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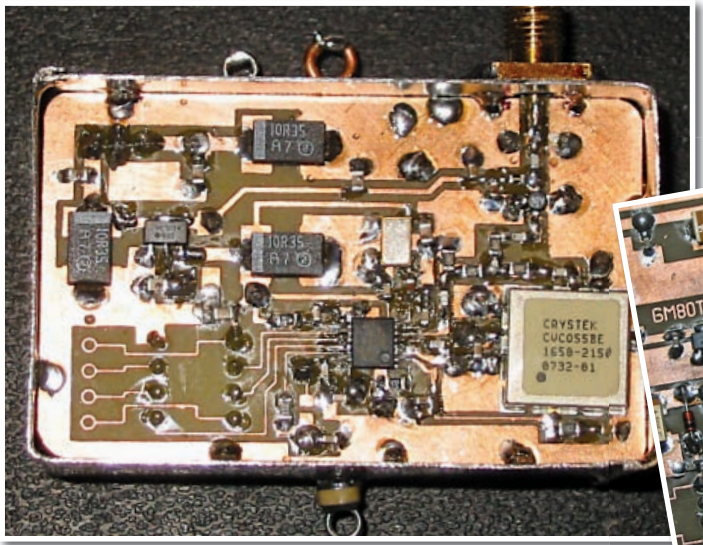
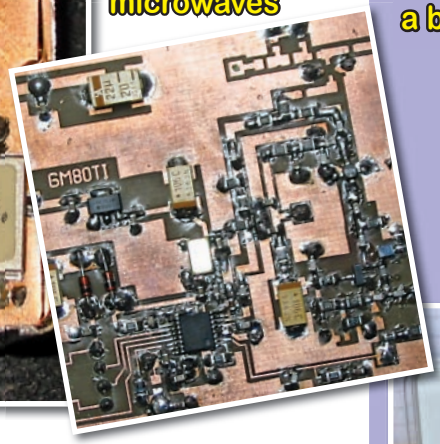


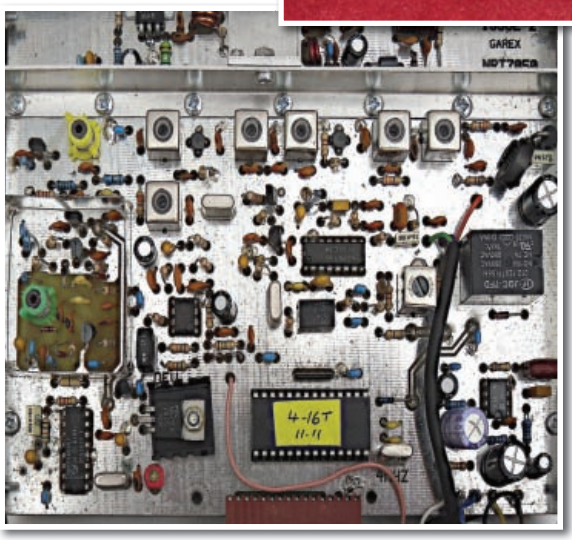


A Budget USB Data Interface

How to spot a bargain!

What Next?

Improving the G6MXL 70MHz station



Doing it by Design

Just because it's in production – doesn't mean that it's perfect!

Practical Way

Making simple audio derived S-meters

In the Shop

Why is neutralisation necessary?

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HF - UHF Antennas

LFA Antennas - The Ultimate in Performance!

Low Noise Designs up to 5kW with Models from 30m to 70cms

LFA (Loop Fed Antennas) Yagi antennas are the creation of **G0KSC at InnovAntennas** and represent the very best in engineering & low noise designs. The ultimate for weak signal h.
We list just a few in the range!
Special orders can be made.

4 El ement 2m LFA with 29dB F/B ratio!

20m 3 El 7.5dBi F/B 14.2dB boom 4.2m 5kW vswr 1.3:1 max **£429**
17m 3 El 8.3dBi F/B 19.2dB boom 4.9m vswr 1.3:1 max 5kW **£329**
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70cm 10 El LFA 14.4dBi F/B 27.85dBi Boom 1.7m **£92.95**
70cm 18 El LFA 18.1dBi F/B 37.94dBi Boom 4.3m **£174.95**
70cm 26 El LFA 19.7dBi F/B 36.15dBi Boom 6.8m **£255.95**

NEW From AirNav Systems!

SHIPTRAX See the exact position of Ships Worldwide! NEW

ShipTrax is an advanced Windows based Ship Tracking application. It receives ship data from various sources (AIS, TCP/IP, AIS Nees tworks) allowing you to track ships worldwide in real-time. Just plug the supplied receiver into the USB port of your PC and load the software. The supplied miniature antenna picks up the data - LIVE!
Data displayed on maps includes Vessel name, Position, Photo, Location, Speed, Track, IMO.MMSI, Call sign, Vessel type, Length and voyage details. Also includes personal log book. Now you can track your favourite cruise liner wherever it goes!

ShipTrax-Pro **£399.95 C**
The standard system that includes receiver, antenna and software. It provides a flat display on your PC/ laptop screen and is ideal for normal use.

ShipTrax-3D **£489.95 C**
The 3D version adds the dimension of Google 3D mapping systems that gives the most realistic views possible in great detail and is particularly effective for river traffic and docks.

HF - UHF in One Box!

YAESU **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 performamnce 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!

YAESU **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

ICOM **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

TEN-TEC **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

YAESU **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

TEN-TEC **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

Sofware 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!

£2499.95 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: 14.51k8

£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

AOR *We are UK Distributors*

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

NEW Icom ID-31E D-Star Handy

NEW

- Built-in GPS receiver
- IPX7 submersible construction
- D-STAR DV mode (Digital Voice + data)
- Micro SD card slot
- Full dot-matrix display & directional keypad
- Automatic repeater list function
- Total 1252 memory channels
- 5W output power
- Multiple scan functions
- CS-31 cloning software
- External DC power jack
- Built-in CTCSS/DTCS encoder & decoder
- 16 DTMF memory channels (24 digits)
- Full Analogue facilities

Introductory Offer
FREE 2GB SD Card!
Offer subject to availability.

£349.95 D

Handheld Transceivers

VX-3E 2m / 70cm Handheld Wideband receive
£169.95 D

VX-6E *Offer!* 2m/70cms handy, 5W. +FREE Case ~~£249.95~~
£214.95 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 & DTCS GPS Compat.
£329.95 D

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

IC-E92D Dual band 2m/70cm waterproof fitted D-Star. Rugged radio.
£387.95 D

TH-F7E Dual band 2m/70cm + wideband receive inc. SSB
£236.95 D

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

TG-UV2 Dual band 2m/70cm with CTCSS DCS & LED torch!
£81.95 D

NEW from Kenwood!

NEW **TM-281E** 2m FM 65/25W Mobile Transceiver

On or off the road, Kenwood's TM-281E is a mobile radio you can always count on. As tough as nails, this MIL-STD-compliant transceiver delivers powerful performance, excellent audio clarity, and a host of advanced features.

£169.95 D

NEW **TH-K20E**
** TX 144-146MHz * RX 136-174MHz * 5.5W Max Output * 200 Memory channels*
£119.95 D

NEW **TH-K40E**
** TX 430-440MHz * RX 400-470MHz * 5W Max Output * 200 Memory channels*
£119.95 D

Hygain Vertical Antennas

AV-6160	6-160m aerial 43 feet self supporting 1500 Watts	£434.95 D
AV-6110	160/80m high effi ciency matching network	£279.95 D
AV-12AVQ	10-15-20m Vertical 1.5kW 13ft	£169.95 D
AV-14AVQ	10-15-20-40m Vertical 1.5kW 18ft	£209.95 D
AV-14RMQ	Roof mount kit : baseplate/mast & radials	£109.95 D
AV-18AVQ11	10-15-20-40-80m vertical 1.5kW 18'	£279.95 D
AV-18HT	10-12-15-20-40-80m Vertical 1.5kW 53ft	£1,089.95 D
AV-18HTJR	10-15-20-40-80m 5kW Vertical 39ft	£399.95 D
AV-18VS	10-12-15-17-20-30-40-80m vertical 1.5kW 18'	£134.95 D
AV-620	6-20m Vertical inc WARC 1.5kW, 22.5' long	£329.95 D
AV-640	6-40m Vertical inc WARC 1.5kW 25.5' long	£479.95 D
DX-77A	10-12-15-17-20-30-40m vertical 1.5kW 29'	£479.95 D
DX-88	10-12-15-17-20-30-40-80m Vertical 1.5kW 25'	£409.95 D
KIT-160-88	160m add on kit for DX-88	£209.95 D
GRK-88	Ground radial system for DX-88	£109.95 D
RRK-88	Roof radial system for DX-88	£109.95 D
LC-160Q	160m mod kit for AV-18HT 150 W	£124.95 D
MK-160A	160m mod kit for AV-18HT 1 KW	£135.95 D
MK-6	6m add-on kit for most HF yagis & rotatable dipoles	£49.95 C
MK-17	17m add-on kit for AV-14AVQ	£99.95 D
MK-80	80m add-on kit for AV-14AVQ	£94.95 D

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With Graphic Colour Display!

Get an instant Graphic display of both VSWR and impedance curves!

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. An opptional Lithium cell pack and AC charger is available - phone..

£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.

£259.95 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

Watson Weather Stations

Back In Stock!

W-8683

Compact wireless weather station with external temp/ humidity sensor, pressure readings and radio controlled clock.

£25.95 C

W-8684

Indoor/outdoor wireless thermometer with clock. Large LCD display, ideal for home or office use.

£11.95 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

MFJ Antennas & Accessories

MFJ Vertical HF Antennas. Ideal for small gardens.

MFJ-1796 A 1.5kW40m - 2m self supporting vertical. Requires no radials. Height 3.65m **£244.95**

MFJ-1798 An 1.5kW 80m to 2m vertical that is self supporting and needs no radials. Height 6.7m **£309.95**

MFJ-1625	Window Ant + Tuner	£204.95 D
MFJ-1796	40m-2m vertical	£244.95 D
MFJ-1798	80m-2m vertical	£309.95 D
MFJ-1908H	43ft fibre glass mast	£249.95 D
MFJ-1922	Digital screw driver control	£101.95 D
MFJ-1924	Prog. screw drvr control	£142.95 C
MFJ-1925	ATAS-100 controller	£84.95 C
MFJ-202B	Receiver noise bridge	£82.95 C
MFJ-250X	1kW dummy load (x-oil)	£56.95 C
MFJ-260C	300W dummy load	£45.95 C
MFJ-261	100W dummy load	£33.95 C
MFJ-265	2.5kW load fan cooled	£209.95 C
MFJ-403	Micro CW keyer	£64.95 C
MFJ-403P	Micro travel iambic	£79.95 C
MFJ-4103	PSU for FT-817	£53.95 C
MFJ-417	Pocket morse tutor	£73.95 C
MFJ-442	Slim electronic keyer	£199.95 C
MFJ-461	Pocket morse reader	£99.95 C
MFJ-4726	6-way remote ant switch	£164.95 C
MFJ-490	Memory keyer + paddle	£234.95 C
MFJ-495	Memory keyer	£179.95 C

Heil Microphones

Pro-Set-Elite-6 NEW

Modelled on the ProSet-6 but adds phase reversal switch which offers a spatial awareness.

Pro-Set-Elite-6	£179.95 C
Pro-Set-Elite-IC	£189.95 C
AD-1 Rig adaptor leads	£22.95 C

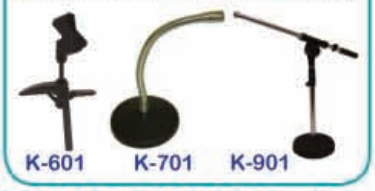
NEW Genesis HM-12

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



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0%!

Beat the price increases and get the rig you want today. Telephone, come in or e-mail us to arrange. Over six months that £900 radio costs £150 per month. Over twelve months there is a £29 admin fee and your radio costs just £75 p/month!

Avair Power SWR Meters

All models have 12V backlight and include DC Cable.

AV-201	1.8-160MHz, 5/20/200/1kW	£49.95 C
AV-400	140-525MHz 5/20/200/400W	£49.95 C
AV-601	1.8-160MHz / 140-525MHz	£69.95 C
AV-1000	1.8-1300MHz.	£79.95 C

Cross Needle Models - Even Lower Prices!

AV-20	30W / 200W, 3.5-150MHz	£39.95 C
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. **£99.95 C**

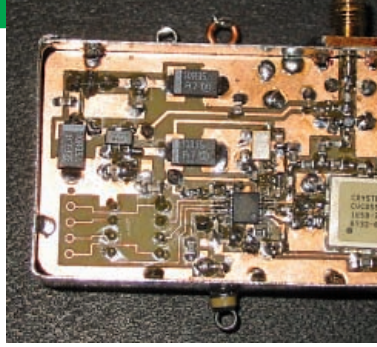
NEIM-1031MKII New Low Price		£129.95 C
Noise Eliminating In-Line Module.		
NEDSP-1061-KBD New Low Price		£89.95 C
Noise Eliminating DSP module for FT-817		
NEDSP-1062-KBD New Low Price		£94.95 C
Noise Eliminating DSP module for speaker.		
ANEM-MKII New Low Price		£115.95 C
In-Line "Noise Away" amplified DSP module.		
DSPKR New Low Price		£139.95 C
Noise Eliminating DSP Ext. Speaker 10W.		
DTNA New Low Price		£139.95 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.		

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

Practical Wireless March 2012

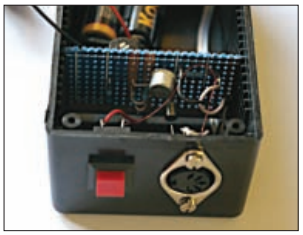
contents

Volume 88. Number 3. Issue 1258. On sale 9th February 2012



Editor's apology: The review of the Baofeng 144MHz hand-held transceiver has been held over to the April issue.

Front cover design by **Steve Hunt.**



Rob Mannion G3XFD/EI5IW's

Keylines

Rob reports on the first airing of GB80PW on Thursday January 12th and the reason why the 'on the air' dates have been changed to Saturdays.

During 2011, I was considering how to celebrate the coming 80th anniversary year of *PW*. The 75th anniversary was celebrated in style – and many readers will remember that with the help of many clubs and friends we operated GB75PW from different locations including Wales, Scotland and Northern Ireland. This time however, after discussing the ideas with **Tex Swann G1TEX** and our publishers, I planned to apply for and operate a Special Event station from my home QTH.

Thanks to the assistance of Ofcom, the Notice of Variation (NoV) for the Special Event station **GB80PW** was granted. Unfortunately, the NOV arrived three days after we'd passed for press on the February issue, but it was in plenty of time to get it on the air on Thursday January 12th. I've since learned that Ofcom have been extremely busy organising radio communications for an extremely large international sporting event that takes place in London and other locations this year! My thanks go to Ofcom staff for taking the time to arrange G80PW for us when they must be literally rushed off their feet!

As I mentioned (in *PW Newsdesk* in this issue) the first 'on the air' session was planned for the official publication day of *PW* (second Thursday of each month). The only difference is that instead of operating under my own callsign – thanks to Ofcom – it was GB80PW that appeared on 7MHz on Thursday January 12th, with **Phil Ciotti G3XBZ** taking the first session.

Phil and I took turns of an hour or so each operating mainly on 7MHz from 1000UTC and were very pleased to be kept busy, working *PW* friends all over the UK, Ireland and Europe. Conditions on 40m were variable but they didn't stop a few mini pile-ups!

Tex Swann G1TEX and Publisher and Art Editor **Steve Hunt** were also listening in to GB80PW at the *PW* offices in Broadstone – thanks to the remarkable web-based receiver available at **www.nachtuilen.net/** (the facility is located in the southern part of Holland). I also monitored Phil as he was operating from my study while I was supposedly working on the March issue of *PW*! Indeed, I was so fascinated at hearing GB80PW via the Dutch-based web receiver I mostly just sat and listened during Phil's sessions.

Indeed, the web receiver proved very helpful because when we were working a portable station in Britanny and conditions were difficult – Tex (monitoring via the Dutch receiving system) sent a text with the information we weren't copying direct. It's certainly a very useful facility and I thank those who are involved for their efforts on behalf of the Amateur Radio community.

Change Of GB80PW Schedules

Although Phil G3XBZ and I were very busy with GB80PW – following a number of E-mails from readers – it's obvious the 'on air' schedules need to be changed. I'm afraid that I obviously made a fundamental mistake in choosing a weekday to put our Special Event station on the air! I apologise for this but I have to be honest – I could have used the euphemism 'by popular demand' – I had originally thought **it was** an appropriate choice!

However, one of the first *PW* readers to comment – because he's busy at work during the day – was **Jan Stigell SM0WHH** in Sweden. Jan pointed out to me that he was dismayed that he'd not be able to contact GB80PW because it was unlikely that band conditions would permit it by the time he'd arrived home from work.

Jan's dismay was echoed by many other readers anxious to get the chance of working GB80PW – and I fully accept that I made a mistake and apologise to all our friends. Obviously, we want to provide you with the best chance to work the station and help you share *PW*'s special anniversary. Changing to a Saturday should help a great deal.

So, please look out for GB80PW on the **Saturdays** immediately following publication days during 2012. The dates are **Saturday February 11th**, **March 10th**, **April 14th**, **May 12th**, **June 16th**, **July 14th**, **August 11th**, **September 15th**, **October 13th**, **November 10th** and **December 15th**. Keep those dates in your diary and Phil G3XBZ and I – and the other operators who'll be involved – look forward to working you!

Rob Mannion G3XFD/EI5IW

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Readers' Letters

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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**.

Help With Antenna Erection

Dear Rob,
Reading your excellent idea that those of us in the hobby should arrange some form of help for the who are unable to erect antennas themselves should be taken forward. I think this is a common problem and perhaps the RSGB should be involved?

I have installed over 100 antennas during 2011 either for new operators or those who are disabled. I've also serviced/repaired antennas. Like many other Amateurs I'm very busy helping our community and hopefully I will always be available to do so. If we can organise the resources, get publicity arranged and the 'machine' will then work itself!

I would like to suggest an idea centralising the offer of help to any Amateurs who need it, I have set up a personnel website here: **http://m0tav.webs.com/**

At the top of the page in the forums section there is **Antenna Help & Servicing**. Anybody who wants help, please post your contact details and relevant information, including location. I invite anybody who can offer help anywhere in the UK please E-mail or '*Skype'* me your contact details.

I will be happy to organise everything needed. It will take some time to set up properly. It is already in motion locally, just needs some co-ordination and some of *PW*'s wonderful public relations work on behalf of the hobby. Kind Regards.

Vinny Hopkins M0TAV
Old Arley
Coventry
West Midlands
E-mail: **happyhopkins@hotmail.com**
Skype address: **vinnyhopkins2e0cov**

Editor's comments: *Thanks for your helpful and enthusiastic response Vinny. The dedication shown by you – and the others – who contacted me on the same subject have provided a real 'boost' to*

£20 Star Letter

Taking a pro-active approach towards new Licence holders

Dear Rob,
Like many, these days, I'm a member on a on-line Forum and I'm also one of the Moderators. The group **www.charlietango.co.uk** offers advice and information to **all** radio users.

I'm concerned with the Amateur Radio aspects. It has come to our attention a few times that one of the first 'complaints' M3/M6 callsign holders mention is their treatment on-air (h.f. bands) by 'older' operators. I must also say at this point that it's very easy to generalise and that not all M3/M6s complain and neither do all older operators give them a hard time!

A lot of debate, about the current licence system, followed on our On-line forum and it became clear that it's very much a 'two sided' problem. Indeed, I believe that one of the main reasons is that the Foundation Licence gets a student a licence – but teaches them very little about Amateur Radio in the 'real world'.

Nowadays, I think that many new licence holders go straight to h.f. and not the higher bands like in days past when any 'mistakes' were only heard 'locally'. Also with some certainty – once on h.f. the next stop is 14MHz (20m) **the** DX band. And I think that it's fair to say that many operators on 20m are so keen that they end up making the band very competitive and hostile most of the time. We can survive if we know what we're doing – but easy prey if we don't!

Through 'the good offices' of the *Letters* pages in *PW* and via the Charlie Tango Admin, I'd like to put forward an idea via charlietango Admin, to provide a 'safe working environment' for new licence holders to have their first QSO on h.f. without fear or ridicule during one of the on-air nets that our group organise.

Many of our members have come from CB radio – so some adjustment in their approach and operating protocol is sometimes needed. If we can do this and make the early days of Amateur Radio enjoyable then they might just stick with the hobby and progress to the full licence.

The CT nets are normally held on the top end of 7MHz on Sunday mornings and are well supported. Any M3/M6 who wishes to join can do so knowing the only advice (if needed) they get will be friendly. Everyone is welcome to call in, of course. and say "Hello" and we would encourage everyone to do so. Full details, time and frequency, are announced on the day of the net via the CT site.

Finally, we hoped that in the near future that a club callsign will be issued to make finding the CT net a bit easier. Thank you for your support.

Bob Taylor G1WEX
Rowley Regis
Oldbury
West Midlands

Editor's comment: *I wish you well in your venture Bob and I that that any initiative to help newcomers on to the air should be supported by everyone. Please join me on the* Topical Talk *page for further comment.*

my belief in the friends we have around us in the hobby. Please join me on the Topical Talk page for further comment.

Low Voltage Problems While Operating On Battery Power

Dear Rob,
Many Amateurs – in an attempt to avoid mains borne interference – use a 12V car battery to power equipment. However there's a down side to this. My FRG-7 works fine with fully charged battery but once voltage drops to 11.5V the lowest band reception is not as good as it was. When the voltage drops below 11V the Wadley loop fails to 'lock'. So operators should bear in mind there is a minimum voltage requirement for rigs.

The minimum required for my Alinco DX-70TH is 11.7 volts, not far from a fully charged battery, so fellow Amateurs – please remember there is a minimum voltage required that a car battery may not be able to supply for very long.

Ross Bradshaw G4DTD
Roche
St. Austell
Cornwall

Editor's comment: *Many of us have come across this problem – including myself – Ross and it can be a real nuisance. The handy little PIC-based battery monitor unit – produced by* ***Phil Cadman G4JCP*** *and published in the January 2012 issue (page 14 onwards) would be most useful for those who use batteries in the shack or for portable use.*

The SDR Kit Reviews In The February Issue

Dear Rob,
I'm a bit depressed about your article on the Software Defined Radio (SDR) radio kit build on page 14 in the February 2012 issue of *PW*. I think that the builder has fallen into a trap which will – yet again – damage the reputation of a perfectly good method of radio reception.

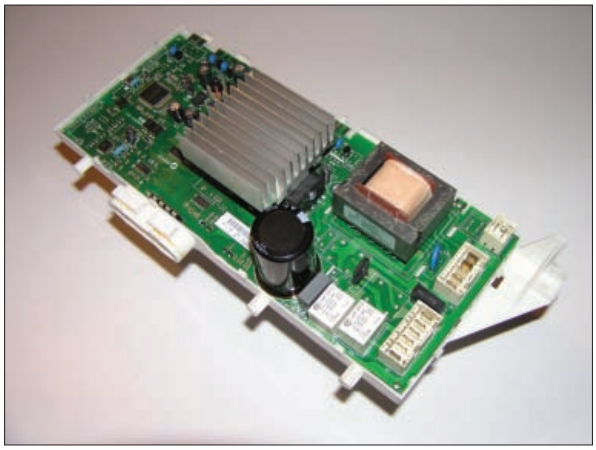
In practice SDR is a concept, which for an incredibly small outlay in cost, can provide cutting edge performance. It's a system that is being used extensively in commercial communication that provides virtually limitless flexibility. You don't need to read the article to see that the kit hasn't been built properly. The error is indicated in the display pictures.

I know I will not be popular for drawing your attention to this but it is the classic mistake made when working with this form of detection.

Attached is a waterfall display with a correctly made and set-up SDR radio system at the level you are describing. You will see there is no symmetry in the display. You will also see the c.w. section of 7MHz to the left of the screen and part of the s.s.b. section to the right. There are no images i.e. in the case of s.s.b., repeats of same l.s.b. signals as u.s.b. signals elsewhere in the band. It is a Softrock40 kit that is being used here into a cheap (£250 new) Dell desktop running the excellent *WINRAD* software created by I2PHD.

If symmetry exists then there's no 90° (phase) shift between the I and Q output of the SDR board. Or there is no signal in either the I or Q outputs. Or the sound card is a mono only card as is

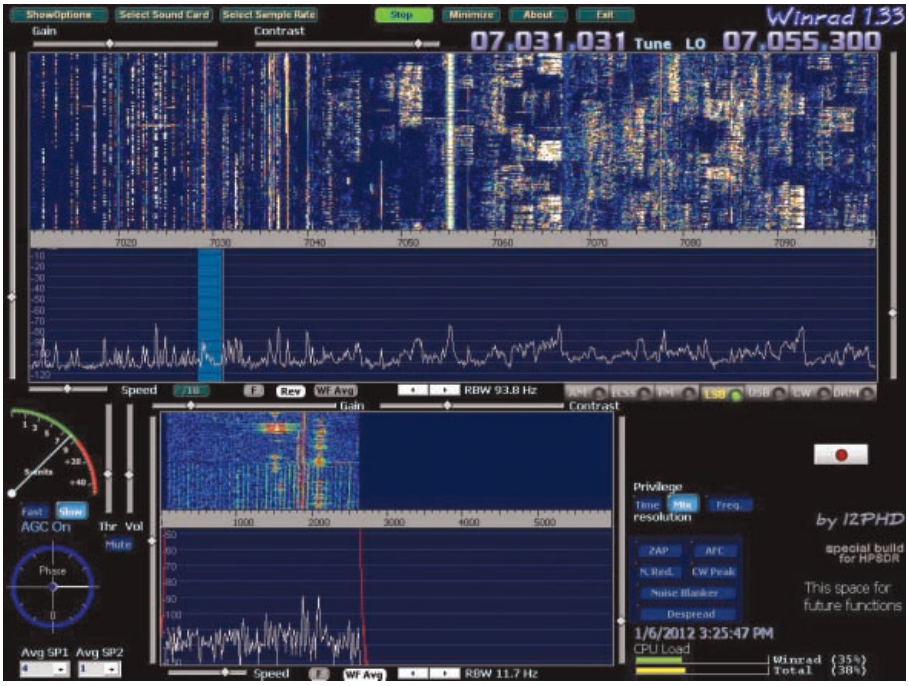
Another Source Of Components For Constructors



Dear Rob,
A recent correspondent to the *Letters* pages, extolled the value of dismantling old low energy light bulbs for components. So, when our washing machine needed a new controller board I asked the Engineer if I could have the old one.
The accompanying photo shows that there's an excellent assortment of components including a 330µF 400C electrolytic capacitor and an impressive heat sink. In discussion the Engineer explained that, now such boards that have been assembled with lead free solder are getting older – more are failing due to cracked solder joints, especially on machines subject to vibration or when dropped. I wonder if any other *PW* readers have come across this problem?
The washing machine was just 3 years and 1 week old. The guarantee was 3 years! Best wishes.

Bob Hayter G4OAC
Rochdale
Lancashire

Editor's comment: *Well done Bob – any more ideas readers?*



the case with early Laptop PCs. I hope you read this in the spirit in which it was sent – I'm an Annual subscriber and *PW* is the only Amateur Radio journal I buy regularly.
Peter March M0FMT/G8FMT
Holwell
Hitchin
Hertfordshire

Tex Swann G1TEX PW's Technical Editor replies: *Thank you for your letter Peter. We have made sure that your comment about the stereo line input of his computer's sound-card, have been passed on to* ***Phil Ciotti G3XBZ****, who is a retired prototype wireman. And to alert readers to problems with decoding SDR signals, Mike Richards will look closer at this problem, hopefully in his next* Data Modes *column.*

Working GB80PW On The HF Bands

Dear Rob,
Having seen the mention about GB80PW operations, getting on the air on Thursday January 12th, in the news in the February *PW*, I was somewhat disappointed that those of us who work office hours, won't be able to have a QSO with the Special Event callsign. After all, when I finish at work about 1700 local time (1600 GMT) or so, and then having a travel time of some 45+ minutes, you'll be long gone before I can switch my rig on and try for a QSO.

With just 10W I am rather limited, but nevertheless I can work quite a few countries from my flat. But I would really appreciate if it would be possible to work your Jubilee Call Sign, especially since I read your magazine every month. I like the 'down-to-earth' approach of the magazine and the fact that a lot of the stories are of, and for, those with limited facilities and power.

To be an Amateur Radio operator,means among other things that I need to put up a suitable antenna. The word 'suitable' could then mean quite a few things, from a 30 metre tower with mono-band beams comparable in size to a DC-3 aircraft, to a stealth wire that must not be seen, to an indoor antenna. Should there be other people in their flats as well, the neighbours (and also a possible resident's committee), probably have their opinion directing both the choice of antennas and their mountings. A further complication would be if no external coaxial cable or other feeders are permitted.

As a Radio Amateur living in a multi-flat building, I think it's often better that your neighbours don't realise that you are an Amateur! Otherwise, guess who will be suspected for any and all interference suffered by the neighbours, regardless of if you are at home or not? In my case – with six floors with flats and 16 flats on each floor – I really need to be as anonymous as possible!

On v.h.f. and u.h.f. I use an antenna in the window – either hanging or (temporarily) on the window-sill. Various repeaters compensate for my poor range. Direct traffic, on the other hand is rather limited in range.

On h.f. however, discreet antennas are required. I use an end-fed wire, consisting of a 20 or 22s.w.g. enamelled wire, with a metre long coaxial cable running from the rig to the upper part of the window. This is where I have connected the wire and brought it between window and frame, wrapped-up in a plastic bag as an extra insulation.

The wire runs from the window to a suitable tree, together with two counterpoises in my 'radio room' – in reality my bedroom! Also, my rig is an Icom, IC-703, with all of 10W output and a very competent built-in tuner. This combination has, so far at least, not raised any suspicion among my neighbours.

My antenna has been discovered. It's hard to avoid when there's some frost on the wire, coupled with a high humidity, which make it look like a cat's tail – but my explanation that "It's a s.w.l. antenna" has been accepted so far! Also, when there's quite a lot of snow on the roof it will need to be shovelled down and then I might have to replace the wire. But so far I have been lucky.

Does my simple set-up work? Most certainly! I have spoken to quite a few countries in Europe, with the farthest station being located in Volgograd in Russia, using 10W s.s.b. only on the h.f. bands. I am practicing my c.w., but have so far not used it on the air. There are of course some limiting factors, among them that on the lower h.f. bands there's quite a lot of loud QRM from various electronic 'household jammers', and also that my combination of counterpoises and antenna locks the station on 24MHz. On the other hand, even though it's not a perfect set-up – it's much better than no set-up at all! 73.
Jan Stigell SM0WHH
Stockholm
Sweden

Editor's comments: *Thank you for your interesting letter Jan. There's some good news for you on the* Keylines *page and we hope to work you soon!*

Another Quote From George G3RJV!

Dear Rob,
I have just been reading your *Topical Talk* for February. It brought to mind a quotation from **Roy Lewallen W7EL** (a real antenna guru) "*Just remember the general rule for antennas:*
small — efficient – broadband: pick any two."
... that's the way it is! 73.
George Dobbs G3RJV
Littleborough
Oldham
Greater Manchester

Editor: *Thanks George – the search for the perfect antenna will be never ending!*

Operating GB80PW On Thursdays

Dear Rob,
Unusually, I was at home on Thursday January the 12th when **Phil G3XBZ** and yourself put the *PW* Special Event station **GB80PW** on-air for the first time. Normally, I would be at work because, although I am retired, I still do some HGV driving. This means I'm usually away from home during the week and can be anywhere in Nottinghamshire or Lincolnshire delivery agricultural equipment.

I was only at home because I hurt my back and it was great to listen to GB80PW on the air. You were certainly busy and as a listener I was pleased to hear you both acknowledge those who were listening in to GB80PW.

I hope you will also be operating GB80PW on Saturdays too so that I can hear you again. I look forward to the GB80PW card when they're printed and that you enjoyed mine. Best wishes.
John Taylor
Newark Northgate
Newark
Nottinghamshire

Editor's comment: *Some good news for you on the Keylines page John and it was good to hear from you again!*

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

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FTM-10E Dual band 2/70cm, 50 Watts output **£309.95**

FT-7900E Dual band 2/70cm 50/40 Watts with wideband RX **£239.95**

FT-2900E Single band 2m 75 Watt heavy duty transceiver **£139.95**

FT-1900E Single band 2m 55 Watt high performance transceiver **£129.95**

Portable

FT-897D HF/VHF/UHF Base/Portable transceiver 1.8-430MHz 100 Watts HF+6, 50 Watts 2M, 20 Watts 70cm **£809.95**

FT-817ND HF/VHF/UHF Backpack Transceiver RX 100kHz – 56MHz 76-154MHz 420-470MHz 5 Watts **£539.95**

Base

FT-2000D HF/6m All mode 200 Watts transceiver RX: 30kHz – 60MHz **£2,899.95**

FT-2000 HF/6m All mode 100 Watts transceiver RX: 30kHz – 60MHz **£2,249.95**

FT-950 HF/6m 100 watt transceiver with DSP & ATU RX 30kHz – 56MHz **£1,259.95**

FT-450 Compact transceiver with IF DSP, HF+6m 1.8-54MHz, 100 Watts output **£649.95**

FT-450D "New" model compact transceiv er with built-in ATU **£839.95**

RANGER Communications Inc.

Authorised dealer

Mobiles

RCI-2970N2 All mode 10/12m with a massive 100 Watts output **£399.95**

RCI-5054DX-100 All mode 6m 50-54MHz with 50 Watts output **£299.95**

RCI-2950DX3 All mode 10/12m with 10 Watts output **£299.95**

Yagi Antennas

All Yagis have high quality gamma match fittings with stainless steel fixings! (excluding YG4-2C)

YG27-4 Dual band 2/70 4 Element (Boom 42") (Gain 6.0dBd) **£59.95**
YG4-2C 2 metre 4 Element (Boom 48") (Gain 7dBd) **£29.95**
YG5-2 2 metre 5 Element (Boom 63") (Gain 10dBd) **£59.95**
YG8-2 2 metre 8 Element (Boom 125") (Gain 12dBd) **£79.95**
YG11-2 2 metre 11 Element (Boom 185") (Gain 13dBd) **£119.95**
YG3-4 4 metre 3 Element (Boom 45") (Gain 8dBd) **£69.95**
YG5-4 4 metre 5 Element (Boom 104") (Gain 10dBd) **£79.95**
YG3-6 6 metre 3 Element (Boom 72") (Gain 7.5dBd) **£69.95**
YG5-6 6 metre 5 Element (Boom 142") (Gain 9.5dBd) **£89.95**
YG13-70 70 cm 13 Element (Boom 76") (Gain 12.5dBd) **£54.95**

ZL Special Yagi Antennas

The ZL special gives you a massive gain for the smallest boom length ... no wonder they are our best selling yagi's!

