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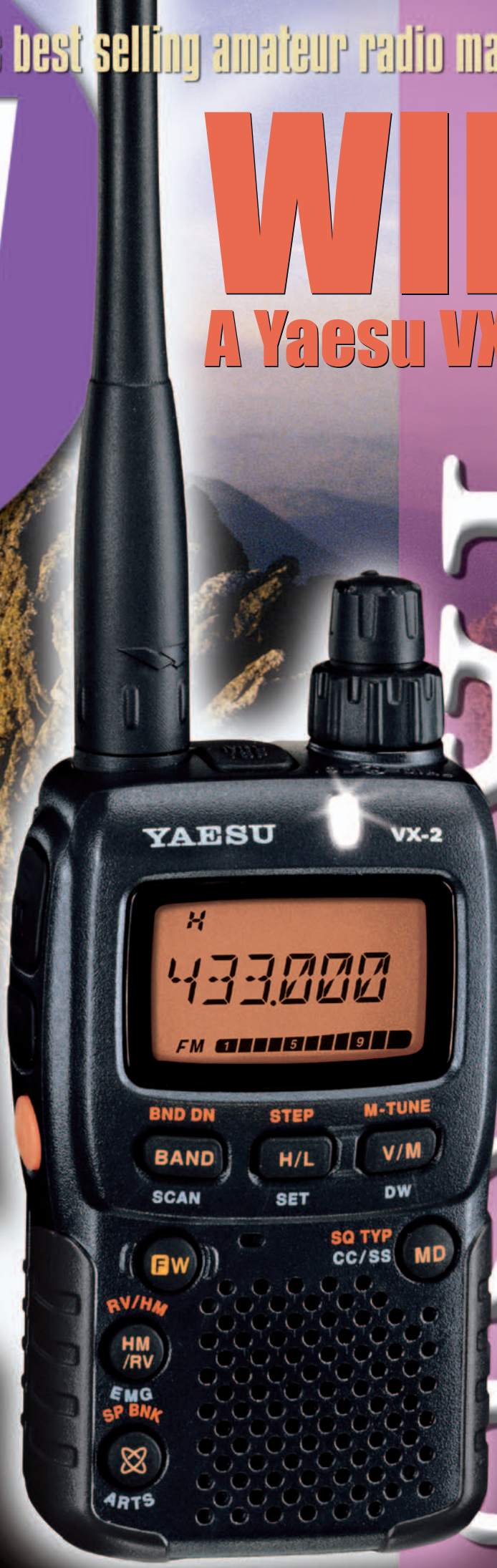
WIN
A Yaesu VX-2E



Mobile Texting
On Test - KIF700 Keyboard Interface

A Mighty Beast
Yaesu VX-2E Reviewed

Technological Thriller
The Vectis Run

Build
A Loop Antenna for DX

January 2004 £2.95

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The Brand new 2004 W&S Radio Communications Equipment Guide

*Over **350** colour pages, making it the largest of its kind in the world packed full of technical spec, over 4000 products, 2500 photographs and additonal articles.*

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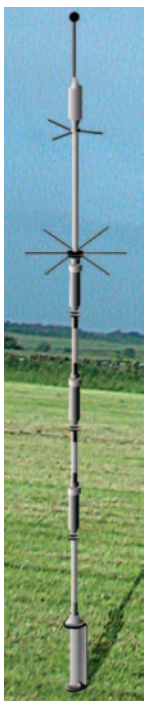
HUSTLER ZERO SPACE DX ANTENNAS

Run full legal power - 80m to 10m - with no masts or guys to worry about. 50 Ohm feed.



Small garden, planning problems or similar restrictions? Then the Hustler range is the answer. These HF verticals will take 1kW of power, work at ground level, and are self-supporting. A single earth rod will get you going. Add buried radials for even better results. Many hams have got on the HF bands with just this simple system. So why not join in the fun. These are rugged, well-built antennas that American hams have been using for years. Now they are available in the UK from our three stores.

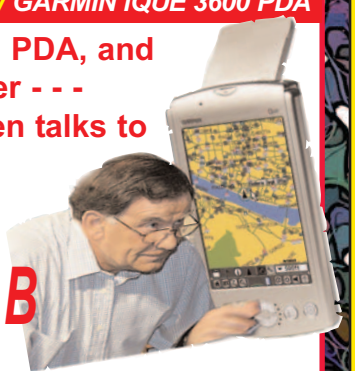
4BTV
40-20-15-10m. 6.52m high. Full band coverage.
£159.95 C

5BTV
80-40-20-15-10m. 7.64m high. Full band coverage (100kHz on 80m).
£199.95 C

6BTV
80-40-30-20-15-10m. 7.3m high. Full band coverage (100KHz on 80m).
£219.95 C

BRAND NEW GARMIN iQUE 3600 PDA

Its a GPS, PDA, and MP3 player - - - And it even talks to you!



£549.95 B

The New Garmin IQ3600 gives you a pocket full of power. The advanced 12-channel GPS receiver with flip-up antenna is coupled with Palm OS 5 software package that makes it a fully equipped PDA with all the associated capabilities. We give you a FREE Mapsource disc that goes down to street level for most of Europe! The navigator speaks to you as you drive - so eyes always on the road! A lovely bright crisp screen makes it perfect for car, bike or walking. Includes lithium cell, charger, and USB hod for PC synchronisation. Amazing value and a great companion.

ICOM IC-756 PRO II £1999 C

3 Year Warranty
on orders before 1st Jan.

Flagship of the Icom range of HF transceivers. HF & 50MHz, features large colour LCD with spectrum scope, auto ATU and 32-bit floating point DSP unit.

