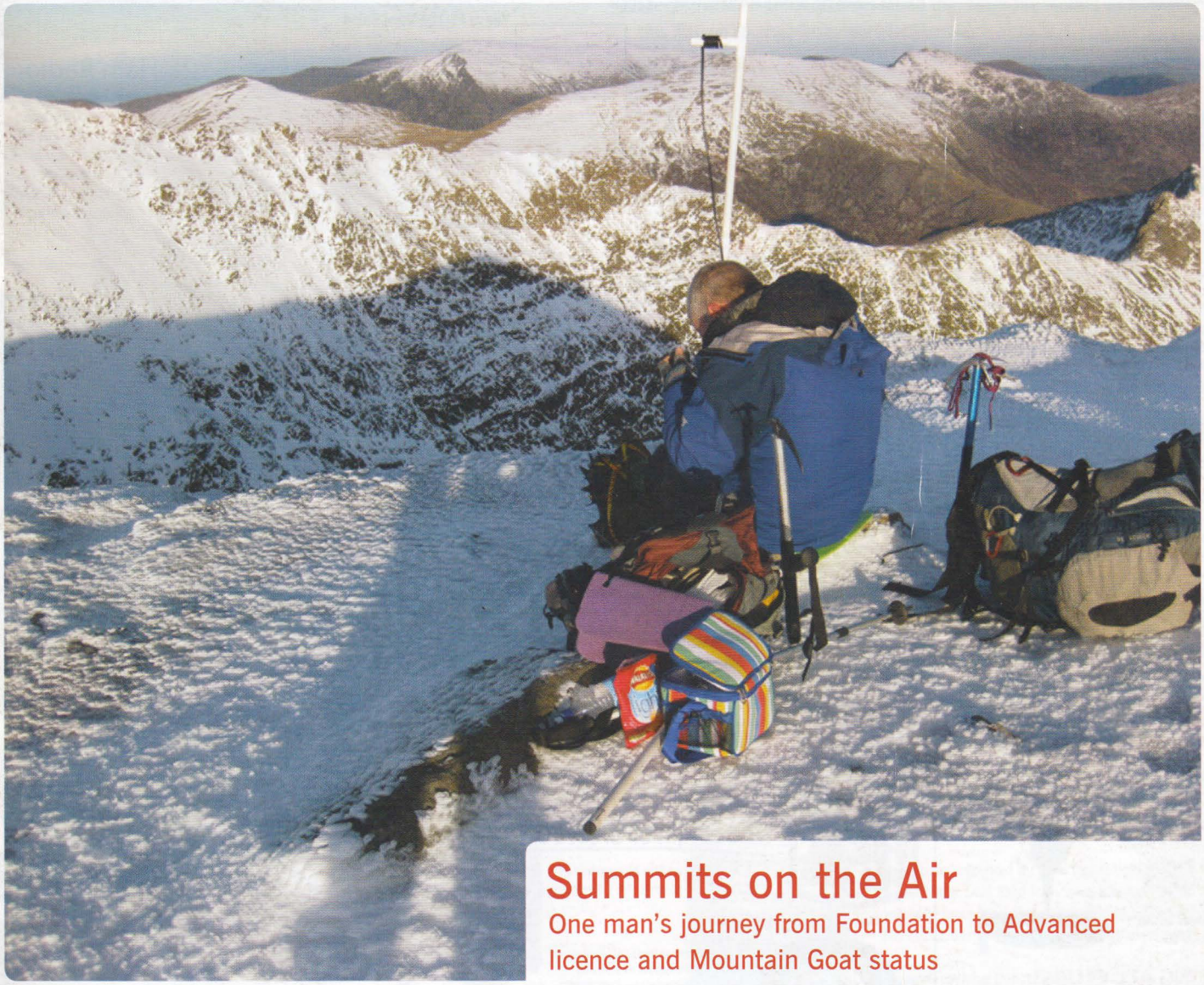
RadCom

RADIO SOCIETY OF GREAT BRITAIN
ADVANCING AMATEUR RADIO SINCE 1913

FEBRUARY 2015
VOLUME 91 ◆ NUMBER 02 ◆ £4.95

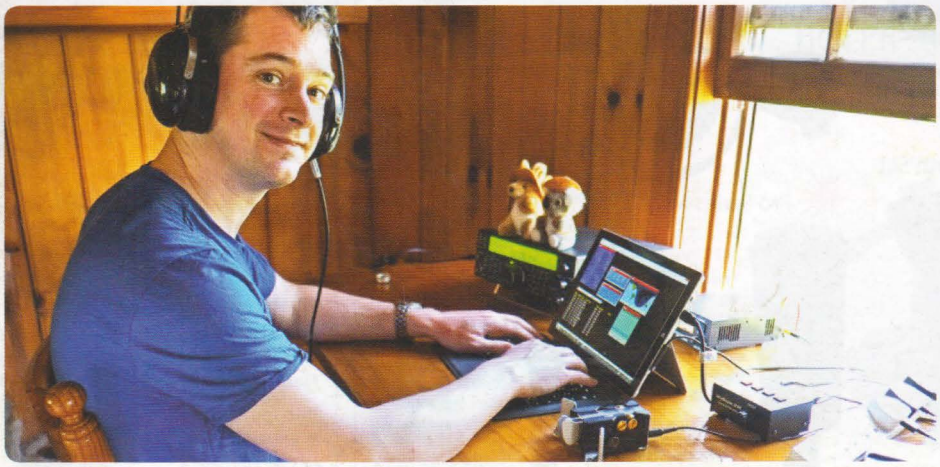


Summits on the Air

One man's journey from Foundation to Advanced licence and Mountain Goat status

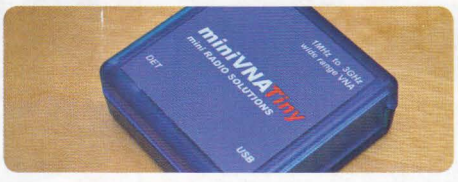
0215

HF



Michael, G7VJR QRV from Norfolk Island (VK9) on 18 and 21MHz

Review



The diminutive miniVNATiny

Design Notes

"Mains power" wherever you need it

WATERS & STANTON

Head Office & Southern Store

Spa House, 22 Main Road, Hockley, Essex SS5 4QS
Phone: (+44) 01702 206835 or 01702 204965
FAX: (+44) 01702 205843
Email: sales@wsplc.com
Opening: Monday - Saturday 9am - 5.30pm

Scotland & Northern Store

W&S @ Jaycee, 20 Woodside Way, Glenrothes
Fife KY7 5DF
Phone: (+44) 0845 5050128
FAX: (+44) 01592 610451
Email: jayceecoms@aol.com
Opening: Tuesday - Saturday 9.15am - 5pm

Web: www.wsplc.com
Blog: blog.wsplc.com

VISA MasterCard PayPal

Sposers of RSGB Club Of The Year

Change Is In The Air!

Things are changing here at W&S. We have recently gone through the "pain" of updating our systems here in Hockley - a task we last carried out 12 years ago. This has resulted in a complete reorganisation requiring a lot of additional work behind the scenes.

We are now ready to launch into a new era at W&S with new levels of service and even more advanced products. All this will begin to show through over the next few months.

As a result of this, we will be recruiting extra staff in the near future, both full time and part time. So if you live within commuting distance of Hockley and are a licended ham or have had experience in radio communications, please mail us your C.V, to sales@wsplc.com.

YAESU Choice of the World's top DX'ers

As the longest serving Yaesu dealer we are able to offer some great deals.

FREE Camera Mic (MH-85 A11U) when you buy an FTM-400DE or FT-1DE from us.
Worth over £100!
Ends 31/3/15

CALLING ALL CLUBS!

£400 waiting for You!

DR-1XE £1159 (Before CashBack)
The Yaesu Digital Repeater.

This is a 19" rack mounted dual band repeater (2m/70cms) that is easy to set up and has power levels of 50/20/5W. A great club project with our £400 cash-back offer. Don't miss out - the offer ends 30/6/15 (subject to stock availability). PHONE!

We've Extended our CashBack Offers!

FTDX5000 Series – CashBack	**£240.00**
FT-450D CashBack	**£64.00**

Valid Until the 31/3/15

And Finally!

Great Deals on Icom & Kenwood

Part Exchange, Cash Back & Offers!

YAESU Choice of the World's top DX'ers

In Stock!

FT-DX1200

Plus 15%Discount off any MFJ items ordered at the same time! (FT-DX1200 only)

£1295 d

FT-450D Special Price £619 !

FT-DX3000 HF & 6m Transceiver £2069

Peter Hart Review in RadCom:
"There is little I could find fault with."

Plus 15%Discount off any MFJ items ordered at the same time! (FT-DX3000 only)

The new HF generation of base stations from Yaesu/ Built in auto ATU with advanced DSP and superb roofing filters.

Yaesu FT-1DE Dual Band With FREE Mic Deal

Phone!!

ICOM ID-5100E

Dual Band FM & D-Star

ID-5100E Regular **£569.96**
ID-5100E Deluxe **£719.95**

* Blue tooth Interface
* Blue Tooth Headset for hands-free
* Suction mount and accessories

YAESU FTM-400DE

Dual Band FM & Fusion

£539.95
With FREE Mic

Grab Yourself a Bargain!

This is Yaesu's great new digital Dual Band Mobile with colour touch screen. Experience the great new Fusion digital system,

W & S are Exclusive Retail Distributors for More Suppliers than ANY OTHER DEALER

Elecraft - Apache Labs - MFJ - Heil Sound - Diamond Antennas - InnovAntennas - Force12 Antennas - Mosley Antennas - TenTec Ham Radio - W2EHY Audio Processing - TigerTronics - AOR - HI-Mound Morse Keys Vectronics - Cushcraft Antennas - HyGain Antennas - Radio works Antennas - Adonis Mics - Ameritron - Avair Meters - Watson Products - Bencher Keys - Butternut Antennas - TGM Antennas - Create Rotators - SPID Rotators - OM Amplifiers - GAP Antennas - Hari Traps & Baluns - Hustler UK Antennas - Kent Special Keys - Microset - Peet Bros - Ramsey - RT Systems - Samlex - SGC - TigerTronics - Tonna - Vibroplex Uniden Bearcat - Buddipole - WestMountain - WoodBox Radio - YouKits - ZX Antennas - - - and MORE!

The Origin of Great Sounding Signals

HEIL SOUND

It All Starts at The Microphone!
W&S Exclusive Ham & Pro Distributors

ProSet Boom Mic.

The favourite of contesters and DXpeditions

ProSet Elite Boom Mic Headset
Large dual headphone & boom mic. with HC-6 element and Phase Reversal System. £179.95 c

ProSet Elite IC Boom Mic Headset
Icom boom set inc Icom lead £189.95 c

ProSet- 6 Boom Mic Headset
Everything that you get with the ProSet Elite other than the phase reversal.
£149.95 c

We can supply matching cables for any radio

ProSet-3 Heaphones

ProSet-3
If you have never tried a pair of professional headphones, then you are in for a big Surprise. The ProSet 3 has a real "WOW" factor. At last you can hear exactly what is coming out of your receiver. Nothing missing and nothing added. A real investment.
£109.95 c

Fist Mic. HMM

The fist mic is back with an acoustic front vent to reduce noise and echo. Typical Heil quality.
Available from stock £79.95 c
Matching Rig leads available

Blue Tooth Set

HBA Blue Tooth Set.
Allows you to dispense with your microphone lead and wander all round the room if needed! For use with PR-781 mics. or other "PR" series microphones. A great idea. £109.95 c

Pro Series Mic

If you are looking for the very best microphone for ham radio, this is the one. Bob Heil designed this for use with top range transceivers using the same element as is used in the best broadcast mics. Available from stock. £179.95

Base Station Mic

Using the broadcast quality HC-6 insert, this is the ideal base station microphone for the modern transceiver with EQ control. This really is great value and gives you Heil quality at a great price. Call us with details of your radio and we advise on matching lead.
£69.95 c

Headset Adaptors for boom mics.
These are **AD-1** codes **£18.95 for each radio type**

Mic. Adaptors
These have **CC** codes
£35.95 for each radio type

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

WANTED DEAD OR ALIVE!

We will accept any ham radio equipment in part exchange, even non-working items in many cases.

Just a Phone Call Away! 01702 203353
email: sales@wsplc.com

UK's Largest Selection of SDR Ham Radio

Justin, G0KSC, designer of the InnovAntenna range, is now our SDR consultant. He will be happy to pass on his experience of SDR from LF to Moonbounce!

Justin Johnson G0KSC

APACHE LABS

ANAN-200DE

We are exclusive distributors of the range of Apache Labs SDR transceivers.

The New ANAN-10BE

Here's is the new intro level transceiver from Apache Labs. 10W output on 160m to 6m with 2 receiver slices and the Apache Labs performance! **£899 Intro Price**

ANAN-100E	100W	**£1958.95 d**
ANAN-100DE	100W (dual Rx)	£2659.95 d
ANAN-200DE	100W (dual Rx)	**£3449.95 d**

The Tmate-2

Allows Apache LAbs & FlexRadio to have analogue VFO and button control surface.
£269.95 c

FlexRadio Systems® Software Defined Radios

Flex-6700

The latest transceiver from Flex radio offers LF - 77MHz operation and receive on 2m. This model has dual hardware receivers.
£5799

Other Models

Flex-6700R	Receiver	**£4699 d**
Flex-6500	Transceiver	**£3499 d**
Flex-6300	Transceiver	**£1699 d**

Flex-1500.
At time of this advert we still have a few left. **£599 c**

Ham Radio "Toys" For 2015

All Mode
Communications receiver
100kHz - 2GHz
USB Powered

The New WATSON W-SDRX1

Every so often a product comes along that takes the market by storm and this Watson receiver looks like being just such a product. This small package embodies a fully featured LF-UHF communications receive.

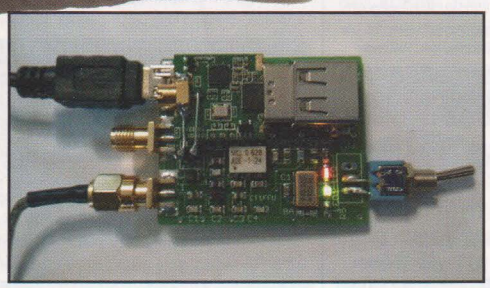
The W-SDRX1 Software Defined Radio (SDR) receiver has a very wide frequency range. This in contrast to the usual cheap USB dongles. This receiver has dedicated sections for HF and VHF/UHF. The additional sections and filters all help to provide a much better dynamic range with good strong signal handling performance.

A great feature of the Watson W-SDRX1 is that the entire frequency range is provided without gaps and all the popular modes of transmission can be received. With two independent antenna connectors (SMA) you can always use the best suited antennas. A small switch on the side of the receiver controls a low-noise pin diode switch for changing from HF to VHF ranges. The selected state (HF/VHF) is indicated by a multi coloured LED. The maximum sampling rate supported by the hardware is 3.2MS/s, but this is usually limited by the software and PC. The result is a sampled panoramic spectrum range of 96 kHz up to 1 MHz. Being USB powered, the W-SDRX1 is an ideal companion for any laptop PC, and providing a great portable travel system.

Operation of the Watson W-SDRX1 receiver is possible with any software which supports the RTL2832 based DVB-T stick. Possible programs are (among others):

SDR# (Windows)
HDSDR (Windows)
sdr-radio.com (Windows)
SDR Touch (Android)
Gnu Radio (Linux)

Another Watson Winner



Just £99.95

Installation of the Watsin W-SDRX1 is simple. It is recommended not to use the windows USB drivers but those provided through the 'Zadig' installer. Most SDR programs (some mentioned above) are free software products, and you will find installation instructions on the various websites of the program authors. The connection to the computer is done with USB, a cable from USB-A connector to USB-Mini-B is required. The PC requirements are very modest and any modern PC should have no problem operating with this radio.

Yaesu FT-991 HF - 70cms up to 100W

£1279

The FT-991 is the next generation in all mode, all band MF/HF/VHF/UHF transceiver with C4FM (System Fusion) Digital capability. The FT-991 includes multi-mode operation on CW, AM, FM, SSB, and Digital Modes (Packet, PSK31, RTTY and C4FM), with 100 Watts of HF/50MHz capability (50 Watts VHF/UHF). You won't pay more than this price, and if the final price is lower you get the lower price.
£100 deposit for forward orders.

Yaesu FT-2DE Digital Touch Screen

£469

This brand new model from Yaesu brings ham radio handhelds even closer to the Smart Phone!

Yaesu have announced the New Digital Portable C4FM – FM 144/430 MHz Dual Band Transceiver, offering easy operation with large touch panel display. Includes built-in high sensitivity 66 ch GPSS. Dual Watch and Dual Monitor, plus lots more.

You won't pay more than this price, and if the final price is lower, you get the lower price. **£50 deposit for forward orders.**

Heil PRO-7

Pro-7 Stabdard (needs CC-1 adaptor **£249**
Pro-7 IC (includes Icom adaptor) **£269**

The new Pro-7 Headset is not a "modified aviation type" but a new Bob Heil design direct from the drawing board. The 2" foam/air ear pads offers luxury comfort and up to -26dB passive noise reduction. The driven elements are tuned to precisely the same free air resonance as the enclosures in which they are seated. This results in extremely low distortion. The mic boom element is freely interchangeable and has a frequency range of up to 12KHz, There is a basic dynamic element for most radios, and an alternative electret insert for Icom radios. The supplied lead is designed to be used with one of Heil's standard CC-1 adaptors. The Pro-7 is available in black, red, blue or pink.

Heil PR-10 Package

The New PR-10 package is the most advanced ham radio base mic. It comprises the dynamic cardioid PR-10 mic together with the LB-1 table top base. The latter has a 3-way LED illumination option (continuous, transmit only or off). The PR-10 uses a 1.125" diameter insert that offers great articulation from 85Hz to 6KHz - just the ideal bandwidth for SSB operation.

The LB1 stand also benefits from fully adjustable angle and estension that offers height adjustment. Requires the use of 2 x AA cells for illimination.

PR-10PKG Mic & Stand (needs CC-1 radio adaptor) **£249**
LB1 Stand (needs CC-1 radiator adaptor) **£99**

PayPal VISA

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

WATERS & STANTON

Head Office & Southern Store

Spa House, 22 Main Road, Hockley, Essex SS5 4QS
Phone: (+44) 01702 206835 or 01702 204965
FAX: (+44) 01702 205843
Email: sales@wsplc.com
Opening: Monday - Saturday 9am - 5.30pm

Scotland & Northern Store

W&S @ Jaycee, 20 Woodside Way, Glenrothes
Fife KY7 5DF
Phone: (+44) 0845 5050128
FAX: (+44) 01592 610451
Email: jayceecoms@aol.com
Opening: Tuesday - Saturday 9.15am - 5pm

Web: www.wsplc.com
Blog: blog.wsplc.com

VISA MasterCard PayPal

MFJ

MFJ-269 HF-UHF Antenna Analyser

Isn't it time that you made antenna adjustments more quickly and more accurately? That's exactly what this analyser does. Improve your antenna performance and have full data information displayed.

* Freq Coverage 1.8-170, 415-450MHz
* Frequency Counter * LCD readout
* SWR & impedance or SWR Bargraph
* Coaxial loss meter * VSWR Meter
* Signal Generator * Freq Counter)

£378c

MFJ-259B HF-VHF Antenna Analyser

* Frequency Coverage 1.8-170MHz
* Frequency Counter * LCD readout
* SWR & impedance or SWR Bargraph
* VSWR Meter * Signal Generator
* Frequency Counter

£279c

AMERITRON AL-811XCE 600W

£929c

Legal limit amplifier with valve peformance and low cost valve replacement cost.

1.8 - 30MHz (Inc WARC) • Output: 600W PEP • Input: 50 Ohms 50W (typ) 100W (max) • Valves: 3 x 811A • Meters: Grid & Plate current Plate Voltage • Matching: Pi-network 50 Ohms • Voltage: 1,500V • Built-in 230V AC supply • By-pass switch • Shielded RF compartment • Matches Solid State Rigs • Switching: Close for transmit • Cooling: Quiet fan 20 cubic fpm • Size: 380 x 350 x 210mm Weight: 14.51kg

MFJ-945E 300W 1.8-50MHz Coax

The small 8W x 2H x 6D inch black aluminum cabinet uses little room. The Cross-Needle meter shows SWR, forward and reflected power -- at a glance

£133.95c

MFJ-971 1.8-30MHz Portable ATU

The MFJ-971 is ideal for portable work and as well as dual ranges of 30W and 300W, it is possible by changing an internal jumper to convert to QRP 6W or 30W FSD. Wire, coax or balanced.

£125.95c

MFJ-941E 1.8-30MHz 300W ATU

Here is amazing value. A cross needle meter, antenna selector switch, and the ability to match wire, coax and balanced feed. This makes a great base station tuner capable of up to 300W and has internal 4:1 balun. 12v illumination

£189.95c

MFJ-949E 300W HF ATU + Load

More Hams use the MFJ-949E ATU than any other model. Match any antenna. Wires, coax, balanced, plus 8-way antenna switch Large 3" cross needle and internal dummy load.

£171.95c

MFJ-993B Auto ATU

One of our most popular auto antenna tuners that will match wire, balanced line and coax feeders. It not only tunes your antenna but also gives you a digital display showing characteristics of the matching.

* Automatically tunes unbalanced/balanced antennas
* 1.8-30 MHz with 4:1 current balun for balanced line
* .Now with 20,000 memories
* Antenna Switch and Efficient L-network design
* .Select 300 Watts (6-1600 Ω) or 150 Watts (6-3200 Ω)
* Digital SWR/Wattmeter Audio SWR meter
* Backlit LCD - Remote control port .- Radio interface

£259c

MFJ-16010 200W Wire Tuner

The MFJ-16010 is a variable L-network random wire antenna tuner designed to match the low output impedance of your transmitter to the high impedance of a random wire. Covers 3.5 - 30MHz.

£68.95c

MFJ-901B

The MFJ-901B is MFJs small and most affordable 200 Watt PEP Versa Tuner. Its designed to match virtually any transmitter (up to 200 Watts and can match coax and end fed antennas.

£109.95c

MFJ-986 1.5kW 1.8-30MHz ATU

Differential-T Tuner uses a differential capacitor making tuning easier. Broadband coverage ends constant re-tuning. A rugged roller inductor atu that handles 1500 Watts PEP SSB power and covers 1.8 - 30 MHz continuously.

£379.95c

MFJ-989D 1.5kW ATU

New and improved! The world's most popular legal limit antenna tuner just got better -- with no increase in price! You get better efficiency, lower losses, and a new true peak-reading meter. Easily handles full 1500 Watts SSB/CW, 1.8 to 30 MHz.

£379.95c

MFJ-962D 1.6kW ATU

The compact MFJ-962D handles 1500 Watts PEP SSB amplifier input power (800 Watts PEP SSB amplifier output power). Its perfect for Ameritrons best selling 800 Watt AL-811H or 600 Watt AL-811 amplifiers!

£289.95c

Tiny Tuner MFJ-902B

Tiny 4 1/2 x 2 1/4 x 3 inch tuner handles full 150 Watts! Covers 80-6 Meters, has tuner bypass switch, tunes nearly anything! Wire or coax.

£98.95c

MFJ-267 1.5kW Power Meter & Load

1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna! Up to 650MHz

£169.95c

MFJ-890UK DX Prediction

• Beacon frequencies: 14.1, 18.110, 21.150, 24.930, 28.200MHz • Configurable to local 60kHz Time Signal • Built-inAtomic-ClockReceiver • Internal jumpers to program • WWVH, WWV, JJY, MSF etc • Manual Sync or Atomic Sync • Green LED shows synchronised time signal • Eighteen Red LED's on World Map LED's light up showing current DX beacon • 5 bands to choose from • Supply 9V int or 12V Ext.

£133.95c

MFJ-914 Auro Tuner Extender

Having problems matching you G5RV with internal ATU? This is your easy answer. Just place between transceiver and antenna. Adjust and operate. Simple!

£86.95c

• 1.8 - 30MHz • 300W • Ideal for rigs with auto ATUs • 7 load positions • Ground & By-pass position • SO-239 sockets • Connection for dummy load • Separate earth terminal • Size 150 x 42 x 90mm • Weight 415g

MFJ-652 Voice Equaliser

MFJ-652 - Voice Band Equaliser (300Hz, 600Hz, 1.2kHz, 2.4kHz center frequencies), low noise Preamp, Universal Mic-Interface, headphone monitor, PTT, Auxiliary-in, RF proof, aluminium case. 71/4W x 21/4H x 5D inches.

£136.95c

MFJ-434 Voicel Keyer

This voice keyer allows you to record and send up to 5 messages with a total time of 75 seconds. You can also set up an auto repeat mode. Great for CQ and contesting.

£204.95c

MFJ-925 for IC-7000 & FT-857

MFJ-925 IntelliTuner™ specifically complements todays compact HF transceivers, such as the IC-706MKIIG, IC-7000, FT-857D, DX-70TH and TS-50S. Operates from 2 - 200W

£174.95c

MFJ-991B 300W Auto ATU

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 VirtualAntennaTM Memories. Like MFJ-993B, less digital SWR/Wattmeter/ LCD display, audio SWR meter/ audio feedback, antenna switch or 4:1 current balun.

£229.95c

MFJ-998RT 1.5kW 1.8 - 30MHz

Weather-tight ABS plastic cabinet top with a stainless steel bottom. Send DC/ RF down the coaxial line. Has MFJ's InstantRecall to see if that requency has been used before. If so, tuning is instantaneous. Measures 13 3/4W x 6 3/4H x 17 1/2D inches. It's the true fit and forget Auto ATU for those using linear amplifiers.

£729.95c

MFJ-994BRT 600W Remote ATY

As you're ragchewing, contesting or DXing, your MFJ IntelliTuner is learning! to operate in milliseconds! We've made this tuner to suit the UK market, so that those with linear amplifiers can enjoy the benefit of auto ATU. Includes coax DC feed.

£389.95c

MFJ-926B 200W Remote ATY

MFJ-926B Automatic Antenna Tuner covers the entire HF band and will match a random wire or coax-fed antenna 1.8 - 30 MHz at a full 200 Watts SSB/CW. Matches impedances 6-1600 Ohms (SWR up to 32:1).

£279.95c

MFJ-993BRT 300W Remote ATU

The Remote IntelliTuner is mounted in a durable hard plastic case. Covers 1.8 to 30 MHz, has heavy duty 16 Amp / 1000 Volt relays and a highly efficient L-network. It also includes the MFJ-4117 BiasTee Power Injector to send DC/RF down your coax.

£329.95c

MFJ-927 200WRemote Auto ATU

Weather protected remote auto tuner for coax/ wire ant., includes MFJ-4116 Power Injector. Most MFJ-929 features, no LCD/buttons. This is a low cost ATU that will get you on all HF bands using just a single wire.

£259.95c

MFJ-402 Nano Size Paddle Key

t's a nano-size 2" x 3" x 1" and weighs just 3 ½ ounces! Speed adjusts 5-65 WPM, weight 25-75%, has lambic mode A or B, normal or "bug" mode and reverse.

£72.95c

MFJ-417 Morse Code Tutor

The really smart way to learn morse code or to increase you speed capability. Carry it with you and learn.

• Microprocessor controlled • Non-volatile memory • Self test • Generates random characters & words • Simulated QSO generator • Group length Farnsworth mode • Tone control 280-1060Hz • Volume control • 3.5mm headphone socket • Supply 9V int. • Size 60 x 25 x 95mm

£78.95c

MFJ-935B Indoor Loop Tuner

Just make yourself a "square" loop of wire around 1/8 wave long and enjoy indoor operation on 40-30m, or 20-17m etc. It really works!

£204.95c

Power rating 150W
• Int Antenna current meter • Carry handle
• No power supply • Size 159 x 242 x 134mm • Weight 1.2kg

MFJ-784B DSP Filter

£294.95c

• DSP filter, fully programmable • 16 Factory pre-sets • Works with any Rx or trcvr • Plugs directly into audio out socket • Drives speaker or headset • Requires 12V DC at approx. 500mA . Improve your old receiver!

MFJ-1026 Noise Cancel Unit

£189.95c

• Frequency range: 1.8 - 30MHz • Max power handling: 100W (Max) • Switching: RF sensed/control • Supply: Ext. 13.8V • Size: 210 x 60 x 150mm

MFJ-1263 Mic. Conntroller

£119.95c

• 2x Separate 8-pin round and 8-pin modular input sockets • Mic select button Mic A & Mic B • Radio select button Radio A & Radio B • Separate speaker i/p & o/p sockets 3.5mm • Aux input 3.5mm • Internal jumpers to match different rigs etc. • Speaker volume control • Speaker On/Off button • PTT socket 1/4in • Headphone socket 1/4in • Rubber feet • Size: 210 x 35 x 140mm • Weight: 575g

MFJ-998 1.5kW Auto ATU

*Full 1500 watts SSB/CW *Digital & Analog SWR/WattMeter *Ultra-fast, Safe Automatic Tuning *Wide Tuning Range (12-1600 Ohms from 1.8 to 30 MHz) *Built-in Antenna Switch for two coax/long wire *Automatic Bypass protects your amplifier *Field Upgradeable Software *Very Compact!

£649.95c

MFJ-901B HF ATU

£109.95c

One of our most popular antenna tuners and offered at a very attractive price. It covers 1.8 - 30MHz and handles 200W. It is very versatile and handles end fed wires, balanced feeder and coax fed systems.

MFJ-704 Low Pass Filter

This filter is the sure way to suppress unwanted and unwelcome harmonics. It cuts off above 40MHz and can handle up to 400W.

£67.95c

MFJ-928 Budget HF Auto ATU

Here's a great budget auto ATU that will handle up to 200W. Designed for coax feeder, it is a great way to add an auto ATU to your base station.

£203.95c

MFJ-4416B Battery Booster

This Super Battery Booster eliminates low voltage problems by boosting input voltages as low as 9 volts up to the desired 13.8 volts at up to 25 amps peak with a typical efficiency of close to 90%. Designed for car use direct from battery or the cigar socket.

£158.95c

MFJ-616 Intelligibility Unit

£194.95c

• Superb audio • Eliminates hum, buzzes, poor frequency response, low audio power • Works with SSB, FM, AM & CW • Four overlapping octave ranges centred at 300, 600, 1200 & 2400Hz • Separate boost/cut controls • Balance control • Immunity to RFI • Front panel phone jack • On/Off speaker switch • Two selectable transceiver inputs • Bypass switch for in/out comparison • Power 12V DC

ORDER NOW!
01702 206835
01702 203353

PayPal VISA

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

Contents

RadCom

THE RADIO SOCIETY OF GREAT BRITAIN'S MEMBERS' MAGAZINE

MANAGING EDITOR:
Elaine Richards, G4LFM
E-mail elaine.richards@rsgb.org.uk
TECHNICAL EDITOR:
Giles Read, G1MFG
E-mail giles.read@rsgb.org.uk

All contributions and correspondence concerning the content of *RadCom* should be posted to: The Editor, *RadCom*, 3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH
Telephone 01234 832 700
Facsimile 01234 831 496
E-mail radcom@rsgb.org.uk

Advertising. All display and classified advertising enquiries (except Members' Ads) should be sent to: Chris Danby, GODWV, Danby Advertising, Fir Trees, Hall Rd, Hainford, Norwich, Norfolk NR10 3LX
Tel/Fax 01603 898 678
E-mail adsales@rsgb.org.uk

Notices to readers concerning errors and omissions and advertisments can be found at www.rsgb.org/radcom

RadCom is published by the Radio Society of Great Britain as its official journal and is sent free and post paid to all Members of the Society. **The March edition of *RadCom* is expected to arrive with most Members by 25 February, although this can take up to a week longer in some cases; international deliveries can take longer still.**

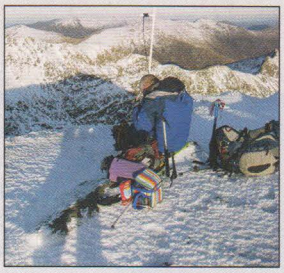
Layout and design by Kevin Williams. Original concept by Imotea Creative Mediadesign.

The online *RadCom* is at www.rsgb.org/radcom/

News and Reports

Features

Reviews



Cover image: Gerald Davison, MW0WML activating Snowdon for Summits on the Air

Photo courtesy of MW0WML

Technical Features

G3BJ used this QRP transceiver to win a contest – read more on page 24

Regulars

2015 Band Plans

The combination of the IARU Region 1 Conference at Varna, spectrum release and Ofcom licence changes are incorporated into the 2015 band plans on pages 36 to 41. The result is quite a contrast between relatively few changes at HF, as opposed to significant alterations in some VHF/Microwave bands.

HF. The updates for 2015 are confined to the addition of a usage note in the 472kHz band and a wider bandwidth all-modes segment in 29.0-29.1MHz that were agreed at Varna. In addition the licence notes that referred to NoVs for 472kHz and 5MHz have been changed to reflect their incorporation into the new licence and indicate that specific conditions apply.

VHF/UHF. The most noticeable feature is that 146-147MHz has been included. However IARU changes and the Ofcom-ETCC packet review also result in changes to the main 145MHz band. Several packet channels have been cleared whilst the bottom of the band is now shared with new narrowband amateur satellite downlinks.

Both 145MHz and other VHF bands see the deletion of old RTTY and FAX channels amongst others to leave more flexible room for all-modes usage. 70cm also sees some change including a more consistent designation for the 12.5kHz operation of Internet gateways. A landmark change is the removal of the UK beacon segment, reflecting the success in moving to standard IARU beacon frequencies.

MICROWAVE. The Ofcom spectrum release changes see the 2350-2390 and 3410-3475MHz ranges removed from the appropriate band plans and some of the remaining frequencies being reset to all modes. In future this may change further as new data and DATV developments become clear. The new 2300-2302MHz segment (if you have the NoV) is incorporated as a separate table. The 10GHz band also sees a clearout of old designations and updates for repeater and wideband usage. A new shaded warning zone in the bottom 10-10.125GHz section indicates where the Primary User now has increased use, having been pressured out of other spectrum.

GENERAL NOTES. These have also been updated, including the need to refer to specific Ofcom conditions and guidance for certain bands. New notes provide an explanation of MGM (Machine Generated Modes) and firm guidance regarding eSSB usage. Another new note, agreed by IARU Region 1 at Varna emphasises that all VHF WSPR frequencies in the band plans are transmitted centre frequencies and not ambiguous dial settings.

FINALLY... As we have said before, band plans are living entities and do evolve over time. Please ensure you only refer or link to the current ones on the RSGB website and remove any older ones you have locally. The band plan including the master Excel files can be found on the Operating section of the RSGB website – and if you are unsure, by all means contact the HF, VHF or microwave Spectrum Manager (via hf.manager@rsgb.org.uk, vhf.manager@rsgb.org.uk or mw.manager@rsgb.org.uk).

Murray Niman, G6JYB
RSGB Spectrum Chair

British Science Week

The annual British Science Week takes place between 13 and 22 March. This exciting ten-day programme is now only a few weeks away and here are some of the many individuals and clubs that have started planning events:

- All Saints Academy, Stoke Ferry Norfolk
- Bath ARC (taking part in the Bath Taps event with Bath University)
- Angel of the North ARC (John Gould, RSGB President, will be giving the keynote presentation at their convention)
- Kevin Richardson, GOPEK
- Silcoates School, Wakefield
- Worcester Radio Amateurs Association

There's still time to get involved, so if you need some inspiration, turn to page 83 to see what two clubs did last year.

New RSGB Director

The RSGB Board recently co-opted an additional Director. Barrie Palin, G4AHK will take a lead responsibility, amongst other areas, for the implementation of the Promotional Plan that is being formulated.

"My interest in radio/electronics started during my school years in the sixties when cycling/fishing and sports consumed my spare time as it did for many, however I needed something to keep me interested during the long dark evenings. I had always been fascinated by tuning around at home on a trusty old valve medium wave receiver which I still have and in the evenings listening to foreign radio stations from countries I only knew existed from my geography lessons and atlas books.

"The acquiring of a radio/electronics kit put me on a pathway to a hobby that would captivate me throughout my adult life in leisure and a professional career within the electrical and lighting industry.

"Looking back, the additional motivation to learn more came from having a couple of pals who were like minded; we would discuss and exchange ideas on our work in progress projects. During my school days I learned how to fix transistor radios; the dead ones were, of course, a good supply of spare parts for other projects as components were expensive for the pocket money that I had available. Local clubs were visited and a visit to a real shack from a local ham stimulated my interest further and an RAE course followed.

"My interest continues with high performance transceivers and of course SDR software developments. Making antennas work at my QTH has always been a challenge, like so many operators these days who have a small garden."

Ofcom Consultation

On 5 January Ofcom published a consultation document on updating the Interference Regulations under the Wireless Telegraphy Act. The aim is cover any interference from modern electronic technology. The Society broadly welcomes Ofcom's proposals although exactly how they will be put into practice and how they will benefit the amateur radio community remains to be clarified. The consultation documents can be found on the Ofcom website and can be reached via tinyurl.com/GB2RS-undue. Following a meeting with Ofcom in mid January, the RSGB has published guidance on the website to help Members understand the background and implications of the proposed Regulations. All amateurs are encouraged to read the guidance and respond to Ofcom by the 16 February deadline.

Volunteer Spotlight

Hello, I'm Roy Taylor, MORRV, retired but still extremely active. I've been interested in radio for more than 30 years but only got around to taking my Foundation licence back in 2006. Since then I've progressed and been helped along the way by many fellow enthusiasts, I enjoy volunteering for RSGB as it's my way of giving something back to the hobby I love. I've been the M6 QSL sub-manager since 2011 and recently added the M3 series to my portfolio.

Yes, it can be a little frustrating when people move, don't have their details on QRZ.com, have no e-mail address or when there are stacks of cards and no envelopes lodged for me to put them in. Sometimes there's a good reason for it and I don't mind helping out and I'm always available to my users, by phone or e-mail. Please can I ask that Members let their QSL Manager know when they change their e-mail address. It really helps.

I run a very active online help forum for Foundation call holders, encouraging them to get involved share things like antenna files, pictures and ask the sort of questions that they might feel embarrassed to ask elsewhere, in the hope that I can give something back.

Moans: People who don't realise that they get cards even if they never send one, then don't collect and those that move up the licence ladder and forget that cards still arrive for up to 5 years after the QSO.

What makes me happy? Seeing my card collection rate increasing!

Oddest Experience? The guy who sent me his collection envelopes with an address on one side and the postage stamps on the back – no call, no Membership number!

Regional and Board elections final call

Elected Director John Rogers, MOJAV is standing down at the next Annual General Meeting and will not be available for re-election. Nominations are now sought for this post accompanied by 10 supporting signatures.

There will also be 5 Regional Manager vacancies for Regions 2, 3, 6, 7 and 11. In Region 3, the current RM, Kath Wilson, M1CNY is prepared to stand for re-election and in Region 11, the current occupant, Pam Helliwell, G7SME is also available for re-election. Nominations for all the Regions with vacancies are welcome accompanied by 10 supporting signatures from Members resident within the respective Region.

Paperwork can be downloaded from the RSGB website (www.rsgb.org.uk/candidatepack) or by post from RSGB HQ. Completed papers must be returned to RSGB HQ by noon on 2 February 2015.

Committee Spotlight

The Contest Committee (CC) has eighteen members and is responsible for defining and running all RSGB contests. A comprehensive in-house developed website is run by the CC with links to all RSGB contest rules, results (past and present) and to the log submission robot.

Adjudication is also performed using in-house developed software and could theoretically produce results totally automatically. However, the CC considers it to be essential that an adjudicator carefully validates each error identified by the software to ensure accurate results. Even with extensive validation, results are often made available within a week of the log submission closing date. The adjudication software also produces reports on the errors found in each log, which can be viewed by each entrant so that they can see where and why points were lost.

Sometimes, points are lost because the rules of the contest have not been followed. More often than not, rule infractions are the result of entrants not reading the rules rather than a deliberate attempt to circumvent them. If you want to enter a contest, please read the rules before the contest starts!

In an attempt to involve contest participants in updating contest rules, a consultation White Paper containing many potential rule changes was issued in May 2014. The reaction to this White Paper from the contesting community was very encouraging with 112 responses received and these responses have contributed to the formulation of the recently published 2015 rules.

A new White Paper will be issued around May 2015 containing suggested rule changes for 2016. If you are interested in contesting, why not sign up for the CC monthly Newsletter (www.rsgbcc.org/cgi-bin/subscribe.pl?subtype=news) so you can receive the latest news from the CC and be notified when the 2015 consultation paper is available for download?

Ian Pawson, G0FCT, Chairman, Contest Committee

CONGRATULATIONS

To the following Members whom our records show as having reached 70, 60 or 50 years' continuous Membership of the RSGB.

70 Years
Mr P J Williams, GW3CZC
Mr J Smith, RS9475

60 Years
Mr B Alderson, G3KJX
Mr GP Rigby, G3KTJ

50 Years
Mr M J Newton, G3UKW
Mr J F Wilson, G3UUT
Mr D Dade, G3XCT
G Moda, I7SWX

RadCom Online

Don't forget that RSGB Members can view the latest edition of *RadCom* online at www.rsgb.org

Click on the Publications tab and then on *RadCom*. You will need your RSGB Membership Services login to view the issue. Those who use this Membership facility have commented that the page turning animation works well and if you want a closer look then the zoom facility is responsive and very clear. Navigation is smooth whether you are turning pages or zooming in to see the detail too.

If you haven't seen *RadCom* online before, why not give it a try?

Correction

The photo of the operators M6ENN and M0NRD on page 48 in the January edition was wrongly attributed. It should have been the GB2FFC group. Our apologies to both groups.

Congratulations

The RSGB would like to congratulate Charles Brookson, G4GBA on being awarded an OBE in the New Year's Honour List. He is Chairman of the Network and Information Security Steering Group and received the honour for his services to telecommunications security.

G14YOTA

Annie, M6RXF on the microphone with Peter, M6PXB logging.

The Youngsters On The Air (YOTA) operation at The Priory Academy Lincoln School of Science and Technology (callsign MX0PSL) on 4 December started at 0830 and continued with only short breaks to change over operators until sign off at 1800. A total of 380 stations were worked on 40m and 20m in over 25 countries with the best DX being the east coast of the USA and Israel. The day was high energy from start to finish. All agreed that the excitement of being the station everyone wanted to contact just had to be experienced. There were highs and lows throughout. The low point was when they were called several times by a KL7 in Alaska on 20m but (despite frantic turning of the Yagi) he somehow got away. It was soon forgotten though when Peter, M6PXB managed to break through a massive pile-up on 20m to work the YOTA station in Slovakia, OM9YOTA and later when James worked HF0YOTA on 40m. The day was a huge success for the school's radio club; becoming a focus for its activities, giving youngsters the opportunity to see another 'cool' side of amateur radio and for dispelling the perception that younger people don't have a voice on the amateur radio bands. The pile-ups during the day left them in no doubt that the YOTA event has captured the imagination of the amateur radio community. The courteousness, patience and interest shown to the young operators during the contacts was a clear demonstration of how the hobby can and should be enriched by young people. They felt privileged to be a small part of sending out that message to the world. Thank you YOTA and thank you RSGB!

Silent Keys

Dr George Brown, MW5ACN/G1VCY, passed away peacefully on the morning of 9 December 2014. An enthusiastic amateur for many years, he served the RSGB in a number of ways including as Technical Editor of *RadCom* from 2000-2006.

Born in 1941 (according to his QRZ.com page), he was originally from near Bishop Auckland and he maintained his soft Durham accent even after many years of living "down South".

He was first licensed as G1VCY but became M5ACN with the introduction of the 'Class A/B' 5WPM Morse licence.

He was the author or editor of a number of books, including *Amateur Radio Essentials*, *Radio and Electronics Cookbook* and *Practical Projects*.

A quiet, reserved, even shy personality, yet despite this a gifted teacher with the ability to put across complex issues in a way that non-technical people could understand. He held Foundation classes at RSGB HQ in Potters Bar and had a 100% success rate.

George had a rare combination of talents: a thorough understanding of all technical aspects of amateur radio combined with a first-class command of the English language. He had tremendous attention to detail: no split infinitive or incorrect use of tenses would slip past George's editorial blue pen! He was also a superb proof-reader and this combination of talents meant the job of *RadCom* Technical Editor could almost have been written for him.

John Dunnington, G3LZQ became a Silent Key on 8 December 2014, passing away peacefully in his sleep. John generously served amateur radio and the Society in many ways, including as DXpedition Fund Manager. He was RSGB Awards Manager from January 2003 until very recently, when poor health obliged him to step down from his roles. John's work was recognised by the Board in 2012 with the presentation of the prestigious Founder's Trophy.

Nigel Wears M0NJW, *of* Silcoates School ARC said, "John supported the club at Silcoates School right from the start. He donated equipment and always would ask 'How are the Silcoates lads doing?' He saw no limits on what a school club should do and was instrumental in introducing the pupils to contesting. He was an unassuming man and much of his support and encouragement of youth work may have gone unnoticed.

"I told the pupils as soon as I found out and some of the older members have decided that our YOTA activity will be in his memory, with a mention on the QSL cards."

QSL Matters

The new Fair Usage policy, issued by the RSGB Board is now in place. Whilst most users of the bureau will notice no change, frequent users, DXpeditions, GB stations and Clubs need to be aware of the new annual allowances for sending cards included within your Membership – 15kg for each Member; 20kg for each affiliated club. There remains no limit on cards received. These limits are per Membership, regardless of how many callsigns are held: they are not an allowance per callsign.

If you have a club callsign recorded against your own Membership number, it is important that you visit the *'My Account'* section on the RSGB website, or contact HQ, to ensure the club is separately listed, with all its callsigns and has its own Membership number.

The changes also include reduced limits on the number of cards to any one destination, now 1kg. All users with typically, 300+, 3g or 250, 4g cards for one address, should now send them direct to the overseas bureau and not via us.

Pease read page 8 of the January *RadCom* and make sure you are up to date with the new policy (details are also on the RSGB website).

G4D & G4R. The bureau says goodbye to a number of its highly valued volunteers who help make the system tick. Tim Beaumont, M0URX has been sub manager for the G4D & G4R groups for over seven years. Tim is stepping down to concentrate on his ever growing QSLing management commitment to the DX community worldwide.
The G4D group is now part of Ian Fugler, G4IIY's expanding remit, with details on the remaining callsigns coming later.

MM SERIES. Two other major supporters of the bureau are also retiring this month, both hard acts to follow. Brian Shearer, MM1HMV has been instrumental in consolidating multiple groups into one MM series, over the past 9 years. It has been a major task for which we are most grateful. Steve Gill, 2M0SGQ is now taking on this active group – see website for details.

ABBREVIATED CONTEST CALLS. Graham Morris, M0AXO, the sub manager for the single letter Contest Call series for around the last 5 years, is retiring for health reasons and we wish him well. This is a major part of our UK distribution with up to 30,000 cards per year. We are now actively seeking a new volunteer for this role, which would perhaps best suit an active contest enthusiast. If you have time, space, commitment, willingness to help others and some computer spreadsheet skills please get in touch.

RSGB shop

FROM P&P FREE OVER £30 SEE PAGE 78 FOR DETAILS

E&OE All prices shown plus p&p

RadCom 2014 Archive

Every year *RadCom* produces well over a thousand pages of amateur radio information. If you want an easy way to search this information and look back over a year then the *RadCom 2014 Archive* is for you. Every page of all twelve editions produced in 2014 are presented in the easy to use and searchable PDF format.

RadCom published a mass of material in 2014 marking a bumper year for its readers. Included there are a massive 55 Construction & Technical Features, 29 Reviews and over 50 other Feature articles. There were equipment reviews from Alinco to Yaesu and much in between. You will also find twelve 'getting started' articles and a host of other material and regular columns too. Everything printed in the magazine in 2014 is included, even the adverts are provided, allowing you to print any of the pages but also search for those specific items you want.

The *RadCom 2014 Archive* also contains the very latest version of Acrobat Reader and additional bonus material including samples from other *RadCom Archive* CDs and RSGB books. If you want to every page from *RadCom* in 2014 and much more besides, the *RadCom 2014 Archive* is simply a bargain.

CD & USB Options

The *RadCom Archive 2014* is available as either the traditional CD version or in a new USB Memory Stick version. Both versions are easy to use and contain the mass of material *RadCom* produced in 2014 along with all the bonus material provided.

Non Members' Price: £14.99
RSGB Members' Price: £12.74

Radio Society of Great Britain **www.rsgbshop.org**
3 Abbey Court, Priory Business Park, Bedford, MK44 3WH. Tel: 01234 832 700 Fax: 01234 831 496

Club of the Year

There is still time to enter the 2014 Club of the Year competition as the closing date is 31 January 2015. The leading club in each Region will then go forward to the National competition. The top three clubs will be awarded their prizes at the 2015 AGM in London. See your local RSGB website for entry details.

UK Events Planner

The RSGB is pleased to announce it will soon be possible for clubs to post their events and activities directly onto the RSGB website where they will be displayed as markers on a map of the country. The UK events planner will be provided as part of RSGB Membership Services for affiliated clubs.

More details on the RSGB website.

Thinking Day

If you are taking part in Thinking Day on the Air on 21 and 22 February please send in a report, no matter how short, to Liz, M0ACL so that she can report the event in *RadCom*. Report forms will be available from Liz via email to lizowl@gmail.com or the website www.guides-on-the-air.co.uk.

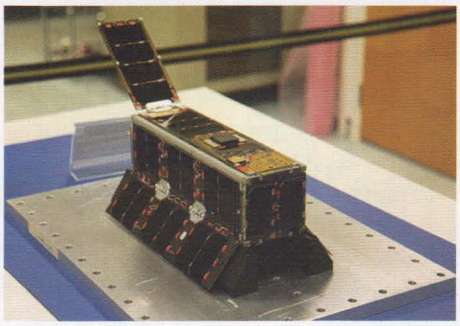
The RSGB would like to welcome to the RSGB family the following new Members who have joined their voice to ours and are helping to keep the RSGB strong.

Mr N Draeger
Mr S Woodlock, 2E0BBN
Mr M A Tinsell-Stanton, 2E0DGG
Mr J Pattinson, 2E0FUR
Mr S Sawyer, 2E0NHR
Mrs C M Vincent, 2E0PCR
Mr P Metters, 2E0PEM
Mr D Darby, 2E0TVZ
Mr W Reeves, 2E0WBR
Mr R Cross, 2I0XDR
Mr W Fulton, 2M0MOK
Mr A Tofarides, 2W0FMD
Mr M Irizarry, AB4KJ
Mr P Everitt, AF6GA
Mr G Bonnet, F4LKG
Mr J Rogerson, G0GEQ
Mr L Hemming, G0HOR
Mr P Waters, G0LRP
Mr J Fossey, G0TUX
Mr E O'Donnell, G1GJF
Mr P Ingham, G6HDD
Mr J Castelow, G6MHR
Mr M Budd, G7JZS
Mr R Williams, G7LND
Mr M Berry, G8BHX
Mr S Hall, G8DGC
Mr C Boon, G8FGZ
Mr D Williams, G8PUO
Mr J Haslip, G8ZAT
Mr E Hawkins, GW4ZEA
Mr K Ruehli, HB9RXB
Mr D Colalto, IZ3LQN
Mr J Sansoterra, K8JRK
Mr G D Pratt, KA7CTG
Mr G Zafiropoulos, KJ6VU
Mr R Lefrancois, KK4OOQ
Mr S Veland, LB5MA
Mr I Lunde, LB6B
LRMD, LY1RMD
Mr C Bloy, M0DQO
Mr T Zasada, M0HAQ
93 Contest Group, M0NTG
Mr S F Astbury, M0SFA
Mr C Kakoutas, M0WCK
Mr S Harris, M0WFO
Mr S Hogan, M1SPH
Mr P Connelly, M3KUS
Mr R Edmonds, M6EOQ
Mr D Levett, M6EUH
Mr P Thompson, M6EVM
Mr P Jenkins, M6EWC
Mr A Holt, M6EXG
Mr S Baldwin, M6EXJ
Mr D Harrison, M6EXQ
Mr S Strange, M6EYP
Mr D Edmondson, M6HDE
Dr G Eibl-Kaye, M6IBL
Mr R Simpson, M6KVT
Mr M Humphries, M6MHU
Mr P Billingham, M6MIY
Mr G Calder, M6NIF
Mr M Wilsher, M6OCB
Mr O Hopkins, M6OKH
Mr O Kelland, M6OKI
Ms R Vincent, M6PUQ
Master M Saunders, M6RUN
Mrs D Bardell, M6RZO
Mr S Ibbotson, M6SJI
Mr S Friend, M6TCI
Mr D Fletcher, M6TMF
Master S Candogan, M6TUZ
Mr T Crouch, M6TZR
Mr D Zorn, M6UDZ
Mr C Easton, M6URL
Dr T Varoudis, M6VAR
Mr K Hunt, M6WBZ
Mr P Attwood, M6WYR
Mr P Smith, M6YPS
Ms S McCann, MM3YGE
Mr C Edwards, MM3YLP
Mr I Learmonth, MM6MVQ
Mr. S McIntosh, MM6ROT
Mr. S Street, MM6ZFG
Mrs S Lee, MOYOG
Mr W Brooks, MW6GUL
Mr I Rogers, MW6IRR
Mr R Hewson, MW6MMI
Mr H Patrick, ON5AV
Mr O Frederiksen, OY1OF
Mrs G Hogan, RS183061
Mr M Brundrit, RS212136
Mr T Wale, RS301357
Mr M Dear, RS301834
Mr S Knapman, RS301847
Miss C Whitfield, RS301848
Mr C Rafferty-Floyd, RS301935
Mr M Byard, RS301942
Mr D Rackham, RS301985
Mr A Gaunt, RS302104
Mr E de Bernardi, RS302108
Rev G Wellington, RS302131
Mr I Franklin, RS302157
Mr D Selwyn, RS302164
Mrs J Brookes, RS302165
Mr D McNiven, RS302250
Mr D Chivers, RS302259
Mr D Walters, RS302280
Mr D Decogan, RS302301
Mr G Reason, RS302308
Mr B McKinlay, RS302327
Mr K Nicholson, RS302414
Mr B Weston, RS302419
Mr J Williamson, RS302464
Mr M Eversley-Gibson, RS302477
Mr P Sweeney, RS302495
Mr K Fisher, RS302522
Mr P Sweeney, RS302588
Mr J Trotman, RS302586
Mr V Afd Amstelveen, RS94826
Mr G Eriksson, SM5XW
Mr G Charron, VE3VCF
Mr P Stanford, VK4GXC
Dr J Burningham, W2XAB
Mr B Rambo, W4WMT
Mr D Forster, W6AXR
Mr S Rogers, W7VI
Mr W Yushkevich, WA1VMA
Mr C R Plaisted, WA1ZDA

The RSGB would like to welcome back the following Members who have rejoined the Society.

Mr D Martin, 2E0DKH
Mr A Jepson, 2E0USA
Miss B Wilson, 2E0YZA
Mr B Jenkins, 2W0JBJ
Mr M Ryall, 2W0LRE
Mr N Powell, EI3JE
Mr M Eastman, G0DDZ
Mr D Cornelius, G0DLD
Mr A G R Grimes, G0GVZ
Mr A Simmonds, G0HND
Mr G Beech, G0KBN
Mr A Baker-Munton, G0KPY
Mr C A Bell, G0PXQ
Mr W J Ford, G0TGP
Mr R J Collins, G0TLC
Mr F Howsam, G0TLL
Mr S Glover, G0UFJ
Mr I Hampson, G1DFT
Mr E Norman, G1GWV
Mr D G Meaton, G1IKD
Mr J Easton, G1ILB
Dr W Morden, G1OHL
Mr K C Chappell, G1OPG
Mr M A Smith, G1PIB
Mr J H Matthews, G3LTG
Mr J C Outen, G3VGU
Mr M Miller, G3ZZO
Mr R G Harris, G4APV
Mr S Metcalfe, G4AZB
Mr T Keats, G4CCN
Mr M J Lang, G4DVK
Mr A Kelly, G4LVK
Mr A W Baxter, G4SIU
Mr A Fry, G4XRS
Mr W Whitecombe, G6SIQ
Mr G Fellows, G7GHP
Mr S Hardes, G7ICV
Mr K J Hadley, G7MRP
Mr A Barnett, G7OLH
Mr J F Leach, G7OXK
Mr M H Mountford, G7POG
Mr C Turner, G8IVI
Mr D Parker, G8OMB
Mr W Burin, G8PDE
Mr A Fraser, G8PWX
Mr R Collis, G8TZU
Mr F Shaw, GM0CDC
Mr W Ferguson, GM6VCV
Mr J H Williams, GW1VRR
Mr W Baker, GW4RGI
Mr W Moore, GW4THK
Mr W J Weston, GW4VKG
Mr S A Richards, GW8LGX
Mr D James, M0BCN
Mr J Bell, M0CON
Mr P G Hawkes, M0ION
Mr J Wieczorek, M0JWT
Mr O Thomas, M0OLE
Mr J B Lovelock, M0SOU
Mr G Turner, M1DHV
Mr J D Grifferty, M1EHM
Mr A A Wilson, M1FBF
Mr I Bardell, M3GXX
Mrs V Leddington, M3SKU
Mr P Sherratt, M3UHN
Mr A Hoyte, M6LLH
Mr A Barter, M6ZAF
Mr D Ankers, MD1CLV
Mr C Campbell, MI6CWC
Mr G Stewart, MM0BIM
Mr C Craig, MM0MRU
Mr D Rumble, MW0JBX
Mr Albert L White, N0TVJ
Mr L G Nachif, PT9KK
Mr V Ferme, VA3VF
Mr I Robinson, ZL2ATD

FUNcube-2 Update



Limited testing of the FUNcube-2 435/145MHz linear transponder on the UKube-1 spacecraft has been undertaken during the recent holiday period. This testing has shown that the transponder is able to work effectively and that it is capable of a similar performance to the transponder already operating on FUNcube-1. AMSAT-UK and the FUNcube team have now submitted a detailed report on the testing to the UK Space Agency, who are the owners and prime operators of the UKube-1 spacecraft. It is expected that a meeting will be held with them late January or early February to plan possible future testing and operations. Details can be found at http://amsat-uk.org/

ML&S Move

Martin Lynch is busy getting the new HQ ready for opening during late January 2015. Not single handed of course, he counted 18 tradesmen on site one day fitting new air conditioning, entrance doors, roller shutters, suspended ceilings, brick walls and even a new passenger lift! The new location has 6000 square feet of space, which is double the previous premises at Chertsey. An Open Day is planned for late March with a Hog Roast in November.

In the middle of all the works, Martin has become a grandfather. Rosemary Anne Lynch was born on 3 December to his eldest son, Dan, who joined the company last year. So, Martin Lynch & Sons & Grand-daughter then?

Bob Heil Awarded

In December, Bob Heil received an Honorary Doctorate from the University of Missouri St Louis. He was recognised by the university for his contributions to the world of broadcast, live and studio sound, and innovations to the amateur radio industry.

Special Event Stations

PA70OV will be on the air to from 6 to 8 February to commemorate Operation Veritable, the successor of Operation Market Garden. Operation Veritable is not known very well and was the battle that formed the prelude to the leap across the Rhine during WWII. Full details at www.pa2p.nl/pa70ov/

The Polish Amateur Radio Society (PZK) is celebrating its 85th anniversary and the 90th anniversary of the IARU during 2015. Until 30 April, twelve special event stations will be on the air: 3Z90IARU, HF90IARU, SN90IARU, SO90IARU, SP90IARU, SQ90IARU, 3Z85PZK, HF85PZK, SN85PZK, SO85PZK, SP85PZK and SQ85PZK. Full details on available awards and operations are at http://85.pzk.org.pl/

HE200GE commemorates the 200th anniversary of Geneva's entrance into the Swiss Confederation. The beginnings of modern Switzerland go back to the year 1291, when the three German language Alpine forest areas signed the Federal Charter. Over the centuries more cantons allied themselves to the original three and among the last was the Republic of Geneva on 19th May 1815. HE200GE will be active on all amateur bands throughout 2015 and contacts will be valid for the Diploma of Genève. QSL via HB9AOF.

New repeater

LAMCO are to sponsor the installation of a Yaesu Digital Fusion Repeater that will be used to replace the equipment currently in use by GB3HS (145.650MHz) at High Hunsley. This will not affect current users of the GB3HS analogue service and the repeater will perform much as it does now but it will allow those users with Yaesu Fusion equipment to use a digital repeater. It will also support cross mode contacts. There will not be an internet connection as that functionality is still in development. Reports and comments are welcome on the Group's forum at www.eyrg.net

Space Funding

Heathland School in Hounslow, West London, recently applied for funding from UK Space Agency in the 2014 Space for All programme. They have just heard that they have been successful in their application and will shortly be spending the £567 award on a FUNcube Dongle and the installation of a low noise preamp, coax and omnidirectional antenna. They are also planning to involve students in the building of some VHF Yagi antennas as well. The schools grant application specifically focused on the educational outreach opportunities of using the UKube-1 and FUNcube-1 amateur radio spacecraft.

Congratulations to the school and to David, G0MRF who supported the proposal.

Equipment on Facebook

A new Facebook group called I Take Pictures Of Communication Equipment has been launched. It is open to all amateur radio operators, engineers plus everyone in between. Visit at www.facebook.com/groups/Itakepicturesofcommunicationequipment/

Furness Ham History

Chris, M0KPW is looking for people who have information on the history of amateur radio in the Furness area (Barrow in Furness, Dalton, Ulverston and the surrounding areas), between 1950 to 1970. He is looking for information on activities in the areas around that time, old photographs, facts, anecdotes etc to help him put together a talk about the history of radio in the area. If you live in the areas, used to live in the area, or have visited the area over the years, and have any information please contact Chris by visiting m0kpw.com or emailing furnessamateurradio@outlook.com.

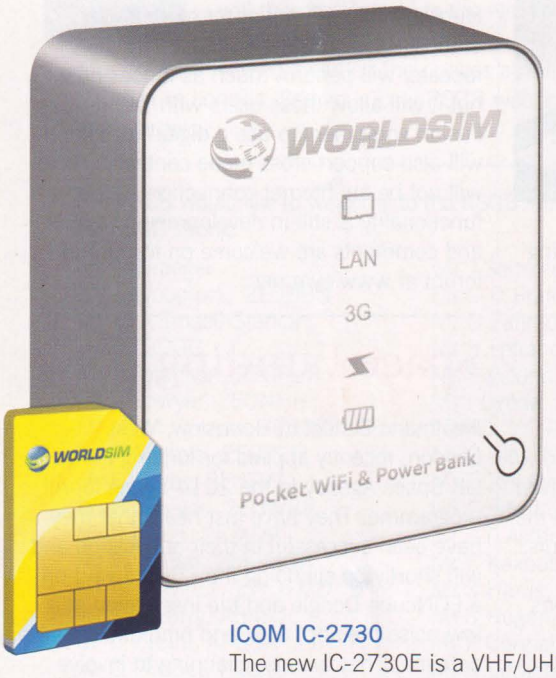
New Products

In the marketplace this month

WATSON SDR RECEIVER

The new Watson SDR receiver has full coverage from 100kHz to 2GHz with independent antenna inputs for HF and VHF/UHF. The receiver also has low noise PIN-diode band switching, a mini USB connector and a double balanced mixer for the diode ring mixer. The software is freeware and easily installed on most machines. The retail price is £99.95 plus £6 delivery. Details at www.wsplc.com

WIRELESS ROUTER



The WorldSIM Tri-Fi is an unlocked wireless router giving worldwide internet on the go, a power bank and storage device all rolled into one. International travellers can get online anywhere in the world on multiple devices simultaneously with the convenience of storing up to 32GB of files. It has an Ethernet port for places that still provide internet via cable rather than Wi-Fi. For more information please visit www.worldsim.com

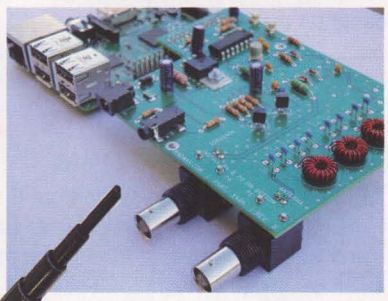
ICOM IC-2730

The new IC-2730E is a VHF/UHF dual band mobile transceiver with simultaneous receive capability as well as VHF/UHF receive. It has an independent tuning knob, separate controller and large display for easy, intuitive mobile operation. The rig also has optional Bluetooth capability allowing you to control the IC-2730E with the optional VS-3 Bluetooth headset. There is 50W output on both VHF and UHF as well as 1000 memory channels. The IC-2730E will be available early 2015 from all authorised Icom amateur radio dealers with a suggested selling price of £299.95 (inc VAT). A full spec can be found at www.icomuk.co.uk

TEST EQUIPMENT

The BOXA-TEST from SOTABEAMS is a set of four different RF loads in one small box that can be used for a variety of purposes. The loads can be used to calibrate VSWR meters and antenna analysers. They are handy for providing a confidence check for network analysers, to compare antenna tuners and to check baluns too. The 250Ω load can also be used to measure the loss of coax cables. The following loads are included: 50, 100, 250 and 5000Ω. The BOXA-TEST is available as a kit or fully built in an aluminium enclosure. See www.sotabeams.co.uk

SKYP1-40

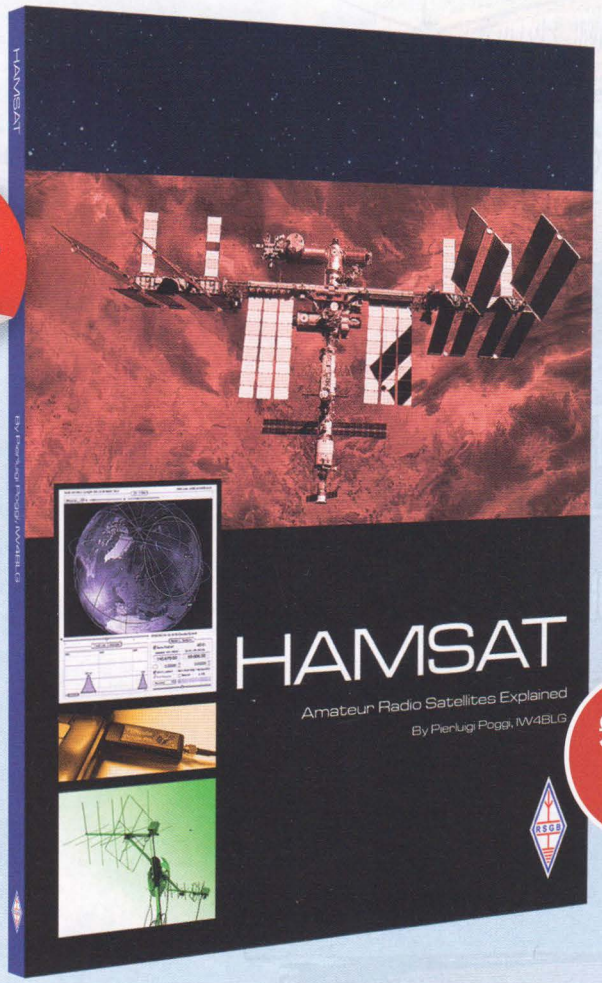


The SkyPi-40 is a software defined radio 40m transmitter that works with the Raspberry Pi Model B or B+ available from RadWAV. So far it supports CW, RTTY and WSPR. There is an optional receiver port. The SkyPi is a 1 watt radio supplied as a kit or fully-assembled, that transmits these new efficient modes using open-source software and with no PC required. Full details at www.radwav.com

SPIDERBEAM

Nevada has been appointed dealers for the Spiderbeam range from Germany. Spiderbeam are well known to DXpeditions for their telescopic fibreglass poles and lightweight beam antennas, but they also make a range of aluminium telescopic poles that will be of interest for home installations. The fibreglass poles are ideal for holiday and travel operations since they collapse to just over 1 metre in length, for the 12m HD version, and prices start from £79.95. The photograph shows the 26m pole with accessories. www.nevadaradio.co.uk

NEW



£8.49
RSGB Members' Price

Hamsat

Amateur Radio Satellites Explained

By Pierluigi Poggi, IW4BLG

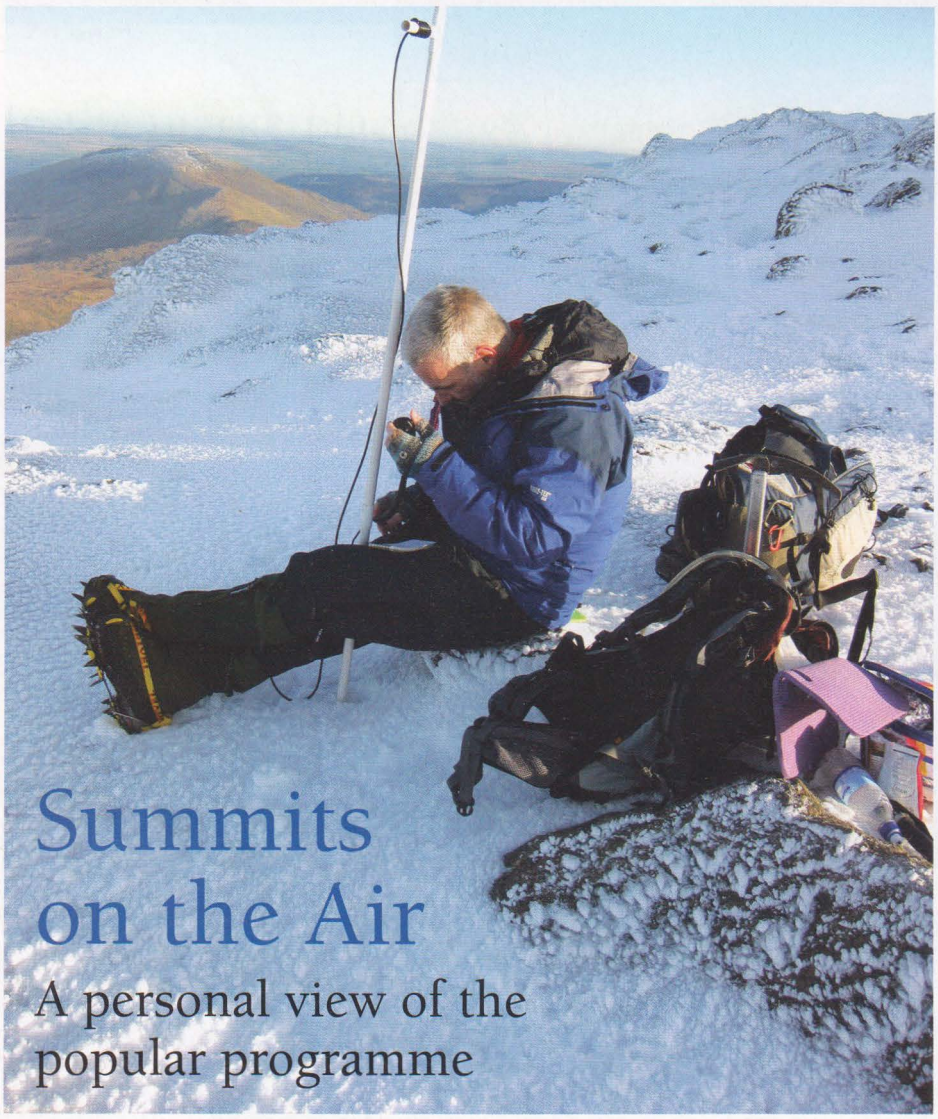
Since the launch of Sputnik back in 1957, Radio Amateurs have been listening to artificial satellites orbiting above the Earth. A mere four years after the launch of Sputnik, Radio Amateurs put their own satellite into orbit, thus beginning a series of amateur satellite launches that continues over 50 years later with the CubeSat operations of today. *Hamsat - Amateur Radio Satellites Explained* sets out to give you details of what you need to know about Amateur Radio Satellite operation.

Hamsat - Amateur Radio Satellites Explained begins with the history of the OSCAR (Orbiting Satellite Carrying Amateur Radio) programme that details the various incarnations from Oscar 1 in 1961 through to the present day. This book explains what is needed in an amateur radio ground station from the antenna through to the receiver. You will find rotator information for tracking the satellite, designs for pre-amplifiers and all manner of technical detail. There is a chapter dedicated to the ground station antennas, giving details of the performance of many commercially available systems and information on 'The Endless Dilemma of Polarisation'. You will also find chapters dedicated to Ground-Space-Ground Propagation, the Doppler Effect, Keplerian Elements and much else too. There is information on suitable transceivers, software, recent developments in this exciting field plus much more.

For anyone interested in operating Amateur Radio satellites *Hamsat - Amateur Radio Satellites Explained* is the book to have. It provides a guide to the history through to what is possible with amateur radio dongles and much more beside.

Size: 174x240, 128 pages, ISBN: 9781 9101 9307 5
Non Members' Price: £9.99
RSGB Members' Price: £8.49

February 2015 • RadCom
Gerald Davison, MW0WML • gerald.davison@gmail.com



Summits on the Air

A personal view of the popular programme

Winter activation of Snowdon GW/NW-001 on a freezing cold, but windless sunny day.

While looking for information about becoming licensed, I found out about Summits on the Air (SOTA). I was immediately interested. Finally there was a way I could combine my love of the mountains with gaining some new skills and finding something new to keep me occupied! I could see straight away that my interest would primarily be in the 'activation' side of the programme. Activating a hill consists of getting into an 'Activation Zone' (basically very near the top of the hill) and making contacts. To 'activate' it you only need one confirmed contact, but to get the 'activator points' you need to get a minimum of four confirmed contacts.

Wait a minute... points? Oh this just gets better! Now this really appealed to me, I like a list or a goal to aim at. You can add up the points as you go along and track your progress against personal targets and the progress of others doing the same thing.

I gained my Foundation licence in March 2011 and immediately started walking up my local hills to activate them. The beauty of SOTA, at least in much of England and Wales, is that you can activate them with very basic, low cost, equipment that doesn't have to be too heavy. I started with a VX-8 handheld and a vertical 2m dipole for FM. I was hugely excited by the number of contacts I immediately started getting. All the SOTA 'chasers' were keen to speak to me and helped me along as I fumbled my way through those initial calls. I immediately felt that this was a small community of people who all wanted to work together as part of the programme. I made all sorts of mistakes in the beginning, but one area I didn't have a problem with was getting safely up and down the hills and being comfortable when I was on the top. My 30+ years of worldwide mountaineering ensured that I didn't have to worry about that part.

I soon wanted to venture into HF and purchased a second hand FT-817 and made up a linked dipole, supported in an inverted-V configuration, with a collapsible fishing pole as a support. More mistakes ensued, particularly with trying to make myself heard with 5W of SSB on 40m from the top of a Scottish Mountain (Ben More on Mull) for my *first ever* HF QSOs. When I look back now I'm amazed I got anywhere, but slowly the operating skills improved and the contacts kept coming in.

Winter 2011/12 arrived and with it the 'Winter Bonus' of three extra points for activating all but the lowest qualifying hills. I have mixed feelings about this as it possibly encourages inexperienced people to venture out onto hills in the winter. The conditions are usually harder (cold, wet, windy or even snowy and icy) and the daylight hours are short. As a regular winter climber, I grabbed the opportunity and sped up my activation rate to pick up points faster. In addition to this I enjoyed the extra challenge of operating in harsh conditions, often battling with cold hands and antennas that try to blow away.