ZL5-2 2 Metre 5 Ele, Boom 95cm, Gain 9.5dBd **£59.95**
ZL7-2 2 Metre 7 Ele, Boom 150cm, Gain 11.5dBd **£69.95**
ZL12-2 2 Metre 12 Ele, Boom 315cm, Gain 14dBd **£99.95**
ZL7-70 70cm 7 Ele, Boom 70cm, Gain 11.5dBd **£39.95**
ZL12-70 70cm 12 Ele, Boom 120cm, Gain 14dBd **£49.95**

HB9CV

Brilliant 2 element beams ... ideal for portable use

HB9-70 70cm (Boom 12") **£24.95**
HB9-2 2 metre (Boom 20") **£29.95**
HB9-4 4 metre (Boom 23") **£39.95**
HB9-6 6 metre (Boom 33") **£49.95**
HB9-627 6/2/70 Triband (Boom 45") **£69.95**

Halo Loops

Our most popular compact antennas, great base, mobile, portable, or wherever!

HLP-2 2 metre (size approx 300mm square) **£24.95**
HLP-4 4 metre (size approx 600mm square) **£34.95**
HLP-6 6 metre (size approx 800mm square) **£39.95**

G5RV Wire Antennas

The most popular wire antenna available in different grades to suit every amateur .... All from just £19.95!

G5RV-HSS Standard Half Size Enamelled Version, 51ft Long, 10-40 Metres **£24.95**
G5RV-FSS Standard Full Size Enamelled Version, 102ft Long, 10-80 Metres **£29.95**
G5RV-DSS Standard Double Size Enamelled Version, 204ft Long, 10-160 Metres **£54.95**
G5RV-HSH Half Size Hard Drawn Version, pre-stretched, 51ft Long, 10-40 Metres **£29.95**
G5RV-FSH Full Size Hard Drawn Version, pre-stretched, 102ft Long, 10-80 Metres **£34.95**
G5RV-HSF Half Size Original High Quality Flexweave Version, 51ft Long, 10-40 Metres **£34.95**
G5RV-FSF Full Size Original High Quality Flexweave Version, 102ft Long, 10-80 Metres **£39.95**
G5RV-HSP Half Size Original PVC Coated Flexweave Version, 51ft Long, 10-40 Metres **£39.95**
G5RV-FSP Full Size Original PVC Coated Flexweave Version, 102ft Long, 10-80 Metres **£44.95**
G5RV-HSX Half Size Deluxe Version with 450 Ohm ladder, 51ft Long, 10-40 Metres **£49.95**
G5RV-FSX Full Size Deluxe Version with 450 Ohm ladder, 102ft Long, 10-80 Metres **£54.95**

Accessories

G5RV-IND Convert any half size G5RV to full with these great inductors, adds 8ft on each leg **£24.95**
MB-9 Choke Balun for G5RV to reduce RF Feedback **£39.95**
TSS-1 Pair of stainless steel springs to take the tension out of a G5RV or similar **£19.95**

Trapped Wire Dipole Antennas

Commercial quality trapped wire dipoles that resonate, so require no ATU!

MDT-6 FREQ:40 & 160m LENGTH: 28m POWER: 1000 Watts **£79.95**
MTD-1 (3 BAND) FREQ:10-15-20 Mtrs LENGTH:7.40 Mtrs POWER:1000 Watts **£69.95**
MTD-2 (2 BAND) FREQ:40-80 Mtrs LENGTH: 20Mtrs POWER:1000 Watts **£79.95**
MTD-3 (3 BAND) FREQ:40-80-160 Mtrs LENGTH: 32.5m POWER: 1000 Watts **£129.95**
MTD-4 (3 BAND) FREQ: 12-17-30 Mtrs LENGTH: 10.5m POWER: 1000 Watts **£69.95**
MTD-5 (5 BAND) FREQ: 10-15-20-40-80 Mtrs LENGTH: 20m POWER:1000 Watts **£119.95**

(MTD-5 is a crossed dipole with 4 legs)

Multiband Mobile

Why buy loads of different antennas when Moonraker has one to cover all! SPX series has a unique fly lead and socket for quick band changing

SPX-100 9 Band plug n' go portable, 6/10/12/15/17/20/30/40/80m, Length 165cm retracted just 0.5m, Power 50W complete with 38th PL259 or BNC fitting to suit all applications, mobile portable or base ... brilliant! **£44.95**
SPX-200 6 Band plug n' go mobile, 6/10/15/20/40/80m, Length 130cm, Power 120W, 3/8th fitting **£39.95**
SPX-200S 6 Band plug n' go mobile, 6/10/15/20/40/80m, Length 130cm, Power 120W, PL259 fitting **£44.95**
SPX-300 9 Band plug n' go mobile, 6/10/12/15/17/20/30/40/80m, Length 165cm, High Power 200W, 3/8th fitting **£54.95**
SPX-300S 9 Band plug n' go mobile, 6/10/12/15/17/20/30/40/80m, Length 165cm, High Power 200W,PL259 fitting **£59.95**
AMPRO-MB6 6 Band mobile 6/10/15/20/40/80m, length 220cm, 200W, 3/8th fitting, (great for static use or even home base – can tune on four bands at once) **£74.95**
ATOM-AT4 10/6/2/70cm Gain 2m 2.8dBd 70cm 5.5dBd, Length 132cm, PL259 fitting (perfect for FT-8900R). **£59.95**
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**

Yagi Antennas

Diamond performance from the superb Diamond factory

A502HB 6m 2 Elements, Power 400W, Gain 6.3dBi, Radial Length 3m **£109.95**
A144S10R 2m 10 Elements, Power 50W, Gain 11.6dBi, Boom Length 2.13m **£99.95**
A144S5R 2m 5 Elements, Power 50W, Gain 9.1dBi, Boom Length 95cm **£59.95**
A430S15R 70cm 15 Elements, Power 50W, Gain 14.8dBi, Boom Length 224cm **£79.95**
A430S10R 70cm 10 Elements, Power 50W, Gain 13.1dBi, Boom length 119cm. **£59.95**

HF Mobiles

Get great results with the Moonraker range of HF mobiles !
... from as little as £17.95!

AMPRO-10 28MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-12 24MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-15 21MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-17 18MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-20 14MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-30 10MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-40 7.0MHz, Length 220cm, 38th fitting (slimline design) **£19.95**
AMPRO-80 3.5MHz, Length 220cm, 38th fitting (slimline design) **£24.95**
AMPRO-160 1.8MHz, Length 220cm, 38th fitting (heavy duty design) ... **£59.95**
ATOM-20S 14MHz, Length 130cm, PL259 fitting (compact design) **£24.95**
ATOM-40S 7.0MHz, Length 165cm, PL259 fitting (compact design) ... **£26.95**
ATOM-80S 14MHz, Length 165cm, PL259 fitting (compact design) **£29.95**

Ground Plane Free Colinear Verticals

You've have always wanted antennas without radials, without the compromise of performance – well now you can.

SQBM110P 2/70cm, Gain 3/6dBd, RX:25-2000MHz, Length 100cm, SO239 fitting **£54.95**
SQBM1010P 6/2/70cm, Gain 1.5/2.0/5.0dBd, RX25-2000MHz, Length 140cm, SO239 fitting **£84.95**
SQBM1010N 6/2/70cm, Gain 1.5/2.0/5.0dBd, RX25-2000MHz, Length 140cm, N-Type fitting **£89.95**
SQBM225P 2/70/23cm, Gain 2.5/5.0/8.5dBd, RX25-2000MHz, Length 130cm, SO239 fitting **£79.95**
SQBM225N 2/70/23cm, Gain 2.5/5.0/8.5dBd, RX25-2000MHz, Length 130cm, N-Type fitting **£84.95**

GP2500

All Band HF Vertical

This is the perfect answer for anyone with limited space and requires no radials. Covering 80 through to 6M with a VSWR below 1.5:1!

Frequency 3.5-57MHz without tuner, Power 250 Watts, Length 7.13M

All at an amazing £229.95!

NEW GP2500F fibreglass version now in stock **£279.95**

All New MP2500 HF Base Loaded Mobile Antenna

TX 40-6m & RX 3-100MHz VSWR 2:1 (atu recommended for best results) length 2m power 120W SSB

intro price just £199.95

VHF/UHF Mobiles

GF151 Glass Mount 2/70cm, Gain 2.9/4.3dBd, Length 78cm complete with 4m cable and PL259 ..... **£29.95**
MRM-100 MICRO MAG 2/70cm, Gain 0.5/3.0dBd, Length 55cm, 1" magnetic base with 4m coax and BNC **£19.95**
MR700 2/70cm, Gain 0/3.0dBd, Length 50cm, 3/8 fitting **£9.95**
MR777 2/70cm, Gain 2.8/4.8dBd, Length 150cm, 3/8 fitting **£19.95**
MRQ525 2/70cm, Gain 0.5/3.2dBd, Length 43cm, PL259 fitting (high quality) **£19.95**
MRQ500 2/70cm, Gain 3.2/5.8dBd, Length 95cm, PL259 fitting (high quality) **£26.95**
MRQ750 2/70cm, Gain 5.5/8.0dBd, Length 150cm, PL259 fitting (high quality) **£36.95**
MR2 POWER ROD 2/70cm, Gain 3.5/6.5dBd, Length 50cm, PL259 fitting (fibreglass colinear) **£26.95**
MR3 POWER ROD 2/70cm, Gain 2.0/3.5dBd, Length 50cm, PL259 fitting (fibreglass colinear) **£32.95**
MRQ800 6/2/70cm Gain 3.0dBi/5.0/7.5dBdBd, Length 150cm, PL259 fitting (high quality) **£39.95**
MRQ273 2/70/23cm Gain 3.5/5.5/7.5dBdBd, Length 85cm, PL259 fitting (high quality) **£49.95**

Dual and Triband Colinear Verticals

Diamond quality – Moonraker prices ! These high gain antennas have been pre-tuned for your convenience, easy to use, easy to install, and a choice of connection ... look no further

SQBM200P 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, SO239 ..... **£54.95**
SQBM200N 2/70cm, Gain 4.5/7.5dBd, RX 25-2000MHz, Length 155cm, N-Type **£59.95**
SQBM500P 2/70cm, Gain 6.8/9.2dBd, RX 25-2000MHz, Length 250cm, SO239 ..... **£74.95**
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 4.5/7.5/12.5dBd, RX 25-2000MHz, Length 155cm, N-Type **£74.95**

Chameleon Antenna™

New appointed UK dealer! New lower prices on these smash hit antennas from the U.S.

Chameleon V1 HF/VHF/UHF 11 bands 80-70cm multiband base antenna 500W SSB **£149.95**

Chameleon V2 HF/VHF/UHF 11 bands 80-70cm multiband mobile antenna 200W SSB **£99.95**

Chameleon V3 HF/VHF/UHF 160-70cm ultimate portable antenna 250W SSB **£349.95**

Chameleon V4 HF/VHF 20-6m Ultra portable antenna, dipole or end fed 250W SSB **£109.95**

Moonraker Retail Shop & Mail Order
Cranfield Road, Woburn Sands,
Bucks MK17 8UR
Tel: 01908 281705
Open Mon-Fri 9-5:30pm

Moonraker Satellite Shop
@ M5 Communications
Moto Services Area, Junction 30 M5 South
Exeter EX2 7HF. Tel: 01392 367097
Open Mon-Thur 9-6pm Fri 9-4pm

News & Products

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Alan UK On The Move To Nevada!

Alan UK, the **Midland Radio** distributor, has announced an exciting new partnership agreement with Nevada Distribution. The Alan UK operation – based at Swindon – will move to Nevada's distribution centre in Portsmouth and become Alan-Nevada UK, part of the Nevada group.

Alan UK Managing Director **Lance Horne** said, "This new partnership will bring many benefits to all of our customers with increased product ranges, better service support and extended "last order" times, for next day delivery, to mention but a few".

Nevada Managing Director **Mike Devereux G3SED** commented, "Midland have many new products to launch in 2012 for the radio and consumer electronics market. I look forward to giving you more details as soon as I can."

Picture shows (left to right) **CTE Sales Manager Giuseppe Coppola**, **CTE President Corrado Torreggiani** (CTE are major shareholders of Alan UK), Nevada Managing Director Mike Devereux and Lance Horne Managing Director Alan UK, at the signing of the agreement.

Mike Devereux G3SED
Managing Director
Nevada
Unit 1 Fitzherbert Spur
Farlington
Portsmouth
Hampshire PO6 1TT
Tel: **(02392) 313095**
Website: **www.nevadaradio.co.uk/**

Limited Edition Wouxon Pro-Packs At ML&S

Martin Lynch G4HKS contacted *Newsdesk* to alert readers that he's had a special delivery of an – extremely limited (100 only) edition of the new Wouxun KG-UVD6D 'Pro-Pack'. In 2011, the Wouxun KG-UVD1-P was the best selling Handie in the UK. In 2012, ML&S introduce the new improved **KG-UVD6D**. Better still, at only £159.95 including ALL the accessories, you save yourself a massive £50! Martin added... "When they're gone, they're gone!"

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

- ✓ KG-UVD6D New Dual Band Handie
- ✓ Desk Top Charger (110-234v & 12V input) & Power Cord
- ✓ Cigar Car Charger
- ✓ Headset with PTT & Mic
- ✓ Eliminator
- ✓ Remote Mic/Speaker
- ✓ Leather Case
- ✓ 1300mA Li-Ion Battery
- ✓ 1700mA Heavy Duty Li-Ion Battery
- ✓ AA Empty Cell Case
- ✓ PC Programming Lead
- ✓ PC Drivers & Software

For a **Limited Time Offer** the factory has bundled together all your favourite accessories and placed them inside a presentation box.

Jim Lee G4AEH To Operate GB80PW

Latest GB80PW news: Jim Lee G4AEH will be operating the *Practical Wireless* 80th anniversary year Special Event station GB80PW. Jim G4AEH – whose voice is usually found on BBC Radio 4 and Radio 4 Extra has kindly accepted the invitation from the Editor to operate GB80PW from **G3XFD**'s home QTH during 2012. "I've still got the GB75PW callsign board you presented me – it's in my shack. I'll be delighted to join you again Rob".

The actual dates when Jim will on the air with GB80PW have yet to be finalised (please see *Keylines* for more comment) but it has been decided that along with the news Saturday dates, that GB80PW will be on the air on one special Thursday – to celebrate the actual 80th year publication date anniversary on **Thursday September 13th**.

West Tyrone Club's Intermediate Course

West Tyrone Amateur Radio Club are running a course for the Intermediate Exam which will take place on Tuesday 3rd April 2012. The course will be on the Saturday afternoons of **February 18th** and **25th, Saturday March** 10th, 24th and 31st. The club will be holding a registration night before their regular monthly meeting on Tuesday February 7th (later registration will be possible via the website). The cost of the course is £65 which includes all materials needed for the course and the exam fee. A registration form can be downloaded from their website at **www.wtarc.co.uk** The club look forward to meeting candidates! Further information from **Philip Hosey MI0MSO/EI8GPB**, E-mail: **mi0mso@yahoo.co.uk**

The Queen's Jubilee 2012 – Special Q Prefix Available

The **Radio Society of Great Britain** (RSGB) and **Ofcom** have reached agreement on the optional use of special callsigns for Her Majesty the Queen's Jubilee (Celebrating her 60 years as our Queen). For the Queen's Diamond Jubilee, all UK Amateur Radio stations will have the option of applying for a variation to their Licence if they wish, to use a special prefix for a five week period. This will add or substitute the letter "**Q**" in the place of the Regional identifier in the callsign. **The period covered will be from: 00:00BST May 5th 2012, to 23:59 BST June 10th 2012**.

For the period of the Olympic Games and Paralympic Games, a similar facility will exist for a seven week period, using the letter '**O'**. **The period covered is from: 00:00 BST July 21st 2012 to 23:59 BST September 9th 2012**.

Further information from the Ofcom website: **https://services.ofcom.org.uk/faqs?faqcat=amateurradio**

New Four-Band YouKits Rig Arrives At Waters & Stanton

Peter Waters G3OJV of Essex-based *Waters & Stanton PLC* contacted *Newsdesk*: "Good news – we now have the new four-band QRP c.w. transceiver from YouKits. It covers 3.5MHz (80m), 7MHz (40m), 10MHz (30m) and 14MHz (20m) plus full receive coverage of 3.2 to 16MHz (c.w. and s.s.b.). A new front panel control now offers variable selectivity down to 400Hz.

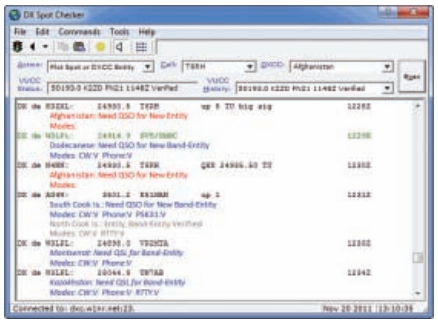
"We also now have the new Li-ion battey packs and matching a.c. chargers that are designed for both HB-1B transceiver and the FG-01 VSWR analyser."

Further information from:
Waters & Stanton PLC
Spa House
22 Main Road
Hockley
Essex SS5 4QS. UK
Tel: (**01702) 206835**
E-mail: **sales@wsplc.com**
Website: **www.wsplc.com/**

New DXtreme Station Log – Multimedia Edition, Version 8.0 Launched

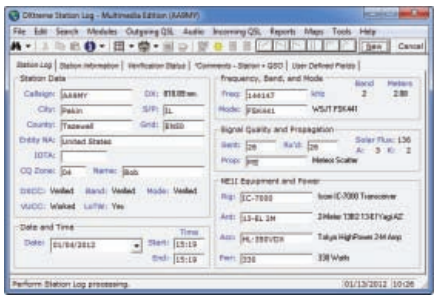
The USA based software supplier DXtreme Software™ has released a new version of its logging program for Amateur Radio operators: ***DXtreme Station Log* — Multimedia Edition™ Version 8.0**. Like other logging programs, *DXtreme Station Log* lets hams log their contacts and import ADIF files from contest programs. But unlike other logging programs,

Station Log provides multimedia and advanced functions that enhance logging activities. The (abbreviated list) of facilities include:



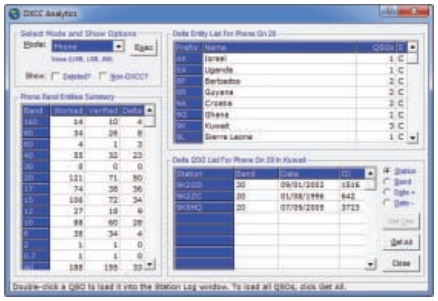
The DX Spot Checker

The *DX Spot Checker*™ receives DX spot announcements from Telnet-based DX Cluster and DXSpider servers. As each spot arrives, the DX Spot Checker optionally queries the Radio Amateur's *Station Log* database to let him or her know, by rich text and/or audio, whether a QSO is needed with the spotted station for a new or verified DXCC entity or band-entity.



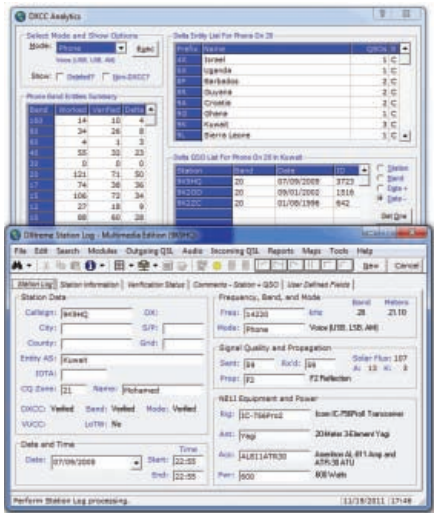
Station Log Window

The *Station Log* window is the focal point of the electronic logbook. In addition to providing the expected logging functions, the window also: Retrieves the frequency and mode from supported rigs through integration with Afreet *Omni-Rig*. Lets users perform a DX Atlas**3** azimuth plot from their location to that of a logged station. Displays DXCC and Grid/VUCC status information for logged stations. Indicates whether logged hams are users of *LoTW*. Retrieves and stores current and historic Solar Flux, A-Index, and K-Index values per station; also lets Radio Amateurs track the propagation mode used.



Multimedia Functions

Multimedia functions allows Radio Amateurs to listen to previous contacts and view QSLs whenever they browse their logs. The embedded audio facility lets operator create the audio archive, and the embedded QSL Imaging™ facility lets the operator scan, capture, and view the physical and electronic QSLs they receive — including *LoTW* QSLs.



Advanced Functions

Advanced functions lets Radio Amateur users: Analyse their DXCC standing using the window-based DXCC Analytics™ tool. Create QSL and address labels for physical QSLs. Create signed *TQ8* files automatically for uploading to the *LoTW* server. Produce ADIF-based electronic QSLs for uploading to eQSL.cc.

The *DXtreme Station Log* runs in 32- and 64-bit versions of Microsoft *Windows 7*, Microsoft *Windows Vista*, and *Windows XP*. It retails for $89.95 USD in North America and $93.95 USD elsewhere for electronic delivery. (Special pricing is available for upgrading users.) All prices include lifetime product support by E-mail. (CD shipment is also available at a nominal surcharge.)

For more information about *DXtreme Station Log* — Multimedia Edition V8.0, visit **www.dxtreme.com**, or contact **Bob Raymond NE1I**, at **bobraymond@dxtreme.com**

Pontefract Takes The Cake For Activity On The Air!

Nigel Ferguson G0BPK from the **Pontefract & District Amateur Radio Society** – they're busy as ever and keep the *PW* team 'topped up' with Pontefract Cakes – shares the latest news from 'The Liquorice town' reporting: "We're running **GB0SRW** for SOS Radio Week and hope to raise money for the Lifeboats again. From Mid February to March 10th we're putting on **GB0PAS** to mark the visit of ***Apollo VII*** **LMP Walt Cunningham** to give a talk at Carleton High School, then on May 12th and 13th it's **GB1AVR** (Ackworth Vintage Rally).

Nigel Ferguson G0BPK
E-mail: **g0bpk@roydmoor.com**

Latest Chelmsford ARS Course Oversubscribed!

The latest training course run by the **Chelmsford Amateur Radio Society** (CARS) was rapidly oversubscribed. **Trevor Hawkins M5AKA** reports, "Such has been the demand from people wanting to get into Amateur Radio that all 12 places on the CARS Foundation course, starting January 12th, were swiftly taken with many would-be candidates now having to wait until the next course.

"In addition to the usual coverage in the local newspapers this course also got a mention on local radio. A press release was sent to the local radio station BBC Essex and a few days later, at 7:30a.m., the CARS training organiser, **Clive Ward G1EUC**, received a 'phone call asking him to pop into the BBC studio later that morning. There he gave a live eight minute interview in which he described the hobby, along with an overview of the Foundation Course.

"Some of those who rang up enquiring about the course were pleasantly surprised to discover that you don't need any previous experience in radio or electronics. Everything you need to know to get an Amateur Radio licence is taught on the short Foundation course".

The CARS volunteers started running Amateur Radio courses in January 2002 and since then have run 43 courses and trained over 300 people. The work of the dedicated team of trainers has invigorated the hobby in Mid-Essex. The club run a full range of training courses from Foundation to Advanced, for further information speak to Clive Ward G1EUC. Tel: (**01245**) **224577**. Mobile (07860) 418835.
E-mail: **training2011@g0mwt.org.uk**
Web: **www.g0mwt.org.uk/training/**
BBC Essex interview recording: **www.essexham.co.uk/news/cars-on-bbc-essex-dec11.html**

Irish Radio Transmitters Society Celebrate 80 Years With CQIR

During 2012 the **Irish Radio Transmitters Society** (IRTS), celebrates the 80th anniversary of its founding in 1932. As part of the Jubilee celebrations, the Society is organising an International Radio Contest, "**CQIR - Ireland Calling**".

For further information contact the Contest Manager **Séamus McCague EI8BP** at **contestmanager@irts.ie**

The CQIR celebrates the IRTS 80th Anniversary and the "Irish" Radio Amateur community worldwide. It's where the Irish, at home and abroad, work the World and have fun on the air. This is an "everyone works everyone" event on the five contest bands from 3. to 28MHz (80 to 10m). Full rules are available at **www.irts.ie/cgi/cqir.cgi**

Date and Contest Period: **From 12:00 UTC Saturday 17th March 2012 to 11:59 UTC Sunday 18th March 2012**. Note: The contest finishes (is over) at 12:00 noon on Sunday. Best wishes from Dublin!

Séamus McCague EI8BP, IRTS Vice-President and PRO

Communications At 2454 Warbreck Squadron ATC

Brian Nuttall M0OYG contacted *Newsdesk* with news from his ATC Squadron; "Since May 2011 the **Cadets at 2454 Warbreck Squadron Air Training Corps (ATC)** have been training for the Amateur Radio Foundation Licence. I know this sounds like an extremely long period – but the training has to fit around all the other activities undertaken by the Cadets.

"Their participation in the class takes dedication and quite a bit of work outside the time they would normally spend at squadron. Having said all that, the Cadets really enjoy their time doing the course, so much so that Cadet **Topping-Lees** has even started learning Morse just one week after completing his exam.

"While most Cadets are not likely to have access to radio set-ups at home they will be taking part in special events with other Squadrons as well as with local radio clubs such as the **Central Lancashire Amateur Radio Club** (CLARC). This will help raise much needed funds for the Squadron. The CLARC members also provided the much needed contacts during the practical part of the foundation course.

"The exam took place in October and due to the squadron presentation dinner being due in December – I decided to contact my friend and local Amateur Radio **Dave Starkie G4AKC** to ask him to come along and present not only the pass certificates, but also the squadron Radio Operator of the Year Trophy. Dave very kindly agreed to do so and the pictures of the presentations are below.

The names of the radio group in **Fig. 1**, from left to right are as follows; Back Row; Cadet **Matthew Lightfoot M6MGL**, Cadet **Sreekar Ganti M6XTF** Front Row; Cadet **Matthew Meecham**, Cadet **Jack Topping-Lees M6DMJ** receiving his certificate from **Dave Starkie G4AKC**

The photograoh, **Fig. 2**, shows Cadet Sreekar Ganti M6XTF receiving his Radio Operator of the Year award from G4AKC.

Finally, I would like to thank my wonderful exam team: The Exam Secretary (and my long suffering wife) **Jennifer Nuttall M6MIJ**, **Sue Crook** our Invigilator. Thanks also go to one of our Civilian Instructors at the Warbreck Squadron – **John Topping** – for opening up our headquarters to enable the course and exam to take place.

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Websites **www.2454-sqn.org www.clarc.webs.com** and **www.qrz.com/db/g4akc**

Fig. 1: left to right are as follows; Back Row; Cadet Matthew Lightfoot M6MGL, Cadet Sreekar Ganti M6XTF. Front Row; Cadet Matthew Meecham, Cadet Jack Topping-Lees M6DMJ receiving his certificate from Dave Starkie G4AKC

Fig. 2: Cadet Sreekar Ganti M6XTF receiving his Radio Operator of the Year award from G4AKC.

Project

John Cooke GM8OTI continues describing his development work for microwave operations and this time looks at the specialised local oscillators that are required.

Microwave Home Brew

Experiments with local oscillators for microwaves

For the improved version of my 1.3GHz transverter (to be published in *PW* soon) I built a compact local oscillator (l.o.) using a miniature 'block' crystal oscillator module and a series of frequency multipliers with filters.

The design of the l.o. for 1.3GHz was inspired by **Paul Wade W1GHZ** who has used block crystal oscillator modules for his single board transverters. The techniques has also been used by **Sam Jewell G4DDK** who used surface mount (SMD) inductors and a helical filter at the end of the multiplier chain.

The diagram, **Fig. 1**, shows the circuit of this oscillator for comparison with the phase locked loop designs described below. This design has an oscillator module running at 64MHz, which is tripled to 192MHz, then again to 576MHz, and finally doubled to 1152MHz to give the required 1296MHz when mixed with a 144MHz intermediate frequency (i.f.).

Worked Well

The oscillator has worked well over the past year or so, and I have become used to powering up the transverter box as soon as I arrive at my /P location, to allow the crystal oscillator module frequency to stabilise. Since I built the oscillator, compact temperature compensated crystal oscillator modules (t.x.c.o.) have become readily available at a reasonable price (a few pounds) and I would choose one of these for a future miniature local oscillator using frequency multiplier stages.

There are however, some disadvantages when using a multiplier chain for a local oscillator for microwave frequencies. I'll next look at them in order.

Even at 1.3GHz, several stages of frequency multiplication are needed. At 2.3GHz another multiplication stage would be added, increasing the complexity.

Having chosen the receiver i.f. (let's say 144 or 432MHz), the required l.o. frequency is calculated from the desired frequencies in the chosen band. It may not be easy to find a readily available crystal or oscillator module that multiplies up to give the required l.o. and custom-made crystals aren't cheap!

In future, the band plans can change (and possible changes in the microwave bands are already being discussed). These could require a replacement oscillator module or crystal and possibly redesign of the l.o. multiplier chain.

Fortunately, there's an alternative which in my view is simpler in that it doesn't need tuning and is more versatile because it's programmable. This alternative is to use a voltage controlled

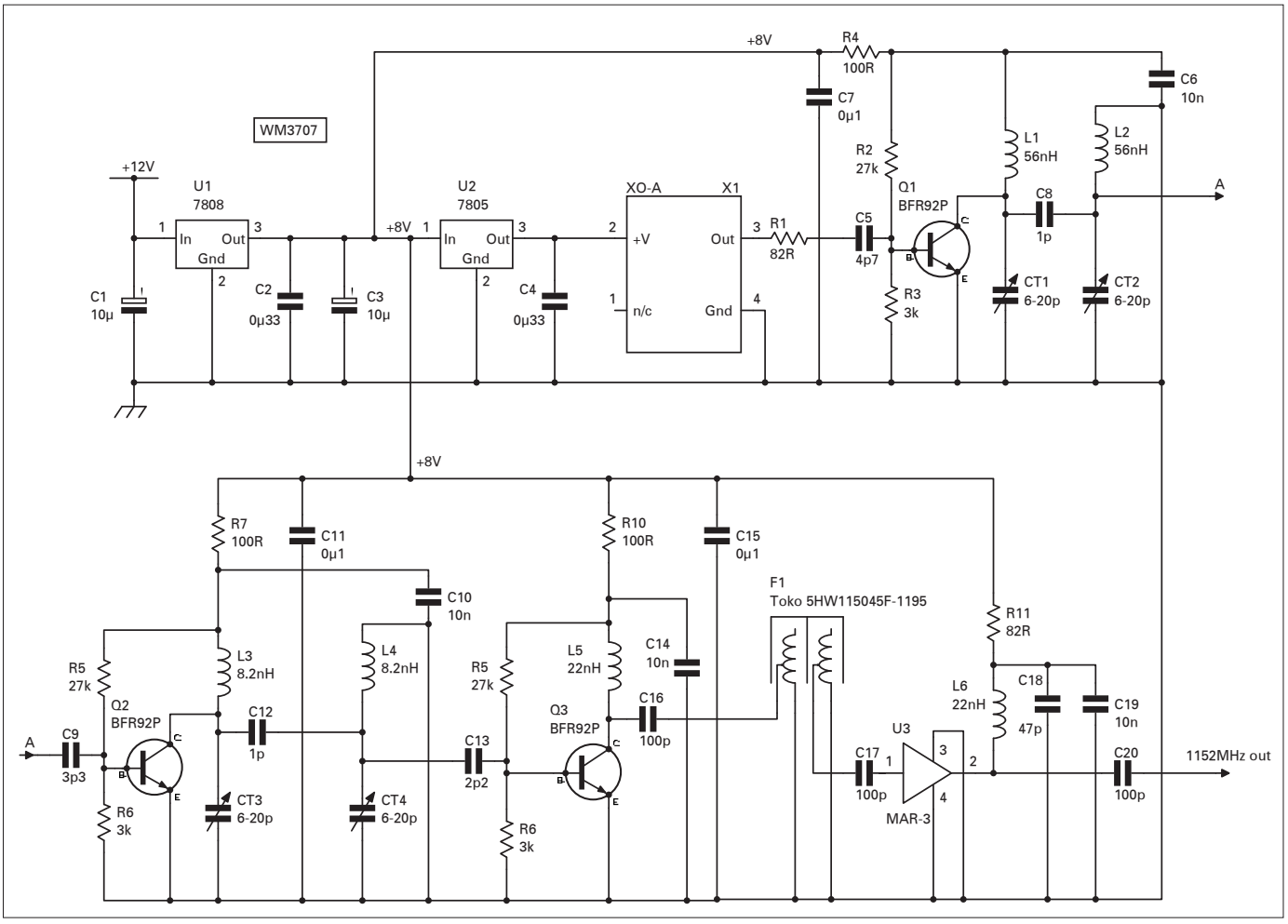

Fig. 1: Circuit of the compact 1152MHz local oscillator for 1.3GHz.

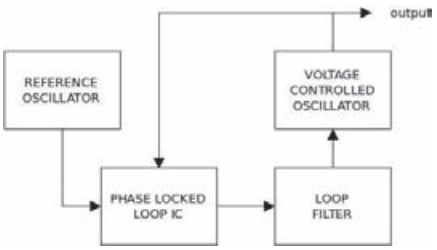

Fig. 2: Block diagram showing the key components of a phase locked loop oscillator.