ICOM IC-7400 SPECIAL OFFER £1299 C

3 Year Warranty
on orders before 1st Jan.

HF/VHF 100W transceiver. Features large LCD with spectrum scope, auto ATU and same DSP system as IC-756PRO II.
Comes with *FREE* SP-21 Speaker & SM-20 Desk mic.

ICOM IC-706 IIG DSP £789 C

3 Year Warranty
on orders before 1st Jan.

HF/VHF/UHF mobile DSP transceiver. Its relative small size not only makes it a great mobile rig but also for fixed station use as well. HF general coverage Rx and VHF & UHF.

ICOM IC-703 NEW £599 C

3 Year Warranty
on orders before 1st Jan.

HF/50MHz Transceiver 0.1-10W Portable, Mobile, Base Station. (9-15.87V DC) Designed especially for the Foundation Licence/QRP. Built-in features auto ATU, DSP memory keyer. (5W when using 9.6V batts)

ICOM IC-718 £499 C

3 Year Warranty
on orders before 1st Jan.

HF 100W transceiver. Covers all HF bands plus wideband receive. C/w auto notch, dual VFO, SWR meter etc. Options include extnl ATU DSP & filters.

ICOM IC-910X with 23cm £1249 C

3 Year Warranty
on orders before 1st Jan.

Icom's all mode VHF/UHF transceiver with 23cm. Large clear LCD with lots of facilities. 100W on VHF and 75W on UHF, 10W on 23cm. IC-910H version £1149

KENWOOD TS-2000 £1599 C

3 Year Warranty
on orders before 1st Jan.

Top-of-the-range 100W Kenwood transceiver. HF/VHF/UHF or up to 23cm with the optional module. Built-in auto ATU, DSP and its unique TNC.

KENWOOD TS-870S DSP £1399 C

3 Year Warranty
on orders before 1st Jan.

HF DSP 100W base station. Excellent all round rig great for DX working with its ability to winkle out weak stations using its true IF DSP. No filters to buy.

KENWOOD TS-570DGE £849 C

3 Year Warranty
on orders before 1st Jan.

HF100W base station with built-in auto ATU. Very popular rig, excellent performance on SSB and CW. Two fitted antenna sockets - very handy.

YAESU FT-1000 MKV £2349 C

3 Year Warranty
on orders before 1st Jan.

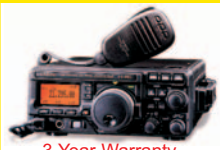
200W HF transceiver, EDSP, Collins filter, auto ATU, 220V AC PSU - Acknowledged as one of the finest DX rigs on the market. Superb tailored audio and the ability to select Class A bias for dramatic signal purity.

YAESU FT-1000 FIELD £1749 C

3 Year Warranty
on orders before 1st Jan.

100W HF transceiver, EDSP, Collins filter, auto ATU, 220V AC / 13.8V DC - Building on the success of the FT-1000MkV, the Field has become a respected leader in its class.

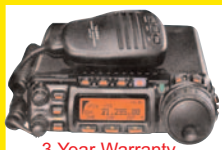
YAESU FT-897 NEW £989 C



3 Year Warranty
on orders before 1st Jan.

100W HF rig plus 2m and 70cms (50W/20W) 13.8V external supply / internal optional FP-30V AC power supply / self powered portable using optional Ni-MH pack at 20W output. Compatible with FC-30 auto ATU and ATAS 120/100 antennas. The "must have" radio for 2003.

YAESU FT-857 NEW £799 C



3 Year Warranty
on orders before 1st Jan.

HF/50/144/430MHz Mobile Transceiver HF/6m 100W, 2m 50W, 70cm 20W. (13.8V DC) Developed on the FT-897 and FT-817 transceivers. Built-in features 32 colour display, spectrum scope, AM airband receive, built-in memory keyer, detachable front panel, DSP unit supplied.

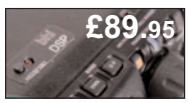
YAESU FT-847 £1199 C

3 Year Warranty
on orders before 1st Jan.

1.8 to 440MHz, this all-in-one transceiver offers unbeatable value. 100W on HF plus 6m, and 50W on 2m and 70cm. You get genuine RF clipping on SSB for up to 6dB gain and there are 4 separate antenna sockets.

YAESU FT-817 £539 C

bhi DSP Module now available!



160m - 70cms. Up to 5W output all modes. ***Ours includes*** **battery and charger.**

Add £110 for DSP ready fitted.

NEW DSP Module
There is NO new FT-817 DSP! The fact is that the UK manufacturers. **bhi**, (of whom we are their largest distributor), have produced a lovely 4-stage DSP module that can be fitted inside the FT-817. The module costs £89 plus a fitting charge of £25 for retro-fitting to existing models. This includes installing a mini switch and LED on top cover.

NEW FT-817 Clip on metal front support stand. In stock now £19.95 +£1 P&P

LINEAR AMP UK RANGER 811H £895 C

HF linear amp 160-10m including WARC bands. Drive 10-100W, output 800W (max) CW. Soft start on switch-on. Compatible with all modern 100W HF rigs. Silent running Papst fan.

AMERITRON AL-811 XCE £799 C

Ideal 600W HF Linear more than enough for the full UK limit. 160-10m including WARC bands. Uses 3x 811A low-cost valves. Matches all modern 100W solid state HF rigs. Silent running cooling fan.

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PRICE MATCH

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carriage charges: A=£2.75, B=£6, C=£10

ICOM IC-2725E £269 C

The Icom IC-2725E dual band FM transceiver is proving very popular. Easy to install, the controller is separated from the main unit - great where space is limited.

NEW LOWER PRICE!

ICOM IC-2100H £229 C

2m 55W FM mobile. Commercial grade, rugged construction. One piece die-cast aluminium chassis. Selectable green or amber display.

