

Let's now look at the Decimation Stage. To reduce the 1.4GS/s bit stream to a more manageable bit-rate, it's common practice to follow the DDC with a decimator, or decimation stage. In our example, we were trying to extract a 1MHz wide band of frequencies from a sample that covered 0-30MHz. But the 1.4GHz sample rate for a 1MHz bandwidth would be overkill.

For our 1MHz bandwidth, the decimator reduces the final sample rate to just over 2MHz by discarding unwanted samples. Once complete this more modest digital signal can easily be passed over a standard USB port to the PC for final processing.

So that was a quick review of the fundamental building blocks of Software Defined Radio. Next time, I'll take a look at some of the hardware and software and see how it all fits together.

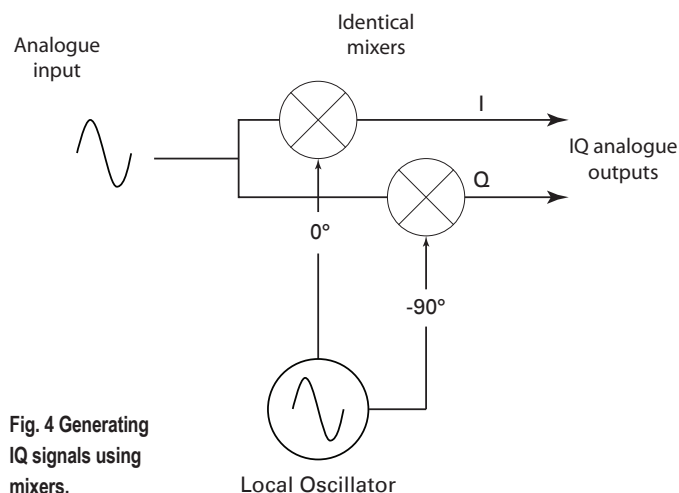


Fig. 4 Generating IQ signals using mixers.

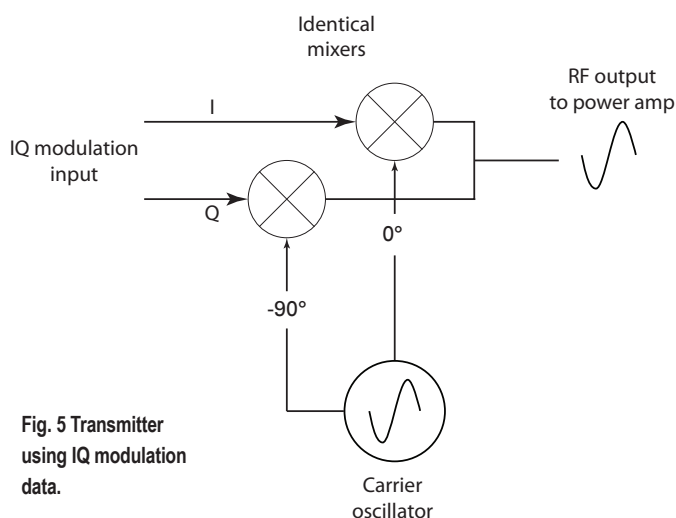


Fig. 5 Transmitter using IQ modulation data.

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The Ten-Tec Eagle

Roger Cooke G3LDI is *PW*'s 'Morse Correspondent' and a keen h.f. operator. He's the ideal man to review the latest transceiver from Ten-Tec!



A simple front panel, with choice of background colour to the display. Roger found pale blue the best for himself.

The Ten-Tec Eagle – also known as the 599 – is aptly named for the c.w. enthusiast and appears to be aimed at the portable and mobile market. It's not ergonomically suitable as a fixed station transceiver, although the performance is not far short of that standard. It weighs 3.3kg (7.25lb) and the size is similar to the Yaesu FT-450, at 216 x 254 x 73mm (8.5 x 10.25 x 2.9in.)

The size makes it ideal for the Summits On The Air (SOTA) enthusiast too, but you would still need a 12V supply capable of around 30A. Carrying that might be a daunting prospect! Looking at the front panel, it looks bereft of controls when compared to some of the larger transceivers – but don't let that fool you.

The control buttons have dual functions and once these have been mastered, controlling the operation of this transceiver is fairly straightforward. However, obviously it pays to read the book first, set it up as per the instructions and then put the transceiver on the air.

Basic Settings

Basic settings are achieved first off by holding down the **FNC** button while switching on. This enables the user to set the colour of the display by adjusting

red, green and blue levels to produce the colour of your choice, similar to grey-scale adjustments in the old colour televisions.

Other functions depend on what the user has installed as 'extras'. I set the display to a nice pale blue, a very restful background. This is the limit of what could be called a menu. To tilt the transceiver upwards off the desk, there is a good bail stand to unfold.

As you can see from the photographs, the Ten-Tec Eagle is also well laid out inside. Surface mount technology is used throughout and looking at some of the components was enough to make this old and retired TV Service Engineer break out into a cold sweat! I can hardly see the miniature components these days, much less replace them!

The case is aluminium, and the front panel is plastic. Unlike some of the other similar sized transceivers designed for mobile or portable use, the Eagle is 'all-in-one' box, with no detachable front panel. I suspect this might put off some people from using it in mobile applications.

The transceiver I had to review came with a 500Ω fist microphone as standard, with no other functions on the microphone. There was no automatic antenna tuner (a.a.t.u.) fitted, neither

was the noise-blanker board fitted. The speaker is fitted in the top of the case and sounds very adequate.

Running 100W in such a small confined case can be tempting providence and the heat sink is very small. However, to help with the cooling, Ten-Tec provide two built-in fans.

Down Conversion

This latest release from Ten-Tec USA is a down-conversion 9-band transceiver, also featuring 50MHz (6m). General coverage receive is possible from 500kHz up to 30MHz and the receiver uses the latest low-noise receive technology combined with digital signal processing (DSP) and software control. **Note:** The firmware is up-datable from the Internet, as with many modern transceivers.

Performance is maximised on the Amateur bands. Looking at the front panel shows very few controls. Making up the complete front panel are concentric audio frequency (a.f.) and radio frequency (r.f.) gain controls, main tuning, the multi-function control and the selectivity controls, i.e. pass-band tuning and filter bandwidth, together with a load of push-buttons.

The pushbuttons have dual functions with the primary function being etched onto the button itself. The secondary

function is printed directly above the button, this being accessed by first pushing the FNC button. This then flashes and so does the Function legend on the main display.

Certain functions, such as the pre-amplifier, auto-notch, etc., can be switched on and off using the FNC button. Other parameters, such as the automatic gain control (a.g.c.) and the c.w. parameters can be set up in a similar fashion. It takes a little while to get used to the procedure, but after a few times it comes pretty naturally. It would pay to practice this routine a few times. The action is indicated in the display.

Additional roofing filters are required for amplitude modulation (a.m.) and frequency modulation (f.m.) operation, but I suspect most users would not bother with these. I was very pleased to see that the standard 8-pin round microphone socket is used, instead of the wretched RJ45 connector, so common these days and also, for headphones, the quarter inch standard jack socket.

An Aged G3!

The actual display is large enough for an aged G3 Amateur to read! It shows all the necessary parameters as set by the user, as well as the frequencies of the two variable frequency oscillators (v.f.o.s) in a large font, with **VFO A** – the main v.f.o. – being larger than **VFO B**. Tuning rates on both v.f.o.s are adjustable down to 1Hz, but I doubt anybody would use that much resolution.

However, to change rates is a one-way operation, so say you were tuning around in the 10Hz step and decided to change frequency up the band, you would have to push the **Fast** button once to enable you to QSY fairly quickly. But to return to 10Hz tuning rate you would then have to push the button four times.

While the tuning rate change operation might not seem to be much of an imposition, it could be just that if you were doing it over a period – but it doesn't pose much of a real problem. The usual A=B function is there, ability to swap and split is there and receiver incremental tuning (RIT) is available too, although there's no transmitter incremental tuning (XIT).

There are two v.f.o.s but only one control. So, if you wished to move the split on VFO B, you would have to swap and do it that way, not forgetting to swap back again.

There are 100 memories available for storing frequencies and mode. The

metering is limited to two functions, **S-meter** and **SWR** indication and this is provided by a single bar graph in the main display.

The rear panel is also simple in layout, consisting of a single SO-239 antenna socket, an external speaker socket, a stereo miniature jack socket for a paddle and a standard USB socket. (This is used for updating the firmware or interfacing to a computer).

There are also two direct current (d.c.) output sockets for powering accessories – with a limitation of 500mA. (The fuse is unusual in that it is a standard car-type fuse). There's also an accessory DIN socket for connecting a Terminal Node Controller (TNC) or similar interface for data modes, together with push-to-talk (p.t.t.) and linear switching.

Operating On SSB

This transceiver has 'few bells and whistles' – there's no audio tailoring, no equalisation – so there's little to do in the way of setting up. Incidentally, I spent ages looking for the speech compression control and eventually discovering it's a secondary function adjustment.

Setting the compression level involved pushing the FNC button and then the SP-CW button brings up the compression level on the display – adjustable from 0-9 from the rotary control. However, an hour or two mastering these sequences would be the thing to do. After setting these levels, it really is then as simple as pushing the microphone p.t.t. control. Receiver bandwidth is adjustable on the **BW/PBT** control.

Operating On The Key

Again, there is not much to do to operate on c.w., other than setting the parameters of the built-in keyer. This is done by pressing the FNC button to enter Secondary Function Mode, and

Pros: A pleasure to use on c.w. Compliments came from everybody!

Cons: Few 'bells & whistles'.

Company: Ten-Tec USA.

Price: £1735 for regular Eagle and £1899 for version with built-in auto a.t.u.

Jeff Stanton G6XYU of Waters & Stanton comments: Our thanks go to Roger G3LDI for his interesting review. However, Roger infers that it's not really suitable as a mobile rig – but is really suitable as portable rig. As far as I know the ones we have sold are mainly for base use. We think it's not too small for such use. As regards pricing – we're selling to customers who want Ten-Tec quality and/or radios from the USA.
Best regards. Jeff G6XYU



The rear panel is also of simple layout. Note though, the unusual power socket and vehicle style fuse on the upper right corner.

then pressing the **Mic/SP-CW** button to toggle through the functions. The only thing I adjusted here was the QSK control, which I set at 16 as I don't like QSK (full break-in operation).

I must say though that the QSK keying was very clean and I could use it – I just don't like the concept, preferring semi-break in. The side tone is adjustable too, from 400 to 999Hz. The speed range of the keyer is 5 to 60 w.p.m. I set it for around 28 to use on the air.

There are three levels of a.g.c. – fast, medium and slow, along with a power control that allows adjustment all the way from 100W down to zero. (And I really do mean zero too, as I tried this out on the air and at 0 there's nothing coming out!). With 1W indicated on the display, I measured 1.6 on voice peaks on my power meter.

The Acid Test

The acid test comes when a rig is on the air, especially I was listening to the DXpedition **TX7M** on 10MHz c.w., so I decided to set the Eagle up there and compare it to my FT-2000. I had installed an antenna changeover switch – so an instantaneous comparison was possible. I was pleasantly surprised to find that the Eagle performed as well as my Yaesu FT-2000 – at least as far as receiving was concerned.

Closing the receiver bandwidth on the Eagle eliminated most of the QRM. And I found it very pleasant to listen to, even though I was only using the built-in speaker. I then asked my friend, **Dave Johnson G3MPN**, who is my local 'honest broker' when testing transceivers, to come on and do some tests.

First, we went onto 1.8MHz 'Top Band', as it was daytime and a quiet band. Dave told me he had "no complaints" at all on s.s.b., although it did not have 'the attack' (which is understandable) of my Heil microphone insert I use with the FT-2000. One comment here regards the supplied fist microphone supplied. This is larger than the fist microphone supplied with the FT-2000, which seems strange, as the transceiver is much smaller than the FT-2000.

We were joined by another local, **Robert Scarfe G4TUK** and as he lives only about 5km (3 miles) away and I got his opinion too. He thought the transmission was fine, good sideband suppression and no splatter. He rated it at 9 out of 10 on 1.8MHz. I tried the speech compressor, covering the whole of its range, 0 to 9 and determined that it did bring the average audio level up,



A view of the underside innards, show that there appears to be an area for optional expansion towards the far right hand corner of this picture.

but wasn't aggressive in any way.

We then moved to 28MHz (10m). Here it was somewhat different. Robert found the audio distorted and could hear what sounded like intermodulation distortion (IMD) products 10kHz below and 10 kHz above my fundamental transmission. **David Johnson G3MPN**, who lives about ten miles away also reported this, but didn't regard it as as severe.

I then adjusted the microphone gain down to 10 (it was 50) and turned the compression off. The problem had almost gone at those levels. I must say however, that I had no adverse reports from any other stations during casual QSOs – so we are perhaps being hypercritical.

We then tried c.w. together – and compliments were flowing on this mode. Indeed, no complaints at all. I didn't even have to change any keying parameters, so Ten-Tec's reputation for great c.w. is retained.

I must say again that the Eagle really is a pleasure to use on c.w. The built-in keyer is good and I was using a paddle key that was built in Norfolk by **Peter Raven G4KLM** – it's a prototype but nevertheless it performed very well. David's final comment was that the Eagle ticked the boxes, which is good enough for me!

Ideal Portable Station

Summing up, I don't think that the Ten-Tec Eagle is a transceiver that I would choose for the main station. On the other hand – I think that as a portable 100W c.w. light-weight basic transceiver it's ideal. There are no massive menus to plough through, a minimum of front panel controls to contend with and it has an easy-to-read display when you're operating portable – very helpful.

You would, however, need a good power supply or battery to run the Eagle at the 100W level. I also thought the tuning dial was a bit noisy and it didn't have the 'silky' feel or spin capability of my Yaesu FT-2000. However, the main limitation for mobile use would be that it doesn't have a detachable front panel, which is quite an attraction for mobile use these days. (A detachable front panel makes it very difficult for thieves to steal the whole transceiver).

The other obvious limiting factor is the price. At £1735 in the UK, I think it is over-priced. But then I'm a G3 and think that everything is over-priced! With the extras, this could top £2000 and I would expect a more up-market transceiver for the price. My thanks to Waters & Stanton for the loan of the transceiver. ●



Building A Z-Match Tuner

This month the Rev. George Dobbs G3RJV describes the construction of a traditional – and very useful – antenna matching tuning unit after sharing the appropriate quotation!

“The goal of life isto match your nature with Nature.”

Joseph Campbell (American Author 1904-1987)

Welcome to *Carrying on the Practical Way (CotPW)* where we share the enjoyment of ‘hands on’ Amateur Radio. This month we are going to look at an antenna tuner. The Joseph Campbell quotation might look rather fanciful for a mere antenna tuner unit (a.t.u.) except that we are attempting to match what we have, with what is out there!

I have featured variations on the topic of an a.t.u. a number of times in this column. The last one I can remember was a link-coupled balanced tuner in the February 2008 edition on *PW*.

To over simplify the explanation, an a.t.u. attempts to match the impedance of a receiver or transceiver to the antenna, thus improving the power transfer between them. It's never as good as a naturally resonant antenna on the frequency in use – but resonant antennas are relatively rare in Amateur Radio usage; very often because of space restrictions.

The a.t.u. can also enable one antenna to be used over a range of frequencies. Not surprisingly, a.t.u.s have become a popular subject among Radio Amateurs with many circuits and ideas in the amateur radio literature.

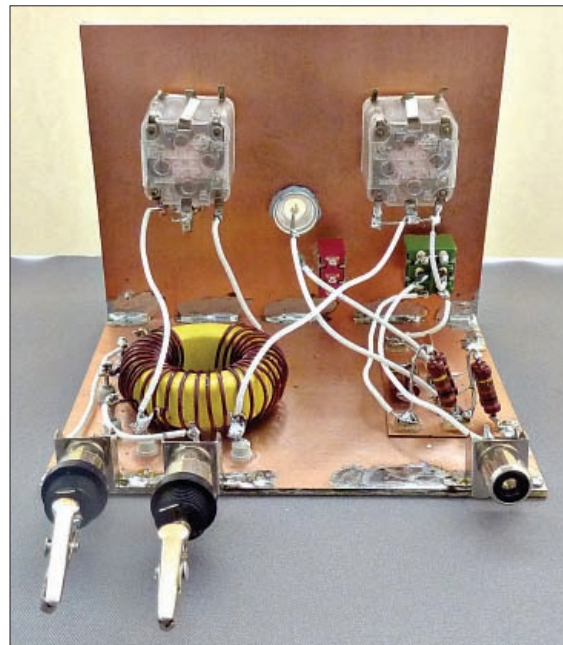
In recent years the G QRP Club Annual Convention has included a ‘Buildathon’, which is an event where less experienced radio constructors have built a practical project under the guidance of more experienced constructors. It has fallen to me, with the help of **Graham Firth G3MFJ**, to produce the project for each of the Buildathons.

Buildathon Z-Match ATU

Following requests, for the 2011 Buildathon, we produced a Z-Match antenna tuner. The Z-Match tuner can be configured for balanced or unbalanced feed lines.

Many of you will have read the article, in the November 2011 issue, on balanced feeder tuning by our illustrious Editor **Rob G3XFD**. Rob described his good results using balanced feeders and a balanced tuner. He concludes by saying, “I would recommend that anyone considering erecting a balanced feeder fed antenna should also consider a dedicated a.t.u. for the job.”

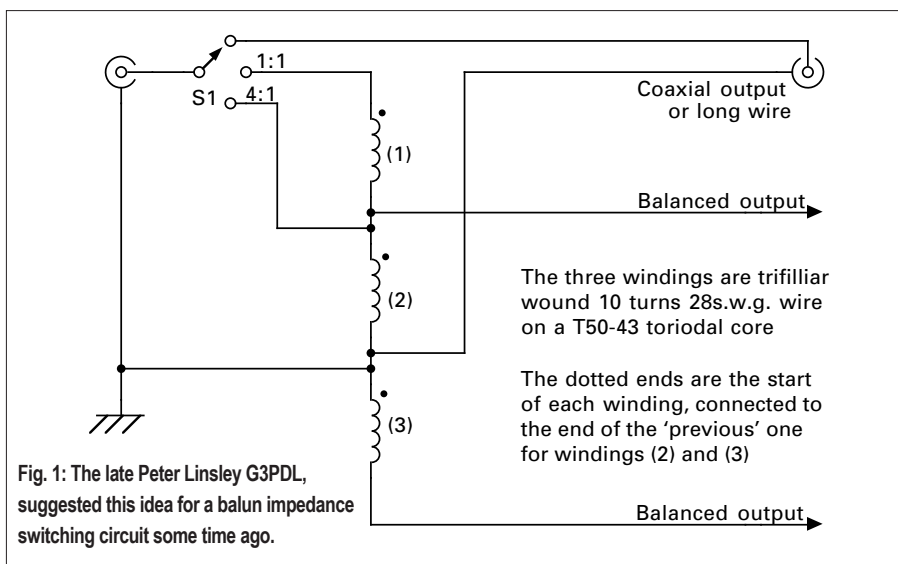
Many station set-ups with a balanced antenna use a convention a.t.u. configuration with a balun (balanced/unbalanced transformer) to facilitate a balanced output. I run a simple Amateur Radio station from my ‘alternative’ Welsh address. The station equipment is classic

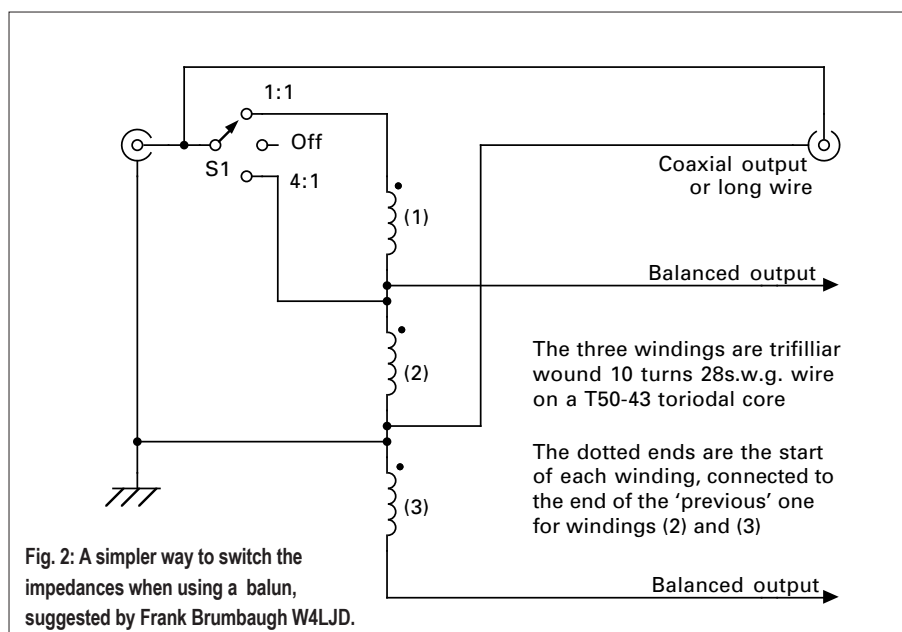


Looking at the Z-match tuner from behind shows more of the lay-out. The crocodile clip on plugs make it easier to try different antenna options.

rather than state-of-the-art. I managed to find a Yaesu FT-707 transceiver with matching power supply and FC-707 a.t.u. at a bargain price.

The FT-707 is an old piece of equipment but I like it, because it was one of the last commercial transceivers produced that I knew what was happening inside the box and I could probably fix it if it went wrong. My antenna is a W3EDP antenna running





through the trees of an adjacent wood.

The W3EDP responds well to a balanced antenna tuner but the FC-707 requires a balun for balanced output. My solution was a circuit from my old friend of 50 years, **Peter Linsley G3PDL**, now sadly a Silent Key.

Peter's circuit is shown in **Fig. 1**. A balun is added to the output of the antenna tuner to convert the unbalanced output to a balanced output. The common balun configurations offer a ratio of 1:1 (one to one) or 4:1 depending upon the antenna and the frequency. Peter's circuit uses a 3-way switch to offer a direct link (unbalanced) or a 1:1 or 4:1 balun.