Time for an upgrade! I completed my Intermediate exam in September 2012 and started carrying a heavier, but more powerful, FT-857 on some activations where the walk wasn't too long, usually less than three hours to the summit. This really made a difference on some marginal HF days, but I often found myself completing the activation with a newly acquired FT-270 2m handheld. As a result HF was relegated to the days when I would activate a single hill and had a lot of time. This has set the pattern for the last two years, where I have predominantly used the FT-270, with as light a setup as I can manage, concentrating on using a good antenna.

I now wanted to try this abroad. Time for another upgrade! The Advanced exam for my Full licence was achieved in April 2013 and I was able to do my first overseas activation of some peaks in southern Spain, none of which had previously been activated for SOTA. In hot summer conditions using 5W on the FT-817 and the trusty linked dipole, I was able to make 20m and 40m contacts around Europe and into North America. I remember completing one of these, sitting on the ground, thinking how great it was to be on top of a fairly remote 2000m+ mountain in Spain, chatting to SOTA chasers back in the UK.

I'm now trying to pick up summits in Scotland that have not been activated before. This often means a very long day out as most of the higher unactivated summits are quite remote.

On 9 December 2014 I reached 1,000 activator points and therefore qualified for the SOTA Mountain Goat award. It has taken me three and a half years to do this. I've had lots of fun, learned a lot about radio and met some really nice people along the way. It is a great way to enjoy the outdoors with your radio. (www.sota.org.uk)

If you pick easily accessible hills in England and Wales you can often activate them successfully with light weight inexpensive 2m or 70cm handhelds. Don't rely on the basic antenna on the set, instead use a good external antenna for best results. HF can give spectacular results, with relatively low powers.

If you are going out on the higher summits make sure you have the hillcraft skills. Get some training or go out with suitably experienced friends.

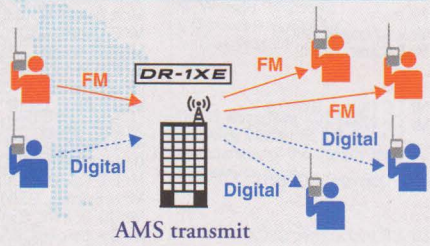
System Fusion

The Best Solution for the Future

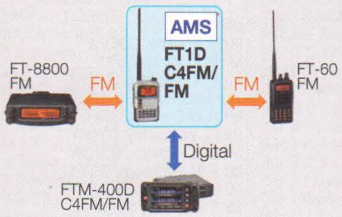
System Fusion provides Total Integration of Digital and Conventional FM

FM Friendly Digital & Auto Mode Select (AMS)

System Fusion is designed to enable seamless intercommunication between conventional FM and C4FM Digital using a single unified platform, without manually switching between the communication modes.



AMS transmit



This is made possible in System Fusion by the Auto Mode Select (AMS) function.
With AMS, the modulation mode of your station is automatically selected according to the received signal.
If a member transmits the conventional FM, the other System Fusion radios automatically select their modulation to conventional FM and permit communication between all members.

The Choice of C4FM Digital & New Attractive Digital Functions

System Fusion - C4FM Digital makes possible **9600 bps data speed** utilizing **12.5 kHz bandwidth.**
9600 bps data transmission speed enables the high speed data communication and provide the new attractive digital functions to expand your enjoyment of the amateur radio communication.

Digital Group Monitor (GM)

Automatically checks whether members registered to a group are within the communication range, and displays the distance and the direction with each call sign on the screen.

Smart Navigation

Real-time navigation function enables Location checking at any time. With the simple touch of a button, you can start navigating to your departure point or any location previously saved. (Backtrack Function)

Snapshot (Image Data Transmission)

Simply connect an optional speaker microphone with camera (MH-85A11U), you can take snapshots and easily send them to other System Fusion radios.

C4FM Digital Clear Voice
Clear and Crisp Voice Technology

144/430 MHz DUAL BAND
C4FM/FM DIGITAL REPEATER **DR-1XE**

System Fusion Lineup

C4FM FDMA 144/430 MHz DUAL BAND
5W DIGITAL/FM TRANSCEIVER
FT1DE *Heavy Duty Package*
(1800 mAh Li-Ion Battery FNB-102LI included)

C4FM FDMA 144/430 MHz DUAL BAND
50W DIGITAL/FM TRANSCEIVER
FTM-400DE

Amateur Radio Internet Linking Kit
HRI-200

YAESU
The radio

YAESU UK Ltd
Unit 12 Sun Valley Business Park, Winnall Close
Winchester, Hampshire SO23 0LB

For latest Yaesu news, visit us on the Internet: http://www.yaesu.co.uk

Old Timers' Honour Roll

On 31 December 2014, the following had unbroken Membership of the Society for 50 years or more.

79 Years
Mr V J Flowers, G8QM
Mr E C Ilott, VE3XE

78 Years
Mr T C Bryant, GW3SB
Mr J D Wightman, ZL1AH

77 Years
Mr G Openshaw, G2BTO

76 Years
Mr A R Richardson, G2CXT
Mr R P B Udall, G2HKS
Mr A J Hallett, G3CQ
Cdr A J R Pegler, G3ENI

75 Years
Mr L W Smith, G2FSI
Mr K N Watkins, CD, G3AIK
Mr F E Springate, G3BWV
Mr T D Jardine, GM2BMJ

74 Years
Mr J Sagar, GW3ARS

73 Years
Mr S R Minson, G2FGB
Mr T Knight, G2FUU
Mr S W Saddington, G2FXQ
Mr S P Shackleford, G2HAX
Mr C W Cragg, G2HDU
Mr A J W Rozelaar, RS4590

72 Years
Mr E H Trowell, G2HKU
Mr H S King, G3ASE
Mr S H Feldman, G3GBN
Mr P T Pitts, G3GYE

71 Years
Mr G G Gibbs, G3AAZ
Mr R A Harding, G3AKU
Mr J W Emmott, G3ANG

70 Years
Mr A G Short, G2DGB
Mr A W W Timme, G3CWW
Mr V Galea, G8EUK
Mr B Clark, GW3HGL
Mr R D Thomas, RS558
Mr J Crabtree, RS8896

69 Years
Mr D T Arlette, G0AEW
Mr B Sykes, G2HCG
Mr K G Thompson, G3AMF
Mr R E Sparry, G3BJC
Mr D R J Adair, G3BVB
Mr W H Borland, G3EFS
Mr J R Davey, G3FPN
Mr J F Stratfull, G3IJS
Mr P J Williams, GW3CZC
Mr J E T Lawrence, GW3JGA
Mr J Smith, RS9475
Mr F W Adderley, RS9710
Mr A R A Bunnage, RS20428
Mr N A Champness, W2CIH

68 Years
Mr M Warriner, G0TTG
Mr P Carbutt, G2AFV
Mr W G Bailey, G2CHI
Mr P V Pugh, G2CQX
Mr R L Edginton, G3AGF
Mr S Fenwick, G3AIO
Mr A G Stacey, G3BXS
Mr H H A Sanders, G3CRH
Mr B H Thwaites, G3CVI
Mr J D Mathews, G3ENG
Mr K I Procter, G3EPO
Mr P W F Jones, G3ESY
Mr E F Jones, G3EUE
Mr G A Errock, G3HCO
Mr J D Harris, G3PFJ
Mr V A Tomkins, G4KEE
Mr K Wilks, G8MVD
Mr H J Darling, RS644
Mr P Zeid OBE Fisp, VK6PZ

67 Years
Mr J D Heys, G3BDQ
Mr A Bolton, G3BMI
Mr G Cripps, G3DWW
Mr P W Bowles, G3ECM
Mr K G Perkins, G3EDS
Mr G Wormald, G3GGL
Mr J C Bird, G3GIH
Mr B W Legrys, G3GOT
Mr J Bazley, G3HCT
Dr J C W Ickringill, G3HHU
Mr E C Clayson, G3IIY
Mr H E Smith, G3IVF
Mr D J Durrant, G3MUI
Mr G A Couzens, G3NTA
Mr R A Bravery, G3SKI
C B H Bradshaw, G3VHP
Mr M J L Fadil, G4CCA
Mr D C Hepworth, G4LKX
Mr T P Hughes, GM3EDZ
Mr J W Hayes, GW3FPH
Mr J Cairns, GW3ITT
Mr L Grout, RS15845
Mr D A Pilley, VK2AYD

66 Years
Mr F Pilkington, EA7FSF
Mr W J Rawlings, G3BON
Mr N L H Williams, G3BYG
Mr R G McDonald, G3DCZ
Mr D H Maclean, G3DNQ
Mr J Vaughan, G3DQY
Mr B A Armstrong, G3EDD
Mr R Staniforth, G3EGV
Mr G C Bagley, G3FHL
Mr E C Lambert, G3FKI
Mr J A Lambert, G3FNZ
Mr P J Mullock, G3HPM
Mr J D Forward, G3HTA
Mr E J Hatch, G3ISD
Mr J P Hewitt, G3IWT
Mr I M Waters, G3KKD
Mr E W Bettles, G3KXE
Mr P H Brown, G3WUZ
Mr D Oswald, GM3COQ
Mr K Street, GM3ENJ
Mr J Reilly, GM3HOM
Mr J B Armstrong, GW3EJR
Mr F J W Trollope, RS4190
Mr B M Collings, RS17032
A M C Macklow-Smith, RS17058
Mr G S Bracewell, VK3XX

65 Years
Mr F J Crisp, G3GZJ
Mr J Hague, GM3JIJ
Mr J Anthony, G3KQF
Mr R Thomson, GM3OBC

64 Years
Mr J G Houghton, G1KEP
Mr W E Waring, G3GGS
Mr T I Lundegard, G3GJW
Mr F V Kershaw, G3GKI
Mr J Lacey, G3GLB
Mr T N Green, G3GLL
Mr F E A Green, G3GMY
Mr D Atter, G3GRO
Mr G Halse, G3GRV
Mr F Robins, G3GVM
Mr B J Mitchell, G3HJK
Mr D F Willies, G3HRK
Mr A G Bounds, G3KDP
Mr J D Smith, G3KGW
Mr E Prince, G3KPU
Mr R Wheeler, G3MGW
Mr K Frankcom, G3OCA
Mr K W Dews, G3PMW
Mr R A Rimmer, G3RQS
Mr A W Wright, GM3IBU
Mr R G Clement, RS18978
Mr M B Greenberg, RS20443
Mr AJ Gibbs, VK6PG

63 Years
Mr C N Wridgway, G3GGO
Mr E McFarland, G3GMM
Mr H C Young, G3HIA
Mr D A Wood, G3HKO
R E W Marshall, G8HLE
Mr F Watson, G3HRE
Mr S P Hay, G3HYH
Mr J Allan, G3IJA
Mr G S Garrett, G3IJW
Mr C J Leal, G3ISX
Mr H R Davis, G3IUZ
Mr D C Youngs, G3JIE
Mr P C Hayward, G3JMX
Mr J W Fox, G3KHR
Mr J Burgess, G3KKP
Mr T W Mitchell, G3LMX
Mr S Harle, G3MEA
Mr D Rosen, G3MZO
Mr J D Nias, G3VRB
Mr M J Palmer, G8BOP
Dr G R Sutherland, GM0UPE
Col G RK Lyon, VK6LK

62 Years
Mr A J Turner, G0FMU
Mr C N Chapman, G2HDR
Mr D M Mallett, G3HUL
Mr S J Heard, G3IEW
Mr J W Birkbeck, G3IGV
Mr D W Bruce, G3IGZ
Mr A A Chisholm, G3INL
Mr N R Pascoe, G3IOI
Mr R D Franklin, G3ITH
Mr K V Franklin, G3JKF
Mr W F Blanchard, G3JKV
Mr F G Blain, G3JLN
Mr J Guttridge, G3JQS
Mr T Jones, G3JTJ
Mr J Kirby, G3JYG
Mr P O Hooper, G3KSP
Mr K Wallace, G3LQW
Mr H Taylor, G3LWK
Mr E Griffiths, G3LZG
Mr S A Gaunt, G3PXJ
Mr M J Mills, G3TEV
J A St. Leger, G3VDL
Mr D M Pratt, G4DMP
Mr D A D Smith, G8IDL
Miss J G Fish, GM3NYG
Mr D A S Holmes, GW3JSV
Mr R Jones, GW3MDK
Mr M Addicott, RS19615
Mr J C P Sharp, RS21683

61 Years
Mr R J Appleby, G3INU
Mr H Hyman, G3IZQ
Mr E W G Allen, G3JHP
Mr V E Brand, G3JNB
Mr T R Whittaker, G3JNM
Mr M Watson, G3JME
Mr M G Rimmer, G3KDA
Mr G J McGee, G3MDM
Mr P E W Allely, GW3KJW
Mr A Ernest, GW3LQE
Mr G C Price, GW3MPP
Mr P A Braham, GW4BYA
Mr M Probert, GW4HXO
Mr A J Kightley, RS20103

60 Years
Mr J A Hardcastle, G3JIR
Mr D A Platt, G3JNJ
Mr F G Whatley, G3JOT
Mr G C Voller, G3JUL
W J Grainger, G3JYO
Mr M Pharaoh, G3LCH
Mr P J Aitchison, G3LSQ
Mr A R Smith, G3MPB
Mr P Sorab, G3NDO
Mr A B Woolford, G3SNN
Mr R J Pye, G4IUH
Mr B J Jayne, G8BFL
Mr P Cohen, GM3LKY
Mr M Harrington, RS20249
Mr L Foster, RS20323

59 Years
Mr J E Mulye, G0VEH
Mr M E Lambeth, G2AIW
Mr J V Hoban, G3EGC
Mr R M Page-Jones, G3JWI
Mr J E Smith, G3JZF
Mr G E Mackrell, G3KAX
Mr R Bray, G3KEL
Mr R Robson, G3KGB
Mr D Maclennan, G3KGM
Mr B Alderson, G3KJX
Mr D G Alexander, G3KLH
Mr J Greenwood, G3KRZ
Mr G P Rigby, G3KTJ
Mr H Peabody, G3KUG
Mr J B Butcher, G3LAS
Mr M Hayward, G3LGA
Mr G H Taylor, G3MDC
Mr C A Hogg, G3NRZ
Dr T R Skrbic, G3TOE
Mr D G Enoch, G3KLZ
Mr R Scaife, G3RSB
Mr J C Alford, G4DOE
Mr A D Patterson, GI3KYP
Mr T I Kennedy, GM3OYO
Mr J H Birkett, RS20842
Mr J H Reisert, W1JR

58 Years
Mr P Craw, G3CCX
Mr P C Cole, G3JFS
Dr K L Smith, G3JIX
Mr M J Street, G3JKX
Mr C H Noden, G3JPB
Mr K G Grover, G3KIP
Mr D H Plumridge, G3KMG
Mr W T Addy, G3KRX
Mr J T A Ault, G3KTU
Mr J D G Davies, G3KZE
Mr D W Blakeley, G3KZN
Mr R E Wolpers, G3LCB
Mr D A Shepherd C.Eng. MIEE, G3LCS
Mr R J Cooke, G3LDI
Mr K Day, G3LDJ
Mr G L Adams, G3LEQ
Mr C B C Hill, G3LGS
Mr D Webber, G3LHJ
Dr M J Underhill, G3LHZ
Mr O Jackson, G3LKZ
Dr A J Hodgkinson, G3LLJ
Mr R Scrivens, G3LNM
Mr G Dale, G3MFH
Mr P T Burt, G3NBQ
Mr E N Cheadle, G3NUG
Mr D W Stevens, G3NWG
Mr A J Balmforth, G3RKQ
Mr A R Stevenson, G3YNT
Mr C W Harlow, G8BTK
Mrs Beryl Ann Long, G8FKY
Mr A Kettlety, G8HTN
Mr H R Mesny, GJ3LFJ
Mr F Claytonsmith, GM3JKS
Mr V W Stewart, GM3OWU
Dr J C Craig, VO1FB

57 Years
Mr F L Wiseman, G3GRY
Mr M Harrison, G3HKH
Mr G B Moser, G3HMR
Mr L J Loveland, G3KZX
Mr R L Gerrard MBE, G3LAZ
Mr B E Gee, G3LDG
Mr R D Taylor, G3LDY
Mr R D Muir, G3LHN
Mr J Gale, G3LLK
Mr B M Johnson, G3LOX
Mr E Pickering, G3LPS
Mr P N Ackley, G3LRP
Mr C H Evans, G3LUO
Mr J F R Weston, G3LYW
Mr F A Griffiths, G3MED
Mr A V H Davis, G3MGL
Mr D E Johnson, G3MPN
Mr K Ashcroft, G3MSW
Mr F E Garrett, G3MVZ
Mr R J Weaving, G3NBN
Mr J H W Broomhead, G3NCX
Mr C R Burchell, G3NKQ
Mr D Thom, G3NKS
Mr M E Slater, G3NML
Mr J Hogg, G3NUA
Mr A B Plant MBE, G3NXC
Mr W H Fletcher, G3NXT
Mr S J Gilbert, G3OAG
Mr R M G Maule, G3OEF
Mr E D Wilson, G3OJQ
Mr D W Thompson, G3OXG
Mr D J Penny, G3PEN
Mr R W Fisher, G3PWJ
Mr D E Waller, G3SUL
Mr J E C Baldwin, G3UHK
Mr W J C Pinnell, G3XWK
Mr A V Evans, G3ZZX
Mr J Juleff, G4MXU
Mr W Clinton, G8KZN
Mr D B Whitfield, G8VMY
Mr J F Gray, GM3LRG
Mr M Williams, GW3LCQ
Mr G H Price, GW3LXI
Mr H Mulkens, ON4FP
Mr J E Orme, RS21408
K J Slomczynski, SP5HS
Mr R N Jones, RS25982

56 Years
Mr G R Watts, G0EVW
Mr R J Oram, G0FXI
Mr P K Hamblett, G0TKT
The Lord Rix, CBE, DL, G2DQU
Mr R W Emery, G3FYX
Prof L W Barclay, G3HTF
Mr D G Pinnock, G3HVA
Mr P M Rackham, G3IRQ
Mr J E Cleeve, G3JVC
Mr J E Symes, G3LNN
Mr R Brown, G3LQP
Mr P K Blair, G3LTF
Mr R W B Smith, G3LVW
Mr P Buck, G3LWT
Mr M D Scott, G3LYP
Mr J D Masters, G3MBM
Mr B Vaughan, G3MCV
Mr W J Kennedy, G3MCX
Mr J S E Pearce, G3MEC
Mr R E Piper, G3MEH
Mr C N Cory, G3MEV
Mr E J Landon, G3MHT
Dr T G Langdon, G3MHV
Mr D Nappin, G3MLS
Mr G A Whiting, G3MMS
Mr H J Benjamin, G3MNB
Mr D L Byne, G3MRQ
Mr R A Strafford, G3MRT
Mr G F Gott, G3MUO
Mr D A Beales, G3MWO
Mr D G Blake, G3MWV
Mr C K Richardson, G3NAE
Mr G Mallinson, G3NAK
Mr K A V Hurrell, G3NBC
Dr J E Larson, G3NBL
Mr D J Cousins, G3NCC
Mr C R Fry, G3NDI
Mr J T Leviston, G3NFB
C L Desborough, G3NNG
Mr M T George-Powell, G3NNO
Mr D B Foster, G3NRU
Dr P G Robson, G3NZK
Mr D Bemister, G3OBX
Mr R P Welch, G3OFX
Mr J Rose, G3OGE
Mr R A Hargreaves, G3OHH
Mr J Sleight, G3OJI
Mr M W Plaster, G3OJL
Mr A J Hobbs, G3OJX
Mr D A Skye, G3PLR
Mr C Thomas, G3PSM
Mr I G Dufour, G3PWB
Mr R E Parkes, G3REP
Rev J L Marshall, G3RKH
Mr M S Box, G3RZG
Mr M Shardlow, G3SZJ
Mr L P Best, G3THM
Mr J R Shewan, G3UZB
Mr R I Buckby, G3VGW
Mr T Sorbie, GM3MXN
Mr M D Watson, G3WMQ
Mr B M Crook, G4AZN
Mr R J Lister, G8IXP
Mr D H Young, G8TVW
Prof. J D Last, GW3MZY
Mr L France, GW3PEX
Mr R D Pearson, M0CTM
Mr W J M Hume, RS26142
Mr A C Doty Jr, W7ACD
Mr J R Blackman, ZS1PM

55 Years
Mr E Chicken MBE, G3BIK
Mr M J Stevens, G3CPN
Mr C Wallis, G3CWV
Mr R L Chidzey, G3IOM
Mr P J Wright, G3JDM
Mr A Shannon, G3KKJ
Mr C A Mattacks, G3KQQ
Mr P A Whitford, G3MME
Mr A S Walker, G3MPW
Mr J T C Sladden, G3MWS

Honour Roll

Dr G H Grayer, G3NAQ
Mr W K Ginder, G3NAS
R K Webb, G3NDK
Mr L R Beckwith, G3NFP
Mr G L Quarterman, G3NHX
Mr G C W Munden, G3NIL
Mr H White, G3NKW
Mr H E Perkins, G3NMH
Mr E H Matthews, G3NPL
Mr E S Collin, G3NQV
Mr J W Heaviside, G3NYX
Mr R J Powell, G3OGP
Mr I Jackson, G3OHX
Dr R A Simpson, G3OMS
Mr J Denman, G3OND
Mr R Burns, G3OOU
Mr D A Evans, G3OUF
Mr J G Wilcox, G3OYF
Mr G J Petrie, G3PDG
Mr B D Simpson, G3PEK
Mr A W Tomalin, G3PTB
Mr A L Gray, G3RBG
Mr R G Dobdinson, G3RGD
Mr I Macey, G3RVD
Mr J A Strutt, G3SAS
Mr A P Hewitt, G3SVD
Lt Col J G Barber, G3TTJ
Mr H M Davison, G3TVW
Mr M D Leighton, G3UKM
Mr L S Margolis, G3UML
Mr M A Hall, G3USC
Mr M Foster, G3VOF
Mr P Beecroft, G3WVY
Mr R H Edmondson, G3YEC
Mr P L A Burton, G3ZPB
Mr H R Perrin, G4AFY
Dr B Chambers, G8AGN
Mr M J Bonner, G8ALB
Mr M Hearsey, G8ATK
Mr M G Wallace, G8AXA
Mr R H Chambers, G8BCA
Mr T Harrison, GM3NHQ
Mr A E Gwynne, GW3LNR
Dr B G Taylor, HB9ANY
Mr E J Kelly, KG6XF
Mr G G Gemmill, RS22502
Mr H J Randall, RS25603
Mr D M Willoughby, RS27261

54 Years
Mr J J Pink, G8MM
Mr A Prichard, G0CPA
Mr J Crerar, G3BYV
Mr G D Lively, G3KII
Mr G Jenner, G3KIW
Mr R E Hardman, G3LGV
Mr S J W Freeman, G3LQR
Dr A E Wilson, G3MAE
Mr B C Gibbs, G3MBN
Mr E K Tunstall, G3MSO
Mr C R Bell, G3NIE
Mr K A Morgan, G3NWX
Mr A J Taylor, G3NYE
Mr A J Melia, G3NYK
Mr T C Haydu Jones, G3OAD
Mr W A Jeffs, G3OAF
Mr C Bowden, G3OCB
Mr D A G Martin, G3ODC
Mr M S Beer, G3OGZ
Mr G Badger, G3OHC
Mr J C G Parker, G3OLX
Mr P E Judkins, G3OMJ
Mr D S Moffatt, G3RAU
Mr D C Sylvester, G3RED
Mr D R Mullins, G3RGM
Dr A J Shepherd, G3RKK
Mr M J T Smith, G3RMN
Mr A Notschild, G3RSF
Mr A T James, G3RUV
Mr R W L Limebear, G3RWL
Mr P J Cort-Wright, G3SEM
Mr P J Hart, G3SJX
Mr L P J Lethbridge, G3SXE
P W Myers, G3UWT
Mr J Greaves, G3UXM
Mr W J McClintock, G3VPK
Mr P S Downham, G3WIB
Mr P Barville, G3XJS
Mr J E Kasser, G3ZCZ
Mr M Duce, G4BQF
Mr D H Squires, G4DAC
Mr N J L Lockett, G4EMB
Mr G P Gaunt, G4IJO
Mr K Aaron, G4KCI
Mr L Arnold, G8AHE
Mr R A Fuller, G8CEZ
Mr F C Thorogood, G8ORV
Mr G Hodgkinson, GI7TPO
Mr L D Woolf, GJ3RAX
Mr G A Maclauchlan, GM3NVU
Mr H R Thornton, GM3PKV
Dr A J Masson, GM3PSP
Mr J F Kelly, GM3TCW
Mr G R Kelly, GM8MST
Mr A E Pritchard, GW3ODB
Mr K Robbins, GW3PFV
Mr A Richards, GW3SFC
Mr D W Bowers, GW4AVC
Mr A J Richards, GW4RYK
Mr G A S Lander, HB9AJU
Mr D Gray, MODLL
Dr D J Harvey, RS25435
Mr M A Hoare, RS22800
Mr M J J Dawe, RS23071
Mr M T Bland, RS24640

53 Years
Mr D F Beattie, G3BJ
H Hensler, DL6DZ
Mr P G O'Kane, EI5DI
Mr D G Dawkes, G0ICJ
Mr E L Masters, G0KRT
Mr W J Purser, G2AXO
Mr J W Swift, G3CTP
Mr J F France, G3KAF
Mr A M Pomfret, G3LZZ
Mr C D Stephens, G3MGS
Mr B S Collins, G3MXA
Mr J R Vickers, G3ORI
Mr A G Rumbold, G3ORX
Mr R G Titterington, G3ORY
Mr D R Westbury, G3OXL
Mr D Swainson, G3OXN
Mr G D Clinton, G3OYT
Mr B Davies, G3OYU
Mr J Holstead, G3OZC
Mr R E A German, G3OZT
Mr J J Davies, G3PAG
Mr J Rabson, G3PAI
Mr A J Baker, G3PFM
Mr H A Buckenham, G3PGN
Mr J J Morris, G3PHA
Mr P E H Day, G3PHO
Mr B J Todd, G3PHW
Mr P R Chandler, G3PID
Mr J E Hoare, G3PJI
Dr B Whelan, G3PJT
Mr R W Cox, G3PLP
Dr R G Fenby, G3PLS
Mr J P Martinez, G3PLX
Mr A J Feist, G3PMV
Mr A Floyd, G3PNQ
Rev I S Partridge, G3PRR
Mr P Blakeborough, G3PYB
Mr J L Green, G3PYF
Mr R J Parsons, G3RBP
Mr D C Griffiths, G3RDQ
Mr A J Pampling, G3RSP
Mr R V Southern, G3RST
Dr J S J Craig, G3SGR
Mr R G Pett, G3SHK
Dr J R Whittington, G3SHZ
Mr R L Turner, G3SMD
Mr W M Furness, G3SMM
Mr K F Jessop, G3TAA
Mr M J G Dawson, G3TCL
Mr E H Ingram, G3TDX
Mr W B Bickham, G3TJH
Mr M J Nicholas, G3TOI
Mr G Grimshaw, G3TQX
Mr R T Collins, G3TRC
Mr A C L Coates, G3TVV
Prof M Harrison, G3USF
Mr J L Delves, G3VHH
Mr A W Davis, G3VTR
Mr G Oakes, G3WRK
Mr C J Langley, G3XGK
Mr R G Davy, G3XVF
Mr R Cutbush, G4ADK
Mr R J Taylor, G4BEL
Mr R J Wells, G8BNR
Mr HR Skelhorn, G8BPU
Mr G F Wilks, G8DVJ
Mr M T Bowen, G8DWA
Mr D L Edmonds, G8EWN
Mr N E Brown, G8NCK
Mr A S Foster, GM3OXA
Mr J Carson, GM3OXK
Mr C S Penna, GM3POI
Mr J G Walford, GM3POT
Prof I A Macpherson, GM3RXU
Mr G A Hunter, GM3ULP
Mr N J Dudman, GW8GGW
Mr P W Whipps, M0PWW
Mr D S Kendall, N6HEQ
Mr M E Kensdale, RS23278
Mr T G B Hobbis, RS24754
Mr T P Flinn, RS30993
Mr J F C Johnson, ZL2AMJ
Mr H C Kingsland, 7Q7HK

52 Years
Mr D K McDermott, EI4DW
Mr B W N Harris, G3GTF
Mr D W Aird, G3MFE
Mr B J Newman, G3MMN
Mr Richard J Harris, G3OTK
Mr C J W Thomson, G3PEM
Mr L G Sear, G3PPT
Mr L D Rooks, G3PUO
Mr J B W Braithwaite, G3PWK
Rev A Speight, G3PYW
Mr E D Hodgson, G3RAR
Mr AF Stagles, G3RBY
Mr A W Kendrick, G3RDW
Mr H Neale, G3REH
Mr K J Randall, G3RFH
Mr D J Thomson, G3RGS
Mr D Carden, G3RIK
Mr N Ackerley, G3RIR
Mr C M Garland, G3RJT
Mr M S Vann, G3RLV
Mr R Collins, G3ROC
Mr J Pennington, G3RTP
Mr M A Sanders, G3RWV
Mr A A Lawrance, G3RZV
Mr G D Aram, G3SET
Mr P J Casemore, G3SGF
Mr B Naylor, G3SHF
Mr I B Hamill, G3SMF
Mr P Torry, G3SMT
Mr R H Jennings, G3SOE
Mr R P Smith, G3SVW
Mr P A Whitchurch, G3SWH
M A Trundle, G3TCG
Mr O S Tillett, G3TPJ
Mr R Farrance, G3TRH
Mr N S Cawthorne, G3TXF
Mr R McNair, G3UBZ
Mr R J Constantine, G3UGF
Mr M I Vincent, G3UKV
Mr P B Johnson, G3UMV
Mr M Farmer, G3VAO
Mr B Clark, G3VCL
Mr C W Westwood, G3VFD
Mr R Bailey, G3WCQ
Mr R Lapthorn, G3XBM
Mr R Hargreaves, G3XZQ
Mr F A G Bourne, G3YJQ
Mr M J Quee, G3ZWW
Mr D J Jarvis, G4CEU
Mr B J Payne, G4CJY
Rev J A Wardle, G4CVA
Mr D F Berry, G4DFB
Mr M J Cooke, G4DYC
Dr J C Axe, G4EHN
Mr L M Rose, G4KAB
Mr R Singleton, G7OXP
Mr R S Boardall, G8AJZ
Mr M R Perry, G8AKX
Mr C H Towns, G8BKE
Mr J P Abbott, G8CWJ
Mr W S Steer, G8CYG
Mr H Parker, G8GUN
Mr R J C Davey, G8MRI
Mr C G Bristow, GI3PSQ
Mr G Burt, GM3OXX
Mr G R Henderson, GM3RTJ
Dr R D Harkess, OBE, GM3THI
Mr R H G Weaver, GW3KXX
Mr J H Jones, GW3TMP
Dr C G Potter, MODDT
Dr P Calvi-Parisetti, MM0TWX
Mr E Penikis, VK1VP
Mr H R Tyreman, VK2BHT

51 Years
Mr D A Whitaker ,BRS25429
Mr L P Purcell, EI6D
Mr B J Giddings, G1JLG
Mr A J Gould, G3JKY
Mr R G Heslop, G3KMQ
Mr R W Nolan, G3KWK
A R Preedy, G3LNP
Mr P W F Darragh, G3MNV
Mr J H Moxey, G3MOE
Mr S Kay, G3OMA
Mr D Beakhust, G3OSQ
Mr J Garrett, G3RHP
Mr B Turner, G3RLE
Mr W H Hall, G3RMX
Mr T J Venn, G3RPV
Mr P R Lewis, G3RQX
Mr P M Madagan, G3RQZ
Mr R H Crowe, G3RVA
Mr J M Walch, G3RVI
Mr C I B Trusson, G3RVM
Mr P N Henwood, G3RWF
Mr P Chadwick, G3RZP
Mr R C Marshall, G3SBA
Rev G A Stanton, G3SCV
Mr R A Brown, G3SCZ
Mr J J Bottom, G3SDG
Dr B R H King, G3SGK
Mr R C Cottrell, G3SHY
Mr J C Burbanks, G3SJJ
Mr G M Smith, G3SNO
Mr E F Taylor, G3SQX
Mr R S Hewes, G3TDR
Mr P H McPherson, G3TEL
Mr P J Walters, G3THW
Mr E Ross, G3TJC
Mr G C Wynes, G3TLV
Mr M Smith, G3TRV
Brig M G Taylor CBE DL, G3UCT
Dr R J Butcher, G3UDI
Mr D M Browning, G3UEY
Mr D G Mason, G3USD
Mr R A J Smith, G3VKT
Mr I Walker, G3VNY
Mr D W Aslin, G3WGN
Mr J R Hartley, G3WGQ
Mr R G Harris, G3ZFR
Mr P D Hall, G4AQA
Mr T G Giles, G4CDY
Mr J A Cobley, G4RMD
Mr J N Houldridge, G6KYD
Mr D Mann, G8ADM
Mr G R Smith, G8AOJ
Mr G Swan, G8ASJ
Mr N D Fisher, G8ATO
Mr J D Bosworth, G8BAV
Mr R B Harbison, GI3PDN
Mr H A Sinclair, GI4GOS
Mr B B Nelson, GJ4KBM
Dr H M Brash, GM3RVL
Mr IMG Miller, GM4JAE
Mr ARB Gordon, GM6RXQ
Mr D M Thomas, GW3RWX
Mr R F C Alban, GW3SPA
Mr S Hulme, GW3SRM
Mr B Carter, GW8AAG
Mr F R Hopwood, GW8BIA
Mr J H Tait, GW8MGF
Mr R Otterstad, LA5HE
Mr M L Sufit, M5AHF
Mr John Devoldere, ON4UN
Mr K H Hagemans, PA0JOH
Mr J Willerton, RS19211
Mr S B Harrison, RS20102
Mr C A Cooper, RS25672
Mr P V Lingham, RS38098
Mr D Dunn, VK3DBD
Mr F C Beadle, VK7HJ
Mr T S Cooper, ZS1PS

50 Years
P Stepponat, DL7BAT
Mr R A Ball, G0INZ
Mr P C Shepherd, G0KXX
Mr T H Gonsalves, G0OYJ
Mr B J Whitty, G3HWX
G N Fare, G3OGQ
Mr S Revell, G3PMJ
Mr D M Gresswell, G3PWY
Mr I Walker, G3RJF
Mr P D Lee, G3SPL
Mr J J Jarvis, G3SUG
Mr D R Coltart, G3SYM
Mr B C Ward, G3SZV
Mr C J Lambert, G3TA
Mr W Eaton, G3TAO
Mr J C Boydell, G3TAX
Mr J D Cree, G3TBK
Mr AS Bye, G3TCI
Mr G F Kimbell, G3TCT
Mr C R Bonner, G3TGF
Mr D R Stimson, G3THC
Mr D R French, G3TIK
Mr P S Duncan, G3TKA
Mr D F Heathershaw, G3TLI
Mr A M Fentham, G3TON
Mr G Parkhurst, G3TOZ
Mr R A W Stevens, G3TVI
Mr I D Brown, G3TVU
Mr D W Fill, G3UBB
Mr J P H Burden, G3UBX
Mr L L N Cobb, G3UI
Mr D Houghton, G3UPY
Mr P J E Carey, G3UXH
Mr C Pedder, G3VBL
Mr R G Luckock, G3VDX
Mr D N Davison, G3VFX
B R G Hutchinson, G3VGH
Mr D J Aldridge, G3VGR
Mr E J Harland, G3VPF
Mr D T M Clemens, G3VXM
Mr W A Coates, G3WAC
Mr I F Peterkin, G3WDU
Mr D Poulter, G3WHK
Mr K E Griffiths, G3WIC
Mr J W Hall, G3WLD
Mr P R Smith, G3WPB
Mr S W Powell, G3WRA
Mr P G Brooker, G3WXC
Mr A Strong, G3WXI
Mr J K Gibson, G3WYN
Mr G W Bedwell, G3XYX
Mr F Wilson, G3YQA
Mr H Tabberer, G3YVK
Mr P J Marcham, G3YXZ
Mr J Yu, G3ZQT
Mr J P Billingham, G4AGQ
Mr D J Butler, G4ASR
Mr G E Austin, G4DPA
Mr T Jewell, G4ELM
Mr J M Butcher, G4GWJ
Mr B R Coleman, G4NNS
Mr P Herman-Cranmer, G4TFP
Mr J O Haile, G8ADC
Mr P Helm, G8AEN
Mr C G Partridge, G8AUU
Mr K Rothwell, G8EAP
Mr G D Drinkwater, G8GCU
Mr E S Campbell, G8PHS
Mr A K Sinclair, GD3TNS
Mr S Dornan, GI3TNK
Mr J T Barnes, GI3USS
Mr M J W Hamilton, GM3TAL
Mr V T Budas, GM3VTB
Dr B W Flynn, GM8BJF
Mr P A Miles, GW3KDB
Mr R Volck, GW3RKV
Mr K J Winnard, GW3TKH
Mr C S Carver, GW4EYO
Mr P J W Rowell, RS12236
Mr G Ferguson, RS26003
Mr W Inglis, RS26642
E D Moustakas, SV1AN
Mr G M Potgieter, ZS5NK

On 31 December 2014, the following Clubs had unbroken Membership of the Society for 50 years or more.

80 Years
Coventry ARS, G2ASF

78 Years
Royal Air Force ARS, G8FC

68 Years
South Hampshire Int.Tele. Soc, G3DIT

67 Years
Manchester Wireless Society, G5MS
Sutton & Cheam RS, G2XP
Yeovil ARC, G3CMH

66 Years
Derby & DARS, G2DJ
Isle of Man ARS, GT1IOM
Stoke on Trent ARS, G3GBU
Wirral ARS, G3NWR

65 Years
Spen Valley ARS, G3SVC

64 Years
Dorking & DRS, G3CZU
West Kent ARS, G3WKS

63 Years
Cambridge & DARC, G2XV

62 Years
Stockport RS, G6UQ
York ARS, G3HWW

58 Years
Bury RS, G3BRS
Medway ARTS, G5MW

57 Years
Crystal Palace Radio Elec Club, G2LW
Newbury & DARS, G5XV

56 Years
Clifton ARS, G3GHN
Preston ARS, G3KUE
Scarborough ARS, G4BP
Southport & DARC, G2OA

55 Years
Conwy Valley ARC, GW6TM
Guildford & DRS, G6GS
RS of Harrow, G3EFX
Reigate ATS, G5LK

54 Years
Royal Naval ARS, GB3RN
South Birmingham RS, G3OHM

53 Years
Royal Signals ARS, G4RS

52 Years
Basingstoke ARC, G3TCR
Loughton & Epping Forest ARS, G4ONP

51 Years
Belfast RSGB Group, RS101022
British ATV Club, RS38114
Harlow & DARS, G6UT
Mansfield ARS, G3GQC
Mid Warwickshire ARS, G3UDN
Northampton RC, G3GWB
RAIBC, G4IBC

50 Years
Chester & DRS, G3GIZ
Echelford ARS, G3UES

February 2015 • RadCom
Eamon Skelton, EI9GQ • e-mail: hbradio@eircom.net

Homebrew

A single-band transceiver for 10m

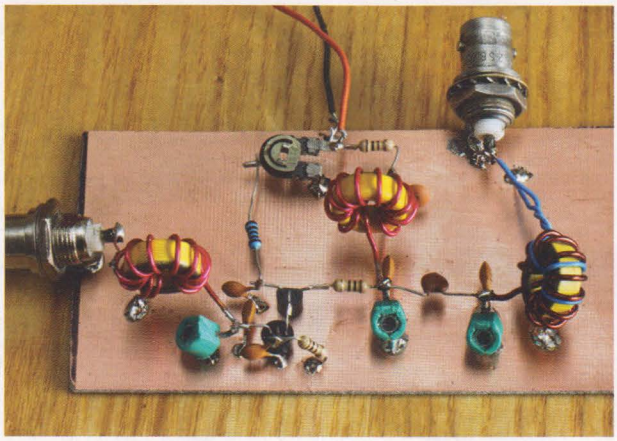


PHOTO 1: Prototype 28MHz amplifier.

RATIONALE. In recent years, I have often felt the need for at least one single-band 10m transceiver. There may even be a case for building two 10m rigs, one for use on the 10m band and the other as a back-end or IF for a VHF transverter. These two intended uses call for quite different design specifications. The receiver section of a 10m rig would usually have a low-noise RF amplifier with sufficient gain and sensitivity for receiving weak signals on a quiet band.

As the receive section of a typical VHF/UHF transverter will usually have a very low noise figure and substantial conversion gain, the sensitivity of the entire receive system will be largely determined by the performance of the transverter front end. A HF receiver designed for use with a transverter will usually require greater dynamic range rather than extreme sensitivity. The ideal receiver will have a very strong front end of the type that would usually be more appropriate for use at LF/MF.

The transmit section of a normal transceiver will need to produce at least several watts of RF output. For driving a transverter, only a few mW will be required. Some commercial transceivers have a separate low-level output for driving transverters. Where a low-level output is not available, it is necessary to attenuate the transmit signal from the HF rig using a high-power attenuator. This is a rather ugly compromise that always results in higher levels of noise and distortion on the transverter output signal. One of the greatest advantages of building your own equipment is that it is easily to optimise the design for the intended application. For instance, an HF transceiver designed for use with a transverter would have a very linear Class A RF output stage producing no more than a few mW. At such low power levels, it is quite easy to design a transmitter with very low levels of distortion and noise.

For this month's construction project, we will build the receive front end of a 10m transceiver. Two designs will be presented for this section, one for normal 10m use, the other for use with a transverter. Before we get to the active circuits, we will first take a look at the LC circuits used for RF filtering in the receiver and transmitter stages.

RF FILTERS AND MATCHING NETWORKS. I have received e-mail from several readers asking for specific details about the design of RF filters and matching networks. Typical questions are:

- How do you know what component values are required?
- Which type of components should I use?
- What happens if I use something different?

In answer to the first question, I don't always know what component values are optimum for a particular type of network. Previous experience will often give me some indication for a reasonable starting value. Some LC networks can be designed around a single component having any arbitrary value. Quite often, the key to a successful design is choosing component values that are readily available or easily achieved in the case of home-made components. Extreme values can be very difficult to work with. If possible, I try to end up with a design that doesn't rely on extremely small or large values. In the case of bandpass filters based on coupled, parallel resonant circuits, I usually start with a value for the inductors that gives an inductive reactance of around 50-200Ω. In the following examples, an XL value of 104Ω gives good results. The best choice of inductor type will depend on the intended application, component availability and the amount of space available. Large air-cored inductors as found in an ATU will have very high Q (quality factor) and low losses. Small PCB mounted inductors will have lower Q and limited power handling. Coils wound on powdered iron toroids offer excellent performance in a relatively small space. Such coils will typically have Q values of several hundred, low losses when used in filters or matching networks and good isolation from adjacent circuits due to the 'self-shielding' properties of magnetic toroid cores.

All of the inductors for the receive and transmit bandpass filtering are wound on T50-6 toroid cores. The inductance value is nominally 576nH. For the T50-6 with an A_L value of 4, this should require 12 turns ($12^2 \times 4 = 576$). As I have found on several previous occasions, the inductance of my hand-wound toroid inductors turned out to be a little greater than expected. Reducing the number of turns to 11 resulted in an inductance very close to the target value. To make an LC circuit with a resonant frequency of 28.9MHz, we will need a capacitance value of $25330 \div (28.9^2 \times 0.576) = 52.65$pF. This LC resonator will form the basis for all the band-pass filters in the transverter.

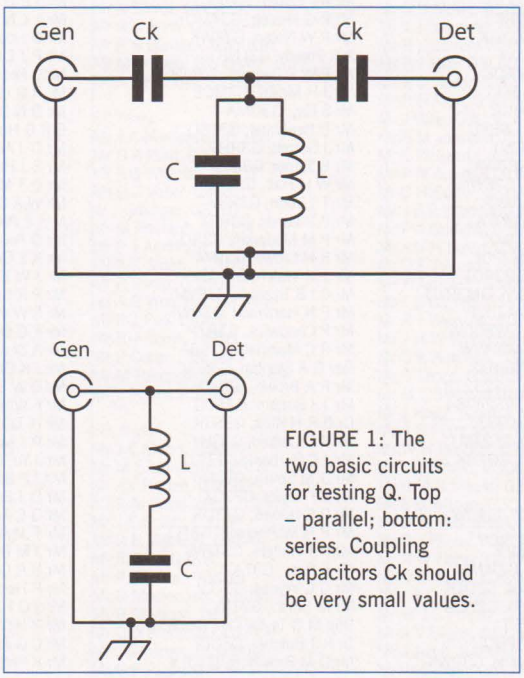


FIGURE 1: The two basic circuits for testing Q. Top – parallel; bottom: series. Coupling capacitors Ck should be very small values.

Q MEASUREMENT. Some of our calculations will require a value of unloaded Q for the resonators. **Figure 1** shows two standard methods of measuring Q. The circuit at the top is a parallel tuned circuit. RF from a signal generator is fed to the Gen input and a very sensitive power meter (detector) is connected to the Det output. The I/O coupling capacitors Ck should have a very small value. A typical setup will use a wire probe with capacitance of a fraction of a pF. When I/O coupling is so light that the insertion loss is greater than 30-40dB, external loading of the resonator will be negligible and the circuit bandwidth will be determined almost entirely by the Q of the resonator. The value of Q is simply the centre frequency divided by the -3dB (half power) bandwidth. An alternative Q measurement method is shown at the bottom of Figure 1. The series-resonant LC circuit acts

RSGB shop

FROM P&P FREE OVER £30 SEE PAGE 78 FOR DETAILS

E&OE All prices shown plus p&p

NEW

£12.74 RSGB Members' Price

£12.74 RSGB Members' Price

Antennas Mastered

By Peter Dodd, G3LDO

Peter Dodd, G3LDO has long been acknowledged as one of the leading experts on antennas in the world. For over a decade he has been the regular antenna columnist of the Radio Society of Great Britain's journal *RadCom*. This book brings together in a scrapbook format his work from this regular column and a collection of other antenna articles from over the years that have appeared in *RadCom*.

Antennas Mastered is packed with everything imaginable connected with antennas. Readers will find practical solutions that cover all bands, antenna types, ATUs, Meters, Software and much besides. Peter's intention in writing the 'Antennas' column was, as he stated ,"The main purpose of this column is to address problems readers may have installing and adjusting antennas from suburban sites that may be regarded as a challenge; although any antenna subject that is considered to be of interest to readers will be discussed or described". This has held true over the years and readers will be staggered by the breadth of material covered in over 280 A4 pages of antenna gold.

Also contained within the *Antennas Mastered* pages you will find several standalone articles written for *RadCom*. Organised in the order they were written, *Antennas Mastered* provides a fascinating look at the practical side of antennas and the comprehensive index provided allows the reader to access any specific subject.

Peter Dodd, G3LDO has created in his 'Antennas' column one of the best archives of antenna material available and *Antennas Mastered* provides this for everyone interested in antennas and the practical solutions they need.

Size 210x297mm, 288 pages, ISBN: 9781 9101 9303 7
Non Members' Price: £14.99
RSGB Members' Price: £12.74

Stealth Antennas

By Steve Nichols, G0KYA

The first edition of *Stealth Antennas* quickly became the 'must have' antenna book for everyone who wasn't living on acres of land. This brand new second edition has been expanded and updated and now provides even more for those with tiny postage stamp-size gardens, intolerant neighbours, planning permission problems or living in apartments.

From using house rain gutters and drain pipes, or a magnetic loop in the loft, through to a tuned loop around the window frame, *Stealth Antennas* provides a wide range of ingenious antenna solutions. Designs include magnetic loops, tuned wire loops, small verticals, zig-zag loaded dipoles and even reviews of a number of commercially-made stealth antennas. Along with new antenna reviews there are two completely new chapters covering Receive Antennas and Top Band Antennas. *Stealth Antennas* does not neglect VHF/UHF antennas. While easier to conceal because of their small size compared with HF antennas, what are the effects of mounting a VHF antenna in the loft? Roof tile absorption is discussed, as are the effects of detuning caused by copper water pipes or house wiring.

Stealth Antennas has dozens of original and ingenious ideas for antennas and should persuade anyone with an amateur radio licence that they can work the world without a beam, tower and linear amplifier. *Stealth Antennas* continues to be the 'must have' antenna book for everyone.

Size 174x240mm, 224 pages
ISBN: 9781 9101 9305 1
Non Members' Price: £14.99
RSGB Members' Price: £12.74

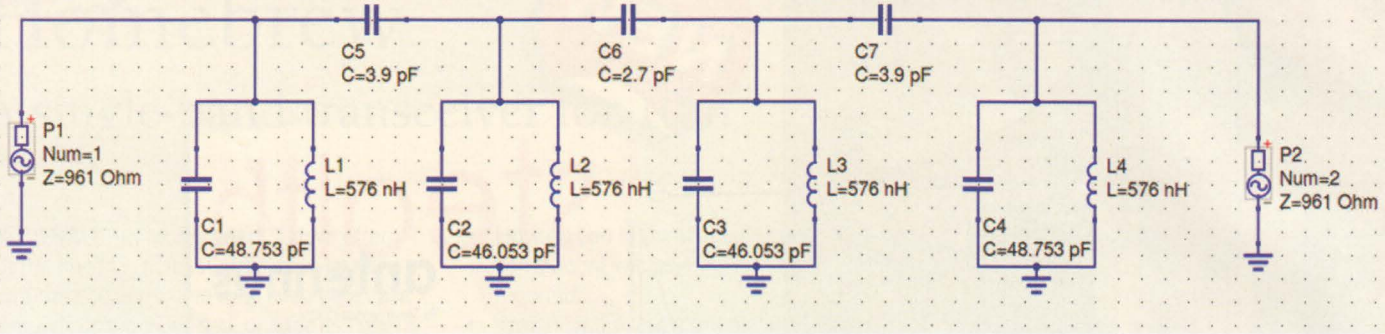


FIGURE 2: 4th order bandpass filter for 28.9MHz. Note that the impedance is not 50Ω.

as a notch filter. The depth of the notch is proportional to Q. Exact details of this method of Q measurement can be found in *EMRFD* [1] and other publications [2] by Wes Hayward, W7ZOI. Both methods were used to test our 28.9MHz resonator. Measured Q values ranged from 180-370, depending on the components used. The higher figure was achieved using 11 turns of 0.95mm enamelled copper wire on a T50-6 and a high quality mica capacitor. Using 0.375mm wire and good quality ceramic capacitors gave Q values around 250. This is in line with previous measurements and I usually use 250 as the default value of Q for resonators of this type.

The 4th order filter in **Figure 2** was designed using methods outlined in Homebrew for September 2010. Further details can be found at [3]. This filter will be used in the transmit section of the transceiver. Note that the filter is not designed for 50Ω I/O. A simplified version of this filter will be used as part of the receiver RF amplifier.

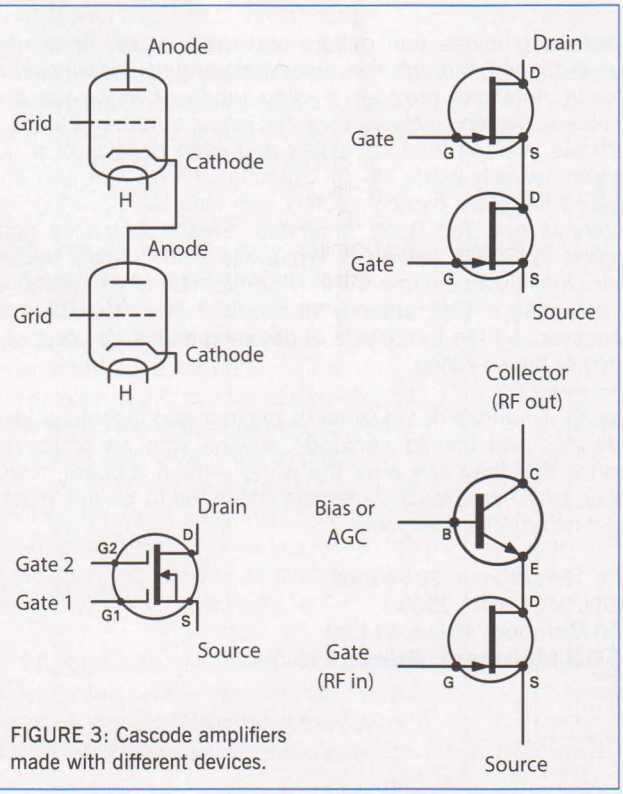


FIGURE 3: Cascode amplifiers made with different devices.

28MHz RF AMPLIFIER. There are several options available for the RF amplifier. Some of our previous HF transceiver designs have used a passive bandpass filter (BPF) followed by a broadband RF amplifier with 10-20dB of gain and noise figure around 6-7dB. This configuration works very well for a multi-band design. There are some advantages to using a tuned RF amplifier in a single-band design. A tuned amplifier based on low noise devices will have an even lower noise figure. Using a tuned circuit will eliminate amplifier noise at the IF image frequency. This can reduce noise by up to 3dB compared with a system using a broadband amplifier/mixer combination.

THE CASCODE AMPLIFIER. **Figure 3** shows several forms of the 'cascode' amplifier. This amplifier configuration was originally used with triode valves. The cascode is a directly coupled, cascade amplifier. The lower half is a common-cathode amplifier, the upper half a grounded-grid amplifier. Because of its excellent performance at VHF, the cascode was often used in valve TV tuners. The circuit provides a way of achieving relatively high gain from low gain triodes. The cascode tends to be stable due to the excellent isolation between input and output circuits. Apart from the lower supply voltage, a JFET cascode is functionally identical to its valve equivalent. Dual-gate devices like the DG MOSFET are internally configured as a cascode. Also shown is a hybrid FET/bipolar cascode amplifier. Cascode amplifiers based on modern low-noise devices offer the same advantages as their valve-based ancestors: high gain, good stability and low noise. The cascode needs a higher supply voltage than some other amplifier configurations. This is not a disadvantage when working from a 12-14V supply, as the optimum supply voltage for a small FET is usually around 5-7V for each device.

28MHz RF AMPLIFIER. A 28MHz RF amplifier based on a hybrid FET/bipolar cascode is shown in **Figure 4**. The FET is a 2SK19. Most JFETs designed for use in VHF amplifiers (BF256A etc) will perform very well in this circuit. Even the theoretically unsuitable MPF102 JFET performs quite well. The bipolar transistor is an MPSH10. The circuit biasing is designed so that it is easy to substitute a JFET/JFET cascode or a single DG device like the BF981. The 100Ω resistor at the source of the JFET may be changed to suit the characteristics of the device used. I didn't have a double-triode valve available to test in this circuit, but it should work without any modification apart from the requirement for a higher supply voltage and a heater supply. It should also be possible to use DG GaAsFET devices like the 3SK124 or 3SK97 if the supply voltage is reduced to around 5V.

CONSTRUCTION. The circuit was built on a strip of PCB laminate. The three inductors L1, L2 and L3 are each 11 turns on a T50-6 toroid, as previously described. Wire diameter isn't that critical. I used 0.95mm enamelled copper. L1 is tapped at 3 turns from the grounded end for the RF input. L3 has a secondary winding of 3 turns made from insulated hookup wire. All resistors are standard 0.25W metal or carbon film. Fixed capacitors are ceramic disc. The trimmer capacitors are 40pF miniature types. Other trimmer capacitors should be suitable once they can be adjusted to approximately 30pF (ie 10-60pF). Good HF/VHF construction practice should be followed, with all leads short and direct and all ground connections direct to the copper foil. Input/output connections on the prototype were via a pair of BNC sockets. These are for testing purposes and will be removed later. The assembled amplifier is shown in **Photo 1**.

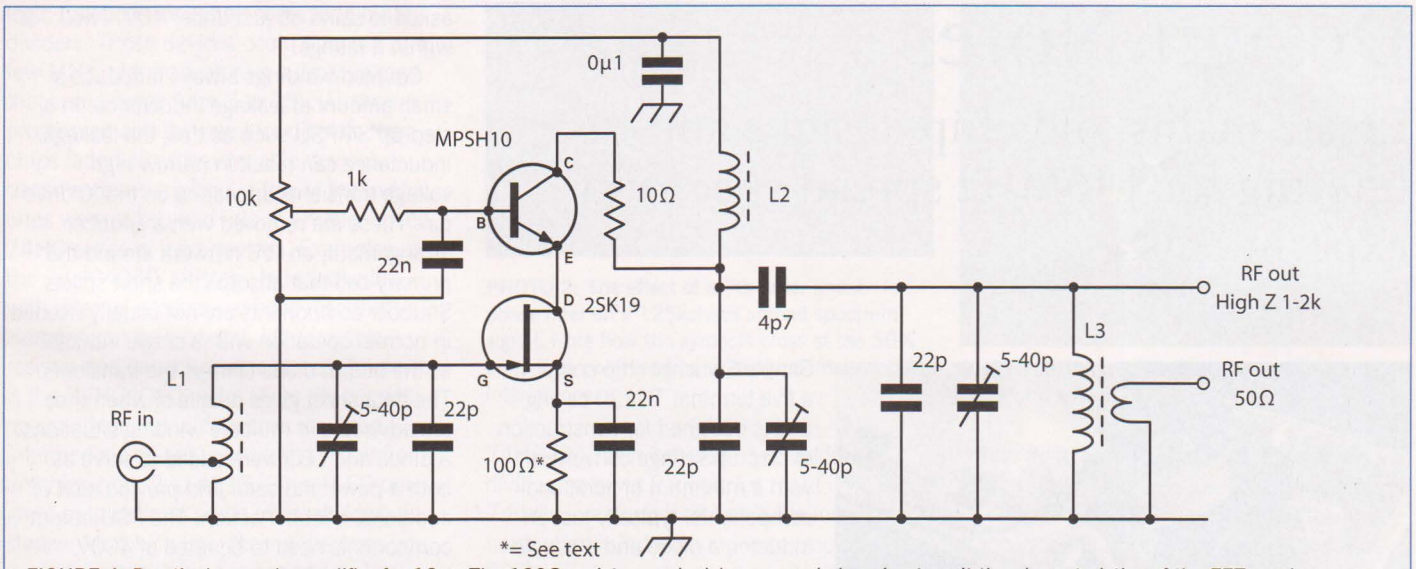


FIGURE 4: Practical cascode amplifier for 10m. The 100Ω resistor marked * may need changing to suit the characteristics of the FET used.

TESTING. The amplifier gain was measured at 18-24dB depending on the type of FET used and the position of the input tap. Highest gain was with the input tapped at 2T. This configuration gave 24dB of gain, a noise figure of 2-3dB and bandwidth that was not sufficient to cover the entire band. With the tap at 3T, gain was measured at 21dB and BW increased significantly. Careful adjustment of the three trimmers gave 20dB gain, -1dB BW of 1MHz and -3dB BW of 2MHz. This is adequate for full band coverage and gives extreme attenuation at the IF and IF image frequencies. This is particularly important because I will be using an unbalanced mixer that gives no rejection of unwanted IF breakthrough. Bias of the top transistor was adjusted so that the DC drain voltage of the bottom JFET is around 6V. **Photo 2** shows the noise test rig using a thermionic noise source (August 2011). NF was 2.7dB with a 2SK19/MPSH10 and somewhat higher with the MPF102. Even lower noise figures should be achievable with DG MOS and GaAsFET devices, although there is probably no real advantage to having such a low NF on the 10m band. The amplifier was grafted into the front end of my HF transceiver. The first test was performed just after dark in mid-winter, when the band appeared to be completely dead. Undeterred, I gave a call and was very surprised to get an immediate response from Jim, W3ZKY. Signals were reported Q5 each way. The standard test of switching between the aerial and a 50Ω dummy load showed a substantial increase in noise with the aerial connected. Tests using instruments are all very well, but a real-world test is usually more satisfying.

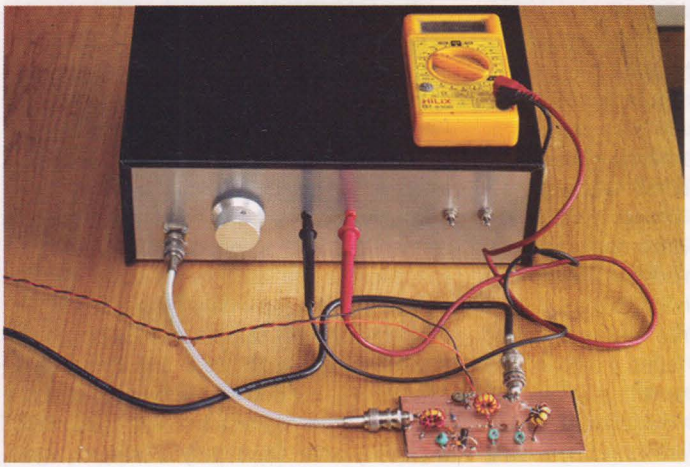


PHOTO 2: Testing the noise performance of the amplifier.

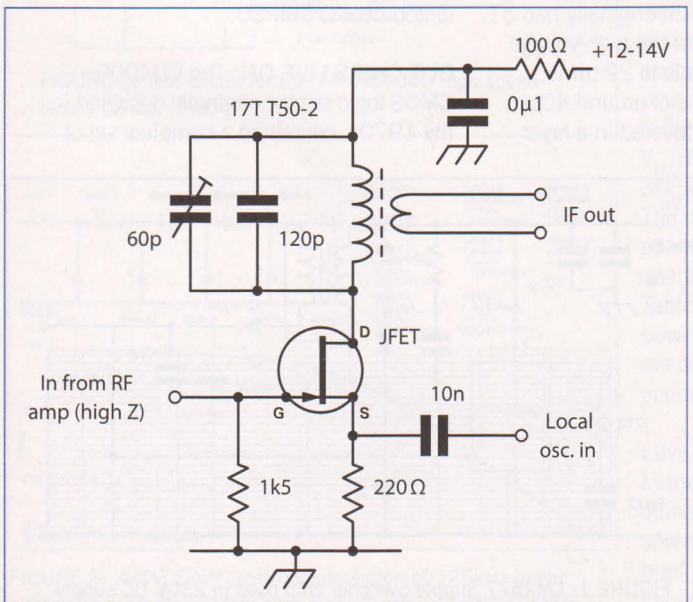


FIGURE 5: A single-ended JFET mixer of acceptable performance.

28MHz FET MIXER. **Figure 5** shows a single-ended JFET mixer. This will be used in the standard version of the 10m transceiver. A 'stronger' mixer will be used in the transverter-specific version. Construction is very straightforward. The FET is a BF256A. Similar devices like the 2SK19 should work equally well. The MPF102 also performed well in this circuit. The IF transformer in the drain circuit is 17 turns of 0.375mm (not critical) on a T50-2 (red) powdered iron toroid. The output coupling is 4 turns for a 50Ω output termination and a yet-to-be-determined greater number (around 7-9 turns) when terminated by a crystal SSB filter.

TESTING. The mixer was also grafted into the front end of my existing HF transceiver alongside the cascode amplifier. Performance seems good with no sign of distortion or other unwanted effects. As my two-tone dynamic range test rig doesn't cover 28MHz, I haven't yet done any dynamic range tests on the new front end.

We will continue with the 10m transceiver next month.

WEBSEARCH

[1] *Experimental Methods in RF Design* Chapter 7, Hayward, Campbell, Larkin; ARRL
[2] *The Two Faces of Q*, Wes Hayward, W7ZOI
[3] http://tinyurl.com/nl7xzje_

February 2015 • RadCom
Andy Talbot, G4JNT • e-mail: ac.talbot@btinternet.com

Design Notes

Ersatz mains, old chip designs and filtering for 146MHz spread spectrum experiments

PHOTO 1: 230V DC supply built into low cost 13A two-way adapter block.

POWERING MAINS CHARGERS FROM DC. Many small items of consumer electronics like mobile phones, cameras and even amateur handhelds now usually include lithium batteries and are often supplied with customised mains plug-in chargers. Other consumer items come with PSUs in a similar housing. They now dominate our surroundings to such an extent these plug in gizmos are often referred to as 'wall warts'. All of this means that our equipment can easily be recharged at home, but what if we want to charge or run it from the car, on a 12V supply? Manufactures usually offer 12V power leads and supplies, but these are frequently quite expensive – especially for the more specialist items such as cameras; and a different lead would be needed for each item. So, how about powering the plug top units themselves from a 12V supply?

All modern plug-in chargers and PSUs uses switch mode technology, so a brief survey was conducted via the *RSGBTech* Yahoo group. This revealed that 100 percent of those units checked were specified for an input voltage range of 100 to 250VAC; none were rated at just the higher (or lower) voltage end. All SMPSUs first of all rectify and smooth the mains in a bridge rectifier and reservoir capacitor. This delivers a voltage somewhere between 140 and 350V DC to the subsequent circuitry and also means these PSUs will function perfectly well if they are supplied with DC at a voltage somewhere within this range. I decided on 230V DC as a nice intermediate voltage, mainly because it is the same as the mains RMS.

So, is there a simple way to generate a few watts of power at 230V? The LM2577 Simple Switcher chip comes in a five terminal TO220 casing and is designed for construction of step-up voltage converters with a minimum of additional components: typically just an inductor, a diode and a couple of resistors and capacitors are needed. The device includes overcurrent limiting and thermal protection so ought to be pretty foolproof! Download the LM2577 datasheet from Farnell [1] or RS [2] for full details. As it stands, the maximum voltage this chip will supply, or stand off, is specified as 60V, so we need a step-up arrangement for a higher voltage. By going for a tapped inductor that behaves as a transformer, the flyback voltage present on the chip can be kept down to a safe level while still supplying the several hundred volts wanted. **Figure 1** shows the final arrangement. The datasheet specifies a typical inductor value of 50 to 100μH for L1 in normal usage, but calculations based on a 15V maximum input supply suggested that a value closer to 25μH would suffice. I found a surplus open construction inductor with a value of 68μH, recovered from an old junkbox PCB, which looked to be easily modified by adding an overwinding. The inductor is the large item dominating **Photo 1** and is somewhat larger than it needs to be. It originally had 31 turns so, to make room for the high voltage overwinding, I reduced this to 22 turns, resulting in an inductance of around 40μH. The primary turns were covered in a layer of tape to provide a winding base for 110 turns of thinner wire that forms the high voltage overwinding. Another layer of tape on the outside gives some protection to the thin wire. The tapped inductor provides a 1:6 step up in voltage and means that at 230V output, the LM2577 is being asked to stand off just under 40V – well within it ratings.

Coupled windings always introduce a small amount of leakage inductance. In a step-up SMPSU such as this, the leakage inductance can result in narrow high voltage transients appearing on the IC drive pin. These are removed with a snubber arrangement, an R/C network around the primary coil that absorbs the short spikes. Snubber components are not usually needed in normal operation with a single inductor as the output diode clamps the transients. The data sheet gives details of when they are advisable in multiple winding situations. A diode and LED were added to serve as both a power indicator and provide a bit of additional snubber action. The PSU output components need to be rated at 400V, including the 150k dropper resistor in the voltage feedback network. Since I use 1/8W 0805 SMT components, this was actually made up from three resistors in series to solve both power dissipation and voltage rating. Similarly, the 620Ω snubber was made up from three parallel resistors to maintain their power rating.

The LM2577 limits at an input current of around 3A; measured efficiency was around 75%, so a maximum output power capability of around 25W can be expected. Photo 1 shows the finished module built into one side of a low cost two way mains adapter. The plastic moulding bits that originally supported one set of mains socket connections were snipped away to make space for the final assembly to be shoe-horned in. Now the whole thing lives in the car, where my camera, mobile phone and anything else can be charged when needed. It is not powerful enough to supply a laptop charger, as these typically need 40W, especially when the battery is being charged. A better solution here is to make a higher power rated 12V to 19V (or whatever the laptop needs) SMPSU.

OLD CHIPS LIVE ON. The CD4000 CMOS logic family, originally designed in the 1970s, contained a complete set of

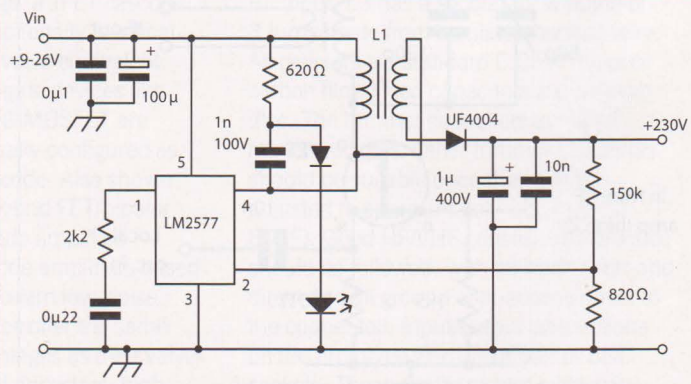


FIGURE 1: LM2577 Simple Switcher chip used in 230V DC supply for powering small plug top chargers and 'wall wart' PSUs.

logic functions including some long binary dividers. Those devices could only run at a few MHz, but did feature a supply voltage that could range from 3 to 15V. As time progressed and the need for discrete logic chips faded as programmable devices became commonplace, a few of the useful ones were subsumed into the higher speed 74HC series of logic devices. Examples are the 74HC4060 14 stage binary divider with internal oscillator, whose resonant element can be a crystal, LC or simple resistor and capacitor. Another useful device is the 74HC4040, a 12 stage divider with no oscillator, but with access to all the intermediate stages, allowing division from anything from 2 to 4096. (The 4060 only gives outputs from some of the divider stages; Murphy's Law means the ones you want are often those not available). The 74HC family will go to around 30 – 40MHz and often, in practice, a fair bit higher. Which is starting to get useful for radio applications.

I wanted a frequency synthesiser for use on the 137kHz and 475kHz bands. The LMX2541 fractional-N chip mentioned last month has its own output divider and generates down to 32MHz. From here, a 74HC4040 can be used as an additional divider for lower frequencies, right down to 7.8kHz – making it also suitable for ultra narrowband underground experiments at 8950Hz.

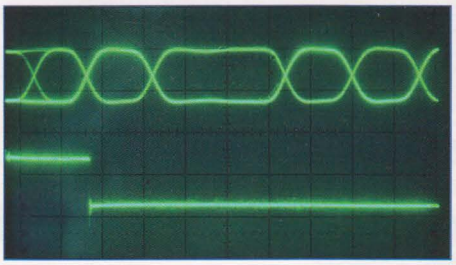


PHOTO 2: The effect of a 7th order linear phase filter on a 125kchip/s spread spectrum signal. Note how the symbols cross at the 50% amplitude point leading to minimal intersymbol interference.

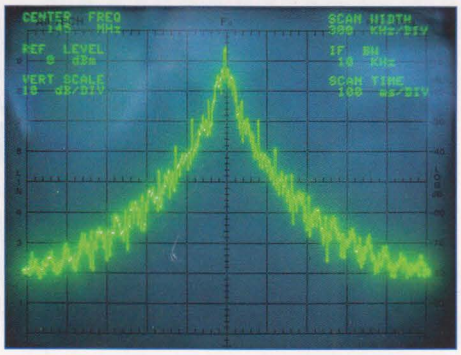


PHOTO 3: The frequency spectrum of the waveform shown in Photo 2.

Perusing the RS web page, intending to place an order for some 74HC4040 chips, I spotted they also did a 74VHC4040 (Very High speed CMOS) version of the chip, which looked interesting [3]. The datasheet suggested that when running from a 5V supply, it would typically function with up to 210MHz input frequency, although it was only guaranteed to 140MHz. This piqued my interest so I ordered a few to play with. The chip was connected as shown in **Figure 2**, with the normal CMOS input biassed to half supply volts in order to accept a standard sinusoidal drive waveform from an RF signal generator with 50Ω termination.

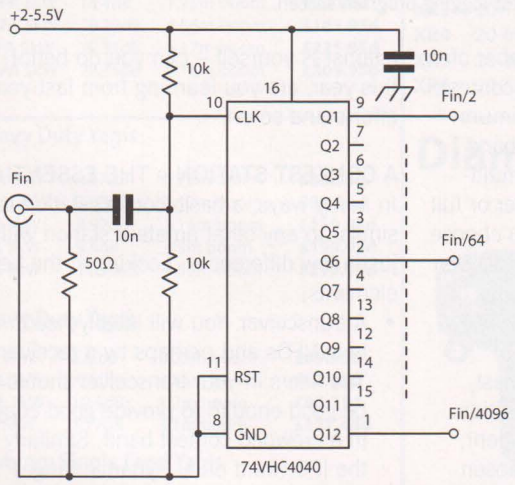


FIGURE 2: Test circuit for the 74VHC4040 high speed binary divider chip.

The results were impressive. Although way outside the manufacturer's specification, it would divide down satisfactorily from an input frequency as high as 400MHz, and certainly at the 210MHz "typical" specified. Even when run with a supply voltage of 3.3V (it will go down to a V_{DD} of 2V), operation up to 300MHz appeared possible. The minimum RF input power needed for satisfactory operation is shown in **Table 1**. Similar minimum power level appeared to be needed for both 5V and 3.3V operation.

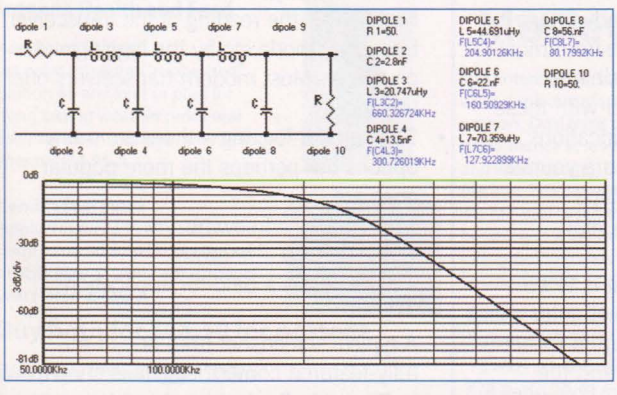


FIGURE 3: *AADE Filter Designer* simulation of 125kHz linear phase 7th order Bessel low pass filter. Cutoff = 3dB@125kHz. Design impedance = 50Ω, input impedance = 50Ω.

LINEAR PHASE FILTERS.

In the November 2014 edition we looked at a spread spectrum source and briefly mentioned the need for a linear phase filter to preserve the waveform shape while maintaining an acceptable frequency spectrum.

The 146 – 147MHz experimental allocation requires very tight control of out of band emissions above 147MHz (and, to a lesser extent, in our own satellite allocation just below 146MHz). It was suggested by G4BVY in his presentation at the RSGB Convention that an attenuation of -70dB really ought to be applied. This makes filtering of spread spectrum signals very difficult. Linear phase filters have very poor frequency attenuation characteristics, with high order filters needed to give any worthwhile attenuation. My original idea of a 250kHz or even 500kHz Gold code spread spectrum, with a simple code generator and filtering, definitely had to be rethought. A suitable compromise is to drop the chip rate to 125kHz then use a 125kHz 7th order linear phase filter as shown in the *AADE Filter Designer* simulation in **Figure 3**.