YAESU FT-8800E NEW £299 C

2m/70cm Mobile **144-146MHz,430-440MHz Tx *108-520MHz, 700-999MHz Rx * 512 memories per band * 6 Hyper memories* tuning steps: 5/10/12.5/15/20/25/50kHz * Audio: 2W output * Supply: 13.8V DC *Size: 140x41.5x168mm Weight:1kg*

YAESU FT-8900R NEW £349 C

Want the best of all worlds then the FT-8900R is just the ticket! A rig with four of the most popular mobile bands - 10m/6m/2m & 70cm. Detachable head. Airband Receive.

YAESU FT-2800M £159 C

The FT-2800M 2m FM 65W High Power mobile transceiver. Rugged construction, excellent receiver performance and direct keypad entry.

YAESU FT-1500M £159 B

Remarkably small and compact, yet built like a Battleship!
Should last for years.

NEW LOWER PRICE!

KENWOOD TMD-700E £449 C

Certainly the best dual band mobile transceiver with APRS. Does not need extra high cost boards to function. The only extra if required is a compatible GPS receiver.

KENWOOD TM-V7E £359 C

A lovely cool blue display, easy with 50/35W output. 50W/35W plus 280 memos and five storable operating profiles.

KENWOOD TM-G707E £289 C

If you are looking for simplicity and low cost, here's the answer. 2m &70cms with detachable front panel and "Easy operation mode." GREAT!

IC-E208 NEW £319 B

VHF/UHF FM Dual Band Mobile Transceiver **Freq range 144-146MHz, 430-440MHz Tx *55/50W (3 pwr steps each band) *Wideband Rx 118-173, 230-549 & 810-999MHz *512 memories *FM narrow capability *104x2 DTCS, 50 CTCSS tone squelch *16 DTMF channels *HM-133 remote control mic *Packet ready for 9600/1200bps-mini DIN or 1200bps-mic socket *Supply 13.8V*

YAESU VX-7R £299 B

6m/2m/70cm handie. The case, keypad, speaker and connectors are all sealed against water damage. Wide Frequency coverage from 500kHz to 900MHz. Easy-to-read 132x64 dot matrix display + plus pictorial graphics.

Available in Silver or Black

YAESU VX-2E NEW £169 B

Dual Band Ultra Compact FM Handie. The VX-2E is unbelievably small yet provides 1.5W on 144MHz and 1W on 430MHz (3/2W with external supply). General coverage receiver 0.5-999MHz, which includes AM mediumwave & FM broadcast bands plus AM aircraft & UHF TV bands.

YAESU VX-110 £109 B

Combining the ruggedness of the VX-150 with the simplicity of 8-Key operation, the VX-110 is a fully featured 2m handheld ideal for the most demanding of applications. It has a die-cast csae, large speaker and illuminated keypad.

ICOM IC-E90 £269 B

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

ICOM IC-T3H £129 B

The IC-T3H 2m handheld features tough quality but with slim looks. Its striking green polycarbonate case has been ergonomically designed. The rig is capable of providing a powerful 5.5W output with either Ni-Cad or Ni-MH battery packs. Supplied with charger and rechargeable battery.

KENWOOD TH-D7E £319 B

DATA COMMUNICATOR

One of the most successful handhelds over the past few years. It has a built-in TNC for Packet use. You can also use it for APRS operation in conjunction with an external GPS unit. Plus NMEA, 200 memos, and up to 5W output.

KENWOOD TH-F7E £259 B

WITH EXTRA WIDE RX COVERAGE

- 144-146MHz Tx/Rx: FM
- 430-440MHz Tx/Rx: FM

Up to 6W out with Li-ion battery and "scanner" style coverage from 100kHz to 1300MHz including SSB on receive! This is a great radio to have at all times when you are on your travels.

KENWOOD TH-G71E £199 B

If you want an excellent 2m/70cm dual-bander then you can't go wrong with the TH-G71. Fully functional with three power levels, 200 memories, CTCSS tone encoder/decoder, illuminated keypad and backlit LED.

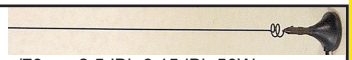
MOTOROLA T-5512 £69.99 B

Motorola Dual Pack PMR-446 Recreational 2-Way radio
·No Licence Fee or Airtime Charges
·8 Channels and 38 Codes
·3km Range
·Lightweight
·Water Resistant
·Handsfree use (VOX) (with optional accessory)
·Supplied with 2 belt clips

MOBILE ANTENNAS

WATSON ANTENNAS (PL-259 base type)

Comes with coax & BNC



WSM-270. 2m/70cm, 2.5dBi, 6.15dBi, 50W max, micro-magnetic 29mm base, length 0.46m. **£19.95** A

W-2LE	2m quarter wave 2.1dBi 0.45m	**£9.95**	A
W-285S	2m 3.4dB 0.48m (fold over base)	**£14.95**	B
W-77LS	2m/70cm 0/2.5dB 0.42m	**£14.95**	B
W-770HB	2m/70cm 3/5.5dB 1.1m	**£24.95**	B
W-7900	2m/70cm 5.6/7.6dB	**£32.95**	B
W-627	6m/2m/70cm 2.15/4.8/7.2dB 1.6m	**£34.95**	B
WGM-270 *NEW*	2m/70cm On glass 3.7m coax 50W	**£29.95**	B

MOBILE BASES

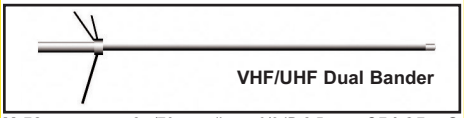
WATSON

WM-14B.
Large diameter 14cm magnetic mount SO-239, c/w 5m RG-58 & PL-259

W-3HM	Adjustable hatch mount	**£14.95**	A
WM-08B	8cm mag mount, 5m cable PL-259	**£9.95**	A
WM-14B	14cm hvy duty mag mount+cable	**£12.95**	A
WSM-88V	BNC mag mount plus 3m cable	**£14.95**	A
W-3CK	5m 5D-FB cable assembly+pigtail	**£18.95**	A
W-ECH	5m standard cable kit assembly	**£12.95**	A

BASE STATION ANTENNAS

DIAMOND



VHF/UHF Dual Bander

X-50	2m/70cm colinear 6/8dB 2.5m	**£54.95**	C
X-50N	2m/70cm colinear 6.5/9dB 3.1m	**£59.95**	C
V-2000	6m/2m/70cm 2.15/6.2/8.4dB 2.5m	**£89.95**	C

CHECK OUR WEBSITE FOR FULL DIAMOND RANGE

WATSON

W-300.
Very popular dualband base antenna. Supplied with u-bolts for mast fixing.