The balun is a singly wound transformer using windings twisted together on a former. The 4:1 ratio requires two windings and the 1:1 ratio three windings. The arrangement is shown in **Fig. 1**. This is achieved by using a trifilar winding in which three wires are twisted lightly together and wound as if they were a single wire. The dots at the top of each winding signify the start of that winding; I have marked the windings as 1, 2 and 3.

The method of connecting the wires is described in **Fig. 1**. The end of winding 1 goes to the start of winding 2 and the end of winding 2 goes to the start of winding 3. The start of winding 1 goes to "1:1" on the switch and the start of winding 2 goes to "4:1" on the switch. The start of winding three is connected to ground on the input.

The balun is made by twisting three lengths of 28s.w.g. enamelled copper wire (about 400mm is required for each wire) then winding the twisted 'wire' onto a T50-43 ferrite core. The ends of the three wires are scraped to the bare copper and tinned with solder.

The ends of each individual wire

are identified using a multi-meter on its ohms range and the ends are connected as shown in **Fig. 1(b)**. It doesn't matter which wires are called 1, 2 or 3 as long as they are connected in the sequence shown in **Fig. 1(b)**.

Frank W4LJD's Suggestion

The diagram in **Fig. 2**, shows a simpler way to switch the balun. This was suggested by **Frank Brumbaugh W4LJD**, in the G QRP Club's magazine *Spratt*. Frank's suggestion uses a centre-off toggle switch. The switch has three positions; two choices of connection with **Off** in the centre. The centre position is used for coaxial cable or long wire antennas and the 1:1 and 4:1 positions are used for balanced feeders.

The switching arrangement doesn't allow the connection of more than one antenna. The user must opt to connect a balanced or an unbalanced antenna. Having used this circuit with the FC-707 unbalanced tuner for some years I can vouch that it does provide a good match.

But this match is at the expense of signal loss in the balun. If like me, operators use only 5W of r.f. power or less, these losses are significant. So, it's much better to use an antenna tuner designed for a balanced feeder.

The Z-Match Tuner

The Z-Match tuner that was used for the Buildathon is shown in **Fig. 3**. The left-hand side of the circuit is a simple resistive standing wave ratio (s.w.r.) bridge used to indicate when the antenna is matched. I've described the resistive bridge several times in this column as the simplest way to visually tune an antenna. It's based on the Wheatstone Bridge, so beloved by my physics master at school.

The circuit assumes that the

transmitter output has a nominal impedance of 50Ω . The bridge has four 50Ω 'legs', one of which is the input to the tuner. When the tuner matches 50Ω , the bridge achieves a balance. This is often indicated by a meter wired across the bridge that shows a null reading when balance occurs.

Meters are expensive items and in this circuit a light emitting diode (l.e.d.) is used as a visual indicator. When the faintest glow in the l.e.d. is achieved the bridge is balanced. An 'ultrabright' l.e.d. is required as these will glow with a very low current passing through them.

Note that a double two-way switch (double-pole double-throw toggle switch or d.p.d.t.) is used to switch the bridge in and out of the signal path. This is because some signal will be lost when the s.w.r. bridge is in-line with the transmitter and tuner. When the antenna tuner has been adjusted for the best match, the s.w.r. bridge can be switched out.

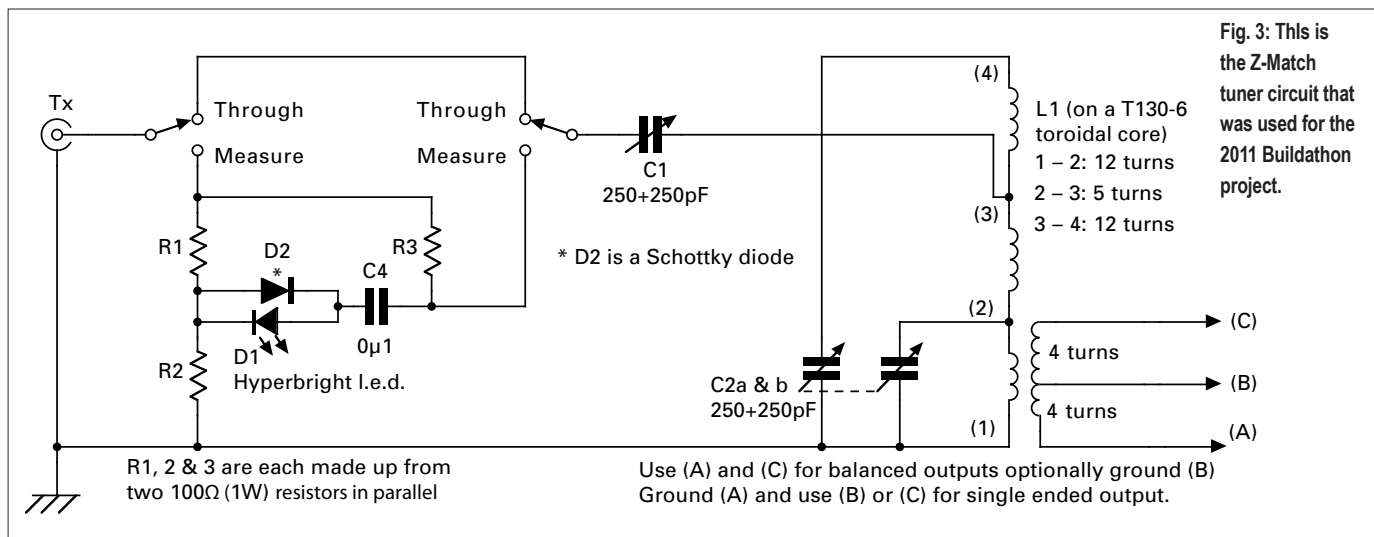
The Z-Match tuner is shown in the right-hand section of **Fig. 3**. It has only three parts; two two-gang variable capacitors and a coil. The circuit is based upon a design from **F. G. Stewart Sims G3WQW** in *Spratt* from summer 1998. The G3WQW single coil Z-Match has become a classic circuit appearing in many journals and websites; often without mention of G3WQW.

In my example featured here, I used a T130-6 core for the coil and a pair of polyvaricon 250+250 pF variable capacitors. My source for the polyvaricon capacitors was **Spectrum Communications**. The Z-Match is a parallel tuned circuit with link coupling to the antenna.

The signal is coupled into the Z-Match via C1; a variable, but high, value of capacitance. The two variable capacitors with the tapped tuning coil offers a wide tuning range. It should be possible to use the tuner on all high frequency (h.f.) band from 3.5 to 28MHz (80 to 10m) to match balanced or single ended antennas.

The whole link winding, isolated from ground (using connections A and C) will feed a balanced antenna. Joining connection A to ground and using connections B or C will tune a single ended antenna such as a long wire tuned against ground.

To use the Z-Match with a single ended or unbalanced antenna 3 must be connected to ground. This will require adding a link wire between A and ground. Some antenna configurations require a higher capacitance value of C1 to obtain a good match and some examples of this tuner offer extra capacitance that can be added to C1. I included a front panel



switch to add extra capacitance to C1 but found it was not required.

Winding The Coil

The most complex part of building the Z-Match is the winding of the coil (L1). It has several tapping points on the main winding and a link coil with a centre tap. The arrangement of the coil windings is shown in Fig. 4. This also shows the completed coil; the designations in brackets are a guide when wiring up the coil. The main coil has 29 turns of 20s.w.g. wire tapped at 12 turns and 17 turns. (This requires about 1.3m of wire).

Each pass of the wire through the hole of the core counts as one turn. Leave about 25mm of spare wire at the beginning of the coil. Keep the turns close to the core with a tight winding. After 12 turns pull out a loop a wire (about 25mm long) and lightly twist it to hold the position. Continue to the 17th turn and make another loop. Complete the 29 turns leaving about 25mm of wire at the end.

To make the taps snip the loop in the centre to form two wires, the position of the wire is maintained by one twist. Scrape the enameled coating off the two short wires until bright copper is exposed. Tightly twist the two wires together and tin them with a generous coating of solder.

Tin the beginning and ending of the winding after removing the enamel coating. Spread the winding to occupy about three-quarters of the core. The link winding has 8 turns of 22s.w.g. wire with a centre tap. This winding should roughly occupy the centre of the first 12 turns on the main winding so begin the winding 2 turns in from the beginning of the main winding. Interleave these windings with the turns on the main winding – winding the turns in the gaps.

Wind the coil and make the tapping connections in the same way as the main winding. The coil should now look like Fig. 4.



Fig. 4: The arrangement of the coil windings in Fig. 3. Starting from the top right and working anti-clockwise, the connections are: (1), (A), (B), (C), (2), (3) and (4).

The G3RJV Prototype

I built my prototype Z-Match using two 100mm by 80mm panels of printed circuit board (p.c.b.) material; one for the front the other for the ground-plane base. The coil is mounted on seven 'glue-on' standoffs arranged around the circumference of the former. Place the coil in position on the ground-plane and using a pencil or small felt tip pen, mark out placements for the standoffs.

Small p.c.b. pads can be used instead of stand-offs in which case the wires from L1 are used to raise the coil above the ground-plane. Remember that connection [1] on the coil must be connected to ground. The capacitors C1 and 2 are connected as shown.

Note: Fig. 3 shows C1 as a single capacitor. However, it's actually made up by using both 250pF sections of variable capacitor connected in parallel to give a total maximum capacitance of 500pF.

Both sides of C1 must be insulated from ground. The s.w.r. indicator parts are mounted on p.c.b. pads in 'Manhattan' style construction. Ideally D2 should be a Schottky diode (BAT42 or similar). The polarity of the light emitting and Schottky diodes must be as shown.



The 2011 Buildathon project was this Z-match antenna tuner.

Excellent But Tricky!

The Z Match is an excellent tuner for most types of antenna. The downside is that it can be tricky to use. A front panel scale for C1 and 2 is useful. Keep a record of the readings of C1 and 2 for the best tuning settings for each band. If possible do the initial setting up using an in-line s.w.r. meter as well as the built-in I.e.d. indicator.

The I.e.d. s.w.r. bridge only offers a simple indication of the tune-up. Connect the transceiver and antenna to the appropriate sockets of the Z-Match and set C1 at the centre of its range. Listen for signals on the desired band and adjust C2 for maximum signal strength. Apply a transmitter signal (1 to 5W). Using both hands (on C1 and C2) adjust C1 and 2 to obtain a null in the I.e.d.

If a null point cannot be found initially try combinations of C1 and 2 until suitable settings can be achieved. On some bands it may not be possible to completely extinguish the light of the I.e.d., in which case aim for the lowest possible glow from the I.e.d.

The Z-Match is an excellent antenna tuner. And when you've got used to steering it you may never want to use another tuner and you can lay lossy baluns aside!

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CLASSIC 20/80m SSB RECEIVER



Classic superhet receiver for 20 and 80m using a 9MHz IF and a 5.0-5.5MHz VFO. Uses a 6 crystal ladder filter with near symmetrical passband, 2dB insertion loss, 1.8:1 shape factor, and 70dB stopband. Minimum discernable signal 0.2uV. Fixed tuned bandpass preselector on 20m, tunable preselector on 80m. Logarithmic AGC and Signal meter response. Maximum signal handling 1mV. 500mW audio output. Supply requirement 13.5V at up to 250mA. **VFO with its drilled box, preselector and main board PCBs and component kits including crystals £92. Complete kit including box and hardware £147.00. Ready built £240.00**.

PORTLAND VFO



A rock stable FET VFO. Meets the requirement for the Intermediate Licence VFO project. Modified to allow alignment to top and bottom of required band. Several versions available: 5.0 - 5.5MHz for 20 & 80 metres; 7.0-7.2MHz for a direct conversion for the extended 40metre band; or 7.900 - 8.400MHz for use as part of a mixer-oscillator system

as local oscillator for 4m RX or TX. Supplied with Buffer 2A to deliver 1.6V p-p into 50Ω with 2nd harmonic 40dB down. **PCB and component kit with potentiometer £18.00. Drilled Box and PCB kit with potentiometer and feedthroughs £27.00.**

Ready built £50.00. State required frequency when ordering.

CTCSS TONE ENCODER as described in PW July 2011. Nine Tones link or switch selectable. PCB size 67x55x12mm. PCB Kit excluding switch **£21.00**. PCB built excluding switch **£30.00** 9-way switch **£2.00**.

COMPONENTS

See our web-site or send SAE for list.

CAPACITORS, DIODES, ICs, RESISTORS, TRANSISTORS, and a wide range of CONNECTORS.

DG MOSFETS BF964S £1.50, 3SK45 £2.00, 3N201 £2.25, 40673 £2.50

TOROIDS & BINOCULAR CORES, dust iron types T37-2 25p, T50-2 50p, T68-2 60p, T37-6 30p, T50-6 50p. Ferrite types FT37-43 55p, FT50A-43 80p, FT37-61 55p, FT50-61 85p. BN0302-43 75p, BN1502-61 75p, BN0102-61 £1.00, BN3312-43 £4.00. P&P £1.00.



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E-mail: tony@spectrumcomms.co.uk

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NEW and IMPROVED GAREX PRODUCTS

NOMAD WIDEBAND PORTABLE

SCANNER AERIAL 25-1300MHz. For use as portable or permanent aerial where a conventional wire aerial cannot be used. The twin wire element is 1.2m (48") long and the matching unit is 18cm (7") long. It is fitted with 4m of 50 Ohm coax cable with a BNC male connector. **Price £18 plus P&P £3.50.**



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PORTABLE SCANNER AERIAL 25-1300MHz. The aerial package comprises Nomad aerial, GA-5 Preamplifier, supply & splitter box and a battery box. Element and matching unit as the Nomad but with 7m coax feeder. The supply splitter has a 280mm (11") coaxial tail fitted with a male BNC connector. Supply requirements 6-15V at 10-15mA via a 2.1mm DC jack. Alternatively it can be supplied with 6V from the 4xAA battery pack. **Price £30.00 plus £3.50 P&P.**



ANGLER HF/VHF/UHF AERIAL has a 14m (46") long-wire portable aerial section for receiving 100KHz - 30MHz together with a wire VHF/UHF section 90cm (36") covering 30 - 1300MHz. The wire sections are brought together using a combiner unit and a tail of coax 0.3m long.

Price £20 plus £3.50 P&P.



SLIM G 144-146MHz TRANSMIT &

RECEIVE AERIAL. Previously called the GAREX JIMP and is essentially a portable version of the Slim Jim. The gain is 1.8dBd, which on 2m is 12dBd better than a 150mm rubber duck. The main element is 300 Ohm twin feeder with a matching section housed in a watertight housing. There is 4m of coax cable with a choice of BNC, or PL259 connectors. The 2m version is 1.55m (61") long and folds down to 25cm (10").

Price £20.00 plus £3.50 P&P.



4001 FM TRANSCEIVER,

70.2500-70.4875MHz in 20 channels in 12.5KHz steps. RF output switchable 5W or 25W. Supply requirement 13.5V at 4A on high power and 1.5A on low power. Sensitivity better than 0.25µV, audio output 0.5W, receive supply current 130mA. **Price £172.50 including delivery.**



RECEIVE VHF

PREAMPLIFIERS boxed built for connection between antenna and receiver. Black enamel painted steel box with BNC connectors, DC chassis plug and on/off switch. Supplied with BNC to BNC patch lead. Supply requirements 6-15V DC at up to 10mA. Box can accommodate a PP3 battery. Various frequency type available, AP-3 118-137MHz 15dB gain for Airband, WP-3 137-138MHz 25dB gain for Weather Satellite, MP-3 156-162MHz 15dB gain for Marine Band, MP-3/AIS 162-163MHz 25dB gain for AIS. **Price £33.00 plus £3.50 P&P.**



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G4CFY / G2DYM AERIALS

Guy	7.1 Trap	T-piece	7.1 Trap	Guy
	TRAP DIPOLE for 80/40/20/15/10m. 106 feet long. Supplied with 70 feet of low impedance twin feeder. 600W rated. Low TVI and low noise. 2 S-points quieter than a G5RV with same feeder length. PVC covered wires with lugs. Regular duty £164.50, strong £182.50, inc. carriage.		TWIN FEEDER 100 Ohm, 2kW rated, 24/0.2 in individual polyethylene sheaths with an outer cover of polyethylene. Solid construction to avoid water ingress. Good flexibility to overcome work hardening and fracture. Typically 0.5dB/m quieter than wide spaced 300 and 450 Ohm feeder and coax. Loss 0.04dB/m at 10MHz. 75p/metre plus £3 P&P. 100m drum. £70 inc P&P.	
	1:1 BALUN 160-10m, 1kW rated. Loss under 1dB from 1.8 to 40MHz. Ideal for use with the G4CFY trapped dipole, or any other aerial fed with low impedance twin feeder. £43.00 inc P&P. Version with Marconi-T switching. £53.00 including P&P.		TRAPPED INVERTED L AERIAL 80/40/20/15 & 10m, for a small garden. Coax driven from far end of garden and tuned against ground. A good all round aerial with 6dB more gain than a 24 foot trapped HF vertical. That's 4 times power on TX and one S point extra on RX. Regular duty £84.00, strong £99.00, inc. carriage.	



Tony Nailer G4CFY's Doing it by Design

PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW

E-mail: tony@pwpublishing.ltd.uk

Return to the Peak!

This time, Tony Nailer G4CFY looks again at peak and band-pass filters in his *Doing it By Design* column.

This month in *Doing it By Design (DiBD)* I'll return to receive audio filters, which I dealt with in *Technical for the Terrified (TfT)* in *PW* June 2010. During the spring of 2010 I had been thinking about audio filters with a view to designing maybe a peak/notch filter. Subsequently I reworked the *PW* Arun design in *Doing it by Design (DiBD)* in *PW* July 2010 with the completion of the finished product in *DiBD* September 2010 *PW*.

In the following month, October, *PW* published an article entitled *Build An Add-on CW Audio filter* by **Mike Jones G3UED**. Mike had used an on-line design package by *Texas Instruments* to determine the component values and had specified a Q value of four and unity gain per section.

Circuit Problems

Looking at the circuit of the filter I was puzzled as to its configuration though it looked a bit like two cascaded multiple feedback (MFB) band-pass filter sections. With further thought I realised that there were missing connections* between C1 and 2 and between C3 and 4 and also a missing



connection from pin 9 of IC1c and pin 3 of IC1a and pin 5 of IC1b. The corrected circuit is shown in **Fig. 1**.

Mike's unit had been built using Veroboard and there was a drawing viewed from the underside with positions of components. Also there was a photograph of the underside but neither of these was easy to follow. Without a p.c.b. lay-out I think it would be very difficult for anyone to reproduce the project.

Editor's apologies: The transcription errors were most likely down to us I'm afraid. My apologies to anyone who ran into difficulties with the project. **Rob G3XFD**.

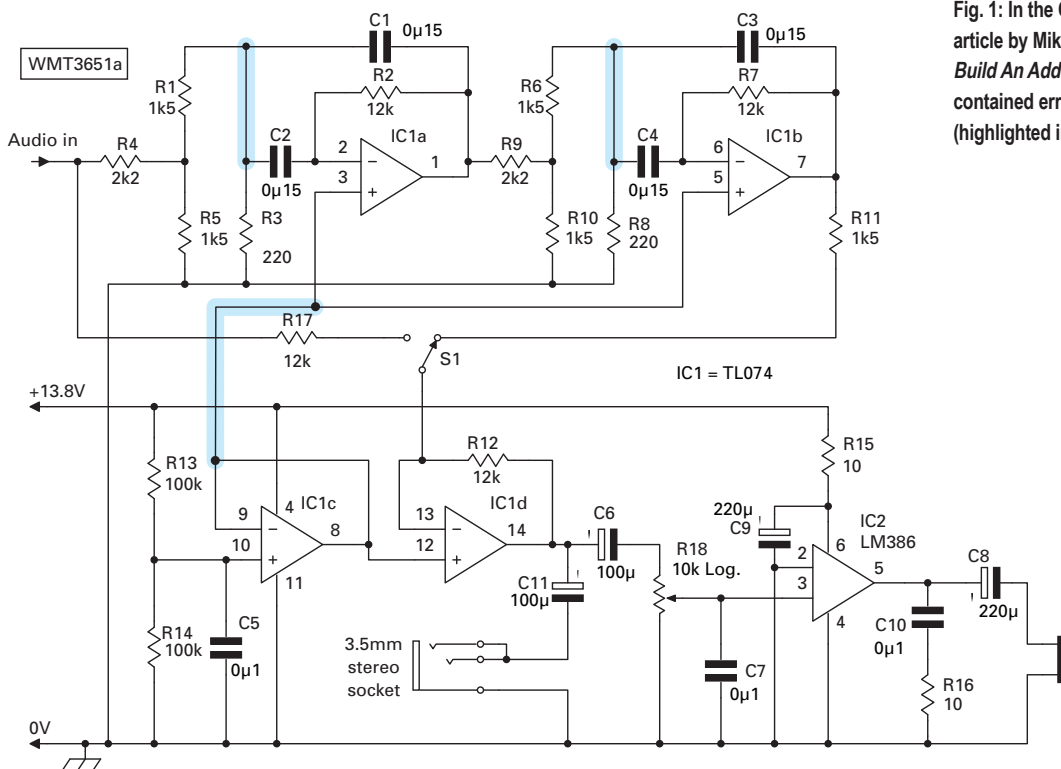


Fig. 1: In the October 2010 *PW* an article by Mike Jones G3UED entitled *Build An Add On CW Filter*, which contained errors. The additional links (highlighted in blue) are shown here.

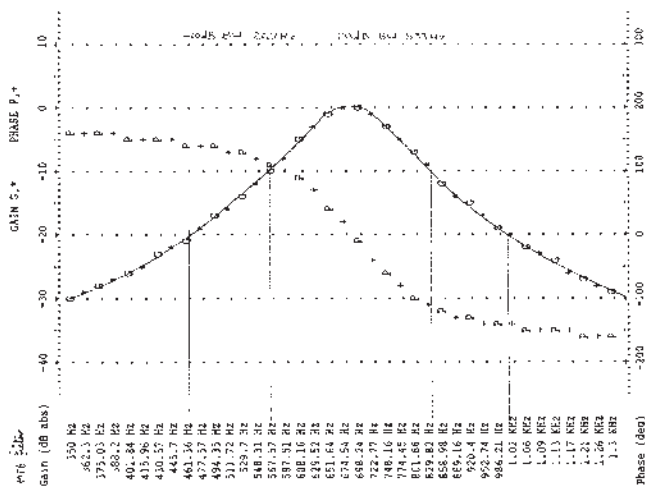


Fig. 2: After correcting the circuit of Fig. 1, and using circuit analysis software, Tony found the projected rather wide response was as shown here.