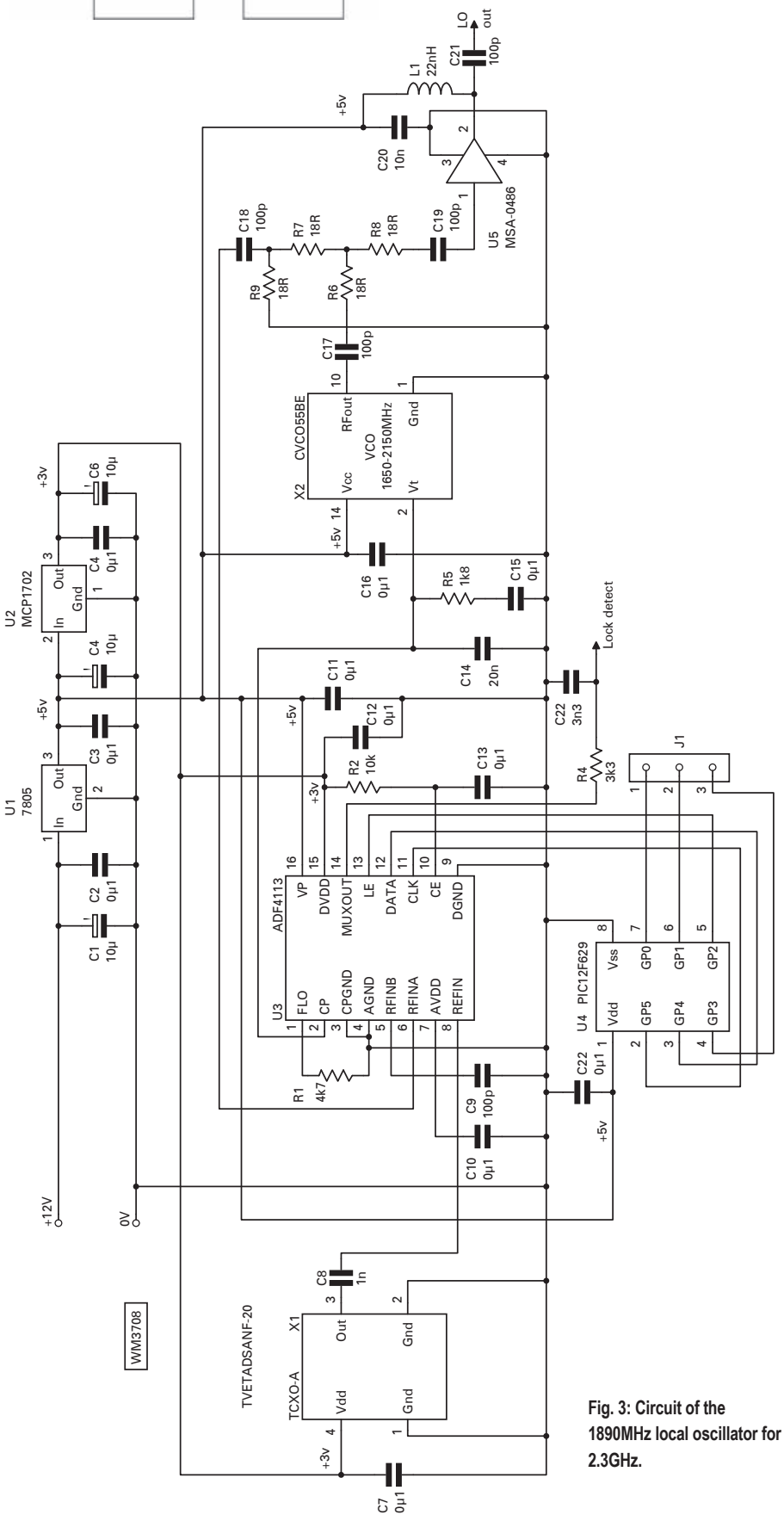

Fig. 3: Circuit of the 1890MHz local oscillator for 2.3GHz.

oscillator (v.c.o.) working at the final l.o. frequency, which is frequency locked to a reference oscillator using a phase locked loop system. For my 2.3GHz local oscillator, I decided to use this technique.

A Phase Locked Loop

A phase locked loop (p.l.l.) controlled oscillator has four key components (**Fig. 2**). The reference oscillator provides the basic stability and accuracy. The voltage controlled oscillator (v.c.o.) provides the output frequency, which is controlled by a tuning voltage.

The p.l.l. integrated circuit (i.c.) takes the reference frequency and the output frequency, and by comparing them produces a control voltage that tunes the v.c.o. The loop filter controls the rate at which the output frequency can be changed.

The i.c. based p.l.l. actually performs several functions – with a frequency and phase comparator at its heart. It has two dividers, which divide down the reference frequency and the output frequency. **Note:** At the intended design frequency, the outputs of the two dividers will have the same frequency.

The comparator acts so, that if the output frequency from one divider is higher (or lower) than the output frequency from the other divider, the output control voltage moves up (or down). However, this 'sense' can be reversed by a control bit in the i.c. This control voltage provides the feedback to adjust the v.c.o. frequency towards the design frequency and the loop filter acts so that the tuning voltage on the v.c.o. isn't changed too quickly or too slowly.

The p.l.l. i.c. has to be programmed so that parameters such as the control voltage sense are set correctly, and so that the frequency dividers are set to perform the correct division of the inputs. This programming can be done during operation of the i.c., to change the v.c.o. output frequency in real time, but for a local oscillator application it is done once on power up, after which the programming microcontroller (not shown in the block diagram) is set to 'sleep'.

Receive Converter

A design for a 2.3GHz receive converter is described by **Herbert Dingfelder DL5NEG** in the *International Microwave Handbook*

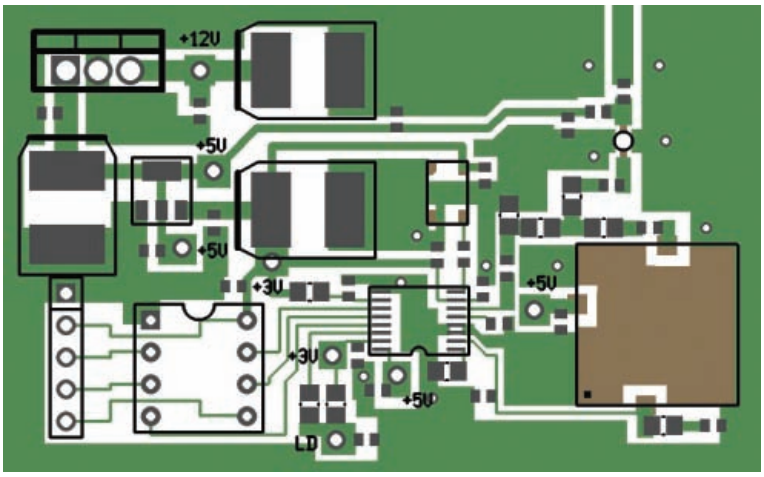

Fig. 4: The board layout for the 1890MHz local oscillator drawn using *PCB Designer*. The error in the pad placement for the v.c.o. module has been corrected in this drawing. Note that the 5V regulator and the microcontroller are on the ground plane side of the board.

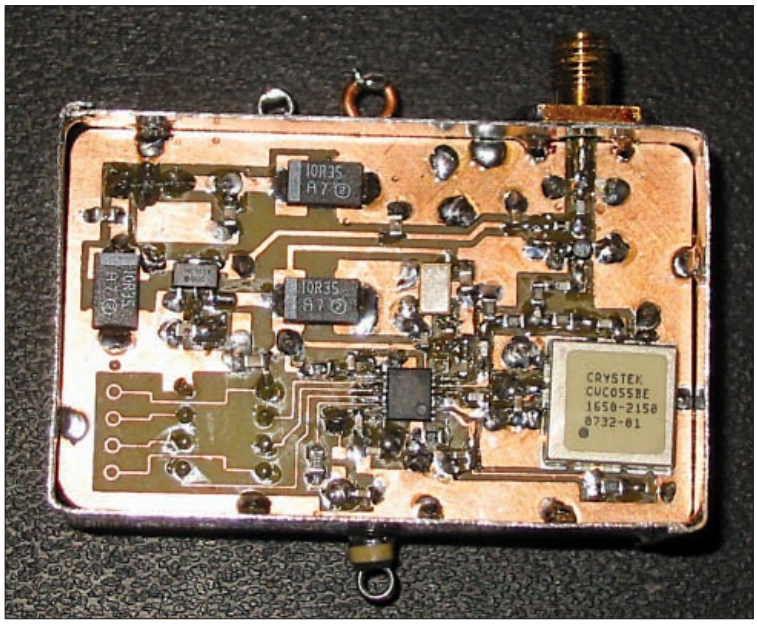

Fig. 5: Component side view of the completed 1890MHz local oscillator board.

(RSGB/ARRL, second edition). As a result of studying this I bought a *Crystek* v.c.o. module from *Farnell,* covering 1650MHz to 2150MHz, that would be suitable for use with a 432MHz i.f.

The illustration, **Fig. 3,** shows the circuit diagram for my 2.3GHz local oscillator. I chose a temperature compensated crystal oscillator module (t.c.c.o.m.) was chosen for the frequency reference. This has a frequency tolerance of 2ppm (meaning that it's actually likely to be much better than that) and a stability of 0.2ppm, with ageing of 1ppm per year.

At a frequency of 2320MHz, 1ppm is of course 2320Hz. The temperature compensation would remove the drift problem that I had experienced with the crystal oscillator module used as a basis for the 1.3GHz local oscillator.

An *Analog Devices* ADF4113 p.l.l. frequency synthesiser was chosen for the p.l.l. device, since it was easily available and not too expensive (about £5) when I bought the v.c.o. module. There are other suitable devices.

I used the ***ADIsimPLL*** software available by free download from the *Analog Devices* web site to design the loop filter (C14, C15 and R5).

Programming the p.l.l. i.c. to contain the correct values for the reference frequency divider, and the input frequency dividers, is done using a simple serial 3-wire interface. There are a few other parameters, fully described in the device data sheet, which also need to be set up correctly.

The programming is easily done using a microcontroller such as a PIC© (*Microchip Technology Inc*) and at present I use the PIC12F629 device for simple functions like this.

I programmed the p.l.l. to give a l.o. frequency of 1890MHz, giving an i.f. of 430MHz for the 2320MHz part of the 2.3GHz band. This i.f. suits my *Yaesu* FT-817 and simplifies reading the frequency on the FT-817 display, since 430MHz on the readout corresponds to 2320MHz at the antenna.

Lay-Out & Board

I used the open source ***PCB designer*** software to draw the layout (**Fig. 4**) for the l.o. This was designed for 0.8mm FR4 (glass filled epoxy) material, which is less lossy at these frequencies than 1.6mm FR4, although this factor is probably not critical for the application.

The lay-out for the etch mask was then printed in reverse onto transparent foil using a laser printer. This was then placed, toner side down to give the sharpest possible image, on a piece of pre-sensitised double sided p.c.b. for the required ultraviolet (UV) exposure. I then exposed the board, developed and etched using times and temperatures that I had already found to work well by experimenting. There's no substitute for experience when it comes to making and etching your own printed circuit boards (p.c.b.s) - I encourage you to have a go!

The most difficult part of construction was soldering the p.l.l. i.c., since the pins are very close together. However, in the second version built (see below) I found that with the circuit board pads pre-tinned and a little flux applied to the pins before applying the tinned iron tip, using no extra solder, the pins were soldered perfectly.

The illustration, **Fig. 5**, shows the completed board; I had to mount the v.c.o. module at a slight angle as I had not read the data sheet carefully enough when drawing the pads for this device on the layout!

As is normal for microwave construction, it's important to provide good grounding and de-coupling to ground. There are a number of through connections between the component side of the board and the ground plane, especially close to component ground pins. De-coupling capacitors are mounted close to components, for example near supply pins.

The microcontroller program used on power-up is simple; it loads four control registers in the p.l.l. i.c. with the correct data using the serial data and control pins, then goes to sleep. **Note:** The code is available from my web site and the web link is given at the end of this article.

Getting It To Work!

Unfortunately, the circuit didn't appear to work at all on first testing. The v.c.o. was oscillating, but the tuning voltage was stuck near zero. I tried various changes to the p.l.l. i.c. programming, to make use of the diagnostic functions available

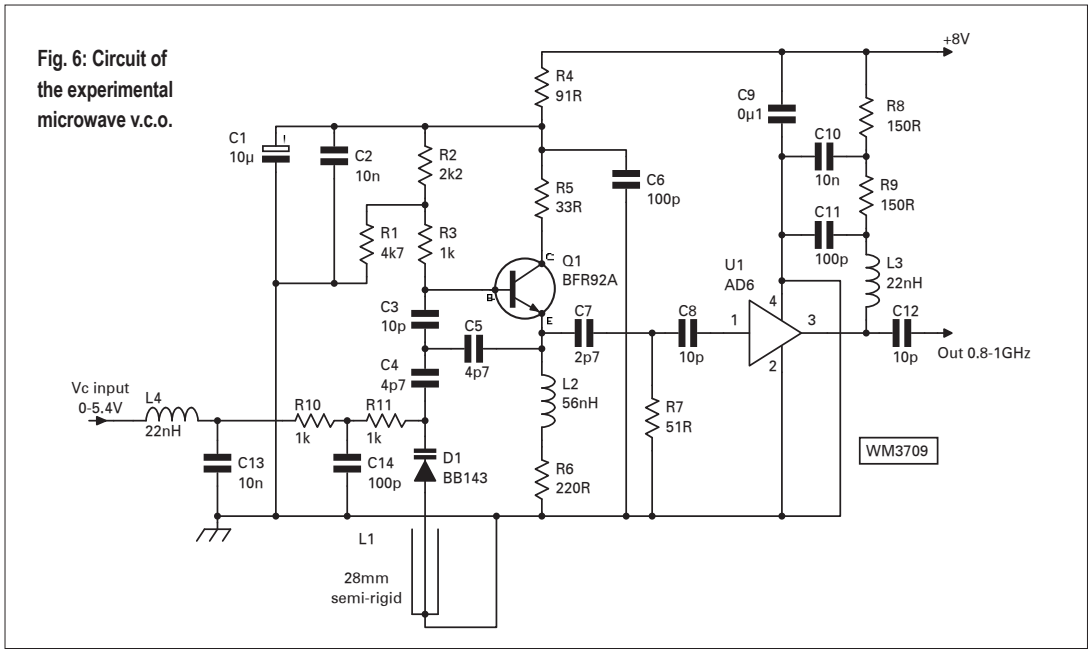

Fig. 6: Circuit of the experimental microwave v.c.o.

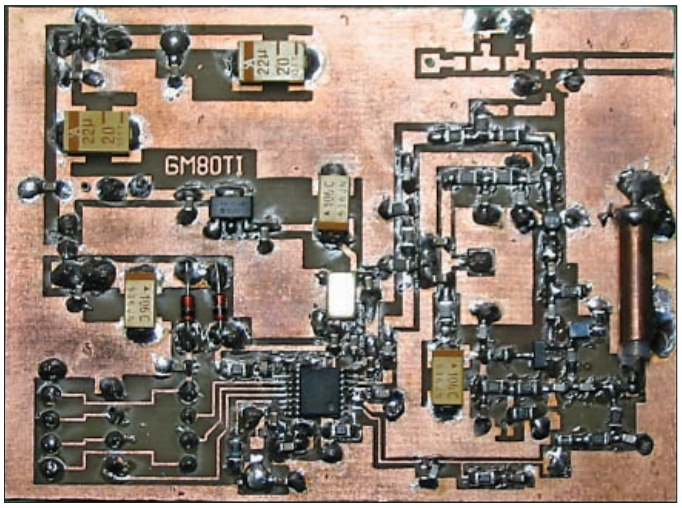

Fig. 7: The experimental v.c.o. incorporated into a p.l.l. controlled oscillator board. The 14mm semi-rigid coaxial inductor is on the right of the board. The output buffer amplifier has yet to be added.

on the ADF4113, but with no result.

Eventually, my careful inspection of the board around the p.l.l. i.c. using a magnifier revealed a possible problem – the serial data programming pins for the device didn't appear to have cleanly flowed soldered joints. Even though I had checked them with a continuity meter after soldering and the connections with the solder pads showed zero ohms.

However, after reflowing these joints and applying power the oscillator sprang into life, giving the design frequency on the output! I can only conclude that the pressure of the test probes during the test after first soldering had closed the circuit to the pins, which then became open circuit on removing the probes, so that the p.l.l. IC could not be programmed properly.

With the l.o. producing a stable oscillation at its design frequency – the frequency counter showed 1890.000MHz – the board was then assembled into a home-brew box made from tinplate (available from model building suppliers) ready for use in the 2.3GHz transverter. This design is easily adaptable for use as a local oscillator for 1.3 or 3.4GHz by the use of different v.c.o. modules from the same (*Crystek*) range.

Experiments With Oscillators

Having built a successful p.l.l. controlled oscillator, I decided to try some further experiments. The v.c.o. modules are not cheap (about £15) and I wondered if I could build a v.c.o. that would work satisfactorily using discrete components. I had come across such v.c.o. circuits in transceiver base units available as surplus from rallies, and decided to try "reverse engineering" one of these, using components from my stock.

The circuit of my test v.c.o. is in **Fig. 6**. A BFR92A was used for the gain device, with a piece of semi-rigid coaxial line for the inductive part of the tuned circuit. Frequency control is with a BB143 varicap diode; I deliberately chose to use a small control voltage range to keep the design simple. I built the v.c.o. on its own board to begin with, using a small trimmer potentiometer to set the tuning voltage on the varicap.

The circuit as built, oscillated first time, with a 28mm piece of semi-rigid coax giving a frequency range of 830MHz to 1010MHz using a 0 – 5V tuning voltage. This was encouraging, and I drew out the layout for a full p.l.l. controlled oscillator using this v.c.o. circuit. This version uses the ADF4118 which allows for easier in-circuit programming of the microcontroller.

With a 14mm semi-rigid coaxial inductor (as shown in **Fig. 7**) I obtained a v.c.o. frequency range of about 960 to 1100MHz, somewhat lower than I'd calculated but I had taken no account of stray capacitance – at these frequencies 1pF makes a big difference!

With the p.l.l. i.c. in place, the circuit worked first time, the frequency counter showing 1000.000MHz as programmed. This was encouraging, and also shows that the t.x.c.o. modules used are close to being accurately on frequency.

During the tests I was able to produce a stable output from 965 to 1100MHz by suitable programming of the p.l.l. i.c. The top frequency was pushed a little higher by removing some of the copper ground plane under the varicap and inductor connection to reduce stray capacitance but there are other experiments that can be done with this board.

Incidentally, I have already tried a transistor with a higher transition frequency – a BFP420 – together with a s.m.d. 1.8nH inductor in the tuned circuit, rather than a piece of semi-rigid coaxial cable, in a free-running v.c.o. Again the oscillator started first time, although I couldn't push the bias on the varicap very high, giving a maximum frequency of 1270MHz before oscillation stopped.

I will have to perform further tests to establish how high in frequency this particular circuit can be pushed. It will probably be necessary to try reducing stray inductance as well as stray capacitance as much as possible. Using the new local oscillator

I hope you've enjoyed reading about my microwave adventures. Hopefully you'll be encouraged to have a go yourself! ●

The Microcontroller program code can be found at: www.marwynandjohn.org.uk/GM8OTI/PICmicrocontroller/ADF4113power-up.html

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Looking at SDR Hardware and Software

In his *Data Modes* column this time, Mike Richards G4WNC continues his introduction to SDR, looking at some hardware and software systems currently available.

Welcome to *Data Modes* (*DM*) where this month I'm continue looking at SDR hardware and software. The main purpose of the SDR hardware is to present the desired radio signal to the computer as separate I (In-phase) and Q (Quadrature) signals.

In most cases these signals can be in digital or analogue form. Those with digital outputs normally have a built-in sound-card chip that does the conversion and makes the output available over a USB or Ethernet link. If the IQ signals are in analogue format they are normally presented to the audio inputs of the PC's sound-card.

Hardware For SDR

As you might expect, SDR hardware comes in a very wide variety of forms, from highly sophisticated surveillance receivers costing thousands of pounds, to very simple direct conversion (DC) kits costing just a few pounds! For this article I will concentrate on the simpler and cheaper options that allow you to experiment with SDR at minimal cost.

The SoftRock

The SoftRock series of kits have been around for a while now and caused quite a stir when first launched. These are all based around the Tayloe DC switching demodulator that I described in last month's *Data Modes*. This is an excellent system that can produce superb results. I've been in contact with **Tony Parks KB9YIG**, regarding availability of kits and he assures me that he will continue to produce them as long as there's a demand‡.

The main receiver in the range is the SoftRock RX Ensemble II Receiver Kit. This currently sells for around $56USD and provides coverage from 1.8 through to 30MHz.

The original SoftRock kits were all crystal controlled and you had to select a crystal for the band segment you wanted. However, the newer Ensemble II kit includes the excellent Si570 programmable oscillator to provide stable and continuous coverage.

Tuning control is handled over the USB port and most of the currently available software includes support for SoftRocks with Si570 oscillators. The IQ output from the Ensemble II is analogue and is connected directly to the PC's sound-card. The width of spectrum analysis available from the SoftRock receivers is essentially determined by the sample rate your sound-card.

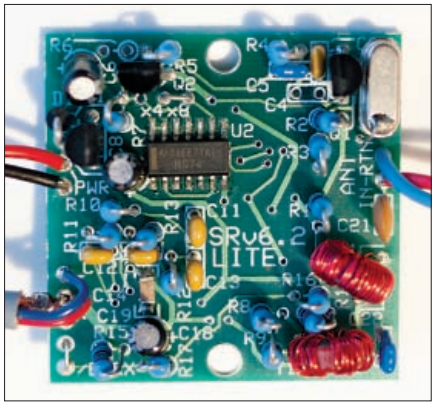
There are plenty of sound-cards around these days that can handle 96kHz sample rates (thus giving a proportionately wider IQ spectrum). But the most common sampling option is 48kHz.

In addition to the Ensemble II receiver, Tony also produces a transceiver kit that provides for a 1W SDR transceiver operating on one of four band groups. Tony is also still selling the basic crystal controlled SoftRock Lite II kits at $20. For more information, the following site has full circuit diagrams, layout and constructional notes: **www.wb5rvz.com/sdr/**

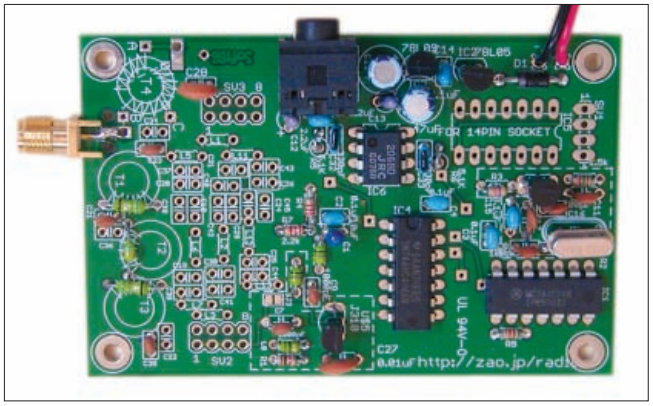
‡ Ordering information for the SoftRock kits can be found on Tony's main site at: **www.kb9yig.com/** or, when available, though **www.sdr-kits.com/**

The Soft66

A slightly more modern variant of the Tayloe demodulator can be found in the Soft66 kits produced by **Kazunori Miura JA7TDO**. The kits use the SN74CBT3306 FET quad bus switch for the demodulator and an Analog Devices AD9834 for the programmable local oscillator. The basic crystal controlled kits are the Soft66RF and Soft66Lite



SoftRock Lite single-band kit SDR project.



One of the series of SDR kit projects from Kazunori Miura JA7TDO, all are very affordable.

and are both single-band units costing $21 and $18 respectively.

Kazunori has also introduced wide coverage versions of the kits with the Soft66LC2 and Soft66ADD units that cost around $118 in assembled form. More information on the Soft66 range can be found here**: http://zao.jp/radio/soft66ad/**

Cross Country Wireless

A relatively new entry – **Chris Moulding**'s Cross Country Wireless (CCW) – have a few SDR options that provide a relatively low cost entry point. Their SDR Receiver version 3 provides a fully assembled single-band receiver that uses a modern Tayloe demodulator to produce the IQ signals. Current price of the version 3 receiver is £49.95 plus postage.

Alternatively the CCW's SDR-4 is a full coverage receiver that uses the Si570 programmable oscillator to produce continuous coverage from 0.85MHz through to 30MHz at £149.95. However, these units were in short supply at the time of writing so you might have to wait to get your hands on one but they are very good value for money. More information can be found here: **www.crosscountryradio.co.uk/**

The FUNcube Dongle

The FUNcube Dongle was developed to provide the Earth station segment of the CubeSat project but it has been extremely successful as a general purpose stand-alone v.h.f./u.h.f. SDR receiver. The receiver is entirely contained within a USB 'dongle' that's not much larger than a standard memory stick!

Continuous coverage is provided between 64 and 1700MHz thanks to the internal programmable oscillator. I recently reviewed the FUNcube Dongle for *PW's* sister magazine *Radio User* and the performance was excellent and certainly great value for money at just £125.

Note: Readers need to be aware that the FUNcube Dongle is supplied with very basic firmware that needs to updated before you can make use of some of the more advanced features. The main FUNcube Dongle site can be found here: **www.funcubedongle.com/**

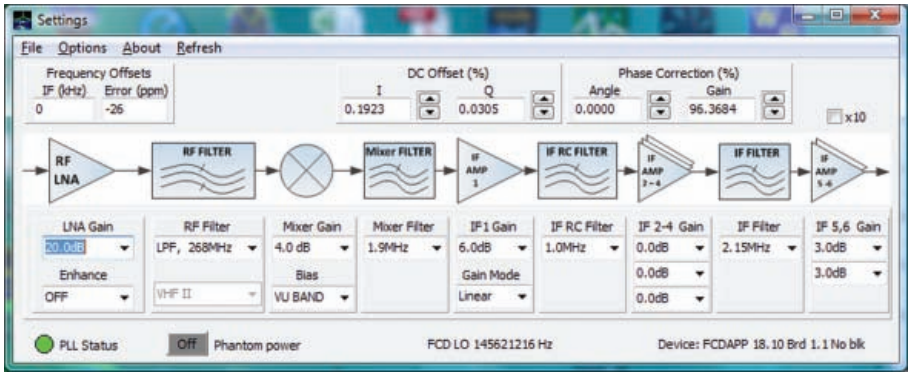
The RFSPACE SDR-ONE

The RFSPACE SDR-ONE is still in development, but looks very interesting, it's intended as an experimenter's board or as a transceiver module to use in commercial SDR transceivers. Features include digitisation of the 0-30MHz spectrum, bandwidth of up to 80% of the sample rate. Full duplex operation on same or different frequencies, compatibility with existing sound-card based SDR software and transmitter r.f. output of -10dBm.

Price is expected to be less than $300USD which equates to under £200 at current exchange rates and it is due to be available in 2012. Latest information on the SDR-ONE can be found here: **www.sdr-one.com/**

The SDR4 receiver from Cross Country Radio has a synthesised l.o. allowing coverage from 0.85–30MHz.

The Funcube dongle is probably the smallest SDR receiver covering 60-1700MHz and will not break the bank!

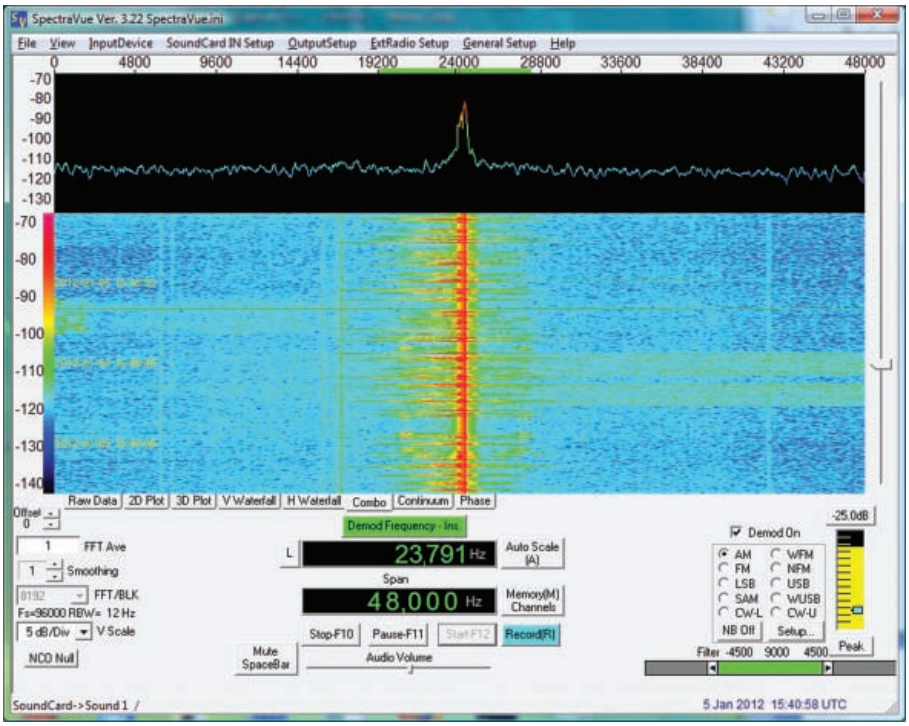


The FUNcube *ExtIO* control panel, allows very comprehensive setting of the r.f. sections of the dongle.

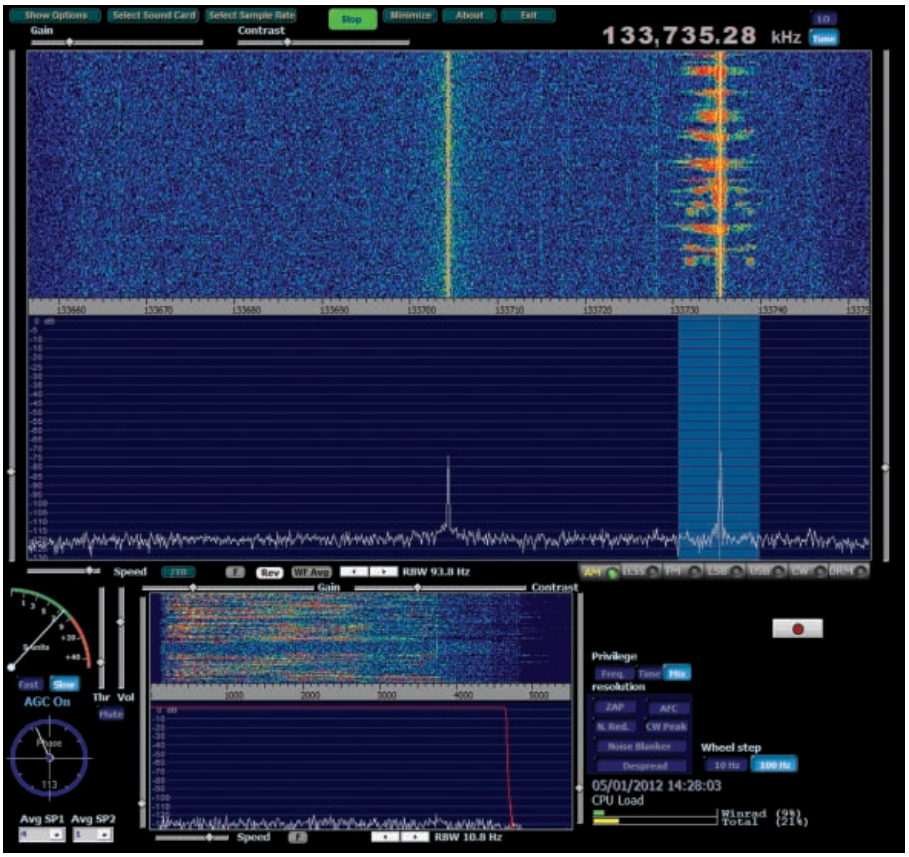
An IF Panadaptor

If your existing rig has a wide-band i.f. output, one excellent option is to use an SDR receiver to provide a panoramic (i.f. Panadaptor) view of your rig's currently tuned frequency. For this you just need a very simple SDR, i.e. fixed frequency SoftRock or Soft66 receiver that has a centre frequency the same as your rig's external i.f. feed.

Providing the i.f. bandwidth is wide



The *SpectraVue* program in use, analysing an a.m. signal.



Using *WinRad* viewing part of the v.h.f. Air Band showing a clear central spur line.

enough, you will be able to use the SDR receiver to show the spectrum either side of the tuned frequency and listen to adjacent frequencies. This can be invaluable when dealing with interference or when hunting out DX or competition stations.

Complete Solutions

If you're looking for a complete ready-made SDR solution there are a number of options available. The RFSPACE SDR-IQ is a very good standalone SDR receiver or i.f. Panadaptor with coverage from 500Hz to 30MHz and a spectrum span of up to 190kHz.

Like many of the more sophisticated SDR systems the SDR-IQ digitises the entire 0-30MHz spectrum with a 14-bit analogue to digital converter. There are also the well advertised offerings from Flex Radio, Perseus and an extensive range from WiNRADiO.

Software For SDR

Next, I'm looking at SDR software, which has the role of taking the IQ signals from the receiver hardware and providing extensive filtering, demodulation and tuning controls. For the transmit chain the software will process audio signals and generate IQ outputs – or in the case of data signals will generate IQ signals to emulate a wide range of data modes.

One of the great things about SDR software for Amateur use is that it's all free! – thanks to the generosity of a number of very talented software engineers. However, where authors include a donate option on their site, please donate as it will encourage the author to keep the software alive and to develop even more features.

Unusual Aspects Of SDR

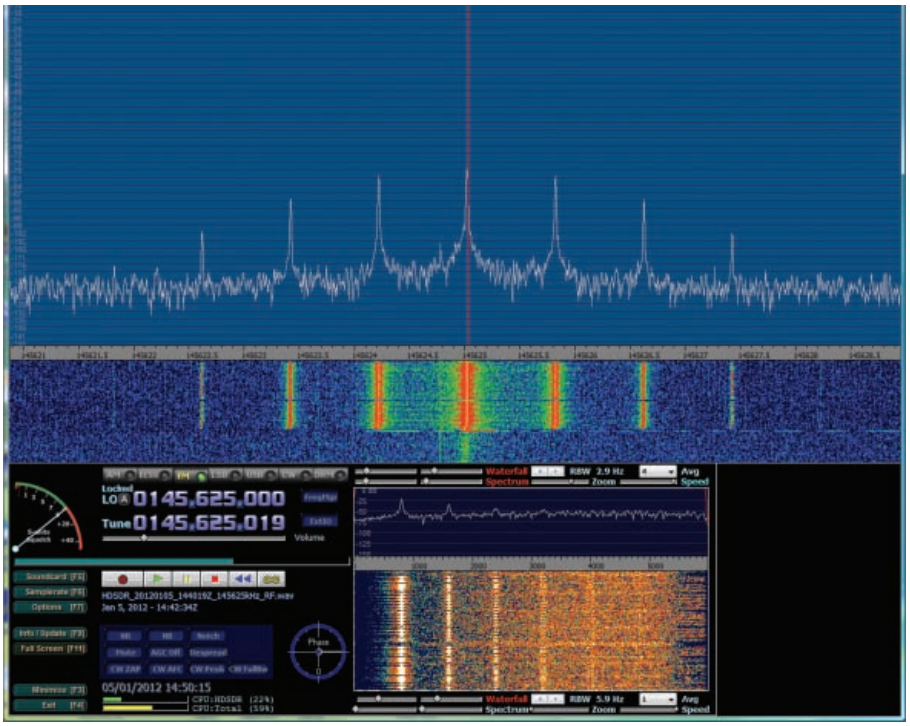
While using SDR based radios is very straightforward – there are a few unusual aspects that you need to be aware of. The first is the need to press a 'Start' button to begin reception! The majority of SDR software systems open-up with the receiver processing halted. To start processing you will find there's a **Start** or **Play** arrow somewhere on the receiver's control panel. I must admit not realising about the Start function, it had me scratching my head the first time I encountered an SDR receiver a few years ago!