W-30	2m/70cm colinear 3/6dB 1.15m long	**£39.95**	C
W-50	2m/70cm colinear 4.5/7.2dB 1.8m long	**£49.95**	C
W-300	2m/70cm colinear 6.5/9dB 3.1m long	**£64.95**	C
W-2000	6m/2m/70cm 2.15/6.2/8.4dBi 2.5m	**£69.95**	C

WATSON W-25SM PSU £79.95 B

Very popular budget switch mode power supply. **Output voltage 13.8V DC *Output current of 22A (25A peak) *Front panel output terminals *Over current & voltage protection *Quiet operation*

WATSON W-25AM PSU £89.95 C

DC power supply for the shack & esp. for use with 100W transceivers. Separate voltage and current meters. **Output voltage 0-15V DC *Output current of 25A (30A peak). *3 sets of output terminals *10A cigar socket. *Over current protection*

CHECK OUR WEBSITE WWW.WSPLC.COM FOR MORE DETAILS OF THESE PRODUCTS

WATERS & STANTON

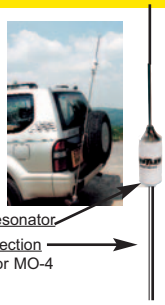
1973 — WATERS & STANTON PLC — 30th ANNIVERSARY — 2003

PRICE MATCH

VERTICAL ANTENNAS

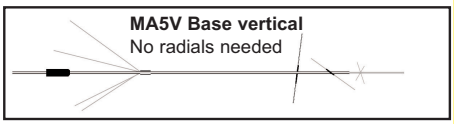
Hustler Mobiles

Get top performance when on the move. Purchase the **MO-3 base** (137cm) for **£26.95** or the **MO-4 base** (68cm) for **£22.95**. Then add the resonator of your choice. **RM-10, RM-12, RM-15**, all **£19.95** ea. **RM-17, RM-20 £24.95** ea. **RM-40 £26.95, RM-80 £29.95**



CUSHCRAFT BASE ANTENNAS

MA6V *NEW*	20-17-15-12-10-6m 250W PEP	**£289.95**	C
MA5V	20-17-14-12-10m 250W PEP	**£229.95**	C



R8	40-30-20-17-15-12-10-6m 1.5kW	**£529.95**	C
R6000	20-17-15-12-10-6m 1.5kW PEP	**£349.95**	C

BUTTERNUT BASE ANTENNAS

HF9V-X	80-6m 7.9m 1kW PEP	**£365.00**	C
HF6V-X	80-40-30-20-15-10m 7.9m 2kW	**£315.00**	C
HF2V	80-40m 9.75m (160m opt) 1kW	**£230.00**	C

HY-GAIN BASE ANTENNAS

AV-640	40-6m 1.5kW, 300W 6m (PEP)	**£399.95**	C
AV-620	20-6m 1.5kW, 500W 6m (PEP)	**£299.95**	C
AV-14AVQ	40-20-15-10m 1.5kW PEP	**£179.95**	C
AV-12AVQ	20-15-10m 1.5kW PEP	**£139.95**	C
DX-88	80-10m 1.5kW, 250W 30m	**£395.95**	C

High quality German traps. (Pairs)
200W 20m £44.95 40m £49.95 80m £53.95
1kW 20m £59.95 40m £64.95 80m £73.75

High quality German Baluns SO-239
200W 1:1, 4:1 or 6:1 £25.95 ea.
1kw 1:1 £34.95 4:1 or 6:1 £41.95 ea

HORIZONTAL BEAMS & DIPOLES

CUSHCRAFT

Premier HF beam used around the world by serious DX'ers.

X-7	20/15/10m 7 el. Yagi 2kW	**£699.95**	D

Not got the space for a full sized HF beam antenna, then the mini beam MA-5B should be considered.

MA-5B	10-12-15-17-20m 4 el. Yagi 2kW	**£389.95**	C
A4-S	10-15 & 20m 4 el. Yagi 2kW	**£599.95**	D
A3-WS	12 & 17m 3 el. Yagi 2kW	**£399.95**	D
D-3	10-15-20m dipole element 2kW	**£259.95**	C

Don't want a wire antenna but can't fit a Yagi, then consider a rotatable dipole.

D-3W	12-17-30m dipole element 2kW	**£259.95**	C
D-4	10-40m dipole element 2kW	**£349.95**	C
D-40	40m dipole element 2kW	**£319.95**	C
TEN-3	10m 3 el. Yagi 2kW	**£229.95**	C
ASL-2010	13.5-32MHz 8 el. log periodic	**£799.95**	C

RADIO WORKS

A choice of quality wire antennas available to fit almost any circumstances.