Circuit Analysis

Having corrected the circuit I ran it on *ANALYSER II* circuit analysis program to produce the response shown in **Fig 2**. Marked on the response you can see that -10dB corresponds to about 565Hz and 830Hz , a bandwidth of 265Hz . Also that -20dB corresponds to 461Hz and 993Hz , a bandwidth of 532Hz .

The analysis revealed that, while the design will reduce the wide-band noise from receive audio, it's not really narrow enough for the rejection of other c.w. signals close-by. Additionally, that the half-rail generating op-amp IC1c was probably not required and could be replaced with a Zener

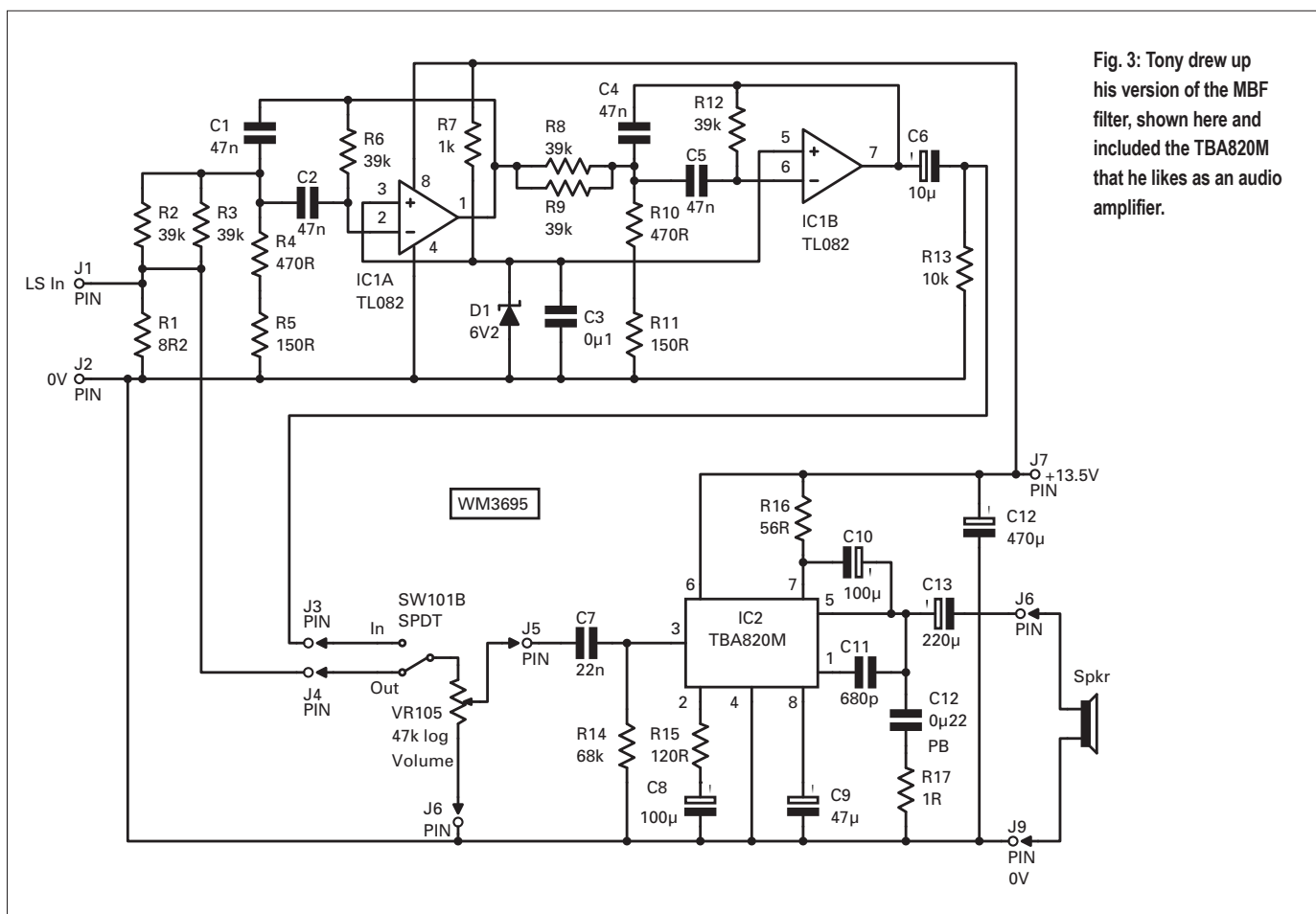


Fig. 3: Tony drew up his version of the MBF filter, shown here and included the TBA820M that he likes as an audio amplifier.

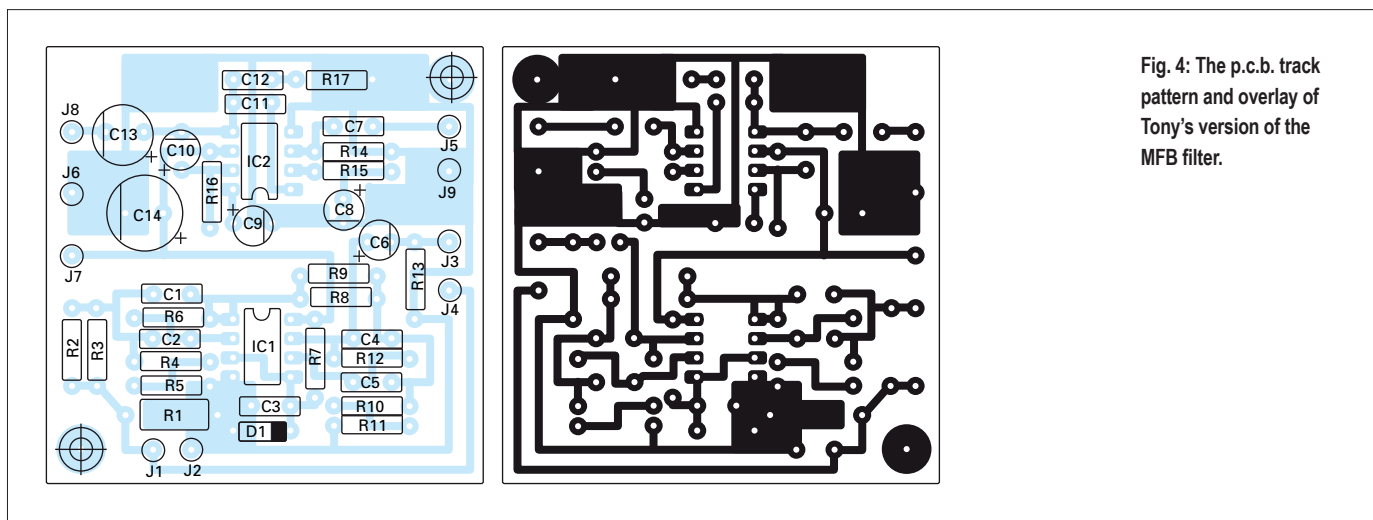


Fig. 4: The p.c.b. track pattern and overlay of Tony's version of the MFB filter.

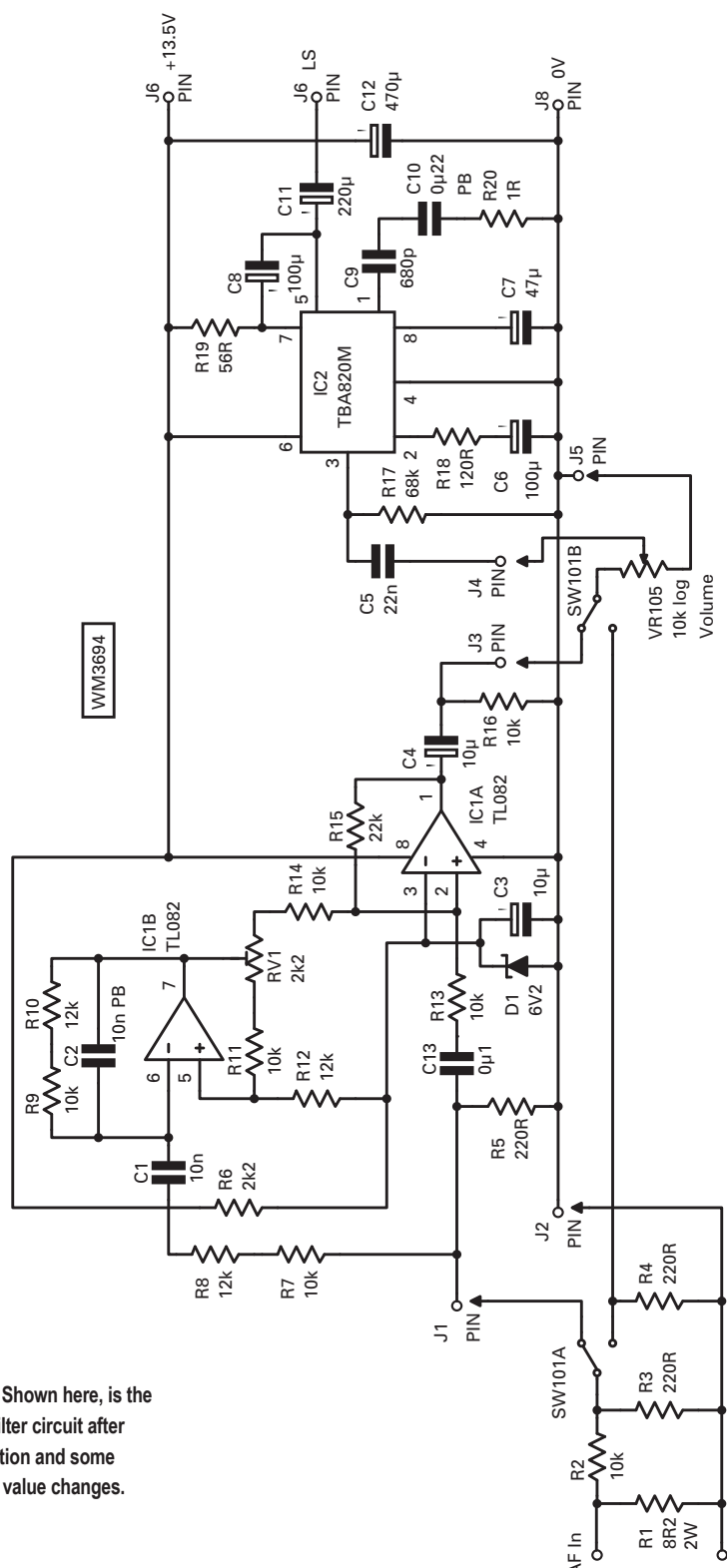


Fig. 5: Shown here, is the peak filter circuit after correction and some circuit value changes.

stabiliser. Finally, the buffer IC1d wasn't really required as headphones could be plugged in to replace the loudspeaker.

Program in BASIC

Back in the days of the Tandy TRS80 computer, I wrote a program in *BASIC* to calculate circuit values for all types of active filter – and I still use the program today whenever required. Maybe I should rework it on an *Excel* spreadsheet but that's way down my priority list!

Nevertheless, I ran the program using unity gain and

Q of 4 with a centre frequency of 700Hz. Instead of 150nF for the filter capacitors I chose them to each be 47nF, which resulted in the series input resistor being 19.5kΩ and the shunt input resistor being 620Ω. These being non-standard values I chose to create 19.5kΩ by having two 39kΩ resistors in parallel. The 620Ω was made up with 470Ω in series with 150Ω.

I drew up a circuit and this is shown in **Fig. 3** and includes the TBA820M that's standard in most of my products requiring an audio amplifier. The circuit was built on a plug-in bread-board and worked just as expected with no problems or value changes. From the circuit a p.c.b. was laid out and the artwork is shown in **Fig. 4** with the component overlay shown.

New Peak Filter

Realising that it's very difficult to obtain a sufficiently narrow pass-band using the two cascaded MFB filters I extracted one part of my dual peak/notch filter design. Instead of a frequency adjustment potentiometer I used fixed resistors for 700Hz. The calculated value was 23.2kΩ so I made provision for two resistors in series.

Knowing that the Dual Peak Notch filter was a success I drew up a circuit of the single peak section together with a TBA820M as audio amplifier. With great confidence I laid out a p.c.b. design, produced the artwork and made the board.

When the board was assembled, I then tested it and found not to be working as expected. The output of one of the op-amps was at the positive rail. A look at my circuit revealed that I hadn't included a d.c. blocking capacitor at the non-inverting input. Lifting the input resistor and wiring a 100nF capacitor in series cured that problem.

Getting It Right

Testing the unit with an audio signal generator revealed the centre frequency was just below 700Hz and to get it about right required the

frequency setting resistors to be reduced to a total of 22kΩ. Had I known that to start with I could have used a single resistor. Now it was made up with a 10kΩ in series with a 12kΩ.

The circuit diagram was modified accordingly and is shown in **Fig. 5**. The printed circuit layout was modified to include the new capacitor designated C13. It really was not worth renumbering all the others requiring a complete re-lay of the board. Likewise I didn't remove the surplus frequency setting resistors and they were handy for the routing. The printed circuit layout component overlay are shown in **Fig. 6**.

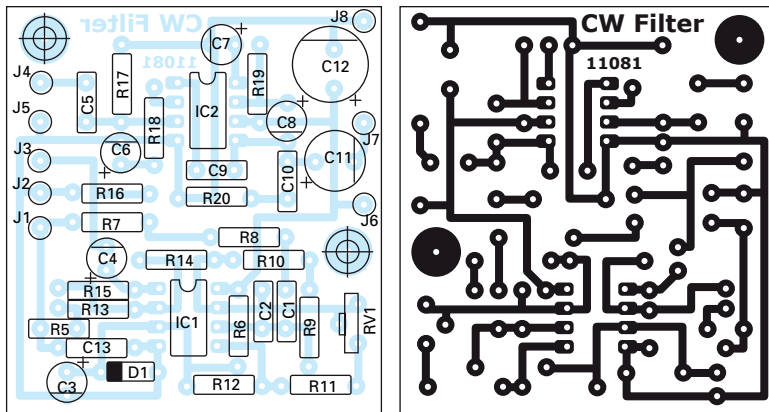


Fig. 6: The new p.c.b. pattern and overlay for the circuit of Fig. 5.

Kits & Bits

The p.c.b. for the Peak CW Filter costs £3.50 plus £1 p&p.

The p.c.b. and component parts kit costs £13 plus £2 p&p.

Contact Spectrum Communications,
Tel: (01305) 262250,
or E-mail:
tony@spectrumcomms.co.uk

Finally, I set the filter to about the maximum stable sharpness by adjusting RV1 and the total value of that and R11 were used in the circuit analysis program. The result is shown in **Fig. 7** and reveals a -10dB bandwidth of 82Hz and a -20dB bandwidth of 200Hz . Now that's sharp enough to reject adjacent frequency signals!

I had intended to send the two filters to Mike G3UED but never followed that up. Instead I cropped the TBA820M section off the MFB board and then fitted it together with the peak board into an old project box. A switch was included so the straight through or peak filter or MFB filter could be selected.

The unit was wired up and then first tested using an audio signal generator to prove correct function. After this I tested it with my Classic receiver on the 3.5MHz and 14MHz bands. Adjustment of RV1 on the Peak board controlled the sharpness of the peak but also dramatically affected the output audio level.

To compensate for this the value of R5 needs to be changed. With more testing it will be possible to get the sharpness at optimum then set a new value of R5. Then set-up just requires RV1 to be adjusted so output is the same as the straight through path. Maybe the design should have included a trim-pot for R5, so the user could adjust sharpness and gain.

The difference between the two filters is quite dramatic when the Peak filter is at sharpest setting. This results in a bit of a hollow sound with the audio and is a result of filter ringing. There will be a setting less than sharpest where the ringing will not be noticeable but the bandwidth will still be much narrower than the MFB filter.

Two Circuits

Two distinct circuits have been produced. The first is a MFB Filter electrically the same as performance as the Mike G3UED's filter, though it uses different component values. The other is the Peak filter with a much tighter passband.

Of the two, I feel that the latter is more versatile as the pass-band is easily adjusted by RV1. Any increase or reduction of pass-band gain can be compensated for using the volume control.

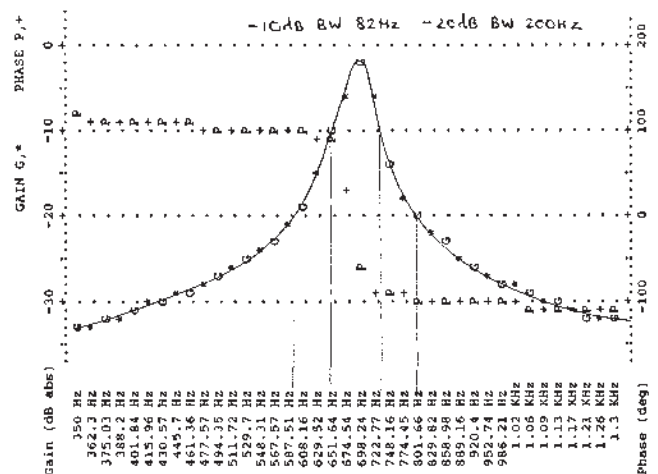
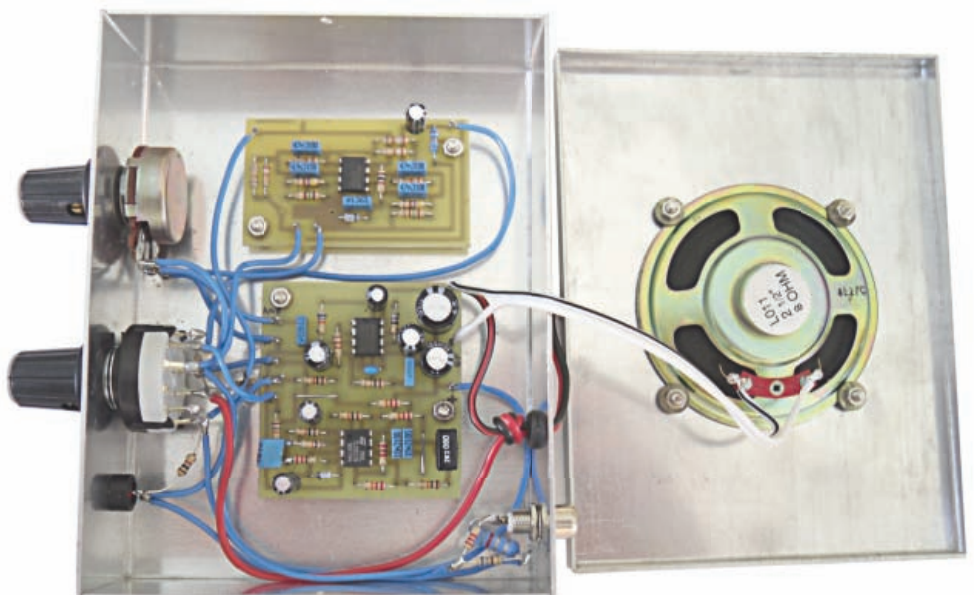


Fig. 7: Testing of the circuit of Fig. 5, revealed a -10dB bandwidth of 82Hz and a -20dB bandwidth of 200Hz . Now that is sharp enough to reject adjacent frequency signals.

If you wish to contact me regarding this article or any previous one, you may do so using:

tony@pwpublishing.ltd.uk



The I-Pro Home Multi-Band Antenna

Dave Mason G3ZPR uses his h.f. operating skills to evaluate the latest antenna from the design desk of Carl Kidd G4GTW.

The I-Pro Home is yet another innovative concept from Carl Kidd G4GTW who clearly understands that types, shapes and sizes of antennas are important issues for many Amateurs. Acquisition of a rig is fairly easy – but when it comes to the antenna there is an extensive list of criteria to be considered.

When looking at the fully constructed I-Pro Home antenna, I can see similarities with other I-Pro antennas. In fact, it's something between a large version of the I-Pro Traveller and a the Dual Beam Pro on its side.

Regular readers will note close resemblance of text in this review with that of the previous review of the Dual Beam Pro (PW September 2011). This is inevitable as many component parts and materials are common to both antennas.

Each antenna, however, has its individual merits and is designed to suit different requirements. The I-Pro Traveller is portable, the Dual Beam a base station steerable beam. So, what are the merits of the latest antenna from Carl? Let's take a look.

The Elements

I'll start by looking at the elements of the antenna, which come well packed in a rigid cardboard tube together with an accompanying box for the smaller components. These comprise;

- 4 x 35mm M6 stainless set screws
- 6 x M6 Nylon insert stainless nuts
- 6 x M6 stainless backing washers
- 1 x Galvanised base support bracket
- 1 x Pre drilled GRP rod centre joining section
- 1 x GRP base insulating rod and 28mm plastic sleeve spacer
- 2 x Matching transformer connection bars
- 1 x Pro Antenna matching transformer
- 1 x Large screw clamp clip to secure matching transformer
- 2 x End element securing brackets

- 2 x 3/8in alloy elements with plastic end caps
- 2 x Pre-drilled 1in diameter main dipole sections
- 1 x Centre support arm bracket
- 1 x 1in x 16in alloy tube centre support arm
- Assembly instructions.

Tools & Materials Required

Next, I'll look at the tools and other materials required; Two 10mm spanners or single 10mm spanner plus 10mm socket and wrench. One 13mm spanner and a plain screwdriver. Additional materials required; Self amalgamating weather-proofing tape, pvc insulating tape. Also required is a 1.52 to 1.82m (5ft to 6ft) ground post to which the antenna is to be fixed. (The supplied 'V' bolts are suitable for 37 to 50mm (1.5-2in) metal tube).

Coaxial Cable Feeder

A good specification coaxial cable should be used with a minimum length of 20m, any excess may be coiled neatly at the equipment end. It should be terminated with a PL259 plug at each end.

Carl has calculated total line loss for this antenna using 20m of RG213 and RG58 types as follows; RG213 - 40m/4dB, 30m/1.5dB, 20m/1.0dB, 17m/0.83dB, 15m/0.87dB, 12m/1.27dB, 10m/1.4dB. For RG58, the losses are: 40m/6dB, 30m/2.14dB, 20m/2.0dB, 17m/1.3dB, 15m/1.4dB, 12m/1.73dB, 10m/2.0dB.