The resulting spread spectrum waveform is shown in **Photo 2**, showing how symmetrical are the transmitted symbols using this type of filter. The associated spectrum is shown in **Photo 3**. In the 10kHz resolution bandwidth of the spectrum analyser, the level of out of band components is only 60dB below the peak, making even this low chip rate system barely acceptable.

WEBSEARCH
[1] LM2577 datasheet from Farnell – www.farnell.com/datasheets/1804884.pdf
[2] RS Components LM2577 datasheet – http://uk.rs-online.com/web/p/boost-converters/5338120/
[3] Search for 74VHC4040 at http://uk.rs-online.com

TABLE 1: Minimum input power needed for correct operation of the 74VHC4040 binary divider test circuit shown in Figure 2.

Frequency	Input power
50MHz	-6dBm
150MHz	-4dBm
200MHz	0dBm
250MHz	+3dBm
300MHz	+4.5dBm
350MHz	+6dBm
400MHz	+7.5dBm

February 2015 • RadCom
Don Beattie, G3BJ • e-mail: g3ozf@btinternet.com

Getting started in... HF Contesting

Your first steps in competitive amateur radio

INTRODUCTION. What is it about contests? They are a bit like Marmite: you either love them or hate them. Rarely is there anything that generates so much heated discussion in amateur radio circles as contests. And yet, contests are an increasingly popular aspect of amateur radio – as the entry numbers in the major contests show – and in this article I will try to explain why this might be, and how *you* can join the increasing numbers who are fascinated by this competitive aspect of amateur radio.

THE CASE FOR CONTESTING. There is an in-born human trait to compete. We see it in sport, we see it in business and we see it in day-to-day life. Competing can have a destructive aspect, or it can build strong bonds and camaraderie amongst competitors and lead to heightened performance. Contesting does the latter. Contesting allows you to test your station – and you. It tests the technical capability of your station, its reliability, and it tests your understanding of propagation and of efficient and speedy operating.

Over the years, contesting has been responsible for developing the operating skills of many thousands of the top DXers and has also been the catalyst for many of the technical developments that we now take for granted in modern amateur equipment. In short, it advances amateur radio and those who pursue it.

Contests require each competitor to maximise his score, through working stations and (generally) looking for 'multipliers' – these are new countries or zones or some more local attribute like Russian Oblast numbers. The contest exchange between stations (as defined in the rules) is generally a signal report and some additional information like zone, IOTA reference or Oblast number. The total score is then (generally) the result of multiplying QSO points by total multipliers. QSO points can also depend on the continent of the station being worked, encouraging DX contacts. So the successful contest operator will work out what will make for the highest score, and plan his strategy accordingly, taking account also of likely propagation etc.

Some look on contesting as an endurance test, but this is not necessarily

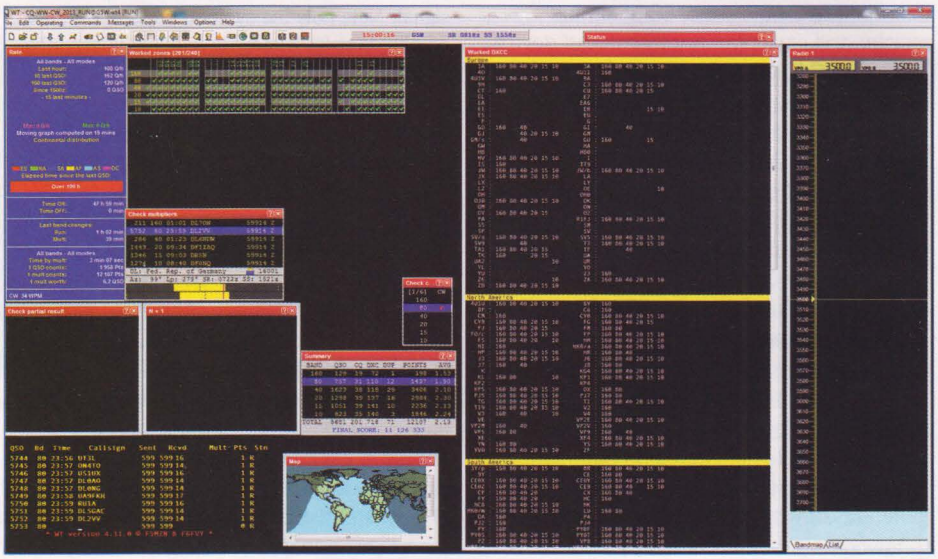


FIGURE 1: A typical fully-featured contest logging program screen.

the case. Most contests have a number of entry categories. Depending on the contest, these might include a range of maximum hours of operation, multi- or single-band entry, antenna type (single wire or multi-element) and power (QRP, low-power or full power). So it is generally possible to choose a category of entry that suits *your* particular circumstances. It pays to read the rules of each contest carefully, as there are many differences between contests.

When considering entering a contest, you will want to consider the competition. In UK-based contests that is self-evident, it is the other UK stations in your chosen category of entry, but in the large global contests, who do you measure yourself against? Certainly not the stations that are optimally located (perhaps in North Africa or the Canary Islands) to take advantage of being in a different continent from most of the activity. It is near-impossible to compete on a level playing field with these super-stations in hand-picked locations, but you should expect to measure yourself against other UK stations, perhaps checking progress from year to year against this peer group.

So the first rule of contesting is to *be realistic*. Choose your category of entry and your competitive peer group to reflect the capabilities of your station and the degree of time you can give to contesting. Never forget, however, that the most important person you are competing against is yourself – can you do better this year, are you learning from last year's efforts and so on?

A CONTEST STATION – THE ESSENTIALS. In many ways, a basic contest station is similar to any other amateur station with just a few differences. Looking at the key elements:

- A transceiver. You will ideally need twin VFOs and perhaps twin receivers. The filters in your transceiver should be good enough to provide good copy in a crowded contest band. Similarly the IP3 (third order dynamic range) should be good enough to operate in a band of very strong signals without introducing additional noise or distortion. Furthermore, your transceiver should have CAT – the reading of the transceiver frequency/mode etc by the logging computer. Most modern transceivers offer this facility.
- Software for logging – there are many options but perhaps the more popular ones are:
  - *N1MM+* – freeware
  - Ei5DI's *SD* – freeware
  - *Win-Test* – a paid-for application

A typical screenshot from one of the fully-featured contest loggers is shown in **Figure 1**. Contest logging programs provide a comprehensive 'management information' service to the contest

The Exclusive Collection of Antennas

Only Available from:

01702 206835 sales @wsplc.com

22, Main Road, Hockley, Essex SS5 4QS

Waters & Stanton Ltd

www.wsplc.com

Exclusive Retail Stockist

InnovAntennas

We are the exclusive retail stockist of this remarkable range of antennas that outperform anything else we know of. These high performance designs are engineered to last a lifetime. Nothing else comes close.

InnovAntennas Baluns

High Quality Baluns - Exclusively appointed retailers.

70cms 700W N connector feed and terminal tags. **£24.95 b**

2m 1kW N connector feed and terminal tags. **£29.95 b**

4m 1.5kW N connector feed and terminal tags. **£33.95 b**

6m 1.5KW N connector feed and terminal tags. **£39.95 b**

20-6m SO-239 connector feed and terminal tags. **£39.95 b**

VHF / UHF Types

HF Type

Create Rotators

RC5-1 £499 d

- Torque: 6kg/m
- Brake torque: 80kg/m
- Max. vert load: 400kg
- Mast size: 48-63mm
- Weight: 5kg • Cable: 7 core

RC5A-3 £599 d

- Torque: 22kg/m
- Brake torque: 200kg/m
- Max. vert load: 700kg
- Max. horiz load: 1000kg
- Mast size: 48-63mm
- Weight: 5kg • Cable: 7 core

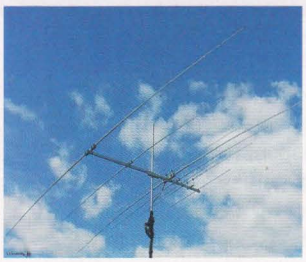
2m Light Weight Yagis

4 El. OWL 2kW	8.9dB	0.56m boom	**£49.95 c**
6 El. OWL 2kW	11.5dB	2.6m boom	**£80.70 d**
8 El OWL 2kW	12.1dB	4m booom	**£129.95d**

2m Heavy Duty Yagis

5 El. LFA 5kW	11.16dB	1.79m boom	**£89.95 d**
6 El. LFA 5kW	11.8dB	3.73m boom	**£104.95d**
8 El. LFA 5kW	13.3dB	4.4m boom	**£164.95d**
9 El. LFA 5kW	14dB	4.4m boom	**£194.95d**
12 El. LFA 5kW	15.8dB	7.13m boom	**£269.95d**
10 El. LFA 5kW	14.4dB	1.75m boom	**£92.95d**
19 El. LFA 5kW	18.29dB	4.56m boom	**£185.95d**
24 El. LFA 5kW	19.31dB	6.17m boom	**£235.95d**
30 El. LFA 5kW	20.35dB	8.18m boom	**£309.95d**

InnovAntennas HF Yagis



These are no comprise designs. No traps and no coils. Rated at 5kW, these are single feed designs that present a natural 50 Ohm feed impedance. Boom 3.1m

XR3	20-15-10m 6.7dB F/B 21dB 3.1m boom	**£759.95 d**
XR4	20-6m 7.5dB F/B 25dB 3.5m boom	**£845.95 d**
XR5	20-10m inc WARC 6.7dB F/B 20dB 3.5m	**£896.75 d**
XR6	20-6m inc WARC 6.7dB F/B 25dB 3.5m	**£929.95 d**

Spid Rotators

RAU RAK

Spid rotators are tough with worm drives and include the control box. USB ready for Ham Radio Deluxe

RAU	120kg load Torque 180nM wgt 6.5kg	**£479.95d**
RAK	120kg load Torque 180nM wgt 8kg	**£539.95d**
REAL	Elevation rotator	**£549.95d**
BIG RAK	1 degree accuracy	**£829.95d**
RAS	Elevation rotator up to 14x4 el 2m	**£879.95d**
RAS	Elevatin 0.1 degrre accurate	**£1044.95d**
Big RAS	Double worm gear up to 20x4 el 2m	**£1305.95d**

6m Heavy Duty Yagis

2 El. LFA 5kW	6.67dB	0.73m boom	**£89.95d**
3 El. OWL 2kW	7.67dB	1.12m boom	**£99.95d**
3 El. LFA 5kW	8.92dB	2.14m boom	**£119.95d**
4 El. LFA 5kW	9.4dB	3.3m boom	**£159.95d**
5 El. LFA 5kW	11.38dB	4.53m boom	**£299.95d**

4m Heavy Duty Yagis

2 El. LFA 5kW	6.5 dB	0.55m boom	**£69.95d**
3 El. OWL 2kW	7.7dB	0.85m boom	**£62.95d**
5 El. OWL 2kW	10.4dB	1.3m boom	**£80.71d**
5 El. LFA 5kW	10.7dB	3.1m boom	**£127.46d**

Dual 6m/4m Single Feed Yagis

3+3 El. 5kW	6.9dB	1.17m boom	**£139.95d**
4+4 El. 6kW	8.4dB	2.1m boom	**£199.95d**
6+6 El. 5kW	10.95dB	5.4m boom	**£339.95d**

Diamond Dipole Baluns

BU-50 £44.95 c

Great Japanese engineering, this balun also acts a the centre dipole feed insulator and is fitted with SO-239 socket. Range is 1.7 - 40MHz and rated up to 1.2kW.

BU-55 £44.95 c

This is similar to the BU-50 but has a frequency range of 3 - 76MHz with a lower power rating of 500W.

Diamond Antennas

The Diamond HF mobile antennas make it so easy to go HF mobile with an efficient system that fits directly onto any SO-239 mount. Antenna includes an easy adjust "finger tighten" resonator. 200W

HF80FX	80m 1.4m L	**£69.95c**
HF40FXW	40m 1.4m L	**£62,95c**
HF30FX	30m 1.4m L	**£62.95c**
HF20FX	20m 1.2m L	**£59.95c**
HF16FX	17m 1,2m L	**£59.95c**
HF15FX	15m 1.2m L	**£54.95c**
HF12FX	12m 1.2m L	**£56.95c**
HF10FX	10m 1m L	**£54.95c**
HF6FX	6m 1m L	**£64.95c**

Antenna Health and Feed

Feed Point Sealant.
Just paint this liquid "rubberised" solution on any joint or plug for a long lasting weather proof seal. Essential for an efficient noise free antenna. **£4.95 A**

ConduaSeal Paste
Apply this paste to all your element joints to avoid xorrosion and enable easy antenna adjustments years later. **£4.95 A**

Buy both for £11.50 inc postage

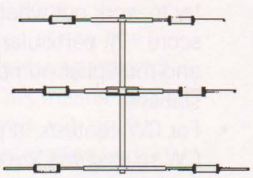
WestFlex Coax Cable 100m

Outer Sheath: 10.3 mm
Inner Conductor: 2.7 mm
Minimum Bending Radius: 55mm
Velocity Ratio: 0.85

£150 C

Mosley HF Tri-Banders

The antenna that started it all and still outsells its competitors. Dual traps mean great performance at lower weight and wind loading. The TA-33 fearures 1kW SSB rating whilst the MP-33N raised the power handling to a full 2kW power rating. Both models offer amazing value.



TA-33Jr. £399 D
MP-33N £499 D

Bands: 10-15-20m
Power 1kW SSB / 2kW SSBGain 10=8
15=6.8 20=5.8 (dB)
F/B Ratio 20dB max on all bands
Boom 12ft
Longest El. 26.7ft
Turn Radius 14.7ft
Weight 21lbs / 23lbs

Antenna Analysers

VAA 500kHz - 60MHz

This model shows graphic display of VSWR and impedance. Comes with internal battery and USB charge lead.

£199.95

AA-170 0.1-170MH:

This battery powered unit is highly accurate and has the facility to down load data via its USB port.

February 2015 • RadCom
Don Beattie, G3BJ • e-mail: g3ozf@btinternet.com

operator, as well has handling the routine of logging QSOs. *N1MM+* and *WinTest* are capable of supporting the more complex requirements of networked computers in a multi-station contesting environment, but for the beginner in contests, where single operator, unassisted (ie no packet cluster support) operation is planned, *SD* is more than adequate.

- A voice keyer for SSB contests or a CW keyer for CW contests. Generally these are integrated into the more comprehensive contest logging programs, using the sound card of your computer for voice keying through a suitable interface.
- An appropriate antenna for the band(s) you will be using in the contest. Remember that a good strategy when starting out in contests would be to choose a single band entry using your 'best' band in terms of antenna(s). Single band entries can also help in often not requiring 24 hour operation in the major contests, as some bands will be closed for part of the daily cycle.
- Internet connectivity, if you want to enter into an 'assisted' category – one where you can use Packet Cluster or the Reverse Beacon Network to help you find multipliers.
- If you are entering contests more seriously, and on a multiband basis, you may also want to consider:
  - Automatic antenna selection, based on the chosen band. Most contest logging software provides for this through a simple hardware interface. Some of the commercially available station controllers integrate voice keying, CW keying and antenna selection in one box.
  - If you are using a SteppIR or similar dynamic beam antenna, the control of antenna tuning directly from your transceiver.

  The whole objective of automating as many functions as possible is to make QSYing from band to band in a contest as quick and foolproof as possible.

  Unless you are considering multi-station contesting (for example multi-single or multi-two – see below) you will not need to bother about bandpass filters, but these add some additional complexity to the more elaborate contesting stations.

TAKING THE FIRST STEPS. So let's assume you have decided to take your first steps in contesting. Here's how you might proceed, having assembled the necessary equipment.

- Start by 'dabbling'. Don't worry about a serious entry – just get on the air and get used to the style of operating. Dabbling allows you to check out your station, get used the contest logging software and generally get used to the way things happen. Remember that in CW contests in particular you can do well with a very modest station. You will find that the cacophony of QRM that may seem the norm for busy CW contests eases as you move up the CW segment of the band – so it may be sensible to start listening quite high in the CW segment of the band. The same applies to a lesser extent on SSB. But in both cases, remember to check the rules, as some contests set out band limits for contest QSOs. Remember though, that you should still submit a log – even if just dabbling. It helps with cross-checking, and if you wish you can submit it as a check-log, meaning that you will not be listed in the entrants, but your log will be publicly acknowledged.
- Once you have gained a little confidence, choose your contest for a first serious try. Here you will take into account the station you have available, your own commitment and time availability. Read the contest rules carefully and plan your approach. Look at the last results and try to work out what makes for a good score – in particular the target QSO and multiplier numbers of the leading stations.
- For CW contests, it pays to practice your CW so that you are comfortable with reading calls and exchanges correctly first time. A useful free tool for practising is *Pile-up Runner* by Alex Shovkoplyas, VE3NEA. This is an outstanding piece of software that realistically simulates a contest with noise/fading etc. It is well worth spending some hours practicing with it. Remember that in nearly all contests, you are penalised for errors you make in copying callsigns and exchanges. So it pays to hone your skills in properly copying and logging incoming exchanges.
- In long contests, research the likely propagation and tentatively plan your rest breaks at times when the QSO points to be found are likely to be lowest.
- Make sure the layout of your station makes for minimum physical effort on the part of the operator. Not so important for short contests, but vital in long ones, where fatigue can set in.
- Set up your logging software for the contest involved, including the necessary CW messages accessed by the function keys. Make sure you can enter calls quickly enough onto the keyboard – practice your typing skills!
- Check that any new features you have added to your station are working correctly – for example the CAT link between your logging program and your transceiver, your voice or CW keyer, any automatic antenna switching you have installed and, if you plan to use it, your link with the Packet Cluster, checking that it populates the band map in your logging program. If using Cluster, set your band map appropriately – do you want it to display multipliers only, or all unworked stations?
- Remember also that most logging programs include the facility to make an audio recording of the contest. Consider setting up this facility as it can help in your training and also is a useful check on QSO content.
- Work out your strategy – will you try to hold a transmit frequency, working stations as they call you (called 'running') or will you tune the bands

PHOTO 1: A contest-winning QRP transceiver!

looking for stations and those all-important multipliers (called 'search and pounce', or S&P)? Your choice here will most likely depend on the relative strength of your signal. It is much easier to 'run' with a strong signal, whereas S&P can work well (when coupled with good skill in timing your calls) when you have a more modest signal.

- Think about your operating technique in advance. Whilst we all want to be polite during contests, think about how to keep unnecessary words (or letters on CW) to an absolute minimum. See **Table 1**.
- If you are unclear about any aspect of preparing for a contest, don't be afraid to ask. There is a great community of contesters in the UK who will be more than willing to help. Join the Yahoo reflector, which is a source of advice and guidance for all contesters.
- But remember, you can enter contests with the simplest of equipment – **Photo 1** shows equipment that G3BJ has used in the past to win a QRP contest!

So enter the contest and have fun! Don't be disheartened when there are periods when you can't find a station to work – this happens from time to time. Keep your motivation up and vary the mix between running and S&P. Also remember that in a multi-band contest, a low QSO rate may indicate that you are on the wrong band for the time of day or your beam (if you have one) is set for the wrong direction. Keep an ear on the other bands for high activity.

After the contest, your contest logging program will generate a file for you in the 'Cabrillo' format – the format required for all contest entries. This can be opened with any basic text editor, so before submitting your log to the adjudicator, check it for silly typing errors – perhaps the most common is the interchange of 0 for O. This will lose you points! A good way to check the log is to take the Cabrillo file, put it into *Excel*, then sort the QSOs by callsign. This often highlights where the typing errors are. Then remember to get the checked log to the adjudicator by the due date – read the rules!

Immediately after the contest do one other thing – write down what went well and what went badly. This is an invaluable check list for next time, and forms the agenda for future work to improve your station (and yourself as an operator). Remember to refer back to that list before the next contest.

FURTHER DEVELOPMENTS. Most people are happy working contests with a relatively 'normal' station – one transceiver, perhaps an amplifier, and antennas for the bands in question. It can be a life's work to optimise you and your station's performance. But an increasing number of people are dipping their toes into the water of more elaborate contesting:

Single Operator Two Radio (SO2R). This is a technique where the station can operate on any two bands simultaneously, and where the operator is able to 'run' on one band and 'S&P' on a second, interleaving the QSOs in real time. It requires two separate stations (including antennas), with the transceivers side-by-side, a logging program that supports SO2R, and a special SO2R controller to control the routing of audio, PTT, CW/voice and transceiver selection. It also requires proper bandpass filtering of the outputs of each station to avoid inter-station interference. Whilst it is a technical challenge to build the SO2R station, it is much more of a challenge to the operator to handle the dual inputs from the two bands and process all that data in the brain. It takes time to develop SO2R skills but the rate of score advancement during a contest can be significantly improved with SO2R facilities.

Team Contesting. If you are able to establish a station with two separate transceivers and sets of antennas, you may alternatively want to consider team contesting. Most contests have entry categories for forms of multi-operator operation – typically multi-single and multi-two.

In *multi-single*, only one transmission is allowed at any one time unless the station being worked is a new multiplier. This means that the station is configured with one transceiver as the 'run' station and the second as the multiplier hunting – 'mult' – station. Both operating positions are manned throughout the contest and there is no limit on the total number of operators. This can lighten the load of a long contest, by allowing operators to work in shifts, taking rest periods in between.

TABLE 1: Optimised contest exchanges. Remember every additional word wastes time – keep it short!

Station	In CW	By voice
Me	G3BJ G3BJ TEST	G3BJ Golf Three Bravo Juliet, Contest
Him	G4ABC	Golf Four Alpha Bravo Charlie
Me	G4ABC 5nn 143	G4ABC 59 143
Him	5nn 178	Thanks 59 178
Me	TU G3BJ TEST	Thanks – G3BJ, Contest

In *multi-two*, both stations can 'run' but the secret here is to get the balance right between acquiring multipliers and maximising QSO numbers.

In both multi-single and multi-two there are limits to the number of band changes that can be made (typically in each hour) – read the rules carefully. Most logging programs will keep a check on this parameter to make sure you don't transgress.

Don't think that team contesting is just for the mega-stations – a competent multi single capability can be created by adding a multi-band vertical to an existing station: you do not necessarily need two sets of beams.

Team contesting is great fun, building up a team spirit and having fun together. Several UK contest groups run team entries in the major contests from portable locations – this is hard work but can be very rewarding.

A HEALTH WARNING. After taking your early steps in contesting you may find that it becomes addictive. That human trait to compete can take over and you may find yourself becoming very focussed on doing better next time. This is natural – we all like to succeed – and it will do a lot for your station and for you as an operator for a little bit of addiction to take over. But keep it under control.

So happy contesting, and remember – by joining the ranks of the contesters, you will be joining one of the fastest growing aspects of amateur radio and a world-wide community of like-minded people ready to support and help you take your first steps into this exciting world. Even if you only join in to 'give a few points away' you can contribute to this world-wide phenomenon.

WEBSEARCH

[1] Sherwood Engineering: www.sherweng.com/table.html
[2] N1MM+: http://n1mm.hamdocs.com/tiki-index.php
[3] EI5DI: http://www.ei5di.com/
[4] Win-Test: www.win-test.com
[5] Microham: www.microham.com/
[6] *Pile-up Runner:* www.dxatlas.com/pileuprunner/
[7] Yahoo reflector: uk-hf-contesting@yahoogroups.co.uk

MOONRAKER

Radio Communications Manufacturer and Reseller

Moonraker UK Limited
Cranfield Road
Woburn Sands
Bucks MK17 8UR
Open Mon-Fri 9-5:30pm

Sales Line 01908 281705
E-mail: sales@moonraker.eu Web: www.moonraker.eu

PayPal SOLO VISA Maestro MasterCard

If we advertise it – we stock it!

Wouxun

Authorised dealer

The **New KG-UV8D** is the latest handheld to hit the market from Wouxun. It has a lovely large blue colour display and all the other main features you have come to expect for a **Super price £99.95**

Wouxun KG-UV950P Quad Band 10/6/2/70

The Wouxun KG-UV950P is a quad band FM mobile transceiver covering 10 meters, 6 meters, 2 meters and 70cm – with up to 50W on VHF, **with a price of just £229.95** nothing else come close.

Best selling quad band radio - in stock now!

New KG-UV950PL quad band mobile but now with 4m instead of 10m so 6/4/2/70cm and at **unbeatable price £249.95 – in stock now**

Don't miss out on this amazing compact radio - been a real hit with customers with limited space, looking for a rig for holiday and even seen them fitted to motorbikes

FREE SOFTWARE AND CABLE WHEN MENTIONING THIS ADVERT

The **New Leixen VV-898** is an amazing compact 2/70cm dual band rig, with nice clear display, great sound, switchable 4/10W out, complete with mounting bracket and microphone.

The most amazing bit - Just £99.95 !!!

Looking for a new portable, mobile or base HF Transceiver on a budget – then look now further than these two winners

X1M Platinum 5 Band HF QRP Transceiver 5 Watts USB, LSB, CW including integrated CW keyer ..... **Amazing price of just £249.95!**

And for more power and features there is the

X108 0.5-30MHz HF Transceiver 20 Watts (see web for full details) **£399.95**

YAESU

Authorised dealer

Hand-helds

FT-1DE The FT1D Digital Portable Transceiver is the first Dual Band Digital/Analog Transceiver developed with advanced C4FM FDMA digital technology for Amateur Radio, providing many unique features in digital communication..... **£299.95**

VX-8DE Triband same spec as VX-8E but with enhanced APRS..... **£299.95**

VX-7R Tri band 50/144/430MHz RX 0.5-900MHz, 5 Watts outut..... **£289.95**

VX-6E Dual band 2/70cm RX 1.8-222/420-998MHz, 5 Watts output..... **£179.95**

VX-3E Dual band 2/70cm RX 0.5-999MHz, 3 Watts output..... **£129.95**

FT-60E 2/70cm 5W FM RX 108-520, 700-1000MHz..... **now only £119.95**

FT-270E Single band 2m, 144-146MHz, 137-174MHz Rx..... **£99.95**

FT-252E 2m rugged 5w handie..... **now only £69.95**

Mobiles

FTM-400DE Digital Dual Band Mobile – In Stock Now at **£539.95** – see full details at www.moonraker.eu

FT-8900R Quad band 10/6/2/70cm 28-430MHz, 50 Watts output..... **£299.95**

FT-8800E Dual band 2/70cm RX 10-999MHz, 50 Watts output..... **£279.95**

FTM-10E Dual band 2/70cm, 50 Watts output..... **£329.95**

FT-7900E Dual band 2/70cm 50/40 Watts with wideband RX **£219.95**

FT-2900E Single band 2m 75 Watt heavy duty transceiver..... **£149.95**

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

HF Transceivers

FT-857D is the world's smallest HF/VHF/UHF mobile transceiver and provides base station-type performance from an ultra-compact package that's ideal for mobile or external battery portable a work – now at new low low price direct from stock of **Now at a new low price from stock £689.95**

FT-450D is a compact yet superb HF/50MHz radio with state-of-the-art IF DSP technology configured to provide World Class performance in an easy to operate package. Suitable for all applications; beginners, casual operators, enthusiasts, portable/field users and emergency service providers at all at a new low low price ~~**£699.95**~~ **£609.95**

FT-DX1200 provides up to 100 Watts on SSB, CW, FM, and AM (25 Watts carrier) and a rugged state of the art highly balanced receiver circuit configuration for top performance on today's crowded bands. Similar to the high-end "YAESU FT DX" series, it uses 32-bit high speed floating point DSP for renowned proven performance and at an amazing low price of just ~~**£1349.95**~~ **now £1299.95**

FT-DX3000 is a member of the long line of top performing YAESU FT DX Series of transceivers. It inherits the design concepts of the FT DX 9000 and FT DX 5000 transceivers that have received high praise from all over the world by those pursuing the highest ideal of Amateur HF communication equipment – in stock and all for just **£1999.95**

Due in early Next year the amazing Yaesu FT-991 !!!

The FT-991 is the next generation in all mode, all band MF/HF/VHF/UHF transceiver with C4FM (System Fusion) Digital capability. The FT-991 includes multi-mode operation on CW, AM, FM, SSB, and Digital Modes (Packet, PSK31, RTTY and C4FM), with 100 Watts of HF/50mhz Capability (50 Watts VHF/UHF).

The New FT-991 now includes a high-resolution full colour 3.5" TFT Touch panel for superior operability and visibility, incorporating a High Speed Spectrum scope with ASC (Automatic Spectrum-scope control) built right in.

£1299.95 taking £50 deposits now to secure one of the first batch

All Yaesu accessories in stock on line at www.moonraker.eu

BAOFENG 寶鋒

Authorised dealer

"MASSIVE BULK 500pc PURCHASE"

UV-5RC PLUS Amazing dual band handie. Full 4.5 Watts, 136-174/400-470MHz plus 65-108MHz RX comes complete with desktop charger, antenna, belt clip, and an amazing 1800mAh battery as standard and that's not the best bit.

Price Smash ~~**£49.99**~~ **NOW £29.99!!!!**

Yes, a dual band handie version for under fifty quid . . . **don't delay, order today**.

Accessories:

Speaker Microphone	**£9.95**
Battery Eliminator	**£9.95**
Replacement Battery	**£12.95**
Ear Piece	**£4.95**
Programming Cable	**£14.95**

INTEK

Authorised dealer

HR-2040 Dual Band Mobile Transceiver

Lovely rugged construction with Dual Band, Dual frequency, Dual Display and Dual S/RF Meter. **Now with free remote head kit – all for an amazing £199.95**

Pocket sized handies don't get better than this!

KT-980HP Dual Band handie with a serious power of 8W on VHF!!! Complete with all the accessories you could expect but with an 1800mah battery as standard to handle the extra output – **Now at a super low price** ~~**£59.95**~~ **£39.99**

ICOM

Authorised dealer

Hand-helds

ID-51E D-star dual band with integrated GPS..... **£409.95**

Mobile

ID-5100E D-star dual band mobile with touch screen technology **£569.95**

Deluxe version of above..... **£719.95**

ID-E880 D-star dual band mobile transceiver **£439.95**

Base and Portable

IC-7100 HF/VHF/UHF Transceiver with touch screen... **£1249.00**

Check on-line for all updates, new products and special offers Visit us now at **www.moonraker.eu**

LOOKING TO PART-EX THE EASY WAY?

Come to Moonraker - we will deliver your new radio and collect your old one at the same time.

No Charge, No Stress, No Hassle and it could be done in 24 hrs

If you are tired of buying off the internet from back room sellers?

- **Then come to a "Real" shop with "Real" radio enthusiasts.**
- **We have 4 front line sales staff waiting to help you.**
- **Call, E-mail or visit us today!**

MOONRAKER

G5RV Wire Antennas

The most popular wire antenna available in different grades to suit every amateur .... All from just £24.95!

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 **£36.95**
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 **£42.95**
G5RV-HSP Half Size Original PVC Coated Flexweave Version, 51ft Long, 10-40 Metres **£43.95**
G5RV-FSP Full Size Original PVC Coated Flexweave Version, 102ft Long, 10-80 Metres **£49.95**
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 **£59.95**

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**

MOONRAKER

Yagi Antennas

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

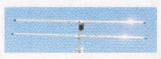
YG27-35 Dual band 3/5 element 3.5/12.5 dBd gain with one feed! **£79.95**
YG4-2C 2 metre 4 Element (Boom 48") (Gain 7dBd) **£29.95**
YG5-2 2 metre 5 Element (Boom 63") (Gain 10dBd) **£59.95**
YG8-2 2 metre 8 Element (Boom 125") (Gain 12dBd) **£79.95**
YG11-2 2 metre 11 Element (Boom 185") (Gain 13dBd) **£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) **£79.95**
YG5-6 6 metre 5 Element (Boom 142") (Gain 9.5dBd) **£89.95**

ZL Special Yagi Antennas

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

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**

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**

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**

20ft Swaged Mast Sets

(5ft Sections)

These heavy duty masts sets have 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**

MOONRAKER

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!**
GP2500F fibreglass version of above **£279.95**

Happy New Year
to all our customers

MOONRAKER

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-200S 6 Band plug n' go mobile, 6/10/15/20/40/80m, Length 130cm, Power 120W, PL259 fitting **£44.95**
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**

MOONRAKER

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**

PAM Kit

A great portable freestanding tripod which can be extended to 4m. Perfect for field days at a perfect price.
Just £59.95 complete

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 **£179.95**
TMF-1.5 Fibreglass mast ★ 5 sections 200cm each ★ 60mm to 30mm ★ Approx 30ft erect 8ft collapsed **£249.95**
TMF-2 Fibreglass mast ★ 5 sections 240cm each ★ 60mm to 30mm ★ Approx 40ft erect 9ft collapsed **£299.95**
TMF-3 Fiberglass mast * 6 sections 240cm each * 65-23mm * Approx 50ft erect 8ft collapsed **£349.95**

MOONRAKER

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

SQBM100P 2/70cm 3.00/6.00dBd, RX 25-2000MHz, Length 100cm SO239 ..... **£49.95**
SQBM100N 2/70cm 3.00/6.00dBd, RX 25-2000MHz, Length 100cm N-Type **£54.95**
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**

MOONRAKER

HF Wire Antennas

All our HF wire antennas are made with complete waterproof potted baluns and high quality "original" flexweave antenna wire.

MDHF-80 3.5MHz balun matched mono dipole, length 40m **£59.95**
MDHF-40 7.0MHz balun matched mono dipole, length 20m **£44.95**
MDHF-20 14MHz balun matched mono dipole, length 10m **£39.95**
OSHF-80 3.5-30MHz balun matched off set dipole, length 40m. **£59.95**
OSHF-40 7.0-30MHz balun matched off set dipole, length 22m... **£44.95**
OSHF-20 14-30MHz balun matched off set dipole, length 11m.... **£39.95**
LWHF-160 1.8-50MHz unun match end fed antenna, length 42m **£49.95**
LWHF-80 3.5-50MHz unun match end fed antenna, length 20m **£44.95**
LWHF-40 7.0-50MHz unun match end fed antenna, length 10m **£39.95**

MOONRAKER

HF Mobiles

Get great results with the Moonraker range of HF mobiles! ... from as little as £19.95!

AMPRO-20 14MHz, 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**

Other frequencies available. Call or see online for more details.

- **Come and visit us at our retail premises**
- **We have massive stocks in our large warehouse**
- **We import direct from all over the world**
- **See us at many rallies throughout the country**

Connect Systems CS700 UHF DMR handheld

A look at the Digital Mobile Radio standard and an affordable digital handheld for that system

INTRODUCTION. Digital voice appears to be coming of age in the VHF and UHF bands so in this review I'll provide a view of the technology and a more detailed look at the new CS700 handheld from Connect Systems.

ABOUT DIGITAL VOICE. Until comparatively recently, the only viable digital voice product available to radio amateurs was the open source D-Star system that has been heavily supported by Icom. That situation has changed completely and the radio amateur now has a choice of three different VHF/UHF digital voice systems. Whilst choice is usually a good thing, in this case it also brings confusion as a cursory look at the three systems might lead you to assume that they may be interoperable. Despite the many similarities between D-Star, Yaesu System Fusion and Digital Mobile Radio (DMR), they are, in fact, wholly incompatible! Like many markets where multiple standards exist (eg Mac vs PC vs Linux), the user has to commit to one system. At the moment there is not much independent guidance available so the decision is not an easy one. For many entering the digital voice market the choice will be primarily driven by their local repeaters. This is because many of the benefits of the various digital systems are linked to the networking that is provided by the repeater infrastructure. This networking provides the facility to work amateurs from around the world using a low power handheld whilst sat in the garden!

DIGITAL VOICE TECHNOLOGY. One of the most important characteristics of all digital communications is its ability to transfer information with no loss or degradation to the original data. From the point of view of digital voice, that means the audio quality can be as good at the edge of the coverage area as it is right next to the repeater. The not so good aspect of digital signals is that they completely break up when you reach the coverage limit, whereas an analogue signal will usually give plenty of warning that the path is worsening before total loss of communications. This loss-free transport of the digital link is accomplished by digitising the audio signal and then ensuring that the resultant numbers representing the signal arrive at the distant end without change. As a result, the reconstructed audio signal will be very close to the original.

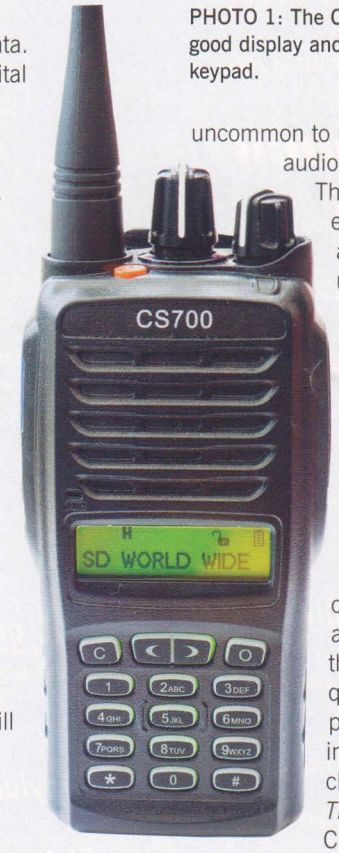


PHOTO 1: The Connect Systems CS700 has a good display and clearly labelled alphanumeric keypad.

DIGITISING THE VOICE. The first and vital stage of any digital voice system is to convert the analogue voice signal from the microphone into a digital format. The most obvious way to do that is to use a simple analogue to digital converter (ADC). As ADCs are a vital building block in most digital systems and there is a huge range of ADC chips available. As you will know from analogue rigs, we don't need the full 20Hz to 20kHz audio range of the (young!) human ear to resolve speech and it's not uncommon to restrict the top end of the audio range to 2.8kHz or less. The extreme low frequency end is also unnecessary and communications audio usually starts at 300Hz, thus giving us a 300Hz to 2.8kHz range to digitise. The common method of digitising any signal, including voice, is to record regular voltage measurements of the signal. The question, of course, is what is the minimum number of measurements or samples required to create an accurate representation of the signal? The answer to this question comes from papers published by Harry Nyquist in the 1920s and the later classic *The Mathematical Theory of Communications* by Claude Shannon. Commonly known as the Nyquist sampling theorem the answer is simply that the measurements must be made at a rate that is at least twice the highest frequency in the analogue signal. In our case that means the measurement or more correctly sample rate should be at least 5.6kHz, so for the sake of simplicity, let's assume a 6kHz sample rate. The other aspect to consider is the accuracy of each measurement as that will affect the size of the number required for each sample. As you probably know, computers like binary numbers and preferably in 8-bit chunks, known as bytes. Whilst 16, 24 or 32-bit measurements may be used for high quality consumer and broadcast audio, simple digital voice only requires 8-bit measurements and that gives a potential 256 values for each sample. Using the numbers I've suggested here gives us an ADC taking 8-bit measurements at 6ksps (kilo samples per second). That gives

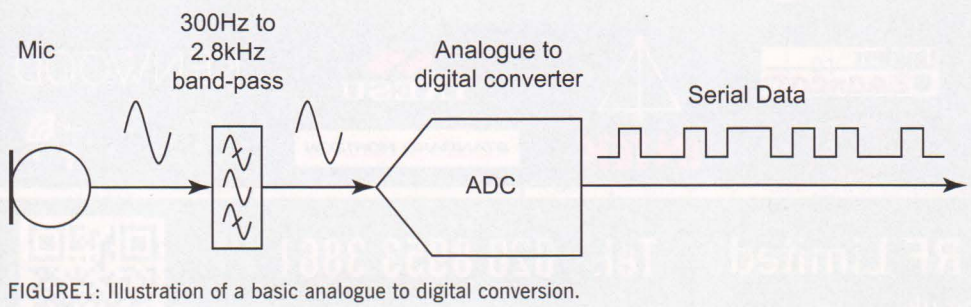


FIGURE1: Illustration of a basic analogue to digital conversion.

Taylor Made RF Limited

Your first choice for all your radio and audio needs

SBS-3

From Kinetic Avionics this is your all-in-one monitoring station ADS-B, AIS, ACARS, Audio and SDR – all from one box , USB or Ethernet

£499.95 Inc. UK VAT at 20%

SDR-PUCK

SDR-Receiver, 27-980MHZ
On-board Decoders and multiple audio channels

£249.99 Inc. UK VAT at 20%

1090-PUCK

The same ADS-B receiver as the SBS-3 without the SDR receivers

£249.99 Inc. UK VAT at 20%

PS-23 Power Supply

NEW

NEW lightweight, highly efficient, compact 23A switch mode power supply great performance

Bargain Introductory Price

£49.95 Inc. UK VAT at 20%

Check out our new Garage Section of our website for quality used equipment

For more information on any of these and many more products please visit www.taylormaderf.co.uk

Connect Systems CS-700

DMR-MARC

Available in VHF or UHF
Join the fastest growing digital network

Great Price, compatible with Motorola and Hytera DMR Radios, LCD Display and Full Keypad, Highest Power, 4 Watts UHF, Better Battery, 1700 mAH Lithium Ion, a massive 1000 channels available. Easy to understand instructions. Free Programming Software and Lead. See www.dmr-marc.net for details on the network

Simple Programming.
Reliable Communications

Introductory Price
£199.95
Inc. UK VAT at 20%

New Free Code Plug update just released!
Now includes all Known
UK DMR and analogue repeaters

As reviewed in October 2014 Practical Wireless Magazine

New Mobile Version (CS-800) coming soon!

TMRF 20-10

As reviewed in Radcom

New improved version using Kevlar wire for durability

£24.95 Inc. UK VAT at 20%

26 foot long centre fed antenna covering 20m-10m in essence a quarter Size G5RV.
No coils or baluns ideal for use with simple ATU's.
Great antenna for holidays or permanent installation.

Taylor Made RF Ltd and Elstree Amateur Radio Society

are committed to supporting our hobby and to that end sponsor hosting of the D-star Reflector REF001 and Two New DMR repeaters

Taylor Made RF will be offering many new products in 2015

Check our website regularly!

Enhance your range with trusted brands:

MOONRAKER · Bonito · Uniden Bearcat · M0CVO ANTENNAS · YAESU · KENWOOD
PANORAMA ANTENNAS · CSI · HEIL SOUND · INTEK · STANDARD HORIZON

Taylor Made RF Limited
www.taylormaderf.co.uk
email: sales@taylormaderf.co.uk

Tel: 020 8953 3861
Address: Elstree Aerodrome,
Borehamwood, Hertfordshire WD6 3AW

PHOTO 2: The top panel contains the antenna socket, a programmable button, channel & volume controls and a Tx LED. The belt clip is quite sturdy and just visible at the top of the panel is a moulding to take a lanyard.

a serial data rate emerging from the ADC of 48kbps (6kHz x 8 bits). I've illustrated the process in **Figure 1**. The problem here is that a 48kbps data rate signal is going to require more RF bandwidth than the original analogue voice signal! Clearly more work is required and the solution has been provided by the communications industry. Everyone from phone companies through to mobile radio manufacturers needs to make every ounce of bandwidth sweat so great efforts have been put into squeezing the human voice into as small a space as possible whilst maintaining intelligibility. As reducing the digital bandwidth of voice inevitable requires digital signal processing (DSP) technology the compression can be combined with noise reduction and other enhancements to create a complete voice processing unit that produces a signal that's ready for modulation and broadcast.

This unit is known as a vocoder (VOice enCODER). Although there have been lots of different designs, one reigns supreme and has topped many comparison tests. The winner is known as AMBE® (Active Multi-Band Excitation) and was originally developed at the Massachusetts Institute of Technology (MIT) but is now owned and licensed by Digital Voice Systems, Inc in the USA.

AMBE operates by splitting a segment of the digitised voice into a number of frequency bands that are each examined for signs of speech. Those without speech are discarded and those with speech are processed. This enables the vital elements of the speech to pass unhindered whilst eliminating noise and other unwanted artefacts. There are many other aspects to the processing but the end result is an encoded voice signal that will fit in an industry standard LPC-10, 2.4kHz digital voice channel, but with much better audio quality. Although 2.4kHz is the industry minimum, many systems, including some amateur digital voice allow a larger digital bandwidth to provide better speech quality. The three current amateur digital voice systems all employ the DVS Inc AMBE vocoder.

INSIDE DMR. The Digital Mobile Radio system is an open standard that was originally introduced to support the commercial Private Mobile Radio (PMR) market. The intention was to have a common standard that would allow the mixing of radios from different manufacturers on the same network. Whilst this has largely worked, inevitably some manufacturers have developed network enhancements that only work with same-brand radios. Of these enhancements, the Motorola MOTOTRBO system is one of the most popular and forms the basis of the amateur DMR network. Coordination of the amateur network is handled by DMR-MARC (Digital Mobile Radio – Motorola Amateur Radio Club) in the US. For the UK, we have DMRUK who provide advice and services to UK amateurs and are affiliated to DMR-MARC.

The MOTOTRBO system used for amateur DMR employs 4-FSK modulation along with time division multiplexing (TDM) to deliver two separate channels in a standard 12.5kHz RF bandwidth. The 4-FSK modulation system is illustrated in **Figure 2** and is a phase continuous system where the frequency changes occur at the zero crossing points. This provides for simple modulation circuitry and also allows the use of more efficient non-linear PAs that help to conserve battery power. The provision of two separate channels on the same frequency is achieved through time division multiplexing, where each channel is allocated its own timeslot and the two signals are then interleaved as shown in **Figure 3**. The result is two entirely separate channels on the same frequency.

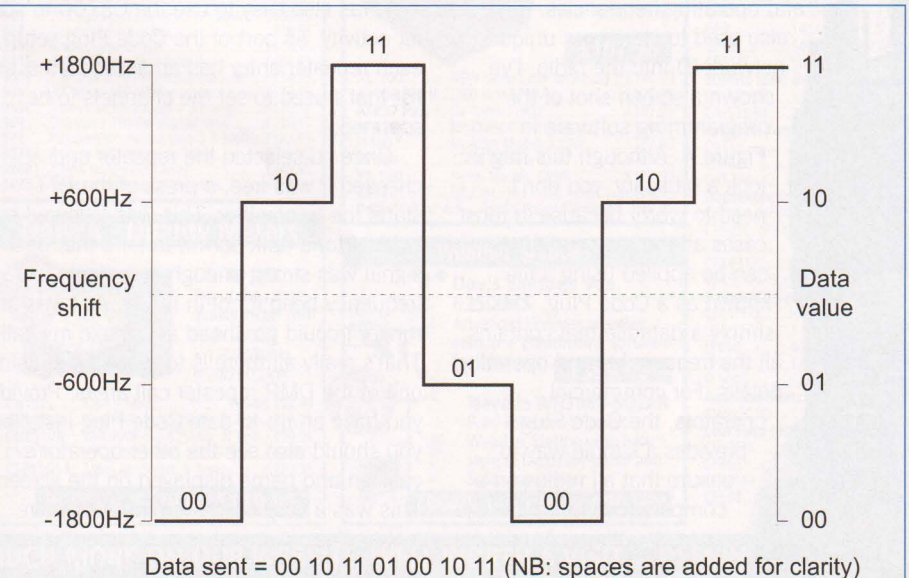


FIGURE 2: 4-FSK modulation used by DMR.

DMR REPEATERS. Whilst most analogue repeater just repeat, digital repeaters usually include some interesting features that can transform your operating. The key factor is the use of internet links to join repeaters between different parts of the country and even other countries. All three amateur digital systems support this kind of linking but the DMR variant is probably the easiest to use. With DMR there is no setup as the connections are pre-established so the operator just has to decide which one to use. On repeaters connected to the DMR-MARC network the choice is: Worldwide, North America, Europe, Local S2, UK wide S2, Local S1, UK wide S1, English Europe S2, English Europe S1, Roaming, English WW. The S1 and S2 references relate to the time slot so English Europe has two channels available on time slot 1 (S1) and time slot 2 (S2). As you can see, you're really just setting the areas or zones you want to call. The commands to rebroadcast your call over a wide area are automatically sent to the repeater as part of the digital connection that carries your voice. For those areas where DMR take-up is slow, it is possible to set some repeaters for dual mode operation so they can handle both conventional analogue traffic as well as DMR calls. The downside of dual-mode operation is the loss of networking as you can't link a dual-mode repeater with the DMR-MARC network. The other important point about DMR networking is that you have to register for a free, unique ID for your radio. Registration can be via your local repeater group or via the central registration site [1]. I found the registration to be very quick and straightforward.

February 2015 • RadCom
Mike Richards, G4WNC • e-mail: mike@photobyte.org

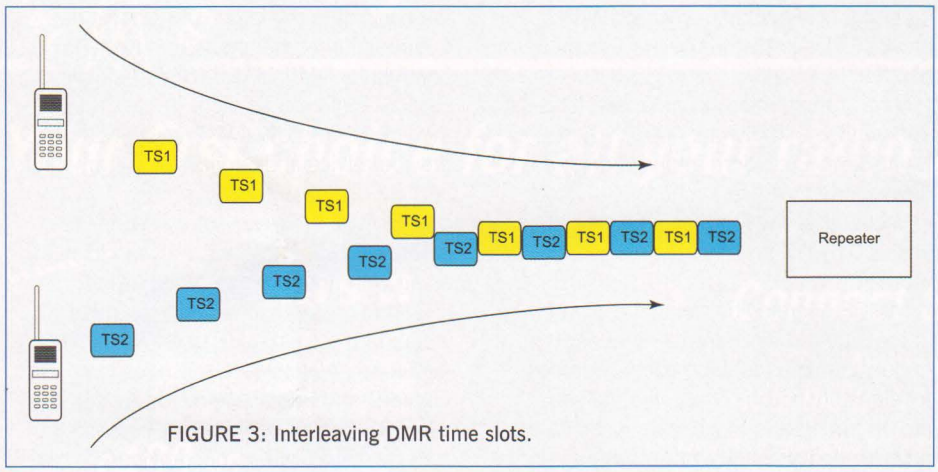


FIGURE 3: Interleaving DMR time slots.

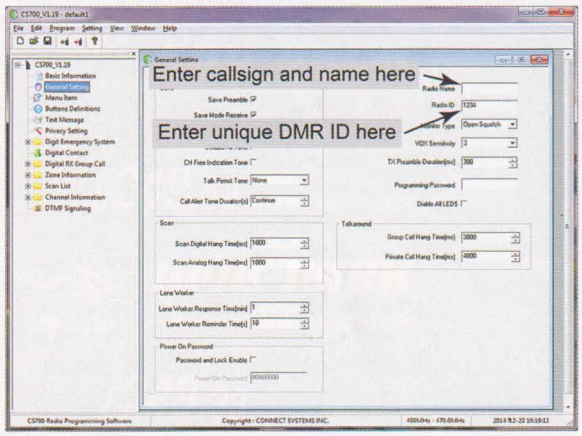


FIGURE 4: Connect Systems CS700 programming software.

CONNECT SYSTEMS CS700. Let's now take a closer look at the CS700 to see what it's like to use. When I first unboxed the radio I was very impressed with the general feel of it. The construction was very sturdy and it looked like it could handle some pretty heavy use. This ruggedness is a common feature of DMR rigs as they are designed with commercial use in mind so they have to be tough to survive! Included in the pack was a desk charging unit with PSU, rubberised whip antenna, programming lead, sturdy belt clip and a printed instruction manual. The CS700 uses a 7.4V 1700mAh lithium ion battery that slides securely onto the rear of the radio. As you can see from the photos, the CS700 has just two rotary controls on the top panel and a set of alpha-numeric buttons on the front panel. The left-hand knob is a 16-position channel selector whilst the other is a conventional on/off and volume control. The main PTT button is located on the left-hand side along with two programmable function buttons. There is also a programmable button on the top panel. On the right-hand side is a substantial rubberised flap that provides access the external microphone and speaker jacks. This can be used with the optional fist mic for mobile or even base station operation. The supplied desktop charger held the radio very firmly and included an LED status indicator to show the charging progress. The review model was the UHF version that has 4W RF output on high power. There is also a VHF model available that features 5W RF output.

PHOTO 3: The radio sits snugly in its supplied drop-in charger.

CS700 SETUP. Before you can use the CS700 on the network it first needs to be configured. In most cases this configuration will be completed by your supplier but the programming software is a free download and a programming lead is included with the CS700. The programming process is used to populate the CS700 memories with all the amateur repeater identities and operating frequencies. It is also used to store your unique network ID into the radio. I've shown a screen shot of the programming software in **Figure 4**. Although this might look a bit scary, you don't need to worry because in most cases all the major settings can be applied using a file known as a Code Plug. This is simply a data file that contains all the frequencies and operating details. For commercial operators, the Code Plug provides a simple way to ensure that all radios on a company network have the correct settings. Amateurs use it in the same way to ensure all radios have the correct repeater details. The only settings unique to your radio are the name/callsign and the vital network ID. If you are planning to program your own rig, you should start by making a backup of the current settings save them on your PC. The programming software includes the facility to read the settings from the rig and save them as a custom Code Plug. By doing this simple back-up you will at least be able to return the radio to its supplied state if you get in a muddle! At the time of writing, Taylor Made RF have full CS700, VHF and UHF UK Code Plugs available for free download from their site [2]. In addition to populating the radio with simplex and repeater details, the programming software can be used to create pre-set text messages and to set the function for the CS700's three programmable buttons.

OPERATING THE CS700. With the setup complete, getting on the air was pretty straightforward. The first task was to select my local repeater by pressing and holding the left/right arrow key to bring up the menu, selecting Zone and then scrolling until I found a local repeater, which in my case was GB7SD, Dorchester. Finding the repeater was made easy because each entry included the local town name as well as the repeater callsign. This naming could be very helpful when operating away from home. At the time of the review GB7SD was not connected to the DMR-MARC network but the local repeater group were busy putting together a network of South West repeaters. This type of local linking is quite common with DMR so it's worth checking the plans with your local repeater group. Whilst visiting their website you might like to make a donation as the repeater groups rely on donations to keep the service running. When the desired repeater (Zone) had been selected, the channel knob on the top panel was used to select the appropriate call area, ie it was also easy to use the CS700 to scan for activity. As part of the Code Plug setup, each repeater entry has an associated scan list that's used to set the channels to be scanned.

Once I'd selected the repeater and checked it was free, a press of the PTT starts the transmitter. This was followed by a twiddly tone (talk permit tone) if the repeater signal was strong enough or a single low frequency beep if not in range. As I *was* in range, I could go ahead and make my call. That's really all there is to a basic call using one of the DMR repeater call areas. Provided you have an up-to-date Code Plug installed you should also see the other operator's callsign and name displayed on the screen. This was a very useful reminder if you're as hopeless as me at remembering names! Once you get familiar with the rig, it's

Continued on p94

nevada® radio

NEVADA the longest serving amateur radio emporium in the UK!

ALINCO

save £100 — SPECIAL OFFER

DX-SR8E HF Transceiver
- with QRP output facility!
- 1.8-30MHz All Mode Transceiver
- Power up to 100 Watts
- Special QRP 0.1-2 Watts output feature
- Optional 5 MHz coverage

~~£599~~ NOW JUST £499

NEW

DJ-500
Twinband VHF/UHF handheld
- 3 adjustable power levels
- 200 PC-programmable channels
- Lithium-ion battery pack

~~£79.95~~ £64.95

NEW

DR-138H
High power VHF 145MHz FM mobile transceiver
- Frequency range:144-146MHz
- Output power selectable 60W/25W/10W
- PC programmable 200 channel memory

INTRO PRICE £99.95

NEW

DR-638H
VHF/UHF twinband mobile FM transceiver
- Covers 144-146 / 430-440MHz
- 758 memory channels
- 50/40W power 145MHz/433MHz

£249.95

TOP SELLER

DR-135UK
28 MHz (10m) all mode AM/FM/SSB mobile transceiver
- Frequency range: 28.000 - 29.700 MHz
- Power 1-25w SSB (1-12W AM/FM)
- Operating modes AM/CW/FM/LSB/USB

£159.95

MFJ

MFJ 949E
300W 1.8-30MHz antenna tuner
- Peak reading
- Cross needle meter

£199.95

225	1-180MHz 2 port graphic analyzer	£328.95
259C	HF/VHF portable antenna analyzer	£299.95
266	New style HF/VHF/UHF analyzer	£339.95
269C	Multi-function antenna analyzer	£389.95
550	Very popular practice morse code key	£16.95
557	Morse code key with oscillator	£45.95
901	200 Watts portable tuner 1.8-30MHz	£109.95
912	Remote 4:1 balun box	£79.95
931	Artifical ground unit	£114.95
941E	300 Watts max Vera Tuner II	£164.95
945E	1.8-60MHz 300 Watts manual tuner	£134.95
948	300 Watts PEP reading antenna tuner	£174.95
959C	Receive antenna tuner + pre-amp	£126.78
969	300 Watts 160-6m manual tuner	£219.95
971	Portable/QRP antenna tuner 1.8-30MHz	£122.95
993RT	Remote 300 Watts auto tuner	£329.95
998RT	1.5kW remote auto tuner	£749.95
1025	Noise canceller/signal enhancer	£184.95

DAIWA - Quality Meters

save £10

CN-801HP
Top of the range quality meter with large display
- 1.8-200MHz
- 20/200/2kW

CN101L	1.8-150MHz	~~£99.99~~ £74.99
CN103LN	SWR/PWR 140-525MHz..N Type	£79.99
CN801VN	SWR/PWR 140-525MHz..N Type	£99.99
CS201A	2 Way Ant Switch..SO239 Type	£24.95
CS201G11	2 Way Ant Switch N Type.	£29.95

SPECIAL ~~£129.95~~ £119.95

ICOM

PRICE MATCH

Icom IC-7600
Twin DSP 100 Watts HF/6m transceiver with colour screen
- Dual DSP for TX/RX and spectrum scope
- 5.8 inch wide TFT display
- 3 x 1st IF filters, inc 3kHz bandwidth

OUR PRICE £2599

IC-7100	Touch Screen Multiband Mobile	£1249.95
IC-7410	HF/6m All Mode Base	£1499
IC-2730	NEW twinband mobile VHF/UHF	£299.95
IC-R8500	professional desktop receiver	£1399
IC-9100	NEW HF/VHF/UHF base transceiver	£2699
ID-5100E	NEW dualband D star mobile	£569
ID-51E	NEW twinband handheld with D-Star	£419

KENWOOD

PRICE MATCH

Kenwood TS590SGE
100W HF/6m all mode transceiver
Replaces the very popular TS590S
- Latest Firmware installed
- Dual roofing filters - 500Hz & 2.7kHz

OUR PRICE £1349.00

TS-990	Flagship model 200W HF/6m	£5995
TS-480SAT	100W HF/6m with ATU	£738.95
TS-480HX	200W HF/6m w/o ATU	£829.95
TM-V71E	Twinband VHF/UHF mobile	£299.00
TM-D72E	VHF/UHF Handy GPS TNC APRS	£399.95
MC-60A	Classic desktop microphone	£119.95
HS-5	Headphones..£51.95	HS-6...Lightweight..£34.95

YAESU

PRICE MATCH

FT-DX3000
Brand new style 100 Watts all modes HF/6m transceiver
- Operating Modes: USB, LSB, CW, AM, FM
- Latest digital noise reduction system
- Large 4.3 inch colour TFT display

OUR PRICE £1999.95

FT-DX1200	100W HF/6m all mode base	£1295.00
FT-1DE	NEW digital VHF/UHF H/H	£299.95
FT-857	All bander HF/VHF/UHF mobile	£689.95
FT-817ND	Top selling all mode portable tx	£524.95
FT-450D	100W HF/6m with ATU/DSP	£639.95
FT-7900E	Twinband 2m/7cms mobile	£219.95
FT-2900	High power 75W 2m mobile	£149.95

NEVADA Power Supplies

Nevada PS-08
6-8 amp linear PSU with meter & cigar socket
- Input power: 230V 50Hz
- Output voltage: DC 13.8V
- Output current: 6A~8A Max
- Dimensions: 140 x 110 x 250mm WHD
- Weight: 4kg

£34.95

PS-40M	35-40 amp Linear Supply	~~£129.95~~ £116.95
PS-30M	25-30 amp Linear Supply	£99.95
PS-30	25-30A Switch Mode Supply	~~£89.95~~ £79.95
PS-30H	25-30A Switch Mode Supply	~~£79.95~~ £69.95
PSW-50	40-50A Switch Mode Supply	~~£139.95~~ £125.95
PSW-07	Switch Mode Supply	~~£29.95~~ £26.95
PSW-04	Switch Mode Supply	~~£24.95~~ £22.95

Anytone

CTCSS BOARD NOW INCLUDED!

AT-6666
High power 60W 10m (28 MHz) mobile transceiver
- Modes: AM, FM, USB, LSB, PA
- High/Med/Low power selectable

£199.95

CTCSS BOARD NOW INCLUDED!

AT-5555N
New style 10m (28MHz) all mode mobile
- All modes: AM/FM/SSB
- Power: Up to 30W
- Freq: 28-29.7MHz

£169.95

AT-5189	25W 70MHz (4m) mobile TX	£129.95
AT-588	60W 145MHz (2m) mobile TX	£129.95
Software kits	for above radios	just £14.95

LDG

Z11-Pro2
(160 - 6m) 125W

£167.95

AL-100	NEW Auto Tuner for Alinco	£149.99
AT100 Pro II	(160-6m) 125W	£209.95
AT897 Plus	for Yaesu FT897	£187.95
AT1200	for FT450/FTDX1200	£199.95
IT100	for Icom Models 125W	£167.95
RT100	100W Remote Tuner	£189.95
YT 100	Yaesu Models 125W	£177.95
Z817	QRP for FT817 160 - 6m	£124.95
Balun 1:1 or 4:1	200W Power Handling	£34.95

Weather Stations

Davis Vantage Vue 6250UKS
Advanced Wireless weather station + Weatherlink software for Windows

£399.95

save £20

Nevada WH3080-SOLAR
Fully Featured Wireless Weather Station with new style LCD display panel and Solar transmitter

~~£99.95~~ THIS MONTH £79.95

NEW spiderbeam

Full range of Spiderbeams, Telescopic Poles, Aluminium Masts & accessories - now in stock!

SPIDER BEAM Kits

3 Band Beam 20-15-10m	£299.95
5 Band Beam 20-17-15-12-10m	£359.95
5 Band Beam 20-17-15-12-10m HD	£419.95

Fibreglass Telescopic Poles

12mtr Heavy Duty	£79.95
18mtr Standard	£189.95
26mtr Standard	£469.95

Aluminium Telescopic masts

10.metre	£289
10 metre Heavy Duty	£299.95
12.5 metre	£319
14.5 metre	£399.95

Dxpedition Ultra Lightweight Dipole
Model 404UL 40-20-17-15-12-10-6m £89.95

COMET

Comet H-422
4 Band HF V Dipole
- 10/15/20/40m
- Max Power: 1kW SSB
- Connector: SO239
- Length: 10.3m (straight)
- Weight: 5.4Kgs

£299.95

HF Antennas

CHA-7350H	40/80m 1kW SSB Vertical NEW	£299.95
CHA-250B	Multiband HF Vertical 80-6m	£349.00
CWA-1000	Quality Multiband 80-10m Dipole	£129.95

VHF/UHF/50MHz Vertical Antennas

GP1	145/433MHz 1.25m	£69.95
GP3	145/433MHz 1.78m	£74.95
GP6	145/433MHz 3.07m	£119.95
GP9	145/433MHz 5.15m	£169.95
GP98	145/433/1200MHz 2.94m	£159.95
GP15N	50/145/433MHz 2.42m	£129.95

50MHz (6m) Beam Antennas

CA-52HB2	2 Ele 6m (50MHz) Yagi	£99.95
CA-52HB4	4 Ele High Gain 6m (50MHz)Yagi	£139.95

Antenna Tuners

CAT10	10Watts 3.5-50MHz Manual Tuner.	£99.00
CAT300	300W 1.8-60MHz Cross Needle	£199.95
CAT273	250W VHF/UHF Cross Needle	£199.95

Duplexers/Triplexers

CF416A	145/433MHz w/leads SO239-PL259/PL259	£39.95
CF503C	50/145MHz SO239-PL259/PL259	£49.95
CF530A	50/433MHz PL259-SO239/SO239	£49.95
CFX431A	145/433/1200MHz N+N+PL Leads	£59.95
CFX514N	50/145/433/MHz SO239/PL259/PL259/N	£59.95

Baluns/Current Baluns

CBL1000	High Power 1kw 1.8-30MHz 1:1	£39.95
CBL-2500	1.8-56 MHz 2.5kW (PEP) 1:1	£44.95
TF400	400w Current Balun 1.8-500MHz	£79.95
TF1800	1800w Current Balun..1.8-500MHz	£89.95
TF5000	5Kw Current Balun...1.8-500MHz	£119.00

Antenna Switches

CSW-201G	1.5kW 2 Way PL Type	£29.95

Low Pass Filters

CF30MR	Low Pass Filter 32MHz 1kW	£59.95
CF30S	Low Pass Filter 32MHz 150W	£39.95
CF50MR	Low Pass Filter 50MHz 1kW	£59.95
CF50S	Low Pass Filter 57MHz 150W	£39.95

LOTS MORE on our WEBSITE!

Cable and Antenna Wire

MASTRANT

Mastrant M-Series
Revolutionary hi-strength guy ropes using Dyneema® Max Technology - designed for heavy loading

M-3...100m Drum 3mm 390kg B/s Guy Rope.....**£58.95**

NEW

100m Drums

M2	2mm 240kg B/s	£37.95
M4	4mm 900kg B/s	£125.95
M5	5mm 1150kg B/s	£189.95
M6	6mm 1850kg B/s	£237.95
M8	8mm 2600kg B/s	£336.95

Mastrant P-Series
Synthetic guy ropes - UV stable, low stretch

P-4...100m Drum 4mm 400 B/s Guy Rope.....**£34.95**

NEW

100m Drums

P2	2mm 100kg B/s	£16.50
P3	3mm 200kg B/s	£24.95
P5	5mm 500kg B/s	£46.95
P6	6mm 850kg B/s	£84.95
P8	8mm 1,300kg B/s	£99.95

Nevada - the Cable Specialists

Aircell 7

100 metre drum	£179
Price per metre	£1.99
PL259 connector (part: 7390)	£2.65
N type connector (part: 7392)	£5.25
BNC type connector (part: 7391)	£5.25

Aircell 5

100 metre drum	£125
Price per metre	£1.39
PL259 connector (part: 7760)	£2.25
N type connector (part: 7700)	£3.95
BNC type connector (part: 7720)	£3.25

Westflex 103

100 metre drum	£139.95
75 metre length	£112.50
50 metre length	£75.00
Price Per metre	£1.50

RG-213U – Mil Spec

100 metre drum	£116.00
50m length	£64.50
Price per metre	£1.29

OTHER 100M DRUMS

RG-213™	Low loss	**SPECIAL PRICE** £79.95
RG-Mini 8	Super XX low loss	£59.95
RG-58CU	Mil spec low loss	£39.95

NEVADA Antenna Wire

Military style, low visibility, antenna wire, uses central fibres of Aramid (Kevlar) for incredible strength. With green outer jacket for low visibility.

Nevada 28	2.8mm 2kW	per metre £0.99
Nevada 28D	2.8mm 2kW	100m Drum £89.95
Nevada 32	3.2mm 5kW	per metre £1.20
Nevada 32D	3.2mm 5kW	100m Drum £110

MUCH MORE ON OUR WEBSITE, WELL WORTH A VISIT.....OPENING HOURS: MON - FRI 9AM - 5:30PM CLOSED SATURDAY

www.nevadaradio.co.uk

023 9231 3090

Unit 1 Fitzherbert Spur Portsmouth PO6 1TT

RSGB Band Plan 2015

The following band plan is largely based on that agreed at IARU Region 1 General Conferences with some local differences on frequencies above 430MHz.

EFFECTIVE FROM 1st JANUARY 2015 UNLESS OTHERWISE SHOWN

136kHz	NECESSARY BANDWIDTH	UK USAGE
135.7-137.8kHz	200Hz	CW, QRSS and Narrowband Digital Modes

Licence Notes: Amateur Service – Secondary User. 1 watt (0dBW) ERP.
R.R. 5.67B. The use of the band 135.7-137.8kHz in Algeria, Egypt, Iran (Islamic Republic of), Iraq, Lebanon, Syrian Arab Republic Sudan, South Sudan and Tunisia is limited to fixed and maritime mobile services. The amateur service shall not be used in the above-mentioned countries in the band 135.7-137.8kHz, and this should be taken into account by the countries authorising such use. (WRC-12).

472kHz (600m)	NECESSARY BANDWIDTH	UK USAGE
IARU Region 1 does not have a formal band plan for this allocation but has a usage recommendation (Note 1).		
472-479kHz	500Hz	CW, QRSS and Narrowband Digital Modes

Note 1: Usage recommendation – 472-475kHz CW only 200Hz maximum bandwidth, 475-479kHz CW and Digimodes.
Note 2: It should be emphasised that this band is available on a non-interference basis to existing services. UK amateurs should be aware that some overseas stations may be restricted in terms of transmit frequency in order to avoid interference to nearby radio navigation service Non-Directional Beacons.
Licence Notes: Amateur Service – Secondary User. Full Licensees only, **5 watts EIRP maximum**. Note that conditions regarding this band are specified by the Licence Schedule notes.
R.R. 5.80B. The use of the frequency band 472-479kHz in Algeria, Saudi Arabia, Azerbaijan, Bahrain, Belarus, China, Comoros, Djibouti, Egypt, United Arab Emirates, the Russian Federation, Iraq, Jordan, Kazakhstan, Kuwait, Lebanon, Libya, Mauritania, Oman, Uzbekistan, Qatar, Syrian Arab Republic, Kyrgyzstan, Somalia, Sudan, Tunisia and Yemen is limited to the maritime mobile and aeronautical radionavigation services. The amateur service shall not be used in the above-mentioned countries in this frequency band, and this should be taken into account by the countries authorising such use. (WRC 12).

1.8MHz (160m)	NECESSARY BANDWIDTH	UK USAGE
1,810-1,838kHz	200Hz	Telegraphy
1,838-1,840	500Hz	Narrowband Modes
1,840-1,843	2.7kHz	All Modes
1,843-2,000	2.7kHz	Telephony (Note 1), Telegraphy 1,836kHz – QRP (low power) Centre of Activity 1,960kHz – DF Contest Beacons (14dBW)

Note 1: Lowest LSB carrier frequency (dial setting) should be 1,843kHz. AX25 packet should not be used on the 1.8MHz band.
Licence Notes: 1,810-1,850kHz – Primary User: 1,810-1,830kHz on a non-interference basis to stations outside of the UK. 1,850-2,000kHz – Secondary User.
Notes to the Band Plan: As on page 41.

3.5MHz (80m)	NECESSARY BANDWIDTH	UK USAGE
3,500-3,510kHz	200Hz	Telegraphy – Priority for Inter-Continental Operation
3,510-3,560	200Hz	Telegraphy – Contest Preferred. 3,555kHz – QRS (slow telegraphy) Centre of Activity
3,560-3,580	200Hz	Telegraphy 3,560kHz – QRP (low power) Centre of Activity
3,580-3,590	500Hz	Narrowband Modes
3,590-3,600	500Hz	Narrowband Modes – Automatically Controlled Data Stations (unattended)
3,600-3,620	2.7kHz	All Modes – Automatically Controlled Data Stations (unattended), (Note 1)
3,600-3,650	2.7kHz	All Modes – Phone Contest Preferred, (Note 1). 3,630kHz – Digital Voice Centre of Activity
3,650-3,700	2.7kHz	All Modes – Telephony, Telegraphy 3,663kHz May Be Used For UK Emergency Comms Traffic 3,690kHz SSB QRP (low power) Centre of Activity
3,700-3,800	2.7kHz	All Modes – Phone Contest Preferred 3,735kHz – Image Mode Centre of Activity 3,760kHz – IARU Region 1 Emergency Centre of Activity
3,775-3,800	2.7kHz	Priority for Inter-Continental Telephony (SSB) Operation

Note 1. Lowest LSB carrier frequency (dial setting) should be 3,603kHz.
Licence Notes: Primary User: Shared with other user services.
Notes to the Band Plan: As on page 41.

5MHz (60m)	AVAILABLE WIDTH	UK USAGE
5,258.5-5,264	5.5kHz	5,262kHz – CW QRP Centre of Activity
5,276-5,284	8kHz	5,278.5kHz – May be used for UK Emergency Comms Traffic
5,288.5-5,292	3.5kHz	Beacons on 5290kHz (Note 2), WSPR
5,298-5,307	9kHz	
5,313-5,323	10kHz	5,317kHz – AM 6kHz maximum bandwidth
5,333-5,338	5kHz	
5,354-5,358	4 kHz	
5,362-5,374.5	12.5kHz	5,362-5,370kHz – Digital Mode Activity in the UK
5,378-5,382	4kHz	
5,395-5,401.5	6.5kHz	
5,403.5-5,406.5	3kHz	5,403.5kHz – USB Common International Frequency

Unless indicated, usage is All Modes (necessary bandwidth to be within channel limits).
Note 1: Upper Sideband is recommended for SSB activity.
Note 2: Activity should avoid interference to the experimental beacons on 5290kHz.
Note 3: Amplitude Modulation is permitted with a maximum bandwidth of 6kHz, on frequencies with at least 6kHz available width.
Licence Notes: Full Licensees only, **Secondary User, 100 watts maximum.** Note that conditions on transmission bandwidth, power and antennas are specified in the Licence.
Notes to the Band Plan. As on page 41.

7MHz (40m)	NECESSARY BANDWIDTH	UK USAGE
7,000-7,040kHz	200Hz	Telegraphy – 7,030kHz QRP (low power) Centre of Activity
7,040-7,047	500Hz	Narrowband Modes (Note 2)
7,047-7,050	500Hz	Narrowband Modes, Automatically Controlled Data Stations (unattended)
7,050-7,053	2.7kHz	All Modes, Automatically Controlled Data Stations (unattended), (Note 1)
7,053-7,060	2.7kHz	All Modes, Digimodes
7,060-7,100	2.7kHz	All Modes, SSB Contest Preferred Segment Digital Voice 7,070kHz; SSB QRP Centre of Activity 7,090kHz
7,100-7,130	2.7kHz	All Modes, 7,110kHz – Region 1 Emergency Centre of Activity
7,130-7,200	2.7kHz	All Modes, SSB Contest Preferred Segment; 7,165kHz – Image Centre of Activity
7,175-7,200	2.7kHz	All Modes, Priority For Inter-Continental Operation

Note 1: Lowest LSB carrier frequency (dial setting) should be 7,053kHz.
Note 2: PSK31 activity starts from 7,040kHz. Since 2009, the narrowband modes segment starts at 7,040kHz.
Licence Notes: 7,000-7,100kHz Amateur and Amateur Satellite Service – Primary User.
7,100-7,200kHz Amateur Service – Primary User.
Notes to the Band Plan: As on page 41.