CW-160	160-10m 76.8m long	**£139.95**	C
CWS-160	160-10m 40.5m long	**£134.95**	C
CW-80	80-10m 40.5m long	**£99.95**	C
CWS-80	80-10m 20.1m long	**£119.95**	C
CW-40	40-10m 20.1m long	**£94.95**	C
CW-20	20-10m 10.36m long	**£84.95**	C
CW-620	20-6m 9.7m (32ft) long	**£94.95**	C
G5RV PLUS	80-10m with balun 31m (102ft) long	**£64.95**	B

MANSON EP-925 PSU £99.95 C

A general purpose 3-15V DC, 25A (30A peak) power supply able to provide the needs of the modern 100W HF transceiver. **Dual analogue meters *Over current protection *Large power terminals for rigs *Quick snap connectors for ancillaries*

WATSON FC-130 Frequency Counter £59.95 B

SPECIAL PRICE

The FC-130 is an ideal frequency counter for the shack, mobile or portable use. Supplied complete with Ni-Cads, charger and telescopic whip.

MFJ-461 Morse Code Reader £84.95 B

**Stand alone unit *Built-in mic *32char high contrast LCD *Automatic speed tracking *Serial port *Built-in speaker *9V PP3 (not included)*
Simple PC program available (user supplies disk)

bhi NES10-2 & NES-5 DSP Speakers

NES10-2

£99.95 B

**Speaker with built-in DSP noise filters *Dip switches for 8 filter settings (NES10-2) *DSP settings preset, no user adjustment (NES-5) *Plugs directly into 3.5mm speaker socket *Handles up to 5 Watts input *Max 2.5 Watts output *Requires 12V at 0.4 Amps max*

NES-5

£79.95 B

bhi NEIM1031 £129.95 B

NOISE ELIMINATING IN-LINE MODULE
** Noise attn - 9-30dB (typical) * Noise Attn levels 8 * Audio output power 2.5W RMS max (8 Ohms) * Audio connections: Line level in/out (RCA Phono), Audio in/out 3.5mm mono jack * Line i/p impedance 10K * Line o/p impedance 100 Ohms * Line in sensitivity 300mV -2V RMS * Headphone socket 3.5mm mono jack * Power 12-24V DC 500mA*

bhi 1042 SWITCH BOX £29.95 B

Connect more than one piece of equipment to your bhi noise eliminating speaker with the 1042 Switch Box. Allows 6 pieces of equipment to be connected, 3 inputs loaded at 8 Ohms and 3 unloaded inputs (for low level signals). Two audio leads provided.

SGC ADSP² SPEAKER NEW £99.95 B

The ADSP² Speaker has three modes of operation - no noise reduction - original ADSP noise reduction - or the new ADSP² noise reduction mode which provides up to 26dB of noise reduction within the passband.

SGC ADSP² MODULES NEW £89.95 B

ADSP² is supplied in two versions. One for low level audio power ADSP-2 Board Low (70-11) and the ADSP-2 Board High (70-12) for high level audio power installation. Both versions contain full instructions and identify the relevant wire connections. They can be installed by the user or by a dealer. All SG-2020 upgrades will be done at the factory.

HEIL QUIET PHONES NEW £99.95 B

Active Noise Cancelling Headphones that use two small mics inside the headphones that listen to outside ambient noise and the in-line differential amplifier cancel it out! Everything below 400Hz drops away as you switch NR unit on. Amazing reduction! **Soft leatherette cushions *Fitted 3.5mm / 1/4" jacks. *In-line battery holder *Requires 1xAA battery (lasts 30hrs) .*

WEST MOUNTAIN RIGBLASTERS

RIGblaster pro	Data interface 8-pin/mod, Cd & cables	**£229.95**	B

The RigBlaster Pro

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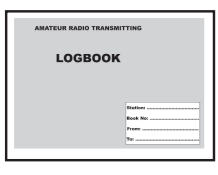

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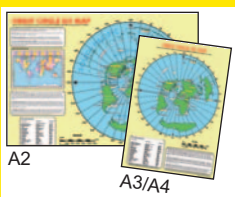

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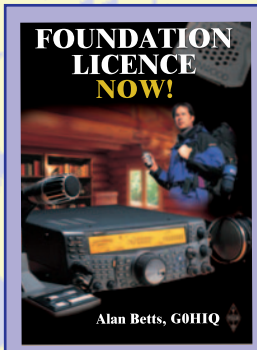

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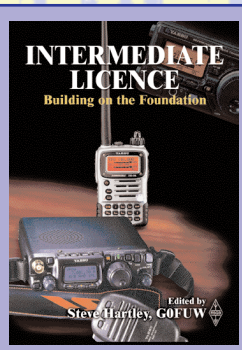

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BROADSTONE
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Directors: Stephen Hunt & Roger Hall

Editorial Department
☎ 0870 224 7810
Fax: 0870 224 7850

Editor
Rob Mannion G3XFD/EI5IW
rob@pwpublishing.ltd.uk

Production Editor
Donna Vincent G7TZB/M3TZB
donna@pwpublishing.ltd.uk

Deputy Production Editor
Zoë Shortland
zoe@pwpublishing.ltd.uk

Technical Editor
NG (Tex) Swann G1TEX/M3NGS
tex@pwpublishing.ltd.uk

Art Department
☎ 0870 224 7820
Fax: 0870 224 7850

Art Editor
Stephen Hunt
steve@pwpublishing.ltd.uk

Layouts
Bob Kemp
bob@pwpublishing.ltd.uk

Typesetting
Peter Eldrett
peter@pwpublishing.ltd.uk

Sales Department
Fax: 0870 224 7850

Advertisements
Eileen Saunders M3TTO
eileen@pwpublishing.ltd.uk
☎ 0870 224 7820

Book Orders
Clive Hardy G4SLU
clive@pwpublishing.ltd.uk
☎ 0870 224 7830

Subscription Orders
Joan Adams
joan@pwpublishing.ltd.uk
☎ 0870 224 7830

Subscription Administration
(For all queries regarding exisiting subscriptions)
Kathy Moore
subs@pwpublishing.ltd.uk
☎ 01590 641148

Finance Department
☎ 0870 224 7840
Fax: 0870 224 7850

Finance Manager
Alan Burgess
alan@pwpublishing.ltd.uk

Finance Assistant
Margaret Hasted
margaret@pwpublishing.ltd.uk

Web Site
www.pwpublishing.ltd.uk

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Cover subject

Cover Subject
The Yaesu VX-2E dual-band hand-held is reviewed in this issue by **John Goodall G0SKR**. If you fancy one for your shack then why not enter our competition - we've got two to give away thanks to Yaesu UK Ltd.