The Design

The I-Pro Home is another of Carl's non-resonant designs requiring an internal or external antenna tuning unit (a.t.u.) for the 14 to 28MHz (20 to 10m) bands operation and an external a.t.u. for the 7 and 10MHz (40m and 30m) coverage.

The design has an upper power limit of 400W peak envelope power (p.e.p.) –



Although tall, the antenna tends to 'disappear' against any garden background.

but the user is cautioned not to exceed the power handling capacity of the a.t.u in use.

Good Quality

Materials used are of good quality to provide good resistance to weather and corrosion. Aerospace alloys are used for the elements and all fixings are of stainless steel. The mast to ground post fixing bracket is of heavy gauge steel (galvanised) and will accommodate mast sizes from 37 to 50mm (1.5-2in).

Standard Of Engineering

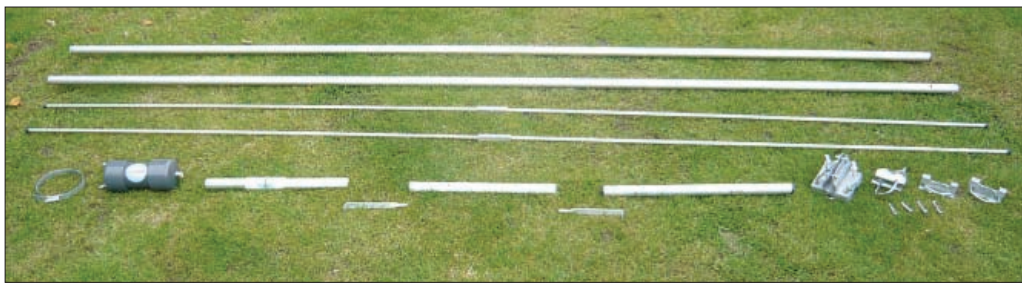
So you might ask, what's the standard of engineering? Here I can only repeat the comments I used to describe that of the I-Pro Dual Beam – the parts actually fit together with no rough edges or swarf from the cutting and drilling processes of manufacture. The transformer design and its housing, is fully sealed and weatherproof with good mechanical connections to the driven elements.

Simplicity of design and assembly have made the whole device easy to construct single-handedly. No assistance was needed in raising and clamping to the ground post. (Not supplied).

Step By Step

Step-by-step instructions are provided for assembling the antenna. **Note:** A caution is given to ensure that the back nuts of the transformer connection bar bolts are held with one spanner – while tightening the locking nut with the other spanner. Take care with these pre-formed bars to ensure they are correctly oriented when fixed or they won't align with the element fixing points.

The two 25mm (1in) diameter main



The contents of the tube and the small box as they arrive in the post.



Two spirits levels to make sure the support pole is truly vertical when it's embedded in the ground.

vertical sections should be joined at the centre on to the pre-drilled GRP rod using only the outermost two bolts (35mm M6 size) – making sure that the uppermost section is the one fitted with a blanking plug.

The prepared matching transformer is then attached using the innermost bolts ensuring that the **red** terminal is fitted to the upper element. (The Pro Antennas logo should appear upright).

The 25mm diameter centre support arm is then clamped to the back of the GRP rod insulator, so that it runs behind the transformer and the large screw clamp clip fitted to secure the two components. **Note:** This should clamp over the thicker part of the transformer at the SO-239 end. Here, I would advise all of the centre assembly bolts are initially only lightly tightened and that they're fully tightened as a final task in the assembly.

The end elements can then be fitted. To assist with this I knocked a wooden peg into the lawn and secured the centre assembly to it with a rubber bungee to maintain it in the vertical position. One of the end elements was then fitted, by positioning its clamp between the pencil marked rings at approximately 6mm from the tube ends with the 'U' bolt coming up through the clamp. When secured the second element was fitted in the same way. All parts must then be



A close-up of the 'potted' balun.

levelled symmetrically, locking up each bolt in turn.

A suitable ground support post should next be set into the ground at the chosen point making sure that there's sufficient ground clearance to attach guys and that these will clear the rotation of the lower element should you require to do so. The post should be at least 600mm (2ft) into the ground – and preferably more depending on the nature of the ground. It should also be at least 900mm or so (3ft) from ground level to the lower element. Take time to ensure this post is truly vertical (see picture).

The GRP base support rod has an alloy sleeve at one end, it is this end which should be clamped into the base bracket.

The feeder can then be fitted and the whole joint weatherproofed with the self-amalgamating tape. The feeder can then be taped with pvc tape to the support arm. I decided to fit guy lines in the prescribed way. I used three 6m lengths of nylon cord – fitted just above the central support arm, two trailing in the direction of the arm and the third line braced against the feeder.

Erecting The System

The I-Pro Home is light enough to single-handedly lift into position. The lower end element should be turned

Company
Pro Antennas

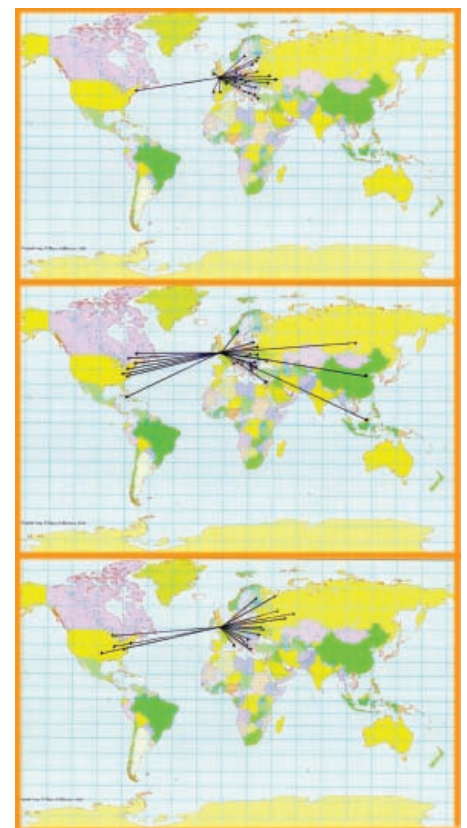
Product
The I-Pro Home antenna

Pros
Once again Carl has produced a winner. The antenna does what he claims for it – and the QSO maps and chart clearly demonstrate how well that's achieved

Cons
I can't think of any!

Cost
£229 plus £8.99 p&p

Contact details:
Pro Antennas,
3 Forsythia Close,
Hedge End,
Southampton,
Hampshire SO30 4TP.
Tel: (01489) 789960,
E-mail:
sales@proantennas.
co.uk
Website:
<http://www.proantennas.co.uk/>



The areas of the world worked by Dave G3ZPR using the review antenna showing from the top: the 7 and 10MHz bands, then the 14 and 18MHz bands above the 21, 24 and 28MHz bands.

to an acceptable position for your own convenience in the garden and the clamp secured. (The antenna is **not** directional). Then secure the guy lines. As my feeder was in two lengths it was convenient for me to insert my Z11 automatic antenna tuning unit (a.a.t.u.) where the sloping feeder reached the ground and the second length routed to the shack.

On The Air

For the on the air tests I used the Kenwood TS-570D running 100W. With the help of my friend and fellow club member **Phil Ciotti G3XBZ**, we carried out a run through the bands, checking the standing wave ratio (s.w.r.) and power levels using an internal antenna tuning unit (a.t.u.) on 14 to 28MHz (20 to 10m) with results ranging from 1.2:1 to 1.5:1. A further check with Phil's Kenwood TS-440S resulted in 1:1 across the same range.

The tests were then repeated with the TS-570D with the addition of 10MHz (30m) and 7MHz (40m) with my external Z11 a.t.u. and using the Kenwood SW2100 s.w.r./power meter. The results were very acceptable with the s.w.r. ranging from 1:1 to 1.5:1. This is in line with the designer's comments that: "It's normal in use to see an s.w.r. on your feeder and this is why the antenna is described as requiring the use of an a.t.u." And from my point of view, you can also expect there to be variations between internal rig a.t.u.s!

The Results?

From the first 'switch on' this antenna was 'bringing them in'! Indeed, I soon found out that if I could hear them I could work them! This was refreshing from my QTH where I don't enjoy the best aspect for propagating south or north-west.

However, it wasn't long before I realised that I needed to be selective of the stations I worked or there would be too many of the same country – so the selective hunt began. One thing is clear, you can only work stations that are there and, in spite of improving conditions, there are still periods of very low activity.

On one occasion I went to the shack to check the level of activity and found the c.w. end of 14MHz virtually silent. While checking the log a G/portable station called. I responded – only to find the location was within 32km (20 miles) of me. We enjoyed a lengthy chat (about 40 minutes) and then signed off.

The rig remained on in silence while I completed the log when another station called on the empty frequency. I replied and was delighted to work a station in



Phil G4XBZ, took his rig along to see how the I-Pro Home antenna worked when two rigs were tried in the same location.

Beijing. This was a first for me as I had never before worked a Chinese station!

The chart shows a summary of the practical 'on air' tests; QSOs per band are shown along the bottom line Total QSOs: 85. Both A1A (c.w.) and J3A ('phone) modes have been used for these tests.

The Final Comments

Next, my final comments. The 'I-Pro Home' is well produced, easy to assemble and erect, doesn't seem to be affected by the close proximity of house walls, trees, etc., and still performs. This design works and there's is no doubt in my mind with respect to the performance of the product.

Once again Carl has produced a winner. The antenna does what he claims for it – and the QSO maps and chart clearly demonstrate how well that's achieved. The chart closely reflects the available activity per band during the test period and its close relationship to the propagation predictions. Three conveniently grouped maps have been produced to show the performance of the seven bands.

Because I have tested most of the Pro Antenna range my expectations are high. My inspection standards, however, remain consistent. As per my usual style for these reviews, I've not made direct comparisons but I can only say that I could easily be tempted to replace my existing main station antenna with the I-Pro Home. Sadly, there are more antennas than cabbages growing in our garden just at the moment and my wife may well have a different view on this!

My thanks to Carl G4GTW, the designer of the antenna for the opportunity to review it. It has been a pleasure. Dave G3ZPR.



Dave G3ZPR, lifting the completed antenna up onto the supporting ground post.

The Dual Beam Pro Specifications

Vertical section length	5m
Overall span of top and bottom elements	2.5m
Total weight including support bracket and centre feed transformer	4.5kg
Upper power limit	400W

Carl Kidd G4GTW

comments: I would like to take the opportunity to thank Dave the reviewer for his very comprehensive overview of my product. The market offers many base fed verticals and it is commonly known that the performance will be closely related to how much work goes into the systems grounding and at the very least 4 x $\lambda/4$ wave long wire radials should be installed. My centre fed approach offers a complete system with no dependency on the use of radials or grounding. The design also utilises low-loss capacity end loading over the lossy trapped/loading method. This is very liberating and allows for a very quick efficient installation and although the product is focused as a home base antenna, I have enjoyed great results using it portable.

Carl G4GTW



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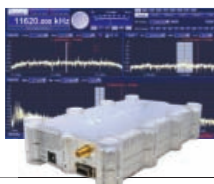
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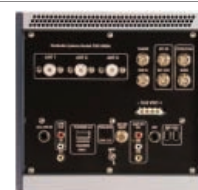
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Feed-back on Low Profile Antennas

In this edition of *What Next?* Colin Redwood G6MXL presents feed-back from readers' own experiences with low profile antennas.

Welcome to *What Next?* (WN?), where this month I'm reporting back on some of the correspondence I've received from readers about low-profile antennas. There's also a reminder of a small change to the syllabus for the Foundation Exam, which should already be in place.

Four readers replied to my offer in the October 2011 issue to feature some readers' low profile antennas. It's clear from their correspondence that low profile antennas can really work well and I'm hoping that the input from these readers will encourage others who need to disguise or hide their antennas.

Ross Bradshaw G4DTD

Within hours of my October issue landing on the door mat, I had an E-mail from **Ross Bradshaw G4DTD**. On

the estate where Ross lives, with the exception of satellite dishes, external antennas aren't permitted. Ross has used a slightly different technique for a gutter antenna, which I think readers may find useful.

I'll let Ross explain. "As shown in your photo the problem is that the tiles overhang the antenna and on wet days you end up with an electrostatic screen masking off one direction. What I did was put the antenna in the gutter itself **but** I did not lay the antenna on the bottom of the gutter where the water runs. I used stick-on plastic clips to secure the antenna wire close to the top (just inside) of the outside edge of the gutter. This puts the antenna out of water, away from the tiles and more or less out in the open but still not seen by anyone."

Thanks Ross! The ingenious technique used by Ross certainly works. He reports working Massachusetts while running about 20W, and Krasnoyarsk (Siberia) and Dallas (Texas) running less than 50W.

Alan Schiffman G4GQL

I then received an interesting E-mail from **Alan Schiffman G4GQL**. He lives in a ground-floor flat and needed something to get on the air with. Alan has designed a top-loaded vertical for flat dwellers based on the **Keep It Simple Stupid** (KISS) design. Alan says, "I've tried almost everything else from a piece of wire, to £500 worth of loop and cannot improve on this in such a limited space."

"I have made modifications to it like the capacity hat (**Fig. 1**), and the feeder is RG8 with the inner and outer joined to form a solid wire and is part of the radiating element".

Alan continues, "The three coils at the top, two close-wound on a non-radiating wooden dowel and one spaced give excellent results and s.w.r. on all the bands, and very effective on 20m. The lower part is a copper tube. The antenna is tuned with an MFJ-949E a.t.u., and there's a second antenna, almost identical, connected to a MFJ-1025 noise canceller and signal enhancer. I have been using this for the last five years, and have made RST 599 contacts all over Europe."

In addition to a compact and very effective antenna system, Alan has also been successful in minimising the visual impact of his antennas (there are at least two in the picture (**Fig. 2**) by amongst other things use of colours that match the surrounding paint work.

Thank you Alan!

Jonathan Kempster M5AEO

The next reader who contacted me with his ideas was **Jonathan Kempster M5AEO**. Jonathan dropped me an E-mail describing his experiments and successes with a helical vertical design with radials which he uses on the balcony of a top floor flat.

Jonathan says, "Your article in this month's *PW* along with **Ray Howes G4OWY**'s contribution to the same issue prompted me to write with my experience of low-profile antennas, which I thought might be useful and of interest to other readers. I've attempted

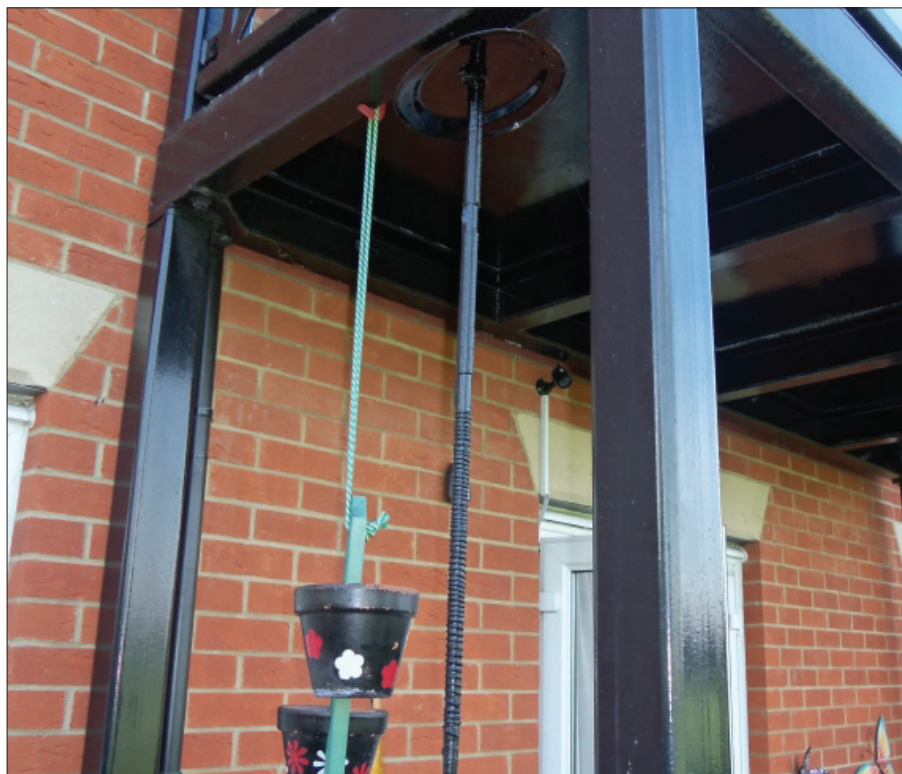


Fig. 1: Alan Schiffman G4GQL's top-loaded Vertical with a capacity hat.

to attach some photos to help illustrate the project (please let me know if this worked!).”

“When I moved house from rural Milton Keynes to urban East London I practically gave up Amateur Radio. I had no garden and had legal restrictions on outdoor antennas. I settled down to short wave broadcast listening on my portable Sony and whip antenna. However, as we all know, you can’t keep a Radio Amateur down! and I soon set to thinking how I might be able to get back on the air, even on the h.f. bands.

“My problem was that the only outdoor space available to me was the 3.5 x 2.5m (12ft by 10ft) balcony. Fortunately, it’s the top floor so there was open sky above and we are 18m (60ft) above the ground, which has definite advantages.”

“At first I went down the road of getting as much wire in the air as possible. By rigging up various ‘loops within loops’ I was able to erect about 27m (90ft) of wire in the air. It tuned up well enough, but it was very inefficient: my signal just wasn’t being heard. As I started dismantling this attempt I ended up with just the helical element to which I had attached the loops. I thought I’d see if it could do anything for me, and to my surprise it seemed to radiate a signal.

“Since then I have developed the helical vertical design and now I think I have achieved the ultimate design for the space available.

“The antenna consists of 33ft (a



Fig. 2: Alan G4GQL’s well-disguised antenna farm.

quarter wave at 7MHz) of insulated copper wire wound round a wooden dowel rod inside a small diameter plastic pipe (Fig. 3). A smaller diameter pipe is then slid into the bottom pipe and the helical winding extended to the top: a pipe length of about 4m (13ft) in total. This main element is then attached to the corner of the balcony railings with cable-ties.

“The wire exits the bottom of the plastic former and feeds into an LDG 1:1 balun (Fig. 4). On the earth side of the balun are 14 radial wires of varying lengths. The radials are either hanging down off the balcony or spread in amongst the wooden decking of the balcony. Attached directly below the balun is a common-mode choke and then RG8x coaxial cable feeds the

whole system into the shack and into a Palstar a.t.u.

“This antenna **works!** My aim was to get onto 7MHz and above and I have achieved that with amazing results! The antenna tunes up on all bands 7MHz (40m) and above, including 50MHz (6m). I get good (5&9) reports from all over Europe and beyond using 100W of s.s.b. I have just worked VK (Australia) on 14MHz u.s.b. using 100W. Obviously, it’s not as good as a full size dipole but considering the restrictions it really is good.

“The antenna only costs about £8 to make (excluding the balun); so I can’t understand people spending £300 on a bit of metal with a balun at the bottom! I found that the radials make a great difference. I started with three of 10m



Fig. 3: The LDG 1:1 balun used by Jonathan M5AEO. The bottom of the antenna can be seen on the left, fixed to the railings with cable-ties.



Fig. 4: Jonathan Kempster M5AEO’s low profile antenna is about 4m (13 feet) tall, which is almost invisible from the ground as it’s mounted around 18m above ground.

(33ft) in length then slowly added more of various lengths (cut to the bands required). Adding more radials made the antenna more efficient and improved the bandwidth that it would work across.

"Overall, the antenna is efficient, cheap and low profile. Being made out of white pipe it's virtually invisible from the ground. The antenna has been up for a couple of years now and nobody has noticed it. Also, it seems to be free of any EMC issues: I tested it on all bands at 100W of s.s.b. with my neighbour watching his TV and received no reports of TVI – I think the choke is probably helping here.

"The antenna has also proved to be quite sturdy. I have guyed it on three sides with strong fishing mono-filament line (again invisible) and it has survived the recent storm-force winds. If it did get damaged in any bad weather – it would only cost a few pounds to make another! My next challenge is to start messing about with loading coils to see if I can get onto 80m!"

Thanks for that Jonathan!

David Bambrook 2E0DAB

The next readers to write in to offer help **David Bambrook 2E0DAB**. David wrote to describe how he mounted two mobile whips back-to-back in his loft space while drinking numerous pots of tea. He told me "I had a rest day off from work – I'm a bus driver – and decided I wanted to build myself a new h.f. antenna.

"I've had various wire dipoles in the lofts of previous houses but these still had to be fairly long to get the best r.f. out and hear what was going on out there! Shortening the wire dipoles then represented a problem in the loft, to overcome this I made two short dipoles stacked and managed to work on 40 and 20 metres.

"So on this rest day I decided these dipoles with some modifications would go back in the loft, but opening the box they were in, revealed some damage, as they had been thrown in the back of the shed during the move to our new property and had unfortunately broken. So, time for a cup of tea! After finishing a pot of tea, I remembered that, possibly somewhere in the garage, was one if not two Ampro mobile 40m Antennas.

"Rushing out to the garage I found these immediately under the work bench in un-used and un-damaged condition (hooray!). I wondered if I could make a dipole from these two antennas?