10MHz (30m)	NECESSARY BANDWIDTH	UK USAGE
10,100-10,140kHz	200Hz	Telegraphy (CW) 10,116kHz – QRP (low power) Centre of Activity
10.140-10.150	500Hz	Narrowband Modes Automatically Controlled Data Stations (unattended) should avoid the use of the 10MHz band

Licence Notes: Amateur Service – Secondary User.
Notes to the Band Plan: As on page 41.
The 10MHz band is allocated to the amateur service only on a secondary basis. The IARU has agreed that only CW and other narrow bandwidth modes are to be used on this band. Likewise the band is not to be used for contests and bulletins. SSB may be used on the 10MHz band during emergencies involving the immediate safety of life and property, and only by stations actually involved with the handling of emergency traffic. The band segment 10,120-10,140kHz may only be used for SSB transmissions in the area of Africa south of the equator during local daylight hours.

14MHz (20m)	NECESSARY BANDWIDTH	UK USAGE
14,000-14,060kHz	200Hz	Telegraphy – Contest Preferred 14,055kHz – QRS (slow telegraphy) Centre of Activity
14,060-14,070	200Hz	Telegraphy 14,060kHz – QRP (low power) Centre of Activity
14,070-14,089	500Hz	Narrowband Modes
14,089-14,099	500Hz	Narrowband Modes – Automatically Controlled Data Stations (unattended)
14,099-14,101		IBP – Reserved Exclusively for Beacons
14,101-14,112	2.7kHz	All Modes – Automatically Controlled Data Stations (unattended)
14,112-14,125	2.7kHz	All Modes (excluding digimodes)
14,125-14,300	2.7kHz	All Modes – SSB Contest Preferred Segment 14,130kHz – Digital Voice Centre of Activity 14,195 ±5kHz – Priority for DXpeditions 14,230kHz – Image Centre of Activity 14,285kHz – QRP Centre of Activity
14,300-14,350	2.7kHz	All Modes 14,300kHz – Global Emergency Centre of Activity

Licence Notes: Amateur Service – Primary User. 14,000-14,250kHz Amateur Satellite Service – Primary User.
Notes to the Band Plan: As on page 41.

18MHz (17m)	NECESSARY BANDWIDTH	UK USAGE
18,068-18,095kHz	200Hz	Telegraphy – 18,086kHz QRP (low power) Centre of Activity
18,095-18,105	500Hz	Narrowband Modes
18,105-18,109	500Hz	Narrowband Modes – Automatically Controlled Data Stations (unattended)

18,109-18,111		IBP – Reserved Exclusively for Beacons
18,111-18,120	2.7kHz	All Modes – Automatically Controlled Data Stations (unattended)
18,120-18,168	2.7kHz	All Modes, 18,130kHz – SSB QRP Centre of Activity 18,150kHz – Digital Voice Centre of Activity 18,160kHz – Global Emergency Centre of Activity

Licence Notes: Amateur and Amateur Satellite Service – Primary User. The band is not to be used for contests or bulletins.
Notes to the Band Plan: As on page 41.

21MHz (15m)	NECCESARY BANDWIDTH	UK USAGE
21,000-21,070kHz	200Hz	Telegraphy 21,055kHz – QRS (slow telegraphy) Centre of Activity 21,060kHz – QRP (low power) Centre of Activity
21,070-21,090	500Hz	Narrowband Modes
21,090-21,110	500Hz	Narrowband Modes – Automatically Controlled Data Stations (unattended)
21,110-21,120	2.7kHz	All Modes (excluding SSB) – Automatically Controlled Data Stations (unattended)
21,120-21,149	500Hz	Narrowband Modes
21,149-21,151		IBP – Reserved Exclusively For Beacons
21,151-21,450	2.7kHz	All Modes 21,180kHz – Digital Voice Centre of Activity 21,285kHz – QRP Centre of Activity 21,340kHz – Image Centre of Activity 21,360kHz – Global Emergency Centre of Activity

Licence Notes: Amateur and Amateur Satellite Service – Primary User.
Notes to the Band Plan: As on page 41.

24MHz (12m)	NECESSARY BANDWIDTH	UK USAGE
24,890-24,915kHz	200Hz	Telegraphy 24,906kHz – QRP (low power) Centre of Activity
24,915-24,925	500Hz	Narrowband Modes
24,925-24,929	500Hz	Narrowband Modes – Automatically Controlled Data Stations (unattended)
24,929-24,931		IBP – Reserved Exclusively For Beacons
24,931-24,940	2.7kHz	All Modes – Automatically Controlled Data Stations (unattended)
24,940-24,990	2.7kHz	All Modes, 24,950kHz – SSB QRP Centre of Activity 24,960kHz – Digital Voice Centre of Activity

Licence Notes: Amateur and Amateur Satellite Service – Primary User. The band is not to be used for contests or bulletins.
Notes to the Band Plan: As on page 41.

28MHz (10m)	NECESSARY BANDWIDTH	UK USAGE
28,000-28,070kHz	200Hz	Telegraphy 28,055kHz – QRS (slow telegraphy) Centre of Activity 28,060kHz – QRP (low power) Centre of Activity
28,070-28,120	500Hz	Narrowband Modes
28,120-28,150	500Hz	Narrowband Modes – Automatically Controlled Data Stations (unattended)
28,150-28,190	500Hz	Narrowband Modes
28,190-28,199		IBP – Regional Time Shared Beacons
28,199-28,201		IBP – World Wide Time Shared Beacons
28,201-28,225		IBP – Continuous-Duty Beacons
28,225-28,300	2.7kHz	All Modes – Beacons
28,300-28,320	2.7kHz	All Modes – Automatically Controlled Data Stations (unattended)
28,320-29,000	2.7kHz	28,330kHz – Digital Voice Centre of Activity 28,360kHz – QRP Centre of Activity 28,680kHz – Image Centre of Activity
29,000-29,100	6kHz	All Modes
29,100-29,200	6kHz	All Modes – FM Simplex – 10kHz Channels
29,200-29,300	6kHz	All Modes – Automatically Controlled Data Stations (unattended) 29,210kHz – UK Internet Voice Gateway (unattended) 29,290kHz – UK Internet Voice Gateway (unattended)
29,300-29,510	6kHz	Satellite Links
29,510-29,520	Guard Channel	
29,520-29,590	6kHz	All Modes – FM Repeater Inputs (RH1-RH8) 29,530kHz – UK Internet Voice Gateway (unattended) (RH2)
29,600	6kHz	All Modes – FM Calling Channel
29,610	6kHz	All Modes – FM Simplex Repeater (parrot) – input and output
29,620-29,700	6kHz	All Modes – FM Repeater Outputs (RH1-RH8) 29,630kHz – UK Internet Voice Gateway (unattended) (RH2)

Licence Notes: Amateur and Amateur Satellite Service – Primary User: 26dBW permitted. Beacons may be established for DF competitions except within 50km of NGR SK985640 (Waddington).
Notes to the Band Plan: As on page 41.

50MHz (6m)	NECESSARY BANDWIDTH	UK USAGE
50.000-50.100	500Hz	Telegraphy Only (except for Beacon Project) (Note 2) 50.000-50.030MHz reserved for future Synchronised Beacon Project (Note 2) Region 1: 50.000-50.010; Region 2: 50.010-50.020; Region 3: 50.020-50.030 50.050MHz – Future International Centre of Activity 50.090MHz – Inter-Continental DX Centre of Activity (Note 1)
50.100-50.200	2.7kHz	SSB/Telegraphy – International Preferred 50.100-50.130MHz – Inter-Continental DX Telegraphy & SSB (Note 1) 50.110MHz – Inter-Continental DX Centre of Activity 50.130-50.200MHz – General International Telegraphy & SSB 50.150MHz – International Centre of Activity
50.200-50.300	2.7kHz	SSB/Telegraphy – General Usage 50.285MHz – Crossband Centre of Activity
50.300-50.400	2.7kHz	MGM/Narrowband/Telegraphy 50.305MHz – PSK Centre of Activity 50.310-50.320MHz – EME 50.320-50.380MHz – MS
50.400-50.500		Propagation Beacons only 50.401MHz – WSPR beacons ±500Hz
50.500-52.000	12.5kHz	All Modes 50.510MHz – SSTV (AFSK) 50.520MHz – Internet Voice Gateway (10kHz channels), (IARU common channel) 50.530MHz – Internet Voice Gateway (10kHz channels), (IARU common channel) 50.540MHz – Internet Voice Gateway (10kHz channels), (IARU common channel) 50.550MHz – Image/Fax working frequency 50.600MHz – RTTY (FSK) 50.620-50.750MHz – Digital communications 50.630MHz – Digital Voice (DV) calling 50.710-50.890MHz – FM/DV Repeater Outputs (10kHz channel spacing) 51.210-51.390MHz – FM/DV Repeater Inputs (10kHz channel spacing) (Note 4) 51.410-51.590MHz – FM/DV Simplex (Note 3) (Note 4) 51.510MHz – FM Calling Frequency 51.530MHz – GB2RS News Broadcast and Slow Morse 51.650 & 51.750MHz – See Note 5 (25kHz aligned) 51.770 & 51.790MHz – See Note 5 51.810-51.990MHz – FM/DV Repeater Outputs (IARU aligned channels)

Note 1: Only to be used between stations in different continents (not for intra-European QSOs).
Note 2: 50.0-50.1MHz is currently shared with Propagation Beacons. These are due to be migrated by Aug 2014 to 50.4-50.5MHz, to create more space for Telegraphy and a new Synchronised Beacon Project.
Note 3: 20kHz channel spacing. Channel centre frequencies start at 51.430MHz.
Note 4: Embedded data traffic is allowed with digital voice (DV).
Note 5: May be used for Emergency Communications and Community Events.
Licence Notes: Amateur Service 50.0-51.0MHz – Primary User. Amateur Service 51.0-52.0MHz – Secondary User. Available on the basis on non-interference to other services (inside or outside the UK).
Notes to the Band Plan: As on page 41.

70MHz (4m)	NECESSARY BANDWIDTH	UK USAGE (NOTE 1)
70.000-70.090MHz	1kHz	Propagation Beacons Only
70.090-70.100	1kHz	Personal Beacons 70.091MHz – WSPR Beacons ±500Hz
70.100-70.250	2.7kHz	Narrowband Modes 70.185MHz – Cross-band Activity Centre 70.200MHz – CW/SSB Calling 70.250MHz – MS Calling
70.250-70.294	12kHz	All Modes 70.260MHz – AM/FM Calling 70.270MHz MGM Centre of Activity
70.294-70.500	12kHz	All Modes Channelised Operations Using 12.5kHz Spacing 70.3000MHz 70.3125MHz – Digital Modes 70.3250MHz – DX Cluster 70.3375MHz – Digital Modes 70.3500MHz – Internet Voice Gateway (Note 2) 70.3625MHz – Internet Voice Gateway 70.3750MHz – See Note 2 70.3875MHz – Internet Voice Gateway 70.4000MHz – See Note 2 70.4125MHz – Internet Voice Gateway 70.4250MHz – FM Simplex – used by GB2RS news broadcast 70.4375MHz – Digital Modes (special projects) 70.4500MHz – FM Calling 70.4625MHz – Digital Modes 70.4750MHz 70.4875MHz – Digital Modes

Note 1: Usage by operators in other countries may be influenced by restrictions in their national allocations.
Note 2: May be used for Emergency Communications and Community Events.
Licence Notes: Amateur Service 70.0-70.5MHz – Secondary User: 22dBW permitted. Available on the basis of non-interference to other services (inside or outside the UK).
Notes to the Band Plan: As on page 41.

144MHz (2m)	NECESSARY BANDWIDTH	UK USAGE
144.000-144.025MHz	2700Hz	All Modes – including Satellite Downlinks
144.025-144.110MHz	500Hz	Telegraphy (including EME CW) 144.050MHz – Telegraphy Centre of Activity 144.100MHz – Random MS Telegraphy Calling, (Note 1)
144.110-144.150	500Hz	Telegraphy and MGM 144.138MHz – PSK31 Centre of Activity EME MGM Activity (Note 7)
144.150-144.180	2700Hz	Telegraphy, MGM and SSB
144.180-144.360	2700Hz	Telegraphy and SSB 144.175MHz – Microwave Talk-back 144.195-144.205MHz – Random MS SSB 144.200MHz – Random MS SSB Calling Frequency 144.250MHz – GB2RS News Broadcast and Slow Morse 144.260MHz – USB. (Note 10) 144.300MHz – SSB Centre of Activity

144.360-144.399	2700Hz	Telegraphy, MGM, SSB 144.370MHz – MGM Calling Frequency
144.400-144.490		Propagation Beacons only
144.490-144.500		144.492MHz – ±500Hz WSPR beacons and beacon guard band
144.500-144.794	20kHz	All Modes (Note 8) 144.500MHz – Image Modes Centre (SSTV, FAX, etc) 144.600MHz – Data Centre of Activity (MGM, RTTY, etc) 144.6125MHz – UK Digital Voice (DV) Calling (Note 9) 144.625-144.675MHz – See Note 10 144.750MHz – ATV Talk-back 144.775-144.794MHz – See Note 10
144.794-144.990	12kHz	MGM Digital Communications (Note 15) 144.800-144.9875MHz – MGM/Digital Communications 144.8000MHz – Unconnected Nets – APRS, UiView etc (Note 14) 144.8125MHz – DV Internet Voice Gateway 144.8250MHz – DV Internet Voice Gateway 144.8375MHz – DV Internet Voice Gateway 144.8500MHz – DV Internet Voice Gateway 144.8625MHz – DV Internet Voice Gateway 144.9250MHz – TCP/IP Usage 144.9375MHz – AX25 Usage 144.9500MHz – AX25 Usage 144.9625MHz – FM Internet Voice Gateway 144.9750MHz, 144.9875MHz To Be Decided (Note 11)
144.990-145.1935	12kHz	FM/DV RV48-RV63 Repeater Input Exclusive (Note 2 & 5)
145.200	12kHz	FM/DV Space Communications (eg ISS) – Earth-to-Space 145.2000MHz – (Note 4 & 10)
145.200-145.5935	12kHz	FM/DV V16-V48 – FM/DV Simplex (Note 3, 5 & 6) 145.2250MHz – See Note 10 145.2375MHz – FM Internet Voice Gateway (IARU common channel) 145.2500MHz – Used for Slow Morse Transmissions 145.2875MHz – FM Internet Voice Gateway (IARU common channel) 145.3375MHz – FM Internet Voice Gateway (IARU common channel) 145.5000MHz – FM Calling (Note 12) 145.5250MHz – Used for GB2RS News Broadcast. 145.5500MHz – Used for Rally/exhibition Talk-in 145.5750MHz, 145.5875MHz (Note 11)
145.5935-145.7935	12kHz	FM/DV RV48-RV63 – Repeater Output (Note 2)
145.800	12kHz	FM/DV Space Communications (eg ISS) – Space-Earth
145.806-146.000	12kHz	All Modes – Satellite Exclusive

Note 1: Meteor scatter operation can take place up to 26kHz higher than the reference frequency.
Note 2: 12.5kHz channels numbered RV48-RV63. RV48 input = 145.000MHz, output = 145.600MHz.
Note 3: 12.5kHz simplex channels numbered V16-V46. V16 = 145.200MHz.
Note 4: Emergency Communications Groups utilising this frequency should take steps to avoid interference to ISS operations in non-emergency situations.
Note 5: Embedded data traffic is allowed with digital voice (DV).
Note 6: Simplex use only – no DV gateways.
Note 7: EME activity using MGM is commonly practiced between 144.110-144.160MHz.
Note 8: Amplitude Modulation (AM) is acceptable within the All Modes segment. AM usage is typically found on 144.550MHz. Users should consider adjacent channel activity when selecting operating frequencies.
Note 9: In other countries IARU Region 1 recommends 145.375MHz.
Note 10: May be used for Emergency Communications and Community Events.
Note 11: May be used for repeaters in other IARU Region 1 countries.
Note 12: DV users are asked not to use this channel, and use 144.6125MHz for calling.
Note 13: Not used.
Note 14: 144.800 use should be NBFM to avoid interference to 144.8125 DV Gateways.
Licence Notes: Amateur Service and Amateur Satellite Service – Primary User. Beacons may be established for DF competitions except within 50km of TA 012869 (Scarborough).
Notes to the Band Plan: As on page 41.

146MHz IARU Recommendation	NECESSARY BANDWIDTH	UK USAGE
146.000-146.900MHz	500kHz	Wideband Digital Modes (High speed data , DATV etc) 146.500MHz Centre frequency for wideband modes (Note 1)
146.900-147.000MHz	12kHz	Narrowband Digital Modes including Digital Voice 146.900 146.9125 146.925 146.9375 Not available in/near Scotland (see Licence Notes & NoV terms) 146.9500 146.9625 146.9750 146.9875

Note-1: Users of wideband modes must ensure their spectral emissions are contained with the band limits.
Licence Notes: Full Licensees only, with NoV, 25W ERP max – not available in the Isle of Man or Channel Isles. Note that additional restrictions on geographic location, antenna height and upper frequency limit are specified by the NoV terms.
It should be emphasised that this band is UK-specific and is available on a non-interference basis to existing services. Upper Band limit 147.000MHz (or 146.93750 where applicable) are absolute limits and not centre frequencies. The absolute band frequency limit in or within 40km of Scotland is 146.93750MHz – see NoV schedule
Notes to the Band Plan: As on page 41.

430MHz (70cm) IARU Recommendation	NECESSARY BANDWIDTH	UK USAGE
430.0000-431.9810MHz	20kHz	430.0125-430.0750MHz – Internet Voice Gateways (Notes 7, 8)
All Modes 430.4000-430.5750 Digital Links 430.6000-430.9250		UK DV 9MHz Split Repeaters – inputs 430.8000MHz – 7.6MHz Talk-through – Mobile TX (Note 10)
Digital Repeaters		430.8250-430.9750MHz – RU66-RU78 7.6MHz Split Repeaters – outputs See Licence Exclusion Note; 431-432MHz 430.9900-431.9000MHz – Digital Communications 431.0750-431.1750MHz – Internet Voice Gateways (Note 8)
432.0000-432.1000 Telegraphy MGM	500Hz	432.0000-432.0250MHz – Moonbounce (EME) 432.0500MHz – Telegraphy Centre of Activity 432.0880MHz – PSK31 Centre of Activity
432.1000-432.4000 SSB, Telegraphy MGM	2700Hz	432.2000MHz – SSB Centre of Activity 432.3500MHz – Microwave Talk-back (Europe) 432.3700MHz – FSK441 Calling Frequency
432.4000-432.5000 Beacons Exclusive	500Hz	Propagation Beacons only (Note 9)
432.5000-432.9940 All Modes Non-channelised	25kHz (Note 11)	432.5000MHz – Narrowband SSTV Activity Centre 432.6250-432.6750MHz Digital Communications (25kHz channels) 432.7750MHz 1.6MHz Talk-through – Base TX (Note 10)
432.9940-433.3810	25kHz	433.0000-433.3750MHz (RB0-RB15) – RU240-RU270
FM repeater outputs in UK only (Note 1)	(Note 11)	FM/DV Repeater Outputs (25kHz channels) in UK Only
433.3940-433.5810	25kHz	433.4000MHz U272 – IARU Region 1 SSTV (FM/AFSK)
	(Note 11)	433.4250MHz U274
FM/DV (Notes 12, 13) Simplex Channels		433.450MHz U276 (Note 5) 433.4750MHz U278 433.5000MHz U280 – FM Calling Channel 433.5250MHz U282 433.5500MHz U284 – Used for Rally/Exhibition Talk-in 433.5750MHz U286
433.6000-434.0000 All Modes 433.800MHz for APRS where 144.800MHz cannot be used	25kHz (Note 11)	433.6250-6750MHz – Digital Communications (25kHz channels) 433.700MHz (Note 10) 433.7250-433.7750MHz (Note 10) 433.8000-434.2500MHz – Digital Communications
434.000-434.5940	25kHz	433.9500-434.0500MHz – Internet Voice Gateways (Note 8)
	(Note 11)	434.3750MHz 1.6MHz Talk-through – Mobile TX (Note 10) 434.4750-434.5250MHz – Internet Voice Gateways (Note 8)
434.5940-434.9810	25kHz	434.6000-434.9750MHz (RB0-RB15) RU240-RU270
FM repeater inputs in UK only & ATV (Note 4)	(Note 11)	FM/DV Repeater Inputs (25kHz channels) in UK Only (Note 12)
435.0000-438.0000	20kHz	Satellites and Fast Scan TV (Note 4) 437.0000 – Experimental DATV Centre of Activity (Note 14)
438.0000-440.0000	25kHz	438.0250-438.1750MHz – IARU Region 1 Digital Communications
All Modes	(Note 11)	438.2000-439.4250MHz (Note 1) 438.4000MHz – 7.6MHz Talk-through – Base TX (Note 10) 438.4250-438.5750MHz RU66-RU78 – 7.6MHz Split Repeaters – inputs 438.6125MHz – UK DV calling (Note 12) (Note 13) 439.6000-440.0000MHz – Digital Communications UK DV 9MHz Split Repeaters - Outputs

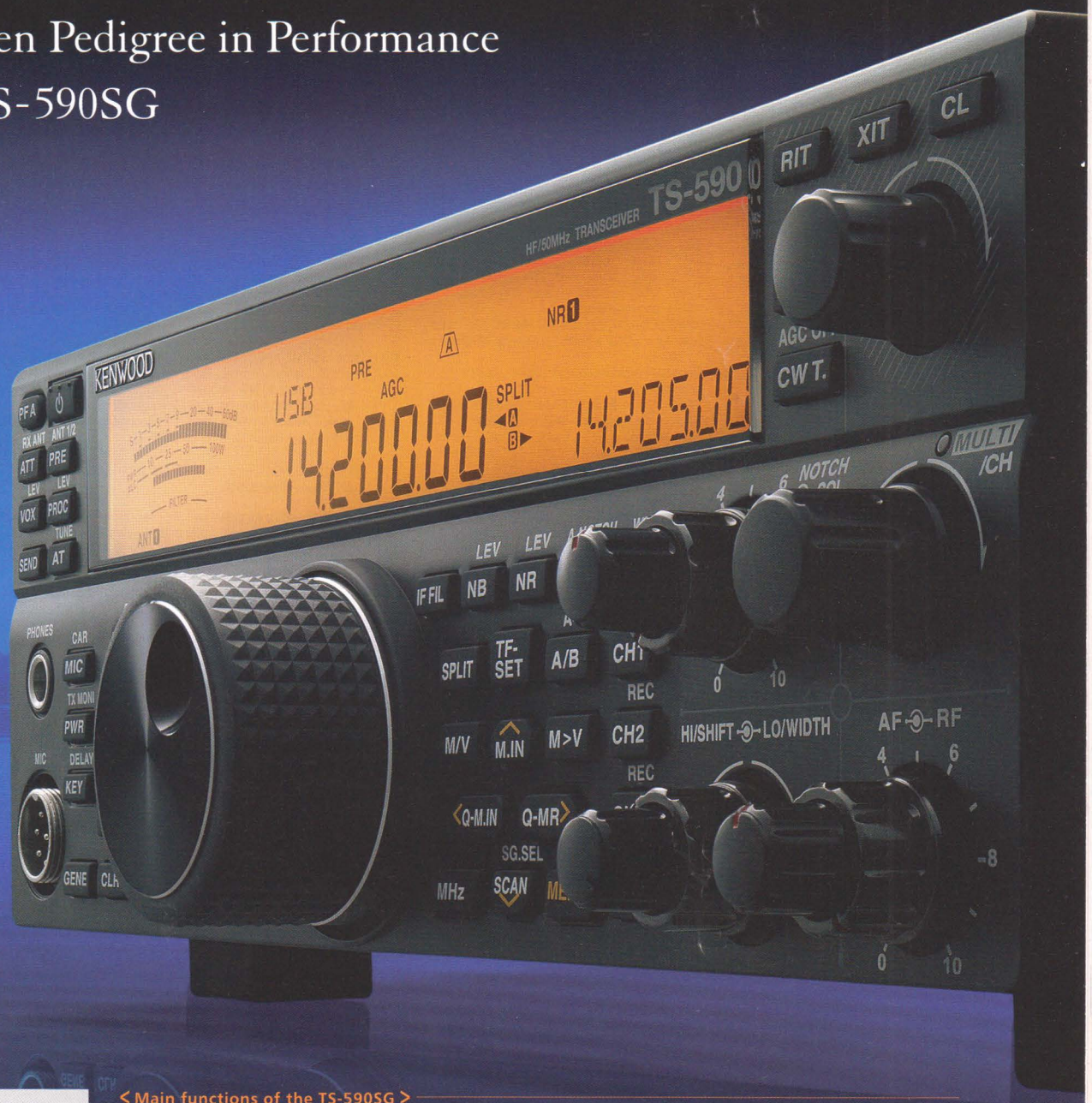
Note 1: In Switzerland, Germany and Austria, repeater inputs are 431.050-431.825MHz with 25kHz spacing and outputs 438.650-439.425MHz. In Belgium, France and the Netherlands repeater outputs are 430.025-430.375MHz with 12.5kHz spacing and inputs at 431.625-431.975MHz. In other European countries repeater inputs are 433.000-433.375MHz with 25kHz spacing and outputs at 434.600-434.975MHz, ie the reverse of the UK allocation.
Note 4: ATV carrier frequencies shall be chosen to avoid interference to other users, in particular the satellite service and repeater inputs.
Note 5: In other countries IARU Region 1 recommends 433.450MHz for DV calling.
Note 7: Users must accept interference from repeater output channels in France and the Netherlands at 430.025-430.575MHz. Users with sites that allow propagation to other countries (notably France and the Netherlands) must survey the proposed frequency before use to ensure that they will not cause interference to users in those countries.
Note 8: All internet voice gateways: 12.5kHz channels, maximum deviation ±2.4kHz, maximum effective radiated power 5W (7dBW), attended only operation in the presence of the NoV holder.
Note 10: May be used for Emergency Communications and Community Events.
Note 11: IARU Region 1 recommended maximum bandwidths are 12.5 or 20kHz.
Note 12: Embedded data traffic is allowed with digital voice (DV).
Note 13: Simplex use only - no DV gateways.
Note 14: QPSK 2 Mega-symbols/second maximum recommended.
Licence Notes: Amateur Service – Secondary User. Amateur Satellite Service: 435-438MHz – Secondary User. Exclusion: 431-432MHz not available within 100km radius of Charing Cross, London. Power Restriction 430-432MHz is 40 watts effective radiated power maximum.
Notes to the Band Plan: As on page 41.

1.3GHz (23cm)	NECESSARY BANDWIDTH	UK USAGE
1240.000-1240.500	2700Hz	Alternative Narrowband Segment – see Note 7 – 1240.00-1240.750MHz
1240.500-1240.750		Alternative Propagation Beacon Segment
1240.750-1241.000	20kHz	FM/DV Repeater Inputs
1241.000-1241.750	150kHz	DD High Speed Digital Data – 5 x 150kHz channels
All Modes		1241.075, 1241.225, 1241.375, 1241.525, 1241.675MHz (±75kHz)
1241.750-1242.000 All Modes 1242.000-1249.000	20kHz	25kHz Channels available for FM/DV use 1241.775-1241.975MHz TV Repeaters (Note 9)

KENWOOD

Be witness to the evolution of KENWOOD's pride
and joy - the TS-590S HF transceiver - pushing performance
and technology to its utmost limit,
with the receiver configured to capitalize on roofing filter performance
and IF AGC controlled through advanced DSP technology.
Enter the TS-590SG. A new generation of high performance transceiver,
with the type of high level response to meet DX'ers needs.

A Proven Pedigree in Performance
The TS-590SG



HF/50MHz TRANSCEIVER
TS-590SG

< Main functions of the TS-590SG >

- An even higher performance receiver with superior adjacent dynamic range.
- Advanced AGC control through digital signal processing from the IF stage.
- Highly reliable TX outputs high-quality TX signal.
- New morse code decoder. Scroll display on 13-segment display unit. Characters shown in dedicated window on ARCP-590G.
- MULTI/CH knob (with push-switch) and RIT/XIT/CL key also configurable in addition to existing PF A and PF B programmable functions.
- New Split function (TS-990S-style) enabling quick configuration added in addition to existing Split setting.
- Transceiver equalizer configurable by mode.
- FIL A/B configurable independently with VFO A/B (convenient during Split operation).

Kenwood Electronics UK Limited
12 Priestley Way, London, NW2 7BA UK.

*Alterations may be made without notice to improve the ratings or the design of the transceiver.
*The photographic and printing processes may cause the coloration of the transceiver to appear different from that of the actual transceiver.

www.kenwood-electronics.co.uk

ATV		New DATV Repeater Inputs Original ATV Repeater Inputs: 1248, 1249
1249.000-1249.250	20kHz	FM/DV Repeater Outputs, 25kHz Channels (Note 9) 1249.025-1249.225MHz
1250.00		In order to prevent interference to Primary Users, caution must be exercised prior to using 1250-1290MHz in the UK
1260.000-1270.000		Amateur Satellite Service – Earth to Space Uplinks Only
Satellites 1290.000		
1290.994-1291.481	20kHz	FM/DV Repeater Inputs (Note 5) 1291.000-1291.375MHz (RM0-RM15) 25kHz spacing
1291.494-1296.000 All Modes	All Modes	Preferred Narrowband segment
1296.000-1296.150 Telegraphy, MGM	500Hz	1296.000-1296.025MHz – Moonbounce 1296.138MHz – PSK31 Centre of Activity
1296.150-1296.800 Telegraphy, SSB & MGM	2700Hz	1296.200MHz – Narrowband Centre of Activity 1296.400-1296.600MHz – Linear Transponder Input
(Note 1)		1296.500MHz – Image Mode Centre of Activity (SSTV, FAX etc) 1296.600MHz – Narrowband Data Centre of Activity (MGM, RTTY etc) 1296.600-1296.700MHz – Linear Transponder Output
1296.800-1296.994		1296.750-1296.800MHz – Local Beacons, 10W ERP max 1296.800-1296.990MHz – Propagation Beacons only Beacons exclusive
1296.994-1297.481	20kHz	FM/DV Repeater Outputs (Note 5) 1297.000-1297.375MHz (RM0-RM15)
1297.494-1297.981	20kHz	FM/DV Simplex ((Notes 2, 5 & 6)) 25kHz spacing 1297.500-1297.750MHz (SM20-SM30)
FM/DV simplex (Notes 2, 5, 6)		1297.725MHz – Digital Voice (DV) Calling (IARU recommended) 1297.900-1297.975MHz – FM Internet Voice Gateways (IARU common channels, 25kHz)
1298.000-1299.000 All Modes	20kHz	All Modes General mixed analogue or digital use in channels 1298.025-1298.975MHz (RS1-RS39)
1299.000-1299.750 All Modes	150kHz	DD High Speed Digital Data – 5 x 150kHz channels 1299.075, 1299.225, 1299.375, 1299.525, 1299.675MHz (±75kHz)
1299.750-1300.000 All Modes	20kHz	25kHz Channels Available for FM/DV use 1299.775-1299.975MHz
1300.000-1325.000 ATV		TV Repeaters (UK only) (Note 9) New DATV Repeater Outputs Original ATV Repeater Outputs: 1308.0, 1310.0, 1311.5, 1312.0, 1316.0, 1318.5MHz

Note 1: Local traffic using narrowband modes should operate between 1296.500-1296.800MHz during contests and band openings.
Note 2: Stations in countries that do not have access to 1298-1300MHz may also use the FM simplex segment for digital communications.
Note 3: IARU Region 1 recommended maximum bandwidth is 20kHz. See also Note 7.
Note 4: deleted.
Note 5: Embedded data traffic is allowed with digital voice (DV).
Note 6: Simplex use only – no DV gateways.
Note 7: 1240.000-1240.750 has been designated by IARU as an alternative centre for narrowband activity and beacons. Operations in this range should be on a flexible basis to enable coordinated activation of this alternate usage.
Note 8: The band 1240-1300MHz is subject to major replanning. Contact the Microwave Manager for further information.
Note 9: Repeaters and Migration to DATV, inc option for new DATV simplex are subject to further development and coordination.
Note 10: QPSK 4 Mega-symbols/second maximum recommended.
Licence Notes: Amateur Service – Secondary User. Amateur Satellite Service: 1,260-1,270MHz – Secondary User Earth to Space only. In the sub-band 1,298-1,300MHz unattended operation is not allowed within 50km of SS206127 (Bude), SE202577 (Harrogate), or in Northern Ireland.
Notes to the Band Plan: As on page 41.

2.3-2.302GHz	NECESSARY BANDWIDTH	UK USAGE

Access to this band requires an appropriate NoV, which is available to Full licensees only. Please note that the current NoVs last for up to three years prior to expiry.

2300.000-2300.400MHz	2.7kHz	Narrowband Modes (including CW, SSB, MGM) 2300.350-2300.400MHz Attended Beacons
2300.400-2301.800MHz	500kHz	Wideband Modes (NBFM, DV, Data, DATV, etc) Note 1
2301.800-2302.000MHz	2.7kHz	Narrowband modes (including CW, SSB, MGM) EME Usage

Note 1: Users of wideband modes must ensure their spectral emissions are contained within the band limits.
Note 2: Full licensees only with NoV, 400 watts maximum, not available in the Isle of Man or Channel isles. Note additional restrictions on usage are specified by the NoV terms. It should be emphasised that this is UK-specific and is available on a non interference basis to exisiting services.
Notes to the Band Plan: As on page 41.

2.3GHz (13cm) IARU Recommendation	NECESSARY BANDWIDTH	UK USAGE
2,310.000-2,320.000MHz (National band plans)	200kHz	2,310.000-2,310.500MHz – Repeater links 2,311.000-2,315.000MHz – High speed data
2,320.000-2,320.150	500Hz	Preferred Narrowband Segment 2,320.000-2,320.025MHz – Moonbounce
2,320.150-2,320.800	2.7kHz	2,320.200MHz – SSB Centre of Activity
2,320.800-2,321.000		2,320.750-2,320.800MHz – Local Beacons, 10W ERP max 2,320.800-2,320.990MHz – Propagation Beacons Only
Beacons exclusive 2321.000-2322.000 2,322.000-2,350.000	20kHz	FM/DV. See also Note 1 Wideband Modes including Data, ATV
2,390.000-2,400.000 2,400.000-2,450.000MHz Satellites		All Modes 2,435.000MHz ATV Repeater Outputs 2,440.000MHz ATV Repeater Outputs

Note 1: Stations in countries which do not have access to the All Modes section 2,322-2,390MHz, use the simplex and repeater segment 2,320-2,322MHz for data transmission.
Note 2: Stations in countries that do not have access to the narrowband segment 2,320-2,322MHz, use the alternative narrowband segment 2,304-2,306MHz and 2,308-2,310MHz.
Note 3: The segment 2,433-2,443MHz may be used for ATV if no satellite is using the segment.
Licence Notes: Amateur Service – Secondary User. Users must accept interference from ISM users. Amateur Satellite Service: 2,400-2,450MHz – Secondary User. Users must accept interference from ISM users. Operation in 2310-2350 and 2390-2400 MHz are subject to specific conditions and guidance In the sub-bands 2,310.000-2,310.4125 and 2,392-2,450MHz unattended operation is not allowed within 50km of SS206127 (Bude) or SE202577 (Harrogate). ISM = Industrial, scientific and medical.
Notes to the Band Plan: As on page 41.

3.4GHz (9cm) IARU Recommendation	NECESSARY BANDWIDTH	UK USAGE
3,400.000-3,401.000MHz	2.7kHz	Narrowband Modes (including CW, SSB, MGM, EME) 3,400.100MHz – Centre of Activity (Note 1)
3,400.800-3,400.995		3,400.750-3,400.800MHz – Local Beacons, 10W ERP max 3,400.800-3,400.995MHz – Propagation Beacons Only
Propagation Beacons 3,400.000-3,401.000MHz 3,402.000-3,410.000 All Modes (Notes 2, 3)	200kHz	3,401.000-3,402.000MHz Data, Remote Control Wideband Modes including DATV Repeater Outputs

Note 1: EME has migrated from 3456MHz to 3400MHz to promote harmonised usage and activity.
Note 2: Stations in many European countries have access to 3400-3410MHz as permitted by ECA Table Footnote EU17.
Note 3: Amateur Satellite downlinks planned.
Licence Notes: Amateur Service – Secondary User. Subject to specific conditions and guidance.
Notes to the Band Plan: As on page 41.

5.7GHz (6cm) IARU Recommendation	UK USAGE
5,650.000-5,668.000MHz Satellite Uplinks	Amateur Satellite Service – Earth to Space Only
5,650.000-5,670.000 Narrowband CW/EME/SSB	5,668.200MHz – Alternative Centre of Activity 5,668.8MHz – Beacons
5,670.000-5,680.000 All Modes	
5.755.000-5,760.000 All Modes	
5,760.000-5,762.000 Narrowband	5,760.100MHz – Current Centre of Activity
CW/EME/SSB 5760.800-5760.995	5,760.750-5,760.800MHz – Local Beacons, 10W ERP max 5,760.800-5,760.995MHz – Propagation Beacons only
Propagation Beacons 5,762.000-5,765.000	
All Modes 5,820.000-5,830.000	
All Modes 5,830.000-5,850.000	
Satellite Downlinks	Amateur Satellite Service – Space to Earth Only

Licence Notes: Amateur Service: 5,650-5,680MHz – Secondary User. 5,755-5,765 and 5,820-5,850MHz – Secondary User. Users must accept interference from ISM users. Amateur Satellite Service: 5,650-5,670MHz and 5,830-5,850MHz – Secondary User. Users must accept interference from ISM users. Unattended operation is permitted for remote control, digital modes and beacons, except in the sub-bands 5,670-5,680MHz within 50km of SS206127 (Bude) and SE202577 (Harrogate). ISM = Industrial, scientific and medical.
Notes to the Band Plan: As on page 41.

10GHz (3cm) IARU Recommendation	NECESSARY BANDWIDTH	UK USAGE
10,000.000-10,125.000MHz All Modes		Note 4 10,065MHz ATV Repeater Outputs
10,225.000-10,250.000 All Modes		10,240MHz ATV Repeaters
10,250.000-10,350.000 Digital Modes 10,350.000-10,368.000		10,352.5-10,368MHz Wideband Modes (Note 2)
All Modes 10,368-10,370MHz Narrowband Telegraphy EME/SSB	2.7kHz	10,368-10,370 Narrowband Modes (Note 3) 10,368.1MHz Centre of Activity
10,368.800-10,368.995		10,368.750-10,368.800MHz – Local Beacons, 10W ERP max 10,368.800-10,368.995MHz – Propagation Beacons Only
Propagation Beacons 10,370.000-10,450.000 All Modes 10,450.000-10,475.000 All Modes & Satellites		10,371MHz Voice Repeaters Rx 10,425 ATV Repeaters 10,400-10,475MHz Unattended Operation 10,450-10,452MHz Alternative Narrowband Segment (Note 3) 10,471MHz Voice Repeaters Tx

10,475.000-10,500.000
All Modes and satellites — Amateur Satellite Service ONLY

Note 1: Deleted.
Note 2: Wideband FM is preferred between 10,350-10,400MHz to encourage compatibility between narrowband systems.
Note 3: 10,450MHz is used as an alternative narrowband segment in countires where 10,368MHz is not available.
Note 4: 10,000-10,125MHz is subject to increased Primary user utilisation and NoV restrictions.
Note 5: 10,475-10,500MHz is allocated ONLY to the Amateur Satellite Service and NOT to the Amateur Service.
Licence Notes: Amateur Service – Secondary User. Foundation licensees 1 watt maximum. Amateur Satellite Service: 10,450-10,500MHz – Secondary User. Unattended operation is permitted for remote control, digital modes and beacons except in the sub-bands 10,000-10,125MHz within 50km of SO916223 (Cheltenham), SS206127 (Bude), SK985640 (Waddington) and SE202577 (Harrogate).
Notes to the Band Plan: As on page 41.

24GHz (12mm) IARU Recommendation	UK USAGE
24,000.000-24,050.000MHz Satellites	24,025MHz Preferred Operating Frequency for Wideband Equipment
	24,048.2MHz – Narrowband Centre of Activity
	24,048.750-24,048.800MHz – Local Beacons, 10W ERP max
24,048.800-24,048.995 Propagation Beacons	24,048.800-24,048.995MHz – Propagation Beacons Only
24,050.000-24,250.000 All Modes	

Licence Notes: Amateur Service: 24,000-24,050MHz – Primary User: Users must accept interference from ISM users. 24,050-24,150MHz – Secondary User. May only be used with the written permission of Ofcom. Users must accept interference from ISM users. 24,150-24,250MHz – Secondary User. Users must accept interference from ISM users. Amateur Satellite Service: 24,000-24,050MHz – Primary User: Users must accept interference from ISM users. Unattended operation is permitted for remote control, digital modes and beacons, except in the sub-bands 24,000-24,050MHz within 50km of SK985640 (Waddington) and SE202577 (Harrogate).
ISM = Industrial, scientific and medical.
Notes to the Band Plan: As on page 41.

47GHz (6mm) IARU Recommendation	UK USAGE
47,000.000-47,200.000MHz 47,088.000-47,090.000 Narrowband Segment	47,088.2MHz – Centre of Narrowband Activity
47,000.000-47,200.000MHz 47,088.000-47,090.000 Narrowband Segment	47,088.2MHz – Centre of Narrowband Activity

Licence Notes: Amateur Service and Amateur Satellite Service – Primary User. Unattended operation is permitted for remote control, digital modes and beacons, except within 50km of SK985640 (Waddington) and SE202577 (Harrogate).
Notes to the Band Plan: As on page 41.

76GHz (4mm) IARU Recommendation	UK USAGE
75,500-76,000MHz All Modes (preferred)	75,976.200MHz – IARU Region 1 Preferred Centre of Activity
76,000.000-77,500.000 All Modes	
77,500-78,000 All Modes (preferred)	77,500.200MHz – Alternative IARU Recommended Narrowband Segment
78,000-81,000 All Modes	

Licence Notes:
75,500-75,875MHz Amateur Service and Amateur Satellite Service – Secondary User.
75,875-76,000MHz Amateur Service and Amateur Satellite Service – Primary User.
76,000-77,500MHz Amateur Service and Amateur Satellite Service – Secondary User.
77,500-78,000MHz Amateur Service and Amateur Satellite Service – Primary User.
78,000-81,000MHz Amateur service and Amateur Satellite Service – Secondary User.
Unattended operation is permitted for remote control, digital modes and beacons, except within 50km of SK985640 (Waddington) and SE202577 (Harrogate).
Notes to the Band Plan: As on page 41.

134GHz (2mm) IARU Recommendation	UK USAGE
134,000-134,928MHz All Modes	
134,928 -134,930 Narrowband Modes	IARU Region 1 Preferred Centre of Activity
	134,928.800-134,928.990 – Propagation Beacons Only
134,930 -136,000 All Modes	

Licence Notes: 134,000-136,000MHz Amateur Service and Amateur Satellite Service – Primary User. Unattended operation is permitted for remote control, digital modes and beacons, except within 50km of SK985640 (Waddington) and SE202577 (Harrogate).

THE FOLLOWING BANDS ARE ALSO ALLOCATED TO THE AMATEUR SERVICE AND THE AMATEUR SATELLITE SERVICE

122,250-123,000MHz – Amateur Service only, Secondary User
136,000-141,000MHz – Secondary User
241,000-248,000MHz – Secondary User
248,000-250,000MHz – Primary User
Notes to the Band Plan: As on page 41.

NOTES TO THE BAND PLAN

ITU-R Recommendation SM.328 (extract)

Necessary bandwidth: For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

Foundation and Intermediate Licence holders are advised to check their Licences for the permitted power limits and conditions applicable to their class of Licence.

All Modes: CW, SSB and those modes listed as Centres of Activity, plus AM. Consideration should be given to adjacent channel users.

Image Modes: Any analogue or digital image modes within the appropriate bandwidth, for example SSTV and FAX.

Narrowband Modes: All modes using up to 500Hz bandwidth, including CW, RTTY, PSK, etc.

Digimodes: Any digital mode used within the appropriate bandwidth, for example RTTY, PSK, MT63, etc.

Sideband usage: Below 10MHz use lower sideband (LSB), above 10MHz use upper sideband (USB). Note the lowest dial settings for LSB Voice modes are 1843, 3603 and 7043kHz on 160, 80 and 40m. Note that on (5MHz) USB is used.

Amplitude Modulation (AM): Amplitude Modulation (AM) is acceptable in the All Modes segments provided users consider adjacent channel activity when selecting operating frequencies (Davos 2005).

Extended SSB (eSSB): Extended SSB (eSSB) is only acceptable in the All Modes segments provided users consider adjacent channel activity when selecting operating frequencies.

Digital Voice (DV): Users of Digital Voice (DV) should check that the channel is not in use by other modes (CT08_C5_Rec20).

FM Repeater & Gateway Access: CTCSS Access is recommended. Toneburst access is being withdrawn in line with IARU-R1 recommendations.

Beacons Propagation Beacon Sub-bands are highlighted – please avoid transmitting in them!

MGM: Machine Generated Modes indicates those transmission modes relying fully on computer processing such as RTTY, AMTOR, PSK31, JTxx, FSK441 and the like. This does not include Digital Voice (DV) or Digital Data (DD).

WSPR: Above 30MHz, WSPR frequencies in the band plan are the centre of the transmitted frequency (not the suppressed carrier frequency or the VFO dial setting).

CW QSOs are accepted across all bands, except within beacon segments (Recommendation DV05_C4_Rec_13).

Contest activity shall not take place on the 10, 18 and 24MHz (30, 17 and 12m) bands.

Non-contesting radio amateurs are recommended to use the contest-free HF bands (30, 17 and 12m) during the largest international contests (DV05_C4_Rev_07).

The term 'automatically controlled data stations' include Store and Forward stations.

Transmitting Frequencies: The announced frequencies in the band plan are understood as 'transmitted frequencies' (not those of the suppressed carrier!).

Unmanned transmitting stations: IARU member societies are requested to limit this activity on the HF bands. It is recommended that any unmanned transmitting stations on HF shall only be activated under operator control except for beacons agreed with the IARU Region 1 Beacon Coordinator, or specially licensed experimental stations.

472-479kHz: Access is available to Full licensees only - see licence schedule for additional conditions.

1.8MHz: Radio amateurs in countries that have a SSB allocation ONLY below 1840kHz, may continue to use it, but the National Societies in those countries are requested to take all necessary steps with their licence administrations to adjust phone allocations in accordance with the Region 1 Band Plan (UBA – Davos 2005).

3.5MHz: Inter-Continental operations should be given priority in the segments 3500-3510kHz and 3775- 3800kHz. Where no DX traffic is involved, the contest segments should not include 3500-3510kHz or 3775-3800kHz. Member societies will be permitted to set other (lower) limits for national contests (within these limits). 3510-3600kHz may be used for unmanned ARDF beacons (CW, A1A) (Recommendation DV05_C4_Rec_12). Member societies should approach their national telecommunication authorities and ask them not to allocate frequencies other than amateur stations in the band segment that IARU has assigned to Inter-Continental long distance traffic.

5MHz: Access is available to Full licensees only- see licence schedule for additional conditions.

7MHz: The band segment 7040-7060kHz may be used for automatic controlled data stations (unattended) traffic in the areas of Africa south from the equator during local daylight hours. Where no DX traffic is involved, the contest segment should not include 7,175-7,200kHz.

10MHz: SSB may be used during emergencies involving the immediate safety of life and property and only by stations actually involved in the handling of emergency traffic.
The band segment 10120kHz to 10140kHz may be used for SSB transmissions in the area of Africa south of the equator during local daylight hours.
News bulletins on any mode should not be transmitted on the 10MHz band.

28MHz: Member societies should advise operators not to transmit on frequencies between 29.3 and 29.51MHz to avoid interference to amateur satellite downlinks.

Experimentation with NBFM Packet Radio on 29MHz band: Preferred operating frequencies on each 10kHz from 29.210 to 29.290MHz inclusive should be used. A deviation of ±2.5kHz being used with 2.5kHz as maximum modulation frequency.

146-147MHz & 2300-2302MHz
Access to these bands requires an appropriate NoV, which is available to Full licensees only.

1.3GHz
The band is subject to re-planning. It is also shared with air traffic radar.

2.3GHz (2310-2350 & 2390-2400MHz)
Operation is subject to specific licence conditions and guidance - see also the Ofcom PSSR statement.

3.4GHz (3400-3410MHz)
Operation is subject to specific licence conditions and guidance - see also the Ofcom PSSR statement.

ICOM

VHF/UHF DUAL BAND TRANSCEIVER **IC-2730E**

New Dual-bander with optional Bluetooth® Headset

- **VHF/VHF, UHF/UHF simultaneous receive capability with independent band controls**
- **Large Easy-to-See, backlit display**
- **Optional VS-3 Bluetooth headset**
- **50W output power on VHF and UHF bands**
- **Easy vehicle mounting and optional MBF-1 suction-cup mounting base**
- **Crossband repeater capability**
- **Free download PC programming software**

Count on us!

ICOM-UK Blacksole House, Altira Park, Herne Bay, Kent CT6 6GZ.
Telephone: 01227 741741 Fax: 01227 741742 e-mail: sales@icomuk.co.uk website: www.icomuk.co.uk

Mini Radio Solutions' miniVNA Tiny

A 1MHz to 3GHz vector network analyser

Mini Radio Solutions' (MRS) miniVNA Tiny is a vector network analyser (VNA) that operates from 1MHz to 3GHz. Whereas a basic antenna analyser can measure SWR, plus impedance/reactance, a VNA can measure the magnitude and phase characteristics of networks, amplifiers, components, cables, and antennas and also plot them. It can be used to measure SWR return loss, reflection coefficient, complex impedance (R+jX), and produce Smith charts if required.

Impedance (Z) can be measured from 1 to 1000Ω and the dynamic range is up to 70dB. The analyser can also be used as a low power RF generator as well.

POCKET-SIZED. The miniVNA Tiny lives up to its name. It is a blue plastic box about 65mm x 65mm x 27mm. As such it will easily fit in your pocket. The only three inputs/outputs are a mini USB port (it comes with a suitable cable) and two SMA sockets for device under test (DUT) and detector (DET).

Note that if you use PL259, BNC or N-type plugs in your shack you will need an adapter.

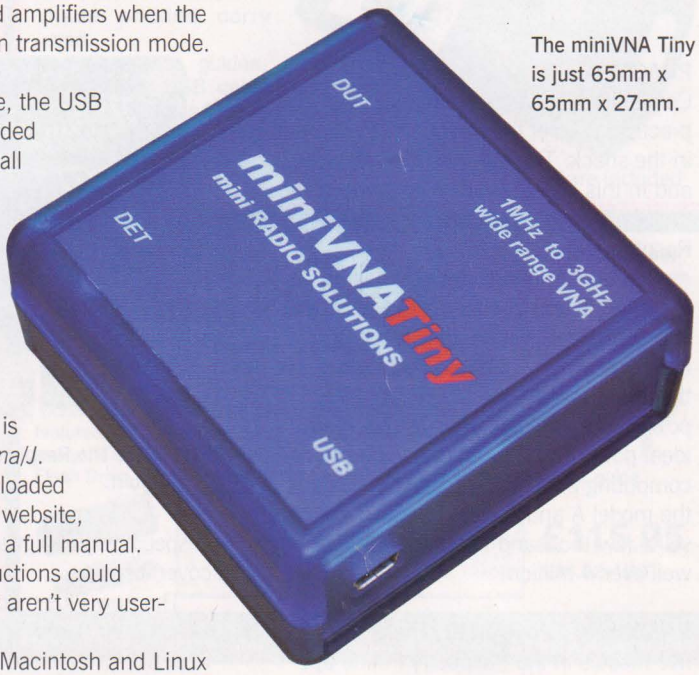
A green LED shows that the device is being powered (via the USB connection) and an orange LED blinks during serial communication. All the controls are performed by a software application running on a PC – you cannot use this as a standalone device.

The DUT port is typically connected to the antenna under test while the DET socket is used to check filters and amplifiers when the analyser is set to work in transmission mode.

SOFTWARE. The device, the USB cable and two double-sided specification sheets are all you get in the box. There is no software or instructions – although the English sheet does point you to miniradiosolutions.com for the latest software and updates. The recommended software is DL2SBA's Java-based *vna/J*. This can be freely downloaded from a link on the MRS website, where you will also find a full manual. I do think that the instructions could make this clearer – they aren't very user-friendly.

There are Windows, Macintosh and Linux versions of the software, but I suggest going to http://dl2sba.com/ for an update on what actual operating systems are supported. There is also an Android app.

On plugging it in to a Windows XP machine, the miniVNA Tiny prompted me that it needed a driver for the 'FT230X Basic UART' and 'USB Serial Port', which it seemed to find on its own. Once I had determined what port number the device had been allocated I was able to select it with the *vna/J* software. Again, this wasn't intuitive, but if you have played with USB ports before you should be OK.



The miniVNA Tiny is just 65mm x 65mm x 27mm.

IN USE. The software first prompts you to calibrate the device. This is done by running set up routines for open load, shorted load and 50 ohms, so you need to own or make suitably-accurate SMA plugs with these conditions. There is an optional £14.99 calibration kit, which might be preferable.

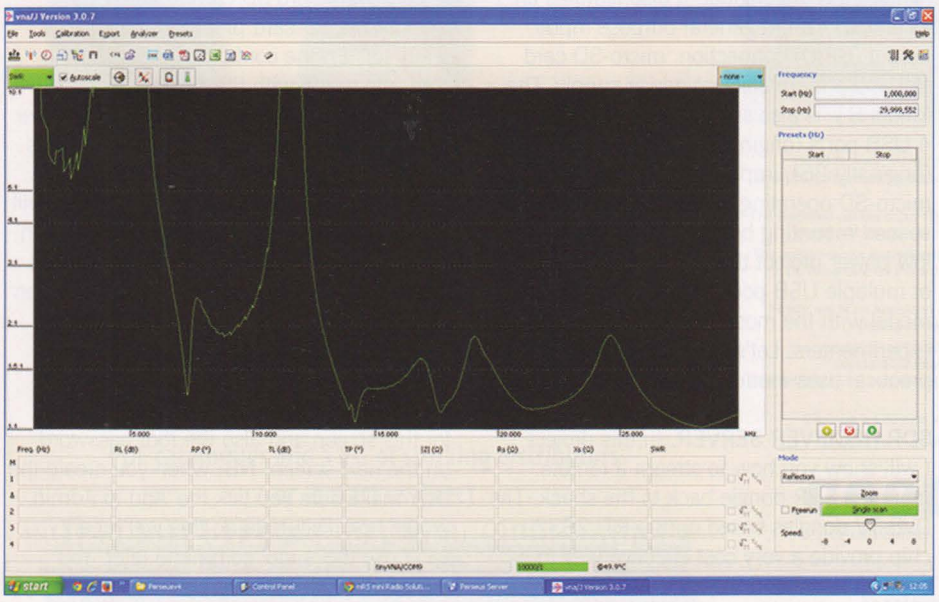
Once complete I was able to connect a multiband HF antenna and complete an SWR sweep from 1MHz to 30MHz. This took seconds and showed where the antenna is resonant – not necessarily quite where I wanted it to be!

This is really a review of the miniVNA Tiny and not the *vna/J* software, but given that one won't work without the other it is worth telling you some of the software's other features.

It can scan SWR, return loss, phase, transmission loss, complex impedance, equivalent resistance and equivalent reactance.

CONCLUSION. This is a very useful tool if you know how to use it and is aimed at the more experienced ham. It worked well, once I had it set up, but I do think that an 'idiots' guide' to its setup and operation would not go amiss.

My thanks to Martin Lynch and Sons (www.hamradio.co.uk) for the loan of the miniVNA Tiny, which costs £349.95 + postage.



A wide SWR sweep from 1MHz to 30MHz takes just seconds and shows where the antenna is resonant.

February 2015 • RadCom
Mike Richards, G4WNC • e-mail: mike@photobyte.org

The Raspberry Pi in your shack

An ultra-cheap computer with a wide range of amateur applications

Originally Presented at
RSGB 2014 Convention
See You in 2015

PRACTICAL PI. At last year's RSGB Convention I gave a presentation on practical uses of the Raspberry Pi computer in the shack. The talk was well received and in this article I will cover some of the projects and bring you up-to-date with the Raspberry Pi.

Although primarily designed as an educational tool to encourage youngsters into computer science, the Raspberry Pi has aroused a huge interest from the Maker fraternity. Its compact size, power and attractive price makes it an ideal powerhouse for a lot of small scale computing projects. The original designs of the model A and B were only expected to sell a few thousand but sales are currently well over 4 million!

RASPBERRY PI RANGE. There are currently five models in the Raspberry Pi line up, namely the Model A, Model A+, Model B, Model B+ and the Compute Module. The Compute Module is a very different beast that has all the computing power of the Pi but arranged in a computer memory strip format with lots of additional connections. It is specifically designed for OEMs so I will not cover it here.

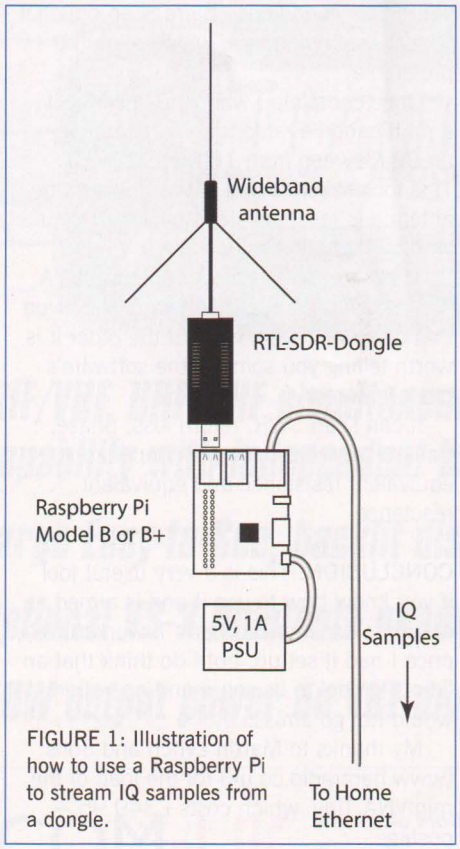


FIGURE 1: Illustration of how to use a Raspberry Pi to stream IQ samples from a dongle.

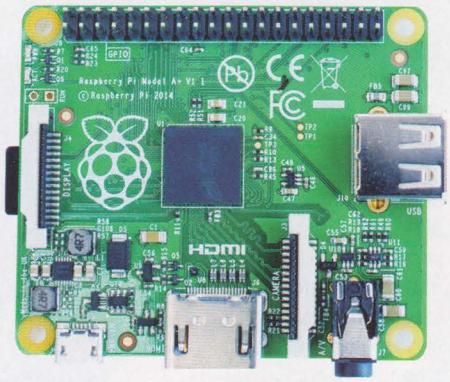


PHOTO 1: The Raspberry Pi Model A+ with new PCB layout.

The new Plus models were introduced in the latter part of 2014 as compatible improvements to the original model A and B. The new and improved models have many new features that make them more attractive and are the first choice for many new projects. The Model A is the simplest and cheapest Raspberry Pi and it comes without an Ethernet port and with a single USB port. As a result, it is lighter, cheaper and has lower power consumption than its bigger brother. The original Model A was the same physical size as the Model B but had a smaller memory and some components omitted. However, the new Model A Plus (**Photo 1**) uses a new PCB layout that, at just 57mm x 68mm, is much smaller and lighter than the original. It also features an extended, 40-pin general purpose input/output (GPIO) connection, micro-SD card slot and a more efficient power supply. The Model B+ is also significantly improved with 4 USB ports (originally 2), 40-pin GPIO (originally 26), improved power supply, micro-SD operating system card and evenly spaced mounting holes. Unless you have a low power project that doesn't need Ethernet or multiple USB ports, the Model B+ is the model with the most appeal to hobbyists and experimenters. Let's now take a look at some practical uses around the shack.

SDR RECEIVER SERVER. In this project I will show you how to stream a remote mounted SDR dongle back to the shack. The DVB-TV dongles based on the RTL2832u chip provide a very cost effective way to create a wideband SDR receiver. These generally have a frequency range that extends from around 60MHz up to well over 1GHz. At the higher frequencies, feeder loss can become a real problem so there can be a significant advantage if the receiver is located close to the antenna. I've shown a diagram of the proposed system in **Figure 1**. This is not a new idea but it is a technique that has been broken since autumn last year. The problem has arisen since the introduction of the B+ model and appears to be linked with libusb in the Raspian Linux distribution and is yet to be resolved. However, I've been experimenting with the Pidora version of Linux and will show you how to set up a working SDR dongle server using that operating system.

Pidora Setup. The easiest way to set up your Pi is to use an Ethernet network connection with an HDMI monitor and a keyboard/mouse combination. I use the Perixx Periduo 707 Plus Wi-Fi keyboard and mouse with all my Pi projects as it's cheap, works well and is compatible with all Pi models. Before you start you will need an SD or micro SD card loaded with the Pidora operating system. You can download a Pidora image from the download section of the Raspberry Pi home site. The image is supplied as a zip file so you will need to extract it to a directory of your choice on your PC. If you're using Windows, you will also need to download the Win32 Disk Imager so that you can burn the image to your SD card. You will find full instructions for burning the operating system to an SD or micro SD card at **[1]**.

With the SD card prepared, you are ready to start the configuration. Insert the card into the Pi with the contacts facing towards the PCB. You can then apply power and you should see signs of life, with LEDs flickering and text on the screen. On its initial start-up, Pidora runs a wizard that will take you through the essential configuration steps. This begins with licence agreements followed by the keyboard language and then the creation of a user ID. As we're not too worried about security for this application, I suggest you stick to using 'pi' as the username and 'raspberry' as the password for this screen and also the root password on the next screen. **NB:** when you create the user make sure you tick the 'Add to Admin group' box. Failure to do this will mean you can't use the 'sudo' command later. You can ignore the Network login and Advanced buttons. When you get to the time-zone

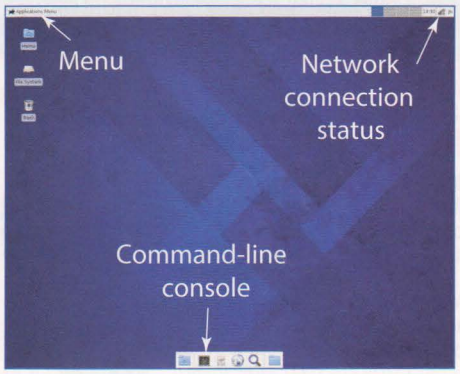


FIGURE 2: Pidora start screen.

screen, select the UK by choosing Europe – London. Leave the file system settings at their default. On the System Settings screen make sure you tick the HDMI to DVI adapter box if you're using an adapter cable. If you don't do this and are using a DVI adapter there will be no screen output after the system reboots – I know because it happened to me!

That completes the setup of the Pidora operating system and, following reboot, you should end up with a screen similar to that shown in **Figure 2**. When prompted, accept the default console settings.

The next step is to begin loading the software and libraries required to support the SDR dongle server. If you've previously used the Raspian strain of Linux you will encounter a few different commands with Pidora. The first step is to open a command line console by clicking the black screen icon at the bottom of the display. The first point to note is the tool we use to install packages which is called 'yum' in place of 'apt-get' that's used with Raspian. To install packages you will see that I've used yum with the '–y' option. The '-y' option effectively bypasses all the y/n prompts that occur during a normal installation and saves unnecessary keyboard interaction.

During yum installations, you should see a progress report on the screen listing all the actions which will include automatically downloading and installing a range of support software.

Now that everything is ready, let's start installing software packages by entering the commands in **Table 1.**

The prerequisites we need are 'cmake', 'libusb-devel' and 'git'. These are downloaded using the first three lines of the text in Table 1. The third line, git, is required so we can clone the rtl-sdr software from the Osmocom online repository. If you don't want to sit by the terminal watching the download and entering commands, it's very easy to create a simple script file that will run the commands for you. Here's how to do that:

1. In the command-line console type: 'cd ~' to make sure you are in the home directory.

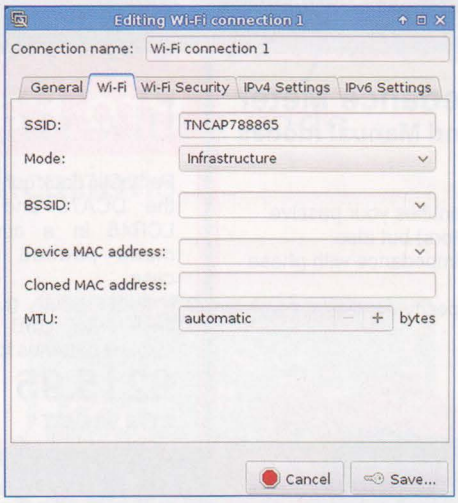


FIGURE 3: Pidora Wi-Fi configuration panel.

2. Type: 'nano sdr.sh'. This will create a new file called sdr.sh and open an edit screen.
3. Type in the commands exactly as shown in **Table 1**.
4. Type control x and answer y to the prompt followed by return. This will save the file.
5. In the command-line console type: 'sudo chmod +x sdr.sh'. This will change the permissions of the file and make it executable.
6. To run the script type: './sdr.sh'. You will be asked to enter your password (raspberry) at the beginning and once more just before the end.
7. This will take a while so make a cuppa!

The final task is to create a configuration file that will tell the system where to find the libraries we've just installed. To do this we first create a new file:

'sudo nano /etc/ld.so.conf.d/sdr.conf'

That will create a new file called sdf.conf and open it in the nano editor so we can add the following, single line of text:

'/usr/local/lib'

Save the file by pressing ctl X followed by 'y' then return. The final task is to update the system path by typing:

'sudo ldconfig'

That completes the installation so you can now reboot by typing 'sudo reboot' in the console.

Once the system has rebooted and you have entered your password, you can check the operation of the SDR dongle server. To do this, open up the command-line console again and type 'rtl_test' This will report the dongle device, list the tuner type and start a continuous read from the device at 2.048MSPS. To complete the test press control C and you will see a report showing the number of samples lost, which is usually 0. That completes the configuration of the Pi, so the next stage is to prepare it for remote operation as a server.

Pidora Wi-Fi Connection. Whilst the SDR streaming works at its best with an Ethernet connection, for some, a Wi-Fi connection may be the preferred route. The disadvantage of Wi-Fi is a much slower network connection, which means the sample rate of the dongle needs to be reduced, which, in turn, gives a reduced IQ tuning band. Here's a step-by-step guide to adding a Wi-Fi connection to Pidora:

1. Open the Application menu (top left) and select Settings – Network Connections and click the +Add button.
2. Choose Wi-Fi from the drop-down menu and click Create, see **Figure 3**.
3. On the Wi-Fi tab enter the SSID of your Wi-Fi network – you should find this printed on your router case.
4. Select the Wi-Fi Security tab and choose the security system (usually WPA & WPA2 Personal) then enter the Wi-Fi password for your system.
5. Click Save and, if prompted, cancel the request for a Keyring password.

That completes the Wi-Fi setup and the Pi will remember the details and automatically connect when your Wi-Fi is within range.

Headless! For use as an SDR Dongle server, we want the Pi to operate as a standalone, network connected unit with no screen, keyboard or mouse. This mode of operation is known as 'headless' and we control the Pi from a remote PC via a protocol called Secure Shell Tunnelling (ssh). It sounds complicated but is dead easy to use.

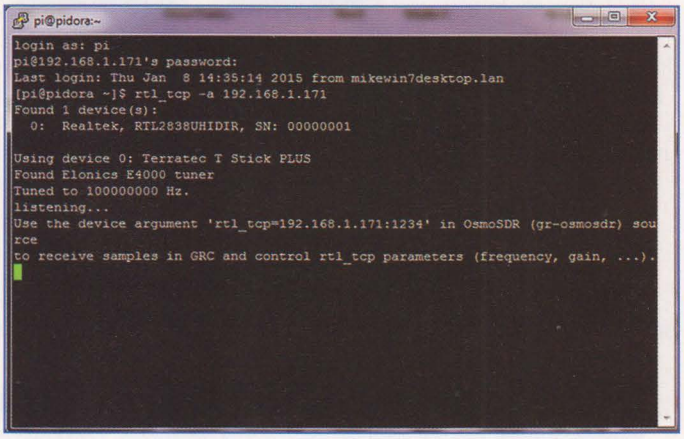


FIGURE 4: Remote access terminal showing the Pi ready to accept an *SDR Sharp* connection.

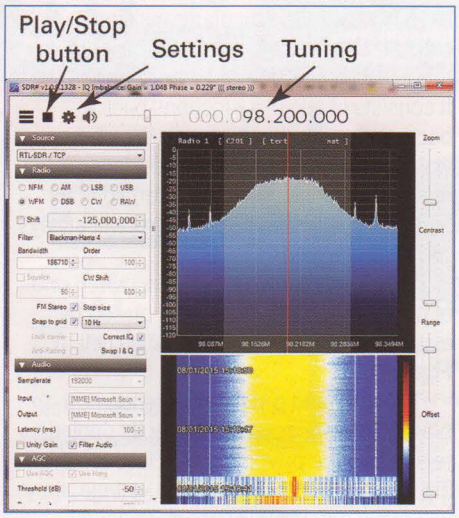


FIGURE 5: *SDR Sharp* main screen with key controls identified.

All we need on the main computer is a simple terminal application such as the old Windows *Hyperterminal* or one of the other open source solutions such as *PuTTY* or *Termite*.

To start a new connection we need the IP address of the Pi. As you probably know, the IP address in a standard home network is allocated by your router using its DHCP server. Ideally we want the Pi to be allocated the same IP address every time it starts and the method of achieving this will depend on your router. One of the simplest solutions, which is available on most home routers, is to force the router to allocate the same IP address to specific hardware. With this option set, the router will see the hardware details (MAC address) of the Pi's Wi-Fi dongle or Ethernet chip and automatically allocate the reserved IP address. The alternative solution is to use a static IP address for the Pi. To do this you will need to consult the manual for your router and follow the instructions for allocating a static IP address.

If you want to see the IP address of the Pi whilst you still have the keyboard and screen connected type: 'IP addr show' at the command line. The first entry shown will be the Pi's loopback address which will show as 127.0.0.1 but you need the eth0 entry for a wired connection or wlan0 for a Wi-Fi connection. The IP address will consist of four numbers separated by dots, usually 192.168.n.n, where n is specific to your own local network.

Once you've established the connection method and the IP address, you can create a headless file for the Pi. This is a simple text file that sits in the root directory of the Pi's SD card but triggers a couple of useful actions. Here are the steps to create a headless file:

1. Power down the Pi.
2. Plug the Pi's SD card into your main PC.
3. Open a simple text editor such as Notepad.
4. Enter text as shown in **Table 2** for a DHCP IP address or Table 3 for a static IP address.
5. Save the file to the root of the SD card with the name 'headless' and no suffix.

In addition to carrying out some useful configuration, the presence of the headless file causes the Pi to read out its IP address via the headphone socket once it's finished booting. The IP address is also sent by flashing the activity led. If you have a smartphone, another way to find IP addresses on a network is to use the free app *Fing*. This will report all the devices on your network and can be very useful.

Get Streaming. That completes the Pi setup so you can start using the system. I suggest you start with *SDR Sharp* as it's currently the simplest system to use and includes full support for RTL based dongles. You can download the latest version from **[2]**.

Here are the steps required to start receiving IQ samples from the remote Pi and SDR dongle:

1. Power up the Pi.
2. Open your main PC's terminal software, eg *Hyperterm, PuTTY* or *Termite*.
3. Choose an SSH connection, enter the Pi's IP address and click Open or Connect.
4. You may see a security warning; accept or cancel that.
5. You will see the log in prompt for the Pi. Enter your username password, which will be 'pi' and 'raspberry' if you followed my earlier instructions.
6. With the login complete, type rtl_tcp –a 192.168.1.171 to start the server. NB: replace the IP address with the one allocated to your Pi.
7. You should see a screen similar to **Figure 4** showing that it has found the dongle and is waiting for a connection.
8. Open *SDR Sharp* on your PC and select RTL-SDR/TCP as the Source in the top left of the screen (**Figure 5**).
9. Click the cogs icon and set the host to the IP address of your Pi and leave the sample rate at 2.048MSPS.
10. Click the Start button (arrow) at the top left of the *SDR Sharp* screen to start the receiver.

The display should burst into life and there should also be some audio signal. If the audio is choppy, that's an indication that your network can't handle the sample rate. For a Wi-Fi connected network you may find that you have to reduce the sample rate down to 0.25MSPS. You can alter the sample rate by opening the cogs icon and using the drop-down menu to choose a slower rate. Ethernet connections are usually fine at 2.048MSPS. For best results you will also need to adjust the RF gain and AGC settings. A good start point is to tick the Tuner AGC once the receiver is running. For more help with operation of *SDR Sharp* you will find lots of tutorials on the web.

LOCATING THE PI. The best location for your Pi will depend very much on your QTH but the loft often makes a good starting point. The precise power requirements will depend on the type of network connection and which model of Pi you are using. My measurements with an Ethernet connection and a Terratec dongle show a current draw of 450mA with the Model B+ and 600mA with the older Model B. If you do decide to mount the Pi outside, you will need a good weatherproof box with ventilation to prevent overheating in warmer weather.

NEXT TIME. Next time I'll be showing you how to use the Pi for datamodes and press it into service as a security camera or wildlife monitor. If you would like to use your Raspberry Pi with a pre-loaded and tested SD card, I have these available for sale via my website **[3]**. Each card is individually tested and supplied with full instructions.

WEBSEARCH

[1] Loading OS to memory card – http://goo.gl/hKmGhe
[2] SDR# download – http://sdrsharp.com/#download
[3] My website – www.g4wnc.com

TABLE 1: Pidora commands to install the rtl-sdr server software.

```
sudo yum -y install cmake
sudo yum -y install libusb-devel
sudo yum -y install git
git clone git://git.osmocom.org/rtl-sdr.git
cd rtl-sdr
mkdir build
cd build
cmake ../ -DINSTALL_UDEV_RULES=ON
make
sudo make install
```

TABLE 2: Content of the 'headless' file without a static IP address.

```
RESIZE
SWAP=512
```

TABLE 3: Content of the 'headless' file with a static IP address. NB: change the IP address and Gateway to match your system.

```
IPADDR=192.168.1.171
NETMASK=255.255.255.0
GATEWAY=192.168.1.1
RESIZE
SWAP=512
```

The UK's Biggest Ham Radio Dealer is on the move!

Due to massive expansion our Chertsey Store is moving lock stock & barrel to Staines. From Friday the 23rd of January come and visit our new Super Store at Wessex House, Drake Avenue, Staines, Middlesex TW18 2AP.

ML&S martin lynch & sons
The World's Favourite Ham Store

CONTACT US
Martin Lynch & Sons Ltd.
Outline House, 73 Guildford St,
Chertsey, Surrey KT16 9AS
Web: **www.hamradio.co.uk**
E-mail: **sales@hamradio.co.uk**

OPENING HOURS
Mon - Fri: 9.00am to 5.30pm
Sat: 9.30am to 4.30pm
Tel: 0345 2300 599
Int'. No: +44 345 2300 599

FRIENDLY HELPFUL ADVICE
We pride ourselves on our customer service. We believe that it has been instrumental in making us the number one choice for thousands of loyal customers.