Design: Steve Hunt
Photograph: Courtesy of Yaesu UK Ltd.

January features

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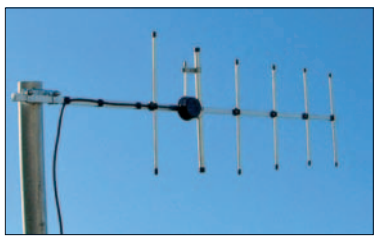

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17 Looking At...
The 'capturing of radio waves' is the topic being 'looked at' this time by **Gordon King G4VFV**.

22 Radio Basics
This month **Rob Mannion G3XFD** presents part 1 of the promised articles on making and using headphones.

24 Yaesu VX-2E Transceiver Review
John Goodall G0SKR discovers the latest dual-band hand-held from the Yaesu 'stables' to be something of a 'mighty little beast', offering versatility and a host of comprehensive features.

26 The Reference Loop
Martti Nissinen OH4NV created the Reference Loop for DX working for himself and his friends to use in their antenna experiments. Share his experience and build your own.

30 *The Vectis Run*
In the first technological thriller to feature in the pages of *PW* **Rupert Templeman** sets the scene, taking us back to early 1939 on the Isle of Wight as wireless sales technician Alan Edwards sets off on his monthly visit to customers on the Island.

32 Åland Island Adventure
'Sandwiched' between Sweden and Finland, the Åland Islands are alive with Amateur Radio activity as **Henryk Kotowski SM0JHF** explains.

34 KIF700 Keyboard Interface Review
Richard Newton G0RSN has been busy testing an interesting accessory for use with Kenwood's TM-D700 transceiver - the KIF700 is a keyboard with a difference!

36 Antenna Workshop
Keen v.h.f. operator **David Butler G4ASR** describes a design for a Yagi antenna for use on the 430MHz band.

38 A Direct Reading Frequency Meter
This classic project from the 1970s by **T. J. Melville** proved very useful to readers then and we're sure you'll find it fascinating today too!

44 A Kit Challenge
Rob Mannion G3XFD takes up the challenge of using and building the Ten-Tec 1340 7MHz QRP c.w. transceiver. Find out what he thought and hopefully you'll be encouraged to have a go too.

46 Making Sense Of The Flux Figures & Weird Numbers
Do you fear propagation figures? **Patrick Allely GW3KJW** says there's no need, as once you know how to interpret them it all makes sense! Read Patrick's article to discover how easy interpreting those 'weird' numbers really are.

48 Competition Time!
Win a Yaesu VX-2E dual-band hand-held in our easy-to-enter competition - don't delay, post your entry today!

50 Carrying on the Practical Way
George Dobbs G3RJV discusses variable frequency oscillators.

52 Valve & Vintage
Indulge in more Miller Memoirs as **Charles Miller** recalls the time in his radio and television servicing days when cathode ray tubes were imploding all around him.

The Publishers and Staff of *Practical Wireless* would like to wish all our Readers, Advertisers and Authors a very Merry Christmas and a Prosperous New Year. Please note that the PW Offices will be closed **from 24 December 2003** until **5 January 2004**.

January **regulars**

9 Rob Mannion's Keylines
Topical chat and comments from our Editor **Rob G3XFD**. This month there's news of a new author soon to join the *PW* fold.

10 Amateur Radio Waves
You have your say! There's a varied and interesting selection of letters this month as the postbag's bursting at the seams with readers' letters. Keep those letters coming in and making 'waves' with your comments, ideas and opinions.

11 Amateur Radio Rallies
A round-up of radio rallies taking place in the coming months.

12 Amateur Radio News & Clubs
Keep up-to-date with the latest news, views and product information from the world of Amateur Radio with our News pages. This month there's a variety of stories for you to enjoy. Also, find out what your local club is doing in our club column.

54 VHF DXer
David Butler G4ASR'reports on the large Auroral openings which recently affected the v.h.f. and u.h.f. bands.

58 HF Highlights
Two more new reporters join **Carl Mason GW0VSW**'s band of h.f. enthusiasts this month.

60 Data Burst
Robin Trebilcock GW3ZCF has news of c.w. decoders, electronic QSLs and RTTY souncards.

67 Tune In
The latest news from the broadcast bands is rounded-up by **Tom Walters** and this month he wishes a Happy Birthday to the Voice of Russia.

68 Bargain Basement
The bargains just keep on coming! Looking for a specific piece of kit? Check out our readers' ads, you never know what you may find!

70 Book Store
If you're looking for something to compliment your hobby, check out the biggest and best selection of radio related books anywhere in our bright and comprehensive Book Store.

76 Subscribe Here
Subscribe to *PW* and/or our stable-mates in one easy step. All the details are here on our easy-to-use order form.

77 Topical Talk
This month **Rob Mannion G3XFD** provides some background information on **Tony Nailer G4CFY** - who's soon to join the team of authors.