If you are using one of the direct conversion SDR systems such as SoftRock, Soft66 or FUNcube Dongle you'll find that you need to make some adjustments to minimise the spur at the centre of the tuning range and improve the image rejection. The central spur is caused by d.c. offsets between the left and right IQ channels of the sound-card.

The FUNcube Dongle includes an adjustment for this that can be accessed via the *ExtIO* control or its *HID* application. The SDR-Radio also includes an automated software adjustment to minimise the central spur.

Slight imbalances between the amplitude and phase of the two IQ channels cause an image of the wanted signal to appear in the spectrum display. However, most of the software described here includes phase and amplitude adjustments for each channel so the image can be minimised.

First find a strong, steady carrier and tune so that it is about 10kHz above the centre frequency of the spectrum display and you will see an image



Screengrab of *HDSDR* analysing the c.w. ident from the GB3SD 144MHz repeater.

appear at 10kHz below the centre. Adjustment is often simply a case of carefully moving each of the controls whilst looking for a reduction in the image.

You'll find the null point is quite sharp and the controls will interact, so you will need to move between the different adjustments to get the best results. In most cases you should be able to put the image well down in the noise.

The *Spectravue*

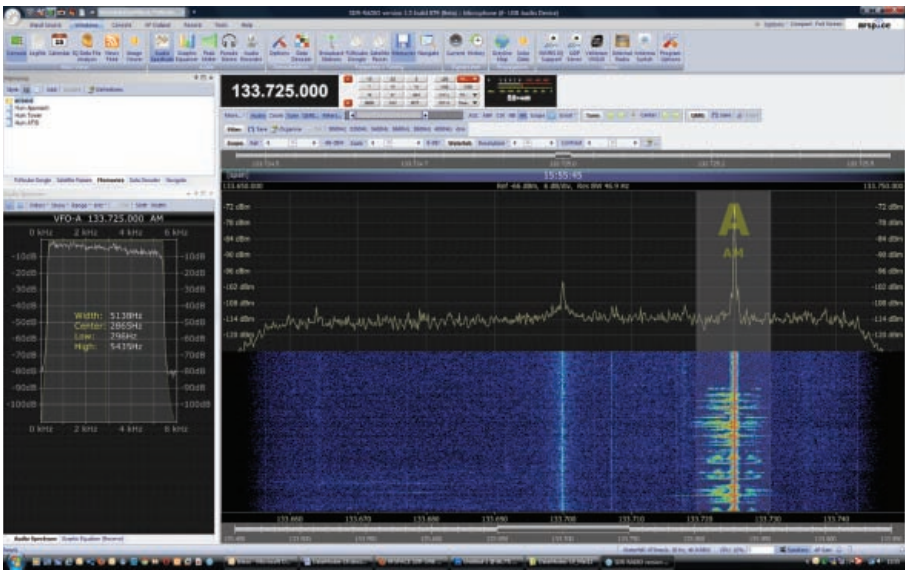
The *Spectravue* software is the most basic of the SDR receiver systems, but remains extremely useful as a simple system to use when testing new SDR hardware. The program is essentially an IQ spectrum analyser and demodulator that can show spectrum and waterfall displays and demodulates a.m., f.m., c.w. and s.s.b. signals. *SpectraVue* can be found here: **www.moetronix.com/spectravue.htm**

The *Rocky*

As the *Rocky* name suggests, this software was developed specifically to support the SoftRock kits and it does a very good job of this. The software handles basic transmit and receive with spectrum and waterfall analysis of the incoming spectrum with particularly crisp and clean displays.

Supported modes include u.s.b., l.s.b., c.w. and PSK. Each of the displays can be zoomed and the demodulator bandwidth can be adjusted by dragging a slider with the mouse.

The later versions include support for SoftRock compatible hardware that's fitted with the Si570 programmable oscillator. You can find *Rocky* at: **www.dxatlas.com/Rocky/**



The SDR-RADIO operating on the v.h.f. Air Band with visible, but much reduced central spur.

The *WinRad* Program

The *WinRad* program is a rather more sophisticated SDR program that includes spectrum and waterfall displays for both the r.f. signals and the demodulated audio. The program supports full control of SoftRock compatibles with the Si570 programmable oscillator using *ExtIO.dll* method. This method of control is a small software package that provides an interface between SDR software and the hardware receiver.

In the case of the SoftRock, the additional *ExtIO.dll* provides control of the tuning so that you can use all the features of the hardware from within the host software application. The method also allows control of other systems and Mike Willis **G0MJW** has produced an *ExtIO.dll* for use with the FUNcube Dongle.

To install the module you simply copy the appropriate *ExtIO.dll* to the program directory of *WinRad* and then choose the appropriate controller via the 'Input' selection option. To download *WinRad* go to: **www.winrad.org/**

The *HDSDR* Program

A more sophisticated development of the *WinRad* program is *HDSDR,* where the screen layout has been tidied-up and transmit facilities have been included for s.s.b., a.m., f.m. and c.w. This program is one of my personal favourites and I particularly like the central tuning ribbon that allows you to rapidly scroll around the bands by dragging the 'tuning ribbon'.

As with *WinRad*, *HDSDR* supports the *ExtIO* hardware control system so it will operate with Rocky compatible hardware or the FUNcube Dongle. The *HDSDR* site can be found at: **www.hdsdr.de/**

The *SDR-Radio* Program

A particularly comprehensive program can be found with *SDR-Radio*. It includes a huge range of features – rather too many to cover effectively here! If you are new to SDR I would recommend that you start with the simpler programs to make sure your hardware is working correctly and get used to using a SDR based radio.

Once the familiarisation is complete you can move up to *SDR-Radio* and make use of the huge range of features available. Here is the *SDR-Radio* site: **http://sdr-radio.com/** Have fun!

Rallies

Radio rallies are held throughout the UK. They're hard work to organise so visit one soon and support your clubs and organisations. PW Publishing Ltd. is attending at rallies marked *. Please check with the organisers that the rally is 'on' before leaving home.

Send your rally info to:

PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW
E-mail: newsdesk@pwpublishing.ltd.uk

FEBRUARY

February 10th/12th

The Orlando Hamcation

The Orlando Hamcation and Computer Show will 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: trev@wig1.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 £2.00. There will be free car parking, trade stands, a Bring & Buy, special interest groups and catering will be available.
Roger GW4HSH
Tel: 01792 404422
www.radioclubs.net/swanseaars

MARCH

March 4th

The Cambridge Radio Rally

The Cambridge and District Amateur Radio Club Rally will be held at the Wood Green Animal Shelter, 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@radiovlooienmarkt.nl
www.radiovlooienmarkt.nl

March 11th

The Bournemouth Annual Sale

The Bournemouth Radio Society will be holding its 24th Annual Sale at the Kinson Community Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth BH10 7LH. The doors will open at 9.30am and admission will cost £1.50. There will be car parking, trade stands, special interest groups, catering and facilities for the disabled.
John G0HAT
Tel: 07719 700771

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

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 licenced bar and facilities for the disabled.
Iain
Tel: 02866 326693
E-mail: iain@learc.eu
www.loughernerradioclub.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 15th

The Cambridge Rally

The Cambridgeshire Repeater Group Rally will be held at the Foxton Village Hall, Hardman Road, Foxton, Cambridge CB22 6RN. The doors open at 10.00am (7.00am for traders) and admission will cost £2.00. There will be talk-in on S22, trade stands, a Bring & Buy, catering and facilities for the disabled.
Lawrence M0LCM
Tel: 01223 711840
E-mail: rally2012@cambridgerepeaters.net
www.cambridgerepeaters.net

April 22nd

The 8th International DX Convention

The 8th International DX Convention will be held at Paestum, Salerno in Italy. Further information can be found on the convention website.
www.dxitalia.it

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

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DB-770M 2m/70cm (3.5/5.5dB) 1m (PL-259)..... £24.99
Diamond CR-8900 10/6/2m/70cm (1.26m)..... £99.99
Diamond AZ-506 2m/70cm – only 0.67m long..... £39.99
PL-62M 6m/2m (1.4m) PL-259..... £23.99
PL-627 6m/2m/70cm (1.7m) PL-259..... £44.99

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Over the ear earpiece.

£9.95

P&P £4.00

RH-770H (BNC)

2m/70cm Tx + wide Rx. High gain up to 5.5dB.

£59.99

P&P £5.00

TWIN FEEDER/ LADDER LINE

300Ω Twin Feeder
£1/mtr £70/roll
450Ω Ladder
£1/mtr £70/roll (100m)

ALUMINIUM POLES (2")

20ft (collection only) £49.99
10ft (collection only) ..29.99
2.4m..... £29.99
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A superb quality ferrite ring with incredible properties. Ideal for "R.F.I". Width 12mm/ OD35mm. 6 for £16.99 P&P £4.00
12 for £26.99 P&P £5.00
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COPPER ANTENNA WIRE ETC

Hard drawn (50m roll)..... £40.00 P&P £7.50
New: 50m roll, stranded antenna wire..... £16.99 P&P £7.50
Flexweave (H/duty 50 mtrs)..... £44.99 P&P £7.50
Flexweave H/duty (18 mtrs)..... £21.99 P&P £7.50
Flexweave (PVC coated 18 mtrs)..... £24.99 P&P £7.50
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Special 200mtr roll PVC coated flexweave..... £180.00 P&P £10.00
Copper plated earth rod (4ft) + wire clamp..... £16.99 P&P £8.00
Copper plated earth rod (4ft) as above + wire ..... £27.99 P&P £8.00
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METALWORK & BITS (Del Phone)

2" mast-floor base plate..... £16.99
6" stand off brackets (no U-bolts)..... £8.99
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12" T & K brackets (pair) £19.99
18" T & K brackets (pair) £24.99
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2" extra long U-bolt/clamp £7.49
2" crossover plate with U-bolts £18.99
15" long (2") sleeve joiner (1.5" also available)..... £18.99
3-way guy ring £8.99
4-way guy ring £10.99
Heavy duty guy kit (wire clamp, etc.) £49.99
Set of 3 heavy duty fixing spikes (~0.7m long)..... £29.99
30m pack (4.4m) 480kg B/F nylon guy £15.00
Roll of self-amalgamating tape 25mm x 10mtr..... £8.99

All our brackets are of high quality, British made and galvanised.

HEAVY DUTY 24ft SWAGED MAST SET

New extra heavy duty 2" mast set. 4 sections x 6 foot that slot together.

£79.99 PER SET

TWO SETS FOR £140.00 SALE: THREE SETS FOR £159.99

NEW SWAGED MAST SETS

24 foot mast. 1½" – 4 sections (6ft long).

£49.99 OR 2 SETS £84.99

SALE:- 3 SETS £99.99

24 foot mast. 1¼" – 4 sections (6ft long).

£46.99 OR 2 SETS £78.99

SALE:- 3 SETS £95.00

H/DUTY CAR BOOT MAST SET

18 foot (1½" dia).
18 foot – 6 x 3 foot (1½") slot together ally sections.

£49.99 per set.

SALE:- 3 SETS £99.99

TWO FOR £79.99 DEL £13.00

NEW CAR BOOT MAST SET

Superb 18 foot (6 x 3 foot sections) that slot together.
Dia: 1¼" ideal to take anywhere.

£39.99

2 for £74.99 3 sets £89.99

LIMITED STOCK

10m PNEUMATIC MAST

We have a small quantity of "military spec" pump-up masts (part of a Government order). All brand new in a crate and supplied with cover (close HT ≈ 6 foot). Anodised green finish.

40m guy kit pack £49.99
Ground fixing spikes (3-off) £35.00
2 foot all ground fixing kit..... £99.99
(Can be hand operated or by compressor/foot pump)

Del £40 10m MAST, ONLY **£1199.99**

NEW NOISE FILTER!

A superb TDK 'snap fix' ferrite clamp for use in Radio/TV/ Mains/PC/Phone etc.

Simply close shut over cables and notice the difference! Will fit cables up to 13mm diameter. Ideal on power supply leads/mic leads/audio leads/phone leads.

2 for £16.99 / 5 for £36.99 (P&P £4.00)

MAST HEAD PULLEY

A simple to fit but very handy mast pulley with rope guides to avoid tangling.

(Fits up to 2" mast) **£14.99** + P&P £4.50

30m pack (4.4mm) nylon guy rope £15.00
132m roll 4.4m nylon guy (480Kg b/f) ..... £45.00 Del £7.50

NEW EASY FIT WALL PULLEY

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

£14.99 + P&P £4.50

Wall bracket, screws not supplied. Simply screw to outside wall and hang pulley on WALL BRACKET £2.99 P&P £1.00

30m pack (4.4mm) nylon guy (480kg)..... £15.00
132m (4.4mm) nylon guy (480Kg) £45.00

HANGING PULLEY

Heavy duty die-cast hanging pulley. Hook and go!

£26.99

BARGAIN WINCH

500kg brake winch. BARGAIN PRICE

£94.99 Del £10.00

(Now includes cable grip)

Winch wall bracket..... £22.99

BUTTERNUT VERTICALS

HF-2V (80/40m).....£279.99
HF-6V (80/40/30/20/15 /10m).....£375.00
HF-9V (as HF-6V + 17/12 & 6m).....£425.00

TONNA YAGIS

220809 9ele 2m..... £79.99
220811 11ele 2m..... £109.99
220817 17 ele 2m..... £139.95
220818 9ele 2m XD..... £129.95
220921 21ele 70cm..... £109.00
2208938 9ele 70cm XD..... £135.99

LOW LOSS PATCH LEADS

£4.50 P&P

Connectors	Length	Price
PL-259 - PL-259	0.6m	£11.99
PL-259 - PL-259	1m	£14.99
PL-259 - PL-259	4m	£19.99
PL-259 - PL-259	20m	£49.99
BNC - BNC	1m	£12.99

MT-3302

Heavy duty universal mount.

Includes 5m cable **£34.99**

MT-6601

Adjustable roof rack/window bar mount

£19.99

COAX BARGAINS

True military spec real UK coax

RG-58 Military spec x 100m.

£49.99 or 2 for £90.00

Coax stripping tool (for RG-58).....£8.99

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£149.99/100m or 2 for £260.00

WESTFLEX 103 (100m) £159.99

NEW DIAMOND WD-330

Amazing performance. Twin folded dipole. 2-30MHz – and it really works. No ATU required (25mts long). Supplied with 30 mtr PL-259 feeder – ready to go. If you want great transmission, look no where else. Japanees quality made product

WOW **£249.99**

NEW DIAMOND BB6W

2-30MHz (250W) 6.4m long. End-fed wire antenna. Icludes matching balun. Sling up & away you go.

BEST BUY **£199.99**

W-8010 DIAMOND SHORTENED DIPOLE

80-10m & only 19.2m long! (Up to 1.2kW) Includes 1:1 Balun. Bargain. Superb Japanese quality antenna system.

£169.99

Q-TEK PENETRATOR

"We've sold 100s all over Europe"

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

£219.99

SEND SAE FOR LEAFLET

NEW Wire Penetrator 50ft long (1.8-70MHz)..... £189.99

CAROLINA WINDOM

CW-160S	(160-10m) 40m long	£175.99 P&P £10.00
CW-160	(160-10m) 80m long	£175.99 P&P £10.00
CW-80	(80-10m) 40m long	£150.99 P&P £10.00
CW-80S	(80-10m) 20m long	£150.99 P&P £10.00
CW-40	(40-10m) 20m long	£139.95 P&P £10.00
G5-RV	(80-10m) + balun	£74.99

TRAPS BACK IN STOCK

BALUNS & TRAPS (1kW)

Baluns 1:1 or 4:1 or 6:1 ..... £39.99 each P&P £4
Traps 80m or 40m or 20m or 15m..... £39.99 pair P&P £5

Q-TEK INDUCTORS

80mtr inductors + wire to convert ½ size G5RV into full size. (Adds 8ft either end)..... £34.99 P&P £4.00 (a pair)

NISSEI PWR/SWR METERS

RS-502 1.8-525MHz (200W) ..... £79.95 P&P £6.50
RS-102 1.8-150MHz (200W) ..... £59.95 P&P £6.50
RS-402 125-525MHz (200W) ..... £59.95 P&P £6.50
TM-3000 1.8-60MHz (3kW) Incls mod meter ..... £69.95 P&P £6.50
RS-40 144/430MHz Pocket PWR/SWR..... £34.99 P&P £5
DL-30 diamond dummy load (100W max)..... £29.99 P&P £5

D-308B DELUXE DESK MIC

(with up/down). Many amateurs (over 4000) have been pleased with it's performance. Includes 8-pin round Yaesu mic lead. Icom/Kenwood & other leads available. Phone (£22.99 each). Replacement foam windshield £3.00 + P&P.

8-pin modular plug converting to 8-pin round Yaesu adapter £19.99

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GENUINE COAX SWITCHES (P&P £6.00)

2 way CX-201 (0-1GHz) SO239..... £24.99
2 way CX-201 'N' (0-1GHz) 'N' £29.99
4 way CX-401 (0-500MHz) SO239..... £79.95
4 way CX-401 'N' (0-500MHz) 'N' £89.95

WATSON COAX SWITCHES

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CX-SW4PL DC-800MHz (5 x SO-239)..£56.95
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YAESU REPLACEMENT MICS

MH-IC8 8 pin Yaesu mic (8-pin round) ..... £44.99 P&P £5
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MH-31A8J 8 pin modular ..... £39.99 P&P £5
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DC-1 Standard 6-pin/20A fits most HF ..... £22.00 P&P £3
DC-2 Standard 2-pin/15A fits most VHF/UHF .... £10.00 P&P £3
DC-3 Fits Yaesu FT-7800/8800/8900, etc ..... £17.50 P&P £3

Q-TEK TRI-MAGMOUNT

Very heavy duty. Available:- SO-259 or 3/8 – specify.

£44.99

Fig. 1: A USB soundcard – £3 delivered from Hong Kong (eBay).

Fig. 2: A 4-way USB hub – £1 from eBay.

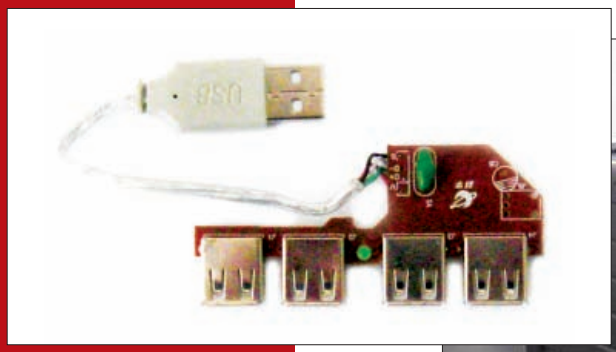


Fig. 3: A USB p.c.b. (2mm is removed from the right hand side of the p.c.b.

Fig. 4: A USB-to-serial adapter. But beware of some cheap versions available from eBay – they have a high failure rate.

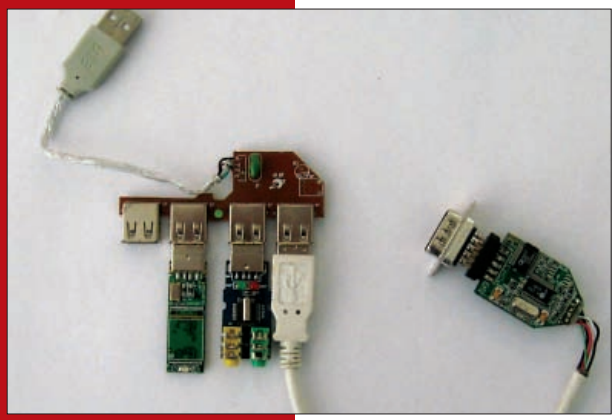


Fig. 5: A USB hub showing USB hub and daughter interfaces fitted.

Feature

A Budget USB Data Interface

Len Paget GM0ONX is well known for his antenna articles in *PW* but this month he's demonstrating that well known trait displayed by Radio Amateurs the world over – how to spot a bargain!

Boxed up smartly for a professional look!

Nowadays Radio Teletype (RTTY), Slow Scan TV (SSTV) and data modes such as PSK31 are really popular. Thanks to advances in computing power and the availability of suitable computer programs, all that's needed to receive these modes is a computer with a soundcard and simple cable between the computer's soundcard and the transceiver.

Transmitting is only marginally more complicated – requiring a single transistor push-to-talk (p.t.t.) circuit connected to the computer's serial coms port or by using the transceiver's voice operated changeover (VOX circuit).

The trouble with the simplistic approach is that audio earth loops can occur between the computer's soundcard and the transceiver causing distortion on audio (a.f.) and radio frequency (r.f.) interference (r.f.i.) can be a major problem on transmit. To add the problem many newer computers don't have serial ports any more making interfacing more complicated.

Commercial interfaces are available that include audio isolation, an onboard soundcard and the transceiver keying circuit all in one box that address these

problems. Unfortunately, they aren't a cheap solution.

While trawling the Internet I came across a USB soundcard for less than £2 on eBay, **Fig. 1**, and a thought was hatched! What about using one of these along with a USB-to-serial adapter, audio isolating transformer, p.t.t. circuit and then build the lot into one box myself?

The USB Hub

The heart of the USB Radio Interface described here is 4-way USB hub, again purchased from eBay **Fig. 2**, (but probably available elsewhere too). I found that that once the USB hub printed circuit board (p.c.b.) was removed from its case and I had trimmed 1mm from the side of the board, **Fig. 3**, it would fit into the side rails of a Hammond 1455K1202 enclosure. A small piece of *pvc* tape covers the edges the p.c.b. to prevent the tracks shorting to the enclosure sides and to gives it a firmer fit.

I removed the existing USB Type A plug on the USB hub and replaced it with a USB type B socket. This was mounted to the rear of the enclosure to allow a standard USB cable to be used. If preferred, you can leave the original plug as it is and dangle out the back of the interface and use a USB extension cable to connect it to the computer.

With the USB hub now fitted in the enclosure, the USB soundcard is plugged into any one of the four available ports. As space is tight between the port outlets the soundcard is also removed from its case and it is secured in place using hot-melt glue.

The next part to be connected to the hub is the USB-to-serial adapter, **Fig. 4**. This provides the switching for the p.t.t./c.w. circuits and a serial port for use with the transceiver's CAT port.

Most programs and transceivers allow the CAT interface to be used without using the RTS/DTS lines allowing them to be used for the p.t.t./c.w. functions. *Ham Radio Deluxe* is one exception and if you use this – you'll need separate serial ports for p.t.t./c.w. and the CAT interfaces.

The PC system *Windows XP* allows multiple USB-to-serial adapters to be used and a second USB-to-serial adapter to be fitted in the enclosure if required. Just plug it into the spare USB hub port.

Pins 4 (DTR), 5 (RTS) and 7 (Earth) on the USB-to-serial adapter are used to control the p.t.t. and the c.w. keying circuit. The easiest way to access these is to remove the interface from the plastic moulding. (I also shortened the cable to make installation neater).

The photo, **Fig. 5.** shows the trimmed USB hub with the soundcard, USB-to-serial converter and a USB memory stick and is used to store the drivers for the USB-to-serial adapter and the data mode software plugged in. As space is tight the covers to the soundcard and memory stick are removed. The photo, **Fig. 6**, shows the USB hub and boards located in the lower section of the enclosure

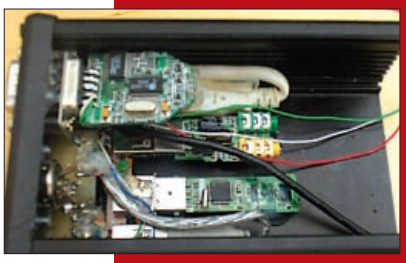


Fig. 6: The USB hub fitted to the enclosure.

The PTT Circuit

Some designs use opto-isolators to totally isolate p.t.t./c.w. circuit from the transceiver. I don't because most mains powered desktop computers and transceivers already share a common earth via as the mains and I've not found it causing any problems.

The p.t.t./c.w. interface and audio isolation transformers are housed on a separate p.c.b. above the USB hub and are shown in **Fig. 7** and the circuit, **Fig. 8**, uses a BC548 transistor which 'grounds' the p.t.t./c.w. connection when operated.

Fig. 7: The p.t.t./c.w. circuit and isolation transformer.

If your transceiver uses a method **other** than grounding to earth to operate the p.t.t. and c.w. functions this interface will not work. The illustrations, **Fig. 9** and **10** show the RTS/DTS solder points on the USB-to-serial converter.

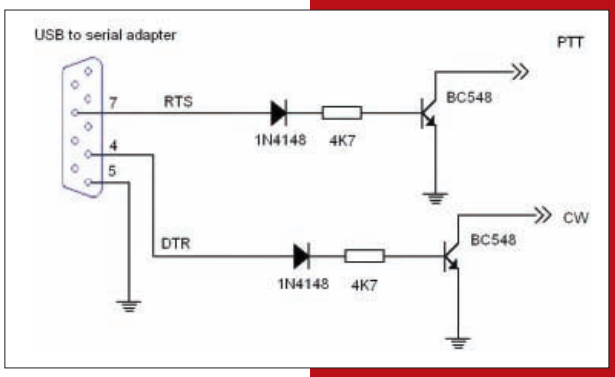


Fig. 8: The p.t.t./c.w. circuit.

If your transceiver uses a negative keying voltage, a *pnp* transistor such as the BC558 should be substituted for the present one. Older valve type transceivers often used higher keying voltages – so bear this in mind and choose a suitable switching transistor as a BC548 has a maximum operating voltage of only about 30V.

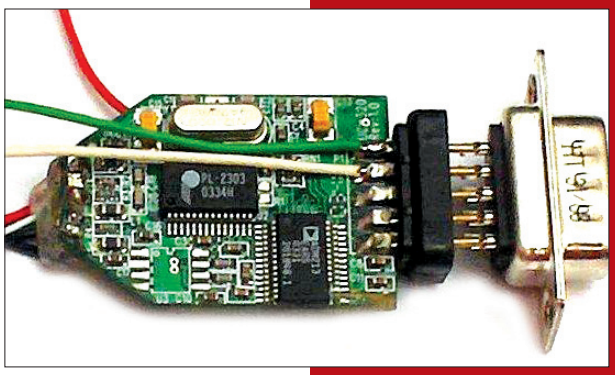


Fig. 9: The USB adapter connections (top view).

Audio Isolation

Although I don't isolate any of the p.t.t./c.w. keying circuits, isolation of the audio circuit is a different matter. Most USB soundcards are designed to be used with headphones and audio hum, earth loops and r.f.i. can be a problem if the USB soundcard is not isolated from earth.

The simplest way to achieve d.c. islation is to use an audio transformer. Most commercial interfaces use a 600Ω isolating transformer but these are expensive

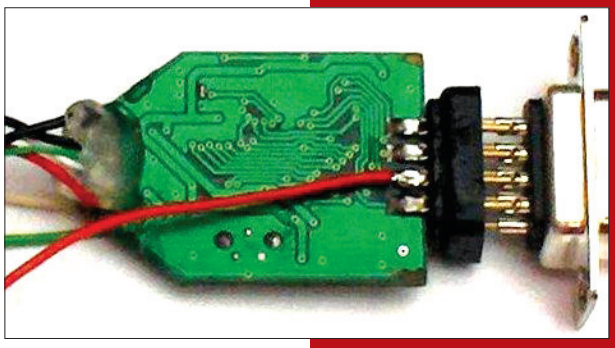


Fig. 10: The USB adapter connections (bottom view).

and difficult to source in small quantities. Instead I used an Eagle LT700 transformer – which is available from Maplin and eBay for around £2 each.

The transformers have a 1.2kΩ input impedance and 3Ω output and give a reasonable match between the transceiver and the soundcard. The soundcard is connected to the transformer using a 3.5mm stereo plug using the tip and outer ring connections. **Note:** Don't use a mono plug as this will short one channel of the soundcard out.

Dependent on the transceiver and user port used the audio levels between the USB radio interface and the transceiver to may be too high. Resistors R3/R4 and R5/R6 as shown in **Fig. 11**, act as an attenuator to reduce the audio levels to with limits that can be easily adjusted by the 'sliders' in the soundcard software.

As the USB soundcard's audio output is designed to be used with headphones or amplified speakers it is already at low level and may not require further attenuation. If this is the case R4 may be omitted and R3 replaced with a wire link. The audio level from the USB radio interface should be set so that the ALC meter of your transceiver below its maximum recommended level.

The PCB Lay-out

The layout of the p.c.b. are shown in **Fig. 12** and component layout **Fig. 13**. The layout is not critical and it is possible to use Veroboard if you prefer. The p.c.b. layout is centred on a 74 x 90mm blank piece of board so that it slides into the enclosure's side rails. The completed p.c.b. is secured in place using hot glue.

Configuring The interface

Connect the interface to the transceiver and a convenient USB port on the computer. The computer should automatically detect the hub, soundcard and USB-to-serial adapter. With the exception of the USB-to-serial adapter all use generic drivers and don't require a set up disk when using *Windows XP*. The USB to Serial connector should come with a driver disk.

When you plug the interface in your computer will change the default soundcard to the USB soundcard. From the Windows Start menu select, Setting, Control Panel, Sounds and Audio Devices options then Audio tab and change back to the default soundcard.

Start your data software and configure it to use the sound card on the USB radio interface using the drop-down menu similar to that shown in **Fig. 14**. The USB-to-serial adapter software should set a new Com port number. This is usually one more than the existing com port number or Com 1 if none are fitted, **Fig. 15**. The soundcard input levels should be set so that background is either black or dark blue and the 'tramway' lines on a PSK signal should be clearly visible on the waterfall display as shown in **Fig. 16**.

Transmit levels should be set so that the automatic level control (ALC) levels on the transceivers meter are not exceeded. **Note:** Remember to switch off any audio processing when using data modes.

As well as a versatile data mode interface, the USB Radio Interface can be used as both a c.w. and voice keyer with contest logging programs like *N1MM.* Ideal for those long 12 midnight to 4a.m. shifts where you've already worked most of the world and nobody else wants to speak to you!

Simple & Effective

Although it's simple in construction this USB radio interface will give a good account of itself and do visually the all functions as the most commercial units. It will also tidy up the inevitable 'rats net' of wires that accumulate behind the PC when you use the computer's own board soundcard, leaving the original computer soundcard available for non-radio use. ●

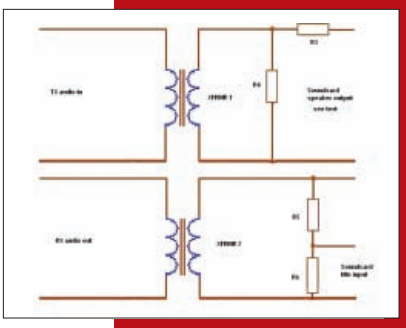


Fig. 11: The isolation transformer and attenuator circuit.

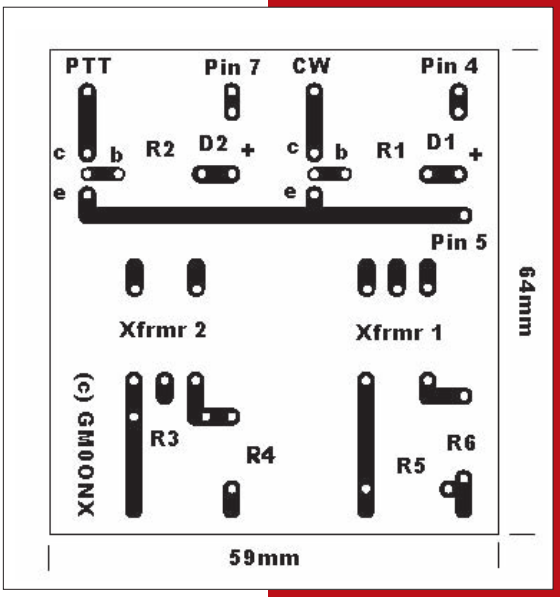


Fig. 12: The underside of the p.c.b.

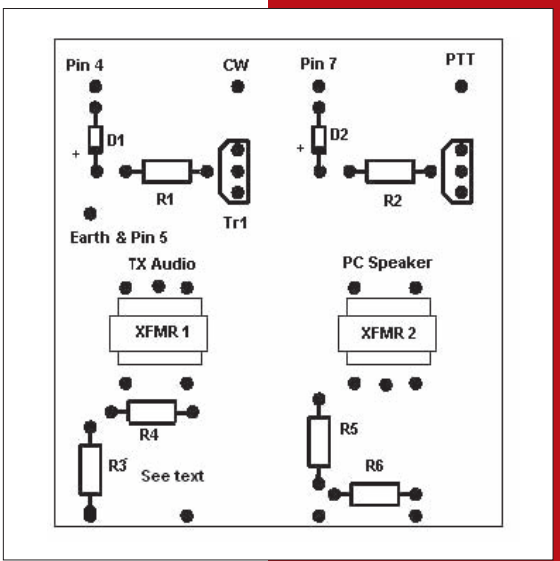


Fig. 13: The p.c.b. component overlay

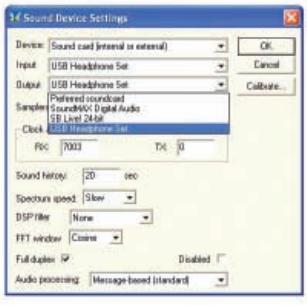
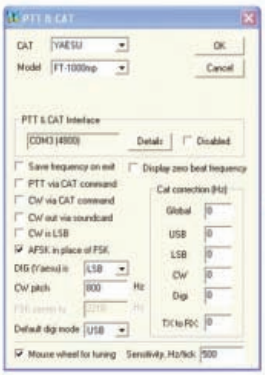


Fig 14: Illustration of the *MixW* Soundcard menu.



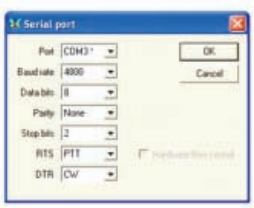


Fig. 15: The *MixW* p.t.t. and CAT menu.

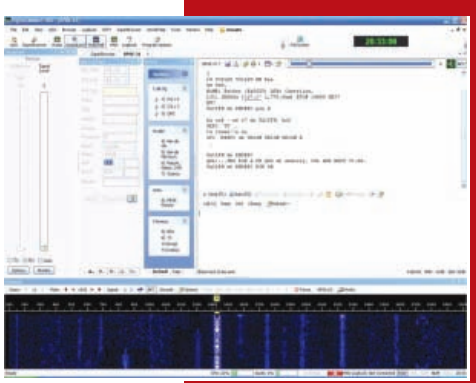


Fig. 16: The *MixW* trace showing correct sound levels.