SAFE ONLINE SHOPPING
Shopping online with ML&S is safe and secure. E&OE
PayPal
FOLLOW US ON TWITTER AND FACEBOOK **HamRadioUK**

YAESU
UK's Largest Dealer Distributor

Yaesu FTM-400DE

Large Colour Touch Screen Display.

The all new FTM-400DE offers 4 modes of transmission including Voice & Data at the same time, Voice FR Mode, Data FR mode & Analogue FM. Massive 3.5" colour display, Dual receive and more.

See www.hamradio.co.uk/ftm400

ONLY £529.95

Yaesu FT-1D

Very first Dual Band Full Digital Handie using C4FM & FDMA Digital technology.

ONLY £299.95

Yaesu DR-1XE

The most advanced mixed-mode repeater available today.

Cash Back Offer Now Extended! See Web for details.

ONLY £1279.99

Yaesu FT-450D

Only £619.95

The baby of the range but not in performance or functionality. Full feature HF-6M base transceiver with large easy to read display.

Yaesu FTdx3000

Only £1995.95

Big brother of the FTdx1200 boasting additional readout, down-conversion architecture receiver like its bigger brother FTdx5000.

Yaesu FTdx5000 Ltd

200 Watt Base transceiver with Pan-adapter display & balanced speaker system, internal PSU & ATU. MP Spec includes OXCO Hi-Stab Oscillator & additional roofing filter.

Only £3999.95
Or without SM-5000 Pan-adapter. £3799.95

Yaesu FTdx1200

The Yaesu FTdx1200 provides sophisticated operation on 160 to 6 meters with up to 100 Watts on SSB, CW, and FM (25 Watts AM carrier).

Only £1279.95
See ML&S video review hamradio.co.uk/ftdx1200video

Yaesu FT-817ND

The Worlds Only All Band Portable!

Only £499.95

Yaesu FT-857D

Includes YSK-857 Remote Head Kit

Only £689.99

Yaesu FTdx9000 series

ML&S Price: Call for details

Yaesu FT-897D

The UK Military really do use this radio, 160m-70cm, compact & rugged.

Only £699.95

Yaesu FT-857D & Atas-120A

160m-70cm HF Base/Mobile. Still our best selling HF Mobile Radio.

FT-857D + ATAS-120A: £979.95
FT-857D HF-70cm Mobile Only: £689.99

Free YSK-857 worth £50!

Autumn & Winter HF Sales Promotion – From Yaesu Musen!

Yaesu FT-1900
Rugged 50W 2m FM **£129.95**

Yaesu FT-2900
2m 75W, MiL spec, high performance **£149.95**

Yaesu FT-8900E
High-power FM on 10m, 6m, 2m & 70cm. When your local repeater is busy, slip onto 10m & work DX!
ML&S Price £329.95
With FREE YSK-8900 Remote Kit

NEW Yaesu FT-252 2M Handie
A compact, simple to operate 2M Handheld Transceiver that provides up to 5 Watts of RF power, along with loud audio output (800 mW)
ONLY £69.95

Yaesu VX-3E Micro Handie 2/70 with scanner **£129.99**

Yaesu FT-60R Twin band handie **£119.95**

Yaesu VX-6E 2/70 handie **£179.99**

Yaesu VX-8DE Triple Band 6/2/70 with enhanced APRS. **£379.95**

Yaesu VR-120D 100kHz - 1300MHz FM/WFM/A **£139.95**

Yaesu VR-160 Miniature communications receiver **£199.95**

QUADRA (VL-1000)
1kW HF/6m Solid State Fully Automatic
1kW HF/6m Linear Amplifier with matching power supply and internal Auto-ATU. **Last one available, call for a superb deal.**

MD-100a8x Base Station Microphone **£139.95**

MD-200a8x Elite Deluxe base Station Microphone **£229.95**

Yaesu Rotators

Largest stocks in the UK and, of course, the best prices. Cable extra.

G-450	£339.95
G-550	£329.95
G-5500	£629.95
G-650C	£379.95
G-1000DXC	£499.95
G-2800DXC	£949.95
GS-065 Mast bearing	£57.14
GC-038 Lower clamps	£34.95
Rotator cable 25m	£69.95
Rotator cable 40m	£123.95
Rotator connector plugs	£25.95

CG SB-2000 Mk11 Radio Interface

New from CG, the SB-2000Mk11 is an updated version of the original. The unit now supports 2 serial ports allowing you to have one reserved for CAT/CI-V rig control, the other for data operation. It also supports faster speed rate for CAT & CI-V, up to 19200bps.

Only £89.99

Connect your computer with USB port.
- USB to UART bridge by FT232 single chip. USB 2.0 compliant. Full speed.
- CAT, CI/V controller and audio transformer are combined together.
- Complete isolation between computer and radio station.
- Optical isolation used for digital signal.
- Audio signal isolated 1:1 transformer. It has internal static isolation.
- Powered via your USB port.
- Excellent EMC(Electromagnetic compatibility)
- Dimensions 135 x 76 x 48mm.
- Weight less than 400 grams.

Complete set of interface cables for your radio £19.95.
For more info see: www.hamradio.co.uk/cg2000

The New Yaesu FT-991

HF-70cm with ATU Built-In.

NEW PRODUCT

Order NOW for delivery in March 2015.

3.5" TFT Colour Display The FT-991 could not provide functions easier than at your fingertips with a 3.5" Full Colour TFT Display for Superior Operability and Visibility.
100 Watts of Solid Performance The RF Amplifier in the FT-991 provides a clean and solid 100 Watts of Operating Power (50 Watts VHF/UHF) and is combined with a large heat-sink and forced air automatic cooling fan to increase operating time and prevent overheating.
Compact, Lightweight & Portable The FT-991 Comes in a compact, lightweight package suitable for portable, mobile and base installations. Measuring 8.8"(W) x 3" (H) x 9.9" (L) at just 9.7 pounds this robust full featured mobile/portable radio is ready to go when and where you are!
Internal Automatic Antenna Tuner Internal High Speed Automatic Antenna Tuner included in the package. The antenna tuner uses a LC switching network that has a large capacity 100 channel memory. The tuning data is automatically memorized to reduce tuning time when changing frequency.
High Accuracy TCXO +/-0.5PPM High Resolution DDS/PLL local Oscillator included as part of the standard package.
USB Capable The FT-991 can be connected to a computer using a USB cable for CAT control and firmware updates, or the use of an optional SCU-17 Interface Unit to support USB Audio In/Out, TX Control (PTT, Key, Shift).

RRP confirmed at £1449.95 but ML&S are offering pre-orders at £1299.95 including Free UK carriage.

PLEASE NOTE: If you see it advertised cheaper elsewhere, ML&S will not only match the price, (including customers who have already placed a deposit), WE WILL BEAT THE PRICE - GUARANTEED*
*See web for conditions

To place a deposit on this exciting new model from Yaesu Musen please see www.hamradio.co.uk/FT991

MyDEL Lexixen VV-898

FREE SOFTWARE & LEAD

Simple to use, no frills full 2m and 70cm DUAL BAND Mobile. Nice clear & bright LCD display, fantastic crisp clear audio, supplied mobile bracket, microphone, DC lead and Handbook. Also included, programming Windows 7 software & cable for easy PC set-up of channels, CTCSS, offset etc. plus all simplex channels. 200 memories as standard and a healthy 4W or 10W output on both bands.

The lowest priced DUAL BAND mobile in the UK!

All this for a frankly ridiculous £99.95. Why not buy two?

New BabyStar D-Star Node

UHF, 10mW standalone D-Star Hotspot offering the D-Star Network without the need to run a PC.
RRP £299.95 **Special Intro price: £239.95**

Tigertronics SL-USB From only £99.95

ALL sound card Digital and voice modes are supported by the SignaLink™ USB. This includes traditional modes such as RTTY, SSTV and CW (to name a few), as well as today's hottest new modes like PSK31, MT-63 and EchoLink.

Call to discuss your rig-to-cable requirements.

ML&S Mobile site now live! Just click www.hamradio.co.uk/mobile from any mobile phone/tablet.

MyDEL

New!
Alinco DM-330FX
Superb 30Amp PSU with twin 5V 2Amp outputs, Twin 5Amp 13.8V, 10Amp Cigar (for Handies). Variable Voltage & Noise Offset control. V&A Metering. **Only £119.95**

MyDEL MP-30SW1V

It's Back!
You kept asking for it so we asked the factory to build us another run. 25Amps, 9-15V DC, super light with digital metering for Volts & Amps.
Ideal for powering any main rig or accessory requiring 13.8 Volts at up to 120 Amps.
£89.95

MyDEL MP-50SW111

50 Amp DC power supply. **£125.00**
Probably one of the lightest 50Amp DC power supplies available today, the new MP-50SW111 weighs in at only 2.2Kilos (4.85lbs). Unbelievably compact measuring a mere 195mm wide including chunky rear terminals and front panel knobs and only 85mm wide.

Two-year warranty on all MyDEL PSUs

MyDEL MP-304Mk11
New addition to the MyDEL range of PSU's. Heavy Duty LINEAR 30Amp
For those of you that prefer old style non-switching technology in your power supply we think this new 30 Amper from MyDEL is the one. Switchable Volts/Amps with large precise metering (analogue of course!) variable Voltage, Cigar socket output for all your accessories, twin front panel outlets for up to 6Amps and two large binding post terminals for up to 30Amps. Remember, all MyDEL PSU's come with a two year no quibble guarantee. **£99.95**

Diamond GSV-3000

* Output voltage 1 - 15V DC & 13.8V Fixed * Output current 25A continuous (CE protocol)
* Built-in cooling fan
* Supply 230V AC 50Hz
* Size 250 x 150 x 240mm
* Weight 9.5kg
RRP £209.95
ML&S £159.95

MyDEL

NEW MP-7L
Small & compact, this new Linear 6-7Amp PSU is ideal for running ancillary items in the shack.
ML&S Price: £29.95

New product! MyDEL SW-2PL
Made from solid die-cast alloy, 2kW DC-30MHz, 250W .5-1GHz and SO-239 sockets. **Only £29.95**

Nifty KX3 Stand
Made of heavy duty black acrylic with a beautiful high gloss finish especially designed to fit the Elecraft KX3.
Only £29.95

NEW! ELAD FDM-Duo
Multi-Use 5W SDR Transceiver

NEW PRODUCT

Crafted out of beautiful aluminium, if Ferrari were to ever build a radio, this would be it. Designed using the very latest SDR technology, 10kHz-54MHz, Direct Conversion RX operating at 122.88MHz. The small transceiver employs a fast analog-digital-converter that samples the received HF directly into digital signals and a downstream DSP module provides for filtering and processing. Another ARM processor handles the signals of the control unit. All Mode, in stock·

ML&S Only £899.95

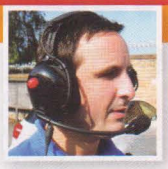
For more info see:
www.HamRadio.co.uk/fdmduo

NEW PRODUCT

dji THE FUTURE OF POSSIBLE

DJI Phantom Vision Plus ARF Kit QUADCOPTOR
DJI Phantom Vision Plus is the latest ready to fly Quadcopter with 14mp Camera with 1080p Video and 3 axis stabilised Gimbal. Ready to fly straight out of the box.
FREE SECOND BATTERY PACK!
For more info see: hamradio.co.uk/DJI

RADIOSPORT HEADSETS



Whether for DXing, contesting, field day, or casual everyday use we think you'll agree Radiosport headsets have the features you want. ML&S are proud to have been appointed their distributor and have stock today.
All headsets are supplied with GEL Cushions giving extra comfort and FREE cloth covers.

RS60CF Deluxe Dream Edition Stereo Headset with boom (as featured)	£179.95
RS20S Deluxe Dream Edition Stereo Headset only no boom	£119.95
Mini-XLR lead set for any radio (Yaesu/Kenwood/Icom/Flex/Elecraft)	£59.95
PTT-FS-RCA Foot switch with 7ft cable with phono plug	£44.95
PPT-HS-RCA Hand PTT Switch, 7 foot cable with phono plug	£44.95

How about an additional 3.5mm socket on the opposite ear cup to allow "tethering" of another headset for a logger or maybe just an additional pair of ears?

Looking for a hands free mic for you car that actually works?
The MS-5. A safety microphone for mobile or base use that really is "plug & play".
Available for most Icom, Kenwood & Yaesu Radios. **Only £39.95**

New DSO-Quad pocket Oscilloscope
Tiny pocket size 4 channel digital oscilloscope for common engineering tasks. Built-in signal generator, internal Lipo battery. **£149.95**

Kent Morse Keys

Kent Morse Practice Oscillator	£31.95	Kent Single Paddle Key	£95.95
Kent Twin Paddle Key	£114.95	Kent Single Paddle Key Kit	£94.95
Kent Twin Paddle Key Kit	£98.95	Kent KT-1 Professional	£109.95
Kent Hand Key	£99.95	Kent Vail Lever Correspondent Replica	£219.95
Kent Hand Key Kit	£86.95		

Alpin HF Linear Amplifiers

Very special prices for two very special amplifiers

Offering extraordinary value for money, Alpin offer superbly engineered HF & 6m Linear amplifiers with excellent reliability. To date we haven't had one back for repair!

BOTH IN STOCK

Alpin 100Mk11
HF+6m Linear Amplifier 1kW+ PEP output.
RRP £2299.95
ML&S Price Only £2279.95

Alpin 200
HF Linear Amplifier 2kW PEP Output from 2 x 4CX800A's.
RRP £3499.95
ML&S Price Only £3195.95

Ameritron Amplifiers

Only available from ML&S, each and every AL-811HXCE is modified and checked in our workshops to improve reliability & performance. A very cost effective way of getting up to 800W PEP from a neat compact mains powered HF Linear Amplifier.
Ameritron AL-811HXCE+ ML&S Price: £1099.95
See web for full range and specifications.

MyDEL **Antenna Tuner**

New! CG-3000R
The best value remote wire antenna tuner now with remote control included.
Save £30! Only £259.95 until end 2014.

Looking for Something to sell? Use our LynchLine.com It's FREE to buy & sell!
Looking for the best USED EQUIPMENT? See www.HamRadio.co.uk/used

The UK's Biggest Ham Radio Dealer is on the move!

Due to massive expansion our Chertsey Store is moving lock stock & barrel to Staines. From Friday the 23rd of January come and visit our new Super Store at Wessex House, Drake Avenue, Staines, Middlesex TW18 2AP.

ML&S martin lynch & sons
The World's Favourite Ham Store

CONTACT US
Martin Lynch & Sons Ltd.
Outline House, 73 Guildford St,
Chertsey, Surrey KT16 9AS
Web: **www.hamradio.co.uk**
E-mail: **sales@hamradio.co.uk**

OPENING HOURS
Mon - Fri: 9.00am to 5.30pm
Sat: 9.30am to 4.30pm
Tel: 0345 2300 599
Int'. No: +44 345 2300 599

FRIENDLY HELPFUL ADVICE
We pride ourselves on our customer service. We believe that it has been instrumental in making us the number one choice for thousands of loyal customers.

SAFE ONLINE SHOPPING
Shopping online with ML&S is safe and secure. E&OE
PayPal
FOLLOW US ON TWITTER AND FACEBOOK HamRadioUK

WonderWand Wonderloop Antennas

For full info & video see: www.hamradio.co.uk/wonderloop

WonderWand Antennas U.K.

The UK's favourite rig-mounted antenna system!

NEW! WonderWand Widebander
1.8-460MHz with 1.3M Whip!.....£129.95

Wonder-TCP
40-10m Tuneable Counterpoise.....£59.95
or buy both together for only £169.95!

New! WonderLoop 4010. 40m -10m

If you are an avid FT-817 or KX-3 operator and enjoy nothing more than heading for the hills on a weekend to active those rare WAB squares. Take a look at the all new WonderWand WonderLoop Antenna.

Incorporating their easy to use tuning circuit, which offers frequency coverage from 40m-10m and handling 10W of RF power, you can be on the air in seconds. The tuning unit is enclosed within a lightweight ABS case, no larger than a pack of cards. This means you will no longer need to carry around all those additional extras needed to string up a wire in the field. There is also no need to worry about running a counterpoise with this efficient loop design.

So how does it perform? As we had sunshine this afternoon, we popped out into the car park here at ML&S and attached the loop to our demo FT-817. Within minutes we had tuned to the 20m band worked into EA, I and 9A. Not bad for 5W and the 'shack' in our hand.

ML&S PRICE ONLY £99.95

HighEndFed Antennas

HEF/3Band	40/20/10m 200W, 11.85m Long	£134.95
HEF/5Band	80/40/20/15/10m 200W, 23m Long	£149.95
HEF/40m-QRO	40m Mono Bander, 2kW Only 20m Long	£219.95
HEF/20m-QRO	20m Mono Bander, 2kW, Only 10m Long	£199.95

For the full range see www.hamradio.co.uk/hyendfed

A professional range of End Fed Wire antennas from the Netherlands. Each antenna is hand made, individually tested for resonance and SWR. All you have to do is take it out of the box and string the antenna up in the air, add a coax feed back to you radio.

Hustler

Hustler are one of America's oldest manufacturers of Ham Radio antennas. The famous "White Whips" have been seen on many cars operating HF mobile. Their HF base range of 4, 5 or 6-BTV antennas are probably the easiest to assemble and get going and of course are ground mounted, operating with just an earth spike mounted close to the base.

See web for full listing!

Base Station Range
Free standing, max 7.3m tall, 1kW

4-BTV	40/20/15/10m	£189.95
5-BTV	80/40/20/15/10m	£229.95
6-BTV	80/40/30/20/15/10m	£269.95

The full mobile and base range and accessories available from stock, including the high power 1kW mobile range.

MFJ Products

Lots more MFJ stocked!

MFJ-974HB	Manual ATU for balanced line antennas, 160-10m	£199.96
MFJ-974	as above but without 160m	Special! £179.95
MFJ-16010	Random Wire ATU 160-10M	£71.95
MFJ-949E	Manual ATU metered, Dummy Load, 1.8-30MHz, 300W	£199.95
MFJ-901B	Manual Mini ATU 1.8-30MHz, 200W	£108.95
MFJ-971	Manual ATU metered, 1.8-30MHz, 200W	£119.95
MFJ-904H	Manual ATU, metered, inc balanced, 1.8-30MHz 150W	£139.94
MFJ-969	Manual Roller ATU Metered 1.8-54MHz, 300W	£199.94
MFJ-993B	Auto ATU Metered 1.8-30MHz, 300W	£259.95
MFJ-1786X	Magnetic Loop 10-30MHz, 150W **re-built & re-aligned by ML&S**	£479.95
MFJ-1788X	Magnetic Loop 7-22MHz, 150W **re-built & re-aligned by ML&S**	£529.95
MFJ-259C	**NEW Antenna Analyser 530kHz-230MHz**	£289.95
MFJ-266	V/U Portable Antenna Analyser 1.5-185MHz + 300-490MHz	Free UK carriage £339.95
NEW MFJ-269C	530KHz-230MHz, 415-470MHz Analyser	£389.95
MFJ-260C	Dummy Load 300W SO-239	£45.95

RF Explorer 3G Combo

Hand Held Spectrum Analyser 15MHz-2.7GHz

Up until now the RF enthusiast have had to limit themselves to cheap "RF Power Detector / Frequency counter" devices. But these are limited to display data for a single point of maximum power, and traditionally power metrics are too unreliable, in the order of 20dB or even 30dB inaccuracy.

In contrast, a spectrum analyser like RF Explorer will display full frequency spectrum in the band, including carrier and modulated shape, it will display Spread Spectrum activity, if that exists, and will show bandwidth to monitor collisions, frequency deviation from expected tone, etc.

ONLY £199.95

MyDEL-SARK110 Vector Impedance Antenna

The SARK-110 Antenna Analyser is a pocket size instrument providing fast and accurate measurement of the vector impedance, VSWR, vector reflection coefficient, return loss, and R-L-C (as series or parallel equivalent circuits). Typical applications include checking and tuning antennas, impedance matching, component test, cable fault location, measuring coaxial cable losses, and cutting coaxial cables to precise electrical lengths. The SARK-110 has full vector measurement capability and accurately resolves the resistive, capacitive and inductive components of a load. The measurement reference plane is automatic adjusted via the Open/Short/Load calibration standard to enable the accurate impedance measurements at the end of an intermediate coaxial cable.

£329.94

New!! Super Antenna MP1DLX Package

A complete portable antenna packaged based around the world's best selling SuperStick

MP1DLX Package includes:

- MP1B antenna (SuperSlider Coil, telescoping whip, 2 extension rods and nut)
- MR1C Counterpoise
- TM2 SuperPod Tripod
- UM2 SuperMount
- GB1 Go Bag
- FG1 Frequency Guide
- MC80 80-meter coil

Super Antenna Features:

- Ham bands: 40m-30m-20m-17m-15m-12m-10m-6m-4m-2m-70cm
- Frequency Range: HF 7MHz~30MHz continuous
- Frequency Range: VHF 48 to 144MHz continuous
- SWR: 1.5 : 1 or better
- Rated Power: 500W SSB; 300W CW / DIGITAL
- Antenna Weight: < 2 pounds (1kg)
- Also configurable for up to 450MHz
- Standard 3/8"-24 male thread for mounting
- TM2 SuperPod tripod included with carry bag
- MC80 80m coil included for 80m band
- Optional MR series radial sets available
- Optional MC60 60m coil for 60m band

All for only £249.95.
Shipping FREE for November (UK Mainland)

For the complete range of Super Antenna products see www.HamRadio.co.uk/Superantenna

mRS MiniVNA Antenna Analysers

Perfect for checking antennas and RF circuits for hams and commercial users.

NEW MODEL! MiniVNA Tiny
Huge coverage, 1MHz-3GHz, Android controllable. ONLY **£349.95**

MiniVNA Pro with Bluetooth
100kHz-200MHz
£379.94

MiniVNA Extender
For Pro only, extends range to 1500MHz **£299.94**

DIAMOND

Huge selection of Diamond products always available

Base Antennas

NEW!	CP-VU8 80m-70cm 200W Compact HF Base, only 2.7m Long!	£469.95
X-30	2/70, 3/5.5dB, 1.3m Long ..	RRP £79.95 **SPECIAL £54.95**
X-50N	2/70, 4.5/7.2dB, 1.7m Long	RRP £72.95 **SPECIAL £64.95**
X-300N	2/70, 6.5/9dB, 3.1m Long	RRP £146.95 **SPECIAL £99.95**
VX-1000	6/2/70 2.15/6.2/8.4DB 1.42M Long	RRP £149.95 **SPECIAL £99.95**
X-510N	2/70 Fibre glass 8.3/11.7dB gain. 5.2m long "N"	RRP £154.95 **SPECIAL £129.95**
V-2000	6/2/70, 2.15/6.2/8.4dB, 2.5m Long	RRP £149.95 **SPECIAL £99.95**

Mobile Antennas

NR-770R 100W, 2/70, 3/5.5dB, .98m Long	RRP £34.95
NR-770RSP as NR-770 but spring loaded	RRP £39.95
NR-7900 2/70, 3.2/6.4dB, 1.46m Long	RRP £54.95

Duplexers/Triplexers

MX-72N 1.6-150/400-460MHz Duplexer	RRP £44.95
MX-62M1.6-56/140-470MHz Duplexer	RRP £69.95
MX-610 HF/6+2+70 (for FT-8900)	RRP £59.95
MX-2000 6/2/70 Triplexer	RRP £91.95
MX-3000N 2/70/23 Triplexer	RRP £86.95

Switches

CX-210A 2-way, SO-239 Die Cast	RRP £53.95
CX-210N 2-way, N-Type, Die Cast	RRP £82.95
CX-310A 3-way, SO-239, Die Cast	RRP £89.95
CX-310N 3-way, N-Type, Die Cast	RRP £114.95

DXE-UT-8213 Coax Cable Stripper
ONLY £47.99!

This tool prepares RG-8, RG-213, 9913F7, LMR-400 (not LMR-400UF) and other similar size coax cable for installation of a PL-259 connector - or DXE-N1001S two-piece Type N connector (requires a slight additional trimming of the cable center conductor length).

LDG Auto Tuner Range

Factory appointed distributor with the largest stock of LDG outside the US.

DM-990	Large Twin Meter for Kenwood TS-990S	In stock only £159.95
RT-100	100W Weather proof remote Auto ATU	£189.95
RC-100	Remote control for RC-100, + DC power over coax	£46.95
AT-1000pro11	1kw Flagship Auto ATU. Separate external head-up large format meter	£494.95
M-1000	Large Analogue meter for the new AT-1000Pro11	£124.95
M-600	Optional 4.5" meter for the AT-600Pro11	£104.95
YT-1200	(formally AT-450) for ALL Yaesu HF Transceivers	£209.99
YT-847	Want a really good Auto ATU for your FT-847? Here it is!	£234.95
AT-600pro11	NEW MODEL 600W pep, Optional external 4.5" Meter	£304.95
AT-200pro11	Designed for new generation of rigs	£219.95
AT-897Plus	Bolt-on Alternative Auto Tuner for the FT-897	£179.95
IT-100	New version of the AT-7000	£167.95
YT-100	NEW AUTO ATU for FT-897/857 or FT-100 with additional Cat Port Control	£186.95
Z-817	Ultimate autotuner for QRP radios, including the Yaesu FT-817D	£124.95
Z-100Plus	Ultimate autotuner for Yaesu FT-817D	£141.95
Z-11ProII	Portable compact & tunes 100mW to 125W	£167.95
RCA-14	4-way DC Breakout Box	£52.12
KT-100	Dedicated tuner for Kenwood radios	£182.95
RBA-1:1	Probably the best 1:1balun out there	£37.95
RBA 4:1	Probably the best 4:1 balun out there	£37.95
FT-Meter	Neat Analogue back-lit Meter for FT-897/857. S-meter, TX Pwr, ALC Etc	£46.95
FTL- Meter	Jumbo version of the famous FT-Meter	£79.95

DM-990

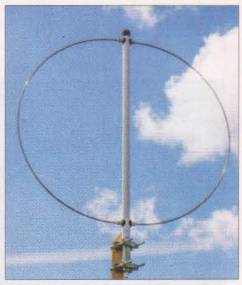
RT-100

AT-1000pro

AT-6000pro

LRX-30 Active Magnetic Loop

The LRX-30 is a High-End Active magnetic loop antenna for receiving signals in the medium & shortwave bands from 150kHz-30MHz. Fully weather proofed, only 1100mm in diameter. Can be used inside or out. Commercial grade.



Only £339.95

BlueCAT Repeater Controller

Using your Android phone you can instantly touch a repeater and see your rig jump to the frequency, CTCSS & offset. Designed & built in the UK by ZBM2, exclusive to ML&S and appointed dealers.

Now available for Yaesu & Icom Transceivers,
see www.hamradio.co.uk/BlueCAT

FlexRadio Systems® Software Defined Radios — The Flex Store at ML&S

FACTORY APPOINTED DEALER

New! Flex 6300

1.8-60MHz, 2 Slice RX 100W SDR TCVR.

RRP £1999.95 **ML&S Price: £1749.95**

ON DEMO & IN STOCK NOW!

As the largest UK dealer of Flex SDR Products, ML&S always not only carry stocks of each model but have demo available.

Flex-6700 Signature now on demonstration in store!

Flex-6300	1.8-60MHz, 2 Slice RX 100W SDR TCVR	£1749.95
Flex-6500	1.8-60MHz, 4 Slice RX SDR 100W Transceiver	£3349.95
Flex-6700	1.8-60MHz, (+RX 135-165MHz) 8 Slice RX SDR 100W Transceiver RRP £5799.95	**Only £4999.95**
Flex-6700R	as above, Receiver only	£4799.95
Flex 1500 SDR	Low cost SDR Transceiver, connect via USB & you have 5W 160-6m	£599.95

We always have the entire FlexRadio range on demonstration via three 42" screens. Call in for a demo today.

Palstar

BT-1500A

HF-Auto	1.5kW PEP fully automatic ATU for QRO	£CALL
AT-500	600W PEP Antenna Tuner	£409.95
AT-2K	2000W PEP Antenna Tuner	£499.95
AT-2KD	Differential 2kW PEP Antenna Tuner	£479.95
AT-4K	2.5kW PEP Antenna Tuner	£789.95
AT-5K	3.5kW PEP Antenna Tuner	£999.95
BT-1500A	Balanced Antenna Tuner	£639.95
PM-2000AM	Power/SWR Meter	£159.95

Palstar Dummy Loads

DL-1500 (1.5KW) **£189.95**
DL-2K (2kW) **£339.95**
DL-5K (5kW) **£429.95**

HF-Auto

New! SP-30H Communications Speaker..... £189.95

Messi & Paoloni Low Loss Professional Coaxial Cable

Messi & Paoloni is an Italian manufacturer, who is relatively unknown in the UK, but will celebrate its 70th anniversary in 2016, and has been producing high-quality coaxial cables for years and years.

M&P ULTRAFLEX 7

7.3 LowLoss cable, 50 Ohm, double shielded

ULTRAFLEX 7 is designed similar to the AIRBORNE 5, but has a plastic-coated copper foil and stranded inner conductors. It is a standard cable for higher performance and with lower attenuation at 6.9dB for 100 metres at 144MHz. The jacket is made of PVC with UV protecting coating. Capacity: 3,7kW at 3.5MHz and 0.9kW at 144MHz. Our connectors for Aircell 7® fit as well.

M&P ULTRAFLEX 10

10.3mm LowLoss cable, 50 Ohm, "alternative for RG-213"

Standard cable with outer diameter similar to RG-213, but about half attenuation. Notice: with a cable length of 40m you get out 3dB more than with RG-213 at 70cm band, so twice the power. This cable is suited for high performance and for use up to GHz range. Design is similar to AC7 Plus: stranded inner conductors made of soft annealed pure copper, triple layered air-foamed dielectric, plastic-coated copper foil, copper braid made of 144 wires in 24 spools, outer jacket PVC. Capacity: 7.6kW at 1.8MHz and 2.7kW at 144MHz, with the buffer mentioned above. 4.74dB attenuation for 100 metres at 144MHz. Our connectors for Ecoflex 10® fit as well.

M&P BroadPro50 double jacket

12.4mm LowLoss cable, 50 Ohm, double jacket

Here's a different approach. This cable has a solid inner conductor with 2,7mm diameter, but this isn't the main advantage. The trick here is the outer jacket. It is double layered: the outer layer is made of PVC. The inner layer consist of red polyethylene. Though, watertight and red. It is red so that you can see damage after 'misuse' at first glance. If only the outer layer is damaged: self-amalgamating duct tape or heat shrink sleeve with glue on the inside applied at the breach, repair done! And if the inner layer is damaged too? Well, additionally copper braid and copper foil are waxed with paraffin-like grease, which also improves the cable's flexibility, too.

This cable was designed at the request of a DXpeditions team, who damaged their cables multiple times by accident when dragging it over sharp rock edges. Maybe you don't plan to do a DXpedition, but you could still need it, maybe for field day? With its solid inner conductor and double jacket the cable is very robust. Or you need a cable which can be buried in the ground or laid in water permanently. Our connectors for Ecoflex 10® fit as well.

For more details (and factory video) including their excellent range of connectors search our website under "ultraflex"

February 2015 • RadCom
Peter Dodd, G3LDO • e-mail: g3ldo@o2.co.uk

Antennas

Steel pipe antenna masts

PHOTO 1: Fold-over pipe mast in current use. An additional counterweight is used to ease the raising and lowering of the antenna.

FOLD OVER MAST DESIGN. Several old copies of *Ham Radio* magazine [1] turned up during a reorganisation of my shack and office library recently. The September 1974 edition contained an interesting article by W3MR on design data for pipe masts [2]. He noted: "One of the best materials available for building self-supporting antenna masts is steel pipe. It is widely available, uniform in quality and reasonable in price. A well designed mast is adequately strong, neat and attractive, and relatively lightweight. And, using steel pipe, it is not too difficult to design a fold-over mast which allows all antenna work to be done at ground level. Even maintenance on the mast itself does not require work at any great height. However, attaining all of these advantages does require some design work. This is particularly important for safety".

W3MR noted that the purpose of his article was to present a set of design curves that give a safe and satisfactory design while using the minimum of material. It contains lots of graphs regarding weights of standard pipes and wind loading for different pipe sizes etc.

From experience I have found that steel pipes that fit into each other make a very strong structure. The mast at my location has been up for nearly thirty years and survived the hurricane of 1987 without damage.

THE KOOHM ANTENNA MAST. As far as I was concerned W3MR was preaching to the converted. I have used pipe fold-over masts for the last 50 years; a mast that can be easily and quickly folded over is a boon for antenna experimental work. The original inspiration for my fold-over masts was an article by Alfred W Hubbard, KOOHM [2] way back in March 1963. It was designed to support a three-element tri-band beam and rotator at a height of 18 metres (60ft). All the sections of steel tubing of the mast were welded together and were partially counterweighted by filling the lower half of the tilt-over section with concrete! A winch was used to manage the remaining 160kg (350lbs) top load. The design is illustrated in **Figure 1**.

9L1HX MAST. I built several versions of this pipe mast over the years. The first of these designs was also 18 metres high and supported an all-metal 14MHz quad. This mast was built when I worked in Sierra Leone as a mining engineer and I had access to welding equipment and some assistance with the installation of the mast. The mast and payload was not fully counterweighted and had a top weight imbalance of around 45kg (100lb), controlled with a winch. This enabled the momentum of the structure to be more easily managed. The antenna was described in *Short Wave Magazine*, August 1966 [3] and the structure is illustrated in **Figure 2**. One departure from the KOOHM design was imposed by the fact I didn't have a rotator. The problem was overcome by using a home-made bearing fitted at the fold-over point to allow the whole mast to be physically rotated from ground level.

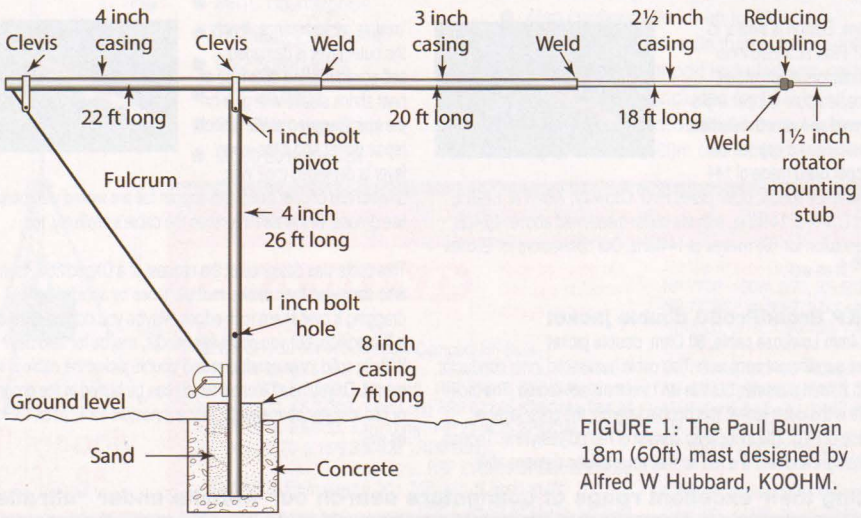


FIGURE 1: The Paul Bunyan 18m (60ft) mast designed by Alfred W Hubbard, KOOHM.

THE PRESENT G3LDO PIPE MAST. The following is a description of a 12 metre (40ft) version of the KOOHM mast that has been in use at this QTH for nearly 30 years, see **Photo 1**, which you may have seen in previous Antennas columns.

The fixed vertical section of the mast is made from 90mm (3½in) steel pipe with a 22mm hole drilled at the top end to take the pivotal bolt. The lower end is fitted into a casing that is fixed in the ground with a concrete foundation. The gap between the mast and the casing is filled with sand or pebbles. The internal casing diameter should be around 5cm (2in) greater in diameter than the vertical section of the mast.

The mast is rotatable and counterweighted with approximately 15kg (30lb) of top weight so a winch is not required. It takes about 15 seconds to raise the antenna mast into the vertical position. The mast is relatively lightweight; the top third of its length is 5cm (2in) diameter aluminium scaffolding tubing. The lower section was originally made from 75mm and 82mm steel tubing but more recently solid 72mm steel rod was used for the lower section of the tilt-over section to make a more weight balanced structure.

Sections of steel tubing that make up the mast are telescoped into each other for about 30cm (12in) and secured by bolts and nuts. This allows the mast to be assembled, modified or repositioned much more easily than if the sections were welded.

The tilt-over mast is fixed to the fulcrum using a 90mm (3½in) section of pipe, to which two short lengths of angle iron have been welded. 22mm holes are drilled at the ends of the angle iron sections enable fabrication of a fold-over section via the pivotal bolt. The original dimensions for this mast is shown in **Figure 3**.

You may have noticed that the bearing casing fold-over section, as shown in **Photo 2**, is longer than is necessary for a simple bearing. This arrangement reduces the degree of mast flexing when folded over. The whole mast can be rotated manually using a handle fixed to the bottom of the mast or rotated using a rotator mechanism.

Although these structures can be built single-handed the following are areas where some assistance would be beneficial:

- Inserting the lower half of the mast into the base casing. Two ropes are tied to the top of the lower section, using the holes drilled for the pivot bolt. The section can then be placed with the lower end over

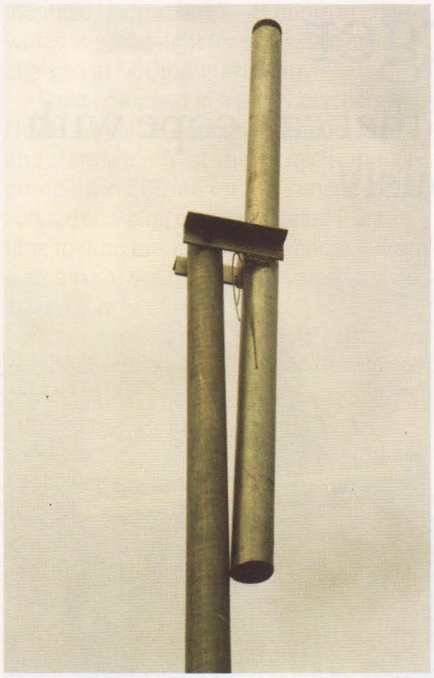


PHOTO 2: Fold-over/rotator mechanism comprising a 90mm (3½in) section of pipe on which two short lengths of angle iron have been welded to make the thrust bearing.

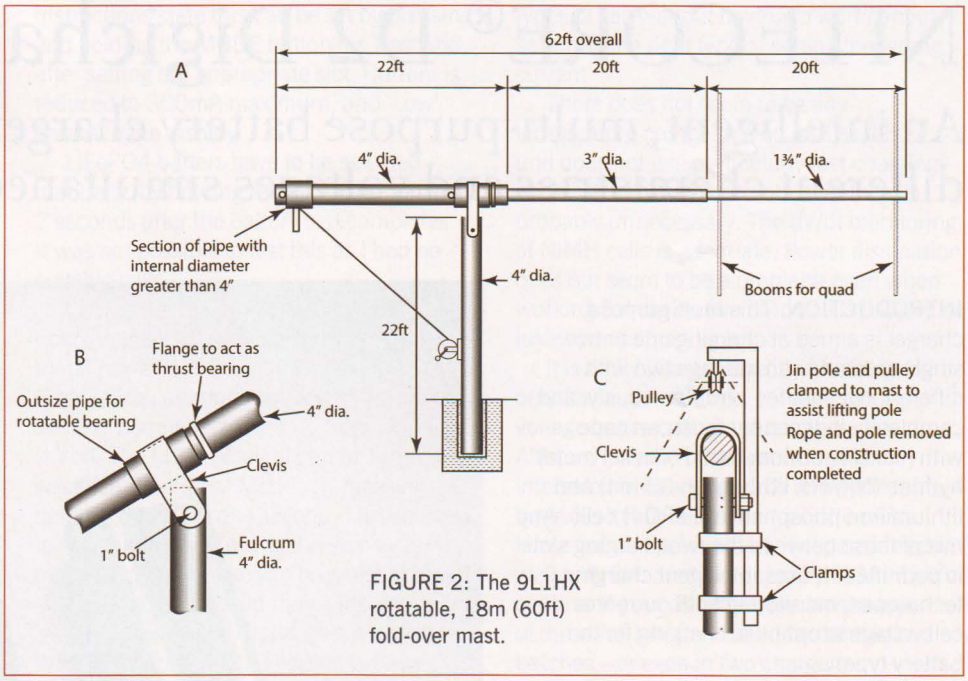


FIGURE 2: The 9L1HX rotatable, 18m (60ft) fold-over mast.

the base casing and the top supported on a stepladder. The section can be raised using these ropes, at the same time the lower end is guided into the casing with a section of angle iron.

- Raising the tiltable thrust bearing to the top of the fixed vertical section and the insertion of the pivotal bolt, see Figure 2B. These tasks can be eased by using a gin pole with a pulley and rope as shown in Figure 2C. The gin pole can be constructed from steel angle iron and clamped to the mast with additional angle iron pieces or steel straps and removed when the structure is complete.

MATERIAL FOR STEEL MASTS. Steel tubing is available from dealers on the internet. You can also find suitable material at local scrap metal yards. Tubing used for antenna masts should be free from damage and excessive corrosion. The lower sections of a 12m (40ft) high steel self-supporting mast should be at least 90mm (3½in) diameter, with a 5mm wall thickness.

Steel tubes should only be joined by employing lengths that telescope into each other, with at least 30cm (12 inches) of overlap and secured with a nut and bolt. Do not weld the sections together; a 12 metre long section of steel tubing is very heavy and difficult to manage. It is much easier to assemble a mast in sections.

Scrap steel tubing is often available, threaded, with screw couplers. These couplers are fine for the purpose for which the tubing was designed, typically piping liquid or gas. When tubing is used for an antenna support mast it is often under some bending stress. Couplers only have a short length of screw thread and will be a source of weakness when tubing is employed as an antenna mast, so do NOT be tempted into making a mast using these pipe and couplers.

Ensure the tubing lengths fit into each other. Some tubing is metric; other older material may be imperial. If necessary, this design could be carried higher, using larger pipe sizes.

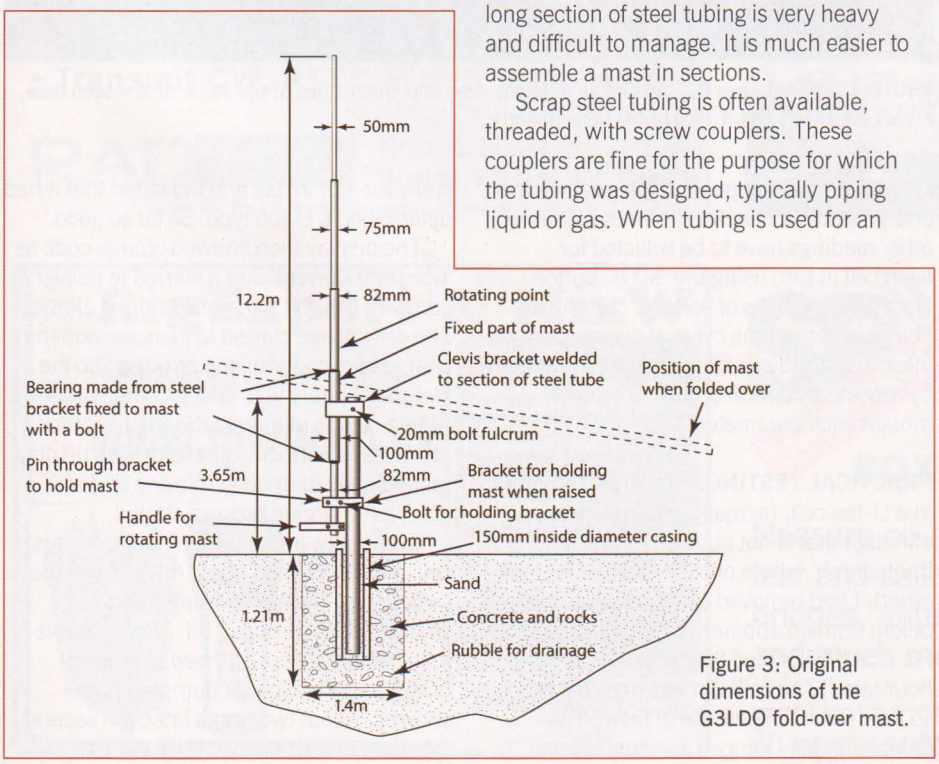


Figure 3: Original dimensions of the G3LDO fold-over mast.

FOUNDATIONS. For reasonably good soils, such as firm loams or clays, a good starting point is to assume that the foundation depth is equal to ten percent of the height, with the jacket set in concrete of sufficient size to keep the soil load to a safe value. Before the concrete and rubble is placed it is a good idea to lay a safety earth of copper wire or straps that are just clear of the foundation and that the ends protrude above ground. These can be then be strapped to the lower section of the mast when the concrete has set.

SAFETY. W3MR notes, "Any antenna mast can become a hazard if good safety practices are not followed. Remember that a quarter or half-ton of steel thirty- to seventy-feet (9 to 21m) in the air is no toy. If you lack experience or don't have the proper facilities, get qualified help. Always remember, safety is no accident."

REFERENCES

[1] *Ham Radio* was a monthly magazine published in the USA and was sold to *CQ* in June 1990.
[2] The Paul Buyan Whip, Alfred W Hubbard, KOOHM, *QST*, March 1963
[3] Fold-over Mast for Beam support, *Short Wave Magzaine*, August 1966

February 2015 • RadCom
Andy Talbot, G4JNT • e-mail: ac.talbot@btinternet.com

NITECORE® D2 Digicharger

An intelligent, multi-purpose battery charger that can cope with different chemistries and voltages simultaneously

INTRODUCTION. This multipurpose charger is aimed at charging one or two single cells and can manage two with different chemistries, simultaneously, and completely independently. It can cope with nickel cadmium (NiCd), nickel metal hydride (NiMH), lithium ion (Li-ion) and lithium iron phosphate (LiFePO4) cells. Any mix of these between the two charging slots is permitted. It uses intelligent charging techniques, monitoring both current and cell voltage to optimise charging for the battery type.

AS SUPPLIED. The charger consists of a single unit with two slots. In each of the side by side slots there is an adjustable spring-loaded slide that accommodates cells of between 30mm and 70mm long. This means it can take anything from AAA up to C-size cells, as well as longer, medium capacity, lithium ion types.

A liquid crystal display sits on the top of the unit. There are two buttons on the side to control various functions. The one labelled 'SLOT' selects which of the two slots the continuously cycling voltage, current and time readouts apply to. The other, 'MODE', selects measurement parameters and is used for special cases of charging selection.

The unit is supplied with a mains lead that connects to the charger via the standard two-pin figure-of-eight socket. A 12V (car battery) power source can also be used and this is delivered to the charger via a 2.1mm round power plug, centre positive; the lead for this is not supplied. A single A4 instruction sheet is clearly written and unambiguously explains all the operation and special settings needed

IN USE. The charger first has to be supplied with power, either mains or 12V. It first performs a quick self check. Then a cell to be charged is just dropped into a slot and held by the spring arm, see **Photo 1**. The charger looks at the voltage present, passes a small test current and, via further measurements, works out the battery type. It then starts to charge the cell according to the type it has determined it to be. A completely dead or reversed polarity battery shows an error indication. The charge type in use also appears on the display, ie Constant Current, Constant Voltage or -dV/dt.

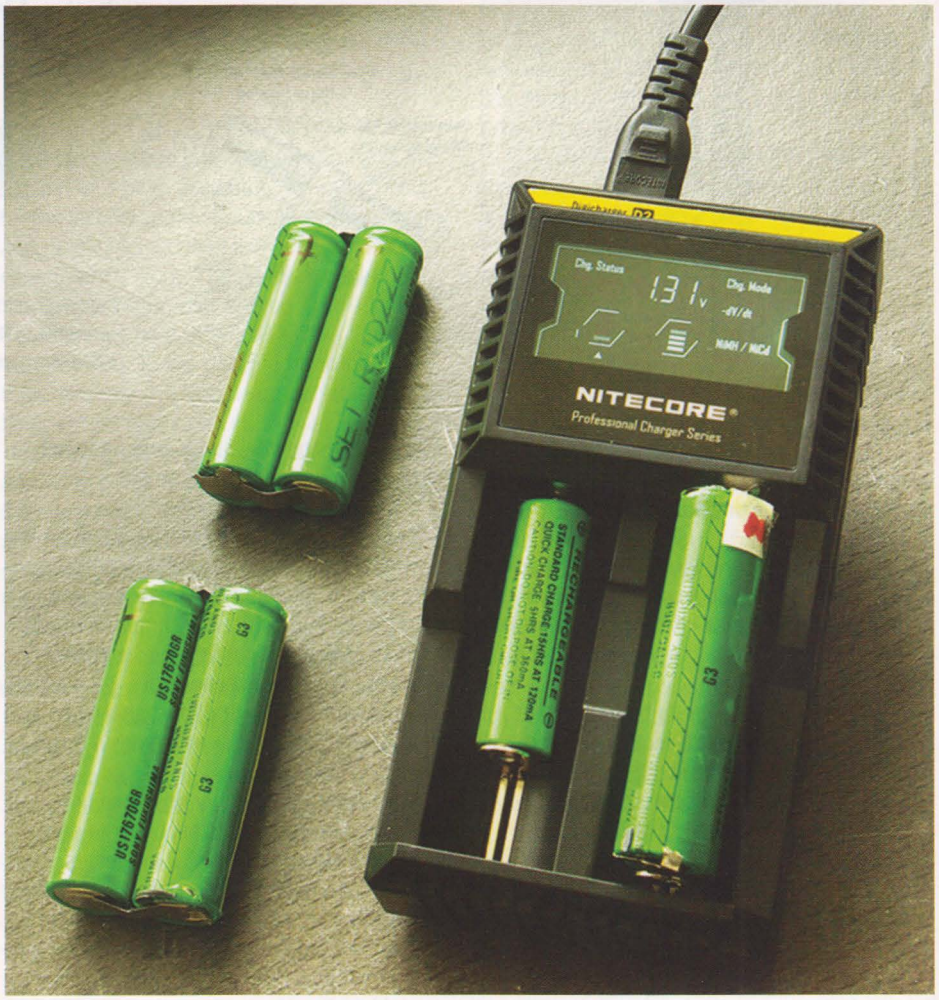


PHOTO 1: The Nitecore D2 can charge different sizes and chemistries at the same time – seen here, a 1.2V AA NiMH and 3.7V 18650 Li-ion battery.

Two moving bargraph displays show the charge status for each cell simultaneously; other readings have to be selected for each cell in turn using the 'SLOT' button. Normally, readings of voltage, current and charge elapsed time cycle at one second intervals; these can be speeded up manually by repeatedly pressing 'MODE' to cycle though each parameter.

PRACTICAL TESTING. First of all I dropped in a Li-Ion cell, (actually two in parallel, although that is not obvious from the photograph, where one is hidden under the other). I had removed these only the day before from an apparently defunct laptop PC. The label stated they were 3.3 amp-hour rated. The cell(s) measured 3.5V each, so they still had some life in them. The charger display jumped automatically to show the slot in use and indicated that it had determined a Li-ion type. So far so good.

The display then showed charge code as 'Constant Current' and it started to deliver a constant 500mA – the maximum it allows. The cell voltage started to increase and the charge bars continued to build up. So the 'defunct' battery was taking charge properly. After a couple of hours I dropped another identical cell into the other slot. The display immediately jumped to this one and an identical charging process started.

Eventually, after about 6 hours, the first cell voltage reached about 4.2V, the mode switched to 'Constant Voltage' and the charge current dropped off. After a couple more hours current dropped to around 60mA and the 'Charge Complete' label showed. About two hours later, the second cell went the same way. They seemed

identical, took about 7 – 8 hours to charge, which is about right for old 3.3Ah cells charged at 500mA maximum.

Then I dropped in a partly discharged NiMH AA cell. It correctly identified this and started a –dV/dt charge cycle, initially pumping in 500mA until the shape of the voltage charging curve indicated it was time to drop to a low trickle charge. I wasn't watching it, but the charge was complete after a couple of hours.

Then, a real test. I completely flattened another AA sized NiMH cell so that its open circuit voltage was just 0.8V (although, interestingly, it still delivered 700mA short circuit current into my DVM). Again, it followed the same procedure and fully charged that in a few hours. (While that was charging, I did the third Li-ion cell of the laptop battery pack and took the photograph). Finally, a really ancient NiCd in a poor state. It went through the same start up procedure as the good NiMH, but very quickly went to the charge complete indication – showing the battery was as useless as expected.

OTHER FEATURES. Small cells, such as AAA sized NiMH ones of less than 0.75Ah, should use a lower charging current. The instructions state this can be set by pressing and holding the MODE button for 1 second, after setting the appropriate slot. Current is reduced to 300mA maximum, and 'Low' shows in the display.

LiFePO4 batters have to be selected manually, by holding the MODE button for 2 seconds after the battery test completes. It was not possible to test this as I had no suitable cells.

Charge time is limited automatically to 20 hours to prevent possible overcharging. Note that if power is momentarily lost the charge timer resets, although the rest of the charge sequence appears to pick up from where it left off. The LCD backlight can be turned off, so called 'Nocturnal Mode', by pressing and holding 'SLOT' for one second. This seemed, to me, rather pointless as the display is not over bright and unlikely to be a disturbance!

When both 12V and mains inputs are provided together, it draws its power from the 12V supply, which appears to have priority. Or perhaps the internal mains PSU just delivers less than 12V and the highest voltage present dominates.

CONCLUSIONS. For a single (or dual) cell charger this is a nice little unit that does what it says on the tin and rapidly charges several types of cell without having to worry about selecting the right type or setting the wrong current.

There does not seem to be any temperature compensation, but as this unit does not use particularly fast charging or deliver very high currents, that facet is probably unnecessary. The dV/dt monitoring of NiMH cells is adequate. Power dissipation does not seem to be a problem: even when working flat out on two Li-ion cells it was just lukewarm to the touch.

It is a pity in a way that this is designed only for single cells and not the higher voltage battery packs we use for radios. Although, as the target user is really only interested in charging torch and cycle lamp batteries it fully fulfils their requirements. However, as I determined, it copes perfectly well with two medium capacity 3.3Ah Li-ion cells, so if your /P battery pack used four of these for 14V they could be done in two batches – or even in two chargers.

The Nitecore D2 charger is available from Nevada, priced at £17.95, and thanks go to them for supplying the review item. Nitecore do make a similar 4 cell charger in this range, the D4, priced at £29.95. See www.nevadaradio.co.uk for full details.

Happy New Year To All Our Customers

RADIOWORLD

Check www.RadioWorld.co.uk For Latest Prices

34-42 Brook Lane, Great Wyrley, Walsall WS6 6BQ

Established 1997. Open Monday - Friday 9am - 5pm and Saturday 9.30am - 4pm

Tel: **01922 414 796** Fax: **01922 417829** Skype: **radioworld_uk**

The Latest Prices (E&OE)

MFJ

MFJ-1868 HF Mobile 80-6m Screw-driver Antenna	£184.96
MFJ-1675T Mobile Whip 3/8th Thread for 75m	£24.95
MFJ-1640T 40m Mobile Whip 3/8th Thread	£23.95
MFJ-1630T 30m Mobile Whip 3/8th Thread	£23.95
MFJ-1620T 20m Mobile Whip 3/8th Thread	£23.95
MFJ-1617T 17m Mobile Whip 3/8th Thread	£23.95
MFJ-1615T 15m Mobile Whip 3/8th Thread	£23.95
MFJ-1610T 10m Mobile Whip 3/8th Thread	£23.95
MFJ-1606T 6m mobile whip 3/8	£23.95
MFJ-1792 80/40m Vertical Antenna	£192.95
MFJ-1793 80-20m Vertical Antenna	£204.95
MFJ-1795 Compact HF Vertical 40-10m	£174.95

CHAMELEON ANTENNA

CHA HYBRID-MINI BASE Frequency: 6M - 160M	£199.94
CHA Zepp Antenna specially designed for apartments	£99.00
CHA EMCOMM II Antenna	£115.00
CHA SKYLOOP 80M and 6M	£125.00
CHA HYBRID Base	£225.00
CHA V1L antenna is a rugged multiband HF mobile antenna	£135.00
CHA V1L antenna is a rugged multiband HF mobile antenna	£135.00
CHA V2L is a rugged multiband HF antenna	£135.00
CHA VHF/UHF dual band antenna for 2M and 70CM.	£22.00
CHA MIL whip Portable HF Antenna 28-54 MHz	£105.00
CHA TD (Tactical Dipole) Antenna	£299.95
Chameleon Dipole Jaw Mount	£39.00
CHA CAP-HAT (Capacitance Hat)	£59.00
Heavy duty antenna tripod	£72.00
Counterpoise Kit	£47.99
CHA RFI CHOKE	£41.99
50' Coax Cable RG-58A with integrated RFI Choke	£71.99
CHA 1V Vehicular HF Antenna 3.5-30 MHz	£149.94
Chameleon Antenna Heavy Duty Carrying Bag	£59.00

BEGALI

Begali Magnum Dual Paddle Key	£539.99
Begali Stealth Daul Paddle Morse Key	£489.98
Begali Sculpture Dual Paddle Morse Key - Standard	£382.99
Begali Sculpture Dual Paddle Morse Key - Black	£414.98
Begali Sculpture Dual Paddle Morse Key - Copper	£414.98
Begali Sculpture Dual Paddle Morse Key - Gold	£414.98
Begali Sculpture Mono Signal Dual Paddle Key	£424.99
Begali Leonessa Dual Paddle Key	£389.99
Begali Stadivarius Dual Paddle More Key	£339.98
Begali Graciella Jr - Gold	£319.99
Begali Graciella Jr - Palladium	£319.99
Begali Graciella Jr - Nickel	£319.99
Begali Pearl Dual Paddle Morse Key - Professional Black	£289.99
Begali Pearl Dual Paddle Morse Key - Gold	£269.99
Begali Pearl Dual Paddle Morse Key - Nickel	£269.99
Begali Pearl Dual Paddle Morse Key - Palladium	£269.99
Begali Contour Dual Paddle Key - Gold	£259.99
Begali Contour Dual Paddle Key - Nickel	£259.99
Begali Contour Dual Paddle Key - Palladium	£259.99
Begali Signature Dual Paddle Key - Gold	£247.99
Begali Signature Dual Paddle Key - Palladium	£247.99
Begali Magnetic Classic Dual Paddle Key - Palladium	£197.99
Begali Magnetic Classic Dual Paddle Key - Gold	£197.99
Begali Magnetic Pro Dual Paddle Key	£217.99
Begali Expedition Dual Paddle Morse Key	£237.98
Begali Adventure Dual Paddle Morse Key - FT-817/ND	£247.99
Begali Adventure Dual Paddle Morse Key - KX3	£247.99
Begali Adventure Dual Paddle Morse Key - KX1	£247.99
Begali Adventure Mono - FT-817/ND	£257.99
Begali Adventure Mono - KX3	£257.99
Begali Adventure Mono - KX1	£257.99
Begali Traveler Light Morse Key - Blue	£237.98
Begali Traveler Light Morse Key - Black	£237.98
Begali Simplex Morse Key - Gold	£139.99
Begali Simplex Morse Key - Palladium	£139.99
Begali Simplex Professional Key	£153.98
Begali Simplex Basic Morse Key	£119.99
Begali Simplex Mono Morse Keys - Gold	£149.99

WEST MOUNTAIN

RB/PR/C RIGblaster PRO West Mountain Rig to Soundcard Interface	£259.96
RB/PL/C West Mountain RIGblaster PLUS data-mode Soundcard Interf	£117.40
RB/NO/CU RIGblaster West Mountain NOMIC 8-pin Mic & RJ-45 Soundc	£69.95
M4-CBL West Mountain Lead RJ-45 to 4-pin mic for Nomic	£18.95
RIGblaster Plug & Play USB Interface 58009-960	£109.96
RPA/I8D West Mountain Adaptor for RB/PP and Icom 8-pin ACC1 suc	£10.96
RPA/I13D West Mountain Adaptor for RB/PP and Icom 13-pin DIN suc	£10.96
RPA/K13D2 West Mountain Adaptor for RB/PP and Kenwood ACC2 13-pi	£10.96
RIGblaster PRO West Mountain Rig to Soundcard Interface 58002-953	£264.95
RIGblaster Nomic 58008-959	£74.95
M8-CBL West Mountain Lead RJ-45 to 8-pin mic for M8 & Plus	£18.95
RJ-CBL West Mountain Lead RJ-45 for Nomic	£9.95
FT100-CBL West Mountain Lead RJ-45 to RJ-22 for FT-100	£15.95
ST-CBL West Mountain Lead RJ-45 to bare end	£4.96
CW-CBL West Mountain Lead RJ-45 to 1/4in stereo jack for Nomic	£15.95
4T8-KIT West Mountain Conversion kit from M8 or Plus to 4-pin mi	£20.95
RB-CD West Mountain Standard RIGblaster Program CD	£7.96
DC-CBL West Mountain Spare DC Lead for RIGblasters	£8.95
RT1/CIV West Mountain RIGtalk USB Rig Control Interface for Icom radios	£54.95
RIGtalk USB for Rig Control Interface 58201-1004	£49.96
RT1/CAT6 West Mountain RIGtalk USB Rig Control Interface	£59.95
CIV/CBL RIGtalk cable for CIV Icom & Ten Tec	£10.96
CATMINI/CBL RIGtalk cable for Yaesu FT100/817/857/897 radios	£14.95
CATMINI6/CBL RIGtalk cable for Yaesu FT736/747/767/980/990/1000/	£14.95
RIGrunner 8012 12-way 12V Distribution Board Complete 58301-1028	£155.95
RIGrunner 4010 Complete 10-way 12V Distribution Board 58303-1030	£149.95
RIGrunner 4012 12-way 12V Distribution Board Complete 58305-1032	£129.95

Full range on our website www.RadioWorld.co.uk we also stock...

KENWOOD · HUSTLER · YAESU · WATSON · bhi · Tigertronics

Palstar · ICOM · Cushcraft · RigExpert · MFJ · DIAMOND ANTENNA

Yaesu FTDX1200

£1288.99 inc. VAT

The Yaesu FTDX1200 provides sophisticated operation on 160 to 6 meters with up to 100 Watts on SSB, CW, and FM (25 Watts AM carrier) and a rugged state-of-the-art highly balanced receiver circuit configuration for top performance on today's crowded bands. Autumn and Winter HF Sales Promotion From YAESU UK, Cash back entitlement for the FTDX-1200 is £80.00. This promotion is effective from the 1st of October.

Kenwood TS-990

£5,998.80 inc. VAT

+ FREE SPEAKER worth £210

The Kenwood TS-990 is equipped with dual receivers to enable simultaneous reception on two different bands. The main receiver employs full down conversion and features a new mixer and narrow-band roofing filters, resulting in a third-order intercept point of +40dBm; this represents the highest level of RX

Icom IC-7100

£1288.99 inc. VAT

The ICOM IC-7100 is designed to include 70MHz European versions where 70MHz is open to Amateur radio enthusiasts. HF/6M/4M/2M/70cm & 70MHz, D-STAR DV Mode Operation, IF DSP Digital Processing, Built in Speaker, Mounting Base Option, Built-in SD card slot for voice storage and data cloning.

Yaesu FT-857D

£669.00 inc. VAT

The Yaesu FT-857D With separation cable with Digital Signal Processing fitted (DSP), the world's smallest HF/VHF/UHF mobile transceiver, provides base station-type performance from an ultra-compact package that's ideal for mobile or external battery portable work. Autumn and Winter HF Sales Promotion From YAESU UK, Cash back entitlement for the FTDX-1200 is £80.00. This promotion is effective from the 1st of October.

Kenwood TS-590s

£1,189.20 inc. VAT

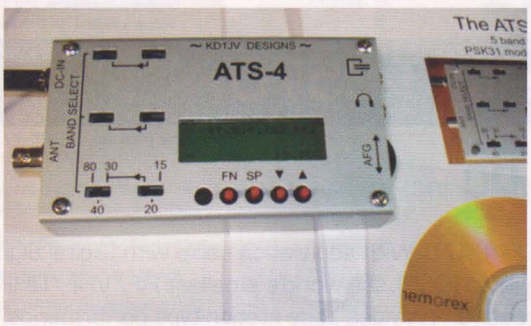
The Kenwood TS-590s 6kHz, 2.7kHz and 500Hz Roofing Filters. 1st-IF Down Conversion (1.8 - 21MHz WARC bands), 32-bit Floating Point DSP, Built-In USB and Serial COM Ports, Built-In Auto ATU (also covers 5MHz band), Built-In CW Keyed with selectable Mode A/B Keying.

QRP

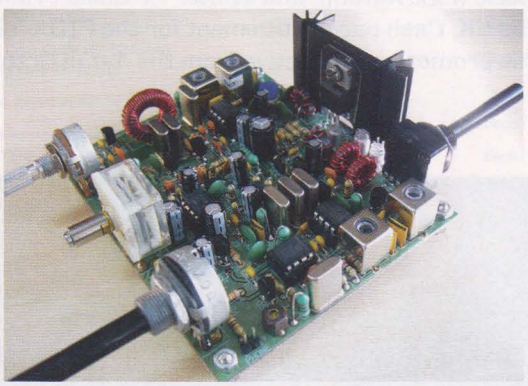
GQRP-EA EA3EGV Memorial Contest

MEMORIAL CONTEST. Towards the end of 2013 I received a couple of EGV-40 kits from Javier Solans, EA3GCY, of the EA-QRP club. Javier produces a small, but well reviewed, range of QRP kits. Probably the best known of these kits is the ILER range of QRP single band SSB transceivers. Last year, Javier produced the EGV-40, a 40 metre CW transceiver, in memory of his friend Miguel Montilla, EA3EGV. Javier and Miguel were leading lights in the formation of the EA-QRP Club. In September 1994, a group of four keen QRP operators, Miguel, EA3EGV, Miguel, EA3FHC, Vicenç, EA3ADV and Javier, EA3GCY, founded the EA-QRP Club. Sadly, EA3EGV became a silent key recently and EA3GCY produced the EGV kit in his memory. Two kits were generously given to the G QRP Club in memory of EA3EGV to use as G QRP saw fit.

The EGV is a 40m superhet transceiver with an IF of 4.915MHz and a very low standby current (25mA), making it useful for portable work. The transmitter RF output is in the range 0 to 3.5 watts. The tuning uses a VXO (variable crystal oscillator) that will tune any 40kHz segment of the 40m band. The printed circuit board is of a very high quality and all controls are mounted directly on the board.



HF transceiver as used by G4ISJ in the EA competition.



The EGV-40 transmitter.

The G QRP Club decided to offer these kits as prizes in a club operating challenge.

There were two possible ways to win one of the two kits:

1. Those G-QRP members that manage the most contacts within the EA DXCC in the period 1 March to 30 September.
2. Those G-QRP members that manage the most contacts with DXCC entities outside EA in the period 1 March to 30 September.

The two winners of the two categories were RW3AI and G4ISJ. They approached the competition in two completely contrasting manners: one from the home QTH and the other with portable QSOs. They were both able to show what is possible with QRP.

Peter, G4ISJ won the category for the most QSOs with EA stations and managed to contact 59 different EA stations. He managed most of these contacts whilst operating SOTA with 4 watts using either an MTR or ATS4, from 21 different 'tops'. SOTA is the popular Summits on the Air programme. The MTR and ATS4 are diminutive, hand-held multi-band transceivers designed by Steve, KD1JV, popular with walkers and backpackers.

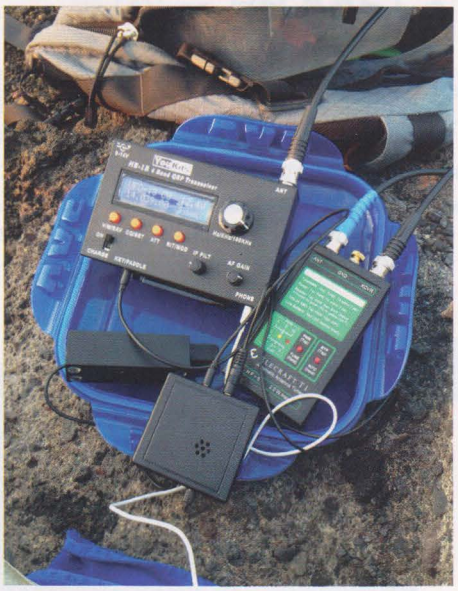
Val, RW3AI won the category for the most QSOs with members outside EA. He managed this by operating almost every day and also entered 37 different contests all in the QRP categories. Val used a range of rigs from an IC-7800 to a homebrew single valve transmitter. No special or complex antennas were used; just simple wires. Val managed to contact 96 DXCC entities and had over 5000 QSOs with more than 3700 unique stations. He also managed to contact 42 EA stations.

Thanks go to all the other entrants (22) who made this such an interesting event and to Dom, M1KTA for organising the event.

FAST WORK! In an e-mail, Dave, G3YMC writes, "Ryan, G5CL asked, in 2011, if any UK QRPers had worked all continents on QRP in under an hour. I don't think anybody claimed they had at that time although some of us were pretty close. In the weekend of the 2014 CQWW Contest, I did it... The following QSOs were all on 20 metre CW on the morning of 30 November 2014:

0830 CR3L (Africa)
0832 KL7A (N America)
0838 OM7RU (Europe)
0844 HD2A (S America)
0900 VK2DX (Oceania)
0928 UB0A (Asia).

"All in 58 minutes. But if I had been trying a bit harder I could have done it in 30 minutes as there were plenty of Asiatic Russians about. The station was an Elecraft K2 running 5 watts of RF output to a low long wire (75ft) and a 30ft vertical that I use on 15m. Big contests are fruitful events for QRP operators. I had 852 QSOs over that weekend."



The compact station used by M0HDF on Tenerife.

ON THE BEACH. A short e-mail from Angel, M0HDF read, "I worked Australia, Japan, Brazil and New Caledonia this morning at sunrise from the beach here in Tenerife (EA8) with an emergency ground plane for 20 metres I built here and 3 watts. I had a blast!"

One of the advantages of being a QRP operator is being able to mount one's own individual DXpedition, perhaps linked with a family holiday. Angel did just that with his own modest, very portable station.

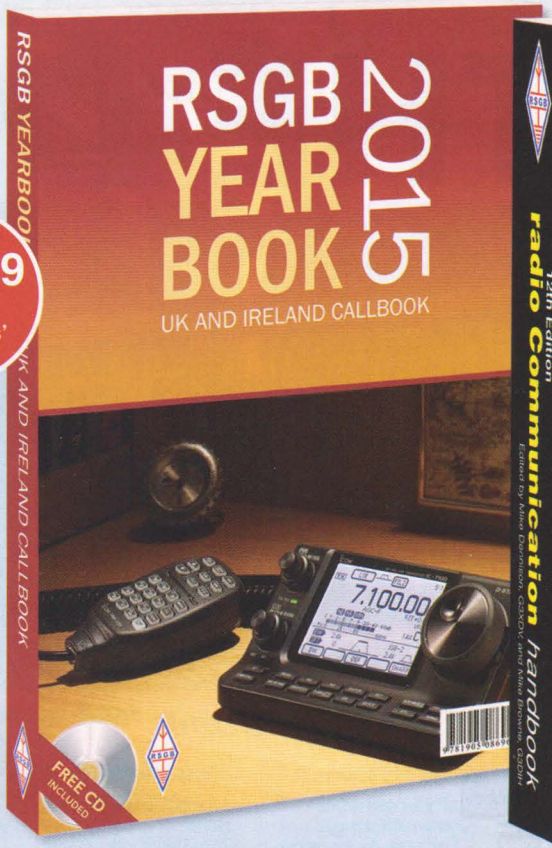
His equipment consisted of HB1B; a 3 to 4 watt HF band CW transceiver, made in China but badged by a number of western dealers, most commonly Youkits. Other items were a 12V lithium pack, a 6 metre Decathlon pole, an Elecraft T1 ATU, a Picokeyer +, iPhone headphones and a short length of RG58 C/U. A main antenna used on the beach was a 20 metre emergency 1/4 wave ground-plane (built during the holiday). Prefixes worked included: GA8, GB2, ON5, S52, OE7, ON4, EA1, EA2, G3, VO1, EA8, 9A4, RA4, RX3, JA1, VK8, G4, CT7, FK8, IK8, PP6, DL3, DQ0, DF6, OM3. Not bad for 3 watts and an emergency ground-plane!

See http://m0hdf.blogspot.co.uk/ for more information and photographs.

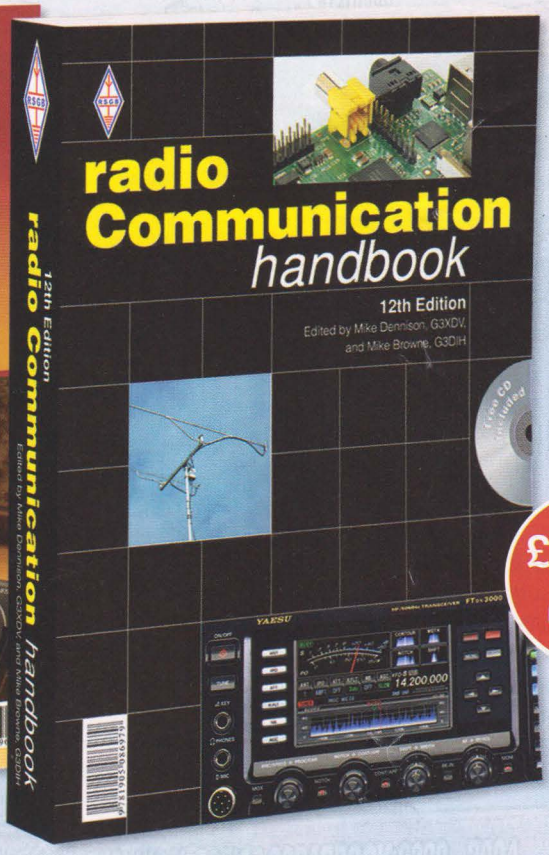
RSGB shop

FROM P&P FREE
OVER £30 SEE PAGE 78 FOR DETAILS

E&OE All prices shown plus p&p



£16.99
RSGB Members' Price



£27.99
RSGB Members' Price

RSGB Yearbook 2015

Edited by Mike Browne, G3DIH

The *RSGB Yearbook 2015* is our biggest ever with 544 pages of the latest callsign information and much more.

With over 84,000 amateur radio licences on issue, including those from the Republic of Ireland, the *RSGB Yearbook 2015* remains the very latest callsign information available. Added to the callsign data there are 176 pages of invaluable amateur radio reference information making this book an indispensable guide.

Callsigns are cross referenced by post code and surname making searching easy. You will find all manner of local information organised into regions so you can find local clubs, repeater and emergency groups, and examinations in the area alongside details of the RSGB Regional Manager Team. There are details of how the Society is organised, the services it offers, committees, who to contact for assistance, etc. National clubs are not forgotten and these are profiled along with featured local clubs. There is a wide range of information sections included from Repeaters, Beacons, Band Plans, RSGB Awards, RSGB Contests and HF Propagation Predictions for 2015. There are also listings of special contest callsigns, permanent special event callsigns and much, much more.

FREE CD
The 176 information pages are why some buy this book every year. The Free CD provides not only all of these pages from the *RSGB Yearbook 2015* in a fully searchable format but you also get, over 600Mb of bonus material. Fully updated you will find samples of the latest RSGB books, masses of amateur radio software, extra club information and more, all in an easily accessed formats.