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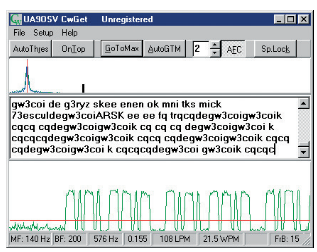

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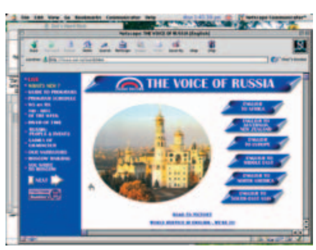

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author**info**

Our Radio Scene reporters' contact details in one easy reference point.

VHF DXer
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed
Herefordshire
HR2 0HP
Tel: (01873) 860679
E-mail: g4asr@btinternet.com

HF Highlights
Carl Mason GW0VSW
12 Llwyn-y-Bryn
Crymlyn Parc
Skewen
West Glamorgan
SA10 6DX
Tel: (01792) 817321
E-mail: carl@gw0vsw.freeserve.co.uk

Data Burst
Roger Cooke G3LDI
The Old Nursey
The Drift
Swardeston
Norwich
Norfolk NR14 8LQ
Tel: (01508) 570278
E-mail: rcooke@g3ldi.freeserve.co.uk
Packet: G3LDI@GB7LDI

Robin Trebilcock GW3ZCF
15 Broadmead Crescent
Bishopston
Swansea
SA3 3BA
Tel: (01792) 234836
E-mail: robin2@clara.co.uk

Tune-in
Tom Walters
PO Box 4440
Walton
Essex
CO14 8BX
E-mail: tom.walters@aib.org.uk

In Vision
Graham Hankins G8EMX
17 Cottesbrook Road
Acocks Green
Birmingham
B27 6LE
E-mail:graham@ghank.demon.co.uk

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rob mannion's keylines

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

Last month in Keylines I mentioned the fact that in my opinion an Editor 'serves' the reader. In a practical sense of course the service to you the reader is shown by the work my colleagues and I carry out producing the magazine itself.

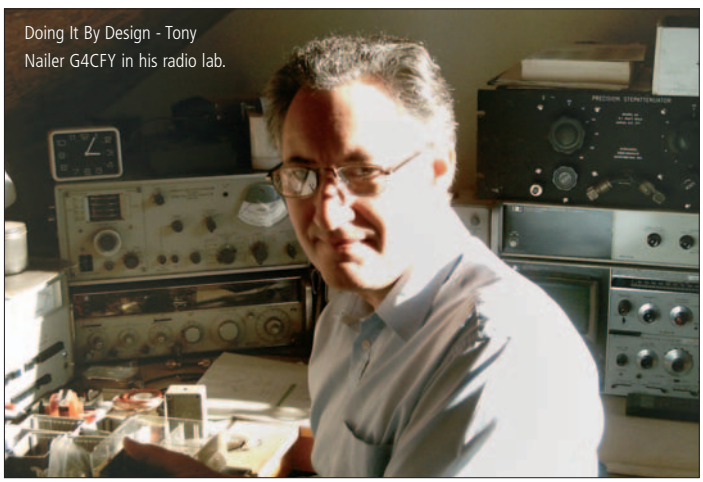
However, in addition to the office work involved with *PW* there are of course the visits to clubs, shows and rallies. And, as I mentioned last month these visits provide extremely valuable feedback.

Readers who have attended a *PW* 'Club' talk will no doubt remember I often mention the extremely popular and long running series Equipment Specifications - The Mysteries Explained, which was introduced directly due to readers' questions and to overcome mystification! **Ian Poole G3YWX**'s series of articles were introduced following a visit **Tex Swann G1TEX** and I made to the former **North Ferriby Amateur Radio Club** (now the **East Yorkshire ARS**) near Hull. It was then - with members of the **Hull & District ARS** joining us for the evening - that we discovered that even the most technically qualified readers found equipment specifications mysterious!

We then started searching for a suitable author and realised that Ian G3YWX was the ideal choice to write the series. The rest is history, but we're always on the look out for specialised authors to provide the best possible magazine content.

Welcome Tony G4CFY

In the continuing effort to react to the feedback from our readers I'm delighted to announce that **Tony Nailer G4CFY** is to join our team of specialist authors. Tony will be producing his new column Doing It By Design from the March 2004 issue of *PW* on a bi-monthly schedule. Here he'll be looking in-depth at Amateur Radio topics covering the more advanced theoretical and design aspects, often ending up with a project/circuit for you to build.



Doing It By Design - Tony Nailer G4CFY in his radio lab.

Although a potted biography of Tony appears on page 77 of this issue, I realise of course that he's extremely well known to many readers through his company, **Spectrum Communications** and RAE tutorial and exam centre services. In fact I meet many readers who've have been tutored and have passed the RAE thanks to G4CFY's efforts.

Indeed, Production Editor **Donna Vincent G7TZB/M3TZB** took her RAE in Dorchester, with the help of the facilities Tony provided. Additionally, my colleague **Kevin Nice G7TZC**, the Editor of *Short Wave Magazine* also took his RAE at Tony's well known establishment.

So, on behalf of everyone I wish Tony a hearty welcome. I know we'll enjoy his column!

Something Different!

This month sees the introduction of something really different in *PW* in the form of a fictional adventure serial entitled *The Vectis Run*. The story has been especially written for *PW* by author **Rupert Templeman** who is himself a radio and technology enthusiast.

The serial runs for 12 episodes and begins in early 1939, a period where radio and communications technology was growing fast. Without spoiling the story too much, I think it also helps pay tribute to the many 'Back Room' people who have often been overlooked.

As far as I can see the introduction of a technically-themed fictional story in a magazine such as *PW* is possibly unique. It's an idea the author and I have discussed for many years and after much deliberation we think now is the time. However, although the serial is aimed at providing interesting reading, while ensuring the technology aspects of a technically based story aren't ignored, **it's not intended to be a technical history lesson!**

Instead, our commissioned adventure serial is intended to provide interesting entertainment for a group of specialised readers. I say this because I know how you respect the world of technology and the crucial part it played before and after the Second World War.