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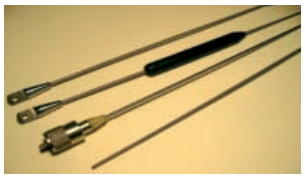

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Tony Nailer G4CFY's Doing it by Design
PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW
E-mail: tony@pwpublishing.ltd.uk

Post Design Work Needed?

In this month's *Doing It By Design* column, Tony Nailer G4CFY says, just because it's in production, doesn't mean that it's perfect!

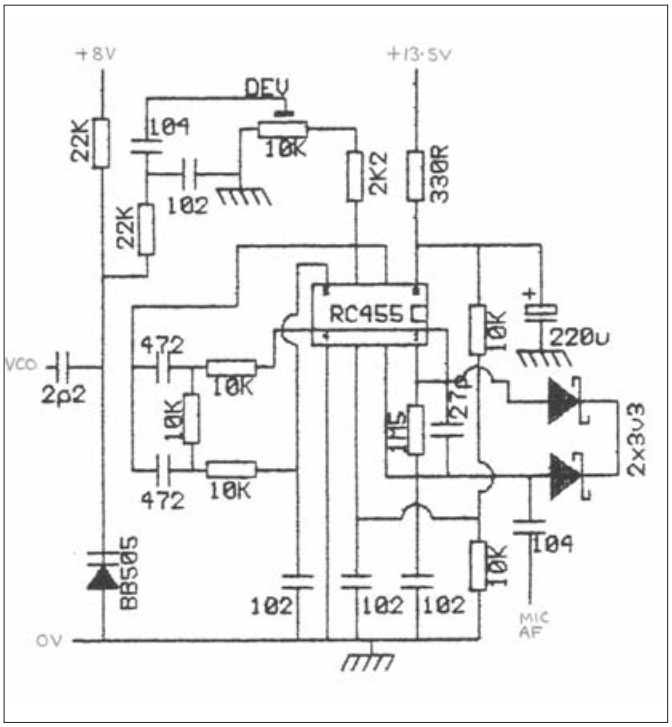


Fig. 1: The microphone amplifier, clipper and filter extracted from the original transceiver circuit.

This month I will continue the theme of audio filtering by applying the k purchased **nowledge to the receive filtering and microphone processing of the former AKD/ Garex transceiver**s. Having Garex Electronics at the start of December it was important to try to re-establish the 70MHz (4m) 25W narrow band f.m. (n.b.f.m.) transceiver type 4001 as a desirable product.

Earlier in 2011 a new transceiver called the Anytone or MyDEL-5189 was imported and marketed by **Martin Lynch & Sons** and was the subject of a review in May *PW*. According to **Peter Longhurst G3ZVI**, the former owner of Garex Electronics, sales of the 4001 took a dive at that point.

So, I undertook a little research to see if I could find out why. A search of the Internet revealed that whilst many preferred the 4001 to ex-PMR radios, there was mention of poor audio quality of the 4001.

Evaluating The 4001

With the stock purchased from Garex came three complete but faulty 4001 rigs so, I set about evaluating them. One of these with a 'no transmit' fault was thoroughly examined and also compared with the others for component errors. There has never been a complete and accurate circuit diagram or board layout for this, or any other rig in the series. And it wasn't really the fault of Peter, as he had bought the design from the original creators.

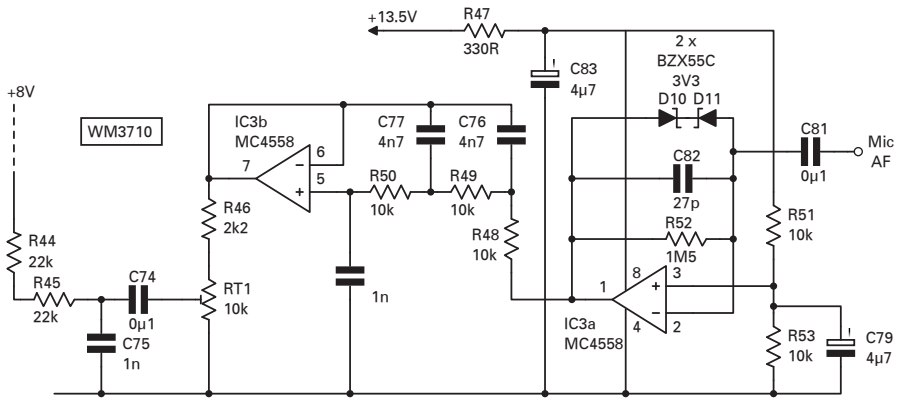


Fig. 2: The microphone amplifier, clipper and filter extracted from Tony's new circuit diagram for the transceiver.

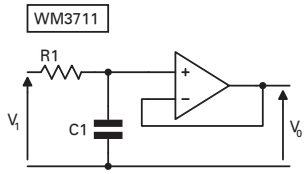


Fig. 3: To prevent the following circuit from loading the capacitive reactance it is recommended to use a buffer amplifier.

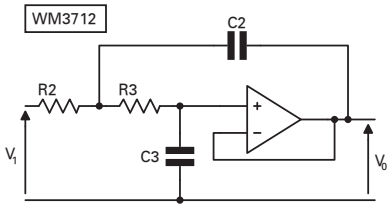


Fig. 4: An arrangement of two RC sections in tandem with the first capacitor returned to the op-amp output is a very effective form of second-order filter.

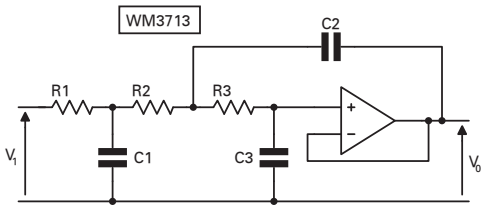


Fig. 5: This type of low-pass filter is referred to as a triple section or third-order Sallen-Key filter.

However, back to the test bench where – by comparison with the other radios – I spotted a coil with a different number of turns in the matching network between driver and output stage. Winding up a new coil with the same number of turns as in the other two rigs, the fault was cured. The r.f. output power was then in excess of 25W.

Receiver Evaluation

Next, I started checking the tuning and performance of the receiver. My signal generator was set to a starting deviation of 5kHz. This was the typical deviation on 144MHz f.m. some twenty to thirty years ago when I was last active on that band. The recovered audio was a little distorted, so I assumed the discriminator coil *Q* was too high. I reduced the value of the damping resistor but it had no noticeable effect.

My next test, started as I varied the signal generator deviation from zero to 5kHz. Around 3.75kHz it became quite 'scratchy' but beyond that became better but not wonderful. This suggested to me that one, or the other, of the receiver intermediate frequency (i.f.|) filters might be mismatched.

The first filter, in the rig, is a 10M07 type, a two-pole crystal filter with a bandwidth of ±3.75kHz and a required termination of 1800Ω. In the transceiver, I was working on, it was 2200Ω, which would have been correct for the original wider bandwidth filters in the same series.

Presumably the transceivers had used wider bandwidth filters originally, but with a reduction in channel spacing, these were replaced with the 10M07. The matching was obviously not modified accordingly.

I chose from my 10mm coil stock, a type 3893 to drive the filter from the tap on the primary. The output load resistor was changed to 1800Ω and the deviation variation with the signal generator was repeated. The audio then smoothly increased in level without any perceptible distortion.

New Circuit & Lay-out

In the holiday period between Christmas and New Year I came to terms with a new circuit diagram (computer-aided design, or CAD) package recently purchased from Labcenter. As with the student versions of *ISIS* and *ARES*, I'd used previously, it was necessary to create models for components that I used, but weren't included in the original program libraries.

Then I worked steadfastly through the transceiver, adding corrections to the original circuit. Following this many days were spent drawing up a new circuit in *ISIS* and including component identification compatible with any shown on the original circuit.

The microphone amplifier, clipper, and filter extracted from the original circuit is shown in **Fig. 1**. There's an integrated circuit (i.c.) marked as RC455 on the circuit but in the rig is a dual operational amplifier, type MC4558 or equivalent, the real circuit configuration is concealed by showing it as an 8-pin dual in-line package.

The same circuit extracted from my new circuit diagram and shown in **Fig. 2**, clearly reveals the circuit functions. Please note that the values of capacitors C79 and C83 on my circuit are the values used in all the rigs and part built boards in stock.

Audio Processing

For an f.m. transmitter's audio processing, it's normal practice to massively amplify the microphone audio and then clip it heavily to produce near constant amplitude speech. The subsequent frequency deviation will then be proportional to the tone variations of the voice rather than amplitude variations.

Most speech contains large volumes of low frequency tones and lower volumes of high frequency tones. But it's the higher

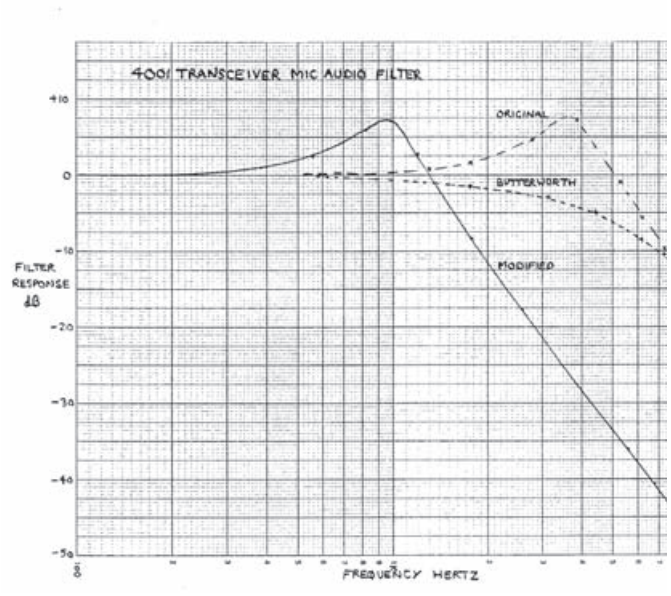


Fig. 6: A linear circuit analysis using Analyser II of the audio filter response drawn on a logarithmic frequency graph.

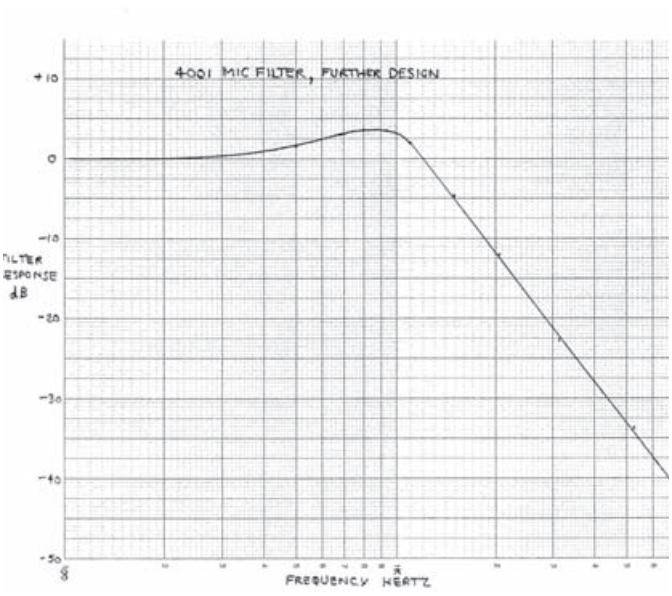


Fig. 7: The result of component changes to the circuit described. Compare the response with those of Fig. 6.

frequency tones that carry the intelligibility of the speech. In the typical male voice the average tonal range is usually in the frequency range 800 to 1000Hz. But in a typical female voice it's usually in the range 1000 to 1200Hz.

Dynamic microphones have rising responses towards 1kHz, or even a bit higher. This characteristic is useful to enhance the high tones at the expense of lower frequency ones. Unfortunately, the now popular electret microphones have really good low frequency response. This is good for high fidelity work – but not so good for radio communications.

When speech is massively amplified then clipped, audio harmonics are created. Clippers are always followed by low-pass filters to remove these unwanted high frequency products before the audio is passed to the varicap modulation diode.

Filter Types

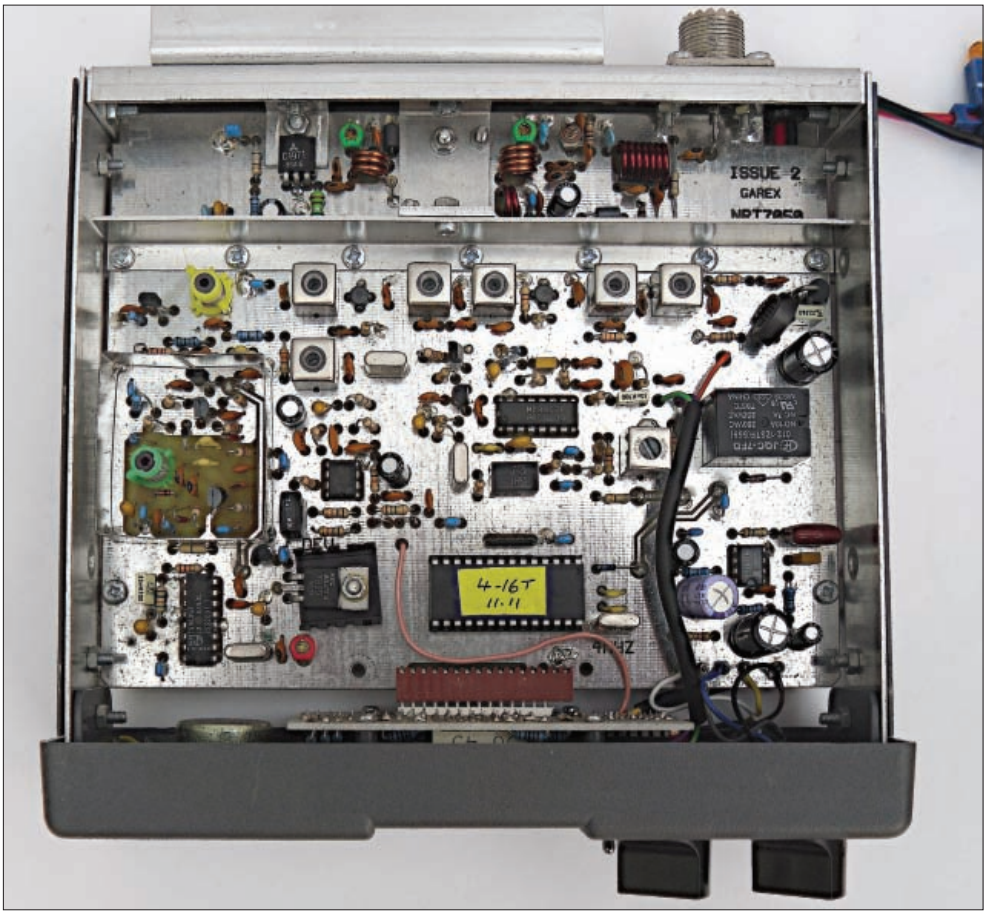
The simplest form of low-pass filter is just a resistor and capacitor (RC) which relies on the capacitive reactance falling with increased frequency. The net result is for the capacitor to act in conjunction with the resistor to create a potential divider, with a falling output as the frequency rises.

To prevent the following circuit from loading the capacitive reactance it is recommended to use a buffer amplifier, as shown in **Fig. 3**. Here the RC filter feeds the non-inverting input of an operational amplifier (op-amp). The input impedance of the op-amp is often well in excess of 1MΩ, and the output impedance under 100Ω.

The arrangement of filter, followed by high input impedance amplifier, is often described as a buffered single section RC filter. It has an output roll-off of 6dB/octave (that is for every doubling of frequency), which is also equivalent to 20dB/decade.

An arrangement of two RC sections in tandem with the first capacitor returned to the op-amp output is a very effective form of a two-section or second-order filter, and is shown in **Fig. 4**. The analysis and mathematics of this arrangement were developed and published by two engineers named Sallen and Key. For this reason this type of amplifier is referred to as a Sallen-Key filter.

The Sallen-Key filter can be further extended by the addition of another single R-C section placed in front. This type of low-pass filter is then referred to as a triple section or third-order Sallen-Key filter, and is shown in **Fig. 5**.



Compare this photograph of the insides of the 70MHz model 4001 with the overlay of Fig. 8.

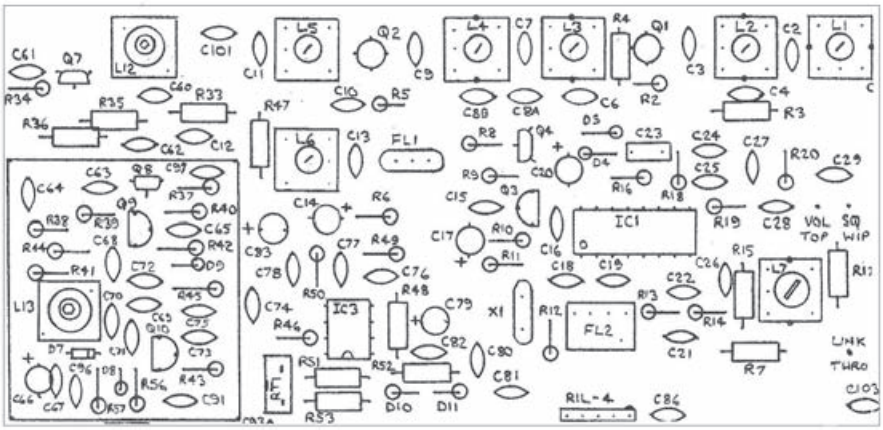


Fig. 8: A hand-drawn overlay of part of the p.c.b. for the 4001 transceiver discussed in this article.

Filter Analysis

Referring back now to the microphone modulation filter of Fig. 2, it's similar to a three section Sallen-Key filter **but** the first capacitor, now designated C76 is returned to the op-amp output instead of ground.

I drew a sketch of the filter with a unity gain amplifier feeding it and ran a linear circuit analysis using *Analyser II*. The result has been drawn on a logarithmic frequency graph, **Fig. 6,** and is the curve described as original. You will probably see that there's a peak in the response, notably with the shape rising to a peak of 7.5dB gain at about 3600Hz, then falling to an attenuation of –17.5dB at 10kHz.

A peaking response at such a high frequency is really not a good idea. Such a response will accentuate the harmonics of the clipping and drive the modulation diode to high deviation with audio products well above normal speech range. The audio will sound 'full bodied' but not clear.

By re-arranging C76 to be grounded in the normal triple section configuration a further analysis resulted in the curve described as Butterworth (the one without a peak in its response). This has a smooth passband without the rising response but still with poor attenuation of the high frequency audio products.

Filter Upgrade 1

The arrangement used in this series of transceiver producing the rising response I decided could be put to good use. Retaining the same arrangement but simply scaling the capacitors and resistors in the filter I was able to relocate the response peak in the region 900-1000Hz.

Now with a rising response to the frequencies carrying the most intelligibility, the filter will enhance the crispness of the voice. The third harmonic of those tones will now be about 27dB below the peak, and at 10kHz is about 57dB below the peak.

To achieve this 'relocation' of the peak response, the filter resistors R48, R49, and R50 are increased from 10kΩ to 18kΩ. Capacitors C76 and C77 are increased from 4.7n to 10nF and C78 from 1n to 2.2nF. Poly-block capacitors are recommended for the filter components.

This upgrade would be particularly useful for those with deep voices but may sound a bit shrill for higher-pitched voices. Ideally the way to determine this is to modify the rig and try it out for a while.

Further Studies

Generally, when I'm designing I wouldn't follow a clipper with any filter with a rising response for the reason that harmonics of lower audio tones would be accentuated together with the most wanted tones. It's good practice to precede the clipper with a high-pass filter, which will accentuate the higher tones at the expense of the lower ones. Then the clipper will clip all tones more equally.

The clipper can then be followed with a low-pass filter with a relatively flat pass-band and a very steep skirt into the stop-band. With the existing three-section filter it's acting like a Chebychev filter with 7.5dB of ripple. This equivalent ripple variation is really excessive and I assume accidental. Most filter tables for Chebychev responses include damping factors corresponding to 0.5dB 1dB or 3dB ripple.

I've tried to find the design equations for Chebychev filters using the Sallen-Key configuration, but none of my textbooks included them. It's my suspicion that this just cannot be done with the unity gain filter.

What I did find was circuits where the non-inverting input was taken back to a potential divider from output to ground, thereby giving a control of stage gain. Such an arrangement is termed a 'Voltage Controlled Voltage Source'. With this form of circuit there are equations for the design of Chebychev filters.

Filter Up-grade 2

I next tried modelling the existing filter with C78 being 3.3nF or even 4.7nF. And though it did reduce the peak, it also moved the cut-off frequency down a bit. This I corrected by reducing the filter resistors from 18kΩ down to 15kΩ. The result of these component changes is the response shown in **Fig. 7**.

I would recommend this second filter as an improvement over the existing one. Resistors R48-R50 are changed to 15kΩ, capacitors C76 and C77 to 10nF poly block, and C78 to 3.3nF poly block. A partial layout of the 4001 transceiver is shown in **Fig. 8**. The capacitors and resistors are on the diagram just above IC3.

Following the upgrade of the filter section with it, the removal of the higher audio harmonics, it's necessary to increase the deviation. This is done by adjusting trimpot RT1, just to the bottom left of IC3.

Final Words

Those readers who own an AKD/Garex transceiver wishing to do the receiver filter matching upgrade, should change L6 to a TOKO type 3892 or similar. The coil has three pins at the primary side and two pins at the secondary side. It is important that one of the pins of the secondary is snipped off, or that the pad where it would solder on the printed circuit board is cleared using a small drill. Also change resistor R8 just to the right of FL1 from 2.2kΩ to 1.8kΩ.

These are some really useful upgrades to these rigs at very little cost. If you wish to contact me, you can do so at **tony@pwpublishing.ltd.uk** Cheerio for now.

●

Emerging Technology

Chris Lorek G4HCL details antennas built into clothing, 3D transistors and transparent batteries

Wearable Antennas

I've mentioned the possibility of antennas built into clothing in past *Emerging Technology* (*ET*) columns and idea is now being taken very seriously as **BAE Systems** in the UK has teamed up with the UK's **National Physical Laboratory** to measure the efficiency of radiation emitted from wearable antennas embedded into T-shirts.

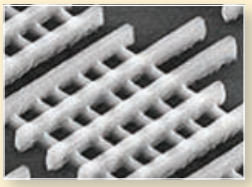
Human dummies wearing the antennas were placed inside a range of different testing facilities. These include a fully anechoic Small Antenna Radiated Testing (SMART) chamber and a ferrite-lined anechoic room, to monitor

the radiation patterns transmitted by the T-shirt. A willing human tester then helped by moving into different poses while they tested the signal being emitted from the shirt.

The company has a long history of antenna research and they are currently working on a range of wearable antennas incorporated into T-shirts, jackets and military helmets and BAE are due to release more information and images of these systems in the near future.

If you can't wait, there's already a company selling such wearable antennas, albeit at a price of £357 a time! Wearable Antenna Technologies say their 'Tactical Vest Antenna System' has a total frequency range of 30 - 512MHz with omnidirectional radiation and a input power rating of 7W!

Three Dimensional Transistors



There are plenty of things coming out in 3D – but now there's been a breakthrough in semiconductors, using 3D technology, with a 'Tri-Gate' transistor. In a field effect transistor (f.e.t.) typically used in our receiver front end circuits, a 'gate' is used, but in the new Tri-gate transistor this planar gate is replaced with a vertical 'fin'.

The current flow in the transistor is controlled by putting a gate on each side of the fin, and another gate across the top. This is said to allow as much transistor current to flow as possible when the transistor is 'on', and as little as possible when it is 'off'. It also enables rapid switching.

Semiconductor manufacturers Intel say that they will be using such 3D transistors in volume manufacture at the 22nm node, and that these will be used in their 'Ivy Bridge' microprocessor, which is due to be in production by the end of 2011.

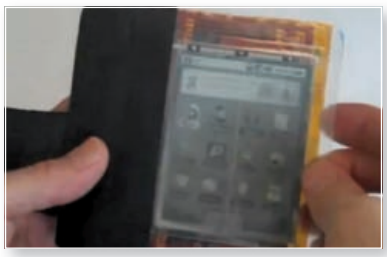
Intel state that the 3D Tri-Gate transistor can operate at lower voltages with lower leakages, to give better performance and energy efficiency. It says that, at the 22nm node, 3D transistors will bring a 37% increase in performance at low voltage compared to 32nm planar transistors. Alternatively, power consumption can be halved whilst maintaining the same performance.

"The performance gains and power savings of the 3D Tri-Gate transistors are like nothing we've seen before," claims Mark Bohr, Intel Senior Fellow. "It will give product designers the flexibility to make current devices smarter and wholly new ones possible!"

Flexible 'PaperPhone' Transceiver

A professor at Queen's University Human Media Laboratory in Kingston, Ontario in Canada has unveiled what is claimed to be the world's first interactive 'paper computer' transceiver. The smartphone prototype — called PaperPhone — is best described as a flexible iPhone. It does everything a smartphone can, such as store books, play music or make phone calls.

But the PaperPhone's display consists of a 940mm diagonal thin-film flexible E Ink display. "Everything is going to look and feel like this within five years" says **Professor Roel Vertegaal**, Associate Professor in Human-Computer Interaction at Queen's University, who helped develop the computer. "This computer looks feels and operates like a small sheet of interactive paper.



You interact with it by bending it into a cell phone, flipping the corner to turn pages, or writing on it with a

›

pen." The PaperPhone is described as being the world's first next generation, thin film smartphone and interactive paper computer. It is based on a flexible electrophoretic (E Ink) display that doesn't consume any electricity when it's not being refreshed.

Thin film sensors allow the phone to respond to bending of the screen to navigate pages in Ebooks, play or pause MP3s, make phone calls, or navigate applications. A flexible tablet also allows users to draw on the screen with a pen just as if it were a sheet of paper.

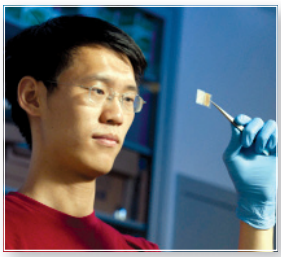
This could also mean no more cracked displays when you accidentally sit on your portable communicator in the future!

Stretchable Electronics

We've had flexible electronics for a while now, but emerging technology is now starting to bring us stretchable electronics! Researchers at Ghent university are developing just this, where nanotubes and polymers combine to create devices in which every element can stretch or bend.

You can probably think of some possibilities for this, such as wearable electronics built into clothes. But stretch your imagination, if you'll excuse the pun, and think of biomedical implants and smart skins. A radio transceiver built into your hand?

Transparent Batteries



I've detailed transparent transceivers in these pages in the past, as well as flexible batteries that can be integrated into clothing and the like. But how about a transparent battery to go with your soon-to-be transparent 144/432MHz hand-held? Yes it's now a reality, and a transparent lithium-ion battery that's also highly flexible has been developed by researchers from Stanford University.

It has about the same manufacturing costs as regular batteries, but with the potential to be used in a range of applications in portable electronics and transceivers. Semi-transparent gadgets have already been created, but achieving complete transparency hasn't yet been possible simply because of the battery that's needed to power these.

Since the needed active materials in batteries can't yet be made transparent, or replaced with transparent alternatives, the team at the university set out to construct a battery in a way that its non-transparent components were too small to be seen by the human eye.

The maximum resolving power of the naked eye is somewhere between 50 to 100µm, so the team set about constructing the battery items at a smaller size than 50µm. A mesh like framework for the battery electrodes was devised, with each 'line' in the grid being approximately 35µm wide. Light could pass through the transparent gaps between the grid lines and because the individual lines are so thin, the entire meshwork appeared transparent.

A transparent, slightly rubbery compound known as polydimethylsiloxane (PDMS) is used. Although this material is cheap, it's not conductive, so metals had to be deposited onto it. To do this, PDMS was poured into silicon moulds to create grid patterned trenches and a metal film was evaporated over the trenches, creating a conductive layer.

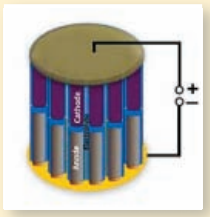
The researchers then dropped a liquid slurry solution containing minuscule, nano-sized active electrode materials into the trenches. By precisely fitting an electrolyte layer between two electrodes, a working battery was created, and according to the team, multiple layers can be added in order to create a larger and more powerful battery.

There is however a limitation right now, as although the transparent battery is about as powerful as a NiCad of the same size it's only about half as powerful as a 'normal' lithium-ion battery of the same size. But then, the advantage is that you can see right through it! Watch this space, as I'm sure they're going to decrease in size and increase in power as technology evolves.

Nanowire Batteries

Following on from this, researchers at Rice University in Houston, Texas, have now fabricated an entire lithium ion energy storage device into a single nanowire, creating what is thought to be the smallest battery in the world.

The research team built centimetre scale arrays containing thousands of nanowire devices, each about 150nm wide, with each of these being a completely discrete battery with all the usual elements such as an anode, cathode, and electrolyte. The team has been working towards this for a few years now, and in December 2010 they first reported the creation of three dimensional nano batteries.



In that project, they encased vertical arrays of nickel tin nanowires in PMMA, a widely used polymer known as Plexiglas, which served as an electrolyte and insulator. They grew the nanowires using electrodeposition on a copper substrate, and then widened the template's pores with a simple chemical etching technique, just like we etch p.c.b.s in our home-brew projects.

So maybe in the near future not only could we be using transparent batteries, they might well be incredibly small! Cheerio for now. ●

See you soon as I explore the future on behalf of *PW* readers. Chris G4HCL.

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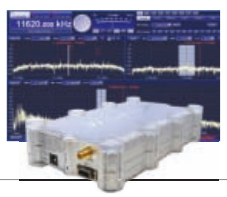

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Making Simple Audio Derived S-Meters

Editor's note: *George G3RJV has been unwell recently – but I'm pleased to say he's getting better – and on behalf of readers and everyone at* PW Publishing Ltd.*, Tex Swann G1TEX and I wish you a speedy full recovery George.* ***G3XFD.***

In this edition of *Carrying on The Practical Way* the Rev. George Dobbs G3RJV describes how you can make a simple audio driven S-meter....after you've read this month's most appropriate quote!

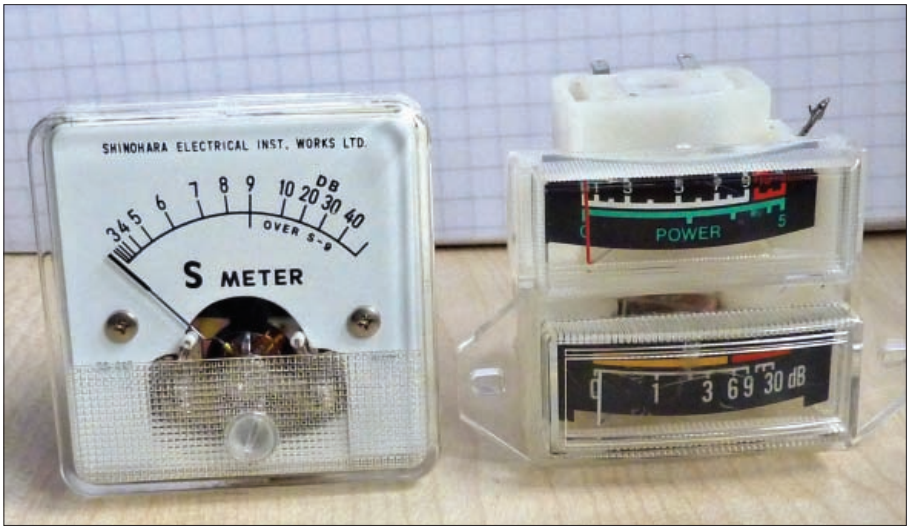
Ben Franklin may have discovered electricity - but it is the man who invented the meter who made the money.
Earl Warren (American Judge 1891 – 1974)

Welcome to *Carrying on The Practical Way* (*CoTPW*) where this time I'm discussing simple S-meters. Although Amateur Radio is, by nature a progressive science-based hobby, many of us are sentimental about the receivers we've owned in the past – I still regret selling my Drake 2B receiver and regret even more parting with my Davco DR-30 receiver!

The Drake was simply a good receiver and the Davco was remarkably good looking. However, as **Rick Campbell KK7B** himself a Davco owner cautioned me – "the good lookers aren't always the best workers!"

When I was a short wave listener (s.w.l.) a local Amateur, a Dentist by profession (who had a very expensive array of radio equipment) was kind enough to offer me the use of an Eddystone receiver for several weeks. I don't remember which model it was, although I think it was probably the S-640.

The thing I remember most about that receiver was the S-Meter, which was an Eddystone 669 external S-Meter. This was a wonderful addition to the radio with the fine moving coil meter housed in a dome shaped die-cast enclosure, with fluted sides and finished in black crackle paint. It was good enough to be a prop in a 'Flash Gordon' film. This was at the time when I considered that the best receivers had lots of knobs and dials and, if possible, at least one meter. The Eddystone 669 was a magnificent meter!



The S-Meter Explained

Just in case you don't know – an S-Meter is a signal strength meter that's provided on many communication and short wave receivers. The earlier ones, like the Eddystone 669, used analogue meters – that's a meter with a printed scale and a moving needle indicator. Usually the meter scale is calibrated from S1 to S9 after the Amateur Radio readability, strength and tone (RST) system of signal reporting.

The S-strength reading is somewhat subjective – but it usually assumes a signal of 50µV at the receiver input to be 'S9'. Then each S-point division marks a six decibel (6dB) change in signal strength; that is a two times voltage change or a four times power change.

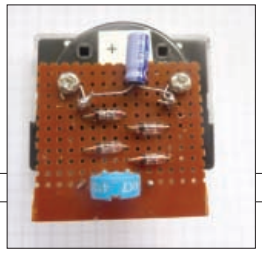
The result is a logarithmic scale – the higher the reading, the smaller the divisions on the scale. This roughly follows the working of the human ear. A 6dB change is what an average human ear can recognise as a change and the response of the ear is more logarithmic than linear. I often noticed this effect when wedding couples were kind enough to invite the Vicar to their evening party with an over enthusiastic disc jockey!

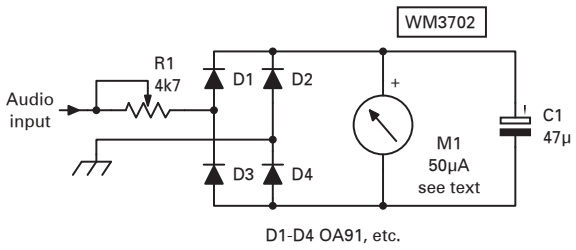
In many receivers the S-meter reading is controlled by the voltage on the receiver's automatic gain control (a.g.c.). Although in reality most Amateur Radio operators simply listen to the signal and give a mental assessment of where it fits on the nine-point scale. Most S-Meters are far from being objective scientific instruments!