210x297mm 544 pages
ISBN: 9781 9050 8696 2
Non Members' Price: £19.99
RSGB Members' Price: £16.99

RSGB Radio Communication Handbook

Whether you are an operator who wants to know what goes on 'under the hood', an avid constructor or someone keen to go on learning about electronics and communication radio, the *RSGB Radio Communication Handbook* is the one book you need. With nearly 600,000 words plus 2,000 illustrations and tables crammed into 864 pages.

This edition has been thoroughly updated with many expanded features. You will find a completely revised HF Receivers chapter and the Propagation chapter has also been completely rewritten with an eye on improving clarity and understanding. There are new authors for the sections on Practical Microwave Antennas and the Low Frequencies. Based on the popular Homebrew column in *RadCom* there is a new chapter that follows the design and construction of an HF transceiver, and provides a host of valuable information and circuit ideas. Expanded chapters include Practical VHF-UHF Antennas, The Great Outdoors, Morse and Digital Communications. Many other chapters have had new, revised and updated parts. Since the last edition, there has been more use of microcomputers, such as the Raspberry Pi, in amateur radio projects; a new amateur band at 472kHz has also been created. These changes have been incorporated into the relevant chapters. Peter Hart's comparison chart of HF receiver performance has been updated, there's more on optical communications and new datamodes have been included.

FREE CD
Enclosed with the book there is a fully searchable electronic version of the Handbook in PDF format. You will find many bonus chapters, samples of other RSGB publications and even a host of useful amateur radio software.

Size: 210x297mm (A4), 864 pages
ISBN: 9781 9050 8697 9
Non Members' Price: £32.99
RSGB Members' Price: £27.99

Radio Society of Great Britain **www.rsgbshop.org**
3 Abbey Court, Priory Business Park, Bedford, MK44 3WH. Tel: 01234 832 700 Fax: 01234 831 496

+44(0)1588 620126
www.thedxshop.com

The DX Shop
...going the extra mile

WORK THE DX!

£1858.80
incl VAT

Pioneer
572B 1kW 1-30MHz HF Amplifier

£2299.00
incl VAT

Challenger
GS35 1.5kW 1-30MHz HF Amplifier

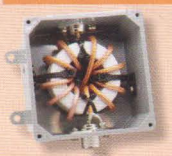
LINEARamp
www.linearamp.co.uk

Discovery 6, 6/4, 2 and 70.
Gemini 6/4, 2, 70, 23 ALL AVAILABLE.

QUALITY BALUNS AND UNUNS from
BALUN DESIGNS™

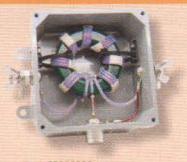
4:1 CURRENT BALUN MODEL 4113ET
- for 1.5-54 MHz
- 3kW power handling
- Insertion loss <0.2dB
- Silver plated SO239 connector
- Eyelets for wire attachment and at top to hang the balun

Ideal for Multiband doublets, Off centre fed Dipoles.
£81.54



1:1 ISOLATION BALUN
- 1-31MHz
- 5kW power handling
- Insertion loss <0.2dB
- Dual Silver Plated SO239 connectors

Ideal for Dipoles & Verticals and as a Common mode current choke, keeping RF out of the shack.
£95.94



9:1 UNUN
- 1-5-54 MHz
- 2kW power handling
- Insertion loss <0.2dB
- Studs on sides with wingnuts
- Silver plated SO239 connector

Ideal for Verticals and Long wire antennas.
£87.54

SPID ROTATORS
DIGITAL CONTROLLER, PRECISION WORM GEARS, SOFTWARE LIMITS, NO BACKLASH.

SPID Elektronik

RAU AZIMUTH ROTATOR
- A lighter duty rotator
- Up to 180 Nm torque
- Worm gear drive so precise stop with nil backlash
- Supplied with digital controller
- Future-proof firmware upgradable via PROM
- Mast or head unit mounting with adaptor plate

Smaller Tri-band beams + VHF and UHF yagis

RAK AZIMUTH ROTATOR
- A medium to heavy duty rotator
- Up to 3240 lb-inch / 336 Nm torque
- Equivalent to G-1000/2800 but with digital control
- Worm gear drive so precise stop with nil backlash
- Supplied with digital controller
- Future-proof firmware upgradable via PROM
- Mast or head unit mounting with adaptor plate

Medium size HF/VHF arrays

BIG-RAK HEAVY DUTY AZIMUTH ROTATOR
- A heavy duty rotator
- Up to 3600 lb-inch / 403 Nm torque
- Equivalent to G-1000/2800 but with digital control
- Worm gear drive so precise stop with nil backlash
- Supplied with digital controller
- Future-proof firmware upgradable via PROM
- Mast or head unit mounting with adaptor plate

Big HF antennas or multiple VHF/UHF Arrays

ECOFLEX CABLES AND CONNECTORS

10, 10+, 15, 15+, Aircell 5, 7, Aircom Plus, Aircom Premium all in stock

Example: Ecoflex 15 Plus attenuation @ 432Mhz 5.8dB/100M, power handling @500MHz 890W, fmax 8GHz

Free termination service available – we will make up your leads for you.

PREAMPLIFIERS

SSB Masthead Preamplifiers
NEW RANGE NOW IN STOCK

SP600 50-52MHz 0.4dB 750W	£313.55
SP200 144-146MHz 0.5dB 750W	£313.55
SP70 430-440MHz 0.7dB 500W	£313.55
SP23 1250-1300MHz 0.9dB 100W	£511.28
SP13 2300-2400MHz 0.9dB 50W	£428.20

SSB
Passion in high frequency

HIGH POWER RANGE

MHP600 50-52Mhz 0.25dB 1500W	£389.95
MHP200 144-146MHz 0.3dB 1500W	£389.95
MHP70 430-440MHz 0.45dB 1200W	£389.95

ALSO AVAILABLE

SOLE EUROPEAN DISTRIBUTORS for Wavenode SWR meters

- Up to 4 remote sensing heads
- PEP, Average , SWR readout
- Optional PC link for Spectrum and IMD monitoring

FROM: £399.00

BEKO ELEKTRONIK

SOLE UK DISTRIBUTORS FOR BEKO AMPLIFIERS

- High spectral purity
- Instant On • Built in sequencer

BEKO SOLID STATE LINEAR AMPLIFIERS

HLV950 950W 50MHz / 500W 70MHz	£2100.00
HLV1000 1000W 144MHz	£2100.00
HLV2000 2000W 144MHz	£3600.00
HLV550 530W 432MHz	£2100.00
HLV350 430W 1296MHz	£2299.00

TRANSMITTING TUBES

3-500ZG / 811A / 572B / 8877 / etc. Singles / Matched Pairs / Matched Quads

PowAbeam ANTENNAS

A range of UK-made, high performance, rugged designs for 6 metres to 23 cms, with wonderful customer reviews.

LNA

G4DDK VLNA pre-built for 70/23/21/13/9cms <0.3dB NF

COAXIAL CABLES

Andrew HELIAX LDF, AVA and the new FXL range all in stock

QRO Coaxial Relays • Low Pass Filters
Aerial splitters • Westflex • Signalink

LF

DX in the deep mid-winter

The receive setup in operation at night.

The beach looks much nicer by day!

A RARE TRIP TO ALASKA. It's hard to get an LF signal across the pole from Europe to KL7L's QTH in Palmer, south-central Alaska. Laurence reckons that he suffers from "Northern Geomagnetic/Geolat signal constipation", a problem with passing signals over the pole when they don't want to be passed!

Despite this debilitating condition, in the middle of December, he managed to receive DK7FC's *WSPR-15* transmissions on 136kHz – a distance of about 7500km. The signal to noise ratio was about -36, ie around the limit of detection, but three perfect copies were received. A very rare occurrence according to Laurence and one that he will proudly add to his collection of remarkable achievements.

Though signals from Europe are rare, the path from Japan is a little more reliable and Laurence reports near-nightly reception of JA1CGM on 136kHz *QRSS*, plus the odd JA on *Opera32*.

Whilst on the subject of Laurence's achievements, he recently spent a week or so working in Mexico and took his LF receiving equipment with him. He set his equipment up on the beach, which looks great in the daylight but turned into what he described as a 'hell hole' at night with hordes of biting insects. To cap it all, conditions weren't particularly good but copies of most of the bigger US signals were made out to about 2700km on MF and LF. Nothing was received from Europe.

MORE VLF SUCCESS. W4DEX has been radiating tests on 8957Hz for some time now and Paul Nicholson in Todmorden has been using various techniques to extract the tiny signals from the noise on this side of the Atlantic. This is ground-breaking experimentation and is providing a lot of data for analysis.

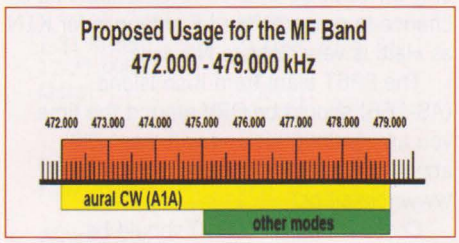
One of W4DEX's December transmissions over a period of several hours has been received in Todmorden at a signal to noise ratio of over 16dB in a 70μH bandwidth after processing.

Dex QSYed to 9177Hz with an aerial current of about 1A for a recent experiment where three receiving stations took part, at Todmorden, Bielefeld in Germany (DL4YHF) and Cumiana in Italy (IK1QFK). Signs of signals were seen at all three stations. The idea is to correlate results from the three sites to see if some advantage can be gained. In these early tests it seems as if Dex's transmission was reaching Italy, which would be a first for amateur VLF if confirmed.

DJ8WX has been improving his VLF aerial recently and has had good reports from OK2BVG and from Todmorden. He has added another 60m of wire, which takes it up to 450m and he has noticed an improvement of 5dB on receive.

VO1NA reports that he has just received a permit to operate at 8 to 8.3kHz with 10mW of ERP. Judging by his success on 136 and 472kHz (see later) there must be a good chance that he'll make it across to the UK.

BAND PLAN FOR 472kHz. At the recent IARU Region 1 conference in Bulgaria, a band plan for 472kHz was approved. Quite why we need to have a band plan imposed is open to debate but it's not too proscriptive. It allows CW operation over the whole band but restricts 'other modes' to frequencies above 475kHz. One worrying stipulation is that the maximum bandwidth of any mode is 200Hz.



A band plan for 472kHz.

This is a pity as it rules out some interesting experimental modes.

NEW ON THE BANDS. A new Russian station, RD4HU, has been reported on 136kHz from Samara, which is about 600km east of Moscow. He must be radiating a good signal as he was reaching G4WGT's grabber in December.

Two Hungarian stations, HA6PX and HA6PC, have been granted experimental licences for three months from 1 December to 28 February. This is for the 472kHz band with 100W of transmitter power. HA6PC has already made QSOs into Germany and hopes that this 'toe in the water' will lead to a full allocation in Hungary soon.

9A3KB informs me that Croatian amateurs now have access to the 472kHz band with 1W EIRP. No news so far of any activity.

IQ2MI, the Milan club, is back on the air and has been putting out a good signal on 472kHz QRSS (slow CW) recently. No reports of any QSOs yet, I think it may just be a beacon transmission on 476.180kHz.

A new callsign that you may spot on LF or MF is WH2XIL. This call belongs to Warren, K2ORS in Massachusetts and replaces his old 136 call, WD2XGJ, which had expired. He has managed to get the WH2XIL call, which used to be just for the US 185kHz band, extended to 136 and 472kHz. He therefore now has this one callsign for all the experimental bands. This caused some interest when the new call first appeared with a big signal on 136kHz!

SOLAR ECLIPSE. On 20 March, around 10am, there will be a solar eclipse visible from the UK. The path of the total eclipse passes between Iceland and the north of Scotland so unless you are planning a trip to the Faroe Islands it won't go completely dark. However it will be interesting to see if it has any effect on LF or MF propagation as it passes by. Watch those beacons.

472kHz TESTS. VO1NA has turned his attention to 472kHz and has been radiating an *Opera 8* transmission overnight. Mike, G3XDV reported 10 hours of good copy in early December and many other European stations such as PA0RDT, PA3RBK, DF2JP and F1AFJ also had good copy during the month. One interesting observation has been that the signals seem to be very strong at one location whilst being almost undetectable at another. Something to do with the long slow QSB that we see at these frequencies?

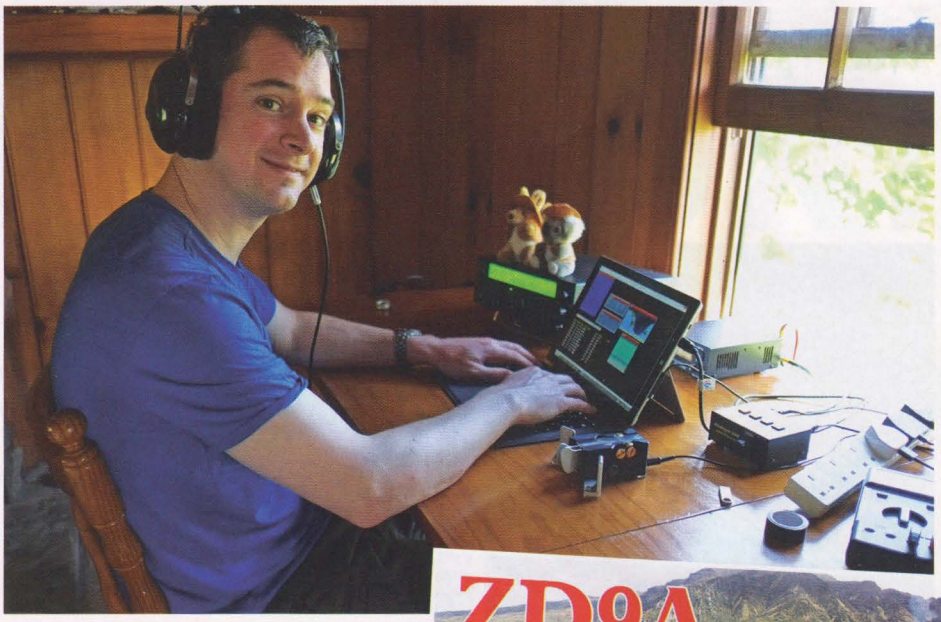
The tests will continue as Joe tries different aerial configurations.

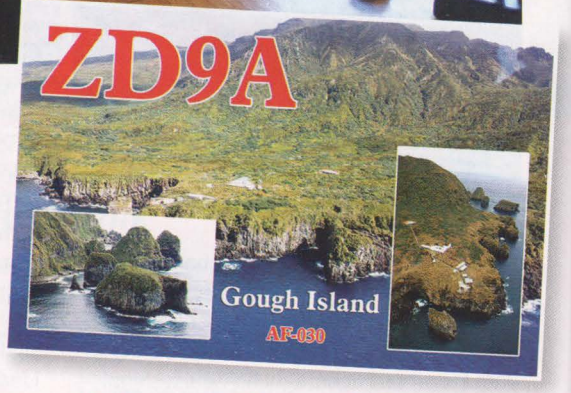
LICENCE REVIEW. Following Ofcom's recent consultation exercise, from mid-January all Full licensees will be allowed to use 472kHz without applying for a Notice of Variation (NoV).

February 2015 • RadCom
Martin Atherton, G3ZAY • e-mail: g3zay@btinternet.com

HF

Propagation holds up for the Winter





Michael, G7VJR on the air from Norfolk Island (above) and the ZD9A QSL card (right).

The solar cycle continued to surprise us in December with fresh crops of sunspots pushing the solar flux index well above 200 on the 18th. Unfortunately, conditions peaked too late for the ARRL 10m contest but there was still a lot of DX to be found. The northern hemisphere of the sun was still producing some spots but the bulk of the action was in the southern hemisphere, which seems to be having its own maximum several years after the northern. There are some interesting graphics online at the solar website of the Royal Belgian Observatory www.sidc.be/silso/. One in particular shows separate curves for the sunspot count in each hemisphere and it seems that the south has been running to a slightly longer period for the last few cycles. The red shading shows where the southern hemisphere spots exceed the northern and the green shading indicates the reverse. Whether this trend will continue or whether the two hemispheres will re-synchronise remains to be seen.

IOTA UPDATE DEADLINE. The 2014 IOTA Honour Roll and Annual Listing will be prepared shortly, based on submissions postmarked by 31 January, so there is still time to get online at rsgbiota.org, prepare your claim and send in your cards. You must update at least once every 5 years to remain in the listings. You may also want to check your privacy settings in your online IOTA profile to check that they allow your score to be published if you want it to be.

LONG PATHS (LP). To my surprise there have been no UK spots recently for Hawaii KH6 via LP on 10m – even during the ARRL contest when there should have been plenty of activity at both ends of the path. KH7Y did work into Israel and Cyprus around 0900 but it seems he could get no further (though he was worked by G3WGN via SP at 1945 on the night before the contest). I'd be interested to know if this long path picks up over the next few months.

At the other end of our spectrum, those people with good 80m antennas were able to exploit the narrow LP window of opportunity into W7 and VE7 around 1600UTC. The sunrise and sunset times only allow QSOs for a few minutes each day for a few weeks around the winter solstice – and then only when geomagnetic conditions are quiet. Despite the distance and the difficulty, signals can be surprisingly good; perhaps due to ionospheric tilts launching a whispering gallery mode. N7UA, for example, was coming through at S9 one afternoon after Christmas around 1545UTC. G3PQA reported an 80m LP QSO with American Samoa at UK sunrise and I believe there was a short path opening to Hawaii one morning but in general I gather the sunrise openings have been poor.

The 20m LP openings around 0800-1000 during December were as reliable as ever and extended up to 15m on many occasions when VKs and FK could be worked via South America until 1100. There were probably times when either direction would have got through.

DXPEDITIONS. The large K1N Navassa Island (NA-098) DXpedition is now set for approximately the first two weeks of February with the exact dates depending on weather and last minute transport scheduling. The team are still seeking donations to cover the enormous cost of the helicopter charters so see their website at www.navassadx.com for more information about the project, including a 'donate' link if you wish to make a contribution.

Tom, KC0W, will be active as HH5/KC0W from Haiti (NA-096) until 3 February on CW only on 160, 80 and 40m. This could be a chance to prepare your LF antennas for K1N as Haiti is very close to Navassa.

The EP6T team from Kish Island (AS-166) should be QRV around the time you are reading this and will stay until about 27 January. Their website is at www.rockall.be/

Cocos Island (NA-012) should be activated around 16 February for 6 days by 3Z9DX and TI2HMJ as TI9A. Their website is at www.nielsen.net/ti9a/. This island is a fascinating location associated with so many tales of buried pirate gold that many areas have been excavated by treasure hunters. Some people claim that the *Treasure Island* story was inspired by Cocos. Nowadays, the Costa Rican government is very protective of the place and permission to visit can be very hard to get. So this could be the last expedition for some time – but on the other hand I hear persistent rumours of a larger DXpedition planned later in the year, so time will tell.

Eric, OE4AAC will be active holiday style as S79AC from Mahe and Praslin (AF-024) in the Seychelles until 10 February. He will operate CW on the 10-40 metre bands.

The Association des Radio Amateurs du Congo (ARAC) has invited the Italian DXpedition Team for a short visit to Kinshasa during March. The plan is for Silvano, I2YSB, and his team to operate on CW, SSB and RTTY on 160-6 metres as 9Q0HQ. Further information, logsearch and OQRS can be found at www.i2ysb.com/idt. The activity will include training and refresher courses for local operators.

A large multinational team from the Provins ARC (F6KOP) will be active from Robinson Crusoe Island, Juan Fernandez Archipelago (SA-005) from 24 February to 5 March. A total of twenty-two operators will be QRV on 160-6 metres.

Six Polish amateurs are sailing around the Caribbean until 14 February and planning to operate holiday style from FM, J6, J8 and J3. Activity will be on 1.8 to 28MHz on SSB, CW and digital modes. Their website at http://expedition.sp7vc.pl/ has their detailed schedule.

The 7QAA operation will begin on 12 March, running CW and some RTTY. The early team are mainly CW ops but John, GW4SKA will be running RTTY. The early team returns home on 21 March and a second team arrives on the 22nd to operate SSB and RTTY until the 31st. They will do the WPX SSB contest as a multi-op team and also be active in the BARTG HF RTTY contest. They plan to have four stations set up for the whole period with amps and hex beams, plus verticals and wires for the low bands.

ACTIVITY. Propagation for the ARRL 10m contest in December was a little disappointing but there were plenty of stations on the air. Typically the band was open from about 0700 to 1900UTC but stations in North America could be heard for a little longer and South Americans could be worked until about 2000. G3WGN worked VK6 but no other VKs or ZLs. G3VMW found ZL on the Sunday. G0ORH reported VK and ZL. Almost everyone seemed to work into the west coast of the USA around 1800UTC but nobody found KH6. Hopefully there will still be some sunspots for the 2015 event.

Michael, G7VJR was QRV after Christmas from Norfolk Island (VK9) on 18 and 21MHz and worked many UK stations. ZD9A has now started operating from Gough Island and has been worked on 10m around 1530z. He will be QRV when work permits until September.

CORRESPONDENCE. Fred, G3SVK had his usual busy month with his dipoles and reported: on 10m China, Hong Kong, Indonesia, Namibia, Tanzania, Zimbabwe, Reunion Island, Zambia, Andaman Islands, Madagascar and swathes of the Middle East, Caribbean and South America; on 15m Japan, Mali, Madagascar, Ethiopia, Galapagos Islands and Martinique; on 17m New Zealand, New Caledonia, Indonesia, Madagascar, Egypt, Anguilla, Trinidad, and Anguilla; on 20m Australia, New Zealand, Alaska, New Caledonia, Indonesia, Malaysia, Thailand, Antarctica, Cambodia and some Caribbean stations; on 30m Andaman Islands, Hong Kong, Galapagos Islands and SMOM; and on 40m Australia, New Zealand, Philippines, India, Andaman Islands, Mauritius, Ascension Island, Afghanistan and most of the Caribbean.

Michael, M0GXM spent quite a bit of time chasing 80m DX on a ¼ wave vertical. His best QSOs were with China and Australia in the 2100-2200 timeslot but he also worked into the US East Coast, North Africa and Asiatic Russia.

Peter, G4XEX says that 2014 has been his best ever year for DX – partly down to a linear to crack the pile-ups and partly thanks to six months practising CW with G4FON's software. His best DX was the Galapagos Islands on several bands and modes. Peter is a regular volunteer at the National Radio Centre and has submitted 2014 scores for GB3RS. From his home QTH during December Peter reports: on 10m SSB Australia, Hong Kong, India, Laos, Malaysia, Falklands, Reunion Island, Galapagos Islands, and the Caribbean; on 10m CW Chagos Islands, Vietnam, Andaman Islands, Yemen, Maldives, Madagascar, Ascension Island, Pakistan and Uganda; on 12m SSB Mexico and the Falklands; on 12m CW Singapore, Andaman Islands, Pakistan and Jamaica, with Djibouti on data; on 15m Australia (SSB), Galapagos and Djibouti (CW), Antarctica (data); and on 17 CW Vietnam and New Zealand.

Peter, G3HQT found: on 10m CW Malawi, Christmas Island (VK9), Madagascar, with Chagos and Grenada on RTTY; on 12m CW Burkina Faso, Aruba (PSK), Ascension Island (RTTY); on 15m CW Papua, Mongolia, Reunion; on 20m RTTY Benin; on 30m CW Cambodia and Andaman Islands; and on 40m CW Cape Verde Islands.

Steve, G1XOW found the LF bands disappointing but the higher HF bands very rewarding. His best DX included: on 10m Ethiopia, Bermuda and Chagos Islands; on 12m Gambia and Thailand; on 15m SMOM; on 20m Djibouti; on 40m Australia and SMOM; and on 80m SMOM, Argentina and Kyrgyzstan.

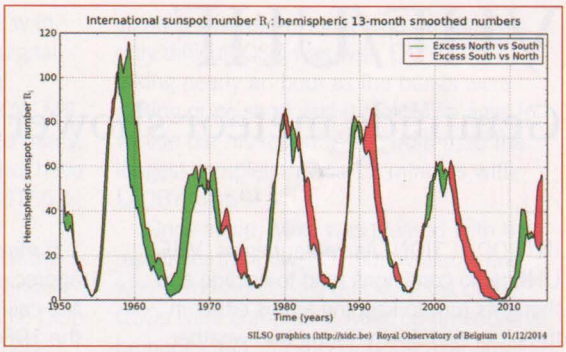
John, G3PQA says 80m was poor during December and 160m was worse! However he did find Palau, Samoa and Western Sahara on 80, and Western Sahara and SMOM on 160m.

RSGB Member Thomas, WO1X wrote in from Connecticut with his claimed 2014 score from a vertical antenna. In November he constructed a 40m 'junkyard' vertical with very short 3m radials and has worked 93 DXCCs just on 40m.

Gordon, G3PXT uses a TS-2000 + HLA300 amp into a wire antenna 8 metres high and logged over 10,000 QSOs in 2014. His best DX in November included Mauritius, Ascension Island, Afghanistan, Japan and the Falklands.

2015 SCORE TABLE. The plan for 2015 is to continue the current type of table listing DXCC entities worked in 2015 on CW, SSB and data – but following a suggestion by G3HQT sorting the rankings by a different column each month. I will also refer to various *Club Log* Leader Boards and tables and would strongly encourage *RadCom* readers to register with *Club Log* and upload their logs from time to time. To appear in most of the league tables you need to check the 'Show in Leagues' button in the 'Callsigns' section under 'Settings'.

THANKS... As always to my correspondents, DX-World, 425 DX News and Daily DX.



Sunspots in the northern and southern hemispheres, see text.

TABLE 1: 2014 Worked DXCC entities.

Call	CW	SSB	Data	All
G4CCZ	260	175	141	271
G1XOW	0	257	0	257
G4ZOY	231	221	186	251
G3UEG	0	246	0	246
G3SVK	243	1	0	243
G4XEX	125	203	78	230
G3HQT	213	0	135	217
MM0TWX	180	132	0	220
M0BVE	210	0	0	210
MU0FAL	180	117	101	193
CT7AGZ	-	-	-	185
GB3RS	80	168	0	180
G3PXT		168	124	175
G4IDL	170	0	0	170
WO1X	155	140	0	170
G3VMY	143	84	93	166
G4FVK	90	94	0	125

TABLE 2: Forthcoming DXpeditions.

Until 27 January	EP6T
Until 3 Feb	HH5/KC0W
Until 5 March	J79XBI
Until 10 Feb	S79AC
Until 25 Jan	5R8DX
15-26 Jan	C5X
24 Jan – 14 Feb	FM J6 J3 J8 by SP ops
Early February	K1N Navassa
5-25 Feb	XW8BM
16-22 Feb	TI9A
16 Feb – 10 Mar	FP/KV1J
24 Feb – 5 March	CE0Z by F6KOP team
1-31 March	XV7BM
12-31 March	7QAA
March	9Q0HQ
April	DX0P
1-12 October	TX3X Chesterfield
Nov/Dec	VK0EK Heard I.
Early 2016	VP8 (Sth Ga and Sth Sand)
Winter 2016	Palmyra?

February 2015 • RadCom
Richard Staples, G4HGI • e-mail: g4hgi@live.com

VHF/UHF

Geminids meteor shower with new stations on the air

INTRODUCTION. As winter begins, VHF/UHF radio conditions tend to decline and thoughts turn to keeping arrays either in the air or tied down during bad weather conditions. This certainly has an impact on activity, reducing the chances of working DX. On the plus side, December is also a month of excellent possibilities. In the first weekend of the month, December hosted the 144MHz RSGB AFS contest that produced excellent activity as well as the 2nd leg of the ARRL EME contest. As you would expect there was a tremendous array of DX stations and expeditions on the air. In particular, PZ5UD/PZ5EME were transmitting from Suriname in exotic locator square GJ25 **[1]**.

With many parts of the UK being lashed by storms there was little tropospheric DX propagation. The sun was littered with sunspots during the period and despite various predictions of impending flares and incoming CME there was little resulting auroral propagation. Once again a monster sunspot appeared, AR2242, which promised much in terms of X class flares. There were numerous short HF blackouts however the 'predictions' often outweighed reality for incoming CMEs. December is however was excellent for meteor scatter with one of the main highlights of the year – the Geminids.

GEMINIDS METEOR SHOWER. The Geminids are created from object 3200 Phaethon, a Palladian asteroid **[2]** with a 'rock comet' orbit. Together with the Quadrantids **[3]**, the Geminids are the only major meteor showers not originating from a comet. Classic Geminids are slow moving and usually peak around 13/14 December, often in the early hours of the 14th. The ZHR (Zenithal Hourly Rate) can potentially reach 120–160 meteors per hour.

The meteors in this shower come from a radiant within the constellation of Gemini (hence the shower's name). Well north of the equator, the radiant rises about sunset, reaching a usable elevation from the local evening hours onwards. The meteors travel at medium speed in relation to other showers, at about 22 miles per second. The Geminids are also a good 'visual' shower however most of the UK was covered by cloud making this difficult. With ionisation occurring in the E layer, the slow burn and long bursts can give the appearance of low level Sporadic-E.

Reports received comment on many long bursts – some over 30 seconds and up to 1.5 minutes. Unfortunately there were no appreciable signals heard on SSB on the MS calling frequency of 144.200, unlike the 1980s and 90s where QSOs could be made quickly with 15 second transmission/reception periods.

This technique seems to have largely died out in favour of digital (WSJT) operation. It is important to calculate the time where the meteor radiant is above the horizon to ascertain the peak for a given location. It is great to see that the shower has generated new interest with a number of first timers on the bands using meteor scatter techniques.

CORRESPONDENCE. Earlier this year Neil, G3RIR (IO92) purchased a FTDX5000MP, permission having been granted by his XYL, Janette, G8TKQ, to celebrate his 70th birthday and their 40th wedding anniversary. Sporting a nice 200W output, Neil decided to try 6m – a band he had never been on before. Construction of a dual band 6/4m 5+5 element G0KSC design antenna was also completed and, after some adjustments, all appeared fine despite it being mounted close to Neil's A3S HF tribander.
With the Geminids imminent Neil was looking to try 6m meteor scatter using WSJT. It seemed that nearly everyone in Europe uses JT6M for 6m MS and, as the connections from the PC to the radio were already in place from Neil's RTTY activities, the correct version of WSJT including JT6M was duly downloaded. Neil decided to under run the FTDX5000MP as JT6M is 100% duty cycle for 30 seconds at a time and ran at 75W.

Having set up a few skeds via ON4KST chat, apparently he posted too much information during the early QSOs making the QSOs invalid – this is something to watch as too much chat can be a bad thing. Along came Dick, G1CWP who kindly tutored Neil through the proper procedures. Neil has now made 24 QSOs on 6m meteor scatter with 15 of them being more than 1000km with several more than 1500km distance. QSOs with Spain, Sweden, Slovenia, Germany Switzerland and Norway all completed but perhaps the best was a QSO with Miro, SP2QOT at 1300km as he was running only 12W to a 2-ele Yagi. During the weekend of 13/14 December, the Geminids peaked and some of Neil's QSOs were made with very long bursts including one up to 18 seconds. Neil has been licensed for 52 years but trying meteor scatter for the first time has been an eye opener and reminds him of the excitement of working an OK station on 160m CW when first licensed.

Peter, G3MLO (JO01) is another newcomer to meteor scatter and was 'trying his luck'. He managed one contact with YT7WE in KN05 at 1560km. Peter was initially trying to get a feel for the operation of the software and the procedure for making QSOs so as not to cause problems to other users. Peter's motto is 'practice makes perfect' so he'll be looking again during the coming months. An LDMOS linear has been running trouble free and Peter hopes to get his new AZ / EL rotators installed soon, then EME will be the next mode to try. At 75 years now Peter reckons he is still learning.

Steve, G4TRA (IO81) has recently started on 2m again at his new QTH. He had his first MS QSO in July and he comments that it has certainly put the excitement back into 2m! Since June, Steve has worked 36 countries and 144 Maidenhead locator squares with just a single 11 element Tonna, TS-790E and Beko HLV-1000 amplifier. During the Geminids, Steve worked 13 new squares and one new country. Some of the best QSOs completed were CN8LI (IM63) at 1990km (new DXCC), UW8SM (KN28) at 1926km, OH2NHP (KP10) at 1863km and SM2CEW (KP15) at 2090km. There were many gottaways, plus trying to juggle meteor scatter with considerable family commitments over the weekend. Whilst there were plenty of reflections, Steve didn't see bursts of more than 5-10 seconds in duration. His quickest QSO was completed in 5 minutes and it was also interesting that a distance of 30 miles between competing UK stations can make a vast difference in what either station can

Table 1: Major meteor showers.

Shower	Duration	Peak	ZHR
Quadrantids	1 Jan-5 Jan	03-Jan	120
Lyrids	15 April-28 April	22-Apr	15
Eta Aquarids	19 April-28 May	06-May	60
Arietids	22 May-2 July	07-Jun	54
Perseids	17 July-24 Aug	12-Aug	90
Orionids	2 Oct-7 Nov	21-Oct	20
Leonids	14 Nov-21 Nov	17-Nov	variable
Geminids	7 Dec-17 Dec	14-Dec	120
Ursids	17 Dec-26 Dec	22-Dec	10

hear due to the received signal footprint. Steve commented that if you think 2m is dead – forget it! Logging onto the ON4KST chat site [4] and networking with other like minded enthusiasts really can Make More Smiles On VHF!

Lyn, GW8JLY (IO81) thought that this year's Geminids was well below average. He certainly didn't work as many stations as usual, with only one QSO over 2000km YL2GD (KO37) at 2049km. For the first time ever in a major shower, he didn't work any new locators, however he did work a lot of countries – YL, ES, LY, OH, SM, LA, OZ, SP, DL, S5, YU and I. There were some great bursts around though, during a QSO with YT7WE in KN05 Lyn copied a 1.5 minute continuous burst. Prior to his sked with YL2GD, again super long bursts, not so when the QSO was actually completed – another case of Murphy's Law. Lyn also noticed some new UK stations to meteor scatter making their first QSOs, including Peter, G3MLO from JO01.

Martin, GM6VXB (IO76 & IO97) spent most of the Geminids making recordings in various directions for a software project that he is developing. This exciting project, MAP65 for FSK441, needs time and patience – both of which Martin readily admits he doesn't have! Active operators on VHF will know of Martin's amazing island hopping activities with his work, which has given the chance for many to work very rare locator squares via MS and EME. During the Geminids, Martin only had 70 and 144MHz operational from IO76JK (near Oban). No new stations were heard except for a few Russian stations who were over 2000km distance. Back to the home location (IO97) and activity was poor after the peak of the shower, however there seemed to be many stations still trying skeds and setting them up on ON4KST Chat. Martin tends to work mainly random operation, ie no sked set up, which is certainly more challenging and rewarding as a result. He also comments that there seems to be a lack of big GM MS/EME stations on the air these days, which is a great shame. Looking forward to 2015, Martin is hoping his 50 and 70MHz QRO system is back in operation.

John, G3WZT (IO90) only had limited time during the shower but confirms that it was not 'classic' Geminids. Bursts seem to be quite well spaced but strong and long lasting when they did arrive. John had just six QSOs, none of which were over the magic 2000km mark. YT3N (KN04), YT7WE (KN05), S51AT (JN75) for MS QSO number 66 with Boris, IV3RYQ (JN65), IV3GTH (JN65) and YL3HA (KO26). John received a monster burst from YL3HA that was so long and strong, around 20 seconds at S9, that WSJT did not quite know what to do with it!

Also in the log were a couple of EME QSOs with ES3RF and RK3FG. Both very good stations and not difficult to work with a moderately equipped station using digital JT65 mode. John also comments that sometimes he laments the loss of HSCW MS but FSK is here to stay and has helped many to do things on VHF that they would not have done before and indeed the same for JT65B for EME over traditional CW.

Conrad, G0RUZ (IO93) thought that the Geminids shower was quite good. Operating as usual from his North Wakefield Radio Club site at IO93FR with a YU7EF EF02012B 12-ele Yagi, an ATF54143 cavity input LNA at the masthead and 100W from an IC-7400. Conrad comments on some stations that were ridiculously loud – YT7WE, 9A4V, YL3HA, YL2AO, S51AT and F6DRO plus he was particularly pleased to work RK1AS at 2002km who has only a small balcony mounted antenna, and also running just 100W. Concentrating on longer distance QSOs, Conrad was very happy to have 8 contacts over 1800km with the relatively modest station. The difficulty was finding a frequency that did not have 3 or 4 QSOs going on at the same time. Sadly, a test with LZ2PI at a distance of 2274km didn't quite complete. Conrad received three bursts from LZ2PI who never copied his R26 report due to a high noise floor so the test was stopped. For 2015, Conrad expects to add an amplifier and to be further active on MS.

John, GW4MBN (IO71) capitalised on the good condition with excellent contacts throughout December and remarked on the increase in activity on 50MHz MS. Bursts can be considerably longer on 50MHz compared to the higher bands, even during periods of sporadic meteors. Some of the Geminids bursts were very long, almost Es-like. It was also a clear moonless night on the 13th, ideal for meteor watching, but John clean forgot to look! Throughout December John has completed the following QSOs all on 50MHz and using JT6M – DC8TS, OE5MPL, DJ9YE, SM7MBH, DL5WP, SM5KWU, DL2IAN, S59A, F8ZW, LX1JX, DF6HT, PE1DAB, F4ARU, OZ1DJJ, PC7M, LA4LN, GM4VVX, SM6MVE, DH6BH, SP2HMR, OZ3ZW, GM4UYE, DL6KR, S57TW, EA1SI, EA3AQJ, EA1HRR, S50P, EI2KK and OE9ICI.

Mike, M5MUF (IO92) managed a few QSOs on 2m and one on 4m after being reminded of the shower by hearing on the news that it was due. Unfortunately, the night was mostly cloudy in the Midlands, so no visuals at all. Likewise, nothing in 2000km+ range but, with the antenna at half mast not so surprising. YT7WE (KN05) at 1758km was worked for his ODX of the shower, which is excellent considering Mike only runs 25W and a 10-ele Yagi on 2m.

Four new locator squares were worked using random techniques with a further sked with Dom, F6DRO (JN03) completing in 4 minutes. Dom was putting in phenomenal signals, with many long, loud bursts. The only difficult QSO was with EA1RJ (IN71), taking nearly an hour as the bursts were getting quite short and it took Mike ages to winkle out his report. Apart from that, the longest completion was 12 minutes with LA0BY (JO59).

Once again, Mike was pleased with the results for the power output available and was surprised at how quickly most of the QSOs were completed. Mike comments that he hopes this will encourage similar small stations to try out MS.

Mike's time on 4m was limited as the band was quite noisy making reception difficult. The one 4m QSO completed was a sked with Enrico, IK0BZY (JN61) using the experimental mode JTMS which cut through the local noise, but bursts were not as good as on 2m. On 4m, Mike's station runs 70W to a 5-ele LFA, again showing that these QSOs via MS can be made using modest equipment.

CONSIDERING METEOR SCATTER? First steps into meteor scatter operation can be quite daunting. However, the sense of achievement and the excitement can be tremendous once the procedures have been learned and station set up correctly.

As a first step I would certainly recommend watching a video of a lecture that was given by Lyn, GW8JLY at the RSGB Convention in 2013 and committed to the video archives by Paul, G4DCV [5]. There are many excellent tips in the video that shows how Lyn has developed his station to be one of the most prolific users of MS in the UK at the moment.

Included this month is a table showing all the major meteor shower's during the year. Predictions are exactly what they are – actual resulting conditions are governed by many factors however good preparation and patience are prerequisites to complete QSOs.

UK SIX METRE GROUP WINTER MARATHON. This event continues until 31 January. Please support this marathon and catch up with the latest news and rules on the UKSMG website where you can also upload your logs [6].

SIGN OFF. Thanks to all the contributors old and new and it is great to see new stations coming on the bands trying MS. If anyone is uncertain, ask some questions and you will be sure to pointed in the right direction.

WEBSEARCH

[1] www.emelogger.com/pz/index.html
[2] www.princeton.edu/~achaney/tmve/wiki100k/docs/2_Pallas.html
[3] http://meteorshowersonline.com/quadrantids.html
[4] www.on4kst.com/chat/start.php
[5] http://vimeo.com/77358505
[6] www.uksmg.org/contest/winter/standings.php

February 2015 • RadCom
Dr John Worsnop, G4BAO • e-mail: john@g4bao.com

GHz Bands

A beginners' receive setup for 1296MHz

PHOTO 1: An RTL dongle plugged into a Google Nexus tablet computer running *SDR Touch* and showing some of the spurious signals mentiond in the text.

WELCOME TO FEBRUARY. The Christmas and New Year is well behind us and only the most hardy go portable or do antenna work in February, so we should be in our warm shacks planning our new challenge for 2015. It might just be making a start above 1GHz and this column suggests an easy way to do this. I for one will be taking SDRs more seriously than just for panoramic displays and I hope to feature more on this later in the year. Meanwhile let's have a look at the beginner end of SDR and how we can apply it to the GHz bands.

AN INEXPENSIVE RECEIVE SETUP FOR 1296MHz. I regularly get asked how to 'get going' on the GHz bands and my response is invariably to start with a cheap receiver. Well, the cheapest receive setup I know of costs around £30 and consists of one of the RTL dongles that I've mentioned many times, plus a software radio running either on your shack PC or your Android phone or tablet. Add a homemade antenna and some low loss TV coax and you are away. The setup described here will be enough to, at a minimum, monitor for beacons and listen to the locals. This is not meant to be a state of the art system, just one to get you going! The PC SDR program *SDR#* has been described many times and a Google search on the name will bring up endless articles on how to set it up, so here I'm going to focus on an Android app that runs on my Google Nexus tablet and my HTC mobile phone. **Photo 1** shows the Nexus with attached dongle and USB adaptor. The program is called *SDR touch* and can be downloaded via the Google Play Store or from the sdrtouch website **[1]**. It installs automatically and there is a quite usable free version that will let you be certain that the program will work with your dongle. I would recommend that once you get familiar with its operation you download a key to make it in to the Pro version with all the features, for the princely sum of £5.99. This is all done on the click of a mouse and the Pro program also installs automatically on your internet-connected mobile device. Once *SDR touch* is installed you'll need an RTL2832U driver, also downloadable for free from the Google Play Store **[2]** and, of course, some hardware. I bought my dongle from Amazon for £6.77 **[3]** and, to connect it to a micro USB connector on the tablet or smartphone, you'll need an adapter, also available from Amazon **[4]** for 98p. As for a cheap antenna, there is an excellent article written by UKuG member and antenna expert Kent Britain, WA5JVB/ G8EMY **[5]**. These antennas are also described in Andy Barter's *International Microwave Handbook* **[6]** and also featured in the *ARRL Handbook* for the last few years. In it he describes a 10 element 1296MHz Yagi with a gain of 13.5dBi that is built on a boom made of 1/2 inch by 3/4 inch wood. **Photo 2** shows this Yagi. The elements have been made variously from bronze welding rod, aluminium rod, hobby tubing and solid ground wire cut from cooker power cable and all seemed to perform. I reckon this could be built for under a tenner! For short feeder runs for /P use, this can be fed with UR67 or even, at a pinch, at 60p/m, with WF100 low loss 75Ω satellite coax. As this is just a receive only system you could, of course do away with feeder loss completely by mounting the dongle on the antenna and run a long USB cable back to the computer!

GHz PERFORMANCE OF THE RTL DONGLE. These dongles are very sensitive and stable, but don't expect transverter/ transceiver performance. Mine is based on the R820 tuner as opposed to the E4000, and has better performance above 1GHz. It allowed me to still see and hear a 1296MHz signal at a level of -131dBm. The dongles have a digitally tuned band pass filter after the preamplifier stage and its bandwidth depends on the type of tuner but is usually either 800kHz or 3MHz. Due to their 8 bit operation they can be subject to overloading and intermodulation by strong signals within this filter bandwidth, and will overload with signals around 60dB above the noise floor. They also suffer from spurious responses; mine had a particularly annoying strong 'birdie' at around 1296.050MHz. Photo 1 shows this on the far left of the screen while tuned to a weak 1296.2MHz signal.

The rtl-sdr.com website has lots of useful information including some detailed measurements made by HB9AJG on the two most popular kinds of dongle tuner **[7]**.

ACTIVITY NEWS. This month's main activity report comes from Mike, G8CUL and his XYL, Ann, G8NVI, who are both regulars from South Oxfordshire (IO91jo) in the 1.3 and 2.3GHz UKACs. Mike writes, "The 1.3GHz UKAC on 18th November seemed to present some of the worst propagation for a long time [agreed! – G4BAO]. Gerard, F8BRK (IN99vf), normally a big signal, was down in the noise and, as usual, Ray, GM4CXM (IO75tw) was our ODX at 525km out of 53 QSOs and 15 locator squares. We had to revert to CW to make it this time, with 519/539 reports. Sunday 23rd November was the final UKuG Low Band contest of the year on 1.3, 2.3 and 3.4GHz. We only operated on 1.3 and 2.3GHz and made 24 QSOs on 1.3GHz (ODX F6APE (IN97qi) at 475km) and 12 on 2.3GHz (ODX

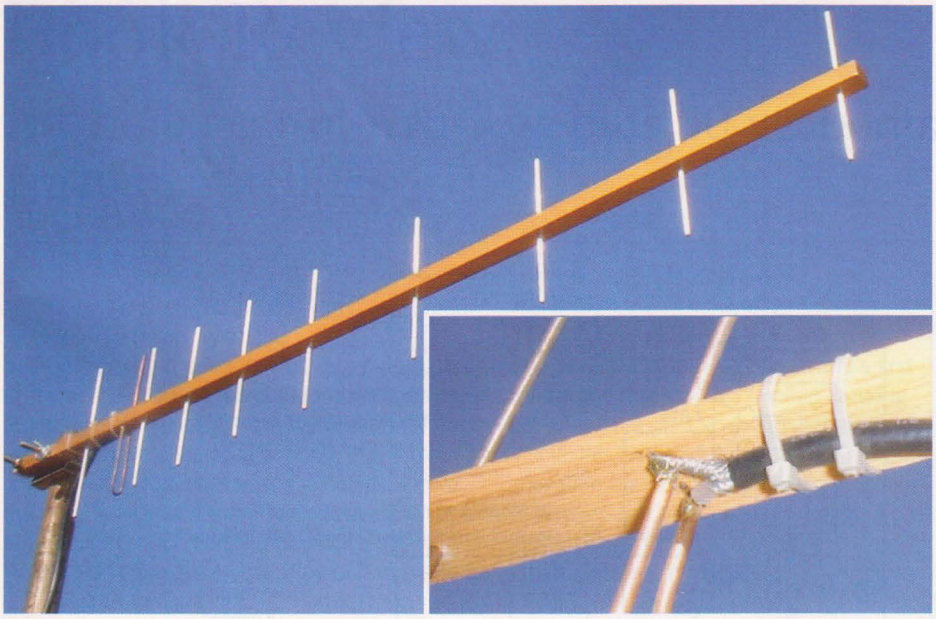


PHOTO 2: Kent's inexpensive 10-ele Yagi for 1296MHz and (inset) the feed arrangement (photo courtesy of WA5JVB/G8EMY).

G4KCT/P (IO93ox) at 260km). Activity was poor compared with the Tuesday night SHF UKACs. The Martlesham beacons on 1.3GHz and 2.3GHz were up the day before but down in the noise in time for the contest. The next Tuesday (25th) was the SHF UKAC but with no equipment (yet!) for bands above 2.3GHz I was able to concentrate solely on that band while Ann did her bit on 50MHz. Although the Martlesham beacon seemed pretty average before the contest, conditions E-W seemed reasonable as I managed to work both Eddie, PE9GHZ (JO11wm) and Simon, PA0S (JO21fw) at good signal strengths. Sadly, Frank, PE1EWR (JO11sl) was right at noise level so no QSO there. Best DX was, again Ray, GM4CXM amongst 24 QSOs and 14 multiplier squares. Other QSOs included G1LPS, G8PNN, G8EOP, G8DTF, G8BUN and of course the 'JO02 mafia'." What cheek!

It's good to hear that G3YJR is starting to experiment on 10GHz from Sheffield, IO93fj, as I've worked him many times on 1.3GHz. Graham has a DB6NT transverter mounted in front of a 60cm old-type Sky dish which is set on an az-el rotator on the chimney. At 235m asl and 10m agl, the mounting gives a reasonable take-off from west through north to east, but to the south it's pointing at houses. SE and SW aren't much better, obstructed with houses and trees. As an IF he uses an Elecraft K3 with its internal 2m transverter, both locked to a GPS-disciplined reference. He copies beacon GB3FNY (IO93nn) at good strength on 10368.752MHz and can sometimes hear GB3MAN (IO83wo) via rain scatter. He has worked Nick, G4KUX (IO94bp) to the north and has copied Gordon G8PNN (IO95ef). Of the locals, G3LRP (IO93ho) is very strong, but he has yet to work G3PHO, who is in nearby IO93gg, but on the other side of the hill with no easy point of reflection. In the November 2014 SHF UKAC he worked Keith, G4ODA (IO92ws) using SSB. You can follow Graham's activity on his blog [8].

2014 SHF UKAC RESULTS. Entries on 2.3 and 10GHz were up last year. Overall band winners on 2.3GHz were the Harwell Club, on 10GHz Cheltenham and on 3.4 and 5.7GHz, Bolton. Individual winner in the 2.3GHz Open section leader was again, G8OHM/P, with G8SFI/P winning the Restricted section. On the higher bands, in the most-competitive, Restricted sections, G0MJW won on 3.4GHz, with M0GHZ winning 5.7GHz and G4WLC/P 10GHz. In the Open sections, G4LDR is runaway winner on all the higher bands. Well done to all participants. Study of the results tells me that if you want to do well in a contest, enter the Open sections of SHF UKAC on the higher bands. Whereas in the 10GHz Restricted section alone there are twenty five separate callsigns, there were just six callsigns appearing in all the Open results for the three higher bands. Considering that the Tuesday night UKACs are the bulk of UK GHz bands activity, SURELY we can do better than this?

2300MHz ACTIVITY. On the subject of activity there seems to be little yet on the new 2300MHz band but I understand a couple of stations in the North West are busy building. The G4JNT 2300.350MHz personal beacon generated an initial flurry of activity and Andy can still put the beacon on at short notice if you need a signal on the new band. Also I'm happy to come on and put a signal your way: just e-mail me, catch me on the ON4KST reflector or via Twitter. My appeal recently for a Monday night sked did not come up with any 2300MHz QSOs, but I did have a couple of very scratchy contacts with Mel, G8EOP (IO93eq) on both 1296 and 2320MHz.

THE DEMISE OF THE MAGNETRON? And finally, the G4BAO shack has always prided itself in its 'no valves here' policy, so I gave a little cheer recently when I saw that one of the last bastions of thermionic RF power above 1GHz, namely the microwave oven, is about to be finally brought up to date. Browsing the *Microwave Journal* online edition [9] and clicking through to Freescale Semiconductors' website [10], I discovered that the semiconductor manufacturer are "leading a transformation from the use of simple magnetron RF power devices to the use of solid-state RF and microwave power devices for a wide variety of heating applications." Hooray! That'll be one less lethal 4kV supply in the kitchen. It seems that there are some 'green' advantages to solid state cookers as well. To further quote Freescale, "A solid-state solution delivers controlled energy to the load, with real-time feedback and monitoring of temperature, power and cavity conditions." There is more to this than an interesting novelty and it may have amateur radio potential. What springs to mind immediately is that a 250W CW 2450MHz device at consumer electronics prices would be very attractive. I wonder if devices such as the MHT1003N [11] would work as non-linear (or even linear?) power amplifiers for 2300/2320MHz for QRO operation using JT modes? We will see as the devices are released.

Please continue to send me reports and interesting tech snippets, either via email, or join the conversation on Twitter @g4bao using the hashtag #GHz_bands.

WEBSEARCH

[1] SDR touch for Android – www.sdrtouch.com
[2] RTL Dongle driver (Google Play store) – http://tinyurl.com/osfanao
[3] Typical RTL dongle (Amazon) – http://tinyurl.com/pffw9x6
[4] Typical USB adaptor (Amazon) – http://tinyurl.com/nk468fq
[5] Kent's cheap 1296 antenna – www.wa5vjb.com/yagi-pdf/cheapyagi.pdf
[6] *International Microwave handbook* 2nd Edition, p316 – www.rsgbshop.org
[7] Measurements on RTL dongles – http://tinyurl.com/mentroy
[8] G3YJR's blog – http://gm3yjr.blogs.it/
[9] *Microwave Journal* – www.microwavejournal.com
[10] Freescale Semiconductor RF heating – http://tinyurl.com/ky675s3
[11] MHT1003N 250W solid state heating device – http://tinyurl.com/my9go2s
[12] 2014 Microwave events list – http://microwavers.org/events.htm

February 2015 • RadCom
Andy Talbot, G4JNT • e-mail: ac.talbot@btinternet.com

Data

News and tips for datamodes

INTELLIGENT COM PORT PTT. Dave, G0WBX wrote in to give details of his solution to spurious triggering of the Tx/Rx control as the COM port is polled during computer activities. "For a year or three, I've been using a simple system to work a radio's PTT from a COM port, which greatly minimises spurious TX events as the computer boots, re-counts (enumerates) USB devices, or when some other non-ham program grabs the port by default. Such events generally raise both RTS and DTR together. In essence, this little solution also uses both RTS and DTR, but in a way that only one combination of the four possible states will key the radio. In this instance, +Ve is one 'state', -Ve or 0V is the other.) An example is shown in **Table 1**.

"I've used it with 'Real Hardware' com ports, as well as many USB / RS232 devices. It is also integrated into a homebrew RS232 / Icom C-IV interface. That works well from a generic USB RS232 device, doing rig control and 'safe' PTT too.

"*FLDIGI* fully supports this under *RigCAT*. Other software titles will use the interface if you just specify one line to use, and you're not using the same port for general rig control.

"It would be trivial for software authors to incorporate the needed settings to allow a user to do this sort of thing, but sadly few do. The author of *FLDIGI* was more than happy when I requested the change a few years back. Others have never responded to the query. Some software blindly raises both lines by default. That is bad.

"The circuit diagram is shown in **Figure 1**. I make no claim for originality, and it is not an isolated design. I'm not sure where the idea came from, but I do recall something like this back in the days of 'Poor Man's Packet' (under DOS) but that's all."

David also adds, "The C-IV interface is nothing special other than being entirely powered by those same handshake lines, with assistance from the PC's TXD line. Made from all discrete components, it runs at the rig's 'Full' speed very well. A three phase full wave rectifier (6 diodes) is used to recover power to run the interface and provide more RS232 like signals back to the PC, from the recovered negative voltage. (RTS, DTR and TXD are all used.) DTR and RTS are flipped in opposition to work the PTT as already shown, while still maintaining power for the interface."

TABLE 1: Example valid Tx state.

RTS	DTR	Tx?
-0	-0	no
+	-0	YES
-0	+	no
+	+	no

(DTR/RTS can be swapped)

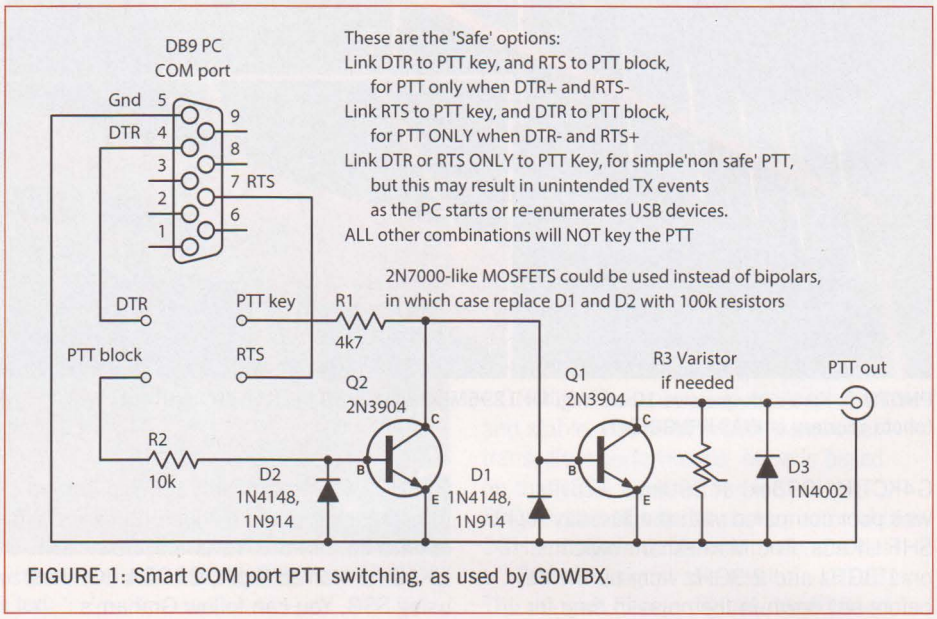


FIGURE 1: Smart COM port PTT switching, as used by G0WBX.

OPERA UPDATE. The latest software version of the on-off data mode *OPERA* was recently released. Graham, G0NBD comments that in the latest build standard all the decoder pass bands have been centred on 1500Hz, rather than on different audio tones depending on the speed selected. Enhancements have been made to the decode process that now enable up to a 60% fade or loss of signal for a decode. Just one tone speed option per band simplifies usage and fixed-beacon deployment. The choice of the preset speed / frequency bands was made based on user suggestions for the optimum preset speeds and associated filtering. *Opera* remains in development and is changing to meet new uses. Latest trials of OP05 on 10GHz in Spain apparently produced good results, even via the dedicated microwave SDR, as have the 70/ 23cm and 2m activities; only Russia seems to have other VHF users.

The lower bands have shown that a longer time line provides significant improvements. 477kHz /OP8 is providing good coverage at the -30 to -35dB decode levels for this reason.

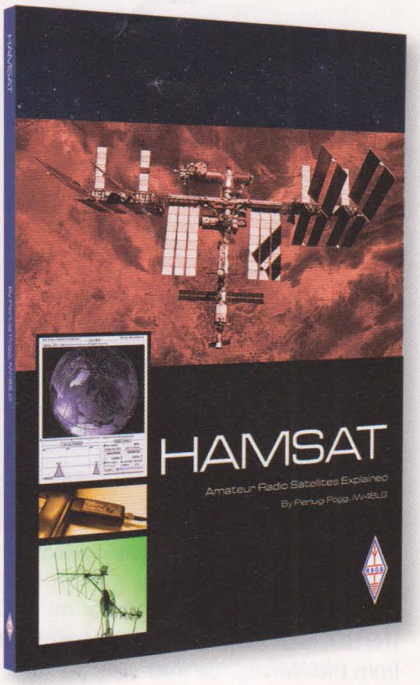
It is difficult, as Jose (the author) says, to make direct comparisons with other narrow, weak signal data modes (such as *WSPR*). The whole concept differs, the power/energy levels may not show advantage, but the design of the data processing has a great influence on the system's ability to recover data from the use of self-synchronising Manchester coding. In addition there is the averaging nature of the detection process and noise immunity by routine. A critical factor is the low level of hardware requirements in terms of complexity and stability. In reality, an external time locked 4-FSK system should provide significant gain over On-Off Keying (OOK).

SPREAD SPECTRUM ON 146MHz – OR NOT. In the August and October *Data* I suggested spread spectrum (S/S) may be suited to experimental use on the new 146MHz allocation, but unfortunately this looks not to be such a good idea for the new allocation. Final details of the simple spread spectrum generator are shown in this month's Design Notes. The spectral cleanliness required at the band edges mean that for a simple generator and filter such as this the symbol, or chip rate, needs to be kept down to 125kHz. This is hardly worth the effort and gives little advantage for S/S – except perhaps for demonstrating how multiple co-channel users could be accommodated. Other schemes, with carefully designed digital filtering performed in gate arrays or as firmware running on fast processors, could no doubt allow for higher bit or chip rate systems.

But it would have been nice to go for a simple system, similar to GPS coding and built using old-tech CMOS components or a small PIC controller, then use something like an RTL dongle to receive with. However, the satellite users could still find a use – spread spectrum could yet be a solution to overcrowding on the Cubesat downlinks.

Book Review

A whole year of *RadCom* plus 50 years of amateur satellites



Hamsat – Amateur Radio Satellites Explained

by Pierluigi Poggi, IW4BLG

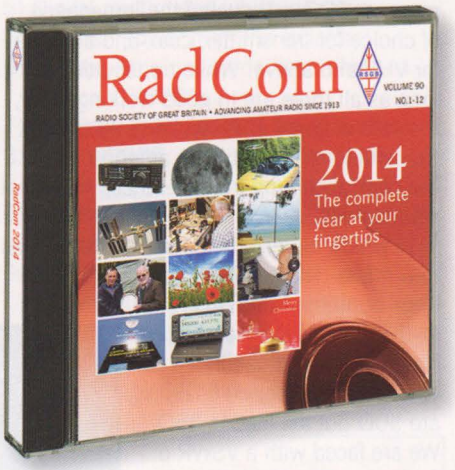
In 2007 the front cover of *RadCom* saluted the 50th birthday of Sputnik 1, the world's first artificial satellite and the accompanying article noted that the first orbiting satellite carrying amateur radio – OSCAR-1 – went into orbit four short years later, in 1961. Since then, radio amateurs have constructed many, many more small satellites and had them placed into orbit courtesy of a variety of space agencies. However, other than the late-60s booklet 25 Years of amateur spacecraft, there hasn't been a comprehensive overview of the achievements of radio amateurs in space communication. This book changes all that.

Hamsat contains a vast array of information about amateur radio satellites, ranging from OSCAR-1 to the latest AO73 FunCube, launched in 2013. (As an aside, I was at the National Radio Centre on launch day with the people who built and would control FunCube when it was launched, and that was an amazing time: the cheer that went up when we first heard signals is still ringing in my ears). But it's far from just a history lesson. The book is packed full of practical information including frequencies, link budget information, what you need in terms of setting up your own ground station antennas, the (over 40!) amateur satellites that are still active today, propagation and much more. All of this is explained in easy-to-read terms, supplemented by diagrams and photographs. The attention to detail amazed me, for instance there is a page that discusses the pros and cons of different coaxial connectors, a round-up of the most suitable radios for satellite working, antenna configurations, satellite frequency and 'mode' and even a primer on the Doppler effect – which, when applied to satellites, can be large in magnitude and complex in action.

Overall, *Hamsat – Amateur Radio Satellites Explained* is a fascinating look at the out-of-this-world experiments that can be done with the amateur satellites that are up there right now, whizzing around our planet at astonishing speeds.

ISBN 9781 9101 9307 5
128 pages, 240 x 174mm
Non Members' price £9.99
Members' price £8.49

RadCom 2014 Archive



At the end of every year, all the master files for that twelve month's *RadCom* are brought together and made into PDF files, one for each edition of the magazine. These files contain every word, every photo, every diagram, every advert and even every spelling mistoke in a compact, easy-to-browse format. With every one of the twelve issues running to 100 pages or more, that's over 1200 pages of the very best in amateur radio.

The 2014 archive contains some 55 construction and technical features, nearly 30 reviews, over 50 feature articles and much, much more. Whichever format you choose to obtain, the Archive takes up just a fraction of the space of the original printed versions and has the unique benefit of being searchable – so for instance if you wanted to find out how many times the word 'aardvark' appeared, the answer (once: last February) is just a few keystrokes away. On a more serious note, the search facility is invaluable for finding articles that you half-remember: it's easy to search on something like 'Moxon' and find all relevant articles.

Whilst many readers like to keep their copies of *RadCom* for later reference, there does come a point at which space becomes a premium in the shack. This is where the *RadCom* Archive can make a major difference. It also means you can take the whole year of magazines with you on your travels, giving you a wealth of reading and reference material on your portable device.

RadCom archives dating back to 1939 are also available – you'll find details of these on the RSGBshop.org website. The 2014 Archive contains bonus samples from earlier editions across the decades, so you can get a taster of how the magazine, its style, and amateur radio technology have changed in that time. (It's probably worth pointing out that only the magazines from about 1996 onwards are searchable: before that, the publishing technoloy did not lend itself to producing searchable files and the PDFs in the earlier archives are scans).

This year the Archive is available in either CD or USB memory stick format for the same price. Both contain the same data files, but the memory stick takes up even less shelf space than the CD. It even has several hundred of megabytes of spare space that you can use to store your own files. The memory stick version is particularly handy for devices such as netbooks, tablets and phones that do not come equipped with optical drives but that do support USB memory storage.

CD or memory stick format
Non Members' price £14.99
Members' price £12.74

February 2015 • RadCom
Mark Atherton, ZL3JVX • e-mail: markaren10@yahoo.com

Microwave circulators

RF magic in a little metal box

PHOTO 1: Circulators and isolators come in all shapes and sizes – and frequency ranges.

INTRODUCTION. This is a follow-on article from the 'Waveguide filter sweeper' article published in the May 2013 *RadCom*. Every time I get an article published, the phone always seems to ring a week or so later with one of the local radio clubs asking if I would mind 'doing a talk' on the subject.

At first examination, the conversion from an article into a *PowerPoint* would seem a simple proposition. In the case of the sweeper article, I kept getting stuck when it came to discussing the isolator, since it is derived from a circulator, which in turn is a jolly-interesting-piece-of-black-magic. Eventually I resigned myself to the fact that the club was getting a talk about a 'Waveguide filter sweeper", and another article and talk would need to be prepared if I didn't want to get too sidetracked. Well, here is the article (and is probably going to precede that next phone call).

BACKGROUND. This article documents some junk-box measurements relating to isolators and circulators from a small pile of goodies that have been slowly accumulating over the past few years (**Photo 1**).

At this point, I must say out loud that I am not an RF engineer. Most of my professional life has been spent convincing (or otherwise) zeros and ones to go rushing back and forth between sometime less than cooperative small black packages, and contributing a tiny part towards the technological advance we call 'the rat-race'.

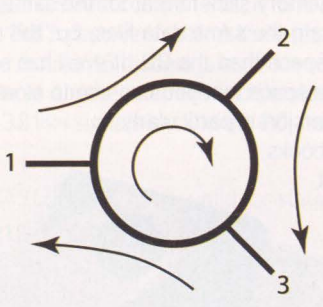


FIGURE 1: Circulator symbol, with the three ports labelled, plus the signal paths (arrows).

FORWARD/REFLECTED POWER & IMPEDANCE MISMATCH. Before we go too much further, it's worth going over some basics associated with impedance mismatch and its consequences. It's particularly useful to understand the concept of return loss [1].

Maximum (RF) power will be transferred between generator and load within an impedance controlled environment when generator, transmission medium and load are all the same impedance. For various reasons, 50Ω is (usually) the impedance of choice for transmitter, coax and antenna for VHF and above. While transmitting, as long as all three are in good working order, the vast majority of RF will end up being (hopefully) radiated by the antenna, with the coax absorbing the difference. This ideal situation results in a VSWR approaching 1:1, which represents the same situation as return loss (RL) exceeding some arbitrarily large number of decibels (>30dB RL is excellent).

Now take a situation where transmitter and coax are 50Ω but the load is 25Ω. We are faced with a VSWR of 2:1 and a RL of 9.5dB. In the case of a 100W (+50dBm) transmitter, reflected power will be 9.5dB below that, +40.5dBm (~11W). There is plenty more to be read on the web about VSWR and RL, but the main point of this example is the relationship between RL (9.5dB) and reflected power (~11W). See [2] for a table of RL vs VSWR from Mini-Circuits.

One related point is that a 4.75dB attenuator that is terminated in an open or a short circuit also has a return loss of 9.5dB (since the RF wavefront has to pass through the attenuator twice between leaving and returning to the RF source).

So to recap, the higher the VSWR of the load, the lower the return loss, and the higher the associated reflected power.

NB: the following text assumes a 50Ω characteristic impedance for the system

STRANGE FERRITE TECHNOLOGY. For quite a while, I have been aware of a very strange technology that, with the aid of ferrite magnets, an oddly shaped piece of brass (or copper) and some terminal points (usually RF connectors), it was possible to inject RF into one port, and for that signal to emerge out of only one of the two other ports. On some devices, the ports are physically 120° apart around a round enclosure and, even by rotating the enclosure and using the new pair of presented connectors, the same rules would still apply. So the RF is thought to 'circulate' around the assembly (see [3] for more details).

It has only been within the last few years that I finally managed to get my hands on a few of these devices so that some level of experimentation has been possible. This article hopes to uncover some of the attributes of such devices and present test scenarios, experiments, and applications for their use.

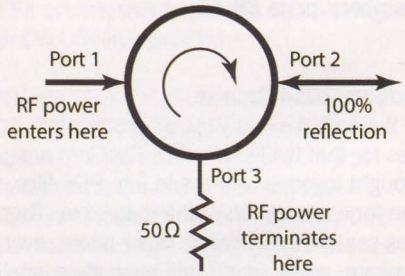


FIGURE 2: Circulator with unterminated port 2 delivers all power from port 1 to port 3.

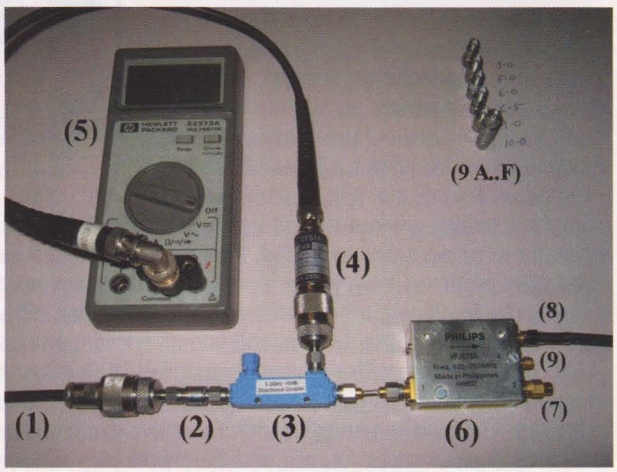


PHOTO 2: Isolator test setup. See text for key, and cross-refer to Figure 3.

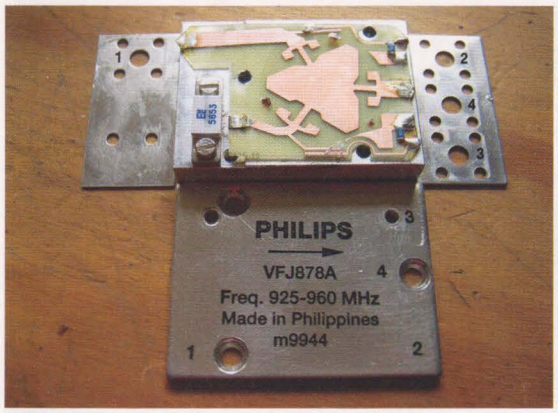


PHOTO 3: Inside the Philips VFJ878A isolator.

THE CIRCULATOR. The basic symbol is shown in **Figure 1**, where the arrows indicate power flow. It is useful to remember that an unterminated port will reflect 100% power straight back into itself. The basic rules of the circulator are:

- Power entering port 1 exits port 2.
- Power entering port 2 exits port 3.
- Power entering port 3 exits port 1.
- Power exiting a shorted port will be reflected straight back.
- Power exiting an open port will be reflected straight back.

Consider an example for a 50Ω system where port 1 connects to an appropriate RF power source, port 2 is unterminated and port 3 is terminated in 50Ω.

- All power entering port 1 will be passed to port 2.
- Port 2 is an open circuit, so power entering it will be completely reflected back into that port, hence will be directed around to port 3.
- Port 3 is terminated in 50Ω, so will absorb all of the power from port 1.
- Given that port 3 has absorbed all of the power from port 2, there is no reflected component to pass back to port 1.

Let's consider the consequences of this scenario. Firstly, the closer the termination on port 2 is to 50Ω, the less reflected power is passed on to port 3. This is rather useful because if you can measure the power arriving at port 3, you have a direct measurement of the quality of the termination on port 2. Zero power at port 3 means perfect termination at port 2. So this is a direct measure of return loss (which relates to VSWR) at port 2.

Secondly, provided port 3 is terminated in 50Ω, the impedance seen looking into port 1 will always be close to 50Ω, regardless of the load attached to port 2. For amplifiers or filters that are fussy about how they are terminated, this is an extraordinarily useful feature.

Generally, a three port circulator that is terminated on port 3 is referred to as an 'isolator', for reasons that are hopefully now obvious.

TEST SETUP. Having made all these claims, let's run through an experiment on the on the bench to verify them. **Figure 3** and **Photo 2** show the setup. The key items are

(1) RF source – a modified, home-made FM TV transmitter for 900MHz, set to 925MHz at +27dBm (500mW)
(2) 3dB attenuator, to ensure that even on the end of a piece of connecting coax, the RF source still looks like something close to 50Ω
(3) Directional coupler, which directs reflected power from the isolator input to the detector
(4) 10MHz to 12.5GHz crystal detector, used to rectify the output of item (3) for display by item (5)
(5) Digital multimeter, which displays reflected power from the isolator
(6) Isolator – the unit under test – here, a Philips VFJ878A
(7) Termination for forward power sniffer
(8) Agilent 8935, used as a signal level meter
(9) Test Port, which attaches to test attenuators
(9A ... F) – test attenuators, each with known return loss. These vary in values from 3dB through to 10dB, which when unterminated directly relate to return loss in the range 6dB through 20dB.

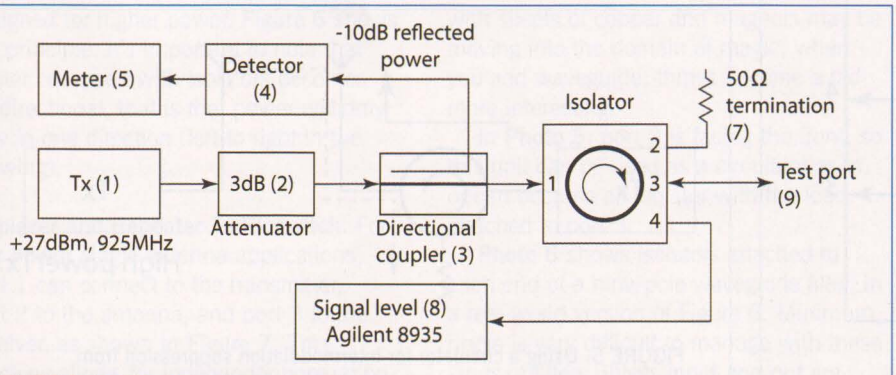


FIGURE 3: Isolator test setup schematic.

Item (a) is a reasonably simple design with a VT08090 VCO controlled by an MC12179 PLL, driving a Hitachi PF0031 power amplifier. Frequency was moved to 925MHz and output level set to +27dBm (500mW) for this application.

ISOLATOR TESTING. The test has two main parts. The first is to display the isolation performance of the unit under test, and is estimated by a display of reflected power from the Isolator. The second is to measure how power reflected from the test port affects power delivery into the unit's internal termination resistor.

Test 1. This is a pretty simple test of applying worst and best loads to the test port and to see how reflected power from the isolator (at port 1) changes.