"I removed them from packaging and laid them out in the garden. Possibly I thought this may work. All I need is something substantial to fit them together to make a centre piece,

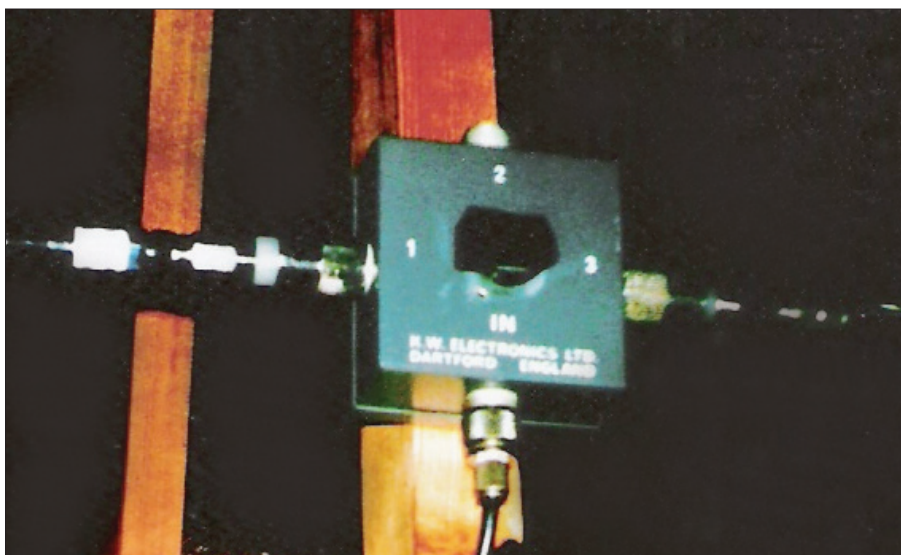


Fig. 5: David Bambrook 2E0DAB used a modified antenna switch box to mount two mobile antennas 'back-to-back' in his loft.

obviously this had to be fairly strong as the antennas (holding them) at the base end are fairly heavy. This took a while!

"With yet another pot of tea brewing, I came up with the idea of shorting-out the terminals of an antenna switchbox with its metal construction would be ideal, so soldering iron warmed up and terminals wired up to how I required them.

"The switchbox was then installed in the loft onto one of the rafters, with the two antennas fitted one either side (Fig. 5.). I then ran the feeder down to the radio via a tuner and had a listen around, it tuned up on 40 and 20m and after some time listening I managed to work a few stations, including Northern Canada, Canary Islands, mainland Spain, Italy and Russia plus loads of UK stations on 7MHz. Great – **what a result** – it works, it's in the loft, neighbours can't see it, and I'm not advertising my activity from my house.

"The next week I went to the newsagents in town to get *PW*. As usual I read a few articles before purchasing, it seemed to open up straight to your page and there I noticed a similar dipole to the one I'd just made." (Shades of Ernie Wise's plays!)

All I can say is that great minds think alike David!

Thanks again to Ross, Alan, Jonathan and David for sharing the techniques they've used. They certainly appear to be very well thought through and executed. I also get the feeling that all four have a real sense of achievement and enjoyment in overcoming the limitations of their locations and making some excellent contacts with their low profile antennas.

I can also agree with David about the need for tea when doing not only antenna work, but other projects around the house. Just as competitive divers

express a dive in 'degrees of difficulty', I express my estimates for doing jobs around the house in cups of tea!

Plastic & Radio Frequencies

Another reader then contacted me with a practical suggestion. **John Wiewiorka GM3YKA**, wrote with a useful suggestion for readers considering using plastic drain pipes to hide antennas. "To check if the plastic is transparent to radio frequency – place a chunk of it in your microwave oven, if it heats up melts or looks if it will take fire it's no good! (Watch it carefully). If it remains cold after a bit, then you're probably okay."

John then suggests "Do this when the mistress of the house is out! It doesn't matter about the kids - the chances are they think you are bonkers anyhow."

Thanks to John for the suggestion. I would suggest running the microwave oven for just a few seconds initially; then in 10 to 20 second periods and you should use a 'sacrificeable' dish/saucer that's proved okay in the microwave before, just in case it ends up with melted plastic welded to its surface.

Foundation Syllabus Change

Finally this month, just a quick reminder of a small change to the Foundation exam syllabus, that has recently come into effect. This has added an additional item to the syllabus requiring candidates to understand that the transmission of music and the use of offensive or threatening language on the air are unacceptable, and what to do if they encounter such on the air.

The change has increased the number of questions in the exam from 25 to 26. The pass mark has accordingly been raised from 18 to 19 accordingly.

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January 3rd

The Friskney Winter Sale

The Friskney and East Lincolnshire Communications Club Mid-Winter Table Top Sale and Auction will be held at the Friskney Village Hall, Church Road, Friskney, Lincolnshire PE22 8RR. The doors will open at 7.30pm and admission will cost £1.50. Tables (two for the price of one) will cost £4.00. There will be free parking, free identity badge printing, one free entry to the raffle and free tea and coffee.

Ian Donnelly 2E0XOD

Tel: 07554 362020

E-mail: felcc@btinternet.com

www.felcc.com

January 15th

The Dover Rally

The eighth Dover Amateur Radio Club Rally will be held at the Whitfield Village Hall, Sandwich Road, Whitfield, Dover CT16 3LY. The doors will open between 9.30am and 1.00pm and admission will cost £1.50. There will be talk-in via GB3KS, trade stands, a Bring & Buy and catering.

Ian Keyser G3ROO

Tel: 01304 821588

www.doverradiorally.com

January 15th

The Red Rose Radio Rally

The Red Rose Winter Radio Rally will be held at the George H Carnall Leisure Centre, Kingsway Park M41 7FJ (M60 junction 9, opposite the Trafford Centre). The doors will be open from 11.00am to 3.00pm. There will be free car parking, trade stands, a Bring & Buy, special interest groups, an RSGB bookstall, catering, licensed bar and facilities for the disabled.

Steve

Tel: 07502 295141

www.wmrc.org.uk/carnall.htm

FEBRUARY 2012

February 5th

The Canvey Rally

The 27th Canvey Radio and Electronics Rally will be held at the Paddocks Community Centre, Long Road, Canvey Island, Essex SS8 0JA (the southern end of A130). The doors will open at 10.30am and there will be free parking, trade stands, catering and facilities for the disabled.

Dave G4UVJ

Tel: 01268 697978 (evenings)

E-mail: rally@southessex-ars.co.uk

www.southessex-ars.co.uk

February 5th

The RadioActive Show

The Mid Cheshire Amateur Radio Society will be hosting the RadioActive Show at the Civic Hall, Nantwich, Cheshire CW5 5DG. The doors will open at 10.30am and admission will cost £3.00. There will be car parking (50 pence for the whole day), trade stands, a Bring & Buy, exhibitors tables and catering.

Simon Chettle G8ATB

Tel: 01270 841506

www.midcars.org

February 10/12th

The Orlando Hamcation®

The Orlando Hamcation® and Computer Show will be held at the Central Florida Fairgrounds, 4603 West Colonial Drive, Orlando, Florida 32808. The doors will be open between noon and 6.00pm on Friday, 9.00am to 5.00pm on Saturday and 9.00am to 2.00pm on Sunday. There will be free car parking, talk-in, trade stands, a flea market, a car boot sale, lectures, special interest groups, family attractions and a prize draw.

E-mail: info@hamcation.com

www.hamcation.com

February 12th

The Harwell Rally

The Harwell Radio and Electronics Rally will be held at the Didcot Leisure Centre, Mereland Road, Didcot OX11 8AY. The doors will open at 10.30am (10.15am for the disabled) and admission will cost £2.50 (under 12s are free). There will be talk-in on S22 (V44), free car parking, trade stands, a flea market, special interest groups, catering, a licensed bar and facilities for the disabled.

Ann G8NVI

Tel: 01235 816379

E-mail: ann.stevens@btinternet.com

www.g3pia.org.uk

February 12th

The Northern Cross Rally

The Northern Cross Rally, organised in association with the Wakefield and District Radio Society, will be held at the Thornes Park Athletic Stadium, Horbury Road, Wakefield, WF2 8TY. The doors will open at 10.30am (10.15am for the disabled) and admission will cost £3.00. There will be free car parking, trade stands, a Bring & Buy (booking-in from 10.15am), catering and facilities for the disabled. In addition, there will be a miniature steam railway in the afternoon (weather permitting).

Ken 2E0SSQ

Tel: 07900 563117 (before 8.00pm please)

E-mail: 2e0ssq@wdrs.org.uk

www.northerncrossrally.com

February 26th

The Rainham Radio Rally

The Rainham Radio Rally will be held at Rainham School for Girls, Derwent Way, Rainham, Kent ME8 0BX. The doors will open at 10.00am. There will be talk-in and catering will be available.

Trevor G6YLW

Tel: 07717 678795

E-mail: trevwig1.co.uk

February 26th

The Swansea Rally

The Swansea Amateur Radio Society Rally will be held at the Court Herbert Sports Centre, Neath Abbey, Neath, SA10 7BE. The doors will open at 10.30am and admission will cost £2.50. There will be free car parking, trade stands, a Bring & Buy,

special interest groups and catering.

Roger GW4HSH

Tel: 01792 404422

www.radioclubs.net/swansears

MARCH 2012

March 4th

The Cambridge Radio Rally

The Cambridge and District Amateur Radio Club Rally will be held at the Wood Green, King's Bush Farm, London Road, Godmanchester, Cambridgeshire PE29 2NH. The doors will open at 10.00am and admission will cost £3.00. There will be talk-in on S22, trade stands, a Bring & Buy, special interest groups, family attractions, catering, licensed bar and facilities for the disabled.

John G0GKP

Tel: 01954 200072

E-mail: j.bonner@ntlworld.com

www.cdarc.co.uk

March 4th

The Exeter Radio

The Exeter Radio and Electronics Rally will be held at the America Hall, De La Rue Way, Pinhoe, Exeter EX4 8PW. The doors will open at 10.30am (10.15am for the disabled) and admission will cost £2.00. There will be trade stands, a Bring & Buy and catering will be available.

Pete G3ZVI

Tel: 07714 198374

E-mail: g3zvi@yahoo.co.uk

March 10th

The National Radio Flea Market

The Foundation Amateur Radio Club Bossche (BRAC) will be hosting the Dutch National Radio Flea Market at the Autotron Rosmalen, Graafsebaan 133, Rosmalen 5248, The Netherlands. The doors will open at 9.00am and admission will cost 7.00. There will be talk-in on S20 (V40), trade stands, a flea market, special interest groups and catering will be available.

E-mail: info@radiovlooiemarkt.nl

www.radiovlooiemarkt.nl

March 11th

The Wythall Rally

The Wythall Radio Club Radio and Computer Rally will be held at the Woodrush Sports Centre, Shawhurst Lane, Hollywood, Nr. Wythall, Birmingham B47 5JW. The doors will be open between 10.00am and 3.00pm and admission will cost £2.50. There will be talk-in on S22 (V44), car parking, trade stands, a Bring & Buy and catering will be available.

Chris G0EYO

Tel: 07710 412819

E-mail: g0eyo@blueyonder.co.uk

www.wrcrally.co.uk

March 25th

The Spring Hangar Sale

The Spring Militaria, Electronics and Radio Amateur Hangar Sale will be held at the Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL. The doors will open at 10.00am and admission will be £2.50. There will be civil, military and

vintage radio equipment plus vehicle spares and more.

Rod Siebert

Tel: 01270 623353

E-mail: coldwatr@hackgreen.co.uk

www.hackgreen.co.uk

APRIL 2012

April 1st

The South Gloucestershire Radio Rally

The South Gloucestershire Amateur Radio Rally will be held at the Scout Activity Centre, Woodhouse Park, Almondsbury, Bristol BS32 4LX. The doors will open at 10.00am. There will be talk-in on S22 (V44), car parking, a Bring & Buy, a car boot sale, catering and facilities for the disabled.

Stan Goodwin G0RYM

Tel: 07833 517370

E-mail:

SouthGlosRadioRallyCoordinator@gmail.com

www.southglosradiorally.org.uk

April 1st

The Lough Erne Rally

The Lough Erne Amateur Radio Club will host the Enniskillen Amateur Radio Show at the Share Holiday Village, Smith's Strand, Lisnaskea, Co. Fermanagh BT92 0EQ. The venue is on the shores of Upper Lough Erne and can be accessed via the Shannon-Erne Waterway. The doors open at 11.30am and there will be car parking, trade stands, a Bring & Buy, catering, a licensed bar and facilities for the disabled.

Iain

Tel: 02866 326693

E-mail: iain@learc.eu

www.lougherneradioclub.co.uk

April 15th

The Norbreck Rally*

The 50th Northern Amateur Radio Societies Association Exhibition (formerly known as the Blackpool Rally) will be held at the Norbreck Castle Hotel Exhibition Centre, on Queens Promenade, North Shore, Blackpool FY2 9AA. The doors will open at 11.00am (10.45am for the disabled) and admission will cost £5.00 (under 14s are free). There will be talk-in, car parking, trade stands, a Bring & Buy, special interest groups, a licensed bar, catering and facilities for the disabled.

Dave M0OBW

Tel: 01270 761608

E-mail: dwilson@btinternet.com

www.narsa.org.uk

April 22nd

The Yeovil QRP Convention

The 28th Yeovil QRP Convention will be held at the Digby Hall, Hound Street, Sherborne, Dorset DT9 3AA (adjoining the central shopping car park). The doors open at 9.30am and there will be talk-in on S22, car parking, trade stands, a Bring & Buy, lectures, catering and facilities for the disabled.

Derek M0WOB

Tel: 01935 414452

E-mail: yarc-contact@tiscali.co.uk



Tim Kirby G4VXE's World of VHF incorporating VHF DXer

Willowside, Bow Bank, Longworth, Oxfordshire OX13 5ER

E-mail: tim@g4vxe.com Twitter: g4vxe

When The MUF Is Up – We Get Better DX!

Tim Kirby G4VXE discusses the increasing maximum usable frequency (MUF) which has brought benefits for h.f. and v.h.f. users, in his *World of VHF* column.

Welcome to the *World of VHF (WoVHF)* and the topic of the month is certainly the increasing MUF. I think most people have been surprised with the very much improved high frequency (h.f.) conditions that have occurred over the last few weeks – hopefully plenty for **Carl GW0VSW** to report in his column.

At v.h.f., which we generally class as being over 30MHz, it takes a little while for the F2 propagation to reach the bands that we are interested in.

However, it's always interesting to have propagation indicators which help us gauge what conditions are like. **Richard Gosnell G4MUF** (Royal Wootton Bassett in Wiltshire) has been listening to private mobile radio (PMR) signals from the USA between 30 and 36MHz. Richard says that his favourite has always been the New York Fire Department on 33.900MHz. Richard has heard them over the last three sunspot maxima; 1981, 1990, 2002 and now this one.

Keeping an ear on signals between 30 and 50MHz can be very interesting and give some clues about the likelihood of propagation reaching 50MHz. During the 1990 maxima, I monitored many pagers and PMR signals from the USA around 35.220MHz and 43.220MHz. I'm not sure whether these frequencies are still active and haven't yet had a chance to listen so far, although I can find these frequencies listed. On the lower, 35MHz frequency, I know Hawaii has been logged from the UK.

The message is, keep an eye on the frequencies between 30 and 50MHz if you can as it will probably help you gauge when 50MHz is likely to open and in which directions the openings are.

The Ariel Radio Group

It was good to hear recently from **Jonathan Kempster M5AEO**, writing as station manager of **G8BBC**. Jon had some good and some bad, news about the **Ariel Radio Group's** operation from London.

Jon takes up the story, "I wanted to give you some news about my Club station G8BBC, the London branch of the BBC Club Ariel Radio Group. As you probably know the ARG has been going since the 1940s – but unfortunately our branch in London has suffered a decline in membership over the last few years. This year we fell below 25 members, so the central BBC Club has disaffiliated us. Fortunately we were able to keep the equipment and continue to use the radio shack at TV Centre.

"Just when we thought we were okay the BBC announced that it was closing the East Tower where we had our shack and all departments had to vacate it by September. This is because several BBC departments are moving to Salford, including the Children's Department who also lived in the East Tower. So the last few weeks have been frantic as we had to dismantle all the antennas and deal with our equipment.

"We managed to sell off some stuff and passed a lot on to other branches such as Manchester and Caversham who appear to be resurgent now. We still have two crates of bits and pieces (junk!) which we hope to sell off when the rally season hots up in the spring.

"So, what is the future? Well, we hope to reform as an independent group with members in the London area, and Ofcom have allowed us to keep the callsign. What may be of interest to your readers is that I'm trying to keep the callsign active from TV Centre,

operating as G8BBC/P. I have done this a few weeks running now during my breakfast break on early shifts (I work earlies every other weekend).

"I pop up to the 7th floor balcony at the front of TV Centre and operate with my new FT-60 hand-held transceiver. The most reliable path has been via the **GB3HR** u.h.f. repeater in Harrow in London, and I have had some pleasant QSOs with several stations so far. So, if anyone is around on weekend mornings, please listen out for G8BBC/P!"

Jon also comments that he found a dual-band rubber helical antenna from Garex Electronics worked much better on the Yaesu FT-60R than with the supplied antenna. He also says it provides much more gain and he's now able to access the repeater with just 500mW – thus preserving battery life.

It was great to hear from Jon. It's sad to hear that the G8BBC club has fallen on fallow times, but it's good to hear that he's keeping it going and hopefully more people at the BBC will learn of the club and get involved. I really hope so!

Making More Of VHF

Brian Carter G8ADD (Birmingham, West Midlands) wrote with some advice based on **Ceri Jones MW6CLJ's** query in a recent column about how he could make more distant contacts on v.h.f./u.h.f.

Brian says, "You are, of course, perfectly right, what is needed is a better antenna, for instance I once made a 'Slim Jim' out of welding rod pieces bent to shape and held together with some 'chocolate blocks', which was cheap and cheerful and worked very well. An immediate improvement of several dB can be obtained by fixing a quarter-wave of wire as a counterpoise to the hand-held, the earthy side of the antenna, just let it hang down and hey presto!

"Ceri is ideally placed to take part in Summits on the Air (SOTA) as a Chaser, Denbigh being central to North Wales, the Welsh Borders, the Lake District, the Pennines and the Isle of Man – and even Ireland. As an activator, on 144MHz I have frequently been called by hand-held users at distances well in excess of 100km so Ceri will find himself with plenty of long-distance contacts.

"I suggest that Ceri looks at [www](http://www.sota-op.org).



Panos Dadis SV1GRN and the Athens QRP group operated from Mount Parnitha (1100m a.s.l.) in KM18ud, reporting contacts with the IRESC Group, using the callsign TC3IRESC, in Turkey from Mount Uludag (2100m a.s.l.) in KN40nc. Two versions of hand-held Yagi arrays are illustrated.



sotawatch.org where on the left side of the page are two columns, 'Spots' and 'Alerts'. Spots will show current activations around the world, it's just a matter of waiting for 144MHz activations in the UK and listening on the spotted channel. Alerts are warnings of intended activations, so it is possible to be ready and waiting for an activation. Whilst you wait for the next activator to summit there is a lively reflector to read, with a recent index on the right-hand side of the page. A full explanation of SOTA is on their **website, www.sota.org.uk** but a warning, it's **very** addictive indeed!"

Thanks for your E-mail – great advice, Brian! And, it was great to hear from Ceri MW6CLJ this week who sent me a message to let me know that he had successfully passed his Intermediate Examination, so we hope to be hearing him with a 2W0 callsign very soon. Congratulations, Ceri!

The 50MHz Band

I was delighted to have a first E-mail from **Ernie Stagnetto ZB2FK** (Gibraltar), although we have heard from him a number of times via **Ronald Pincho ZB2B**. Ernie says that he is generally an h.f. c.w. operator, but has been encouraged to try 50MHz by Ron. Ernie says he is amazed at what has been working with his 'humble' V2000 vertical.

On October 7th 2011 around 2200z he worked ZP5SNA (Paraguay), EA8AQV, PY2XB, PY1RO and LU5FF. On October 12th he worked 5N7M. Ernie says, "After 32 years of h.f. DXing who would have said that 50MHz was

going to give me such a buzz! No wonder they call it the magic band."

It was good to hear from Ron ZB2B (Gibraltar) himself too. He was delighted to have got hold of a new rig for 50MHz, a mono-bander from Ranger, the RCI5054 which is a 100W rig, Ron had bought the rig second-hand from a friend in Canada and wondered why the rigs were not available via UK retailers.

I checked with **Mike Devereux G3SED**, Managing Director at **Nevada Radio** in Portsmouth and asked why this might be. Mike said that he was aware of the radio but that last time he had looked it wasn't CE approved and thus it was illegal to import and sell the rigs in the UK.

Ron ZB2B said there have been several Transequatorial propagation (TEP) openings during the month, but that he has been enjoying the good conditions on 28MHz!

As usual, there's a very interesting E-mail and log from **Mark Marment CT1FJC** – thank you! Mark writes, "50MHz has been good to South America with many 59 signals, but it tends to be the same path and stations each night, but I did work a few new squares which was nice to add to the score."

Mark lists a great list of DX; LU4HP (FE49) worked on October 20th at nearly 10700 km and CE4WJK (FF45) worked on October 11th are two particularly nice ones.

Mark said, "TEP to Africa has also been there but with much flutter at times. 3XY1D was RST599 plus 20dB, but despite many calls to him, I

was unable to complete a QSO. They have real problems with the 50MHz receiver and according to their web site have now stopped trying on the band, because of the fault."

Mark says that some high power/well-sited stations did make it. He continued, "I worked ZS6Y for a new one on JT6M, we started on ISCAT which was better than the JT6M. Also new on JT6M was LU7FA (FF96), which is now my best DX using JT6M. We started with JT65A and it was interesting to compare the two modes at low power levels."

Note: The modes ISCAT, JT65A and JT65M are all protocols – all different – that can be used by stations equipped with the **WSJT** software written by **Joe K1JT**. Mark's observations are particularly interesting as it takes some experience to decide which is the most appropriate mode to try using in different propagation conditions.

The 144MHz Band

Gavin Nesbitt M1BXF (Cambridge) sent an interesting log from the good tropo conditions on October 15th and 16th. Gavin worked EB1LA (IN63), EA1BLA/P (IN53), EA2DHJ/P (IN83) and F1EIT (JN03) on the 15th. Next day on the 16th, distances were somewhat shorter with the majority of stations worked being from Germany and the Netherlands, although Gavin worked two stations in Switzerland; HB9THJ/P (JN46) and HB9EQU/P (JN37).

Gavin says that using his Flex-1500 Software Defined Radio (SDR) he is able to see a waterfall display



A 7-element Yagi antenna standing on a portable tripod mount and supported by guy ropes - from the Greek side of Panis' contacts.

of the band and that most signals were comparatively weak, with the strongest peaking S8, although there was considerable fading. Gavin runs an Icom IC-910, Sagra-600 amplifier and a 9-element YU7EF Yagi antenna at 14m.

Gavin also reports that during the RSGB 144MHz UK Activity Contest on October 2nd when the Camb-Hams group were operating as G3PYE/P they managed to work SP3TL at a distance of around 1021km – an excellent distance!