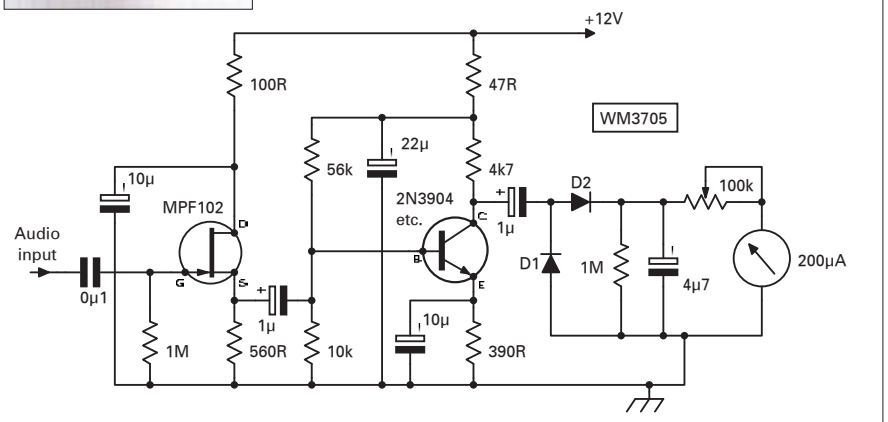
Most of the receivers described in this column don't have anything as sophisticated as an a.g.c. system. But it would be nice to add a meter and bring a bit of life to the receiver.

A simple option is to add an audio derived signal strength meter – a meter that changes it's reading in sympathy

Fig. 1: A basic VU type meter circuit.







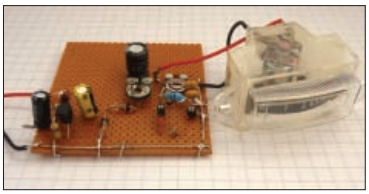
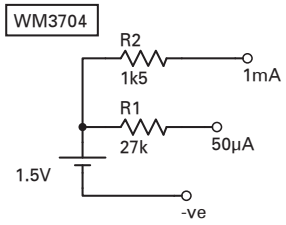


Fig. 3: A commonly used circuit for audio derived S-meter



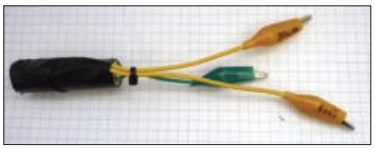


Fig. 2: Will that bargain meter work for you? The Tripus meter testing circuit can help by actually proving that the meter is working or not and identifying the full scale deflection (f.s.d.).

with the audio output. It will certainly not give an objective reading of signal strength but it will give relative readings of the signal strength of received stations. Above all it will do what the Eddystone 669 S-Meter did for the Eddystone and will make the receiver look better!

Several Approaches

There are several approaches to adding an audio derived S-Meter and I will offer the reader three possibilities. All three version measure the audio signal levels of the stations being received.

Readers who are as old as I am will doubtless recall the 1960s television talent show Opportunity Knocks. The show's host, **Hughie Green**, invited the audience to applaud each act. The volume of the applause was shown on a "clap-o-meter" and thus the acts were judged.

The clap-o-meter was a version of the VU Meter. The Volume Unit (VU) meter is often included on more expensive audio and Hi-Fi equipment to show the audio signal level. That's just what we want to do!

The diagram, **Fig. 1**, shows the circuit for a very basic VU meter and I built one to see if it could serve as an S-Meter for a simple receiver. The circuit in Fig. 1 is basic and will require some experimentation according to the receiver in use.

The audio input from the receiver is fed to a diode bridge to convert it to a d.c. voltage to drive the meter. R1 is a simple sensitivity control and the value (4.7k) may have to be increased if the meter is reading too high.

I used Germanium diodes for the bridge because these have a lower forward voltage loss. Any common Germanium diode, like the common OA91, would serve the purpose.

The output voltage from the diode bridge varies according to the strength of the audio input signal. Some signals may be varying quickly (c.w. Morse signals are the worst) and to prevent the needle dancing about too much the capacitor C1 is added to dampen the voltage fluctuations.

The capacitor requires experimentation because some meters have internal mechanical or electromechanical damping. The value of 47µF worked well for me.

The meter (M1) should be a moving coil meter with a full scale deflection (maximum reading) of 50 or 100µA. This is the weak link in this design because you have either got such a meter or you'll have to pay quite a lot of money for one. Thankfully I have a good collection of meters having bought every cheap decent meter I have seen at radio rallies for many years.

You may ask, "Where do you connect the audio input on the receiver?" The answer In my tests I connected it across loudspeaker output and this worked well on most receivers I tried. It is also possible to try a connection to a point further back in the receiver's audio circuit.

It may be that this could disturb the audio circuitry in which case isolate the VU meter by adding a series capacitor of about 200nF (0.22µF) on the input. If you have a suitable meter and are prepared to experiment a little, Fig. 1 can provide a very simple S-meter for many receivers.

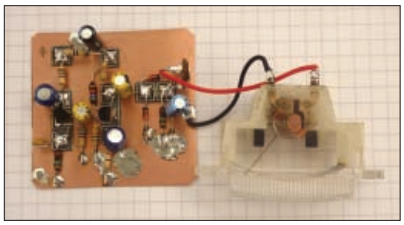
Suitable Meter

As you may have gathered, one of the problems in adding an S-meter to a simple receiver is the provision of a suitable moving coil meter. The couple of designs that follow use a meter with a full scale deflection in the order of 200µA.

Meters, especially good moving coil meters, are expensive items to buy. I have usually tried to buy them at bargain prices in flea markets. But questions arise such as what's the full scale deflection? and … "is that surplus meter fully working?"

The very simple test item shown in **Fig. 2** can answer both questions. It's called the Tripus because it looks like an octopus with three legs. The Tripus is simply a battery with two choices of series resistance to check the full scale deflection of an unknown meter.

The values, 27k and 1.5k give (roughly), a full scale reading of 50µA and 1mA. I say 'roughly' because they are nearest preferred resistor values



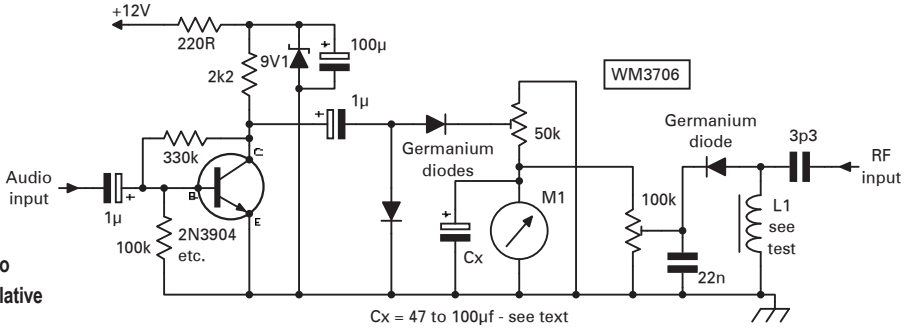


Fig. 4: This circuit has the advantage of serving two functions. It can be both an audio S-Meter and a relative r.f. output power meter.

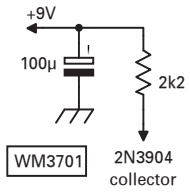


Fig. 5: By using a 9V battery, the S-meter circuit of Fig. 4 can be simplified slightly, and made into stand-alone unit.

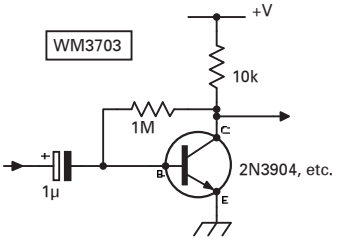


Fig. 6: Adding this pre-amplifier can help the S-meter circuit of Fig. 4 work on lower audio voltages.

and the accurate reading will also depend upon the internal resistance of the meter. But this is near enough for a quick check. The built Tripus uses three clip leads of differing lengths to avoid the ends touching accidentally.

To use the Tripus simply connect the negative clip (-ve) to the meter negative terminal and try a first test with the 50µA lead. If the movement barely moves, try the 1mA clip. This test not only indicates the full scale deflection of the meter but also shows that it is a viable and working meter.

The surplus meter route is a good choice because many of these meters will be VU meters from old tape recorders or S-meters from CB transceivers and will come complete with logarithmic scales – exactly what we require.

Audio Driven Circuit

The diagram, **Fig. 3**, shows a very common circuit for an audio driven S-Meter. I have borrowed the version that appeared in the **G QRP Club** journal, ***Sprat***, by **Marco Eleuteri IK0VSV**. It was also in some versions of the BITX-20 transceiver; a fine little design by **Ashhar Farhan VU2ESE**, (it featured in *PW* some years ago) although it originated from the work of the late **Doug DeMaw W1FB**.

The audio input from the receiver is fed to an MPF102 field effect transistor (f.e.t.) a high impedance stage that's unlikely to offer any significant load that could affect the audio stages. This is coupled to a bipolar transistor amplifier.

I used a 2N3904 but many similar devices like the 2N2222 or BC109 would serve the purpose. From here the audio signal is fed to a pair of diodes acting as a voltage doubler detector producing a voltage across the resistor.

The 4.7µF capacitor helps to smooth out the voltage changes so the meter does not dance about too much. And the 100k variable resistance is the sensitivity control for the 200µA surplus meter.

There are a number of choices as to where to connect the audio input on a receiver. However, it needs to be at a point somewhere towards the end of the audio stages – but at a place in the circuit that is not affected by any volume control that might be present. An ideal place seems to be at the input to the volume control potentiometer.

The connection for the S-Meter may need a little experimentation on the part of the constructor. Once the meter is responding to the signals the 100k sensitivity control is adjusted to give a full scale reading for the loudest signals. This is a matter of individual judgment – but remember I only promised a cosmetic addition rather than a scientific instrument!

Two Function Circuit

The diagram, **Fig. 4**, shows a circuit that has the advantage of serving two functions. In a home built transceiver it can be an audio S-Meter and a relative r.f. output power meter. Again, this circuit comes from *Sprat* where it appeared as a small item from **Bill Bartlett G4KIH**, in the winter 1988 issue. Bill's circuit has appeared in several places since then.

A quick glance at Fig. 4 shows that the S-Meter part of the circuit is similar to that of Fig. 3, but without the f.e.t. stage. An amplifier feeds a diode doubler circuit to drive the 200µA meter. Bill uses germanium diodes (OA91 etc.) because of their low forward voltage loss. The capacitor 'Cx' is to damp the meter action and values between 47 and 100µF can be tried for the best results.

The r.f. output metering is very simple. A low value capacitor (3.3pF) takes a sample of the transmitter output signal to L1; an inductive r.f. load. This is an axial r.f. choke. The value of L1 varies according to band. The values given are 3.5MHz (80m) – 1mH, 7MHz (40m) – 180µH, 14MHz (20m) 47µH, 21MHz (15m) – 18µH. Other bands could be interpolated from these values.

A germanium diode detector and an r.f. bypass capacitor supply a voltage to the meter via a 100k sensitivity control. **Note:** The circuit is only really designed for QRP levels – no more than 10W of r.f. output.

The diagram, **Fig. 5**, shows that the circuit can be run from a 9V supply if that's available from the receiver section of a transceiver, or if only the S-Meter portion is being built for a 9V receiver. If the S-Meter sections lacks sensitivity and high readings cannot be attained, a pre-amplifier can be added to the input of the S-meter section as shown in **Fig. 6**. Adding the pre-amplifier allows lower audio voltages to be used to drive the S-Meter.

Try A Little Movement?

So, if you wish to add a bit of movement or a little (pseudo) sophistication to your home-brewed receiver or transceiver, try one of these circuits. It might not mean much but it could look good! ●

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Carl's Lost QSO!

In this month's *HF Highlights* Carl Mason GW0VSW shares the story of his Morse key problems and then presents your monthly reports. All reports to Carl by the 15th of the month please!

Welcome to *HF Highlights* (*HFH*) and I would like to begin this time with the story of a lost QSO. As I was putting this month's column together I was monitoring 28MHz on my Yaesu FT-817 leisurely tuning up the band with no audible signals until on 28.052MHz I heard a station calling "CQ" and listened in. At first I thought the callsign was 'HR8' but on the stations next call I copied **Alain Loiseau 5R8AL** (Madagascar) at around RST579 at 1540UTC.

As I listened his signal got stronger and at one point was well over RST599 with me on my modified SRC X-80 vertical antenna. I've not worked Madagascar with QRP – so it would have been good to get the call in my log. At the end of his "CQs" I called using my old and well used 'plastic' version of the WT8 Amp No.2 Morse key and was amazed to hear another Welsh station had also heard him.

Mike Greatrex GW4HDB in Swansea called Alain 5R8AL at the same time and with a more powerful signal than my 5W he made the QSO so I sat back and waited for my chance to call. At this point I should mention that my key had been playing up a little earlier in the week. It would stop working mid way through a QSO and not 'key' at all or miss out the occasional 'dot or dash' and then for some reason would work okay again.

There was nothing obviously wrong that I could see but after this had happened a few times it was time to strip down the key and give it a good clean. This seemed to cure the fault and I had no further problems up until then. As the QSO between Madagascar and Swansea was about to end – and with my hand hovering above the key – I waited for my chance to give Alain a call and as "73" was exchanged I took my chance and began sending my call when the arm of the key, **Fig. 1**, just snapped and the key ceased to work!

Desperate to make the contact I looked for a screwdriver to short the connecting wires and try and tap out my call but it was nowhere in sight. To add insult to injury Alain was now calling the "GW QRP station" so he had heard some of my original call. To rub salt in my wound no one else had heard or called Alain and he closed down shortly afterwards.

I couldn't believe my bad luck and as you can imagine a few 'choice' salty ex-Royal Navy type words were used! Looking at the arm of the key it was obvious that it had been weakened at some point in its life and had suffered a stress fracture at that critical moment and was beyond repair. I had some old parts lying around the shack and was able to replace the broken part easily with one from a similar key.

After some use the intermittent keying problem returned and on further investigation it turned out to be a 'dry' solder joint on one of the insulated wire connectors to the keys terminals. Re-soldering the connector cured the problem completely and the key now works fine.

However, it just does not feel the same to me to me so the search for a replacement is on. If any of you have suggestions for a straight key I would be very pleased to hear from you!

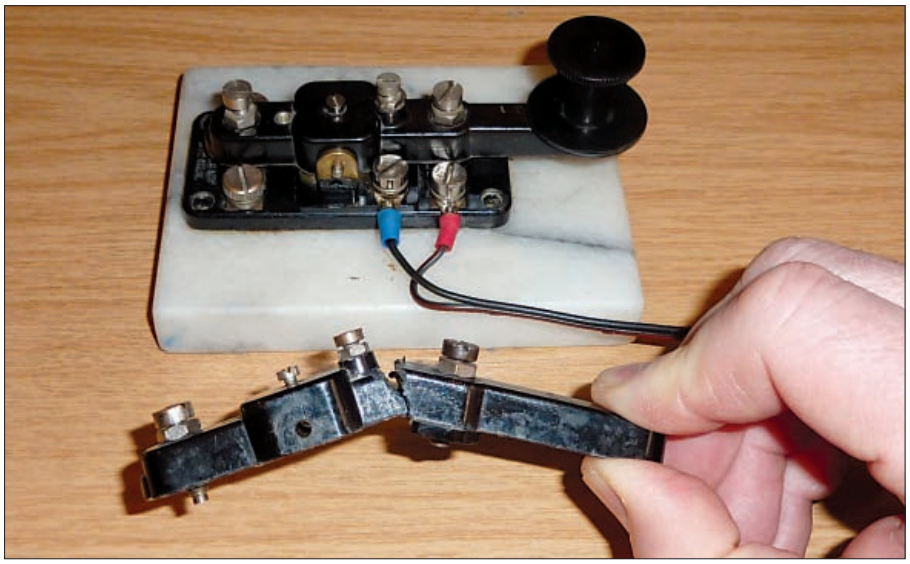

Fig. 1: Carl GW0VSW's broken Morse key

Kit Threat From The EU

Those of you that enjoy building from kits or modifying your equipment may be interested in a news item I first read about on the Southgate ARC's website (it also appeared later on *QRZ.com*). It seems that the European Union is putting Amateur Radio kits and modified equipment under threat because of changes to its EMC directive.

At the moment Amateur Radio kits and modified equipment are specifically excluded from the directive – but under proposed changes they would be fully subjected to it. This would result in high compliance costs making it very uneconomical to develop and sell kits and could see the end of our Amateur Radio kit market.

The changes would mean that if we decided to modify our equipment we would face additional costs to have the modifications approved and all the bureaucratic hassle that would go with it. The European Commission is reworking some of its directives as part of the New Legislative Framework (NLF) alignment package and the EMC directive is one of these, which will have some major changes made to it.

Some of the proposed changes will have little or no effect or would be good from an Amateur Radio operator's point of view. However, there are two slight changes which would have a major effect on us as the sentence "Kits of components to be assembled by Radio Amateurs and commercial equipment modified by and for the use of Radio Amateurs are not regarded as commercially available equipment" is to be deleted in the new version.

The change would render kits and modified equipment to be fully subjected to the EMC directive. The second which is the definition of the term 'electromagnetic disturbance' will include the wanted signal of a radio as a possible source! The IARU Region 1 is responding to these proposed changes by letter and you can read more on the subject by logging on to *QRZ.com* website and search for **News>Amateur Radio News>EU** threat to Amateur Radio Kits which was listed on the 17-12-2011.

The DX News

Next we've some DX news. **David Hutchinson GI4FUM** dropped me a line to say he is now the QSL manager for **Daniel Hubbard ZS6JR**'s DXpedition to Mozambique where he used the call **C91JR** last November. He made over 1,000 QSOs in RTTY and PSK31 using a beam, **Fig. 2**, and four square antenna for 7MHz, **Fig. 3**, and requests for direct QSLs are already flowing in.

David will be part of the team running a DXpedition to Oranjemund in Namibia in March where they will also participate in the CQ WPX SSB Contest and there is still time to join them. Details of this and other DXpeditions and safaris can be found on David's CQ DX African Safaris web site at **http://www.3da0ss.net**

The site also has details of other operations from this part of the world including those of **Mike Tessmer K9NW** who made over 13,000 CW QSOs as **C91NW** from Beline (Praia do Bilene) and 2,400 c.w. QSOs as **3DA0NW** from Hawane, Swaziland in just 15 hours of operating. The QSLs for C91NW and 3DA0NW should go via K9NW.

Your Reports

On to your reports next, and the first is from **Eric Masters G0KRT** in Worcester Park, Surrey who worked with 5W QRP on 3.5MHz, logging OZ4UR (Denmark) at 1916 before moving to 7MHz where he found DL7JOM (Germany) at 1921 using his Kenwood TS-570 and modified W3EDP antenna tuned with an SG-230 smart tuner.

Fig. 2: The 7MHz 4 square antenna used by Daniel Hubbard when he was operating as C91JR.

Fig. 3: The beam antenna used by Daniel Hubbard, operating as C91JR.

Fig. 4: The Bulgarian Saints Award received by George Davis G3ICO.

Also on the band was **George Davis G3ICO** in Yeovil, (**Fig. 4**, shows one of George's QSL cards) who worked a string of USA stations including W2PV (Massachusetts), N9RV (Montana), K8AZ (Ohio), K9CT (Illinois) and W2FU in New York between 0841 and 0853. He used an Elecraft K2 at 5W to a doublet antenna. The 10MHz band provided PG65ISWL (Netherlands) celebrating the 65th Anniversary of The International Short Wave League and 9A04JB (Croatia) at 1618UTC with a special call for the Pope's visit (QSL via 9A3JB).

This was an interesting QSO for George as he used just 300mW from a Michigan 'Mighty Mite', a one transistor transmitter designed by **Ed Knoll W3FQJ** and developed by **Tom Jurgens KY8I**. George was also pleased to receive his Bulgarian Saints Award for working the required number of special event stations last year.

The 14 & 18MHz Bands

George G3ICO used c.w. QRP again on the 14MHz band working EM0RSE (Ukraine) 1129 (It's the HQ station of the Morse club UCWC) QSL via UZ9RR (**Fig. 5**), HA50HH (Hungary) at 1512 (QSL via HA0HH), then came SU9VB (Egypt) 1540 and several USA stations including K8PO in Maine at 1955. Then came TA3AX (Turkey) 1956 and VE3J (Canada) at 2005.

Meanwhile, on 18MHz Eric G0KRT used 100W s.s.b. to log VE6LWF (Canada) 1627, YO2CJX (Romania) 1623, SV2FNN (Greece) 1639, KP4MS (Puerto Rico) NA-099 at 1643 (QSL via W4DN) and KC2R (USA) in New York at 1706UTC.

In Worcester **Steve Wellon M0SAS** spent a good deal of time using PSK31 and best DX was A61BS (United Arab Emirates), QSL cards in **Fig. 6**) at 1725UTC using an Yaesu FT-857D and 20W to a Cushcraft MA5B.

The 21 & 24MHz Bands

To Oxfordshire now and **David Bambrook 2E0DAB** who lives near Bicester and using between 10 and 30 watts s.s.b. on the 21MHz band logged EA8CDP (Canary Islands) AF-004 at 0930, OK2SW (Czech republic) 1010, IZ5TLW (Italy) 1140, ES7GM (Estonia) 1357 and EW8A (Ukraine) 1420 using an Yaesu FT-747GX or FT-817 with an amplifier out to a dipole antenna mounted along his fence.

Next up is **Dennis Upton VE3UTN** who lives in Kichener, Ontario (Canada) who used his Yaesu FT-857D and his Crown Wire Loop antenna on the band to work another *PW* reporter Steve M0SAS in Worcester – using PSK31 at 1130UTC on Christmas Day. They had an interesting chat once they realised they both reported for the column!

On the 24MHz band **Terry Martin M0CLH** in Wantage worked s.s.b. stations 3XY1D (Guinea) 0951 QSL via DL7DF, BH4SCF (China) 1012 QSL via BA4EG, R9FR (Asiatic Russia) 1041, UN7LZ (Kazakhstan) 1235, VA2MZ (Canada) 1501, IT9BHE (Italy) 1504, YO2MMO (Romania) 1506, 5B4MF (Cyprus) AS-004 at 1519, KJ4JC (USA) in Tennessee at 1534, HZ1BL (Saudi Arabia) 1535, V26OB (Antigua & Barbuda) NA-100 at 1451 QSL via DL8OBQ, RL3AW (European Russia) 1624 and VO1JNS (Canada) at 1613UTC using an IC-756 and Cushcraft R8 vertical.

The 28MHz Band

The 28MHz band was the place for **Tony Fitzgerald GW4YMJ** in Porthcawl as he found the band in great shape. Using a Kenwood TS-480SAT and 100W to a ground mounted SRC X80 vertical antenna he worked s.s.b. stations VR2XMT (Hong Kong) 0943, UN7MMM (Kazakhstan) at 1016 (QSL via EA7FTR). Then came VK2IR (Australia) OC-001 in Sydney, New South Wales at 1019. The he worked RA3GS (European Russia) 1022, CT1EHI (Portugal) 1029, OD5PY (Lebanon) 1037 QSL via KU9C, E70YL (Bosnia & Herzegovina) 1120, IZ7DOK (Italy) 1136 and finally PY2HL (Brazil) at 1147UTC.

Still in Wales, **Peter Walton MW0RSS** in Wrexham (North Wales) wrote in to say, "I used to send in s.w.l. reports to *PW* in the 1970s as A9002 and after a long time have recently become interested in QRP. While visiting a friend in Todmorden, Yorkshire, I decided to drive up the nearest hill in my friend's motor-caravan and literally threw about 10m of wire over its fibreglass roof to listen on the band.

There were lots of American stations audible at the lower end of the band with strong signals so I decided to give one a call with 2.5W c.w. from my Yaesu FT-817 on its internal battery. The USA station came straight back to my call M0RSS/P and I was pleased to add N2HSY to my log at 1335UTC. He has since confirmed the contact and it turns out that the operator, **Erich Lucas**, in New York is also a keen QRP operator."

Thanks for Peter! I'm sure there will be many more low power contacts for Peter when he's built the his recent purchase – a Wilderness Radio Norcal 40A – 3rd generation 7MHz QRP transceiver kit designed by **Wayne Burdick N6KR**.

Also operating on 28MHz was **Peter Lowrie MI5JYK** who lives in Newtownabbey, Northern Ireland. Peter has been experimenting with the Resonant Feedline Antenna design and this time employed it as a vertical dipole fixed to his telescopic fishing pole.

Peter has made versions for the 18 and 21MHz bands but concentrated on 28MHz this month using mainly s.s.b. running his Yaesu FT-817 at 3W or less. He worked YO8HP (Romania) 1133, YU1WS (Serbia) 1135, IQ9BT (Italy) 1135, EA7JEZ (Spain) 1141, CT3FQ (Madeira Islands) AF-014 at 1141. Then he logged ES2TL (Estonia) 1157 and A61BK (United Arab Emirates) 1247 (QSL via NI5DX (**Fig. 7**). Next came WO4DX (USA) in Georgia at 1315, followed SV9DJO (Crete) EU-015 at 1331, along with others in New York, Pennsylvania, Florida, Missouri, Maine and Massachusetts around the same time, VA3SWG (Canada) in Ontario at 1553 and PY2NDX (Brazil) at 1426UTC. Simple antennas do work!

Fig. 5: The UZ9RR QSL card sent after he was worked by Steve Wellon M0SAS on 14MHz PSK.

Fig. 6: The A61BS QSL card sent after he was worked by Steve Wellon M0SAS on 14MHz PSK.

Fig. 7: The QSL card sent by A61BK following a QSO with Peter Lowrie MI5JYK on 28MHz s.s.b. QRP.

Fig. 8: The QSL card from IR4C after he was worked by Eric Masters G0KRT on 28MHz s.s.b.

Next reporter is **Keith Morrison M1VHT** in Hadston, Morpeth, in Northumberland who is enjoying his new station that comprises a Yaesu FT-1000MP Mk.V and a two-element tri-band beam antenna. Thanks to an excellent spell of propagation he used s.s.b. to work TT8PK (Chad), PJ7X (Sint Maarten in the Caribbean) NA-105 (QSL via F6EXV) then OA/OE3NHW (Peru), TU2T (Ivory Coast, Africa), YI1RZ (Iraq), FR5DZ (Reunion) AF-016 (QSL via F6CXV), YN2N (Nicaragua, South America), 5Z4HW (Kenya), 9N7MD (Nepal), XU7SSB (Cambodia), 9L0W (Sierra Leone), HC7AE (Ecuador), ZS2CR (South Africa) and XV1X (Vietnam). No times were given* but that's a fair amount of DX.

Finally, Eric G0KRT used 100W and tried s.s.b. and logged IR4C (Italy), **Fig. 8**, at 1442 (QSL via IZ4NIC), F4FRG (France) 1451 and KY5R (USA) in Alabama at 1501UTC.

Editor's request:** Carl and the* PW *team appreciate your reports, but please ensure you provide full details of your contact, including time, antennas, equipment used, power levels and mode. We publish your reports to help other operators work the DX – not just to record your success! (as good as it may be!)* ***G3XFD.

Signing Off

Everyone seems to have enjoyed better conditions and the openings on the higher bands. As usual my thanks go to **Maurio Pregliasco I1JQJ/KB2TJM** the 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! 73, Carl GW0VSW. ●

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Record Breaking Balloon Flights & APRS

Tim Kirby G4VXE welcomes you to the world of Amateur Radio above 30MHz. This time Tim has news of record breaking balloon flights and, of course, your news!

Welcome to the the *World of VHF* (*WoVHF*) and there's a lot of news to share! On December 11th 2011, an Amateur Radio high altitude balloon using the callsign K6RPT-11 was launched from San Jose in California by **Ron Meadows K6RPT** and his son **Lee** of the California Near Space Project. The balloon reached a cruise altitude of between 105,000 and 115,000 feet. The balloon carried a payload contained in a small polystyrene box of an Automatic Packet Reporting System (APRS) tracker running on 144.390MHz – the North American APRS frequency.

The APRS tracker was powered by four AA batteries. The balloon crossed the USA on a path through California, Nevada, Utah, Colorado, Kansas, Missouri, Illinois, Indiana, Ohio, Pennsylvania, Maryland, Delaware, and New Jersey. As the team saw the balloon head east from the New Jersey they suspected that they wouldn't hear from it again. But, next morning CU2ARA's APRS station in the Azores, retuned specially to 144.390MHz picked up the packets from K6RPT-11!

The balloon was travelling at around 250 kph (160mph) and heading for the European mainland. It crossed the coast just north of Cadiz in Spain and headed across Spain just north of Malaga and Almeria and then out across the Mediterranean Sea – where it was tracked by the APRS station of EB6AOK-3 which had also been retuned to 144.390MHz. By this time, I was tracking the flight on the APRS.FI website and wondered how far it could go. One of the limiting factors for high altitude ballooning is the UV exposure affecting the balloon's fabric.

The balloon had been launched around the Winter equinox to limit its exposure to UV radiation. At 0920z on December 14th, at an altitude of 115,000ft, some hundred or so miles north east of Algiers the balloon burst! Over the next 25 minutes or so, we watched it fall until it fell below EB6AQK's radio horizon and into the waters of the Mediterranean. What a flight! And what a privilege to be able to monitor the flight's progress through the medium of the APRS website.

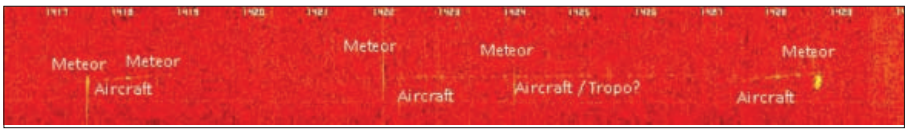

Fig. 1: Tim G4VXE 'recorded' the meteor trails using special software and the high power Graves radar transmitter in France.

We've discussed APRS before in these pages, but this is the first time I think that we've done so in connection with balloon tracking. What an inspiring use of Amateur Radio! Congratulations to the California Near Space Project and also to the various APRS stations, particularly in Europe, who made their facilities available to track the balloon on its historic flight. The balloon travelled 6,236 miles in a time of 57 hours and 2 minutes.

Amateur Radio From The ISS

It was good to hear some activity over the New Year period from the International Space Station (ISS). On December 31st, I heard the ISS in contact with a station at the Historical Museum in Gdansk, Poland and then on January 2nd, I heard the ISS station on 145.800MHz answering children's questions. **Steve Smith G0TDJ** and **Lee Stubbs M6DRS** from Kent also reported hearing this contact.

It's always exciting to hear that the Amateur Radio station from the ISS is active. Although in many ways, the station isn't far away, there's still something magical about being able to listen to a station travelling at 17,500mph above you! Remember, you don't need anything magical to receive the ISS, particularly if it's a good overhead pass – a simple 144MHz f.m. transceiver and a vertical antenna – or even a hand-held will often suffice.

Meteor Scatter

Martin Rigby G4FUI (Penrith, Cumbria) like me, finds meteor scatter (m.s.) fascinating. A quick reminder on this topic is that the mechanism for meteor scatter is that v.h.f. signals can be reflected back to earth when they meet an ionised area of the E-layer which has been created, albeit fleetingly, as meteoric debris enters the atmosphere.

When I mentioned to Martin that I found the GRAVES radar near Dijon in France a useful indicator, Martin suspected that it would be too far from him to be of use as he is something like 1000km from the transmission site. However, he tuned his Yaesu FT-817 to 143.050MHz and using his collinear vertical he soon discovered that he was seeing reflections from the radar and is publishing a real time feed of his observations onto the internet at **http://www.g4fui.net/meteors.html** using the *Argo* and *SpectrumLab* software.

Martin also reminded me of the *R_Meteor* software which you can use on your PC. You run an output from the audio of your rig, in my case tuned to 143.050MHz and feed it into the input of the soundcard on your PC. The software then creates a graphical trace of the signals that you receive. In the example, **Fig. 1**, which I 'recorded' one Sunday afternoon when there was no notable meteor shower activity you can see at least 5 meteor traces – they

are vertical lines. There are also some slanted lines which indicate a longer reflection.

As these lines are slanted upward I suspect these are reflections from an aircraft (presumably flying towards me) – and the slant indicates the Doppler shift on the signals. At one point in the the trace, you can see the line appears horizontal. My suspicion is that at point I am hearing the radar by tropo – hence no Doppler – although it is possible that it is a reflection from an aircraft flying at 90° to me and the radar – and thus exhibiting no Doppler shift. It's fascinating – and you can immediately see the value of displaying the signals graphically.

There are several packages (*SpectrumLab* is a good one, as is *Easygram* – just type them into Google) that you can use to display traces like this if you would like to try it for yourself. Remember, all you need is a 144MHz c.w./s.s.b transceiver and a computer with a soundcard and some sort of interface between the rig and the computer. The crudest method, and I have done this myself, is to just use a microphone connected to the computer, close by the speaker.

Of course, you don't need to limit your experiments to 144MHz. It's well worth monitoring beacon signals on the 50 and 70MHz bands as these exhibit fascinating characteristics too. You'll probably want to choose a beacon that you can only just hear – to make it as interesting as possible. Once you've done some experiments like this, perhaps you will be suitably interested to try some Meteor Scatter tests on the Amateur Bands.

We will come back to the topic in a future column! In the meantime, why not give this a go – it's fun. Be patient – the meteors don't always come to order so you may have to wait some minutes before you hear anything – but you will! As a general rule of thumb, there are usually more sporadic meteors (i.e. not specific showers) in the morning hours (06-09z) but this shouldn't preclude you from listening successfully at other times.

The 50MHz Band

Even when things are quiet, **Mark Marment CT1FJC** (Luz, Algarve in Portugal) always sends an interesting log. Mark had concentrated on Meteor Scatter using the JT6M mode over the Christmas and New Year period. Best DX was S57RR (JN65) at a distance of just over 2000km. However, other stations worked were G0CHE (IO90), F8ZW (JN38), IK5YJY (JN53) and

Fig. 2: Alexandre Castiella F5ICN lives in Tarbes, near Pau in the French Pyrenees (JN03BF) was worked by Tim G4VXE and others on 144MHz.

EA1QT (IN62). Mark had also been pleased to receive QSL cards from OA4TT for his recent 50MHz contacts (**Fig. 3**).

Ernie Stagnetto ZB2FK says that **Ronald Pincho ZB2B** is trying to convince him to put up a beam for 50MHz – and he's tempted! I've replied to Ernie and say that we would welcome his activity on 50MHz during the Es season in particular. But with the F2 conditions improving over the next 18 months or so, if you are tempted to put up a 50MHz beam and make the best of the conditions, now is surely the time to do it!