Before this, a quick sanity check was done to verify that the directional coupler, detector and meter were functioning correctly. This was done by disconnecting the output of the directional coupler. It was confirmed that the reflected power was approaching applied input power of +23dBm. Second step was to attach a 50Ω terminator on the output of the directional coupler. Indicated reflected power dropped below -18dBm, which is the limit of this test setup. The directional coupler was then re-attached to port 1 of the isolator.

With test port (port 4) of the isolator an open circuit, reflected power was measured as -16dBm. With the test port terminated with 50Ω, reflected power was measured as better than -18dBm and rather difficult to quantify given the test setup.

In summary, this indicates a reasonably high performance unit given that it only uses a single isolation element.

Test 2. These tests were conducted on a cold morning and the RF source output level had dropped by 3dB to +23dBm. So with 3dB input attenuator in place, drive level to port 1 of the isolator was +20dBm. **Table 1** shows the measurement results, made using an Agilent 8935 attached to port 3 of the isolator while test loads were connected to port 4.

The output level at port 4 of the isolator is expected to be the port 1 level (+20dBm) less the coupling loss of the port 3 isolation termination sniffer (27dB), less return loss of the load attached to port 4 (twice the attenuator value). Overall the results are pretty much as expected, although the 9dB attenuator seems a little bit off-base.

As a side issue, the original intent was to use a switched attenuator as the return loss reference load, but even the 80mm of UT-141 coax connecting the isolator to the switched attenuator had quite a marked effect on test results. This is why individual SMA attenuators were used instead.

February 2015 • RadCom
Mark Atherton, ZL3JVX • e-mail: markaren10@yahoo.com

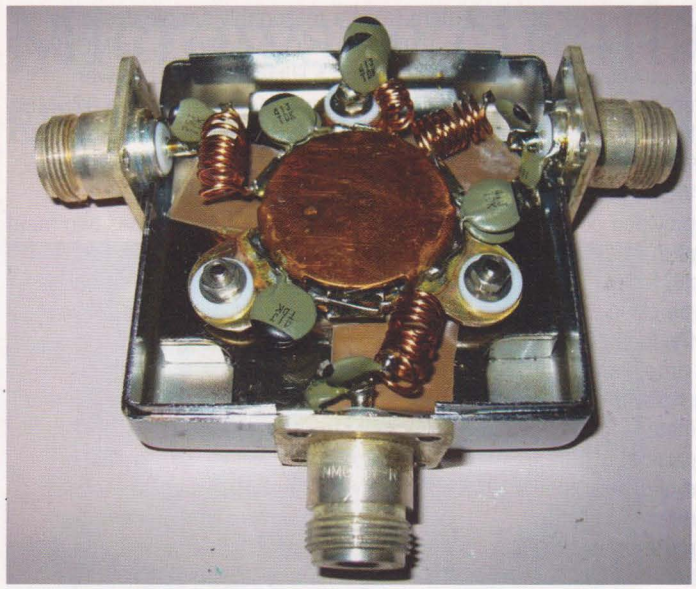


PHOTO 4: Inside the TDK 82MHz circulator.

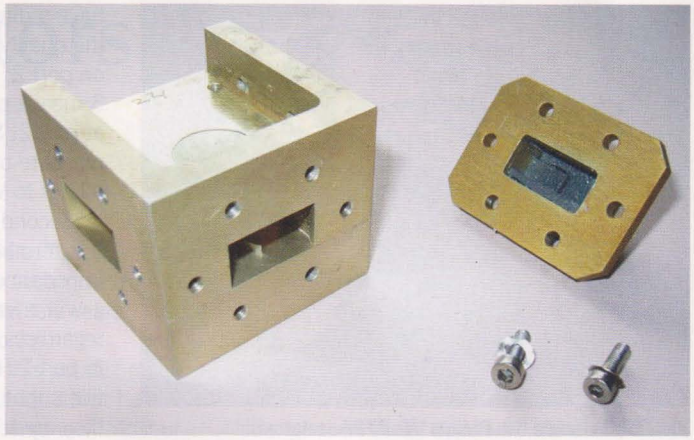


PHOTO 5: 10GHz waveguide circulator (left) and termination (right).

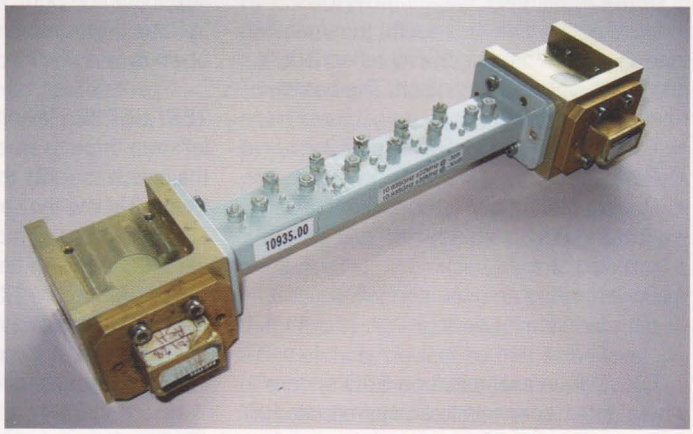


PHOTO 6: A nine-pole 10GHz waveguide filter with isolators (as per Photo 5) attached at each end.

INSIDE THE ISOLATOR. Taking a closer look, the schematic of the unit under test is shown in **Figure 4**. As far as the connections are concerned, port 1 is the isolated input to the unit. Port 2 is a -27dB sniff of the input power arriving at port 1. Port 3 is a -27dB sniff of the power arriving at the internal termination resistor. Port 4 is the main output (although it will also carry reflected power). **Photo 3** shows a glimpse inside the unit, after the lid was gently prised off with the help of a large blowtorch. The unit was also originally fitted with four 50Ω SMA bulkhead female connectors.

The item that is not readily apparent from the photo is the thin round magnet that is just under the lid, and its counterpart that lives under the PCB assembly. The bulk of the magic associated with circulators and isolators is this interaction of magnetic fields, ferrite, electron spin, and a round (or in this case triangular) conductor connecting the three ports. See [3] page 4 for a more comprehensive description of operation.

The two printed prongs on each of the three ports are for impedance matching. From the change in width of conductor past there matching points, it is reasonable to assume that the native feed impedance is higher than 50Ω, maybe 80Ω in this particular case.

Finally, if the internal termination resistor were replaced with a fifth port, this unit would become a circulator.

ALL SHAPES AND SIZES. As Photo 1 shows, isolators and circulators come in various shapes and sizes. Generally, the larger the beastie, the lower the frequency. To get some idea of relative size, large connectors are 'N' type, while small connectors are SMA. One item of note is the 6GHz unit that is configured with a termination on port 2, so input is on port 3, while the output is on port 1.

There are also some 10 and 12GHz units kicking around here. They are about a third of the volume of the 4-8GHz unit, so are becoming quite small.

The oldest unit in the lead photograph appears to be the TDK 82MHz circulator (**Photo 4**). This is quite a work of art inside, with sheets of folded copper, glued magnets, and lumped matching components. The underside of the unit even has access apertures so that internal matching components can be adjusted to set frequency of operation. This is in quite stark contrast to the production engineered Philips 950MHz unit, which is based on an FR4 printed circuit board and a machined casting (as we saw earlier).

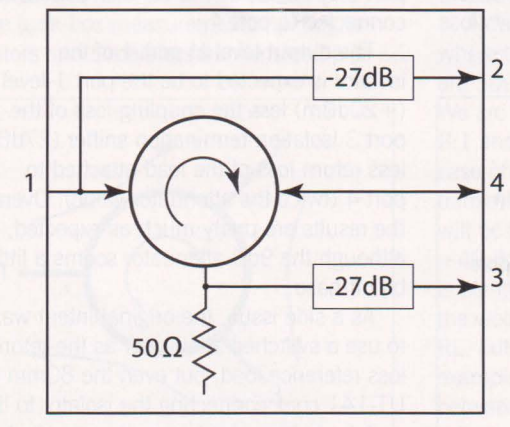


FIGURE 4: Philips VFJ878A isolator schematic.

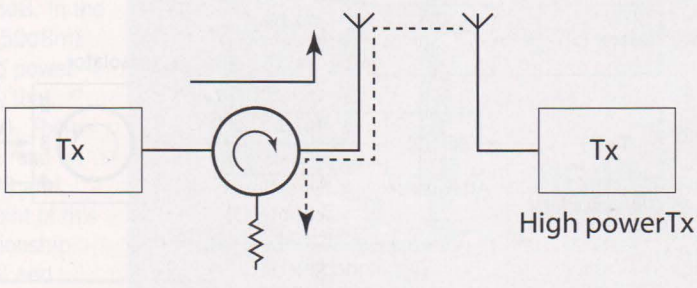


FIGURE 5: Using a circulator for intermodulation suppression from adjacent services.

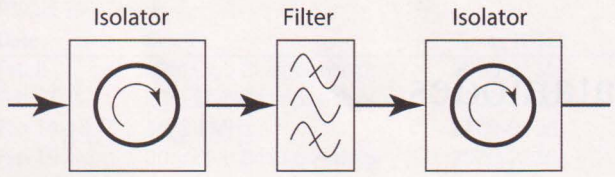


FIGURE 6: Filter matching.

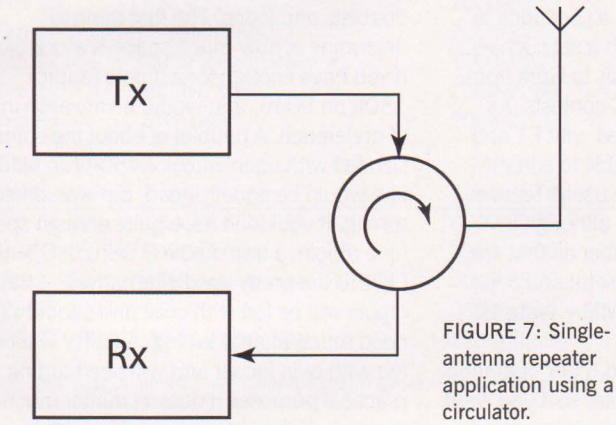


FIGURE 7: Single-antenna repeater application using a circulator.

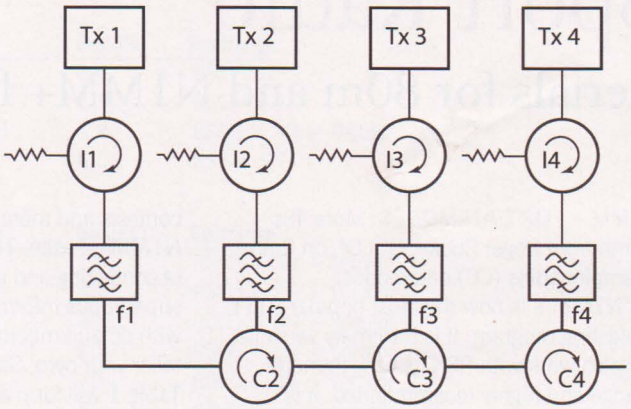


FIGURE 8: Transmitter power combining using circulators.

APPLICATIONS FOR THE ISOLATOR AND CIRCULATOR.

TX intermodulation suppression. In situations where the antenna of a transmitter is located in a high field strength area (usually co-located with other transmitters), there is the possibility of the generation of interference, in the form of intermodulation. RF from the adjacent services can feed into the Tx PA, causing mixing products to be generated. The inclusion of an isolator in the low power Tx antenna feed can fix this problem by diverting adjacent Tx antenna RF into the isolator's load, rather than the PA of the output device. This solution can be beneficial to anything from repeaters to broadcast installations.

Filter matching, and ripple. It can be (much) easier to adjust RF filters for minimum ripple when the unit sees correct matching impedance on both input and output. Given the added cost of an isolator, this usually only applies to filters designed for higher power. **Figure 6** shows the principle. It's important to note that a filter equipped with isolators becomes unidirectional, that is that power will only flow in one direction (left to right in the drawing).

Duplexer and Repeater Tx/Rx switch. For **low power** single antenna applications, port 1 can connect to the transmitter, port 2 to the antenna, and port 3 to the receiver, as shown in **Figure 7**. This topology allows for independent operation of Tx and Rx systems (as in the case of a low power repeater). It also allows full duplex operation, where the Tx and Rx are on different frequencies, and are carrying different traffic. One requirement of this topology is that each port is presented with a reasonably good match from its associated termination. Isolation is by no means perfect and a good receiver is still required – usually with on-frequency filtering – but an isolator will reduce the amount of RF hitting the front end by a good 30dB or so.

RF Power Combining. This is rather a clever topology (**Figure 8**) where the return loss of filter 2 is sufficiently low at frequency 1 that circulator 2 (C2) passes F1 and F2 through to the following stage. This repeats for all additional transmitters. Also, isolators protect the transmitters from any out of band returned power that may leak through the filters.

WAVEGUIDE VARIANTS.

An article such as this just would not be complete without mention of the waveguide variants of isolators and circulators. As much as you (like I) may consider the physics associated with sheets of copper and magnets may be moving into the domain of magic, when you add waveguide, things become a tad more interesting.

In **Photo 5**, port 3 is facing the front, so this unit can be used as a circulator as-is, or can become an isolator with the load attached to port 3.

Photo 6 shows isolators attached to each end of a nine-pole waveguide filter, in a real-world version of Figure 6. Minimum ripple is very difficult to manage with these kinds of filters unless input and out are matched correctly, eg by using isolators.

MEASURING UNIT BANDWIDTH.

I did a fair amount of head-scratching on this subject before the rather obvious solution popped out. In the case of a circulator, terminate the third port with the characteristic impedance of the unit (making it an isolator). Then, with port 1 open-circuit, measure return loss (RL) while looking back into port 2. Within the design bandwidth of the unit, power from port 2 will be directed into port 3 so, for this range of frequencies, the unit will present an increased RL.

CONCLUSION.

During the preparation of this article, a significant amount of stuff has been learned about these quite amazing, passive ferromagnetic devices. For continued reading, see Philips applications note AN98035 [3], which covers some of the physics as well as further applications.

CREDITS.

I would like to thank Julian Corben, VK2EXT, who helped with initial editorial comment about this article. Also, my long-suffering wife, who never seems to be surprised to find lumps of electronics next to the chicken in the freezer, nor ever complains about the odd explosion from my office.

WEBSEARCH

[1] http://en.wikipedia.org/wiki/Return_loss
[2] www.minicircuits.com/app/DG03-111.pdf
[3] http://f6csx.free.fr/techni/CIRCU/Circulateurs2.pdf

TABLE 1: Isolator performance.

Load	Port 4 (dBm)	Theoretical (dBm)
Open	-6.50	-7.00
Short	-6.50	-7.00
3.00	-12.50	-13.00
5.00	-16.00	-17.00
6.00	-16.70	-19.00
6.50	-17.80	-20.00
9.00	-23.00	-25.00
10.00	-26.60	-27.00

Port 1 level	20.00dBm
Port 1 sniffer	-27.00dB

February 2015 • RadCom
Steve White, G3ZVW • e-mail: steve.g3zvw@gmail.com

Sport Radio

Aerials for 80m and N1MM+ for datamodes

N1MM+ FOR DATAMODES. More this month from Roger Cooke, G3LDI, on Club Championships (CC) datamodes.

"N1MM+ is now the most popular RTTY contesting program. It is extremely versatile, will also work with PSK, is easy to mode change and highly recommended. It is especially suitable for contests like the RSGB Club Championships, where it is essential to have QSOs on both modes to attain a good score. Setting up N1MM+ isn't easy, but there is help, so if you have problems ask someone who is experienced.

"Two modes of operation are used in contesting; Run and Search & Pounce (S&P). Running within N1MM+ is very easy with datamodes. It is all achieved with mouse clicks. Configure your screen as you wish to see it and you will probably use the same setup for all data contests.

"For RSGB CC contests use can be made of the DL4RCK Telnet RBN to populate the bandmap before the contest, from those who are grabbing a frequency. Using the bandmap for S&P is great and works well, assuming the stations shown are still there!

"Always make sure your RIT and XIT are in the OFF position, AGC in the FAST position and speech processor OFF. It is easy to forget to switch the RIT off after tuning a station in who was off frequency and then wonder why nobody answers, so make sure you always configure the equipment and software before the contest starts and, if possible, conduct tests with a local to make sure it is all working correctly.

"Macros are available for most major data contests and there are lots of them on the N1MM website. They are an important part of contesting and it is essential to exclude superfluous information. N1MM+ comes with default macros, but it's a good idea to tailor your own. Starting with a set such as in **Table 1** will form a good basis to work from. These are tailored for the CC contests. As you can see the RIT is cleared with F1 and F3 when running. It is possible to edit the macros on the fly too, a very useful feature. Hotkeys are very useful and although it will be impossible to remember all that are available, several are very useful and a full list can be found on the N1MM+ website (see below)."

There is a more advanced RTTY operating article on the UKEICC website, so if you want more ideas please go to www.ukeicc.com/contest-operating-techniques/datamodes-operating/rtty-contesting-techniques

A comprehensive set of N1MM macros (.MC) files can be found at http://n1mm.hamdocs.com/tiki-index.php?page=Setup+RTTY+and+PSK+Contests

The following site provides a wealth of information and good reading on Hotkeys and Shortcuts for N1MM+: http://n1mm.hamdocs.com/tiki-index.php?page=Key+Assignments+-+Keyboard+Shortcuts

BASIC 80m CONTESTING ANTENNAS. With the new 80m Club Championship series starting this month I thought it might be useful for those considering entering for the first time to have some recommendations about suitable antennas. This is a personal view, but based on practical experience.

From the outset I should say that I have a preference for balanced antennas – dipoles, doublets and loops. The first thing to determine is how much space is available. If you have enough for a dipole (approx 130ft on 80m), that would be my antenna of preference. A doublet of about the same size fed with open wires or 450-ohm ladder-line would be equally good, but would need tuning. If you don't have quite enough space for a dipole, a trap dipole (108ft) or G5RV (102ft) are pretty good alternatives. A trap dipole will be fed with coax and shouldn't need much (if any) tuning. A G5RV will be fed with twin feeder and will need tuning. For practical purposes it doesn't matter much if the ends of the antenna are dropped down vertically or pulled across at right angles to the main run, so in the case of the trap dipole you ought to be able to fit it into a 90ft space. For working around Britain an 80m antenna doesn't need to be high. 25ft is enough, although higher is better.

I can imagine those who live in houses with small gardens yearning for such space, but all is not lost! First, if your house measures 30ft front-to-back, you can effectively think of your back garden as being 15ft longer, because that's the distance from the back wall to the ridge of the roof. Secondly, if you can extend the antenna onto the front of the house, you gain even more space.

Next, consider having the antenna in an inverted-V configuration. You can easily gain effectively 20% more space this way. This is what I did when I lived in London. My back garden was 40ft long and my front garden about 20ft long. The house was about 36ft front-to-back, giving a straight line of 96ft, but I managed to squeeze a full-size 80m doublet into that space by having the feedpoint on a pole on a chimney stack and bringing the wires down at angles. I also went diagonally across the plot, from one side of the front garden to the opposite side of the back. Even so, in the front garden I needed to drop the last 10ft or so of wire vertically. The supporting mast at the front was fibreglass, painted dark green and concealed in a holly tree, so barely visible to passers by. It would have been better to position the antenna further from the house, but beggars can't be choosers!

Coming down in size, what if you have a 30ft-long back garden, no access to the front, no convenient trees, no chimney and no access to the roof? If that describes

TABLE 1: G3LDI's suggested datamodes macros.

```
F1 Run CallCQ,{TX}{enter}CQ CC {MYCALL} cq{RX}{ENTER}{CLEARRIT}
F2 Run Exch,{TX}{enter} 599 {EXCH} {EXCH} {EXCH} ! K{RX}{enter}
F3 Run End,{TX}{Enter}TU {MYCALL} qrz?{ENTER}{RX}{CLEARRIT}
F4 MY CALL,{TX}{Enter}{MYCALL} {MYCALL}{RX}{ENTER}
F5 HIS CALL,{ENTER}{TX}!
F6 UR CALL PSE?,{enter}{TX}UR CALL AGN PSE {RX}
F7 QRZ,{ENTER}{TX}QRZ? {MYCALL} k{RX}{ENTER}
F8 NR AGN PSE?,{TX}{ENTER}NR AGN PSE{RX}{ENTER}
F9 MY NR OUT X 3,{ENTER}{TX} NR {EXCH} {EXCH} {EXCH} OK?{ENTER}{RX}
F10 73,{ENTER}{TX}73{RX}{ENTER}
F11 Grab,{Grab}
F12 Wipe,{Wipe}
F1 DE G3LDI,{TX}{ENTER}{MYCALL} {MYCALL} K{ENTER}{RX}
F2 S/P EXCH,{TX}{ENTER}TU 599 {EXCH} {EXCH} {EXCH} K{RX}
F3 TU,{ENTER}{TX}! TU 73 {RX}{ENTER}
F4 MYCALL,{TX}{ENTER}{MYCALL} {MYCALL} k{RX}
F5 PSE RPT,{TX}{ENTER}AGN AGN DE {MYCALL}{ENTER}{RX}
F6 NOT IN LOG,{TX}{ENTER} NOT IN MY LOG - PSE QSO AGN{ENTER}{RX}
F7 MY EXCH AGN,{TX}{ENTER} {EXCH} {EXCH} {EXCH} BK {RX}{ENTER}
F8 MYCALL,{TX}{ENTER}{mycall} {RX}{ENTER}
F9 NUMBER?,{TX}{ENTER}NR AGN PSE? {RX}{ENTER}
F10 UR CALL PSE?,{TX}{ENTER}PSE RPT YOUR CALL ONLY{ENTER}{RX}
F11 Grab,{GRAB}
F12 Wipe,{WIPE}
*,-
```

RSGB HF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Feb 2	80m Club Championships	2000-2130	SSB	3.5	RS + SN
Feb 11	80m Club Championships	2000-2130	Data	3.5	RST + SN
Feb 14-15	1st 1.8MHz *	2100-0100	CW, SSB	1.8	RS(T) + SN + District
Feb 19	80m Club Championships	2000-2130	CW	3.5	RST + SN

RSGB VHF Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange
Feb 3	144MHz UKAC	2000-2230	All	144	RS(T) + SN + Locator
Feb 8	432MHz AFS §	0900-1300	All	432	RS(T) + SN + Locator
Feb 10	432MHz UKAC	2000-2230	All	432	RS(T) + SN + Locator
Feb 17	1.3GHz UKAC	2000-2230	All	1.3	RS(T) + SN + Locator
Feb 22	70MHz Cumulative #1	1000-1200	All	70	RS(T) + SN + Locator
Feb 24	50MHz UKAC	2000-2230	All	50	RS(T) + SN + Locator
Feb 24	SHF UKAC	2000-2230	All	2.3-10G	RS(T) + SN + Locator

Best of the Rest Events

Date	Event	Times (UTC)	Mode(s)	Band(s)	Exchange (info)
Feb 14-15	CQ WW WPX RTTY	0000-2359	RTTY	3.5-28	RST + SN
Feb 14-15	PACC Contest	1200-1200	CW, SSB	1.8-28	RS(T) + SN (PAs send Province)
Feb 21-22	ARRL International DX	0000-2359	CW	1.8-28	RST + tx power (Ws send State, VEs Province)
Feb 21-22	REF Contest	0600-1800	SSB	3.5-28	RS + SN (Fs send Dept No. or overseas prefix)
Feb 27 - Mar 1	CQ WW 160m DX	2200-2200	SSB	1.8	RS + CQ Zone (Ws send State, VEs Province)

§ Super League event * HF Championship event. For all the latest RSGB contest information and results, visit www.rsgbcc.org

your home you clearly don't have space for a balanced antenna that is going to be effective in an 80m contest, but all is not lost! In this situation I would suggest a ¼-wave inverted-L antenna. Fix a 10m-long telescopic fibreglass fishing pole to the fence at the far end of your garden, then install coax from your shack to the base of the pole. Remove the top section of the fishing pole, which is going to be too flimsy to be of much use. The reduced height (approx 9m/30ft) plus the distance to gutter height at the back wall of the house will be about 60ft, which is enough for an 80m ¼-wave. Use fairly thin wire for the horizontal part of the antenna – and don't pull it tight, because it might put too much strain on the fishing pole. Use thicker wire for the vertical part of the antenna. In this type of installation an efficient grounding system will be key to making it efficient. As many earth rods as possible and counterpoise wires of varying lengths along as many fences as possible will help in this endeavour. Even with a reasonable grounding system you shouldn't expect it to be as effective as a dipole/doublet for working around Britain, although it might be better than a low dipole for longer distances.

If you don't want to (or can't) keep such an antenna up all the time, telescope the fishing pole down when it's not in use. Irrespective of whether the antenna was going to stay up permanently or not, what I would do is tape the antenna wire to the fishing pole just below the top of each telescopic section, so that it doesn't flap about much in the wind. This has the added benefit of making the wire hang in loops when the mast is telescoped down, rather than lay in a pile on the ground.

THIS MONTH'S EVENTS. The 2015 series of 80m Club Championship contests starts this month. For several years Bristol CG were the winners, but in 2013 Norfolk ARC won and last year the Three A's CG won, so it's not all one-way traffic these days. It will be interesting to see which of these groups goes all-out to win this year – and also of course if any ambitious new groups try to get their name engraved on the trophy. The first leg is CW on Tuesday 2nd, followed by SSB on Wednesday 11th. The First 1.8MHz Contest is on Saturday 14th. There are CW-only, SSB-only and mixed mode sections for UK and non-UK stations. Please remember that on CW (below 1850kHz) you are allowed to run 400 watts, whereas on SSB (above 1850kHz) you are limited to 32 watts. The last RSGB HF event of the month is the datamodes leg of the 80m Club Championships. The modes are RTTY and PSK63, and you can work the same stations on each of them. The trick of winning an individual datamodes leg is to strike the right balance between the number of RTTY and PSK QSOs – which usually means slightly more on PSK than RTTY.

On VHF the 2m UKAC is the first event of the month, on Tuesday 3rd. 70cm AFS on Sunday 8th will be the final leg of this season's Super League series. Considering it is held at a time of the year when the weather can be particularly wet/windy/frosty/snowy, expect a good number of stations to operate portable. It all comes down to takeoff, which becomes increasingly important as you go higher in frequency. Proof of this is that last year 58% of the stations in the section where the portables are – the Open section – made 50 QSOs or more, whereas only 25% of the stations in the Single Op Fixed section managed to do so. The first in the 2015 series of 4m Cumulatives takes place on the morning of Sunday 22nd. Between February and August there will be five sessions. To round-out the month we return to the UKACs, with 6m + SHF. 13cm activity starts 30 minutes after the other SHF bands.

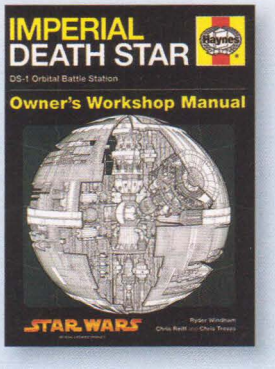
The first WPX contest of the year is the RTTY leg, which will be held over the entire weekend of 14-15th. I know its tempting fate, but if solar conditions are anything like as good as they were for the major international contests toward the end of last year, we'll be in for a treat. If RTTY isn't your thing, the (Dutch) PACC Contest is held for 24 hours over the same weekend on CW and SSB. Work Dutch stations only, exchanging a signal report and serial number. Dutch stations send a 2-letter Province code, instead of a serial number. There are twelve Provinces, which act as multipliers to the score. For the whole weekend of 21st-22nd the ARRL International DX Contest will be keeping the HF bands busy. This is the CW leg (SSB is next month). Work Ws and VEs only, exchanging a signal report and your transmit power. US and Canadian stations send State/Province code, instead of power. For 36 hours over the same weekend the REF (French) Contest also takes place on SSB. Work France and French overseas territories only. Send a signal report and serial number. French stations send a 2-digit Department code instead of serial number. Finally, starting at 2200 on Friday 27th, the CQ WW 160m DX SSB Contest runs for 48 hours. Send a signal report plus CQ Zone (the UK is 14).

WINTER SALE

Even more book offers!

RSGB

Haynes
Imperial Death Star Manual



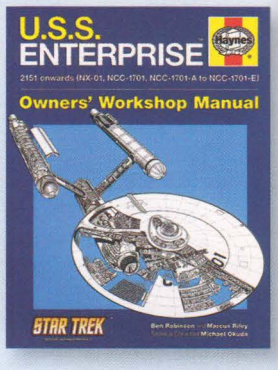
By: Ryder Windham,
Illustrators Chris Reiff - & Chris Trevas

The DS-1 Orbital Battle Station or Imperial Death Star, from Star Wars films is given the Haynes Workshop Manual treatment. This hardback book covers the iconic battle station tracing the origins, from its concept through to a top-secret project that began before the foundation of the Empire and drew design inspiration from the Trade Federation's spherical warships.

The size of a small moon, highly armoured and armed to destroy. The Death's Star's on-board systems and controls are explained in detail, and illustrated with an astonishing range of computer-generated artwork, floor plans, cutaways and exploded diagrams. Covering history, development and prototyping, superstructure, energy and propulsion, weapons and defensive systems, hangar bays, security, service and technical sectors, crew facilities, and also information about Death Star II and its planetary shield generator, this is the most thorough technical guide to the Death Star available.

Hardback, Size: 270x210mm, 128 pages, ISBN: 9780 8573 3372 8
Non Members' Price: £16.99
RSGB Members' Price: £6.99 (£10.00 off)

Haynes
U.S.S. Enterprise Manual



By: Ben Robinson, Marcus Riley
& Tech Consultant Michael Okuda

The Starship Enterprise gets the Haynes treatment! This hardback book provides in-depth information about these extraordinary ships from the TV series', from the Enterprise NX-01 through Captain Kirk's Enterprise NCC-1701 to Captain Picard's Enterprise NCC-1701-D and NCC-1701-E.

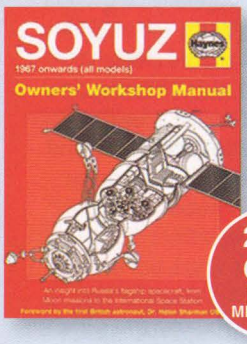
Featuring cutaway drawings, technical illustrations and photographs along with comprehensive background information and specifications on the technology used on board the USS Enterprise, in all its various incarnations. Newly created artwork throughout, including full-ship cutaways of each Enterprise, key systems, and interior locations together with detailed new exterior views by one of STAR TREK's original visual effects artists. There are histories of each vessel, technical information about their systems, and discussions of key technologies such as transporters and warp-speed travel.

Hardback, Size: 270x210mm, 160 pages, ISBN: 9781 8442 5941 0
Usual Retail Price £21.99
RSGB Non Members' Price: £16.99
RSGB Members' Price: £6.99 (£10.00 off)

£10 OFF

EXTRA SPECIAL PRICE OFFER

£6.99 EA RSGB Members' Price

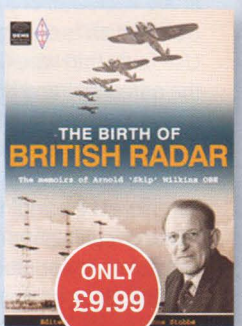


Hardback,
Size 270 x 210mm, 172 pages,
ISBN: 9780 8573 3405 3
Non Members' Price: £21.99
RSGB Members' Price: £16.49
(25% off)

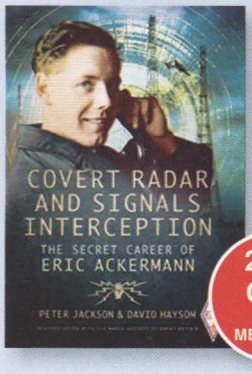
25% OFF RSGB MEMBERS

25% OFF RSGB MEMBERS

Hardback
Size 270 x 210mm, 176 pages,
ISBN: 9780 8573 3272 1
Non Members' Price: £21.99
RSGB Members' Price: £16.49
(25% off)

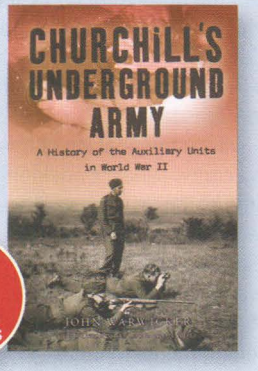


Size 174x240mm, 128 pages
ISBN: 9781 9050 8675 7
Price: £9.99



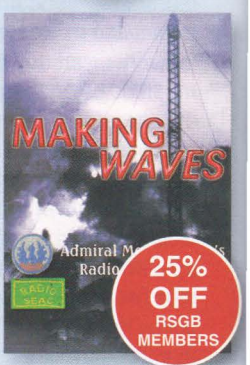
Hardback.
Size: 160x240mm, 224 pages
ISBN: 9781 7834 6268 1
Non Members' Price: £19.99
RSGB Members' Price: £14.99
(25% off)

25% OFF RSGB MEMBERS



50% OFF RSGB MEMBERS

Hardback
Size 162x240mm, 288 pages
ISBN: 9781 8483 2515 9
Non Members' Price: £25.00
RSGB Members' Price: £12.50
(50% off)



Size 150x225mm, 194 pages
ISBN: 9781 4936 9721 2
Non Members' Price: £9.99
RSGB Members' Price: £7.49
(25% OFF)

25% OFF RSGB MEMBERS

FROM P&P FREE

Order on the internet at **www.rsgbshop.org** or you can order by post making cheques and postal orders crossed and made payable to Radio Society of Great Britain or telephone your credit card order to **01234 832 700**. Open 8.30-4.30 (Mon-Fri). Send no cash. **Post & Packing:** Standard Delivery - 2nd Class Post (4-9 Days), For one item £1.95, For two or more items: £3.50, **For orders over £30.00 standard delivery is FREE.** Priority Delivery - 1st Class Post (2-4 Days), For one item £2.95, For two items: £4.95 , For three or more items: £5.95. **Overseas:** Worldwide Surface Delivery, For one item: £3.00, For two items: £5.00, Extra items: £1.00 per item. Worldwide Air Delivery: For one item: £9.00, For two items: £15.00, Extra items: £3.00 per item.

Shop

EVEN MORE OFFERS ONLINE
www.rsgbshop.org

RSGB shop

HF Antennas for Everyone

By Giles Read, G1MFG

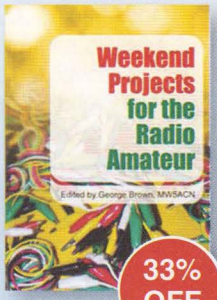
The RSGB has always published the very best antenna designs available. *HF Antennas for Everyone* draws on 90 *RadCom* and *Radio Communication* articles from the last forty years, providing a collection of HF antennas.

The selection in this book is a deliberate mix of the traditional and more recent designs. Sub divided into broad sections including horizontal, vertical and loop antennas, there is much variety to be found here. Whichever bands you want to work on, whatever the state of the sunspot cycle and however large or small your garden, in *HF Antennas for Everyone* you'll find an antenna that will get you heard.

Size 240x174mm, 336 pages
ISBN: 9781 9050 8659 7

Price £9.99: (33% off)

Weekend Projects for the Radio Amateur



By George Brown, MW5ACN

As the title suggests *Weekend Projects for the Radio Amateur* is packed with over sixty articles covering a wide variety of projects for every radio amateur.

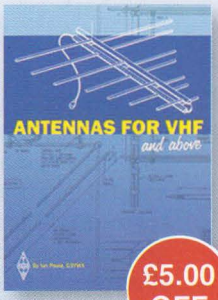
Weekend Projects for the Radio Amateur is broken down into two main parts: Build It Yourself and Reference with the first part split further into three sections Aerials, General and Station Accessories. Reference is packed with articles to maximise the hobby.

With something for everyone, this book is excellent those just looking for interesting ideas to construct and for the newcomers to the hobby looking to expand their knowledge.

ISBN: 9781-9050-8641-2
Size 240x174mm, 224 pages

Price £9.99: (33% off)

Antennas for VHF and Above



By Ian Poole, G3YWX

VHF, UHF and microwave bands provide an opportunity for experimentation with antennas. This book is a guide to what can be achieved in these bands.

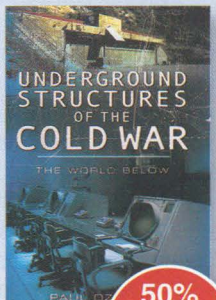
Antenna sizes at these frequencies do not occupy great amounts of space so allowing construction experimentation. *Antennas for VHF and Above*, provides both basic theory and constructional details for antenna designs.

Antennas for VHF and Above, is a mine of information for anyone wishing to understand or construct antennas for the VHF, UHF and microwave bands. This book is a valuable resource for anyone interested in antennas, whether a newcomer or experienced hand.

Size 240x174mm, 144 pages
ISBN: 9781 9050 8645 0

Price: £7.99 (£5.00 off)

Underground Structures of the Cold War

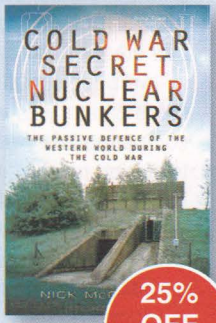


By Paul Ozorak

Underground Structures of the Cold War: The World Below describes when and where these bunkers were built and records what has become of them. It also explains how they would have been used if a nuclear war had broken out and in the case of weapons bases, shows how these weapons would have been deployed. The book covers every sort of facility - public shelters, missile sites, command and communication centres, storage depots and hospitals. There are details of facilities from 65 countries around the world including in depth coverage of the UK and USA and Russia, China, North Korea and Warsaw Pact countries are not forgotten.

Hardback Size: 165x240mm, 384 pages
ISBN: 9781 8488 4480 3
Non Members' Price: £24.99
RSGB Members' Price: £12.49
(50% off)

Cold War Secret Nuclear Bunkers



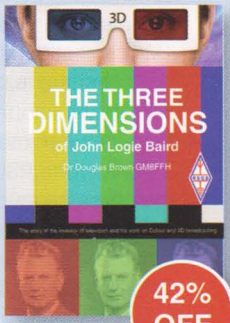
By: Nick McCamley

Many will be aware that Britain is littered with a huge number of "Nuclear Bunkers" many of which are left over from the "Cold War". These relics represent the elaborate precautions that governments took to protect themselves in the event of nuclear war. However, for good reasons the precise nature of these arrangements has until now remained a closed book. *Cold War Secret Nuclear Bunkers* reveals for the first time the true extent of the preparations made.

This book is a fascinating read detailing a huge array of bunkers in the UK and further afield. Recommended reading for anyone interested cold war history.

156x232mm, 288 pages,
ISBN: 9781783030101
Non Members' Price: £14.99
RSGB Members' Price: £11.24
(25% off)

The Three Dimensions of John Logie Baird



By Douglas Brown, GM8FFH

John Logie Baird (1888-1946) is remembered as the inventor of television but his work in colour, 3D and holographic television is much less well known. *The Three Dimensions of John Logie Baird* sets out this work and adds a new perspective.

The Three Dimensions of John Logie Baird details Baird's story from his early years through to those where, despite ailing health and poverty, he did more to advance the early development of television than any other individual.

A fascinating read that provides an excellent reference work to his inventions.

Size 174x240mm, 208 pages
ISBN: 9781 9050 8679 5

Price £9.99: (42% off)

Radio Society of Great Britain **www.rsgbshop.org**
3 Abbey Court, Priory Business Park, Bedford, MK44 3WH. Tel: 01234 832 700 Fax: 01234 831 496

EMC

Latest news on electromagnetic compatibility issues

PLASMA TVS. Further to the item in December 2014 EMC Column about RFI from plasma TVs, these are gradually being phased out but the EMC committee is still receiving reports where plasma TVs affect amateur radio reception. We have found that some major TV manufacturers have been helpful in resolving problems and even where a manufacturer has not been helpful, we have had cases where retailers have been helpful. If any RSGB Member needs assistance with plasma TVs, they can make contact via the RSGB EMC Matters forum (see Websearch).

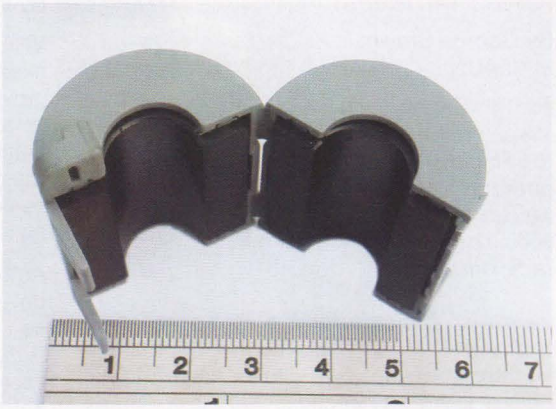


PHOTO 1: Numerous clip-on ferrite cores like this were fitted to a plasma TV by a manufacturer in an attempt to reduce interference. The ruler scale is marked in cm.

In one case in South Wales, a Member has had several problems with plasma TVs over the years. In the most recent case, the neighbour was helpful and understanding and had been into the radio amateur's house to hear the effect that the TV was causing. The matter was reported to Ofcom and we understand that Ofcom confirmed to the neighbour in writing that the interference was coming from the plasma TV. It is reported that the neighbour then contacted the manufacturer and provided a copy of the information from Ofcom but the manufacturer just dismissed the matter.

One of the RSGB EMC Advisors then became involved and e-mailed the manufacturer. The manufacturer asked for various details and asked whether ferrite chokes had been tried. Our advisor explained that this was not likely to be a faulty TV but the problem is quite common and is the nature of this type of TV if it is in close proximity to a radio installation. After the case was escalated to a higher level the manufacturer arranged to pick up the TV and take it to one of their service centres for inspection.

The service centre replaced the power supply unit then the AC filter board and then they exchanged the whole TV but they exchanged it for the same model, which made no difference to the emissions of RFI. The manufacturer was not prepared to exchange the plasma TV for an LED type that would be 'quiet' at RF. Nevertheless, it was pointed out to them that two other manufacturers have done this as a gesture of goodwill in similar circumstances. The manufacturer was also asked about their policy on Corporate Social Responsibility (CSR).

Then the retailer became involved and asked the manufacturer why the TV was radiating RF interference. Eventually the retailer replaced the neighbour's plasma TV with a brand new Panasonic 55 inch LED TV, which produced "not a sound" on the amateur bands. The radio amateur thanked the RSGB EMC Committee for all of its help and advice.

We understand that there have been some other cases where Ofcom has received complaints of interference from a plasma television receiver. It appears that Ofcom has not taken any formal enforcement action in such cases although in about half of the cases, manufacturers have become involved and as a goodwill gesture, they have carried out tests and have apparently taken action.

It has been reported that plasma TV receivers thought to have been causing the interference did meet the current EU Harmonised Standards when tested. Nevertheless, further work has been done on developing new EMC standards for plasma TVs (see later) although these are currently proposals that are not part of the existing standard.

PLASMA TV EMISSIONS. Plasma TVs can radiate directly from the screen due to horizontal bus bars across the screen. These are unterminated transmission lines that carry control waveforms with an amplitude of a few hundred volts and fast rise and fall times. The screen of a plasma TV resembles a wide-band RF 'comb' generator, which is capacity coupled to 'earth'. This causes circulating currents in the mains cable and other interconnecting cables, which then act as antennas. Another effect is that screen bus bars act like an array of W8JK type of close-spaced balanced antennas.

Figure 1 shows radiated emissions from a typical plasma TV from 0–30MHz, received using a portable antenna. **Figure 2** shows ambient signals for comparison when the TV is switched off. Although Figure 1 is measured at a relatively close distance and it cannot be related to RF field strength, it does show the general shape of the radiated emissions from one particular model of plasma TV.

It may be possible to reduce 'screen radiation' from a plasma TV to some extent using clip-on ferrite chokes on the mains cable, antenna cable, SCART or HDMI cable(s) but there are practical difficulties with this approach. Although clip-on ferrites cores can be useful at VHF, it is not usually feasible to wind enough turns to make them effective at HF.

No fewer than six clip-on ferrite cores generally similar to those in **Photo 1** were fitted by a manufacturer in an unsuccessful attempt to reduce interference from a plasma TV. Five of the cores looked similar to TDK ZCAT3035-1330 and, for that type of core, the best that can be achieved with one 'turn' (ie cable straight through the core) is an impedance of about 50Ω at 3.5MHz and 100Ω at 10MHz. That is not likely to have much effect, as emission or immunity problems may need several kilohms for effective suppression. Although a much higher impedance could be achieved using multiple turns, there is often only room for one turn in practice. For example, at 3.5MHz, five turns would give 25 x 50Ω or a useful 1250Ω but for a single turn, it would need 25 cores on each cable to achieve the same effect!

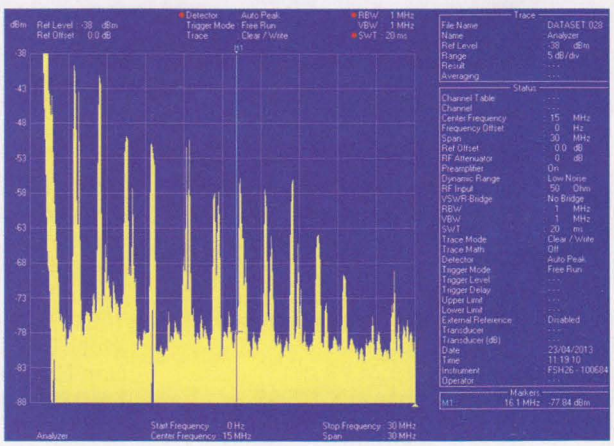


FIGURE 1: Typical radiated emissions from a plasma TV, shown from 0 – 30MHz.

PLASMA TV EMC STANDARDS. Up until now, EMC standards for emissions from IT equipment and broadcast radio or TV receivers have only specified conducted emission limits below 30MHz. The idea behind this is that below 30MHz, the dimensions of most equipment are small compared with a wavelength, so the 'antenna efficiency' of the equipment below 30MHz is low. Another factor is that there is limited use of electromagnetic components and circuitry operating at high and high frequency within the equipment.

The conventional assumption that it is sufficient to measure conducted emissions on external cabling is called into question by the introduction of large-scale flat screen displays. These include TV sets, traffic management and information systems, monitor walls in professional entertainment, education 'white boards', etc.

It is not only the size of these displays that is significant but also new display technologies where current loops form a matrix of magnetic dipoles that are driven synchronously. These behave as a large overall magnetic dipole that can cause significant magnetic field levels.

Following several cases of complaints of interference by amateur radio users, the CISPR subcommittee I Working Group (WG) 1 formed a Task Force (TF) in 2007 to investigate radiated emissions below 30MHz from large plasma TV sets. The TF carried out detailed technical investigations and 'round robin' exercises in several EMC test laboratories in Japan, Korea and Europe. The results showed that supplementary requirements for control and limitation of radiated disturbances from large scale flat screen displays are necessary to enforce CISPR's mission and policy.

In October 2011, CISPR I decided to draft a Publicly Available Specification (PAS), or pre-standard. This sets out an interim solution up until appropriate requirements are added to the CISPR 13 standard or its successor, CISPR 32. The title of the PAS is 'Methods of measurement and limits for radiated disturbances from plasma display panel TVs in the frequency range 150kHz to 30MHz', PD IEC/PAS 62825:2013 (see Websearch).

The measurements in the PAS include magnetic field measurements from 150kHz to 30MHz. The limits are derived from Table 12 of CISPR 11:2009, Amendment 1 (2010). This is a standard for a different product, induction cooking appliances. The PAS for plasma TV sets includes some relaxations in the limits to take account of current state of the art of plasma display panel TVs and also mitigation measures that are economically feasible.

In the Abstract and Scope, the PAS states, "The requirements specified in this specification are essential EMC requirements that should be met in order to protect radio reception in the frequency range up to 30MHz at locations where these display devices are operated in the field." Later on, it states that the limits defined in the PAS do not provide protection of radio reception in all cases.

Nevertheless, if and when the PAS is introduced into the standard for TV sets, it should result in a significant improvement compared to the current situation. The above statement supports the view that if a plasma TV doesn't meet PD IEC/PAS 62825:2013 then it doesn't meet the Essential Requirements of the EMC Directive. Nevertheless, the PAS is currently a proposed CISPR amendment to a CISPR standard, so it does not need to be taken notice of for the purposes of the EMC Directive. It would only come into force if it is adopted as an amendment to an EN Harmonised Standard and if it is published as such in the *Official Journal of the European Communities* (OJ).

WIND TURBINES. The item on wind turbine EMC in the August 2014 EMC column has led to proposals for updating the EMC standard for wind turbines. As explained in the item on plasma TV sets earlier, there is a conventional assumption that below 30MHz, the dimensions of most equipment are small compared with a wavelength, so the 'antenna efficiency' of the equipment below 30MHz is low. 'Small' compared a wavelength is often taken to mean less than one tenth of a wavelength and this is clearly not true in the case of large structures such as wind turbines.

A wind turbine is of wildly different size from anything in the minds of the standards makers who made the generic standards that are referenced by the wind turbine standard. Therefore the emission limits in the generic standards need to be tightened at all frequencies where the tower height is more than about a tenth of a wavelength to compensate for the increased antenna effectiveness.

The question has also arisen of offshore wind farms. Are there any significant emissions in the widely used MF marine band, particularly in the vicinity of 2187.5kHz? This is the DSC calling and emergency channel that is a mandatory part of the GDSS radio systems that offshore commercial vessels have to carry. At the moment, we have no information on whether offshore wind farms radiate on the MF marine band in practice but as existing wind turbine standards do not test radiated emissions below 30MHz, this possibility cannot be ruled out.

There is a large offshore wind farm off Clacton-on-Sea in Essex. It would be interesting to find out whether any RF emissions can be detected on the coast, particularly in the 1.8MHz amateur band.

SMART METERS. There are plans to install 'smart meters' in every home between 2015 and 2020 (see Websearch). Some members have asked how these smart meters will communicate and whether they will use powerline communications.

Powerline communication is widely used by smart meters elsewhere in Europe but this is usually in part of the CENELEC 'A' band and, in practice, 40–95kHz is likely to be used. This particular form of low data rate powerline communications is unlikely to affect reception in any amateur radio band.

Due to the regulatory environment of energy suppliers in the UK, it appears likely that smart meters will mainly use Machine to Machine (M2M) communications via the GSM mobile phone network rather than powerline communications. Nevertheless, in some locations such as blocks of flats, indoor GSM coverage may not be adequate and powerline communications may be used instead. Another consideration is that equipment on the electricity network is expected to operate for decades, whereas the UK mobile phone network may be very different in 10 years time.

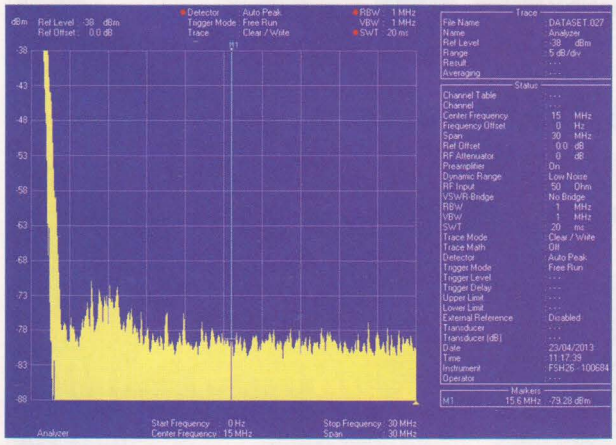


FIGURE 2: Ambient signals for comparison when the plasma TV is switched off.

WEBSEARCH

RSGB Forum EMC Matters – http://forums.thersgb.org/index.php?forums/emcmatters/

IEC/PAS 62825 ed1.0 Methods of measurement and limits for radiated disturbances from plasma display panel TVs in the frequency range 150 kHz to 30 MHz (price 50 Swiss Francs) – http://webstore.iec.ch/webstore/webstore.nsf/artnum/047341!opendocument

Gov.uk Helping households to cut their energy bills – https://www.gov.uk/government/policies/helping-households-to-cut-their-energy-bills/supporting-pages/smart-meters

LAMCO
LAM COMMUNICATIONS LTD

01226 361700
01226 351037

twitter @lamcomms
facebook @lamcomms
sales@hamradio-shop.com

LAM London: (020) 3432 4414 LAMGM: (0141) 530 4077

WANTED! Good Quality Modern Transceivers

ICOM

IC-7600 £2,599.95

IC-718 £599.95

ID-5100 £569.95

KENWOOD

TS-990S £5,799.95

TS-590SG £1,349.95

TS-480SAT/HX
£739.95 £839.95

YAESU

FTM-400
£539.95

FT-8900R £329.95

FT-450D £614.95

YAESU

Yaesu FT DX-1200
£1,279.95

Yaesu FT DX-3000
£1,999.95

Yaesu DR-1 XE
£1,279.95

ACCESSORIES

ANTENNAS

Diamond NR-770R	£41.95
Diamond SG-7900	£109.95
Diamond SRH-771	£19.95
Diamond SRH-940	£29.95
Diamond RH-771	£19.95
Diamond X-700H	£329.95
Diamond CP-6	£329.95
Diamond HF-V8040	£399.95
Diamond D-303	£179.95
Diamond D-130	£199.95

MICROPHONES

Kenwood MC-60A	£124.95
Icom SM-30	£129.95
ICOM SM-50	£264.95
Yaesu MD-100A8X	£129.95
Yaesu MD-200A8X	£229.95

PLUGS

6MM PL259	£1.80
7MM PL259	£1.80
9MM PL259	£1.80

SWR/PWR METERS

TELECOM SX-20	£44.95
TELECOM SX-40	£44.95
TELECOM SX-1000	£99.95
D-Original SX-601	£79.95
Daiwa CN-801HP	£129.95
Daiwa CN-101L	£99.95

SWITCHES

D-Original AV-SW2M	£34.95
D-Original AV-SW3MPL	£49.95
D-Original AV-SW4MPL	£59.95
Diamond SS-500	£74.95

POWER SUPPLIES

QJE 30AMP	£119.95
QJE 40AMP	£139.95
Multicom PS-30 AMP	£119.95
Multicom SM-30 AMP	£84.95
Diamond GSV-3000	£154.95
ICOM PS-126	£479.95
Yaesu FP-30	£279.95

TWO WAY RADIO HIRE AND SALES

For more information feel free to call our PMR department on 01226 361700

Spiderbeam 18m Fibreglass pole
£199.95

Spiderbeam HD 12m Fibreglass pole
£89.95

Spiderbeam Guy Belt Set 12m
£17.95

Clamp set for 12m fiberglass pole
£24.95

Spiderbeam Radial Kit 60mm
£49.95

Spiderbeam 4m Spreaders
£39.95

Watson W-8681 SOLAR
Weather Station
£99.95

Watson [illegible] MK2
£79.95
Weather Station

FREE UK Delivery On All Transceivers

CB RADIO

£199.95
President Grant 2

President Jackson 2
£229.95

What's New?

Yaesu FT-991

The FT-991 HF/50MHz/VHF/UHF internal ATU Base Station Transceiver is capable of operating SSB, CW, AM, FM, Packet and System Fusion C4FMDigital.

ICOM IC-2730D

£299.95
ICOM IC-2730 / D, which is 144 / 430MHz dual-band FM (analog)

Yaesu FT-2D

system fusion compatible, fm friendly digital operation with AMS, Easy operation with large touch panel display

Visit Our Website

We have a secure online web shop feel free to browse

hamradio-shop.co.uk

ADD TO CART

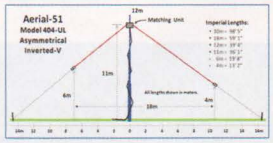
Chat with LAMCO online!

Click to leave a message Online

Need Help?

Click here for live help

Aerial 51



is an ultra lightweight, asymmetrical dipole for operation on 7 or 8 shortwave bands. It is constructed using very light, yet strong components. All hardware is stainless steel. The antenna radiator is made from CQ-534 insulated multi-strand copper-clad steel wire with 1mm outer diameter, which has very low wind load and weighs only 31gramm (!!) yet it still maintains a breaking strength of 10kg. The antenna comes including 12m coax which despite the low weight (only 185g) shows only very modest losses (< 1dB on 40m, < 2dB on 10m). The ultra lightweight matching unit not only matches the coax to the antenna, it also provides excellent choking resistance to suppress common mode current.

£99.95

BRANDS

spiderbeam high performance lightweight antennas
MFJ
QJE
ORIGINAL ANTENNA
Shakespeare SINCE 1897
DIAMOND ANTENNA
LDG ELECTRONICS

LAM Communications Ltd. | 52 Sheffield Road | Hoyland Common | Barnsley | South Yorkshire | S74 0DQ | UK
Shop Opening Times - Mon to Fri : 0930 hrs - 1730 hrs | Sat : 0930 hrs - 1600 hrs

E&OE

British Science Week, March 2015

Have you started planning? If not, let the stories of these schools inspire you

PERDISWELL PRIMARY SCHOOL, WORCESTER. Various reminiscences during a 'natter night' at the Worcester Radio Amateurs Association led to the idea of putting on a station for National Science Week (now British Science Week) last year, so I contacted the Science Co-ordinator at Perdiswell Primary, our local school. I explained how a station could tie into communications, the ionosphere, the history of radio and how we have arrived at today's mobile phone. We weren't setting out to recruit new M6 licensees, but to encourage the 'spark' of science and radio.

The school is a single-storey building and the roof is surrounded by barriers. Working with Andrew, G1SBG and Rich, M0UVA we put all aerials up there, supported by telescopic masts, to have a full 102 foot doublet running the length of the building, and fed with 450Ω feeder. Also lashed to the barriers were a 23 foot Snowdonia HF vertical and a mast carrying a collinear for VHF (see **Photo 1**). The cables came straight down into a quarter light window into the shack, with the doublet into my FT-897 for voice, the vertical into Andy's FT-857 to feed into Digipan and to show PSK text being picked up on the screen. We also had Morse keys and a laptop to show the current pictures of the sun, in explaining sunspots and the sun's influence on the ionosphere, plus the aurora (practically all of the children knew of the northern lights).

On the walls we put big maps of the world with callsigns and a Great Circle map, plus operating information for those on the mic.

We were allocated GB1PER by Ofcom and fired into action at 10am the next morning. Groups of Year 5 and 6 pupils visited every 30 minutes throughout the day until 2.30pm. Over both days we worked 100 contacts in total, mainly on 40m inter G and local EU, though on PSK we picked up stations in Russia and SV.

So what did we learn? To explain clearly who and what we were, as most thought we were from broadcasting. Not everyone wanted to go on the air, but those who did gained confidence. The crib sheet given to them for using phonetics to spell out their name was time well spent and Morse and use of keys fascinated them.

A Year 5 lad went home and recounted with great excitement that he had spoken to a farmer in Plymouth called Barry, and a German pupil rattled off a fluent QSO with a DL station much to everyone's surprise. The Mayor and his wife visited and took part in 'Mayor on the Air', as we dubbed it. And finally, in the preceding week the Year 5/6 pupils had picked scientists to study so regaled us with stories of Jenner, Fleming, Copernicus... but strangely not Marconi!

It was a brilliant event to be involved with and I'd encourage everyone else to try something similar this year.

Max White, M0VNG

ALL SAINTS ACADEMY, STOKE FERRY, NORFOLK. British Science Week 2015 is only three months away and our school, James Bradfield Church of England Primary School, participated in several past events with the callsign GB2JBS. In October we converted to an Academy, All Saints Academy. Our new special event callsign is GB2ASA which has already had an airing as part of the December Youngsters on the Air event.

Our last Science Week event had the theme of communications and the whole school of 90 pupils and most of the teaching staff participated. In addition to the stations and other communication demonstrations, a small exhibition was set up to show how various forms of communication equipment had evolved through time (see **Photo 2**).

The School assembled in the playing field for the start of the demonstrations and the pupils split into small groups. They began by using signalling flags, semaphore, to signal to each other (see **Photo 3**). We even had a demonstration by a local pigeon fancier of how pigeons had been used in communications to carry messages, and some of the pupils assisted her in flying them from the field.

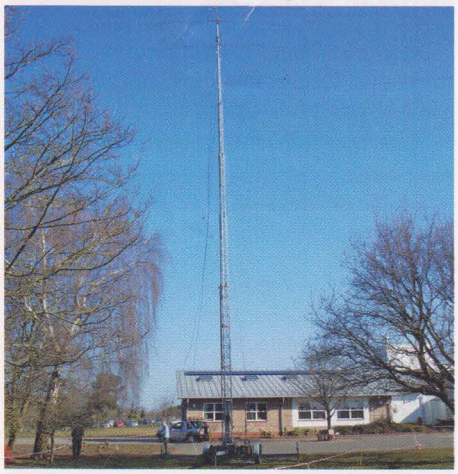


PHOTO 1: The aerials at Perdiswell Primary,

The radio station was hard at work with the pupils brought to the station in groups of four by a teacher or teaching assistant. Operation was restricted to 40m or 20m to achieve inter UK and EU contacts with some opportunity of longer distances if conditions permitted. The mic was passed around the pupils who introduced themselves by name and age. Whilst in contact with a Spanish radio amateur one pupil started chatting about dog breeding when they heard a dog bark in the background.

There were also a number of other school radio stations active and our pupils were able to talk to theirs about school, favourite subjects etc. In one contact they spoke to several 11 year old Foundation licence holders.

We contacted radio amateurs in some 29 countries, the furthest being Australia. These contacts were logged by a marker on a map of the world, which led to pupils discussing which group had contacted the station furthest away etc.

The Morse station had a display about the history of Morse code and the life of Samuel Morse. Most pupils wanted to do more than just send their name and they moved around the Morse alphabet sending and receiving Morse code with very few spelling errors!

On Friday afternoon many parents visited the radio station. The event went well and was enjoyed by all.

We are now wrestling with the question of how amateur radio can be better used to support the school curriculum and what sort of event we should have for British Science Week 2015. We would welcome any suggestions or comments.

John Nicholas-Letch, G3PRU
Andy Beeson, Head Teacher

PHOTO 2: The exhibition of radio equipment.

PHOTO 3: Pupils try semaphore.

Please send news reports to radcom@rsgb.org.uk. To get future events listed here and put on GB2RS, **e-mail details of your meetings as early as possible to radcom@RSGB.org.uk** and we'll do the rest. **We need to know your club name, RSGB Region number, contact name & phone number, date of meeting and detail of meeting.** Example: Fraser Road Radio Club, Region 9, Graham, G0NBI, 01234 832 700, 29 Oct, On the Air. It's that simple. Please note that we don't normally print 'closed', 'TBA' or 'every Tuesday'-type submissions. The deadline for the March edition is 26 January and for the April issue it's 22 February. For GB2RS, the deadline is 10am on the Thursday of the week of broadcast.

INTERNATIONAL

Pafos Radio Club, Cyprus,
Richard, 5B4AJG, 00 357 97 857 891,
5B4AJG@cyprusliving.org

NATIONAL

AMSAT-UK
http://amsat-uk.org/
Weekly net every Sunday 10am, 3.780MHz
Civil Service Amateur Radio Society,
Weekly net every Tuesday, 8pm, 3.763MHz

REGION 1: SCOTLAND SOUTH & WESTERN ISLES

REGIONAL MANAGER: JASON, O'NEILL, GM7VSB, RM1@RSGB.ORG.UK

Ayr ARG
John, GM0EPO, aargsec2014@gmail.com
4 Radio time, Marcus, GM4LVW
18 Surplus equipment and junk sale, Dennis, GM3YDN

Cockenzie & Port Seton ARC
Bob, GM4UYZ, 01875 811 723
5, 12, 19, 26 Morse training,
6 Normal club night
11 On-air activity day
20 Radio check night, John, MM0JXI

Stirling & District ARS
John, gm0fsv@gm6nx.com
1, 8, 15, 22 10.30am till late afternoon for construction, training, projects and operating

West of Scotland (Glasgow) ARS
info@wosars.org.uk, www.wosars.org.uk
4, 11, 13, 18, 20, 25, 27 Construction night & licence preparation
6 Club night with talks, quiz & raffle

REGION 2: SCOTLAND NORTH & NORTHERN ISLES

REGIONAL MANAGER: BERNIE MACINTOSH, GM4WZG, RM2@RSGB.ORG.UK

Aberdeen ARS
Fred, MM0ODL, 01975 651 365
5 Junk sale
12 Question time with an expert panel
19 YOTA, Finland 2014, Adam, MM0KFX
26 Construction and on the air

Glenrothes & DRC
Tam, MM0TGB, on 0775 3526 498
4 Intro to fly fishing, Tam, MM0TGB
11 Raspberry Pi workshop
18 Foundation to Full licence, Ken, GM3YBQ
25 Practical

The deadline for the March Around Your Region is 26 January, so send your news NOW!

REGION 3: NORTH WEST

REGIONAL MANAGER: KATH WILSON, M1CNY, RM3@RSGB.ORG.UK

Chester & DRS
Bruce, M0CVP, 01244 343 825
3 Grand surplus equipment sale
10 Committee meeting
17 Construction competition presentations
24 An insight into the IARU, Greg, G0DUB

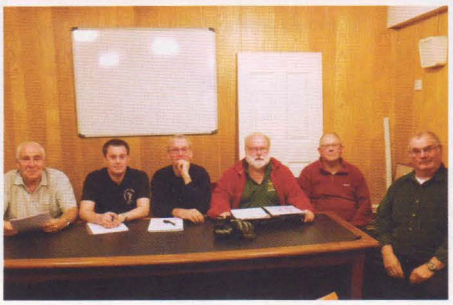
Fleetwood Radio Enthusiasts Group
John, M0JFE, 07940 815 659
3 Natter night
10 How to build & use a field strength meter
17 AGM at FY6 6TF
24 Morse training night

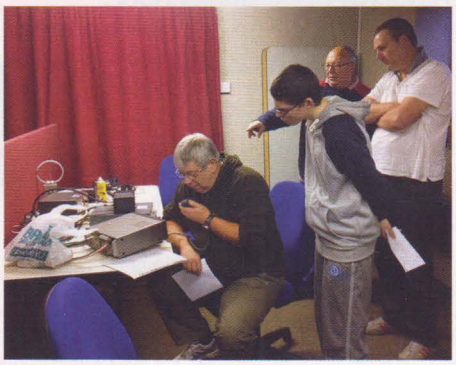
Mid-Cheshire ARS
Peter, G8HAV, 01606 553 401
4 Preparation for Radio Active Rally
11 Equipment and allocation of resources for rally
15 Radio Active Rally, CW5 5DG
18 Rally wash up meeting
25 Committee meeting

South Manchester R&CC
Ron, G3SVW, 01619 693 999
2 Monday technical forum
5 Planning the Advanced training course, Ron, G3SVW
12 An aviation trip to Japan, Derek, G1AFI
19 Tidy the shack night
26 General meeting

Thornton Cleveleys ARS
John E Rodway, G4FRK, 01253 862 810
2 Natter and on the air night
9 Video night
16 Building, Ted, G3WBB
24 Semaphore & satellite, Steve Musgrave

The **Furness Amateur Radio Society** AGM took place at the end of November, where a new committee (shown in the photo) was elected comprising Ivan, G3IZD as Chairman, Dave, G3VUS as Secretary, Chris, M0TES as Treasurer and elected members Mike, G8ALE, Chris, M0KPW, Clive, M6CVD and Jim, M0KYL. Also in November, Furness ARS conducted a Foundation course for four candidates. Spread over Saturday and Sunday, the candidates were taught all aspects of the syllabus as well as the practical elements. The second photo shows three of the four candidates taking part in the on air practical assessment. All four candidates sat the exam on the Sunday afternoon and passed with very good scores, one with 100%. Our congratulations go to the newly licensed Ian, Andrew, Stephen and Jon who will by now have their M6 callsigns. Club members look forward to hearing them on the air soon.





REGION 4: NORTH EAST

REGIONAL MANAGER: NIGEL FERGUSON, G0BPK, RM4@RSGB.ORG.UK

Denby Dale RC
Darran, G0BWB, 07974 423 227
4 Frequency synthesisers, Denis Mott
11, 25 Club net, 145.575MHz, 7.30pm
18 RF surgery, Davis, 2E0EDL

Halifax & DARS
Martin, M0GQB, 01422 341 317
4, 11, 18, 25 Open net, 145.400MHz, 7.30pm
10 QSL Bureau, Richard Constantine

Hornsea ARC
Gordon, G3WOV, 01377 240 573
4 Annual dinner
11 Activities and DVD
18 Logbook of the World
25 Quadcopter regulations

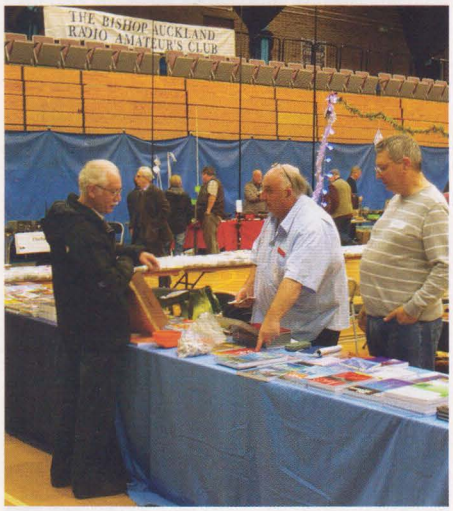
Ripon & DARS
David, G3UNA, 01423 860 778
5, 12, 19, 26 Club night

Sheffield & District Wireless Society
Krystyna, 2E0KSH, 07884 065 375
4 Quiz night, with prizes, James, M6IOU
18 *Heat, Light & Electricity* video, Marcus de Sautoy

Worksop ARS
Paul, M0PJA, 07890 626 684
1 Intermediate course starts 7.30-9pm until 10 May
5 DVB-T dongle SDR for everyone! Paul, M0PJA
19 Introduction to datamodes Paul, M0PJA

Silcoates School held a 'Geographical awareness week' in November. The theme was food, and several pupils went on the air for greetings messages to ask about local cuisine at the school's radio club. You can find a description that the Geography teacher wrote at www.silcoates.org.uk/2014/11/national-geographic-awareness-week/ – it may come in useful to someone in the RSGB to show the benefits of the hobby to a school as a whole, in curriculum areas other than the sciences.

The annual **Bishop Auckland RAC** rally was held on 7 December at Spennymoor Leisure Centre. The RSGB bookstall was present with Regional Manager Nigel, G0BPK and Deputy Regional Manager Ian, G7MFN in attendance. Despite being almost Christmas, business was brisk, perhaps helped by the supply of sticks of RSGB rock and Pontefract cakes for anyone who visited the seasonally-decorated bookstall. It was good to be re-acquainted with Members from the top end of Region 4.



REGION 5: WEST MIDLANDS

REGIONAL MANAGER: MARTYN VINCENT, G3UKV, RM5@RSGB.ORG.UK

Aldridge & Barr Beacon ARC
Albert, G0KFS, 01922 614 169
16 On the air, HF

Bromsgrove & DARC
Contact Dave, M6DKT, 07584 025 156
4, 11, 18, 25 Data night
6, 13, 20, 27 Club night

Central Radio Amateur Circle
Martin, G1TYV, 07906 905 071
3 UKAC 2m Contest, Barr Beacon, 7pm
5, 21 Group Meeting

Cheltenham ARA
Derek, G3NKS, 01242 241 099
3, 10, 17, 24 Slow CW, 8-9pm, 3540-3550kHz
17 Lunch, book with G4IGN
19 Surplus equipment sale

Coventry ARS
John, G8SEQ, 07958 777 363
2, 9, 16, 23 Club net, 145.375MHz & 7.16MHz, 8pm
6 Construction competition
13 No meeting
20 Skittles night
27 Radio workshop & equipment check

Gloucester AR&ES
Anne, 2E1GKY, 01242 699 595 daytime
2 Demonstration of direction finding and suitable antennas
8 Harwell Rally
9 VHF operating from the shack
16 No meeting
23 HF operating from the shack

Malvern Hills RAC
Dave, G4IDF, 01905 351 568
10 The dying art of chassis bashing, Dave, G4IDF

Mid-Warwickshire ARS
Don, G4CYG, 01926 424 465
10 Video/DVD afternoon
24 Software defined radio

Nuneaton & District ARC
Neil, 2E0NEI, info@ndarc.co.uk
5, 12, 19, 26 Club net, 145.475MHz, 9.30pm
6 Social at The Chase, Higham Lane, Nuneaton
20 RAYNET

Rugby ATS
Steve, G8LYB, 01788 578 940
3 UKAC 144MHz, radio operation and projects
7 2m antennas – some DIY ideas, Ian, M0IJS
10 UKAC 432MHz, radio operation and projects
14 Let's build a balun! Steve, G8LYB
17 UKAC 1296MHz, radio operation and projects
21 Vintage electronics video, Mike, G8CTJ
24 UKAC 50MHz, radio operation and projects
28 Practical project session, bring you current project along

Salop ARS
salopamateurradio@gmail.com
4 Club CW net, 144.070MHz, 4.30pm; club net, GB3LH 8.30pm
5 Natter night / committee meeting
12 Video night
19 Shack night, putting G3SRT on the air
26 Building a homebrew 3D printer, Neil, M6TVS

Stratford Upon Avon & DRS
Clive, G0CHO, 01608 664488
9 Practical evening in shack
23 Dip into the RSGB Archives 4 (Aerials)

Telford & DARS
John M0JZH, 07824 737 716
2, 9, 16, 23 4m net around 70.425MHz, 7pm
4 GX3ZME OTA HF plus committee meeting
11 Under a Fiver night
18 Bowls night
25 Railway signalling, G6UDX

Wythall Radio Club
Chris, G0EYO, 07710 412 819
1, 8, 15 Club net, 145.225MHz or GB3WL, 8pm
2 RSGB 80m CC SSB + Foundation course
3 144MHz UK Activity Contest, Morse class, 7.45pm + Rally working party & preparation evening, 8.30pm
6, 13, 20, 27 Nibbles Night in the Shack, 7.30pm
8 Club trip to Harwell Rally, 8am; RSGB 432MHz Affiliated Societies contest, 10am
9, 16, 23 Foundation course
10 Pre-rally committee meeting, Morse class, 7.45pm
11 RSGB 80m Club Championship DATA, 8pm
14 Foundation practicals, 9.30am
17, 24 Morse class, 7.45pm + Rally working party & preparation evening, 8.30pm
22 Club net, 145.225MHz, 8pm
23 Curry night at the Monsoon, 6.30pm

The deadlines for Around Your Region are 26 January (for March) and 22 February (for April), so send your news in NOW!

Nuneaton & District Amateur Radio Club would like to congratulate one of their first members, Dean, M6KVG who successfully passed his Foundation exam at the NDARC Exam Centre in November. The club would like to welcome Dean to the hobby and look forward to working him on the air and helping him grow and explore this fascinating hobby. The club is currently enrolling candidates for an online tutor lead Foundation course, scheduled to begin at the start of February 2015. If you would like more information or would like to enrol, please either e-mail info@ndarc.co.uk or visit www.ndarc.co.uk

Cheltenham Amateur Radio Association held its 38th AGM in December, which was attended by 36 members. The Chairman's report covered another busy and successful year with regular meetings, contests, social events and other activities. Thanks to Giles, G0NXA the club was now involved in the running of training courses for all three licence levels. Membership remained buoyant at 86. The Treasurer reported that the club's finances were in a very healthy state, thanks mainly to the sale of equipment donated to the club by the widows of members who had died in the past year. The G3CEG Memorial Cup, awarded annually to a member for noteworthy on-the-air activities, went to Nick, G4WLC for his extensive portable operations. The G3GWW Award, for exceptional services to the club, went to Ron, G3SZS who recently stood down as Editor of *CARA News* after producing some 90 issues. Elected to the Committee for 2015 were Chairman Giles, G0NXA, Secretary, Derek G3NKS, Treasurer, Pete G3YJE, ordinary members Christopher, M0YNG and Tony, G3YYH. The AGM was followed by a very enjoyable natter session and buffet.