Peter Goodhall 2E0SQL (Oxford) worked a few stations during the month, including 2E0RDU/P (IO83) and also found plenty of activity during the RSGB 144MHz Activity Contest, some of the more distant ones being M0MCV (JO01), M0DXR (JO01), G4DEZ (JO03), G0MBA (JO01) and G4IRC/P (JO02).

Philip Oakley G0BVD (Great Torrington) also worked 2E0RDU/P (IO83) on Winter Hill near Bolton in Lancashire.

Here at **G4VXE** (Oxfordshire), the only unusual QSO of the month was really something a bit different! On the evening of October 14th, I checked the band as I was heading to bed, as things had seemed a bit more lively than usual on the drive home from the station.

The f.m. scanning system stopped on 145.7375MHz and I could hear French voices. Being not too far from the English Channel, this is always interesting but not entirely unusual. Signals were fading up and down from about S5 right down into the noise. Happily the repeater was one that

sends an Identification signal in Morse code; F1ZTL. Imagine my surprise when I 'Googled' it and found that the repeater was located in JN24 square, south west of Lyon in France.

I disabled my continuous tone codes squelch system (CTCSS) tone which would have ordinarily brought up the **GB3AL** repeater near London and waited for a pause in the conversation to drop my callsign in. This I was able to do and it was good to speak with several stations on the repeater. It was particularly fun to have an E-mail within a few minutes from **Romain Lerat F4FGB**, reporting my signals and giving me a few more details about the repeater which is located on Mont Alambre at an altitude of around 1600m.

It was also great to receive an E-mail from **Alan Cook 2W0EAD** from Risca, in South Wales, who could also hear the repeater and said that he had been hearing it for some hours. Alan's QTH is about 113m (375ft) above sea level and he has a clear take off in that direction. Alan's station is a Yaesu FT-857D to a Watson tri-band vertical for 50, 144 and 432MHz.

Although I am not one for repeater DXing as such, I was fascinated to hear F1ZTL at a distance of around 900km from me and to be able to make some contacts. Although I pointed my horizontal beams in that direction, I made no QSOs on c.w. or s.s.b. My guess is that there was a comparatively high-level duct which the repeater was in, but stations lower down were out of the duct.

Perhaps significantly, Alan 2W0EAD also said that F1ZTL was the only DX that he heard that evening. The only other French station that I heard at the same time was the F6ZCU repeater in IN96 – much closer to the coast.

Panos Dadis SV1GRN (Greece) wrote with an interesting report from the Athens QRP Group and their friends at IRESC Turkey. The IRESC Group in Turkey organised a special operation from Mount Uludag (2100m a.s.l.) in KN40nc using the callsign TC3IRESC. The Athens QRP Group team operated from Mount Parnitha (1100m a.s.l.) in KM18ud. Some interesting contacts were made – including on October 1st when SV8GKE (KM08) worked TC3IRESC over a distance of 750km.

Mike Ktenas SV8GKE was using

100W and a 17-element Yagi antenna. Next day on October 2nd, SV1BDS/QRP worked TC3IRESC/QRP over a distance of about 530km. The SV1BDS station was using 5W to a 3-element home-made Yagi and TC3IRESC was using 2.5W and a 3-element Yagi. Panos SV1GRN/QRP was also operating from Mount Parnitha and worked SV7JKK (KN20) and TA3DP/QRP. Nice contacts over the distance with low power.

Panos concluded, "The team from Parnitha was: **Dimitros Pallis SV1JGW**, **SV1IXP**, myself **SV1GRN**, **Marios Gavis SV1QEC**, **SV1LKM** and **Yiannis Souchleris SV1EIW**. Also we had guest operators – **George Katsimaglis SV1BDS**, **Costas Pavlidis SV1KYQ** and **Dinos Krassas SV3IEG** and we thank them for the support."

Mark Marment CT1FJC has been working on his 144MHz moon-bounce system. He worked Gabriel EA6VQ (JM19) on October 23rd using 160W from the Kenwood TS-2000 and a small solid state amplifier to 2 x 7 element bayed DK7ZB Yagis. Mark says that he has worked EA6VQ previously using just a single 7 element yagi! He also plans to improve his 144MHz array and is building a pair of 10-element DK7ZB yagis.

Satellite Operation

Peter Goodhall 2E0SQL (Oxford) had another good month and reports that the ARISSAT-1 transponder is still working when in sunlight and Peter can hear himself on the transponder, although he's not made any QSOs recently. However, VO-52, one of the s.s.b. satellites has been very productive and there have been plenty of QSOs. And the AO-7 satellite gave Peter his first satellite QSO with the USA when he worked K3SZH (FN10).

Peter says that of the f.m. satellites, AO-51 is the most popular (actually, he used the words 'packed and manic!'). Some of the nice QSOs logged were LA4FPA/M (JP20), ES5TF (KO38), GB0BWS (IO91), CR5FSA (IM58), F0GAA (JO10), G3WFM (IO91), RD4F (LO23) and M0TFO (IO81).

Thank You Everyone

To everyone who has written in this month – quite a bumper crop of news – it's much appreciated. As this is the January issue of *PW*, which appears in December, may I take the opportunity to wish you and your families all the very best for the festive season and all good wishes for 2012. Please keep your news coming! See you in the February issue.



Chris Lorek G4HCLs Valve & Vintage

PO Box 400, Eastleigh SO53 4ZF

E-mail: g4hcl@rsgb.org Tel: (01772) 978229



Classic FRG-7000

Chris Lorek G4HCL steps into the *Valve & Vintage* 'shop' to give some handy advice and tips on the Yaesu FRG-7700 h.f. receiver.

In my *Buying Second Hand* column in the July 2011 issue of *PW*, I covered the 'classic' Trio 9R-59DS h.f. receiver. I've subsequently been asked by a number of readers if I could also feature a more modern, albeit more expensive, h.f. receiver with good performance and a digital readout, that's readily available on the second-hand market.

In particular, several readers have specifically asked me if I could cover the Yaesu FRG-7700 receiver. Your wish is my command!

Excellent History

Yaesu have had an excellent history with general coverage h.f. receivers. Starting with the FRG-7, then came the FRG-7000 (I still have one of these here in my shack), and in 1978 they launched the FRG-7000's successor, the hugely popular FRG-7700 which lasted up to 1986 when it was succeeded by the FRG-8800.

At an original selling price of around £250-£300 for the basic receiver, an

FRG-7700 can now be obtained in the UK second-hand for a typical price of between £100-£200 depending on the receiver's condition and any accompanying accessories that are 'thrown in'.

A faulty receiver (see later for typical faults and how to easily fix these!) can be obtained from around £50 upwards.

Receiver Features

The FRG-7700 is an h.f. communications receiver covering 150kHz to 30MHz in 1MHz band ranges, selected by a click-step 'MHz' knob together with an analogue tuning dial to select the frequency you wish to listen to.

A digital display above the analogue dial gives frequency readout to the nearest 1kHz. The reception modes include amplitude modulation (a.m.), c.w. (Morse), lower sideband (l.s.b.), upper sideband (u.s.b.) and frequency modulation (f.m.), again manually selected using a front panel selector knob.

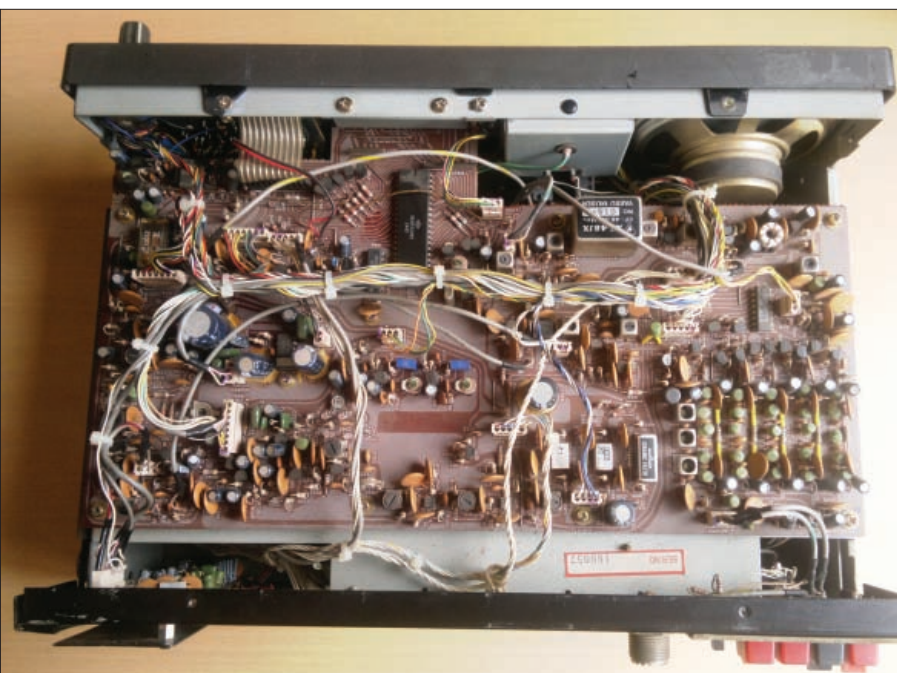
Don't expect a remote PC control facility however – you'll need a more modern receiver for this! The receiver's serial number will tell you the set's age, the first digit gives the last digit of the year, e.g. in the case of my receiver it's '2' which indicates 1982. The next is a letter which indicates the month of manufacture; 'A' for January, 'B' for February and so on, in my case it's 'H' indicating August.

The next three numbers are the manufacturing batch followed by the final three numbers indicating the serial number of the radio from that batch. The receivers hardly differed at all over their lifetime, with only minor changes, such as a felt ring coupling of the dial mechanism to the frequency scale in early receivers which was changed to a spring in later versions.

The receiver operates from an a.c. mains supply, a rear panel voltage selector changing between 100-120V and 220-240V operation. If you're in Europe and buy your set from the USA, make sure you change the voltage setting before plugging in!

It would also be an idea to check the rating of the fitted rear panel fuse, this should be 0.5A for 230V operation and 1A for 110V operation; it may have been changed to a different rating by a previous owner. A rear panel option adds 12V d.c. operation but not all sets have this – check if this is important to you before your purchase.

Separate antenna connectors are



An inside view of the rig. No surface mount devices (SMDs) here!

fitted on the rear panel for short wave and low frequency broadcast band antennas. An SO-239 coaxial connector is wired in parallel with the 'SW/BC' and 'E' (Earth) connectors, and a separate 'BC' connector allows use of a long wire for the I.f. broadcast bands.

If you just want to use one antenna for all bands, then a useful hint is to simply add either an external wire link, or a 100Ω resistor, between the 'SW/BC' and 'BC' connectors.

A rear panel 'DX/Local' switch allows an attenuator to be switched in to help prevent signal overload. Additionally, there's a front panel variable attenuator control which reduces the gain of the receiver's internal pre-amplifier.

Other front panel controls include an f.m. squelch, a mode switch with three a.m. bandwidths of; 2.7, 6 and 12kHz, Fast/Slow automatic gain control (a.g.c.), NB (Noise Blanker) On/Off to reduce the level of pulse type

interference, a display dimmer, and clock controls.

The receiver has a 12 hour clock display together with a clock timer facility with 'On', 'Off', and 'Sleep' time settings. Front panel sockets are fitted for headphones and a 'Record' output. The built-in clock timer also controls start/stop remote contacts on the rear panel accessory connector for a tape recorder. There's also a rear panel connector for an external speaker, and an 'Acc' connector with a.g.c. output, receiver mute input, 11V d.c. output and earth connections.

Internal Options

The most desirable internal option to look for in an FRG-7700 in my opinion is the MU-7700 memory unit. This unit bolts onto the rear of the set's housing and extends the depth of the centre section of the otherwise flat rear panel of the receiver. It provides the facility of 12

memory channels which are selectable from the set's front panel, as well as a 'fine tune' facility.

Don't confuse Memory option with the f.m. unit, which is on a rectangular plate that's mounted entirely flush with the rear panel. All receivers have the front panel memory channel selector plus 'M', 'MR' buttons and a 'M Tune' knob which adds a 1kHz 'fine tune' facility to the receiver, but these are all inoperable unless your receiver has the optional memory unit fitted.

To identify what's what, simply take a look at the rear panel and see if the unit is fitted. If, instead of a 'bulge' there's a blanking plate on a flat rear panel, then there's no memory option fitted. In my set, there's a hole and a set of multi-way leads where the memory unit would have been connected! The memory option uses a set of three AA sized batteries as a memory back-up, these are fitted on a battery unit on the underside of the radio beneath another plate.

However, if you find your set does actually have a memory unit fitted but it isn't holding memories, then remove the lower plate and take a look at this battery bank. The cells may indeed have gone flat!

Other internal options include the DC-7700, which is simply a rear panel connector and internal plug-in lead to add the facility of 12V d.c. operation and an FF-5. This is a low-pass radio frequency (r.f.) filter to reject signals above 500kHz to help prevent cross-modulation and intermodulation from strong broadcast stations above 500kHz.

External Accessory Units

There are three external accessory units that are available for the FRG-7700, housed in slim matching set-top boxes. The FRT-7700 is a compact h.f. antenna tuner to give greater selectivity, a selectable 0-60dB attenuator is also fitted to help prevent overload from strong signals.

If you're not fortunate in having an external antenna, then the FRA-7700 is an active set-top antenna unit with a variable pre-amplifier gain control – it's fitted with a 1.2m telescopic whip together with band and tuning controls.

Finally, for adding v.h.f. coverage to the receiver, the FRV-7700 is a converter for receiving three v.h.f. bands. **Note:** Be aware that there are six different models of this converter, so check which one if any is offered along with the second-hand FRG-7700 you're considering buying.

Model 'A' covers 118-130, 130-140 and 140-150MHz, Model 'B' covers



The classic 'rear view'. Simplicity in the extreme!

50-59, 118-130 and 140-150 MHz, Model 'C' covers 140-150, 150-160 and 160-170MHz. Model 'D' covers 70-80, 118-130 and 140-150MHz, Model 'E' covers 118-130, 140-150 and 150-160MHz, and Model 'F' covers 118-130, 150-160 and 160-170MHz.

You'll be very fortunate if you find a complete 'line-up' of FRG-7700 set-top units offered along with a receiver! But if you do and you don't require one or more of the set-top unit's you'll certainly find a ready second-hand market for the units you don't want!

Distance Buying

If you're buying from a distance rather than collecting personally or from a club sale or radio rally, the FRG-7700 weighs 6kg and measures 334 x 129 x 225mm. The optional memory unit and battery pack adds around 0.5kg to this plus an extra 50mm or so to the set's 225mm depth.

As usual if you're asking the seller to package and send you the receiver, ensure it's well protected against rough handling by the carrier. The most likely part to be damaged is the large front tuning knob so ensure this is well padded!

Common Problems

If the receiver has either been either well-used or placed in store for a while, the most common operational problem will be intermittent contacts on the switches and in particular the volume control. A careful spray of electrical contact cleaner (not an oil based lubricant!) to these while the control or switch is moved back and forth will often effect an instant cure.

Should you find your receiver seems 'deaf' then check the 'DX/Local' attenuator switch on the rear panel next to the antenna connectors. This can sometimes also become intermittent so again a quick spray of switch cleaner here can work wonders. Do use common sense and make sure you unplug the receiver from the mains before you delve inside!

A minor irritation rather than a problem, is dial illumination, where a dial lamp has burnt out with age. These are small 12V 100mA types with long wires; you can easily replace these with a similar type if you're handy with a soldering iron, or just put up with the lack of illumination.

If your FRG-7700 is fitted with a memory unit and it doesn't work, check the backup batteries as I mentioned earlier, many former owners forget about these!

Other Problems

It's worth mentioning mains hum, distorted s.s.b and 39MHz display problems.

I've been reliably told by an experienced repair technician who's had a multitude of FRG-7700s on his bench – that the bridge rectifier unit on the internal mains power circuitry in the receiver is under-rated and that it often fails, causing either a hum on received signals and typically distorted s.s.b. and c.w. audio. This problem can also give an indicated display of '39MHz' due to low voltage.

If your receiver is suffering similar problems, simply replace the bridge rectifier, pin for pin, with a more substantially rated type. It's the black plastic-encapsulated block with four leads adjacent to the large electrolytic capacitor in the mains unit printed circuit board, which itself is next to the mains transformer. You can use any type of bridge rectifier rated for at least 2A and a voltage of around 50V or greater, or use four similarly rated diodes.

Memory Frequency 1kHz Error

A problem that has been acknowledged by Yaesu is a 1kHz error in frequencies recalled from the memory function. To correct this you'll need to delve into the memory unit with your soldering iron and wire cutters – you'll also need two 1N60 Germanium diodes or similar and a small 3.3kΩ resistor.

First of all, cut the p.c.b. track between pin 11 of Q12 (74LS192) and pin 12 of Q04 (74LS123). Fit one of the diodes between these two points, with the diode's cathode (the 'bar' end of the diode) to Q04 pin 12 and the anode (the other end of the diode!) to Pin 11 of Q12. Then connect the other diode between pin 11 of Q12 and pin 13 of Q11, with the cathode (again the 'bar' end of the diode) to pin 13 of Q11. Finally fit the 3.3kΩ resistor between pin 11 of Q12 and +5V, which you'll find at pin 16 of Q12.

No Tuning?

Do other controls such as audio, clock, mode switch, etc., work on the receiver but you find it doesn't tune using the front panel tuning knob? Fortunately, another acknowledged problem by Yaesu was a faulty batch of the phase-lock-loop IC Q38, which is an MC145104. It's only lot No. 7944 that was reportedly affected and this number will be marked on the IC beneath the type number, but this could also be a failure on other sets.

You can replace this by first cutting the legs off from the existing IC, then desoldering the individual remaining legs

from the p.c.b., then replacing the IC with a similar type. This simple low cost repair can make an otherwise 'scrap' FRG-7700 receiver into a fully working one!

Better FM Audio

Many FRG-7700 owners have reported f.m. reception as being muffled due to the low frequency response of the filtering circuitry on the f.m. board, which also affects data decoding of packet radio, SSTV, etc., on f.m. (The f.m. board is mounted on a removable panel on the inside of the rear panel of the receiver).

To give a higher frequency response simply cut away one leg of C13, which is a small blue tantalum capacitor on the f.m. board. Then bend this capacitor body away so that the cut leg contacts no longer make contact (or simply remove the capacitor itself). Purists might like to replace this capacitor with one of 10nF in value to simply filter out any remaining 455kHz intermediate frequency (i.f.) signal.

Technical Documentation & Mods

I hope the article helps in identifying a potential semi-modern h.f. full-coverage receiver that's readily available, and the options you should look out for in an FRG-7700 that's offered on the second-hand market. If readers would like a copy of the FRG-7700 User Manual (32 pages), Circuit Diagrams (4 pages), Technical Service Manual including troubleshooting charts (114 pages). Just send me £2 in coins taped to a card or a PO/cheque for £2 payable to myself together with your postal address and I'll provide the sleeved CD, CD mailer and return postage. My contact details are given in this article.

There are also plenty more mods which I haven't room for here including the excellent 15 page FRG-7700 *Survival Guide* by **Wim Penders PA0PGA**, all in PDF form on a PC-readable CD (at over 31Mb it's unfortunately too much to print or E-mail) I'll be pleased to oblige by post in return for a sleeved blank recordable CD plus with a stamped self-addressed return mailer (remember to add sufficient postage to each, typically 'large letter' stamps of 75p each).

That's it for my bi-monthly feature this time. As before I've plenty of ideas lined up for future *Buying Second-hand* columns, but if readers would like a specific type of equipment covered then please do get in touch, I'm all ears!

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Carl Mason GW0VSW's HF Highlights

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The HF Bands Are Upwardly Mobile!

Welcome to *HF Highlights (HFH)* and good band conditions have prompted rather a large number of reports this month which is always good to see!

There's also just enough space to give you some information on what I think you'll find as a very useful tool.

Roy Walker G0TAK who lives near Kendal, Cumbria wrote in to say "I tuned up on 28MHz in an attempt to have a PSK31 QSO with **Maurizio Marti IV3XAZ** (see *PW* Nov 2011 page 24). Although I didn't manage to find Maurizio, I did have some nice contacts with RV3, LZ1, UR4, YU1, YO5, and UA1 stations with 30W and my 'long' 20m end fed horizontal wire.

Shortly afterwards I had a surprise E-mail from the **PropNET.org** webmaster with an auto generated reception report from **Robert Margeson K4RKM** in Tryon, North Carolina, 6257km distant from me. It reported that his station and other USA Amateurs had heard and reported my signals principally for a contact I had with LZ1LZ and our chat over an extended period of time.'

Take a look at Roy's report at [http://propnet.org/catch3.php?date=2011-](http://propnet.org/catch3.php?date=2011-10-22&call=2E1RAF¢re=2E1RAF)

10-22&call=2E1RAF¢re=2E1RAF

The PropNET project is an ad-hoc two-way (though potentially more) radio frequency (r.f.) based digital communication network whose activity is reported on the Internet. As participating stations periodically ID and exchange data, they report their activity to an Internet data-collection hub for presentation through the PropNET web site. Take a look at www.propnet.org/ and see what you think.

The DX News

On to some DX news now and Martin Rath F8UKP will be stationed in Singapore AS-019 for the next three years and will operate c.w., s.s.b., RTTY and PSK as **9V1RM** in his spare time (QSL direct and via *LoTW*).

Commemorating the 100th anniversary of the birth of **Louis Varney G5RV** (1911-2000) the inventor of the renowned (Originally only for harmonically related Amateur bands 3.5-30 MHz) 31.1m (102ft) h.f. dipole antenna, the **Centro Aficionados Montevideo** will be active as **CW5RV** until the end of the year QSL to PO Box 6000, 11000 Montevideo, Uruguay.