David Proctor M0IOK (Hull, East Yorkshire) says that he has made a 50MHz half wave vertical antenna called a 'Flowerpot'. David says that it is easy to make and it works very well. The design is available on the website of **Andy Dunham G6OHM** (**http://g6ohm.webs.com**) under the Antenna Designs section. David says that it tuned first time with 15 turns on the plastic water pipe. Definitely worth a look if you fancy playing with a vertical antenna for 50MHz.

The 144MHz Band

Paul Bowen M0PNN (Shropshire) found a very good opening into Germany and the Czech Republic on December 27th. He worked DL6NAA (JO50) at a distance of 1020km and also OK1TEH (JO70) on c.w. at a distance of 1200km. Paul was also very pleased to work DG0OPK (JO50) on JT65A for his first QSO on the digimode. Paul included a screenshot of his signals as decoded at DG0OPK.

David Bowen 2W0ZJA (Brecon) had one contact in the tropo opening on December 27th. David found it hard going from his location with 50W and a 9-element Yagi antenna, but was very pleased to work DL6NAA (JO50) over a distance of 1000km or so.

I checked the Hepburn tropo site (**www.dxinfocentre.com/propagation/hti.htm**) on the afternoon/evening of December 27th and there was a fairly thin duct spreading across the UK in a line from north Essex across to South Wales. Stations within that duct, had a good chance to work some DX, but much further north than that line and the band seemed pretty much flat.

I spoke to **Stewart Cooper GM4AFF** (Stonehaven, Aberdeenshire in Scotland) that evening and unfortunately, there was no DX to be had in Scotland. Here at G4VXE I was also very pleased to work DL6NAA (JO50) as well as DH3NAN (JO50) and DG9YH (JO32) on December 27th.

It was nice to have an E-mail from **Alexandre Castiella F5ICN** (Tarbes, near Pau in France) JN03BF, following

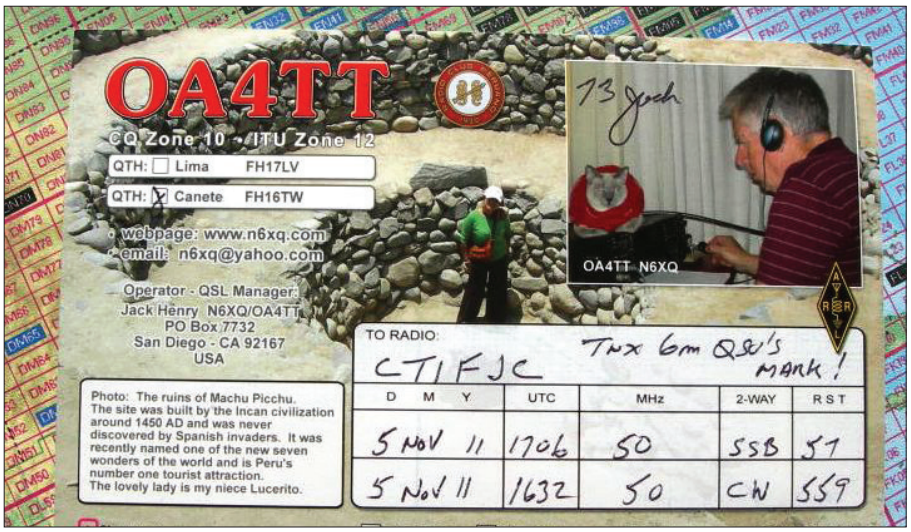

Fig. 3: Mark Marment CT1FJC (who lives in Luz, The Algarve in Portugal) was pleased to receive QSL cards from OA4TT for his recent 50MHz contacts.

on from the opening when I and several others worked him on 144MHz on November 26th. Alexandre has a good QTH about 400m ASL (See **Fig. 2**) and says that there are no obstructions in the direction of the UK for the first part of the path. He has 100W from a Yaesu FT736R and a 17-el F9FT for 144MHz.

Alexandre says that he would like to improve his station and, as he puts it, bring it up to date. He's contemplating a DB6NT transceiver and perhaps trying an SDR receiver, but thinks that the place to start is antennas possibly moving to a 14-element LFA 2 Plus antenna from **Justin G0KSC**. All sounds good and as Alex says, he often makes QSOs with UK stations over paths of 800 to 1000km, so hopefully we shall be hearing much more from him.

Panos Dadis SV1GRN (Athens, Greece) reports that conditions have not been favourable for v.h.f. However, he was pleased to have a 144MHz QRP QSO with SX100A – a Special Event station celebrating 100 years since the battleship *G Averof* was commissioned into the Hellenic Navy.

Peter Goodhall 2E0SQL (Oxford, Oxfordshire) worked 21 stations during the RSGB 144MHz AFS at the start of December. The best DX was G0KPW/P in JO02 . Pete made some QSOs during the RSGB 144MHz UK Activity Contest with the more notable contacts being G4IRC (JO02), G0ODA (IO92), G3PYE/P (JO02) and G0PKT (JO01).

On December 17th 2011 Pete noticed a tweet to say that **Waters & Stanton** (Hockley, Essex) were trying their new Moonbounce array at Hockley, during their Open Day, so Pete was pleased to exchange reports with **Peter Waters G3OJV** operating as **G0PEP.** Pete was active during the Christmas Cumulative contests working mostly the usual suspects, but F8BRK (IN99) and G6HIE (IO90) were two of the more notable contacts.

Steve Smith G0TDJ (Bexleyheath, Kent) wrote that the **North Kent Radio Society** meet in Bexleyheath on 1st and 3rd Tuesdays of each month throughout the year. This, of course, is ideal for participating in the RSGB's UK Activity Contests – especially 144MHz! On January 3rd, they worked 11 stations in the contest, running 15W from a Yaesu FT-857D into a halo antenna.

Steve says that because the club venue is quite close to a number of retail establishments there's quite a lot of local noise, which can make working weak stations quite a challenge. As Steve says, it's not DX but it gives a few stations some extra points and keeps the club active in some way.

Fig. 4: Tim G4VXE has QSO with Rene Voelkel DL6NAA (Leupoldsgruen in Germany), locator JO50. Tim had worked Rene on 144MHz and then (after a c.w. call) also worked him on 432MHz. The photo shows the antenna system at the DL0AR club station, which Rene used for the QSO.

Phil Oakley G0BVD (Great Torrington, Devon) was pleased to make a number of contacts in the RSGB 144MHz AFS contest on December 4th with G0KPW (JO02), G4ZTR (JO01) and G4ODA (IO92) all being good distances from him. Phil sometimes finds the tropo openings to the continent frustrating – but as I've said to him directly – the paths from Devon can be very good and it's just a question of waiting for the right opening!

Nigel Booth M0CVO (Grantham) enjoyed the RSGB's January 144MHz UK Activity contest and the best DX was G4DEZ (JO03). Next day, Nigel was interested to hear the GB3ANG beacon faintly on 144.453MHz – a good distance and an interesting path to experiment with.

I was sorry to hear from **Andy Watts** on Twitter that the GB3JB repeater in Wiltshire had suffered wind damage during the storms in early January and is off air at the time of writing. The GB3JB repeater is an innovative installation and has solar power and (perhaps ironically) wind turbines to supply power.

Dave Boniface G3ZXX writes (on the repeater group's website) that the mast can easily be repaired but that some other work will have to be carried out – so it may, unfortunately, be some time before the repeater is back on the air.

The 432MHz Band

Not much regarding 432MHz to note here at G4VXE with the exception of a very pleasing contact with **Rene Voelkel DL6NAA** (Leupoldsgruen in Germany), locator JO50. We'd worked on 144MHz and I heard him QSY to 432MHz so thought I would take a listen and was really pleased to hear him. He had quite a pile-up, so I dropped my call in on c.w. and was delighted to have a QSO!

Rene has a 16 x 21element Yagi system at the DL0AR club station. It's remarkably sharp and I could easily tell the difference as Rene tweaked the beam heading for stations in different parts of the UK.

Satellite Operations

Peter Goodhall 2E0SQL (Oxford) has made plenty of satellite contacts. Unfortunately, there were no QSOs via AO-51 as the battery is now unable to provide sufficient power. Pete made the best of ARISSAT-1 which has now 'de-orbited'. Pete worked GW1FKY (IO81), PD0RKC, DG1EA (JO31) and IW4BIF (JN64). Pete says that all have had very good signals as the satellite has been getting closer to earth, however the Doppler shift had been getting more significant.

Reports indicate that ARISSAT-1 stopped transmitting on January 4th 2012 – with the last full telemetry being copied around 0602z as the satellite passed over Japan. Pete reckons his QSO with GW1FKY the previous day was probably one of the last via the transponder. On VO-52 Pete worked PE1OXS, F5GVA (JN18), ON5NY (JO10), PA1PAS (JO20), DL2AAZ (JO52) and SP6DCO (JO81). On AO-7 there have been no convenient passes for North America but Pete has had plenty of QSOs with Europe and some Russian stations.

Pete says that with AO-51's demise this has made SO-50 and AO-27 much busier, particularly at weekends. Best news of all, says Pete, is the welcome return of FO-29 on which he worked IK8YSS (JN70), UT1EQ (KO67), OZ1MY (JO65), SV2KGA (KN10) and DG1EA (JO31).

That's all we have room for this month! Thanks for all your news stories – please keep them coming! Until next time! ●

Radio Spectrum under threat!

As users of the Spectrum, the issue is simple: PLA devices are causing interference and if we don't do something now we might not have a hobby take part in – it's that serious. We have created a Spectrum Defence Fund – not just to fight the PLT issue but other threats as and when they come up.

The Spectrum Defence fund is made up from donations from individuals and organisations with an interest in protecting the Radio Spectrum from noise, interference, and other issues that may affect licensed Amateur Radio Operation and Short Wave Listening. It is used to cover the cost of challenging the regulators of the spectrum (Ofcom, EU etc) over threats to spectrum noise level.

We are looking to our administration (Ofcom) to protect our interests, which it is their statutory duty. There are other challenges ahead and the fund will be used only to protect the Spectrum when and where we need to do so. This is a long term project and all monies donated will be 'ring fenced' for these actions alone.

If every amateur in the UK pledged £10 to the Spectrum Defence Fund we'd probably have enough to fight the cause and so we need your donations (no matter how small) to help us meet the threat.

Please help amateur radio and the radio spectrum by donating to the fund today!

RSGB

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Spectrum Defence Fund

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Colin McEwen G3VKQ takes a very practical look at the problems associated with measuring low resitance values.

Measuring Low Values Of Resistance

Measurement principles – a practical Design covering 0 –10Ω.

Most general purpose digital multimeters (d.m.m.) don't offer the ability to measure low values of resistance with any reasonable accuracy. Typically a three-and-a-half 0-1999) digit d.m.m. will have a lowest resistance range of 199.9Ω with accuracy quoted at 1% of reading ±3 digits. This means that a 1Ω resistor should display as 1.0 but the ±3 digits is ±30%!

Measuring low values of resistance with reasonable accuracy presents some special problems. The two main problems are (**a**) generating a suitable test current and (**b**) dealing with the test lead resistance.

A Measurable Voltage

To start the measurement I needed to create a conveniently measurable voltage across the unknown resistance. And if I'm using a digital multimeter as my main instrument, then the industry standard design is 199.9mV (or 200 mV) basic sensitivity.

If I can generate a constant test current of 100mA (accurately!) then this will generate 100mV across a 1Ω resistor and using my multimeter – set to the 199.9mV range – I can measure resistors up to 1.99Ω. (Ohm's Law states that V = I x R). Similarly, if the multimeter is set to the 1.99V range I can measure up to 19.99Ω, provided there's enough power available from the current source.

The calculation also explains why digital multimeters (d.m.m.) don't offer a low ohms range. Normally, the d.m.m. designer aims for reasonable life from a small battery – such as the 9V PP3 (or MN1604). This style of battery cannot deliver 100mA (or not for long!).

Fortunately, most Radio Amateurs don't measure low resistances very frequently. This means that it's feasible to construct a test current source powered by AA or similar batteries and still achieve a useful battery lifetime.

However, before going into the details of the source design, let's look at the effect of test lead resistance.

Lead Resistance

Let's now suppose that I need to measure an unknown resistance which I already know is around half an ohm - but the device is 20 metres away from where the meter can be located. (Perhaps part of an antenna system).

It wouldn't be difficult for each of the two test leads to contribute half an ohm to the set-up, giving 1Ω of test lead and half an ohm of real 'unknown'. Obviously, this isn't a method giving great accuracy!

The standard solution is to use a four-wire test set-up, which is also known as a Kelvin connection, shown in **Fig. 1**. The basic idea is to separate the test current path from the voltage measuring pathway.

The test current flows through the test leads and through the unknown resistor. The voltmeter is connected via separate leads to the unknown resistor. Provided the voltmeter input current is low (easily achieved with a modern digital voltmeter) then the voltmeter reads the true voltage across the unknown resistor.

If the test current is known – then the resistance can be calculated. There has to be enough available voltage from the test current source to drive the test current through the maximum expected value of unknown and test lead resistance.

In practice, the positive current and voltmeter leads can be connected to one test clip, and similarly for the negative leads, as shown in **Fig. 2**.

A Practical Design

The diagram, **Fig. 3**, shows a practical design for a Low Ohms Adapter, covering 0-10Ω and uses a 3V battery made up of two AA cells. It uses an entry-level Digital MultiMeter (d.m.m.) as the voltmeter. (The same d.m.m. is used for setting up the test current).

To see how the idea works, let's assume that the collector current of Tr2 is 100mA (notice that this current must also be passing through the 'unknown' resistance). The emitter current will be slightly greater (about 102mA for a BFY52) and this generates about 0.75 V across R4 (made up from 2 x 15Ω in parallel). The resistors R3 and R2 create a fraction of this voltage, around 0.6V, which is just enough to turn on Tr1.

Resistor R1 provides both the base current of Tr2 and the collector current of Tr1. When Tr1 turns on it robs base current from Tr2. A stable state will be reached when the emitter current of Tr2 generates just enough drop across R4 to maintain Tr1 in conduction (but not saturation). **Note:** The exact value of Tr2 emitter current at the stable state is adjusted via **R3** during the setting-up process.

The design needs about 1V (total) across Tr2 and **R4** – so with a 3V battery a voltage of up to 2V can be generated across the 'unknown' resistor. This should cater for any likely value of test lead resistance and still meet the design aim of measuring up to 10Ω.

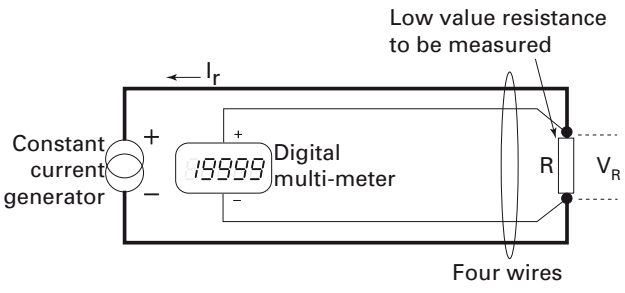

Fig. 1: The four-wire resistance measurement method.

Fig. 2: The physical form of the four-wire connections to test clips.

The Project Lay-Out

The project's layout is not critical and **Fig. 4** and **5**, show the prototype unit. Notice the techniques I've used to avoid discharging the battery unnecessarily. I used a spare pin on the 5-way DIN to disconnect the battery when the unit is packed away – and the test button must be held down to get current.

The switching ensures that if I'm distracted during the measurements – the battery is switched off. I used both techniques in case the button gets held down accidentally when the adapter is packed away in my rather crowded toolbox.

Calibration & Setting Up

To start the calibration connect the test leads via the 5-pin DIN connector – but don't connect the 'unknown' value at this stage. Next, set the d.m.m. to the 20V range. Press the **Test** button and measure the output voltage – this is a battery check. The reading should be about 3V with fresh batteries. Then release the Test button.

Next, set the d.m.m. to the 200mA current range. Press the Test button and adjust **R3** for 100mA. Release Test button and re-set the d.m.m. to the 20V range.

Measurement Of The Unknown

Having checked calibration, connect the unknown and press the Test button. If the 'unknown' is successfully connected, the meter should read 2V or less – possibly much less. If so, release the Test button and reduce voltmeter range to 2V or even 200 mV and repeat the test.

If the unknown value isn't successfully connected – for example due to corroded terminals – the meter will read around 3V (which is out of range). The resistance is calculated as meter reading in volts x 10 (since test current is exactly 0.1A).

Battery Voltage

The first step in setting up checks the battery voltage. If the d.m.m. reading is much less than 3V, check that both the AA cells are fresh and inserted with correct polarity.

In the second step, if it's not possible to get the unit to generate 100mA, and only measures a much lower figure, then check out the following possibilities. Check for wiring errors – if you used Veroboard for construction – check for uncut strips or solder splashes. Check that the test leads are plugged in, but not connected to any unknown, and you remembered to add the link between pins 2 and 4 of the test lead DIN plug.

If you get much more than 100mA, then check that Tr1 really is connected

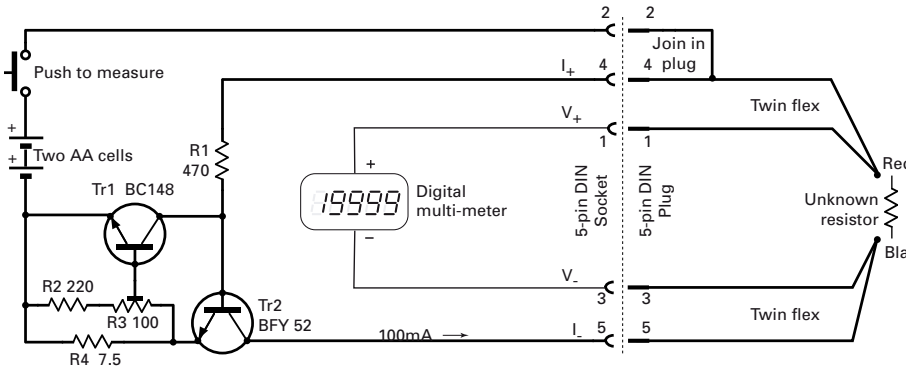

Fig. 3: The complete design of the project.

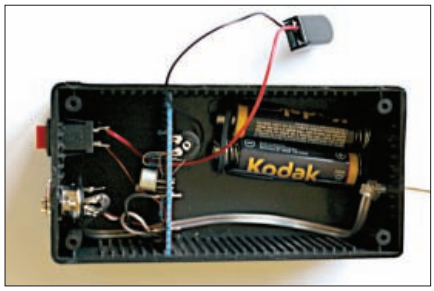

Fig. 4: An overview of construction, showing the simple layout.

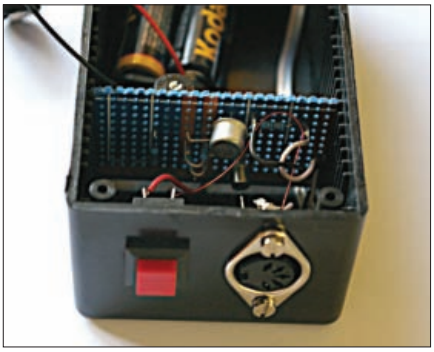

Fig. 5: Looking at the test connector and Test button.

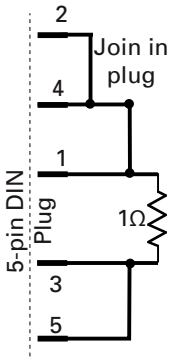

Fig. 6. Test Plug with 1 ohm resistor.

Fig. 7: The 'One ohm in a plug' which Colin uses as as standard value for testing and setting up.

Fig. 8: The internal view of the 1Ω resistor mounted directly onto the pins of the plug.

– a wiring error or dry joint around **R3** is a likely culprit. If you still measure much more than 100mA, then temporarily short the Tr2 base to negative rail – the current should drop to zero. If not, either Tr2 is short-circuit or there is a wiring short.

A Handy Extra

A handy extra for the unit is a '1Ω in a plug'. Buy another 5-pin DIN plug (they aren't expensive) and fit a 1Ω resistor inside, wired as in **Fig. 6** and as you can see in **Fig. 7** and **8.**

When this is connected to the adapter it's possible to measure the resistance and it should be 1Ω± its tolerance. Mark the measured value on the side – I use this to check out the system without having to get several feet of leads out of the box.

Possible Pitfalls

The are some possible pitfalls to the circuit – including blowing the fuse in your d.m.m. So, don't modify this design for test currents much more than 100mA.

The design relies on the accuracy of the d.m.m. to set the current and then measure the voltage drop. However, most d.m.m.s have an internal fuse on the current range which is typically a 200mA 'quick blow' type.

Additionally, users should be aware that some loads cannot accept 100mA – for example small bulbs. Other things may be affected by this level of current – including small motors.

If the d.m.m. shows any significant reading **before** you press the Test switch, then the unknown load has an internal source of power. (It could be charged capacitors or unexpected contact with another supply).

And Finally!

And finally – I've described how you can extend the range of your d.m.m. to cover very low values of resistance. Please keep an eye out for my next article on Test and Measurement Methods and Techniques!

●

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AT-100ProII 100w autotuner £159.00
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Icom IC-R20 manual in Italian £5.00
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Improving The G6MXL 70MHz Station

This month in *What Next?* Colin Redwood describes how he set about improving his 70MHz station and describes a simple 'patch lead tester' unit.

Welcome to *What Next?* (*WN?*) where this time I'm looking at ways to improve the 70MHz station that I described last month. Maybe some of them will spark ideas in readers' minds of ways that they can improve their own stations.

I'm also looking at a technique for joining booms of Yagi and similar antennas which may be useful for readers wanting to transport long booms. Finally, as promised, I am also including details of the patch lead tester to check coaxial cable feeder terminated in any of the popular connectors for continuity and short circuits.

Using Adaptors

As I checked my station, I realised that I was using adaptors on each end of nearly every radio frequency (r.f.) connection. I decided that I would try to reduce the number of adaptors I was using.

You'll probably ask "Why?" The answer is that the main reason was that by eliminating adaptors, there would be one less thing to lose or forget in future. As a secondary reason, adaptors add to losses rather than reduce them. To use an economic expression – the adaptors were not adding any value!

In most cases I decided to change the plugs on the patch leads and antenna feeder to match the sockets on the equipment. In the case of the 70MHz output from the transverter, I replaced the BNC-socket with an N-socket and put an N-plug on the antenna feeder.

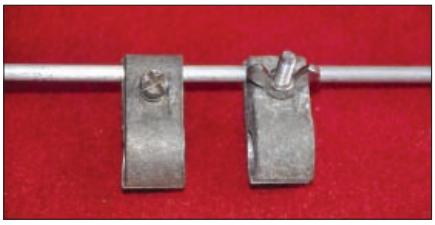

Fig. 2: The M5 screw and wing nut (on the right) used by Colin alongside the old Tonna screw arrangement (on the left).

Fig. 1: The Microwave Modules transverter with the N-socket from Rapid Electronics mounted on the left, replacing the original BNC socket for 70MHz.

Fortunately, Rapid Electronics (**www.rapidonline.com/**) stock N-sockets with their mounting holes centres separated not by the usual 18.25mm but by 12.7mm, like the existing BNC-socket on my transverter. This made swapping the socket on the transverter very easy (**Fig. 1**).

Feeder Length

Although feeder loss at 70MHz is quite low in comparison with 144MHz and the higher bands, I decided to reduce the length of the feeder from about 20m to around 5m. In the unlikely event that I ever need more, I then made the remainder into an extension lead.

I replaced PL259 plug on the equipment end of the feeder with an N-type plug. As my Spectrum Power Amplifier was already fitted with an N socket, I would then be able to connect the antenna feeder to the output of the power amplifier (p.a.) or to the 70MHz output from the transverter without needing adaptors!

Antenna Matching

As I mentioned last month, I needed to clean the matching rod and the clips that attach it to the driven element. Having done this, I set my mind to trying to improve the way that the clips are tightened.

The original screws had a black plastic wing nut moulded on to them. A combination of ultraviolet (UV) radiation from the sun and cold winters caused the black plastic to become brittle and break off.

Underneath the plastic were strange looking screws, which were difficult to turn by any type of screwdriver I tried. I found pliers or an adjustable spanner were the only way to get them to move. I decided to replace the screw arrangement with new M5 set screw hex-head bolts and M5 wing nut **(Fig. 2)**.

I felt that these would provide an easier way to tighten them in the field without the need for tools. I found this is a much more satisfactory arrangement, and something that owners of Tonna 50MHz Yagi antennas may also wish to consider.

Antenna Resonance

I mentioned last month that the 70MHz antenna appeared to be resonant at around 69.1MHz. I was very tempted to cut a few millimetres off the driven element, but without a satisfactory explanation I was a little reluctant to do so.

The model I have is one that I built myself using cut-down elements from a 50MHz Yagi made by Tonna. It uses a design which I originally described in the September 1994 issue of *PW*, which was subsequently reprinted in the *PW* publication *More Out of Thin Air* a few years later (**Fig. 3**).

Then it suddenly came to me! In my original design, I had calculated all lengths as 50.250/70.250MHz of the original 50MHz length. This was fine for the other elements of the antenna, but for the driven element there was a short length of exposed copper and connections in the antenna feed box which would not have changed by 50.250/70.250MHz. I hadn't taken this into account.

I could have done all sorts of careful measurements and calculations, but instead I took a pragmatic approach and cut about 5mm off each side of the driven element. Re-measuring with my MFJ 259B antenna analyser confirmed that this was a good move, as the antenna was now resonant a little higher at around 69.5MHz, but still below 70MHz. I therefore cut another 5mm off each side. Resonance was then about 70.1 MHz. Rather than risking over cutting, I decided to call a halt at this point.

Joining Antenna Booms

Unlike the 50MHz Tonna boom – which was made in three sections – I had used a single boom almost 2.5m in length for my 70MHz version. However, I then found I had to lay the back seat of my car down and very carefully put the antenna boom in so that it went from the rear right (driver's side) of the car to the front left hand side (passenger's side).

With the arrangement described it was just about possible to transport the boom. Unfortunately, it made it difficult for the front passenger to put their seat belt on, and impossible to use the rear seats.

I was reluctant to just reduce the overall length of the boom as I suspected that performance would then suffer. Instead, I decided to cut the boom in half, to make transportation easier and to provide a means of joining the two halves once I'd arrived at my destination.

I purchased short length of square trough-shaped aluminium (from a local DIY store) that would just slot into the square section boom. I also made use of a couple of the joining brackets used by Tonna on the 50MHz beam, which I fortunately kept all these years sub-consciously knowing that one day (17 years later!) they would come in handy.

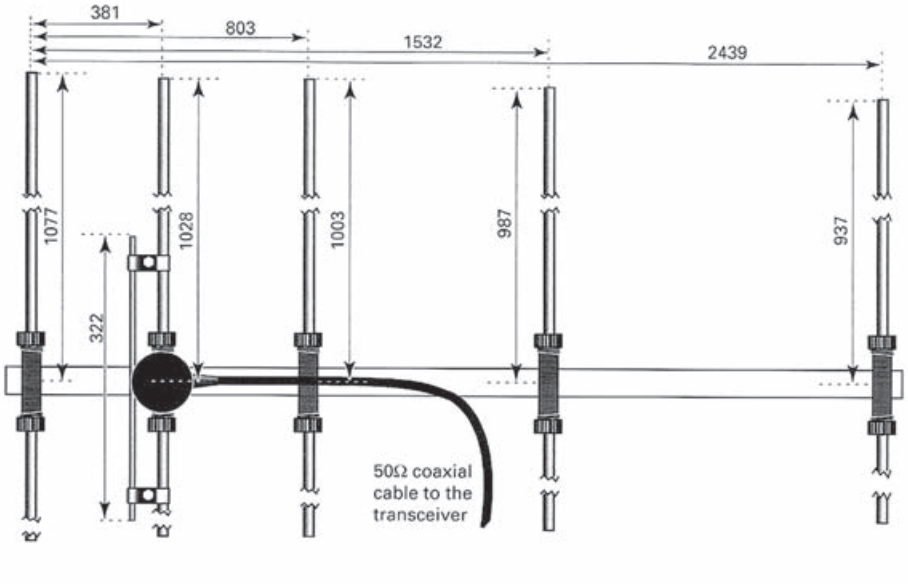

Fig. 3: The original design for the 70MHz beam that appeared in *PW* in September 1994.

Fig. 4: One side of the joint.

Fig. 5: The completed joint.

Using a portable work bench to support the boom, I drilled holes that lined up with the Tonna joining brackets, and then cut the boom in half. I then cut the trough-shaped aluminium to a suitable length and drilled holes through it as well (**Fig. 4**). I then checked it out and found that it all worked remarkably well (**Fig. 5**).

I'm sure that a similar technique could be used with other antenna booms which are too long to easily transport for portable use. The jointing technique could also be used to make really long booms out of multiple lengths of aluminium square section. **Aerial Parts** of Chelmsford (**www.aerial-parts.co.uk**) and **Vortex Antenna Systems** (**www.vortexantennas.co.uk**) both supply boom joining clamps.

Patch Lead Tester

I then decided it would be a good idea to build a patch lead tester. This could make a very simple project for anyone new to construction.

I seem to recall seeing various designs over the years that did all sorts of checks on the r.f. properties of the feeder. However, I settled upon some very simple design criteria.

Firstly, I wanted to be able to test coaxial cable feeder with any combination of the most common connectors found in most shacks, namely PL259, BNC and N. I wanted to be able to check for continuity of the centre core, continuity of the screen, and no short circuits between centre core and screen.

Secondly, as I would be using it infrequently, I decided that it should not need a battery (as the battery would inevitably be flat when I wanted to use it).

Finally, I wanted a design that I could also use to check that the connectors on the end of the feeder were indeed well connected and not intermittent.

In the end I came up with a very simple design (**Fig. 6**) which makes use of a multi-meter on a resistance setting to do the measurements and a pair of each type of r.f. socket. No doubt readers

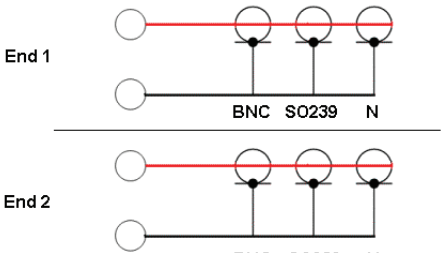

Fig. 6: Circuit diagram of the patch lead tester.

will come up with all sorts of refinements, but this works and does the job for me.

The very simplicity of the patch lead tester means that there is little to go wrong and nothing to calibrate or go out of alignment. This means that it can be relied upon – which for me it the most important thing with test equipment. If you have a multi-meter with an audible continuity setting, then this can be used very effectively.

It would be easy to add other sockets (e.g. SMA, Belling Lee, audio sockets, etc.) that you use. Likewise, there's no need to include a particular type of socket if you don't use it in your station. For the red and black sockets I used 4mm sockets with screw terminals, which also enable tests to be made on open wire feeder.

Electrically Insulated

The panel where the coaxial sockets are mounted must be electrically insulated. Otherwise it will appear that the screen is connected when perhaps it isn't – thus defeating the aim of the project! The size of the box is not critical, as long as it is big enough to have each of the type you use in your shack mounted on the front.

Don't forget to allow enough room between the sockets to be able to tighten the plugs on the feeder you are testing without scratching yourself on the adjacent socket! The box I used measures 15cm x 10cm, which is about right for a pair of N, SO239, BNC and 4mm sockets, with just enough room to add one further pair of smaller sockets at a future date if I ever need to.

I marked out the box with the various holes I would need to drill for each type of socket. I then drilled the holes and de-burred them. For the larger holes needed for the N and SO239 sockets I used a 5/8th inch Q-Max cutter, although those with more patience could no doubt file them out to size.

With the tip of an old screwdriver I carefully gouged a straight groove down the middle of the front of the box between the pair of sockets. In this groove I carefully painted a line in a contrasting colour (white in my case). I thought this would give a more professional finish and clearly indicate in future years the line between 'end 1' sockets and 'end 2' sockets. (**Fig. 7**).

For each socket I needed a solder tag to connect to the screen. My stock of solder tags goes back many years, and they were badly tarnished, so I cleaned each one with some wire wool before tinning. To avoid the risk of melting the box with the heat from the soldering iron, I soldered short lengths of wire between the solder tags from the box.

I then inserted the pairs of sockets and used four suitable screws (M3 or 6BA are ideal), and nuts to secure them together with one already solder tags. I soldered wires from each 'end 1' centre to each other, taking care not to brush the soldering iron against the plastic box. I then repeated the process for the 'end 2' sockets. You can see the inside of the box in **Fig. 8.**

In Use

In use a one end of the feeder is plugged into its appropriate socket on 'end 1' side of the box, and the other end of the feeder is plugged into its appropriate socket on 'end 2' side of the box. Then a multi-meter on a low resistance setting is connected to the two red sockets to check centre core continuity.

Connecting the multimeter still on a low resistance setting to the two black sockets enables the continuity of the screen to be checked. Finally connecting the multi-meter on a high resistance setting to the black and red sockets on the same end will check that the centre core and screen are not shorted out.

For each of these tests, I suggest wiggling the feeder under test around a bit to make sure that there are no intermittent connections or intermittent short circuits. Remember that the design is just testing for direct current (d.c.) continuity and short circuits, so it can't be considered suitable as an adaptor between socket types.

That's It For Now

Well that's it for this month. If you have devised other improvements to your station, I would be pleased to feature them in a future *What Next?* column. I'll also be pleased to receive suggestions for topics that you would like me to feature in the column. See the header for my contact details. Cheerio for now. ●

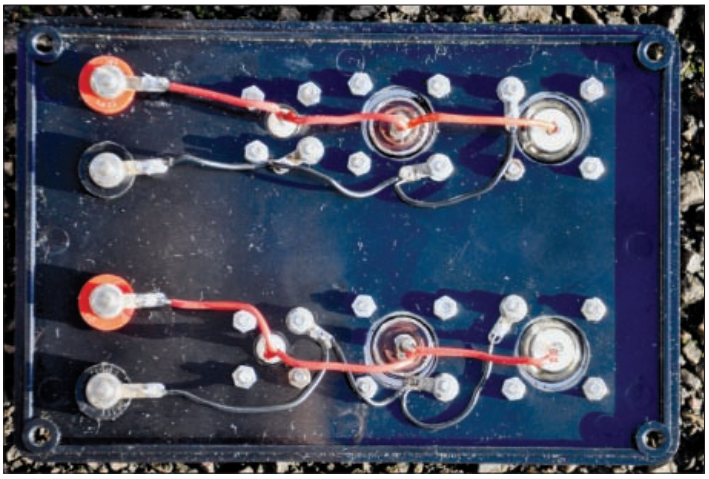

Fig. 8: The inside of the patch lead tester.

Fig. 7: The completed patch lead tester.