The photograph below shows the Chairman with the award winners: left to right, Ron, G3SZS, Giles, G0NXA, Nick, G4WLC.

Wythall Radio Club was celebrating over Christmas. Their new UHF repeater, GB3WL, got clearance from Ofcom just in time for the festive period. Fortunately, RSGB General Manager, Graham Coomber, G0NBI, happened to be making a passing visit at the time and was summarily press-ganged into doing an official switch-on! The club hope that this new 432MHz box will be well used by all amateurs across the wider Midlands. It provides better coverage of the M42 and M40 motorways on UHF than has been possible previously and even covers a large slice of Redditch. More information on GB3WL can be found at www.wythallradioclub.co.uk

Mid-Warwickshire ARS has a new website at www.mwars.club and new contact details. The phone contact remains Don, G4CYG on 01926 424 465 and the new e-mail contact is mwars@mwars.club

William Allen, a new member at Midland ARS, has passed his Intermediate exam. Congratulations from the rest of the club. The photo shows trainer Paul, M0PVN with William.

REGION 6: NORTH WALES

REGIONAL MANAGER: LIZ CABBAN, GW0ETU, RM6@RSGB.ORG.UK

Dragon ARC
Stewart, GW0ETF, 07833 620 733
2 SOTA, GW3GUX
16 Discussion night

North Wales Radio Society
Ceri Jones, 2W0LJC, 2w0ljc@mail.com
5 General meeting
12 Technical topics
19 Holiday pile-ups in C5, Stewart, GW0ETF
26 Natter night

REGION 7: SOUTH WALES

REGIONAL MANAGER: JIMMY SNEDDON, MW0EQL, RM7@RSGB.ORG.UK

Aberystwyth & DARS
Ray, GW7AGG, 01970 611 853
12 WSPR and the Brendan Trophy, Simon, GW0NVN
26 Club net, 145.500 then 145.550MHz

REGION 8: NORTHERN IRELAND

REGIONAL MANAGER: PHILIP HOSEY, MI0MSO, RM8@RSGB.ORG.UK

No entries received this month. Send your programme information to radcom@rsgb.org.uk

REGION 9: LONDON & THAMES VALLEY

REGIONAL MANAGER: LARRY SMITH, G4OXY, RM9@RSGB.ORG.UK

Burnham Beeches RC
Dave, G4XDU, 01628 625 720
2 What's in a whisper? Greg, G4EBY
16 Free radio at sea, Alison, G8ROG

Edgware & DRS
Mike, G4RNW, 02089 500 658, www.g3asr.co.uk
12 Victorian railways talk, Vic Burgess
26 The Museum of Computing, John, G7GCK

Reading & DARC
Pete, G8FRC, 01189 695 697
7 Intermediate course, details g3ngx@radarc.org
12 Radio in the First World War, Dr Elizabeth Bruton
14, 21 Repeaters in the Thames Valley, Baz, G8DOR
26 The Solar Orbiter, Chris Brockley-Blatt, Mullard SSL

Southgate ARC
K Mendum, G8RPA, g8rpa@arrl.net
11 Rummage through *RadCom* since July 1939

Verulam ARC
Peter, G4HSO, g3v@btinternet.com
17 AGM

The **Wey Valley ARG** pre-Christmas party attracted a large number of members, wives and friends to the group's QTH, the recently refurbished premises of Guildford Rowing Club. Masses of buffet food organised by Peter, M3OSP and a well-stocked bar, manned by Mike, G3IAF, combined to satisfy even the hungriest and thirstiest of the partygoers. The CW interests of the group were not forgotten by James, M0VPC who baked cupcakes and then iced them with the club callsign G6XN – written in Morse!
The main entertainment, a huge raffle organised by Tony, G6ZAC saw lucky Roger, G3SXW win the top prize of a bottle of best Islay malt that Chairman Bob, G4HZV had had his eye on all night. It was generally agreed that this was one of the most successful parties the club had ever held. Grateful thanks are due to Janet, XYL of secretary Andrew, M0GJH, for doing the clearing up. Photo courtesy David, G3DJR.

The Edgware Sidebanders, comprising Godfrey, G4GLM on the electric keyboard and G4RNW on alto sax, 'entertained' the club members of **Edgware & District Radio Society** in November. It was done as an encore to the History of the Saxophone presentation. The photo was taken by Chris. See www.g3asr.co.uk

Kempton Park rally on Remembrance Sunday has become something of a tradition for the **Royal Signals ARS**. They stop at 11am and join with those on parade at the Cenotaph in London (via BBC, of course) and remember our comrades who have gone before us, so for a while it's a sad occasion. Thereafter the trading and bargaining continues with a well-filled show hall and lots of valuable spares passing through the out door into new owners' hands. Remember the 58 set? Well, one was sold, not sure what for or even if it can ever be used again as, surely, there was a battery supply problem right from the beginning? Three HROs were on sale – one went, at least. So that is it for now. We are booked into Canvey Island Rally on 1 February and Didcot on the 8th in 2015 with more shows later in the year. We can always do with more help and we could, perhaps, attend more shows and encourage more people to join RSARS.

Like many clubs, St Albans based **Verulam ARC** does not have enough CW operators to man a multi operator multi band 48 hour entry for CQWW CW. However, this year they did achieve this by attracting guests from as far afield as the Orkney Islands! For the third year in a row, three operator positions were enabled in their impressive hill top cabin site and antenna farm, operating all bands. Having fun and personal achievement were the priorities.
Also in December, 17 students, of which 9 are members of Verulam ARC, sat their Advanced exam after a training course run by club member Dr Roger Bleaney, M0RBK.

REGION 10: SOUTH & SOUTH EAST

REGIONAL MANAGER: MICHAEL SENIOR, G4EFO, RM10@RSGB.ORG.UK

Basingstoke ARC
Peter, G0KQA, 01256 414 454
18 Construction challenge and junk sale

Crawley ARC
John, G3VLH, 01342 714 402
25 DC to light, Chris, G4ZCS

Cray Valley RS
Richard, G7GLW, 07831 715797
5, 19 Club meeting, 8pm

Crystal Palace R&EC
Bob, G3OOU, 01737 552 170
6 AGM and construction contest

Darenth Valley Radio Society
Mike, G8AXA, 01689 856 935
11 Natter night
25 JT65 & JT9, Mike, G8AXA

Dorking & DRS
Garth, G3NPC, 01737 359 472
Jan 27 UFOs, Leslie Baker, G8JIC
24 An introduction to the Arduino, Andrew Vine, M0GJH

Eastbourne Radio & Electronics Club
www.ereclub.org.uk
10 Talks/lectures & demonstrations
24 Practical events

Hastings E&RC
Gordon, 01424 431 909/
25 AGM followed by Bring Your Thing

Horndean & DARC
Stuart, G0FYX, 02392 472 846
5 Natter night/social evening
19 GPS update, Hugh, M1ETU

Itchen Valley ARC
Quintin, M1ENU, 023 8078 7799
13 Google Maps, Brian, G0UKB
21-22 Thinking Day on the Air
27 Members' forum

Mid-Sussex ARS
Sue, G6YPY, 01273 845 103
6 Radio night
13 Lecture, paramedic David Davis
20 Radio night and table top sale
27 Q-codes revisited, G6YPY

Sutton & Cheam RS
John, G0BWV, 020 8644 9945
19 Talk by Chris Ridley of Icom UK

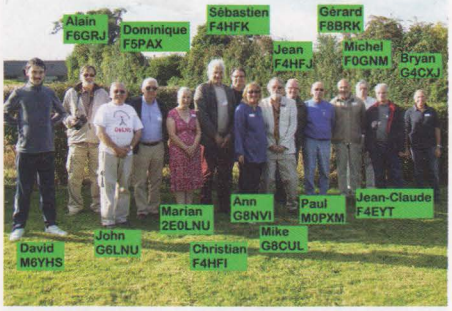
Wimbledon & DARS
Kim, G6JXA, 07812 735 507
13 On Air from WDARS HQ, G4ADM
27 Nursing in the twentieth century, Jane Cook

Worthing & DARC
Gordon, 2E0GTG, 07801 599 470
1 Breakfast meeting
3, 17 Advanced course
4 Home construction, Ron, G3SKI
11 Discussion evening
18 Beginners' guide to astrophotography Part 2, Chris, M6EJK
25 G3WOR on the air evening
28 Foundation training and exam

Horndean & District ARC ran their 13th Foundation and 14th Intermediate exams in November. Training was supported with equipment bought with an Awards-for-All Lottery grant. Both Foundation candidates and the Intermediate candidate passed. The club congratulate all the successful candidates, and thank the club's Foundation tutor Simon, G0IEY and the Intermediate tutor Laurence, G8NJJ. Nigel, M0NAF also assisted with both courses. The Morse assessment module was presented by Roger, 2E0KBK. HDARC training manager, Ken, G0JWL, thanked the training team for another set of excellent results. The photos show (L to R) Nigel, M0NAF, Emma, M6JOT, John, M6JZX and Simon, G0IEY. Also (L to R) Nigel, M0NAF, Ralph, 2E0HES, Simon G0IEY. Laurence, G8NJJ was abroad on the date of the exam.

The recent inter-club quiz that was set by the **Itchen Valley Amateur Radio Club** Secretary, Quintin, M1ENU, was won by a team from Horndean. This result seems to balance the results as Itchen Valley have previously won Horndean's quiz.

For a number of years, Ann, G8NVI, Mike, G8CUL and David, M6YHS have been holidaying in Normandy and have had the pleasure of attending some of the Caen Radio Club events during that time. In 2013 they bought a property in Normandy (at IN98PT) and to celebrate held a BBQ in August 2014 and invited members of the Harwell Amateur Radio Society and the Caen Radio Club. At the event were 15 licensed amateurs, 7 British and 8 French, along with their XYLs and a good time was had by all. The photo shows the assembled amateurs – after they had eaten the food excellently prepared by John, G6LNU and Paul, M0PXM. An account of the event was published in the October 2014 edition of the *Radio-REF* (the French version of *RadCom*), written by Dominique, F5PAX, 'Monsieur Le President' of the Caen Radio Club. Ann and Mike look forward to a repeat event in 2015!



REGION 11: SOUTH WEST & CHANNEL ISLANDS

REGIONAL MANAGER: PAM HELLIWELL, G7SME, RM11@RSGB.ORG.UK

Appledore & DARC
Alan, M6CCH, 01237 422 833
16 WSPR and web SDRs, Mike, G4KXQ

Bristol RSGB Group
Robin, G3TKF, robin@g3tkf.co.uk
23 The history of valves, Colin, G3YHV

Exeter ARS
Nick, M0NRJ, 01363 775 756
2, 24 HF net, 3.675MHz, 7.45pm
3, 10, 16 2m net, 145.575MHz, 7.45pm
9 RF filters for the faint-hearted talk, Pete, G3ZVI
23 Rise & fall of quadcopters, Ivor, G6ATJ

Mid-Somerset ARC
David, G8BFV, 01749 670085
10 Activity night

Plymouth Radio Club
David, 2E0DTC
d.beck123@btinternet.com
10 AGM

Torbay ARS
Dave, G6FSP, g6fsp@tars.org.uk
27 AGM

Yeovil ARC
Rodney, MORGE, 01935 825 791
5 Mini talks
12 SWR, G3MYM
19 Morse practice by G3MYM
26 On the air

The Foundation course at **Flight Refuelling ARS** in November was attended by three candidates from the local areas of Dorset and Hampshire and one from what could be called, for them, a DX location – Yorkshire. The young visitor Jonathan Jackson, accompanied by his father Andrew, MORCL travelled down from York to take advantage of our training weekend in Dorset, which ended on Sunday afternoon with the Foundation exam. The candidates, Tom, Jonathan, Michael and David were delighted after they were told their (provisional) pass marks, especially Jonathan. Keen as mustard throughout the weekend, he impressed us all with them ability considering he is about to turn twelve years old! In fact, he actually danced with excitement on hearing the result and gave a whoop of joy when his father presented him with a VHF handheld transceiver for doing so well. Congratulations are due to all involved for another successful course at FRARS and we look forward to welcoming many more entrants to the hobby on our weekend courses during 2015. Details at www.frars.org.uk

There is still time to enter the National Club of the Year competition (kindly sponsered by Waters & Stanton). Entries must be with your Regional Manager by 31 January. See the RSGB website for details.

After another successful year in the history of the **Plymouth Radio Club**, members celebrated with a Christmas Party. A group photograph was taken to record this special occasion.

REGION 12: EAST & EAST ANGLIA

REGIONAL MANAGER: STEVE THOMAS, M1ACB, RM12@RSGB.ORG.UK

Braintree & DARS
John, M5AJB, 01787 460 947
2 How to DF hunt the club event

Cambridge & DARC
David, M0ZEB, 01353 778 093
13 Surplus sale
27 Thermal imaging, David, G0LRD

Chelmsford ARS
secretary@g0mwt.org.uk
3 Probing the Northern Lights, Brendan Goodbody at Oaklands
5, 12, 19, 26 Training & Morse classes at Danbury Village Hall
16 Skills workshop at Danbury Village Hall

Thames ARG
Mark, M0IEO, 07940 579 116
5 SDR radio, Justin, G0KSC
21-22 Foundation course and exam

Sunday, 7 December saw **Essex RAYNET** supporting Farleigh Hospice at the annual Santa Fun Run in Chelmsford. Nearly 700 runners and walkers dressed in Santa outfits for the 4km run in central Chelmsford, with the team from Essex RAYNET providing event communications. With a relatively short area to cover a single repeater was used, allowing operators to use handheld radios to stay in touch with Control. Four teams were deployed to key checkpoints along the run, with a further team following the runners along the route. Events such as this are a great way for amateurs to use their radio skills and knowledge to help the local community, as well as to train for possible emergencies. As the team was packing up, RAYNET came to the help of a British Red Cross ambulance that lost traction on the muddy park ground, giving them a helpful push. Photos from the event are at www.sxham.uk/santa14

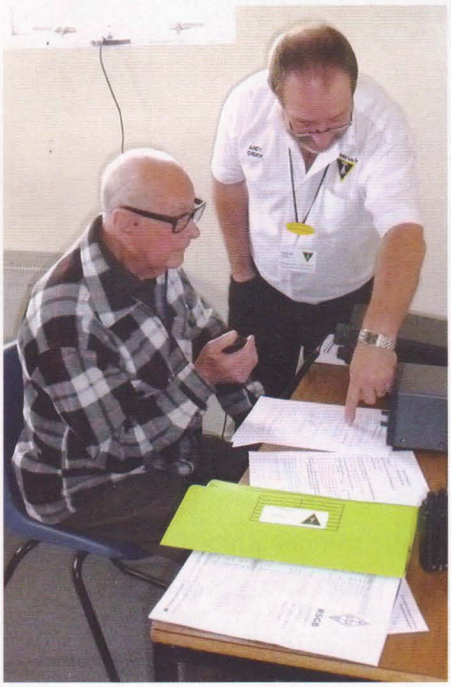
On 13 December, Essex-based retailer Waters & Stanton held its annual in-store Christmas Open Day. This well-attended event saw amateurs from around the county and beyond meet to catch up with old friends and pick up a bargain. Local groups also supported the event with representatives attending from the Chelmsford Amateur Radio Society, the Essex CW Club, Essex Ham, the Essex Repeater Group, the South Essex Amateur Radio Society and the Thames Amateur Radio Group. Twenty members of Essex Ham attended. The photo shows Steve, G4ZUL, watched by a festive Peter, G0DZB, and a short video montage from the event can be found at www.sxham.uk/wsxmas14

The **Braintree & District ARS** meeting of 3 November was an evening dedicated to understanding and using oscilloscopes. Dave, G0DEC, who uses this equipment professionally, gave the presentation. He started by explaining what 'scopes can be used for from audio and deviation testing to component and equipment testing. Dave set up a miniature CCTV camera in conjunction with a large TV screen to enable us all to see the 'scopes on display being used in various test scenarios. He also showed and demonstrated some of the various ancillaries such as expansion probes etc. After a lively Q&A session and a hands-on session, Dave concluded by saying that apart from a good multimeter, an oscilloscope was the second most important bit of test kit in the constructor's shack.

The **Thames ARG** Training Team, consisting of 10 lecturers of whom 6 are RSGB Registered Assessors, has scheduled three one-weekend Foundation Training Courses in 2015. They will take place on 21/22 Feruary, 8/9 August and 14/15 November. An Intermediate course over two consecutive weekends is scheduled for 11/12 and 18/19 April. Candidates are required to have

familiarised themselves with the course handbook and be heads down at 9am each Saturday and Sunday throughout a course. Lunch and regular refreshments are supplied by TARG's certificated catering team. At a recent Foundation course 9 candidates passed, the youngest just 10 years old and the eldest, 90. More training courses will be run according to demand.

TARG has a membership age spanning from 10 to 90 years old, a quarter of whom are female, with 7 family groups and 6 couples.



REGION 13: EAST MIDLANDS

REGIONAL MANAGER: STEVE BODEN, G4XCK, RM13@RSGB.ORG.UK

Loughborough & DARC
Chris, G1ETZ, 01509 504 319
3 Taking the strain, part 2, Brian, G8BUB
10 2m club net
17 Vintage radio and test equipment evening
24 Practical evening

Melton Mowbray ARS
Brian, M0YBX, 07772 659 622
20 Antenna modelling, M0YBX

Nunsfield House ARG
Ken, G3OCA, 01332 720 976
6 AGM
13 Filters part 1
20 Filters part 2 of 2
27 Program planning meeting

RAF Waddington ARC
Bob, G3VCA, 07971 166 250
2, 9, 16, 23 Club net, 145.325MHz, 8pm
12 The 4 Lincoln repeaters, Bob, G7AVU

South Kesteven ARS
Nigel, M0CVO, 01476 402 550
4, 18 Informal evening

Nearly fifty members and guests of **RAF Waddington ARC** attended a delightful and entertaining evening at the Pyewipe Inn for a Christmas meal. Mercifully, the chairman Bob, G3VCA gave a very short speech. James, G0EUN as usual ran the raffle in an efficient and humorous way. Star of the evening was 12 year old Felicity Turner, daughter of Graham, M1DHV and Sandra. Felicity sang like a professional and captivated her audience. A fitting end to a very successful year.

Classified Ads

For Sale

WANT A DATA INTERFACE?
You need an ISOTERM, Various models for your needs. PSK, WSJT, WSPR, CW & RTTY. NEW USB TRAVELLER Interface now available. See www.g3liv.co.uk

THINK ITS TIME TO TIDY UP YOUR MORSE KEY CONNECTIONS?
NEW GOLD PLATED UNIVERSAL CABLETIDYS for most BUG's and PADDLES, VIBROPLEX, JA7GHD,etc See www.g3liv.co.uk email:johnny@melvin.com tel: 0191 2843028

FIBREGLASS TUBE
High strength tube, square box, rod, and other sections all from stock in 6m lengths. Engineered Compositions, Chester. Tel: 01244 676000 e. barbara@engineered-composites.co.uk www.engineered-composites.co.uk

BAOFENG, TYT & VERO HANDHELDS
at best prices from authorised UK importer. Full range of accessories available. www.sinotel.co.uk, 01926-460203, sales@sinotel.co.uk

CTCSS ENCODER AND DECODER KITS,
DTMF Kits and Modules, PIC Microcontroller Development Kits. www.cstech.co.uk

Cards & Design

QSLERS SPECIAL OFFER
1000 full colour both sides qsl cards £40 plus postage. 07720 580968 www.QSLers.co.uk

LOW COST AND HIGH QUALITY QSL CARDS BY LZ1JZ QSL PRINT www.LZ1JZ.com

'QUALITY QSL CARDS 4 colour cards from £34/1000. For samples /enquiries /easy payments contact Charles MØOXO, 60 Church Hill, Royston, Barnsley, Sth Yorks S714NG ; Tel 07900 500775 Email charles.wilmott@m0oxo.com/ Web www.ux5uoqsl.com/

Aerials

M0CVO ANTENNAS
For all your amateur radio antenna needs. Full details at: www.m0cvoantennas.com

SIGMA EURO-COMM LTD
HF Vertical, Wire, G5RV & Mobile Antennas, VHF Base Station Antennas Mounting Poles, Magnetic Mounts Tel 0121 766 8146 stores.ebay.co.uk/sigmaeurocommltd

WESTERN HF 10
67ft wire dipole 160-6m, full details lookup m0bzi at: www.qrz.com buy direct: m0bzi@hotmail.co.uk or 07748331458 reviews at: http://g0kya.blogspot.com/2010_08_01_archive.html **or** http://www.eham.net/reviews/detail/9424

G WHIP ANTENNAS
Over 45 years of amateur & commercial business. Military specification at amateur prices. Famous resonant end fdes, baluns, windoms, many different antennas, mostly made using kevlar mill spec wire. See Eham reports or www.gwhip.co.uk Tel: 07592 135431

GRAB A NEW YEAR DISCOUNT
Available on two top selling antennas Quote: RadCom 2015 www.proantennas.co.uk 07906 512459

THE NEW 9 BAND ROTATABLE DUAL BEAM PRO
The reviews say it all "Outstanding" www.proantennas.co.uk 07906 512459

THE NEW 9 BAND I-PRO HOME VERTICAL
Performance and simplicity! www.proantennas.co.uk 07906 512459

Computer Software

PROGRAMMING SOFTWARE FOR YAESU
Radios Http://www.g4hfq.co.uk bob.freeth@g4hfq.co.uk (01425) 618092

BUILD YOUR OWN DATAMODES INTERFACE!
Audio isolation transformers for PSK31 RTTY SSTV etc. 600ohm 1:1, only £4.99 + postage per pair. For these and more great items go to www.technofix.co.uk

Miscellaneous

CALL IN ON THE UK 'GOOD NEWS' CHRISTIAN NETS!
Every Sunday morning at 8am local on 3747kHz, 2pm on 3747 or 7147KHz (propagation) and 144.205 SSB at 3pm sharing Christian fellowship. Go to www.wacral.org for more information or contact G3XNX at 51 Alma Road, Brixham, South Devon, TQ5 8QR, Tel: 01803 854504 or derekg3xnx@talktalk.net

Equipment

REPAIRS TO RECEIVERS, TRANSMITTERS
New/Old, valve/transistor. Call 07903 023437 for details: www.kentrigs.co.uk

RELIABLE REPAIRS
For all amateur and vintage equipment. Professional service, reasonable rates. Call: 01807 580376
E: radiorepairs@btconnect.com

Wanted

UNWANTED VALVE AMPLIFIERS
Working or not. Known makes only (Kenwood, Yaesu, Drake, Linear Amp, etc), not home-brew. Also 3-500Z/ZG valves. Cash paid. Contact Peter G3ZRS on 01482 862323 or g3zrs@hotmail.co.uk

VINTAGE RADIO & VALVES WANTED
national cash settlement for silent key, shack clearouts 07552678725, vintageradio@btinternet.com

Classified advertisements 58p per word (VAT inc.) with a minimum of 14 words £8.12.
All classified advertisements must be prepaid. Please write clearly. No responsibility accepted for errors. Latest date for acceptance is 1st of the month prior to publication
Payment to: RSGB, 3 Abbey Court, Priory Business Park, Bedford, MK44 3WH

Business Cards

For Business Card advertising Call Chris Danby on 01603 898678

Adertisers Index

FREE MEMBERS' ADS

Charges are waived for Members' Ads submitted by e-mail to memads@rsgb.org.uk. One ad of no more than 40 words per Member per month; other important terms & conditions apply (see grey box on page 93).

FOR SALE

AH-4 ATU, with box. Like new; only used 24 hours. Never mounted. £275 ONO. ICOM ID-31E, mint condition, in box, with 4GB SD card, £185 ONO. Pick-up preferred, but can post if required. Andre Ravary, MORAV, 07588 332 228 (Littlehampton, West Sussex).

bhi NOISE CANCELLING DSP SPEAKER NES10-2 MK3. As new, now superfluous to needs, £50. Buyer collects or p&p extra. Peter, MOPCC, 07749 755 376 (South Croydon).

EDDYSTONE EA12 amateur band receiver £425. 940 gen cov £240. These radios work very well and are very very clean and unmarked. Collect & inspect. Robert, G4IHT, 01285 841 203 (Tetbury, Glos).

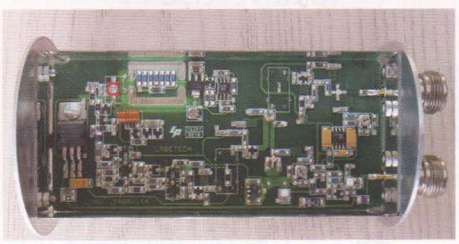
GSV3000 PSU 0-15V 34A & 2x 6A outputs. Excellent condx, no scratches etc. Collection or courier arranged by buyer. G3VLQ, merv.al@btinternet.com (Yeovil, Somerset).

ICOM IC-7400 plus mic, manual, leads and packing, mint, £650. Drake2A receiver, £150. R107 receiver, working, plus original manual, £100. HRO MX, 7 coils, plus PSU, £140. Hanson FS7 144/430 SWR meter, £45. G4BGX, 01258 857 019 (Poole area).

KENWOOD TS-680S 100W HF + 6m. Good working order, little used, boxed, user manual, plus a Watson W25-am PSU unused. Both items bought by myself from new. £350 OVNO. Collection only please. G0CKM, 07881 303 134, cyrillwdgee@btopenworld.com (Dukinfield).

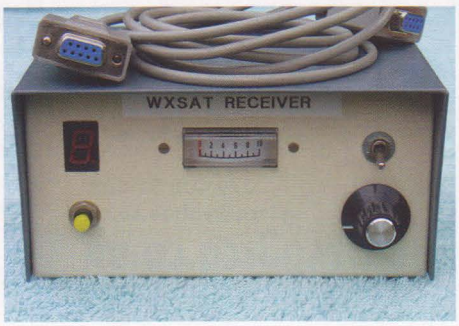
MARCONI TF2300 Modulation Meter, 5.5-1000MHz, £50. Radiometer BK5Fh Distortion Meter, 20Hz-20kHz, £30. Levell TM6B Millivoltmeter, 1Hz-3MHz, £30. Levell TG200D Sine/Square Oscillator, 1Hz-1MHz, £30. 50-500MHz ÷10 prescaler, cased, PSU, £10. 2x8W UV fluorescent tubes, chokes, £10. Altai SWR2t, £3. List available. Bob, G3OOU, 01737 552 170, g3oou@aol.com (Coulsdon).

2400MHz to 144MHz DOWNCONVERTER. Circa 0.8dB noise factor. N type connectors, 12V feed on 144MHz interface (using bias T). Complete with masthead bracket, £75 ONO. Nic, G3YEG, 01983 718 487 (Bembridge, IOW).



PLESSEY 1203 Naval VHF and UHF transceiver equipment. Two UHF programmable Tx/Rx 5820-99-531-1172. 225-399.975MHz. Cabinet for two units. Test unit diagnostic, c/w leads. Manual BR4273 transceiver type 1203 £750.00 collection only Ralph Whitwell, G4EBL Ralph@razel.plus.com (Herefordshire).

REQUIRES RX2 RX2 POLAR ORBITING WX SAT RX, latest PIC installed. Pass Control (Autoscan) function from RS232 PC link. Built into metal case w/signal meter, speaker and RS232 port. External PSU included with software which is also available online. £70 inc carriage. Derek, G3MWO, 01359 270 218, dabeales50@gmail.com (Bury St Edmunds).



SUPER ANTENNA MP1DLX complete portable antenna package, as new, with tripod stand, 80m coil, go-bag and all other accessories. £120 including postage within the UK. Tom, GW3LJS, 01792 363 442 (Swansea)

YAESU FT-2800M 65W 2m MOBILE, boxed, £75. Heater transformer for 8877/3cx1500, £30. Cushcraft A50-5S 50MHz 5-ele beam, £70. Vacuum capacitor 3.4 to 50pF, 10kV, Russian NOS, never used, complete with mounting brackets, suitable for 50MHz high power linear amp, £70. Gordon Mccallum, GM3UCI, 01555 770 914 (South Lanarkshire).

WANTED

572B VALVE, new or used provided that it is good. Vic Waddington, G4JSS, 01924 267 451, g4jss@tiscali.co.uk (Wakefield).

I AM IN NEED OF either a 12 pin socket (as pictured) or better still a complete AC or DC lead for my recently acquired FT-101E. If anyone can help please contact me on 0114 288 1692 or preferably via email to g3wxi@qsl.net. Alan, G3WXI (Sheffield).

ICOM IC-765 or IC-781 wanted in any condition, also filters FL101, FL53A. Marcin, MOGLV, 07522 100 637 (Hull).

LABGEAR LG300 power supply / modulator or LG300 empty cabinet. Derek Dunn, G8KOV, 01548 531 368 (Devon).

QUARTZ CRYSTAL, 453.500kHz, plus or minus 100Hz. B7G base would be ideal, but any other base can be adapted. (Required for KW Rx). Brian Tibbert, G3RKZ, briantibbert2011@btinternet.com (Derbyshire).

SEPARATION CABLE OPC581 OR OPC587 for Icom IC-706 mk11g please. Also IC-756 mk3 and Yaesu 1000. Jim, M6JEK, 01621 892 042, radiojim@outlook.com (Maldon, Essex).

RALLIES & EVENTS

Members of the RSGB Regional Team will be present with a bookstall at the rallies this month marked with an RSGB diamond

1 FEBRUARY – **30th CANVEY RADIO & ELECTRONICS RALLY** – 'The Paddocks', Long Road, Canvey Island, Essex SS8 0JA (southern end of A130). Free CP, OT 10.30. C, DF, TS. Vic Rogers, G6BHE, 01702 308 562, nvr@blueyonder.co.uk. [www.southessex-ars.co.uk].

8 FEBRUARY – **HARWELL RADIO AND ELECTRONICS RALLY** – Didcot Leisure Centre, Mereland Road, Didcot. TI S22, free CP, OT 9.45/10.00, £3 (under 12's free). TS, FM, SIG, LB, C, DF. Ann, G8NVI, 01235 816 379, ann.stevens@btinternet.com. [www.g3pia.org.uk].

15 FEBRUARY – **RADIO-ACTIVE RALLY** – Civic Hall, Nantwich, Cheshire CW5 5DG. OT 10.30, TS, B&B, C, DF, WIN. Jayne 07926 078 232, Jayne.ruscoe@yahoo.com. [www.midcars.org].

22 FEBRUARY – **BRATS RAINHAM RADIO RALLY** – Rainham School for Girls, Derwent Way, Rainham, Gillingham, Kent ME8 0BX. TI, OT 10.00/9.30, TS, SIG. David Filby, 2E0DCN, Dfilby191@yahoo.com. [www.brats-qth.org].

22 FEBRUARY – **PENCOED ARC TABLE TOP SALE** – Pencoed RFC, The Verlands, Felindre Rd, Pencoed CF33 5PB off at J35 M4. Tables £5, OT 8.30am sellers, 9:30am buyers, £2, C. Madeline, 01639 885 126. [www.mw0prg.co.uk/events.uk]

1 MARCH – **EXETER RADIO & ELECTRONICS RALLY** – America Hall, De La Rue Way, Pinhoe Exeter EX4 8PW. OT 10.15/10.30, £2. TS, B&B, C. Pete, G3ZVI, 07714 198 374, g3zvi@yahoo.co.uk.

8 MARCH NEW VENUE – **30th WYTHALL RADIO CLUB RALLY** – WRC HQ, Wythall Park, Silver Street, Wythall B47 6LZ. OT 9.30/10am, £3, CP, TS, C, LB, DF. John, 07428 055 931, m1jss@ymail.com. [www.wrcrally.co.uk].

15 MARCH – **DOVER RADIO RALLY** – Whitfield Village hall, Sandwich Road, Whitfield, Dover CT16 3LY. Doors open at 10am and the auction starts at 12.30pm. The rally ends at 1pm. Entrance price for visitors is £2. For booking form for tables, please visit the website. [www.darc.org.uk].

21 MARCH – **40th DUTCH NATIONAL RADIO FLEA MARKET** – "Autotron", Rosmalen, just off A59 motorway. TI PI4SHB, 145.500MHz, CP, OT 9am. TS, FM, C. Details: info@radiovlooienmarkt.nl. [www.radiovlooienmarkt.nl].

22 MARCH NEW DATE – **HACK GREEN BUNKER RALLY** – Hack Green Secret Nuclear Bunker, Nantwich, Cheshire, CW5 8AL. Sale of electronic equipment, amateur gear, components, military radio sets and vehicle spares. OT 10.00, TS, C. Lucy, 01270 623 353, Lucy@hackgreen.co.uk. [www.hackgreen.co.uk]

22 MARCH – **LAUGHARNE RADIO RALLY** – Millenium Memorial Hall, Laugharne SA33 4QG. OT 10am (9.30am) to 2pm, £FREE, tables free, WIN, C. Matthew, GW6KOA, 01994 427 581, matthew.twyman63@btinternet.com.

Rallies & Events

29 MARCH – **DEVON & CORNWALL REPEATER GROUP + CALLINGTON ARS RALLY** – Callington Town Hall, Callington, Cornwall PL17 7BD. OT 10am, £2, CP, B&B, Camping site available. Roger, 2e0rph@gmail.com

12 APRIL – **WEST LONDON RADIO & ELECTRONICS SHOW** (Kempton Rally) – Kempton Park Racecourse, Staines Road East, Sunbury on Thames, TW16 5AQ. TI, free CP, OT 9.50/10am. TS, FM, B&B, SIG, C, DF, WIN, LEC. Paul, M0CJX, 08451 650 351, info@radiofairs.co.uk. [www.radiofairs.co.uk].

12 APRIL – **31st YEOVIL QRP CONVENTION** – Digby Hall, Hound Street, Sherborne, Dorset DT9 3AA (adjoining the central shopping car park). TI S22, CP, OT 9.30-3.00, £3, TS, LEC, B&B, C, DF. Steve, G7AHP, 01803 666 407, steve@g7ahp.co.uk.

12 APRIL – **52nd NORTHERN AMATEUR RADIO SOCIETIES ASSOCIATION EXHIBITION (Blackpool rally)** – Norbreck Castle Exhibition Centre, Blackpool FY2 9AA. TI, CP, OT 10.15 / 10.30. TS, B&B, SIG, MT, LB, C, DF, RSGB book stall. Dave, M0OBW, 01270 761 608, dwilson@btinternet.com. [www.narsa.org.uk].

19 APRIL NEW DATE – **WEST LONDON RADIO & ELECTRONICS SHOW** (Kempton Rally) – Kempton Park Racecourse, Staines Road East, Sunbury on Thames, TW16 5AQ. TI, free CP, OT 9.50/10am. TS, FM, B&B, SIG, C, DF, WIN, LEC. Paul, M0CJX, 08451 650 351, info@radiofairs.co.uk. [www.radiofairs.co.uk].

3 MAY – **SCOTTISH HIGHLAND RADIO RALLY** – Aviemore Primary School & Community Centre, Muirton, Aviemore PH22 1SF. TS, SIG, RSGB bookstall, CP. OT 10.30am-4pm. Free tables for clubs & private sellers. Seating area. Roy, GM4VKI, 01563 850 976, rkavampsev@btinternet.com.

3 MAY – **DAMBUSTERS HAMFEST** – Thorpe Camp Visitor Centre, Coningsby, Lincs LN4 4PE. TI S22, GB3FR, £3, RAF heritage centre on site. Overnight camping by appointment. C, OT 10am. Mainly an outdoor rally but some limited space is available indoors. [www.thorpecamp.org]. Contact tony.nightingale@yahoo.co.uk.

4 MAY (Bank Holiday Monday) – **DARTMOOR RADIO RALLY** - Tavistock College, Crowndale Road, Tavistock, Devon. PL19 8DD. OT 10.15/10.30, £2, Free CP, No TI, TS, B&B, SIG, C, DF. Roger Hann, 2E0RPH, 01822 852 871, 2E0RPH@gmail.com.

31 MAY – **BLACK COUNTRY RADIO RALLY** – Portway Lifestyle Centre, Newbury Lane, Oldbury, West Midlands B69 1HE. OT 9.30am, TI, CP, TS, B&B, SIG, C, DF, WIN, £2, RSGB Book Stall. Martin, radio-circle@live.co.uk

6 JUNE – **SUSSEX ELECTRONICS & RADIO FAIR** (SERF 2015) – Eastbourne Sports Park, Cross Levels Way, Eastbourne, East Sussex BN21 2UF. info@serf.org.uk [www.serf.org.uk]

7 JUNE – **SPALDING & DARS ANNUAL RALLY** – The Sir John Gleed Technology School, Halmer Gardens, Spalding, Lincs PE11 2EF. TI S22, free CP, OT 10am. TS, C, CBS. John, G4NBR, 07946 302 815, rally-secretary@sdars.org.uk. [www.sdars.org.uk].

14 JUNE – **14th JUNCTION 28 QRP RALLY** – South Normanton Alfreton and District Amateur Radio Club in association with the G QRP Club. Alfreton Leisure Centre, Church Street, Alfreton, Derbyshire DE55 7BD. 10 mins from M1 J28 and the A38. TI S21, OT 10am. TS, SIG, C, LB. Anya Lawrence, 2E0BQS, 0115 930 7322, adylawri@btinternet.com. [www.snadarc.com].

20 JUNE – **SOUTH LANCS SUMMER RALLY** – Bickershaw Labour Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE. OT 9.00 (traders 7.30). £2.50, B&B, C, DIS, CP, SIG, DF, TS, LB. Jason, G0IZR 01942 735 828. [www.slarc.co.uk/rally].

21 JUNE – **28th NEWBURY RADIO RALLY** – Newbury Showground, next to M4 J13. TI S22 (V44), free CP, OT 9am (visitors), 8am (sellers). Visitors £2.50, CBS pitch £12.50. Huge radio, electronics & computing boot sale including demonstration marquee with display of amateur radio on air (SSB, CW, & DATA), air traffic radar, plus clubs and national society stands. TS, C, CBS, WIN, DF, FM, SIG. Contact rally@nadars.org.uk. [www.nadars.org.uk].

28 JUNE – **WEST OF ENGLAND RADIO RALLY** – Cheese & Grain, Bridge Street, Frome, Somerset BA11 1BE. CP, OT 10am-2pm, £2.50. TS, RSGB book stall, C, DIS. Shaun, G8VPG, 01225 873 098, rallymanager@westrally.org.uk. [www.westrally.org.uk].

19 JULY – **FINNINGLEY ARS SUMMER RALLY** – The Hurst Radio Communications Centre, Belton Road, Sand toft, Doncaster DN8 5SX. Easily accessible from M180 J1/J2. OT 10am, £3, TS, CP, B&B, TI S21, RSGB bookstall. Kevin, G3AAF, 07831 614 640. [www.finningleyradiorally.co.uk].

19 JULY – **McMICHAEL RADIO RALLY & CAR BOOT SALE** – Reading Rugby Football Club, Holme Park Farm Lane, Sonning Lane (B4446), Sonning on Thames, Reading RG4 6ST. TI, free CP, £2, LB, C, SIG, WIN, TS, CBS, OT 9:30. Pete, G8FRC, 01189 695 697. [www.mcmichaelrally.org.uk].

26 JULY – **HORNCASTLE SUMMER RALLY** – Horncastle Youth Centre, Lincolnshire LN9 6DZ. OT 10.30, £1.50, DF, C, free CP. Tony, G3ZPU, 01507 527 835, tony.nightingale@yahoo.co.uk.

9 AUGUST – **FLIGHT REFUELLING ARS HAMFEST** – Cobham Sports and Social Club Ground, Merley, nr Wimborne, Dorset BH21 3DA. TI S22, CP, OT 10.00, TS, CBS, LB, C. Tony Baker, G3PFM, hamfest@frars.org.uk. [www.frars.org.uk].

4 OCTOBER – **HORNSEA AMATEUR RADIO CLUB RALLY** – Floral Hall, 7 The Esplanade, Hornsea, East Yorks HU18 1NQ. OT 10am, CP, TS, B&B, SIG, RSGB, RAFARS, LB, C, DF, WIN. Details from Rick, M0CZR, 01964 533 712, R106221@aol.com. [www.hornseaarc.co.uk].

11 OCTOBER – **HACK GREEN BUNKER RALLY** – Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL. Electronic equipment, amateur gear, components, military radio sets and vehicle spares. OT 10am, TS, C. Lucy, 01270 623 353, Lucy@hackgreen.co.uk. [www.hackgreen.co.uk].

18 OCTOBER – **HOLSWORTHY AMATEUR RADIO RALLY** – Holsworthy Community College, Victoria Hill, Holsworthy EX22 6JD. TS, B&B, C, DIS. Register at http://harc.postalboard.com/login to make any enquiries. [www.radioclubs.net/harc/]

This list shows all rallies and events we are aware of as of press deadline. If your rally or event is not listed, TELL US ABOUT IT! **Send an e-mail to radcom@rsgb.org.uk and your event will appear here and on GB2RS.** It's free! Guidelines for submissions: please let us know your event details as early as possible. If you submit by e-mail (to radcom@rsgb.org.uk) then we suggest you set your e-mail program to request a 'read' receipt so you can be sure we've seen the details. We also recommend you check the details are correct in *RadCom* and **tell us if they're wrong.**

Abbreviations: TI Talk-In; CP Car Park; £ Admission; OT Opening time - time for disabled visitors appears first, (eg 10.30/11am); TS Trade Stands; FM Flea Market; CBS Car Boot Sale; B&B Bring and Buy; A Auction; SIG Special Interest Groups; MT Morse tests; MA Foundation Morse Assessments; LB Licensed Bar; C Catering; DF Disabled Facilities; WIN prize draw, raffle; LEC Lectures/Seminars; FAM Family attractions; CS Camp Site.

RSGB MEMBERS' ADVERTISEMENTS

RSGB Members wishing to place an advertisement may do so free of charge by e-mail.

The following terms and conditions apply to all Members' Advertisements.

1) In order to qualify for free insertion, Members Ads must be submitted by e-mail to memads@rsgb.org.uk. You should receive an automatic acknowledgement almost immediately – if you don't, please phone the *RadCom* office on 01234 832 714. Ads may still be submitted by post but must be accompanied by a payment of £5 to cover administration costs.

2) **Your advert must clearly show whether it is For Sale or Wanted and must include your name, callsign or Membership number, telephone number and postal town.**

3) The Ad may not contain more than 40 words, excluding the information in (2), and may be edited for readability at our sole discretion. Longer ads may be accepted if there is a good reason, eg a shack clearance on behalf of a SK Member; e-mail us and ask.

4) Not more than one ad per month will be accepted from any member. 'Recurring' ads will not be accepted, but Members may re-submit the same advert each month if they wish.

5) E-mailed adverts may optionally include one photograph of the item(s) being offered. Images must be attached as a jpg file, at least 800 pixels wide and of good quality. By submitting any image you warrant that you own the copyright of that image and that you permit the RSGB to use it in any way. We will endeavour to publish photos with ads as space permits but cannot guarantee to publish any particular photo.

6) Adverts will be published at the first available opportunity but no guarantee can be given as to when a particular ad will appear.

7) The RSGB believes that it is inappropriate for Members trading in radio equipment in any way to place Members' Ads. We therefore regret we are unable to accept such ads, although we do welcome these in the 'Classified' advertising section of *RadCom*.

8) The RSGB accepts no responsibility for errors or omissions, or for the quality of goods for sale or exchange.

9) Members' Ads are accepted and published in good faith.

10) Members' Ads are accepted at the sole discretion of the Editor, whose decision is final.

WARNING

Members are advised to ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement.

The 'purchase' of goods legally owned by a finance company could result in the 'purchaser' losing both the goods and the money paid.

Members' Ads can now be accessed via Membership Services in the digital edition of the magazine.

SPECIAL EVENTS STATIONS

These callsigns are valid for use from the date given, but the period of operation may vary from 1 - 28 days before or after the event date. Operating details are provided in an abbreviated form as follows: T = 160m; L = 80 or 40m; H = HF bands (30 - 10m); V = 6 and/or 4m; 2 = 2m; 7 = 70cm; S = satellite and P = packet. Details published here are kindly provided by Ofcom.

Date	Callsign	Phonetics	Location	Bands	Keeper
20/02/2015	GB2RSC	Radio Scouting Chesterfield	Chesterfield	TLHV27	G0THF
21/02/2015	GB5WDG	Watton District Guides	Sahan Toney	TLH27	G0AJJ
22/02/2015	GB0PAX	Papa Alpha Xray	London	TLH27	G3YZO
24/02/2015	GB0FHG	Farnham & Hedgerley Guides	Stoke Poges	LH27	G4XDU
28/02/2015	GB2NCL	Newcastle	Newcastle	LH27	G4LIA

25 OCTOBER – **26th GREAT NORTHERN HAMFEST** – Barnsley Premier Leisure Complex, Queens Road, Barnsley S71 1AN or follow the brown Metrodome signs. GNHF in association with SYRG. OT 10am, TS, SIG, C, FAM. Ernie, G4LUE, 07984 191 873. [www.gnhf.co.uk].

8 NOVEMBER – **WEST LONDON RADIO & ELECTRONICS SHOW** (Kempton Rally) – Kempton Park Racecourse, Staines Road East, Sunbury on Thames, TW16 5AQ. TI, free CP, OT 9.50/10am. TS, FM, B&B, SIG, C, DF, WIN, LEC. Paul, M0CJX, 08451 650 351, info@radiofairs.co.uk. [www.radiofairs.co.uk].

15 NOVEMBER **NEW VENUE** – **CATS RADIO & ELECTRONICS BAZAAR** – Coulsdon Community Centre, Chipstead Valley Road, Coulsdon, Surrey CR5 3BE. Limited on site parking (50), street parking available. OT 10am-2pm, £1 including a complimentary tea or coffee, B&B, C, DIS. Glenn, G4FVL, bazaar@catsradio.org.

15 NOVEMBER – **PLYMOUTH RADIO CLUB RALLY** – Harewood House, The Ridgeway, Plympton, Plymouth PL7 2AS. CP, TI, OT 10am, £2, TS, C. Sheila Hart, 2E0YSH, 07815 542 477, sheo@fsmail.net.

5 DECEMBER – **SOUTH LANCS WINTER RALLY** – Bickershaw Labour Club, Bickershaw Lane, Bickershaw, Wigan WN2 5TE. OT 9am, traders 7.30am. £2.50, B&B, C, DIS, CP, SIG, DF, TS, LB. Jason, 01942 735 828.

SILENT KEYS

We regret to record the passing of the following Members:

Name	Date
Dr G Brown, MW5ACN	10/12/2014
Mr D Buttimore, G1NMF	12/2014
Mr C J J Bittan, G1TBO	
Mr T Simpson, GM3BCD	25/10/2014
Mr L R V Mitchell, G3BHK	6/10/2014
Mr H E Richards, GI3DXU	24/11/2014
Mr J Dunnington, G3LZQ	8/12/2014
Mr J E Cronk, GW3MEO	22/11/2014
Mr A C Wadsworth, G3NPF	11/12/2014
Mr D G Bingham, G3VBD	17/11/2014
Mr S D Williams, G4RGX	22/11/2014
Mr G L Holdom, G4SVU	3/12/2014
Mr E Barr, GI7FFF	25/2/2014

SILENT KEY COLUMN ENTRIES

To notify the RSGB that a Member has passed away (and their subscription should end and they should be listed in Silent Keys), please e-mail sales@rsgb.org.uk or telephone 01234 832 700 and then select option 1. We will need to know the deceased's name, callsign or RS number and, if possible, date of death.

OBITUARIES

Oituaries are published at www.rsgb.org/sk. Please send submissions by e-mail (only) to sk@rsgb.org.uk. All submissions are moderated and may be edited for reasons of style, grammar, length etc. *Online obituaries are separate from the Silent Keys column.*

Review

Mike Richards, G4WNC • e-mail: mike@photobyte.org

Continued from p34

possible to use the CS700 to send simple text messages to a specific user and to initiate a private call. The latter is a call to a specific station that can be located anywhere on the network.

In addition to its DMR facilities, the CS700 is a dual-mode rig so can also be used for conventional analogue FM. To help with this the latest UK Code Plug includes analogue simplex and repeater frequencies. The RF performance of the rig appeared to be very good with plenty of sensitivity and no signs of overload even when used with an external antenna. Battery life is difficult to define as it is so dependent on the amount of transmit time.

TABLE 1: Specification summary.

Frequency Range	400-470MHz (UHF model), 136-174MHz (VHF model)
RF Power	VHF: 5W/1W, UHF: 4W/1W
Frequency stability	±1ppm
Analogue sensitivity	0.35μV for 20dB SINAD
Digital sensitivity	0.3μV for 5% BER
AF output	>1W
Battery	7.4V lithium ion
Dimensions	113mm x 54.4mm x 35mm
Weight	275g with battery and antenna

The manufacturers claim 14 hours in digital mode and 11 hours in analogue but I found the life to be nearer 8 hours, which is still a very useful life.

The big question with any digital radio system is audio quality but this is something that's very difficult to convey in a few words. I strongly suggest that you listen to DMR before you buy. Here's my take on the sound quality. I found it to be very clear with good intelligibility and little to no audible background noise. However, the timbre of the voice is changed by the vocoder, making it difficult to hear the vocal characteristics that we use to identify individuals. The net result is that everyone tends to sound the same.

PHOTO 4: Clear labels describe the transceiver and Li-ion battery.

SUMMARY. There is no doubt that the CS700 is a very robust and extremely competitively priced DMR radio that should help this mode to catch on. As mentioned earlier in the review, the key to success in any of the digital voice modes is the availability of repeaters and the DMR network is currently growing quickly. If you want to get into digital voice at low cost the CS700 could be a very good place to start. The Connect Systems CS700 is available from Taylor Made RF [2] and costs £199.99 including VAT at 20%. The rig is supplied with a free programming lead and software. My thanks to Taylor Made RF for the loan of the review model.

WEBSEARCH

[1] http://register.ham-digital.net/
[2] www.tmrf.co.uk/

HF F-Layer Propagation Predictions for February 2015

Compiled by Gwyn Williams, G4FKH

	3.5MHz	7.0MHz	10.1MHz	14.0MHz	18.1MHz	21.0MHz	24.9MHz	28.0MHz
Time	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220	000011111220
(UTC)	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020	246802468020
*** Europe								
Moscow	666.....6666	6.7.....6666	..6.66666...	1.4666664111	..2666662...	..1666651...	...46663....	...34542....
*** Asia								
Yakutsk	21.....23443	3.2....34444	...221.2411.	...33...1...	...1.....	.....	.....	.....
Tokyo	.....3..	.....24433.	....2.23.21.	....2.11....	....1.....	.....	.....	.....
Singapore	.....3.32	55433	.....3542.2	.....442...	.....233....	....1222....	.....11.....	.....
Hyderabad	.....3.33	41.....35444	1.....1453.1	..1...343...	....22341...	...22333....	...22331....	...1222.....
Tel Aviv	.....6.66	6.6.....6666	..6....66.66	116555555233	..3555552.12	..2555531.11	..144332....	...33221....
*** Oceania								
Wellington	.....2....	....2345....	...445554...	...355552...	...24443....	....3331....	....221.....	.....1.....
Well (ZL) (LP)	.....	.....	..1.....	11.....	...2.....1..	...2.....1..	...1.....	.....
Perth	.....2..	.....454..	.....35.3.1	.....34....	.....133....	.....122....	.....11.....	.....
Sydney	.....2..	.....4543..	.....5542..	.....354....	....2333....	....1222....	....1.1.....	.....
Melbourne (LP)	.....	...3.....	...42.....	...33.....	...13.....	....2.....	....1.....	.....
Honolulu	...3.....	..142..1....	...32111....	.....1...	.....	.....	.....	.....
Honolulu (LP)	.....	.....	.....	.....	.....1...	.....1...	.....1...	.....
W. Samoa	.....	.....	.....	.....	.....	.....	.....	.....
*** Africa								
Mauritius	.....3..	4.....14544	2.....34433	.....431..	.....131...	...11122....	....1111....	.....
Johanesburg	33.....33	54.....455	33.....4444	24322	...1..1331..	...111232...	...111221...	....1111....
Ibadan	555.....555	5553....3555	55542...4555	322532235532	1.1544345311	...5544452..	...3544531..	...254332...
Nairobi	.3.....34.	543.....4555	424.....5544	1.22...35211	...322243...	...332342...	...211121...	...1..11....
Canary Isles	6666.....666	7666.....777	66.76...6766	4426666566654	2216666666632	11.566666421	...36666631.	...3666642..
*** S. America								
Buenos Aires	3332.....	4435.....34	3315.....33	...4.....11.	...21....1..	....11..1...	.....1.1....	.....1.....
Rio de Janeiro	333.....3	5544.....45	3324.....343	11.3.....321	...121.122..	....211121..	....21111...	....11.1....
Lima	3333.....	4425.....3	22.4.....2	...2.....	.....1.....	.....11.....	.....1.....	.....
Caracas	3333.....3	44342.....34	22.43.....32	...122...2..	.....32221..	.....3322...	.....3321...	.....211....
*** N. America								
Guatemala	3333.....	44252.....3	22.42.....12	...1.1.....	.....1.1...	.....211...	.....11....	.....
New Orleans	3333.....2	44142.....13	11.4.1....11	.....1.11..	.....322...	.....321...	.....12....	.....1....
Washington	44442.....24	552532...235	22.222111342	.....332331.	.....34331..	.....14441..	.....442...	.....321...
Quebec	.4442.....34	452431...245	11.122112332	.....33333..	.....24441..	.....1443...	.....332...	.....221...
Anchorage	.2.....	.....111.	.....22..	.....	.....	.....	.....	.....
Vancouver	.3.....	.2.3.....1	.....11..	.....22...	.....1...	.....	.....	.....
San Francisco	.3.3.....	.3242.....2	...21.....1	.....1....	.....11...	.....	.....	.....
San Fran (LP)	.....	.....	.....	.....2....	.....2....	.....2....	.....1....	.....

Key: The figures represent approximate S-Meter readings, whilst the colours represent expected circuit reliability. **Black** equals low to very low probability, **Blue** equals good probability and **Red** equals a strong probability. No signal is expected when a '.' is shown. The RSGB Propagation Studies Committee provides propagation predictions on the internet at **www.rsgb.org.uk/propagation/index.php**. An input power of 100W and a dipole aerial has been used in the preparation of these predictions; therefore a better equipped station should expect better results. The predicted smoothed sunspot numbers for February, March & April 2015 are respectively (SIDC classical method – Waldmeier's standard) 67, 65 & 64 and (combined method) 67, 65 & 63. The provisional mean sunspot number for December 2014 was 78.0. The daily maximum / minimum numbers were 121 on 17 December and 39 on 7 December 2014.

RadCom

USE THE 60m BAND IN 2015

David Stansfield, G0EVV

The 60m amateur band is unique in that it is split up into 11 discrete bandlets, each only about 10kHz wide. A Full licence and an NoV are needed to use the band but it offers the opportunity to work stations day and night across the UK and beyond. A number of the bandlets are dedicated to SSB and data use and the lowest bandlet, commencing at 5.258.5MHz, is usually used for CW. Activity levels are generally low so a Centre of Activity, where most of the activity occurs, is identified at 5.260MHz. If you want to polish your CW skills and have a chat to other UK stations, why not give it whirl. You might even work me into the bargain. Enjoy the magic.

[Newly issued Full licences, and all other Full licensees on completion of the current licence re-issue process, will be able to operate on these frequencies without a NoV – Ed.]

FM UNDER THREAT?

Derek, G1ZJQ

Reading through the band plans, I see the 2m Simplex channel section is stated as FM/DV (Digital Voice) use, with a note that DV users are asked not to use the FM calling channel on 145.500MHz. The DV calling frequency appears in a lower section of the band, at 144.6125MHz, with a note that other countries suggest 145.375MHz. At present, it seems DV users are to call CQ in one section then move to mix in with FM users. Is this a recipe for discontent? It is inevitable there will be clashes between FM and DV use on the same frequency – FM users will suffer digital noise while DV users may be unaware of their presence unless reception breaks up. It is as if someone has decided to bash FM users into submission; force them to abandon their simple analogue equipment and buy (not build) quite expensive DV radios. If this is allowed to happen, many may decide to switch off in disgust, depleting a valuable resource.

At present, there is no single DV standard. The big brands have their own proprietary digital modulation and here is no surprise; they are incompatible. If DV users of different brands need to contact each other, they must revert to analogue FM. There may be an open source DV variety in future; even if it was adopted as the standard there could be compatibility issues due to the sporadic habits of us amateurs. DV would be open to firmware updates; given time, early versions might not work so well with the latest so a spell away from the hobby could require a bit of downloading to get back on air.

What is my point? There has been much discussion in *RadCom* about new digital modulation, spread spectrum and remote operating. Doubtless, innovation is a requirement for the hobby to move forward and attract and retain interest. However, we must not neglect another important feature of amateur radio: emergency communications. In the UK, we are fortunate not to suffer frequent, widespread catastrophic natural disasters. A more likely scenario would be a sustained period without electrical grid power. No power, no land line, no mobile phone, no internet, no broadcast TV or radio, no repeaters, etc. If this happened tomorrow, we could provide regional and local communications assistance using simple FM portable and mobile radios (until vehicle fuel starvation) – the majority of amateurs I know have such equipment.

May I suggest the 2m (and 70cm) band plan is altered to ring-fence a small number of channels adjacent to the FM calling channel for exclusive FM use?

Please be assured there is little prospect of FM disappearing or being pressured and we will continue to watch this matter.

The FM/DV dual designation has been present since IARU Region 1 decided how to accommodate DV at the 2008 Cavtat Conference. It is also accompanied by a general footnote applicable to all band plans that DV users check that a channel is not in use by other modes, which in effect protects FM. The use of 144.6125MHz was the choice of early UK adopters before that so it always has looked isolated but no demand has yet emerged for a change. Separate DV and FM Calling channels certainly has helped and in practice we have seen few problems elsewhere.

A key reason is that the vast majority of DV use is closely associated with dedicated digital repeaters and gateways, so FM remains the dominant choice on the simplex channels. As DV grew, in 2012/13, we (and our Region 1 colleagues) re-grouped and separated the DV-nodes and analogue Echolink gateways. The 2015 band plan benefits from space being cleared in the 2m band from older modes such as FAX/RTTY and a reduction in packet radio, so there are further opportunities for DV Simplex to develop away from FM and that is before we consider the fantastic opportunity to use 146-147MHz for digital, including open source (eg FreeDV), innovative DATV or spread spectrum.

Murray Niman, G6JYB, Spectrum Forum Chairman

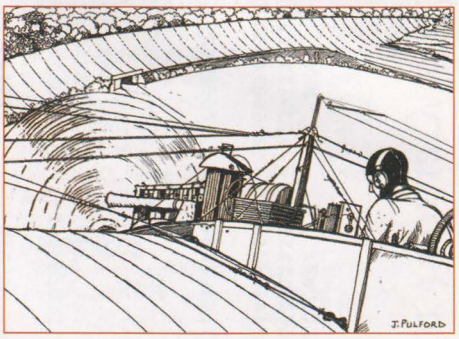
BROOKLANDS AND AVIATION RADIO

Andy Lambert, G8HER

A group of radio amateurs, who are volunteers at Brooklands Museum, are researching the history of radio on the site. This is being done ahead of the centenary of the first ground to air voice communication, in June 2015 (the first ground to air two way communication also took place at Brooklands, four years earlier).

We would like to make contact with anyone who has a detailed knowledge / records of these events, but also people who were involved in aviation radio at Brooklands, prior to the sites closer in the nineties.

We would also like to hear from anyone who was involved with the site's amateur radio club. Lastly, we are always pleased to hear from any radio enthusiast who would like to help us with restoration of equipment or, if living locally, becoming a Steward looking after both the collection and the operation of the museum station GB1BM. Please contact me either via e-mail to andy@andylambert.com or by telephone on 07580 200 500.



CHEQUEBOOK ENGINEERING

Andrew Howlett, G1HBE

The letter from Andy Keddie, M6LCN came as a breath of fresh air. In contrast with so many newcomers to the hobby, it was very pleasant to see such a down-to-earth and pragmatic attitude. The idea that moving from ten watts to (say) fifty watts will miraculously transform one's logbook is wide of the mark. A bit of study with a handful of easily-available books will quickly fill the mind with useful information that will enable the beginner to build some tried and trusted antennas. There's no need to erect a 60-foot tower or pay a fortune for the latest Supergain-Max-DX-Magnet beam; a few lengths of wire will do the trick as long as the basics are understood.

The biggest advantage of this approach is that when the DX begins to roll in, the pride and sense of achievement comes along with it, something that does not happen with 'chequebook engineering' or brute-force power.

Paul Billingham, M6MIY

I am a new Foundation licence holder and I would like to add my observations. A local amateur recently described some of our continental cousin's use of kilowatts of power on 20m the same as placing their beach towel on the poolside and therefore blocking others use, especially on low power. Personally, I seek out quieter bands and have had success on weekdays and at carefully chosen times using the

Letters published in 'The Last Word' do not necessarily reflect RSGB policy. 'Last Word' letters may be e-mailed to radcom@rsgb.org.uk Please note that letters submitted for 'The Last Word' may not be acknowledged. The RSGB reserves the right not to publish any letter, with no reason being given. It is a condition of publication that all letters may be edited for grammar, length and / or clarity. Due to the limited space available, please keep letters as short as possible.

propagation predictors available online.

As a teenager in the early 1980s I desperately wanted to gain an amateur licence and get into HF. Back in the day you had to take a Morse test, otherwise you only had a VHF/UHF licence. At the time this seemed like a poor substitute as we already had access to 11 metres with your CB licence, albeit using only 4 watts max and having FM only. Having joined one club in the 1980s, I was, to say the least, disappointed at other members' attitude to anyone young wanting to join the hobby.

Personally I am pleased that new amateurs can now access the hobby and HF bands with quite a simplified Foundation exam, which promotes experimentation and progression towards more in depth knowledge and more power through the Intermediate and Full licence.

Another new Foundation licence holder and I recently visited a club member who holds a Full licence to see how an end fed wire antenna works. 20 and 40 metres were incredibly busy this particular weekend, with contests going on across Europe. The full licence holder made a contact with a station in the Netherlands using 40 watts on 40 metres. When the microphone was handed to us the power was reduced to 10 watts. The Dutch station reported only a small decrease in S-meter readings and a little decrease in modulation, but we were able to chat away quite freely despite the 75% drop in transmitted power.

I think perhaps some of the equipment manufacturers and especially antenna makers need to take some ownership of the Foundation licence holder's situation. There are loads of glossy adverts for very expensive all band rigs and antenna's which boast working from 1.8MHz through to 50MHz. The distance between 80 metres and 6 metres wavelength is vast and to expect a single antenna to radiate well on all bands is difficult on low power. As we are taught on the Foundation course, an ATU can make your transmitter think there is a good match, but when it comes to radiating effectively on all bands using just 10 watts is simply impractical without higher amounts of power to compensate for a poor match.

What I have learnt is that one size does not fit all if you are limited to 10 watts. I have no personal gripe about being limited to 10 watts, but have learnt that by carefully choosing antennas tuned closely to a given frequency, good feed lines and choosing to work bands away from busy periods I have made contacts across Europe.

NOT ALL BAD

Dr A Gilfillan, G0FVI

It would seem Dr Jonathan Hare, G1EXG is not listening to the same bands as myself or others who enjoy (or should I say enjoyed) chasing rare DX and DXpeditions on HF (Last Word, December 2014).

How tiresome it is to hear the overdriven amplifiers, excessive bandwidths, DQRM, and the cacophony of incessant callers who seem determined to get through even if one has managed to get a response from a DX station. To be fair, the problem seems to be mostly confined to Eastern Europe, but it certainly is a detriment to amateur radio worldwide.

Clèarly there would appear to be a lack of 'technical expertise' together with extremely poor operating procedures. It is time for all national societies and the IARU to address this situation.

AERIALS IN NEW JERSEY

Terry Roeves, G3RKF

The Amberley Museum story from Peter, G3LDO, in the January 2014 edition, Antennas (p36), about his multi band dipole, is close in dimensions to the ZS6BKW optimised G5RV design. I now use one in New Jersey (W2/G3RKF), at approximately 60ft with 100ft of RG8U directly connected to an elderly IC-736. It has an internal ATU. I have included an isolator.

Converting my dimensions back to metric, I can reasonably comment:

- Approximately 93ft (28m) centre fed vs 22m, with 40ft (12m) of 450Ω twin vs 10m
- Coax 100ft (30m) vs 11m
- My Performance: 1:1 on 40m, 20m and 12m.
- Tuneable with internal ATU on 80m, 30m, 15m and 6m (VSWR all over 4:1), external ATU needed for 10m

Peter's photograph shows us the reality for many of us whether a permanent or temporary aerial! Hobson's choice.

The results in New Jersey have been excellent for very little investment. The aerial runs north to south. A CQ call yields prompt frequent DX responses. Being on the same latitude as Benidorm, Spain, makes for excellent propagation throughout Africa, so an SSB S9 QSO with ZS1 or 3B8 is a thrill that eludes me over here. And joining in a pileup isn't a painstaking and frustrating process (with very few exceptions eg VU4). My attention span is minutes so I'm not one to hang about. I'm quite content to bag an 'All Time New One' (ATNO) on a single band only and tick it off my list in an elderly *RSGB Call Book*. Six HF bands from a single wire with three in band resonant frequencies is impressive. I have only worked locals, W2 and W3 on 6m.

This is my third aerial in New Jersey in as many years, losing two to tropical storms and one to hurricane Sandy. However, this one rated at 5kW, is totally insulated and could pull a truck. So I live in hope.

It's a keeper. I just hope it thinks so too! (It does come down when I'm not there, just in case it takes the hump).

COMPUTER GENERATED MORSE

Ken Randall, G3RFH,

I refer to the letter from Dave, G3YYD (Last Word, January 2015) on the use of computer generated Morse (CGM). I absolutely hate CGM because people tend to use it at excessive speeds and use computer programs to receive it! I am an experienced CW operator (25 years Royal Navy Telegraphist) and can copy CW at speeds up to 40 – 50 wpm in short bursts, not writing it down. I took part in the recent CQWW DX CW contest and it was rife with CGM, mostly from Russian and Eastern European stations, using speeds that the human ear couldn't decipher. I listened to one such station and tried 6 or 7 times to get his callsign without success, so no QSO with me. I tend now to ignore high speed CGM and so they don't get a QSO with me.

It isn't CW, it's keyboard operating and as such should be confined to RTTY or digimodes. I use a computer for logging but I use a twin arm paddle and electronic keyer to send and my ears/brain to read it. If you want to do keyboard operating go somewhere else, not on the CW bands!

ACCURATE REPORTS

Bill Kitchen, G4GHB

Today I worked a station on 40m SSB where I received him at 5/4 with everything readable. He gave me a 5/3 but did not get my name or even my callsign properly. What a pointless report. Surely the report for my signal should have been more like1/3 as the station on the other end only knew someone was there but not much more than that.

This contact did not go into my log book as there was no contact, as I see it, a one-sided QSO can not be called a contact.

WATERS & STANTON

Head Office & Southern Store

Spa House, 22 Main Road, Hockley, Essex SS5 4QS
Phone: (+44) 01702 206835 or 01702 204965
FAX: (+44) 01702 205843
Email: sales@wsplc.com
Opening: Monday - Saturday 9am - 5.30pm

Scotland & Northern Store

W&S @ Jaycee, 20 Woodside Way, Glenrothes
Fife KY7 5DF
Phone: (+44) 0845 5050128
FAX: (+44) 01592 610451
Email: jayceecoms@aol.com
Opening: Tuesday - Saturday 9.15am - 5pm

Web: www.wsplc.com
Blog: blog.wsplc.com

VISA MasterCard PayPal

ELECRAFT®

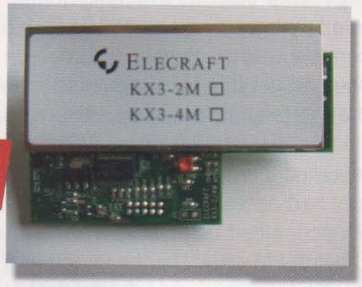
The KX3 Brings to Ham Radio Fun and Perfoprmance!

The KX3 certainly adds fun to ham radio with its 10W all mode output, built-in PSK31 and RTTY, Voice recorder, CW memo channels, Advanced DSP, Variable selectivity, Audio filter, Dual receive up to 15kHz and SDR output jack ..... we could go on!

And as for performance, check Sherwood Engineering's site. (www.sherweng.com) No Yaesu, Kenwood or Icom radio can beat it's receiver performance.

The KX3 160 - 6m transceiver is a great companion for both portable and base station use. Just add a set of AA cells to the internal battery tray and you are set to go.

Anywhere, Any time!



Add 4m or 2m

Add 4m or 2m to your KX3 by adding an Elecraft transverter. Choose "AT" version if you have auto ATU fitted, otherwise choose "NOATU" version.

The KX3 as standard does not include mic, key or antenna,

KX3 Transceiver Kit	**£895 d**
KX3 Ready built	**£959 d**
Transverters "AT"	**£199 c**
Transverters "NOATU"	**£229 c**

KXPA100 Amplifier

FT-817ND
Switched input tc match the 5W drive from FT-817

Add 10dB!

KXPA100-K Kit	**£699**
KXPA100-F Built	**£749 d**
KXPA100AT-K Kit	**£999 d**
KXPA100AT-F Built	**£1049 d**

The KXPA100 is the perfect match for the KX3 and also the FT-817ND. Models are available with or without the built-in Auto ATU. Coverage is 160-6m with a full 100W output and built-in power and VSWR monitoring, including accurate PEP measurement. Auto bandswitching, so only PTT and RF lines needed. Fast and silent QSK and no need for fan cooling. Includes DC cable and PTT cable. For even closer integration with KX3, use the optional KXPACBL **£32.95.**

PX3 Panadaptor

The PX3 is a plug and play panadaptor for the KX3. It offers up to 200kHz bandwidth and instant QSY. Sensitity can be adjusted down to KX3 noise floor and waterfall display is included. Future firmware updates planned are CW, RTTY, and PSK31 decode, and keyboard input.

PX3-K Kit	**£499**
PX3-F Built	**£559**

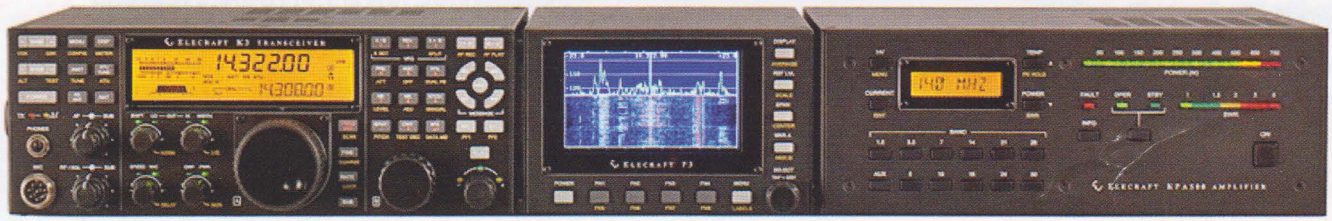
Buddistick The Perfect Partner

As exclusive distributors, we are proud to recommend this as the perfect KX3 partner. The most eficient system we know of. Mounts anywhere or on a 3/8" stud mount. The complete kit in carry bag is great value. 40m - 6m coverage. **Standard kit** with 3/8`` base stud mounting plate for 1/4" tripod **£139.95 c. Deluxe kit** adds universal base clamp and extra antenna element. **£169.95 c**

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

ELECRAFT®

Meet The Family!



This 600W Station Could be Yours for £4707

Based on Kit Prices inc. VAT

We invite you to compare the price with other similar station systems. You will begin to see the value that Elecraft offers. Widely acknowledged as performance at its best, the K3 is a great investment. Time for you to join the Club!

K3 100W Transceiver (also available as 10W version

There are lots of K3s in use, both in the UK and around the world. And whether you opt to build it yourself or have it built for you by us, there is our exclusive 24 month warranty for added confidence. And once you get your hands on one of these 160 - 6m radios, you will soon realise why owners are so proud and glad that they chose Elecraft. You will also begin to understand why so many DXpeditions chose this radio. From the moment you switch on the K3 and listen to the ultra quiet receiver, to the moment that you complete your first QSO, you will just know that you have made the right choice!

K3/10-K Kit		**£1499**
K3/10-F Ready built		**£1599**
K3/100-K Kit		**£1999**
K3/100-F Ready buuilt		**£2099**

Peter Waters G3OJV

Peter, G3OJV, uses Elecraft, and builds Elecraft. He is our resident expert on this fine range of equipment and will be happy to discuss any Elecraft product with you.

Optional Extras for your K3 Transceiver

KAT3-K	Internal 100W ATU has a much wider matching range than normal ATUs	**£319.95 C**
K144XV-K	Internal 2m 8W transverter. Excellent low noise receive performance	**£299.95 C**
KPA3-K	Internal 100W PA used to upgrade from the low power 10W model	**£449.95 C**
K144RFLK	K144XV Reference Lock	**£99.95 C**
KXV3A	RX Ant. IF Out and transverter interface. Also needed for use with P3	**£129.95 C**
KTCXO3-1	High Stability Ref Xtal	**£109.95 C**
KDVR3	Digital Voice Recorder - recommend we fit, as it needs front panel removal	**£144.95 C**
KBPF3	General Cov. Rx Bandpass filter. Improves GC performance	**£169.95 C**
MH2	Hand Microphone with Up/Down buttons. Eletret type.	**£64.95 B**
KRX3	Second receiver, totally independent of main receiver with roofing filter choices	**£599.95 B**

P3 Panoramic Adaptor Display Unit. **Kit £709 Built £759**

The P3 panoramic adaptors opens up a new world of operation. It's the perfect partner for the K3 and offers a continuously variable bandwidth from 2,5kHz to 200kHz. Place the cursor anywhere on the screen and press the button for instant QSY. You also get a waterfall display for weak signal monitoring and the optional SVGA unit will drive an external PC screen.

KAT500 Optional 160 - 6m1kW Auto ATU. **Kit £679 Built £729**

Owners of Elecraft internal auto ATUs soon learn that these designs have a much wider range than other designs and can for example match a G5RV on all bands. The KAT500 is exactly the same and works with any transceiver.

KPA500 600W Amplifier with built-in AC 230 / 115V Supply **Kit £1999 Built £2199**

You don't need to have a K3 transceiver to own and use the 160 - 6m KPA500. (But it helps!) It will work with any modern HF transceiver from 160m to 6m. It auto senses the band of operation and the only connections you need to make are the TX PTT out, and RF out from your transceiver. No ALC connnection is needed. Drive level needed is around 30W and you get additional power control features, such as auto drive levels, when used with the K3.