Your Reports

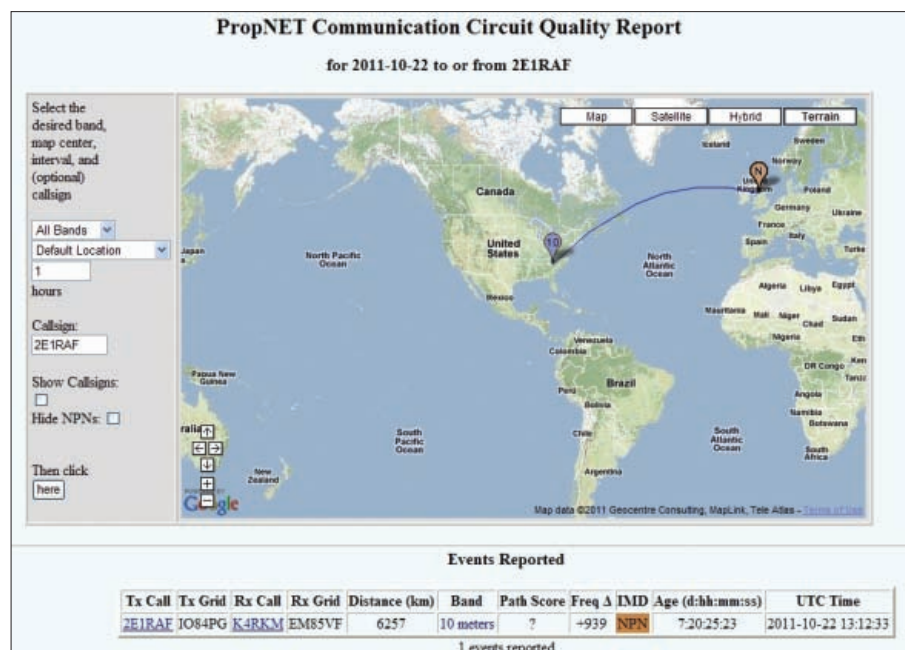
On to your reports next, and the first is from **George Davis G3ICO** in Yeovil, in the county of Somerset. George reports, "the h.f. bands seem to be showing more promise now with more varied DX to be found" and judging by George's log he's right! His 7MHz contacts began with OL6DG (Czech republic) at 1855 Karel Otava who was celebrating his 60th birthday (QSL via OK1DG) while on 10MHz he worked Roy Hunt as CT/G4PRL (Portugal) at 1928.

Moving to 14MHz, George G3ICO found the band in great shape and the pick of his log includes CP8/DF7NX (Bolivia) 0737, VK6AU (Australia) OC-001 at 0744 and John Hawkins (ex G3LSD) in Lesmurde, Western Australia and the Founder of the 'Ex D Association'. The object of the Association is to reunite ex-Service personnel who served in Germany after the Second World War and operated Amateur Radio while based there.

For the full story see *Forward into the Past The Ex D Association* in the November 2004 edition of *CQ* Amateur Radio Magazine. Following this he worked VP9/WW3S (Bermuda) NA-005 at 0957 and later JY5SX (Jordan) at 1812 followed by YT16IARU (Serbia) 1847. This a call marking the 16th IARU World ARDF Championship 2012UTC (QSL via YU1EA). All contacts were using c.w. and made using a Elecraft K2 at 5W to a doublet antenna.

On to the 14MHz band and **Eric Masters G0KRT** in Worcester Park, Surrey. Eric used his Kenwood TS-570 and modified W3EDP antenna tuned with an SG-230 smart tuner to have a 5W c.w. contact with IZ0EUS (Italy) at 2005UTC

The PSK31 log of **Peter Leng ZL4TE** in Cambridge, New Zealand is growing fast as he broke his leg in a Judo competition and has enforced rest at home, therefore more time for the radio! Contacts made with his Yaesu FT-1000MP MKV, 100W and a Cushcraft AV-3 include one s.s.b. contact with 3D2R (Rotuma Island) OC-060 at 0149 (QSL via YT1AD). Then he had PSK contacts with SP9DTE (Poland) 0431, OK2VNJ (Czech Republic) 0433, IZ7MFY (Italy) 0448, 4Z5OZ (Israel) 0554 and HA2ESM (Hungary) 0608, HB9RJG (Switzerland) 0617, UT0EG (Ukraine) 0622, YU7AS (Serbia) 0626, and OE7EHH (Austria) at 0744. Then



The Internet reporting of G0TAK's session on PSK31.

came LU2DBJ/J (Argentina) 0818 and VK4TJ (Australia) 1018 in Top Camp, Queensland. Peter gets on 14MHz most days around 14.060MHz, the QRP calling frequency at 0600UTC so keep an ear open for him.

From his home near Bicester, Oxfordshire, **David Bambrook 2E0DAB** worked on s.s.b. the stations EE8E (Canary Islands) AF004, VY2ZM (Canada) where operator Jeffery Briggs K1ZM established a contest station in 2001 at Eastern Kings County, Prince Edward Island. Then came I2NSQ (Italy) YT1A (Serbia) and LZ1794MAB (Bulgaria) and a special call to honour of Bulgarian Saint **Machenik Anastasii Balgarski** though no times were included for these QSOs. All contacts were made using a Yaesu FT-747GX and 30W to a newly constructed h.f. dipole made with two mobile whips making about 3.35m (11ft) in length mounted in his loft.

Continuing his success with my indoor 'Crown' wire loop design, **Dennis Upton VE3UTN** in Kichener, Ontario lists PSK31 contacts with PV8ADI (Brazil) 2210, 8P9NX (Barbados) NA-021 at 2301 (QSL via W3HNK). Next came VP9I (Bermuda) NA-005 at 2313 (QSL via N1HRA), CU2AO (Azores) EU-003 at 2354, ON3ONOL (Belgium) 0038 a station celebrating 30 years of the **Noord Oost Limburg** radio club located in the North East part of the Province of Limburg (QSL via ON5LL). Then came LU5DKH (Argentina) 0208 and RZ9IZ (Asiatic Russia) at 0153UTC running 20W from his Yaesu FT-857D

The 18MHz Band

In Worcester, Worcestershire, **Steve Wellon M0SAS** was pleased to work and receive a QSL from Alexander Zaytsev RA3ICK for a QSO on the 18MHz band. Alex is an officer of the Russian Air Force who operated from a city called Tver – but can often be found as RA3ICK/AM (Aeronautical Mobile) from an Ilyushin Il-76 freighter aircraft. Steve used a Yaesu FT-857D with 20W to a Cushcraft MA5B.

The 21 & 24MHz Bands

A variety of modes and bands have kept **Bill Ward 2E0BWX** in Edwinstowe, Nottinghamshire busy this month. He used his Icom IC-7400 and 25W and PSK31 to a Pro whip antenna to work OH8GUK (Finland) 0942 and I0IITA (Italy) at 1052UTC in Rome. This was a special event call celebrating the 150th



Russian Airforce officer Alexander Zaytsev RA3ICK's QSL to Steve Wellon M0SAS for their contact on 18MHz.



anniversary of the Unification of Italy (QSL via IQ0RM).

Back in Yeovil, George used QRP once again finding c.w. stations NP3CW (Puerto Rico) NA-099 at 1407, OX/OK1JST (Greenland) NA-018 at 1418, and V85TL (Brunei Darussalam) at 1506 (QSL direct only). Then came E21AOY (Thailand) 1532 with another low power operator Wara Tummanon (also KE2Y and JE6HAM), who was on the island of Koh Phangan AS-101.

The 24MHz Band

On to the 21MHz band next and a welcome to new reporter **Terry Martin M0CLH** in Wantage, Oxfordshire, who has just retired and "Thought" he would have more time for the radio! But he says, "that doesn't seem to be the case" – however, he still managed some



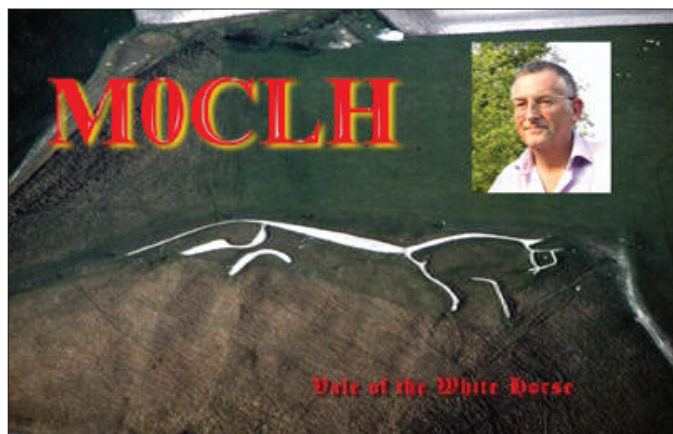
Nicholas Phillips 2E0BPU received this QSL from Ruben Allemand LU8EEM.

For his contact, made using the key on 14MHz, George Davis G3ICO earned this QSL card from Serbia.

time to operate this month. Terry uses an Icom IC-756PRO, Heil headset, an SPE 1K-FA when required and either a Cushcraft R8 vertical for 10-28MHz or an Inverted 'L' at 12m – tuned against half a dozen radials with an SGC SG-230 auto tuner for 3.5 and 7MHz.

Terry's s.s.b. QSOs using the vertical included EV1R (Belarus) 1338, UX3IT (Ukraine) 1340 and VE3AXW (Canada) at 1355. Then came K9LOF (USA) at 1401, who was in Allerton, Illinois, USA. Next into the log was LZ26ZA (Bulgaria) at 1543. This was a Special Event callsign run by the Balkan Sports Club LZ1KZA. They were marking the exploits of 26 Bulgarian monks who perished in defence of the Orthodox faith in 1284 in the St. George Zograph monastery on the Mount Athos Peninsula. Then he worked LU1FAM (Argentina) at 1545, 9H4JX (Malta) 1459 on Gozo Island EU-023, 5N7Q (Nigeria) 1559 QSL via DF8DX and SV3AQR (Greece) 1609UTC.

I was interested in how Terry found his vertical and he replied to my E-mail saying, "The R8 is mounted on a 12 foot



If you work Terry M0CLH in the Vale of the White Horse, this is the QSL card you could receive.

scaffold pole which swivels at the base for ease of maintenance and it's fed by Military spec RG213 to the upstairs shack. Up until now the performance has been okay and with the increase in sun activity its low angle of radiation has proved to be pretty effective. And, of course, it can handle our maximum power level of 400W with ease.

"I should have said that it also covers 6m and is pretty effective when Sporadic-E is about but, of course it lacks any directivity. Once upon a time, I had a lovely, tall horse chestnut tree at the bottom of my garden. I erected a doublet with 100ft top supported in the centre with a 40ft fibreglass pole – from the Spiderbeam man – and ladder line feeder coming down to an SG-230 a.t.u. for matching into the coaxial cable feed-line to the shack.

"This worked extremely well – albeit limited to 200W by the a.t.u. But taking a look inside, I suspect that provided the s.w.r. isn't too high, it would survive 400W. Although it could be an expensive experiment! In my junk box I had a rather nice vacuum changeover relay, which I installed together with a few radials and wired it so that I could change from the symmetric doublet matching to a Marconi 'T' antenna by shorting the feed-line together at the base matched against the earth radials.

"Shortly after completing this change and before I could carry out many experiments, high winds blew my chestnut tree down as it had suffered from some form of root rot. The flexweave antenna wire for that leg broke at the top of the fibreglass support. After a few choice words I realised that with the changeover relay activated I effectively had an inverted L antenna and have been running that ever since. I've had good results on both 3.5 and 7MHz – although not quite as effective as the doublet. which I intend to re-establish in the near future with the help of more scaffold poles.

On the upper bands it will match okay but it's about one to one and a half S-points quieter than the vertical as you might expect".

Thanks for the information Terry! Incidentally, his reply has prompted me to try an inverted 'L' at my home QTH.

The restrictions on antennas mean I have to be careful what I put up and – with care – this should be almost invisible to my neighbours.

Finally for the 24MHz band, **Nicholas Phillips 2E0BPU** in Croydon was pleased to work and receive a QSL from Ruben Allemand LU8EEM in Buenos Aires, Argentina at 1120UTC. Nicholas was exceptionally pleased because he was running just 6W s.s.b. from his Icom IC-703 and had a 30m (100ft) doublet antenna to make his 17 countries confirmed on the band.

The 28MHz Band

Finally, we come to the 28MHz band and the log of **Peter Lowrie M15JYK** in Newtownabbey, Northern Ireland who said "I managed to get on 28MHz today with a bit of an unusual antenna! A Resonant feed-line dipole (RFD), which is in essence nothing more than coaxial cable being employed as a dipole that works using skin effect. I made mine and lashed it on to my roach pole to use as half-wave vertical and connected my Yaesu FT-817 in the car and worked Italy, Russia, Bosnia, Bulgaria with s.s.b. but had no paper to jot down call signs and times.

"A move to narrow band f.m. (n.b.f.m.) found lots of Eastern Europeans active and about 1700 local time I worked SV2MAP (Greece) who was 'parked' just slightly off 29.600MHz, with 5/9 reports sent both ways. An HI8 in Dominican republic was also calling – but he just too close to the Greek station for me to work him.



New reporter Terry Martin M0CLH worked LZ26ZA on 24MHz to receive this QSL card.

When I got home I went to remove the rig from the car, switched it on and 10m was alive with North Americans. So, at 1730UTC I called W3GLH and got a 5/7 report from Gary Hartmun in Volant, Pennsylvania. Not bad for just 3W and a length of coaxial cable! The RFD is amazing on receive, but on transmit I'm not so sure. More power might be the answer and I need to experiment further."

Also operating on 28MHz was Bill 2E0BWV. Bill used 50W s.s.b. to work IZ8OYV (Italy) at 0915 and 25W PSK31, again logging YT1ZP (Serbia) 1022, RA3QSL (European Russia) 1030, and IW7EAP (Italy) at 1028UTC.

Meanwhile, Eric G0KRT reported just one 100W s.s.b. contact with KG2KJ (USA) 1603UTC in Maspeth, New York State.

George G3ICO used the key once again to log ST2AR (Sudan) 1337 S53R (QSL direct only) m NP3CW (Puerto Rico) again at 1429, VE7SV (Canada) 1849 (QSL via VE7WY) and CO6RD (Cuba) NA-015 at 1912UTC (QSL via 8P9NX direct only).

Signing Off

Well that is it for another month and what a busy one it has been. The higher bands are coming to life with plenty to work no matter what your station or mode. As usual my thanks go to **Maurio Pregliasco I1JQJ/KB2TJM** editor of the **425 DX Newsletter** for all the DX information and to all our reporters for their logs. Until next month I wish you all good DX and a very Happy Christmas. 73 Carl GW0VSW.



Harry Leeming G3LLL's In the Shop

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Intermittent Fault? Harry's come across a few of those!

This month Harry Leeming G3LLL looks one of the most annoying of problems – the intermittent faults that cause so much frustration. And he's certainly come across a few of these over the past 50 years or so!

Welcome to *In The Shop (ITS)* where I often look back to my days running Holdings the Amateur Radio, domestic radio and electronics shop, in the north west of England – where I came across many types of electronics fault. Those were the days!

'Freddy' was a bit 'nosey' and when he was in the shack he liked to leave his Yaesu FT-290 tuned to the local repeater to see what was going on. But it seemed that activity was drastically down. After a few days he began to suspect his rig, and then he noticed that sometimes if he tuned it to another channel, and then back to the repeater, or switched it quickly off and back on again, it sprang into life.

He dropped it into the shop a couple of times, but I couldn't find nothing wrong with it at all. Eventually, it was time to get the bench light out, shine it into Freddy's eyes, and give him the 'third degree' treatment.

It eventually transpired that the problem had seemed to start around the time that 'Freddy' had bought a new 40A power supply unit (p.s.u.) and had re-arranged his shack. Whereas previously he had walked into the shack and switched items on individually, now he just threw a master switch, leaving the items such as his p.s.u. and the mobile 144MHz rig permanently switched on.

Some rigs fitted with a phase locked loop (p.l.l.) like to be switched on and off quickly. This is not the case if their **On/Off** switch is left permanently on and the mains supply to the p.s.u. is switched. In this case, as the mains is applied to the p.s.u., the smoothing capacitors take time to charge, and the output voltage gradually increases over say a second to the full voltage.

While the voltage is increasing, different circuits in the p.l.l. start to operate **before** others – the result being that some rigs don't lock onto frequency

properly. After the interrogation, I switched off the bench light (still shining into his eyes) and advised him to always switch his rig off before pressing the master switch and leaving the shack. I also told him not to switch the rig on again until the shack and the p.s.u. had been fired up. Since then, he's never had any more trouble.

A Little More History

Next, a little more history. Stereo multiplex radio transmission on the Band II v.h.f. frequency modulated (f.m.) service started in the late in the 1960s in the UK. For good results a tuner with a much better signal-to-noise ratio is needed for stereo, when compared with mono. Unfortunately however, many British Hi-Fi manufacturers just tried to tack a decoder on the end of their standard f.m. tuners.

The tuners were often not really up to the job of providing good stereo Hi-Fi reception in Blackburn where we had our shop (Holding's) as it was in a valley approximately 64km (40 miles) from the transmitter – on Holme Moss – on the Penine Hills in West Yorkshire. Originally built for 405 line transmissions in 1951, the station lost its TV transmission role with the closure of the 405 line service in 1985 but continues its important task of radiating the Band II f.m. analogue transmissions and the Band III digital audio broadcasting (DAB) services.

See: http://en.wikipedia.org/wiki/Holme_Moss_transmitting_station

As a stop gap measure I had a batch of Band II pre-amplifiers made by a local electronics company, to improve the signal-to-noise ratio of the older tuners. We sent one of these to *Hi-Fi News*, and this was reviewed favourably by **Gordon King** (Later to become **G4VFF**).

Strangely (without us asking), two other magazines also published good reviews, one by someone named 'Earl'



'Freddy' had an FT-290 that didn't like a slow ramp-up switch-on using the p.s.u. On/Off switch instead of its own. Harry explained how he could avoid problems.

and another by a reviewer who's surname was 'Prince'. I later found out that Gordon King had written all three reviews under different names. He must have been one of the most prolific technical writers ever, he used several pen names, all with royal connections, in many different magazines. But we certainly weren't complaining about the extra free publicity.

At that time B & H Morris, who were the wholesale side of Lasky's electronics and Hi-Fi retailers in Tottenham Court Road, London, obtained the UK distributorship for Trio (now using the name Kenwood). One of their 'reps' who had read some of my comments about Band II f.m. tuners in *Hi-Fi News*, turned up with a Trio stereo multiplex decoder equipped f.m. tuner. It was reasonably priced, and much superior to those I had handled previously – and because of this we became Trio Hi-Fi agents.

We did quite well selling Trio Hi-Fi, and I wanted to add their Amateur Radio equipment to the stock. At first **Brenda's** Dad (my father-in-law) thought it was too specialised, but I tried a few receivers such as the 9R59DS, general coverage unit and the JR500 Amateur Bands only receiver. The latter only covered the 3.5 to 28MHz (80 to 10m), but with a new crystal and some Denco coils I added 1.8MHz (160m) and these started selling well.

Next, Trio brought out the improved JR310 Amateur band only receiver. I



The Trio 9R59D series of receivers was one of the first of the Trio (Kenwood) general coverage radios sold in Harry's shop.

then started modifying these for 1.8MHz, advertised them in *Short Wave Magazine*, and soon we were selling them to customers all over the UK.

Then, B&H Morris offered to let us try on 'sale or return', a TS-510 transceiver and so I gradually added Amateur Radio as a side line to the business. Years later when Trio/Kenwood's distributor system changed, I was left out in the cold. But fortunately by then I was becoming better known and we managed to obtain a Yaesu agency.

A Quick Repair

A quick repair next. 'Joe' was out for a walk with his 144MHz hand-held transceiver, when he contacted 'Fred' who wasn't far away. They decided to have an 'eye ball meeting', and almost bumped into each other as they came round a corner. Afterwards however, Joe found that the display had disappeared on his rig, he brought it in to me rather puzzled and told me the story.

I took the rig, went to my bench, poked a pin into a hole in the back and returned it to him in perfect working order a few seconds later. I then jokingly demanded £50. You can't expect to be paid for everything you do – but I reckon the look on Joe's face, plus the comments he made over the air, were payment enough. So, what had happened?

Most modern equipment operates via menus, and any equipment that uses menus also uses a microprocessor and a memory. With a microprocessor it only needs a pulse or a burst of radio frequency (r.f.) in the wrong place and then it crashes, or loses one of its functions.

The rig either then stops working on one or more modes, perhaps the

display shows gibberish or might even flash – almost anything can occur. The stranger the fault is, the less likely it is that something really serious is wrong. With a computer most faults like this can be cured just by re-booting, as the main memory only holds data when the power is on.

Most Amateur Radio equipment, and some domestic radio and TV equipment, maintain and back up the memory with a battery and – as is the case with video recorders – a charge held in a very large capacitor. So, when equipment contains a memory that is backed up in this way the 'fault' is stored, simply switching off and on again won't restore correct operation.

In these cases the first stop is the user manual, as with a bit of luck somewhere near the back page will be found instructions for doing a 'memory re-set'. This wipes out most stored information, returns the equipment to the manufacturer's original settings and sometimes leaves you to re-key in such things as repeater shift.

If you can't find any re-set instruction, in most cases it is safe to disconnect the backup battery, operate the on/off switch a few times with no power connected, and with a bit of luck when you connect the power, all will be well. Once everything is okay, disconnect the power, check the battery voltage, and then re-fit this or a suitable replacement so that the rig can hold its memory.

Warning: You must not however, disconnect the battery, or try and replace it, on some early Icom rigs **without checking with Icom first**. The Icom R71 receiver, and one or two early transceivers use a back-up battery to hold the unit's operating system. If the battery is removed, or goes flat, the operating

system disappears, and the rig will need to be reprogramming by Icom.

The FR50B & FL-50B

In the August issue I said that the FR-50B and rigs were made "In the 1980s". However, **Steve Wigg G1KQH** from Rugely in Staffordshire, has written in to point out that they were apparently manufactured in the late 1960s. A hunt on the internet seems to confirm this and I delved in the attic and found our old 'goods in and out' book; this shows that we sold them new from 1973-75.

As far as I can tell the full story is that while the FR-50 and FL-50B were actually made in the late 1960s, for use by Japanese Novices, they eventually seem to have been sold by Yaesu to the UK importers with the duplicated English instruction book being produced in 1973. Perhaps I need my memory upgrading!

A Warning!

Ross Bradshaw G4DTD spotted the picture of his FL/FR-50B set-up in the August issue and this prompted him to issue a warning "If you have an FT-101ZD, or most other rigs on the bench in front of you, you'll notice that the p.a. compartment is totally enclosed.