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Mike Richards takes a look at the FUNcube Dongle Pro, a software defined radio that is housed in a USB dongle

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Mike Richards stresses the importance of correctly configuring noise reduction units. He offers a roundup of hints and tips about a number of maritime data modes

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Pat Carty takes a first look at the long awaited Kinetic Avionic Products Limited SBS-3 and provides a roundup of visiting aircraft of interest

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Godfrey Manning questions the need for the extensive restrictions on UK airspace to be imposed during July and August

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Robert Connolly offers his view regarding the potential impact of the reorganisation of the UK Coastguard

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Chrissy Brand reminisces about her days at Bush House and states her preference for broadcast reception via the ether rather than a digital stream

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Simon Parker assesses the current state of health of CB and offers an update on the Stabo xm 4006e transceiver. He then brings news of two new high power handheld transceivers from Storm Technologies in the US

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Why is Neutralisation Necessary?

Harry Leeming G3LLL looks back to the time he was busy running an Amateur Radio and Hi-Fi business in the north west of England. In this edition of *In The Shop* Harry aims to answer the question "Why is neutralisation necessary?"

Welcome to *In The Shop* (*ITS*). Last month I mentioned neutralisation, and some of the problems that can occur when replacing power amplifier (p.a.) valves. I would like to cover this matter a little more and first of all I think I should clarify why neutralisation is necessary.

In the early 1900s it was found that the addition of a control grid, to make a diode valve into a triode, enabled the device to act as an amplifier or an oscillator. Amplifying audio signals was quite straightforward, but there were problems when a triode was used as an amplifier at the higher radio frequencies (r.f.).

The diagram, **Fig. 1**, shows a triode valve, wired as an r.f. amplifier, but in practice this circuit wouldn't function satisfactorily at the higher frequencies. A 'component' not physically in the circuit, is the unwanted capacity between the anode and the control grid (c.a.g.). This capacity feeds a small amount of signal back from the anode tuned circuit to the grid tuned circuit.

If the input and output circuits are on **exactly** the same frequency, the feedback will be negative and theoretically this will just reduce the stage gain slightly. In a similar vein you should be able to stand one egg on top of another, if you place them exactly central and vertical. However, in practice keeping the two tuned circuits precisely tuned to exactly the same frequency is about as likely as keeping the eggs balanced!

Once the tuned circuits are a fraction out of step, the feed-back can become positive the stage then oscillates and in doing so 'drowns' the signal it is supposed to be amplifying. Initially this problem was solved by neutralising the stage, as per **Fig. 2**.

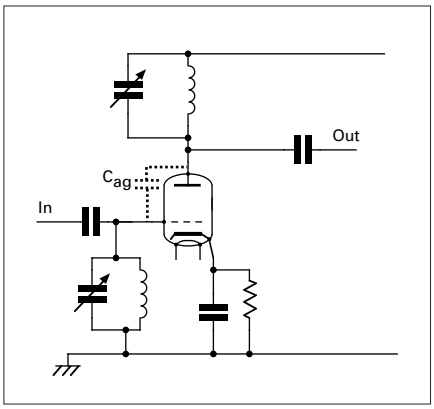


Fig. 1: Here's the illustrations that should have accompanied last month's question. It's a triode amplifier (rather than the pentode shown then) with tuned anode and grid circuits. The dotted capacitor marked Cag is the anode to grid capacitance of the particular valve.

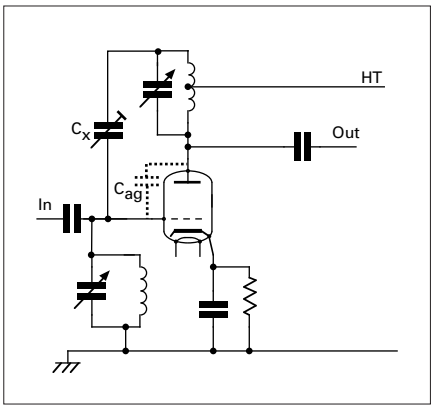


Fig. 2: Adding some neutralisation, via Cx and modifications to the anode inductor, into the circuit of Fig. 1, counteracts the tendency to oscillate, so the stage becomes much more stable and wider band.

Looking at Fig. 2, you can see that the anode coil was centre tapped, and the signal through 'Cx' fed back by Cx. The signal at 'X' is out of phase with the signal on the anode, and if 'Cx' is adjusted to exactly equal the valve's internal anode/grid capacity the feed-back cancels out that capacity and enables the stage to amplify **without** bursting into oscillation.

As far as a tunable multi-stage receiver was concerned neutralising wasn't a very satisfactory answer, as it was difficult to set-up. Eventually the tetrode and then the pentode valves were developed, to amplify at radio frequencies.

The diagram, **Fig. 3**, shows the circuit of the p.a. and driver stages of the FL-50B. The object of the 'screen grid' which is connected to pin 8 of the 12BY7A pentode valve is two-fold. First it alters the characteristics of the valve, so that beyond a certain point the valve anode current depends more on the screen voltage than it does on the anode voltage. Because of this the output impedance of a pentode is higher than that of a triode valve. The higher output impedance increases the stage gain, as it doesn't damp the tuning of the anode tuned circuit, as would a triode, with its lower dynamic impedance.

More importantly, as the name implies, the screen grid 'screens' the control grid from the anode. This very much reduces the internal anode/grid capacity enabling the valve to amplify at radio frequencies without bursting into oscillation.

Note: The extra grid connected to pin 3 and 9 in the 12BY7A is the 'Suppressor Grid'. It's fitted into to stop electrons bouncing back from the anode to the screen (secondary emission), and causing the anode to have 'negative resistance' at certain combinations of voltage, as happened with tetrode valves).

Quantities Up – Prices Down!

In the world of mass production price goes down as quantities go up. Indeed, once when I needed 600 transistors, I found it would be cheaper to order 1000 and throw 400 away! Similarly, in the 1970s, television line output valves were produced in millions, and with competition the price came right down.

A television line output valve is designed to pass large pulses of current, and between the pulses of current the line output transformer in its anode circuit 'rings', (rather like spark coil in older car engines rang when the points opened). This produces very high voltage spikes on the anode which can be stepped up and rectified to provide the extra high tension (e.h.t.) supply to the cathode ray tube (c.r.t).

Because of the high voltage spikes the anode has to be well insulated and for this reason its lead is taken out to a 'top cap' on the glass envelope and not to the base. By a happy coincidence the characteristics and physical construction of a line output valve were quite similar to that of a transmitting power amplifier valve, the main difference being that due to mass production, the price was very much lower.

As the TV valves were not specifically designed to have low inter-electrode capacity, it was a matter of luck as to which type would operate satisfactorily. Yaesu found that some types of line output and video driver valve (made by the two main Japanese manufacturers) enabled them to produce transceivers that, were very competitive on a 'Dollar per Watt' basis.

Over the years, as the frequency range at which receiving valves operate has been extended upwards, they've had to be made smaller and their lead out connections made shorter to keep internal capacity and inductance low enough to ensure stability.

High power valves have to dissipate a considerable amount of heat however, and, so sometimes even those intended for r.f. use can't be made small enough to reduce their internal capacity sufficiently to ensure stability at the higher frequencies and once again neutralisation is resorted to. This is particularly the case when valves intended for audio output, or TV sets, are used in radio transmitters.

The 12BY7A is really a TV video valve but will 'just about' work without neutralisation on the h.f. bands, (although Yaesu did apply a little when they used it in the FT-101). However, the 6JS6C valves definitely need neutralising.

In Fig. 3, the signal from the anode

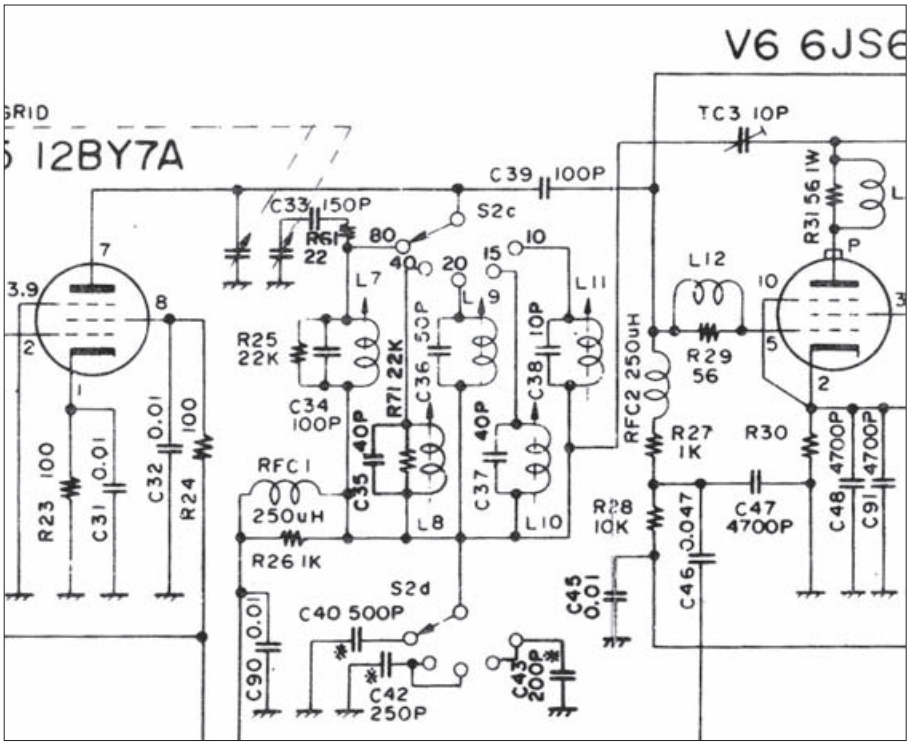


Fig. 3: This is a part circuit that shows the p.a. and driver stages of the FL-50B.

of the p.a. valve is taken via the variable neutralising capacitor TC3. This signal is in phase with the voltage on the anode, and so to cancel out the internal anode/grid capacity it must be applied to the opposite end of the grid coil to that connected to the p.a. valves control grid.

Centre tapping the coils, when multi-band switching is involved, would be difficult. To get over this problem 'bottom capacity coupling' is incorporated with the capacitors C40, C41 and C42, which are switched to allow for slight differences in the optimum neutralisation setting when changing bands.

Note: Some rigs such as the FT-101 use a similar circuit and a single fixed capacitor of about 200pF on all bands. The r.f. choke RFC1 supplies the h.t. to the driver valve, but isolates the r.f. component from the h.t. supply. The neutralising capacitor (TC3) is set so that the signal injected into the bottom end of the p.a. valves grid coil, exactly equals that fed back via the p.a. valves internal capacitance to the top end, cancelling this out and making the stage stable.

That's enough on the subject for now! Next month I'll be taking a look at some of the common faults in the p.a. and driver stages

Harry's Memories

Time for some more of Harry's memories! Just before I wrote the column I had been with my wife **Brenda** to an exhibition of Second World War and 1950s memorabilia at Carnforth railway station (north of Lancaster). And what should I spot but a 'Relay Speaker' – it took me back many years because when I joined the radio trade, a number of households had no 'wireless'. Instead. used "The Relay".

Many years ago a local radio and TV shop would received a couple of BBC stations, amplify them before distributing them around the district on 600 line. A switch on the wall enabled the householder to select the 'Home' and 'Light' programmes, with possibly also a third alternative. When Radio Luxembourg became popular, one relay company in Accrington even installed an AR88, tuned to '208 metres', in a hut on a hill and piped this around to their customers!

By the early 1980s Brenda and I could see no future in the family business as it was and so we rented a small shop in Johnston Street Blackburn. We branched out on our own dealing almost exclusively with Amateur Radio, and the rest of the business closed down.

We will always be grateful to **Ken Perfect** and **Fred Rendal** of **Amateur Electronics Birmingham**, who beside letting us have initial stock on 'sale or return', gave us considerable help and encouragement. We carried on that business until we retired in 1998 and along the way made friends with many of our customers. We also learned quite a lot about running a business!

Running A Business

I'm sure that many *PW* readers will, at sometime, have considered opening

their own retail business. So, perhaps a few words based on our experience won't be out of place.

'Profit' in some quarters seems to be almost a dirty word, but it is the basis of any successful business. To give 'good service' you must be making a profit and it is so easy to get confused, and think that you are doing well, just because the turnover is impressive.

In reality you can soon end up working extremely hard, handling loads of cash, but making little or no profit at all. Putting a cheque for say £1000 into the till may seem exciting – but it's not all your money, from it there will be a supplier, and umpteen other expenses to be paid.

If you are only accustomed to handling only your own domestic accounts, it can be difficult adjusting to the relatively large sums that you will now be dealing with. You can of course install an elaborate computer system, but Brenda's approach to reality was to calculate as near as possible a year's expenses, and then divide it by 52. She knew our approximate profit margin, and so every week she could tot-up our takings, and tell me as whether or not our profit was exceeding expenses.

When calculating the costs, allow for the fact that you may possibly have to spend more protecting yourself against the 'customers' you do not want, than what you spend on advertising for the customers you do want. Of course, it goes without saying that comprehensive insurance is necessary, to cover you for everything from a customer tripping over the door mat, to theft, vandalism, personal attack, and the whole place burning down.

Insurance companies are not charities and they will only insure premises that **they** think are secure. After every break-in, and there will be some, they will demand a step-up in the security.

Forget any idea you have about installing your own alarm system; the main insurers only recognise systems installed by, and maintained by companies that are on their list of approved installers. They are expensive!

In addition to the official security demanded by the insurance company a cheap CCTV system works wonders. When we first opened the shop we had quite a few visits from suspicious characters who were obviously 'casing the joint'.

A friend wired up an old video recorder, and a camera and monitor that he picked up at a rally. The monitor was placed very prominently so that everyone who came in the shop saw their own face and visits from the local Mafia dropped considerably. (Strangely not many Radio Amateurs were seen to produce a comb and adjust their hair style using it!).

Spot the differences and similarities. Construction of the line output valve (on the left) is very similar to the 6146 power amplifier valve on the right.

Windows are easy to break, and so do not even think about putting valuable goods on display unless they are well protected. We started with heavy metal grills on the outside, thieves got through these with bolt cutters and then smashed the window.

We then fitted grills inside and outside of the windows, they still managed to get through. In the end we had to have grills inside and outside the windows while the shop was open, and in addition heavy metal shutters, which came down at night. We were okay then – until the house next door became vacant! When thieves broke in there, and came through the wall, fortunately the alarm went off and after that we had the walls lined with steel sheets.

Security is a constant worry with any small business, and we became extremely allergic to being dragged out of bed in the early hours due to an attempted break in, or a false alarm – and then having to work the next day. In the end we had had enough and in 1998, when I was 62 we retired.

Occasionally we did manage to strike back. Before we had the outside shutters fitted, I spotted **Fagin** (not his real name!), looking in the window. At the time I thought nothing of it but that night the grills were cut, a small hole smashed in the window and a 144MHz hand-held taken.

The 'grape vine' and a conversation heard on CB by a friend pointed the finger at Fagin. He had apparently put someone up to the job – thinking that the 144MHz rig was a scanner.

Nothing could be proved of course, but a few weeks later he turned up with a rather expensive rig which he wanted repairing. Of course 'I spent a lot of time on it, and the bill came to an eye watering amount.

I was quite sure that he realised I had charged a lot, and that he knew why I had overcharged. Perhaps he thought it was some kind of 'honour among thieves' – but he paid up like a lamb!

●

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).

Graham Hankins G8EMX's In Vision
92 Sunningdale Road, Tyseley, Birmingham B11 3QJ
E-mail: g8emx@tiscali.co.uk

Hail and Farewell!

Graham Hankins G8EMX, in his *In Vision* column, bids analogue TV farewell, but does he welcome Digital TV?

Well, it was good while it lasted! But unfortunately, it didn't last very long. "What?" (you may ask) am I talking about? The answer was the new analogue Amateur Television (ATV) 24cm (1.3GHz) receiver, announced by the **British Amateur TV Club** (BATC) only in May 2011. It has now been withdrawn!

After many years no basic analogue receiving kit for 24cm ATV (still the majority ATV mode) BATC announced its new f.m. ATV receiver in its magazine *CQ-TV 233* (May '11) and supplied a 'bare bones' kit made up of a tuner, printed circuit and several 'difficult to obtain' components. But it was the tuner that proved to be the most difficult of the lot!

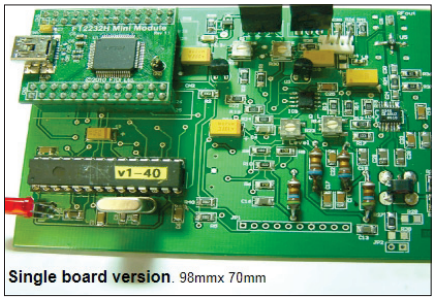
The BATC's chairman **Trevor Brown G8CJS** explains what happened: "The original kits were designed and put together by **Grant Taylor ZL1WTT** in New Zealand. He had another batch of the boards produced, sufficient to match the 20 remaining tuners he had. I located some of the other difficult to source parts in the UK and produced the basic kits. But now Grant has no more tuners!

"The club investigated importing the tuners directly, but we need to order 50+ and it's not clear if they were the 18MHz (i.f.) versions. Either way, we felt we couldn't sell 50 units and I was worried about the tuners not being the 18MHz version".

Trevor concludes by commenting: "Sorry, I've done my best – the problem is not identifying the needs of the ATV community – it's sourcing the solutions in 'Amateur' quantities!" Readers of *In Vision* can download the latest copy of *CQ-TV* by going to **www.batc.org.uk/pw.html**

No Analogue Kits

With no analogue ATV transmitter kit currently available after the withdrawal, is there any solution to helping newcomers to analogue ATV? Contributor to *In Vision*, **Bill Shepherd EI4KB, PA3FDK, G0KPR** makes a request to Office of Communications (Ofcom) saying, "I have been giving some thought to the question of building up the number of users of ATV.



The future of ATV? The new digital TV transmitter from the BATC.

"For many, D(igital) ATV seems especially complex, technically demanding and expensive. Whilst it may become cheaper in the future, currently it seems too demanding. Secondly they may look at the scope of operation and 1.3 and 2.4GHz allow users to operate over moderate distances, using repeaters, though sensitive to terrain limitations. Also, DATV, like f.m. tends to 'drop out' at lower signal levels.

"The 430MHz band is quite a restricted environment in which to operate, even with DATV. We're 'secondary users', priority is given to other users such as Ministry of Defence and Civil Aviation Authority. There's also the needs of other Amateur modes. With sensible precautions it is still possible to operate analogue TV on the microwave bands, but it is challenging for newcomers."

As a result Bill has devised a 'wish list' for Ofcom, stating "Amateur TV needs a simple mode (a.m.) on a decent clear channel (8MHz+) for full sound plus colour. We need cheap, widely available equipment and a frequency that can reach out-of-area. The transmitter should be easy to construct in kit form or available in modules.

"So Ofcom, we would like one old analogue TV broadcast channel. Then we can use the old receivers and TV antennas which we have at home. We hope you will keep one channel for us so that we can feel part of the 'big society'. We promise to use it and not interfere with other users".

Thanks Bill, we'll see! There's certainly no harm in asking!

Digital Switchover

The terrestrial broadcast TV 'digital switchover' takes in the south east of the UK around April or May and the final analogue transmitter to shut will be in Northern Ireland in October. So, how are my efforts to have some of the analogue kit preserved for posterity in a museum going? The answer is not very well!

As I've mentioned before, I had very positive email exchanges with the curators of the **National Media Museum** (NMM) in Bradford, the only place to take any interest in preserving analogue TV equipment at all. Even the London Museum of Science and Industry referred me to the NMM! It appears that storage space is an issue, but I offered some help with that.

All the TV transmitters themselves are now owned by a company called Arqiva, so I wrote to all three of its addresses, plus the manager of my local transmitter at Sutton Coldfield, who very kindly arranged for me to visit the site! He also explained Arqiva's position regarding redundant equipment and I thank him for his time and the information he gave.

The acquisition of other artefacts would have to be a formal matter between the NMM, the company and the transmitter managers. So, I've written to the NMM to explain Arqiva's position as it was explained to me.

My attempts to save some analogue transmission equipment have lasted two years, without help from the previous or present Government's Dept for Culture and Media, or from the RSGB, to whom I wrote seeking support some time ago. So I really have tried to help. Over to the NMM! ●

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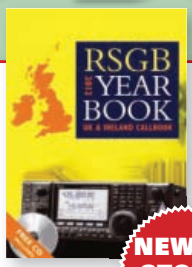

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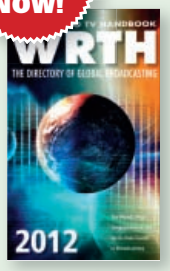

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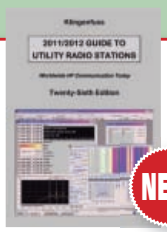

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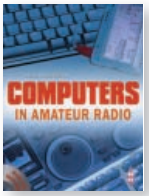

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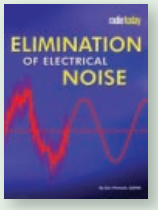

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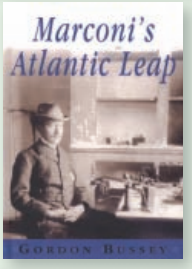

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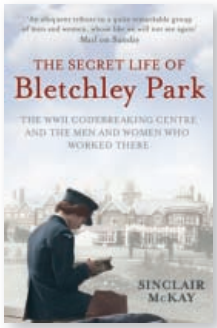

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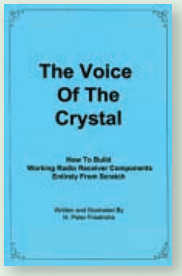

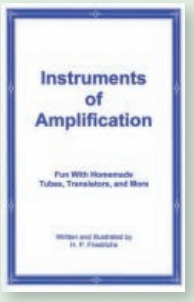

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Rob Mannion G3XFD/EI5IW's

Topical Talk

The Editor discusses ideas suggested by correspondents in this month's *Letters* section. And it seems as though there's possible help on the way for Radio Amateurs who need assistance erecting and maintaining antennas.

I've found the response to my suggestion that we could perhaps organise help for those radio enthusiasts who can't erect or maintain antennas themselves – truly heart warming. Indeed, the response has been overwhelmingly positive.

The letter from **Vinny Hopkins M0TAV** was particularly encouraging and several other readers – who didn't want their responses published, but who are keen to assist.

Although, of course, **Tex Swann G1TEX** and I will be very willing to help with promoting the initiative – I'm afraid that my ladder climbing days are over! Despite this I can fully support Vinny M0TAV and the many others who are keen to assist.

A number of correspondents have stressed the idea that the **Radio Society of Great Britain** (RSGB) should be involved in setting up and running the proposed antenna help scheme – and I fully agree that everyone in Amateur Radio should be involved. Hopefully, if the RSGB does help/or set up a support group of its own to help disadvantaged Amateurs (and listeners!) I would be pleased if *PW* would be invited to participate in the scheme somehow. As far as I'm concerned the old maxim *Together we stand – divided we fall* comes into mind here.

The Antenna That Does Everything?

Mind you – bearing in mind my comments last month that we're all searching for the antenna that does everything and comes free or at least very cheaply and can be held in the hand (see the **Rev. George Dobbs G3RJV**'s comment on this topic in *Letters* this month) – begs the question "What Antenna should we suggest for those in need?" And – of course – the most sensible answer must be "The most suitable...depending on the needs of the user!"

I think that we could find ourselves opening the proverbial *Can of worms (antennas?) here* and I'm immediately reminded of an extremely apt cartoon that appeared in **American Radio Relay League** (ARRL) publications a few years ago. The cartoon showed a typical 'Elmer' type clerk looking after stores (of licences in this case) and the caption conveys the friendly words of the cartoon 'Elmer' very effectively; *"Don't worry, we'll find one to fit your needs!"*

The original cartoon was actually helping to explain the various classes of American Amateur Radio licence to newcomers – but I think it still 'fits' when applied to antennas. Indeed, I'm sure that with the wealth of experience waiting in the wings to help erect and maintain antennas there'll be someone with a pet practical antenna idea that they could share.

When I started off in the hobby the only possible antennas I could erect, were the then almost standard 'long wires'. This type of simple antenna was extremely popular 40 years or more ago as most rigs used pi-tank tuning systems.

Although long wire antennas are still used nowadays – I still occasionally use one myself for portable operation – an antenna tuning unit (a.t.u.) is required with modern transceivers. I've also used long wires at my main QTH, but as regular readers will remember that I have recently been using 100Ω balanced feeder with my inverted V antenna with great success. In fact, just before writing this edition of Topical Talk I had been operating on 14MHz c.w. and there was so little noise present on the band I suspected there was a disconnection – until I heard the DX coming in!

What Antenna Would You Suggest?

So, I'm going to ask the **big** question now readers and I'm sure many of you will be able to answer it! If you were asked to help erect a new h.f. antenna (we'll look at v.h.f./u.h.f. systems later) for someone who couldn't do it effectively for themselves – what would you suggest (bearing in mind the user's requirements)?

Some Radio Amateurs prefer simple vertical antennas for h.f. and some prefer to avoid them for technical reasons (mostly the noise problem). Those Amateurs fortunate enough to have space prefer the traditional dipole fed by open wire balanced feeders. However, what I'd like to know (to share it with our readers) is what relatively simple antenna has worked best for you. Get busy writing to the *Letters* pages please!

Rob Mannion G3XFD/EI5IW

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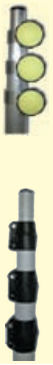
TRIPOD-HDA Free standing, heavy duty, fold away tripod, which adjusts from 50-65mm **£149.95**
TRIPOD-25L Free standing heavy duty tripod to suit masts 65mm or less..... **£79.95**
TRIPOD-20L Free standing heavy duty tripod to suit masts 2 inch or less **£74.95**
TRIPOD-15L Free standing heavy duty tripod to suit masts 1.5 inch or less **£69.95**
TK-36 Heavy duty galvanised pair of T & K brackets, 36 inches total length..... **£49.95**
TK-24 Heavy duty galvanised pair of T & K brackets, 24 inches total length..... **£29.95**
TK-18 Heavy duty galvanised pair of T & K brackets, 18 inches total length..... **£24.95**
TK-12 Heavy duty galvanised pair of T & K brackets, 12 inches total length..... **£19.95**
SO-9 Heavy duty galvanised single stand off bracket, 9 inches total length **£9.95**
SO-6 Heavy duty galvanised single stand off bracket, 9 inches total length **£6.95**
CHIM-D Heavy duty galvanised chimney lashing kit with all fixings, suitable for upto 2 inch **£24.95**
CAR-PLATE Drive on bracket with vertical up stand to suit 1.5 or 2" mounting pole .. **£24.95**
CROSS-2 Heavy duty cross over plate to suit 1.5 to 2" vertical to horizontal pole **£14.95**
JOIN-200 Heavy duty 8 nut joining sleeve to connect 2 X 2" poles together..... **£19.95**
PTM-S Pole mounting bracket with SO239 for mobile whips, suits upto 2" pole . **£19.95**

bhi

NES10-2 Mk3 noise eliminating speaker .. **£112.95**
The NES10-2MKII Noise Eliminating Speaker removes unwanted background noise, hiss, hash computer hash, plasma TV interference, white noise etc from speech so that you can hear the speech much more clearly.

DESKTOP "noise away" robust base station speaker..... **£154.95**
The Desk Top "Noise Away" is a stylish robust base station speaker for use in radio communications, especially amateur radio

Telescopic Masts



TMA-1 Aluminium mast ★ 4 sections 170cm each ★ 45mm to 30mm ★ Approx 20ft erect 6ft collapsed..... **£149.95**
TMA-2 Aluminium mast ★ 8 sections 170cm each ★ 65mm to 30mm ★ Approx 40ft erect 6ft collapsed..... **£249.95**
TMF-1 Fibreglass mast ★ 4 sections 160cm each ★ 50mm to 30mm ★ Approx 20ft erect 6ft collapsed **£149.95**
TMF-1.5 Fibreglass mast ★ 5 sections 200cm each ★ 60mm to 30mm ★ Approx 30ft erect 8ft collapsed..... **£199.95**
TMF-2 Fibreglass mast ★ 5 sections 240cm each ★ 60mm to 30mm ★ Approx 40ft erect 9ft collapsed **£249.95**
TMF-3 Fiberglass mast * 6 sections 240cm each * 65-23mm * Approx 50ft erect 8ft collapsed..... **£299.95**

20ft Mast Sets

(5ft Sections)

These heavy duty masts sets have a lovely push fit swaged sections to give a strong mast set. Ideal for portable or permanent installations . . . also available singly
MSP-125 4 section 1.25inch OD mast set... **£39.95**
MSP-150 4 section 1.50inch OD mast set... **£44.95**
MSP-175 4 section 1.75inch OD mast set... **£49.95**
MSP-200 4 section 2.00inch OD mast set... **£59.95**
MSPX-150 4 section 1.50 inch 5mm scaffold gauge (very heavy duty) **£69.95**

Portable Telescopic Masts

LMA-S Length 17.6ft open 4ft closed 2-1" diameter **£79.95**
LMA-M Length 26ft open 5.5ft closed 2-1" diameter **£89.95**
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 ½m 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 ½m 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 38th thread..... **£3.95**

MFJ Antenna Tuners

New lower prices!

See our website for full details.
AUTOMATIC TUNERS
MFJ-925 Super compact 1.8-30MHz 200W **£174.95**
MFJ-926 remote Mobile ATU 1.6-30MHz 200W..... **£429.95**
MFJ-927 Compact with Power Injector 1.8-30MHz 200W **£254.95**
MFJ-928 Compact with Power Injector 1.8-30MHz 200W..... **£203.95**
MFJ-929 Compact with Random Wire Option 1.8-30MHz 200W **£214.95**
MFJ-991B 1.8-30MHz 150W SSB/100W CW ATU..... **£214.95**
MFJ-993B 1.8-30MHz 300W SSB/150W CW ATU..... **£254.95**
MFJ-994B 1.8-30MHz 600W SSB/300W CW ATU..... **£349.95**
MFJ-998 1.8-30MHz 1.5kW..... **£664.95**
MANUAL TUNERS
MFJ-16010 1.8-30MHz 20W random wire tuner..... **£71.95**
MFJ-902 3.5-30MHz 150W mini travel tuner..... **£102.95**
MFJ-902H 3.5-30MHz 150W mini travel tuner with 4:1 balun..... **£127.95**
MFJ-904 3.5-30MHz 150W mini travel tuner with SWR/PWR..... **£132.95**
MFJ-904H 3.5-30MHz 150W mini travel tuner with SWR/PWR 4:1 balun **£152.95**
MFJ-901B 1.8-30MHz 200W Versa tuner..... **£109.95**
MFJ-971 1.8-30MHz 300W portable tuner **£122.95**
MFJ-945E 1.8-54MHz 300W tuner with meter..... **£134.95**
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 3.6-54MHz 300W tuner with X-needle SWR/WATT..... **£194.95**
MFJ-969 1.8-54MHz 300W all band tuner **£219.95**
MFJ-962D 1.8-30MHz 1500W high power tuner..... **£299.95**
MFJ-986 1.8-30MHz 300W high power differential tuner..... **£359.95**
MFJ-989D 1.8-30MHz 1500W high power roller tuner..... **£399.95**
MFJ-976 1.8-30MHz 1500W balanced line tuner with X-needle SWR/WATT **£479.95**

MFJ Analysers

MFJ-229 UHF Digital Analyser 270-480MHz **£209.95**
MFJ-249B Digital Analyser 1.8-170MHz..... **£269.95**
MFJ-259B Digital Analyser 1.8-170MHz..... **£259.95**
MFJ-269 Digital Analyser 1.8-450MHz..... **£369.95**
MFJ-269PRO Digital Analyser 1.8-170/415-450MHz..... **£389.95**
NEW MFJ-966 Digital Analyser 1.5-490MHz in stock now. **£339.95**

LDG Tuners

LDG Z-817 1.8-54MHz ideal for the Yaesu FT-817 ..... **£119.95**
LDG Z-100 Plus 1.8-54MHz the most popular LDG tuner ... **£134.95**
LDG IT-100 1.8-54MHz ideal for IC-7000..... **£159.95**
LDG Z-11 Pro 1.8-54MHz great portable tuner **£159.95**
LDG KT-100 1.8-54MHz ideal for most Kenwood radios **£174.95**
LDG AT-897Plus 1.8-54MHz for use with Yaesu FT-897..... **£179.95**
LDG AT-100 Pro 1.8-54MHz..... **£199.95**
LDG AT-200 Pro 1.8-54MHz..... **£209.95**
LDG AT-1000 Pro 1.8-54MHz continuously..... **£519.95**
LDG AT-600Pro 1.8-54MHz with upto 600W SSB **£299.95**
LDG YT-450 designed for FT-450 & FT-950 in stock now..... **£224.95**

AVAIR SWR Meters

AV-20 (3.5-150MHz) (Power to 300W)..... **£39.95**
AV-40 (144-470MHz) (Power to 150W)..... **£39.95**
AV-201 (1.8-160MHz) (Power to 1000W) **£49.95**
AV-400 (14-525MHz) (Power to 400W) **£49.95**
AV-601 (1.8-160/140-525MHz) (Power to 1000W)..... **£69.95**
AV-1000 (1.8-160/430-450/800-930/1240-1300MHz) (Power to 400W)..... **£79.95**

MOONRAKER Power Supplies

PS30SWII 25A continuous switch mode PSU with variable output voltage and cigar socket also includes noise offset function. All for just..... **£89.95**

QJ-PS30II 30A continuous, includes lovely large meter displays and large rear terminals for that thick power cable on high powered rigs. Amazing at just..... **£79.95**
QJ-PS50II 50A continuous, same as above with lovely large displays and large rear terminals for that thick power cable on high powered rigs. **£109.95**

NEW 50m Coax Drums

Perfect size reels of cable at the perfect price – why have they not been available before!
From stock we have the following:-
RG58 Standard **£14.95**
RG58 Mil spec **£24.95**
RG213 Mil spec **£59.95**
WESTFLEX 103 ..... **£79.95**

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Check on-line for all updates, new products and special offers

Yaesu are proud to be global sponsors of the T32C Christmas Island DXpedition 2011

The Real DX Compact

The FT-450D 100W HF/50MHz Transceiver

The state-of-the-art IF DSP technology in combination with the Roofing Filter and 8 Band Pass Filters combine in the FT-450D to provide a level of transmit and receive performance only previously available in our high-level base transceivers.

The FT-450D offers world class performance in an incredibly compact package that is ideal for base or DX use.

The FT-450D enabled the T32C Christmas Island DXpedition to achieve 10 World Records!

Total QSOs 213,169
Total Uniques 48,914
CW QSOs 102,216
SSB QSOs 88,416
RTTY QSOs 19,225
10.1 MHz QSOs 16,398
21.0 MHz QSOs 35,489
24.9 MHz QSOs 25,265
North America QSOs 109,327
Oceania QSOs 4,214

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