If you have an FL-50B in front of you, and slide the cover off backwards you'll notice at once that the top of the p.a. compartment, and right side is Open, as the casing you just slid off covered those two open sides. This means that if you have to work on the FL-50B, the p.a. compartment is open and there's 345V on the top cap of the p.a. valve. Also if you want to neutralise the p.a., the control is underneath the rig so you have to pick up the rig and place it on its left side.



Ross Bradshaw G4DTD's FL/FR-50B set-up.

Do you want to try that with the mains on? You certainly don't !"

Thanks for that Ross! Incidentally, by passing on his advice Ross reminds me of something I was taught very early in my days as a trainee radio and TV engineer; "Never try and turn over any equipment while it is plugged into the mains. The heavier the equipment is and the tighter you will have to grip it. If you get a strong shock across your chest whilst gripping something tightly with both hands you will not be able to let go". (Please don't try and prove me wrong).

Thanks Ross. A very good point! A colleague got himself into this position, but fortunately he fell backwards with the set on top of him, and this pulled out the mains plug. He soon recovered but the radio needed extensive surgery!

Ross also makes the following points. "If you have to work on the FL-50B you need it connected to the FR-50B because the v.f.o. of the FR-50B runs the FL-50B. This is a bit cumbersome, but there's a way round the problem – use crystal control.

"On the front panel of the FL-50B you see a socket for an HC6/U crystal. If you have a suitable crystal for each band this can simplify things. Disconnect the leads from the Mute and Ground terminals of the FR-50B but leave the multi-pin accessory socket plugged into the back of the FL-50B, as this connects the heaters.

"However....yet another thing to bear in mind, you cannot plug in just any old crystal"

Here are the frequencies Ross uses, and the not so obvious calculations required.

"On 80 metres to transmit on 3.510MHz, 3.510 plus 5.172.4MHz (5.172.4 is the i.f. frequency) gives

8.682.4MHz – so get a crystal for somewhere around this. frequency.

"On 40 metres 7.010 plus 5.172.4 gives 12.182.4MHz but in this case take half of this – so you require a crystal for about 6.091.2MHz

"On 20 metres 14.010MHz minus 5.172.4 gives 8.837.6.MHz. So get a crystal for this frequency.

"On 15 metres 21.010MHz minus 5.172.4 gives 15.837.6MHz but take one third, so you require a crystal of about 5.279.2MHz

"On 10 metres 28.010MHz minus 5.172.4 gives 22.8376 but take one third – so you require a crystal of 7.6123MHz"

Thanks for that extra useful information Ross!

Out Of Band Operation

Sometime in my days at Holdings, the statement and question, "I have a boat, and I have a licence for operation on the h.f. marine bands. Can you sell me a Yaesu Amateur Radio rig with a wide band receiver, and modify it to transmit on the marine bands?" would come my way.

Before the advent of satellite communication, all long distance contacts to and from ships of any size was by short wave radio. Anyone who has compared the price of Amateur Radio rigs, with that of much more expensive 'Type Approved' Marine HF equipment, must be tempted to ask as to what the extra cost is for? They'd also ask as to why they couldn't use much cheaper Amateur Radio equipment? Was someone trying to rip them off?

Well, although I'm sure that manufacturers must be tempted to think on the lines of, "If they can afford to operate an ocean going, etc.,etc." However, this isn't the whole story.

Equipment for use at sea must be reliable, lives may depend on it, and yet it may be powered by a generator of varying voltage in a salt-laden atmosphere, with an antenna of doubtful characteristics. These conditions aren't the ideal situation to guarantee reliability, hence such equipment must be robust electrically and mechanically. But it isn't just reliability that matters.

If you are operating on – let's say 1.9MHz – your Amateur Radio transmissions will be cleaned up by a low pass filter which is designed to start to cut off at just above 2MHz. It will also remove the second harmonic at 3.8MHz (2 x 1.9MHz) as well as other unwanted products.

If you modify the rig so that it will transmit outside the Amateur bands and transmit above the 1.8MHz band on – let's say 2.1MHz – the rig will probably automatically switch to the 3.5MHz band low pass filter. This only starts to cut off appreciably above 4.5MHz, it will hardly attenuate the second harmonic of 2.1MHz at all, and this is likely to be 'S9' for a few miles around.

Using equipment designed for the Amateur bands outside its intended frequency range, particularly just h.f. of an Amateur allocation, should only be done in a dire emergency where lives are at risk. At the very least, even if you are the type of person that ignores regulations, you must first have the cleanliness of the transmission, on the frequencies you wish to use, checked with a spectrum analyser before transmitting.

In some cases you will find that when operating out of band the spurious emissions amount to several watts. These could cause severe interference to important services – so please be aware!

Good Health & Prosperity

Now it only remains for me to wish you health and prosperity for the New Year. Please do have a joyous and peaceful Christmas, and whilst eating Christmas Dinner ask the children, "If vegetarians eat vegetables – what do humanitarians eat"?

See you next month. 73 Harry. ●

Problems

I like to hear about problems with older equipment, particularly pre-1990 Yaesu rigs. Please E-mail me, (add some radio related term in the subject heading, to differentiate against spam), or write and enclose a stamped addressed envelope. Remember that electricity is dangerous, if you are not familiar with safety precautions you must never work on your equipment whilst it is plugged into the mains. (Switching off at the wall socket does not necessarily make equipment safe).



Roger Cooke G3LDI's Morse Mode

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Morse Cheat?

Roger Cooke G3LDI remembers accusations of cheating, in this month's *The Morse Mode* column.

Welcome to *Morse Mode* – where we enjoy everything 'Morse'! I well remember operating in my first National Field Day (NFD). I'd been a helper, s.w.l. and logger for a few years before then. It was 1957 and I was told I was going to be on the operating schedule. This was my ambition so, I was quite excited about producing a good effort.

However, this was in the days when we had an HRO receiver, a transmitter, running no more than 10W, made especially for NFD and wire antennas only. No computers then, so we used log-sheets and log keepers.

All we had at the time, was a straight key! With the straight key and at that age I could manage around 20 w.p.m., possibly up to 25, but to maintain that speed and accuracy required some stamina. We operated like this for a few years until I built the OZ7BO electronic-bug (el-bug), with my newly acquired Vibroplex paddle. Automation had arrived!

Life Made Easier

The el-bug made life easier and we could maintain that 25 w.p.m. and more, over a longer period. At the time, the word 'cheating' was not mentioned,

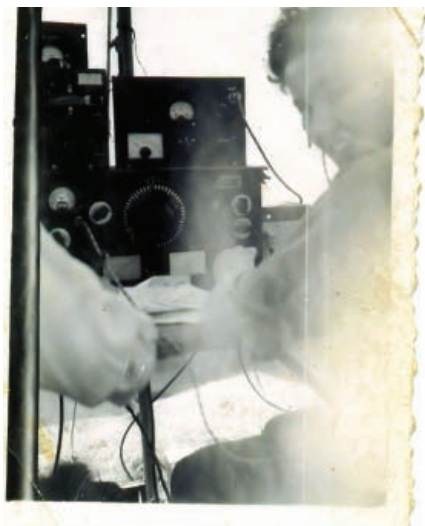


Fig. 1: A very young G3LDI at the straight key. The photo has fared slightly less well than G3LDI himself over time!

although it was said that we were doing things the 'easy' way. However, in the mid-1960s I made a four-memory TTL keyer with programmable push-buttons on the front panel. It was **then** the word 'cheating' was thrown around.

In many respects, it's been the same ever since with every innovation that comes along. I can appreciate the nostalgia associated with those early days, and take comfort that I was part of the scene then. We had a great time each NFD!

We were also lucky if we made 150 contacts over the 24 hours. Something else to ponder was the fact that we had two A4 sheets of UK Club entries each year. Hopefully you can detect how pleased I was by looking at Fig. 1. Photography has also improved somewhat over those years!

Let's come up to the present day, there has been discussions on various forums about 'cheating', when using new innovations. See Fig. 2, which shows a more 'up-to-date' G3LDI operating PC style with **Malcolm Prestwood G3PDH** keeping a wary eye on me! Incidentally, don't look too closely at those items on the far end of the desk. If you happen to identify them, it was a prank by one of our team members. This person just happens to work in a nursing home and I'll say no more!

We've disposed of paper logs and log keepers, now using contest programs such as *N1MM*. We rarely use a key at all, except to perhaps exchange greetings with an old friend, and also manage with just one operator at any one time. However, there is now the 'Big knob – Little knob' style of operating, where the main operator runs the main v.f.o. and the second operator

Fig. 2: A more up-to-date G3LDI, having left the straight key behind for computer operation at NFD.



uses the sub v.f.o., looking for new stations in a lull period.

Modern Innovations

Also in use now are more modern innovations still, such as *Skimmer*, the Reverse Beacon Network, second receivers on other bands, *Skim-Scam* for those with SDR equipment. It's difficult to compete now, with a single operator situation. Some stations go to even more extremes, like choosing a location in the UK that is likely to take advantage of the propagation, a coastal location that will produce a run to the USA and so on.

So, is seeking an advantage, cheating? No, of course it's not! If someone is keen enough to push innovation to the limits then good luck, they deserve the results that they will inevitably achieve. It might be an idea however, to restructure the categories, enabling the smaller clubs to enter with a level playing field – at least with each other. The problem with that is the fact that we are now short of entries anyway! It seems we have created a situation with no solution.

The only thing that hasn't changed over the years is the atmosphere of the weekend itself. We look upon it as a social event as well and at the Norfolk Amateur Radio Club (NARC) it's a very enjoyable one! 73 and May the Morse be with you! Roger G3LDI.

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In Vision

Graham Hankins G8EMX muses on efforts in Holland to increase ATV contest entries, and again asks for help in saving some analogue equipment for future generations.

The **British Amateur Television Club** (BATC) quarterly magazine *CQ-TV* regularly features a *Contest News* page compiled by the club's Contest Manager **Wing Commander Dave Crump G8GKQ**. Reporting the last International Amateur Radio Union (IARU) ATV International Results, Dave commented that overall the increase in 70cm activity was heartening but the UK activity was disappointing, adding: "I am not sure why we in the UK have almost ceased to use the band".

Looking down the list of final results, of the 54 callsigns only two are in the UK and they used one or more of the microwave bands. The BATC recently introduced a Repeater Contest; here, Dave reports, that **Roger Gregory G4OCO** called through **GB3NQ** (24cm, Cornwall) but heard nobody. He had more luck in the March Repeater contest, with three contacts, which meant that he could be the winner!

What's Happened?

So, what's happened to ATV contesting in the UK? Does an answer lie in how they do it 'over there'? Our new contributor to *In Vision*, **Bill Shepherd EI4KB/PA3FDK? G0KPR** is very familiar with the Dutch ATV scene and has looked at why there seems to be more interest in ATV contests in the Netherlands than in the UK. Bill writes: "I contacted **Roel van Dyk PA1DYK** who has been stimulating ATV activity in the Netherlands.

"Roel's approach is to encourage activity in contests and it was through this, that stations found that they could boost their scores by turning to 70cm analogue TV. Roel reinforced interest by immediate feedback. He did this by publishing results within three weeks via the national website; he then also encouraged Novice Class licencees to become contesters since '70cm' was their only opportunity for enjoying ATV.

"They were firstly able to join in by sending reception reports and scoring

receiving points, which also raised the score of transmitting stations. Novices then went on to transmit themselves".

Bills' report continues: "Roel points out that some repeaters in Holland have 70cm input and this also helped to raise activity levels (so have some UK repeaters of course GH). To support this interest he also published articles on how to start on 70cm (for example), with simple down converters.

"Roel realised that many old tuners used in central cable systems could be used as a driver for 70cm transmitters with a suitable following amplifier. Roel also uses a server to keep in direct internet touch with participants and enthusiasts and regards it as vital".

Roel says: "You must have some enthusiastic ATV Amateur Radio stations. So now and then I visit them to make an interview. I make many pictures and ask them how they became a successful ATV Amateur." Roel then publishes the interviews and pictures – very important – in their magazine *Electron*.

Bill concludes: "So in Holland, we see how vital it is to have committed individuals who find ways of stimulating interest and of obtaining cheap, available equipment so that recruits can take part and see their results soon afterwards. Perhaps raising the points multiplier for 70cm contacts in contests would help raise activity? Thanks again to Roel".

Of course, some of this used to happen in the UK, as 430MHz was widely used as bands above were, at the time, technically not feasible for the Amateur, down converters could be purchased or simple kits built. The BATC supplied a very simple 100mW 70cm ATV transmitter. But interference to broadcast television was a common problem with high power analogue transmitters on broadcast bands 'next door' to TV on 430MHz. Then the UK reduced the 70cm bandwidth, vestigial sideband was not a practical proposition for the Amateur who also now wanted colour and inter-carrier sound.



Is the Crystal Palace transmitter in London, to be the final analogue transmitter to close down in 2012? There was a caravan site immediately underneath it – "TV Reception - good" said the site handbook!

The Digital Switchover

While talking about broadcast TV, it's worth mentioning that here in the Midlands the digital switch-over was completed on September 21st and our famous massive main transmitter mast at Sutton Coldfield – once managed by the highly respected Radio Amateur **Tom Douglas G3BA** – shut down its analogue channels.

Responding to requests from local friends, I helped several of them to make the switchover, advising on the many types of receiver available and, as far as I know, everyone made the change okay.

Except for one that is! at 23:00 one night – yes, 11pm – the 'phone rang. The caller had 'lost all his channels!' So, again, I 'talked him through' the Menu options on his remote control. Eventually, he found – again – the 'Autostore' option – "go for it" I yelled! Success, his channels reappeared and we were both able to relax for the night!

With the analogue system now approaching final switch-off (London starts in April/May 2012 I think) I'm still pressing museum curators to put some ex-transmission equipment on public display. I have made contact with the **Curator of the National Media Museum** in Bradford and have even written to the Sutton Coldfield transmitter's manager.

The NMM curator appreciates that we are approaching a 'last chance' point so is 'on the case', but to date I have not had any reply from the Sutton transmitter manager, assuming there even is one, these days! If any readers of *In Vision* have any influence in these matters, can they please contact me urgently? Thanks!

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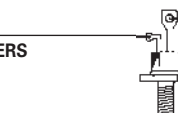
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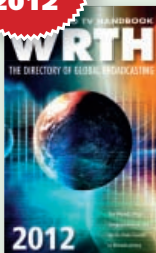
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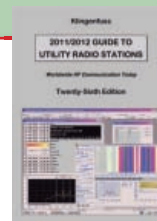
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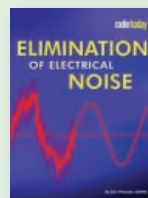
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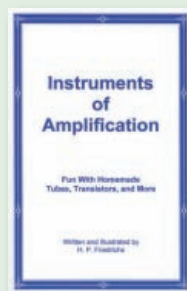
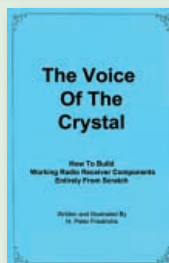
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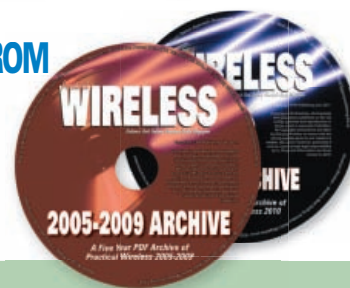


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Rob Mannion G3XFD/EI5IW's

Topical Talk

Topics that have been aired in the Letters pages. Rob's been particularly encouraged by the news from a newcomer regarding the welcome received from a local club.

The letter from **Rik Page** from Cleethorpes in North East Lincolnshire, regarding the welcome he's received from the **Grimbsy Amateur Radio Society** – can only serve to brighten up a winter's day. His E-mail really cheered me up.

Mind you, from the experience I've had visiting clubs – before I became Editor of *PW* – the vast majority of those I visited, as a complete stranger, had always been very welcoming. In fact, during my time when I was working in broadcasting we often found time (I hasten to say this was when I and the other Amateurs in the team, were off duty!) to visit local clubs in the areas where we worked.

Some of the clubs were in remote areas. Inevitably, our especially equipped vehicles – packed with extremely expensive electronic 'goodies' – always attracted attention. This often partly made up for our unexpected (mostly, due to our schedules any visit was usually only planned at short notice) 'invasion' of their club meetings.

I've also been made very welcome when I have been able to visit clubs abroad, where unless they've come across *PW* on the newstands, I'm just welcomed as a visiting Radio Amateur. This is exactly what happened in September 2010 when I visited Wuppertal in Germany – the home of the famous Schwebebahn (an elevated monorail) that runs above the streets and a river.

I was on a private visit but, of course I had intended to ride on the monorail (It

had been over 40 years since I was last in Wuppertal) and it was operating on the Friday evening as I arrived by train from Bournemouth via London. I had chosen a hotel right opposite the monorail station. However, I decided to ride on it after my business had finished on Saturday and Sunday.

Wuppertal had been celebrating its Stadtfest (City Festival) during the week and the pleasant, relatively small riverside city (Wuppertal was formed from a group of smaller towns that are situated alongside the River Wupper) and there was a great deal going on. However, on Saturday morning I was surprised to not hear the monorail trams passing by the hotel (they really are like upside down trams – with the bogies and traction motors mounted on the roof).

Monorail Closed!

I asked the Hotel Receptionist why I hadn't seen any monorail trains. She told me that the system was shut down for major maintenance over the weekend – preparing to celebrate its 100th anniversary in 2011. You can imagine my frustration!

Despite my disappointment, I had seen the monorail in operation and I even saw the famous 'Kaiserwagen' – one of the original wooden bodied trams (beautifully renovated) trundling about on Friday evening. The late Kaiser Wilhelm had ridden in the unit – hence the name – before the system opened and it's now used on special occasions.

Although I was very

disappointed I resolved to return to Wuppertal to have a ride. I then walked into the town (It's very compact) and into a large shopping centre where the local University had many displays and demonstrations of their work going on as part of the Stadtfest. I was even able to see the latest bionic artificial hand control system being demonstrated by the Electronic Engineering Department!

But instead of controlling a prosthetic hand, the myoelectric sensor pads attached to the (mostly young) willing volunteers' upper arms were controlling miniature model electric racing cars on a track! By opening their hands the extremely low level myoelectric currents in the muscles were detected and the cars and their speed were fully controlled. Needless to say, the demonstration was extremely popular and I had a go myself!

I quickly found that a number of the University staff and students were Radio Amateurs and I was made very welcome indeed. Although they were all very interested in my work as Editor of *PW*, as far as they were concerned I was a visiting Amateur who had literally just 'walked in'.

The natural warmth and welcome was so strong it was almost tangible. And the next time I visit Wuppertal I've been invited to visit them at their club. That's Amateur Radio for you – we belong to an international 'family' and wherever I am, I feel there's always a friend nearby.

Rob Mannion G3XFD/EI5IW

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Build A Delta Loop Antenna

Our *Antenna Workshop* guest author **Ray Howes G4OWY** describes the construction of a Delta Loop antenna. It's an often an over-looked design nowadays – but it's capable of helping you to work some great DX on the upper h.f. bands!

Technical For The Terrified

Join **Tony Nailer G4CFY** as he does his utmost to reduce readers' fear of the more technical aspects of Amateur Radio. So, if you are puzzled by s.w.r. or mystified by maths – make sure you see the February column – it's aimed at helping you!

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LMA-L Length 33ft open 7.2ft closed 2-1" diameter	£99.95
CARPLATE-HDT brilliant drive on plate with tilt - ideal to be used in conjunction with the portable telescopic masts and only	£44.95

Patch Leads

PL58-0.5 1/2m Standard RG58 PL259 to PL259 lead	£3.50
PL58-10 10m Standard RG58 PL259 to PL259 lead	£8.95
PL58-30 30m Standard RG58 PL259 to PL259 lead	£16.95
PL58M-0.5 1/2m Mil Spec RG58 PL259 to PL259 lead	£4.50
PL58M-10 10m Mil Spec RG58 PL259 to PL259 lead	£12.95
PL58M-30 30m Mil Spec RG58 PL259 to PL259 lead	£27.95
PL213-10 10m Mil Spec RG213 PL259 to PL259 lead	£18.95
PL213-30 30m Mil Spec RG213 PL259 to PL259 lead	£39.95
PL103-10 10m Mil Spec Westflex 103 PL259 to PL259 lead	£29.95
PL103-30 30m Mil Spec Westflex 103 PL259 to PL259 lead	£69.95

(All other leads and lengths available, ie. BNC to N-type, etc. Please phone for details)

Connectors

PL259-6mm Standard plug for RG58	£0.99p
PL259-9mm Standard plug for RG213	£0.99p
PL259-7mm Standard plug for Mini8	£1.25p
PL259-6C Compression type for RG58	£2.50p
PL259-9C Compression type for RG213	£2.50p
PL259-103C Compression type for Westflex 103	£5.50
NTYPE-6 Compression type plug for RG58	£3.95
NTYPE-9 Compression type plug for RG213	£3.95
NTYPE-103 Compression type plug for westflex 103	£6.00
BNC-6 Compression type for RG58	£1.50
BNC-9 Compression type for RG213	£3.50
SO239-N Adapter to convert PL259 to N-type male	£3.95
NTYPE-PL Adapter to convert N-type to PL259	£3.95
BNC-PL Adapter to convert BNC to PL259	£2.00
BNC-N Adapter to convert BNC to N-type male	£3.95
BNC-SMA Adapter to convert modern SMA radio to suit BNC	£3.95
SO239-SMA Adapter to convert modern SMA radio to suit SO239	£3.95
PL259-38 Adapter to convert SO239 fitting to 38" thread	£3.95

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MFJ-941E 1.8-30MHz 300W Versa tuner 2	£144.95
MFJ-948 1.8-30MHz 300W deluxe Versa tuner	£164.95
MFJ-949E 1.8-30MHz 300W deluxe Versa tuner with DL	£184.95
MFJ-934 1.8-30MHz 300W tuner complete with artificial GND	£204.95
MFJ-974B 3.5-54MHz 300W tuner with X-needle SWR/WATT	£194.95
MFJ-969 1.8-54MHz 300W all band tuner	£219.95
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