'Balanced' with constructional projects, reviews and the rest of the carefully planned content of *PW* the author and I hope very much that the idea will make 2004 reading very enjoyable for you all. With that I wish you all a very happy New Year from everyone who works on *PW*. Best wishes to you all.

Rob G3XFD

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Just some of the services *Practical Wireless* offers to readers...

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

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A complete review listing for *PW/SWM* is also available from the Editorial Offices for £2 inc. P&P.

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

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

Make your own 'waves' by writing into *PW* with your comments, ideas, opinions and general 'feedback'.

Long & Short!

● **Dear Sir**

The enclosed photo shows 'The long and the short of it'! It shows me and my old friend **Ray LX1RB**. We first 'met' on air in 1967 when I was on an LXpedition with two friends, we then met in person in 1968. Since that time we have kept in touch by radio and by several eyeball meetings.

Before retiring, Ray was one of the engineers who kept the long wave Radio Luxembourg on the air (a fascinating place to visit). This latest meeting took place in Irrel, a German village 25km from Ray's home in Junglinster, Luxembourg. I send you the picture, which might fill a space in the news pages of *PW*.

Walter Farrar G3ESP
Ackworth
Pontefract

Editor's comment: Walter's interesting example of friendship through Amateur Radio also provides an opportunity for me to inform readers that a *PW* feature on the historic Radio Luxembourg service is planned for 2004. I must look out that '208m Bandspread' portable!

Walford Kits

● **Dear Sir**

After getting my M3 licence I borrowed an FT-840 radio for about 18 months, when it had to be returned I was left radio-less. Not being in a position to purchase something similar, I thought the next best thing was to build something usable and inexpensive.

A fellow club member had recently given me a catalogue from Walford Electronics. The kits looked very interesting so I sent off an order with a cheque for the Kingsdon transmitter and the Midney Receiver.

The transmitter kit arrived within three days, which I started to build, and the receiver arrived the following week. The instructions were very comprehensive and easy to follow. The kits, when joined together, made a transceiver. They were a joy to build and are a pleasure to use. The performance is far better than expected. My first contact was with **EI/M0TWA/P** in Ireland and the second was **RU5LIJ**, Moscow, all on 5W.

I look forward to your magazine every month, keep up the good work.

Michael F. J. Hearn G1WIA, M3TEX
Brentford
Middlesex

Editor's comments: Feedback from constructors such as Michael has provided, can only help keep the kit market fit and thriving. Without the support of the Radio Amateur/Listener the number of kit manufacturers will continue to dwindle. My 'PCB' motto (Practical Construction is Beneficial) clearly indicates my support for this important aspect of our hobby.

Offended & Disturbed

● **Dear Sir**

As a disabled person, who teaches technology in the community, via the Amateur Radio fraternity, I feel I should bring to your attention for your records, the attached correspondence. I have been greatly offended and disturbed by the actions of the **Radio Society of Great Britain**, a national body, towards disabilities.

I had applied, upon being invited, to attend a residential training course at Priorslee Hall, Telford, organised by the RSGB on the 12 August, clearly stating 'Wheelchair Access' required. I received written confirmation of my acceptance and position on the course on the 15 September. I then received a telephone call from the Society on the 9 October, excluding me from the course because, for no other reason, I am disabled.

The rest should be clear from the enclosed letter. Thank you for your time reading this correspondence.

John Goodall G0SKR
Bournemouth
Dorset

Letter to the RSGB from John Goodall:

Dear Mr Kirby

I feel now is the time I must write to your regarding the Society's inconsiderate exclusion of myself from the 'Teach the Teachers' Residential weekend at Priorslee Hall, Telford.

I spent my working career in the public service, until a criminal injury rendered me disabled and forced my retirement after only 26 years. I rekindled my interest in Amateur Radio and ten years ago started promoting the hobby within my local club. I can say, the satisfaction I and my assistant instructors have received over the years with the high pass returns on our students has been immense. At Christchurch Amateur Radio Society (CARS) we do **not** discriminate against anyone with any disability. Indeed, I shall say at this point, as I remain seated throughout all our courses, very few students even realise that I am disabled. At the club we have had numerous successes in Foundation, Intermediate and Full Amateur Radio Examinations. We have never advertised, and our students all come from word of mouth from our excellent reputation. Students have joined our courses from as far away as Devon, Reading and Newbury. I stand by our excellent reputation and our high level of teaching standards.

On the 12 August I returned to you my application to be considered for the 'Teach the Teachers' residential weekend, stating quite clearly in block capitals, in the special needs section - 'Wheelchair Access'. I was indeed very pleased to receive the confirmation letter, dated 12 September, of my acceptance on the weekend. I made the necessary arrangements for this weekend after I received this letter. I cancelled my involvement in other projects for the weekend named.

As the date for the weekend approached, I finalised my arrangements and route to the venue. You can never imagine my feelings when at 1745 on Thursday 9 October, I received a telephone communication on my mobile excluding me from the weekend because I was disabled! Blatant discrimination of this type is not just morally wrong, but illegal. I would suggest the Society becomes aware of the Disability Discrimination Act 1995, its provisions and implications.

Despite the Society's attempt to put the blame for this fiasco onto the college, this was a total fabrication. The Campus at Priorslee Hall was in fact contacted the very next day, with a view to ascertaining if the discrimination was of their making. This was clearly not the case and **all** accommodation and halls, with the exception of the one chosen by the Society, had disabled access - as required by law.

Should the Society contact them regarding wheelchair user or users, they, the campus authorities, would at no extra cost, with even one days notice, move the venue to premises conforming to the Act. This was obviously not even to be considered by the Society - something to do with, so I am informed, a listed building being a **nicer** venue. I don't know the truth of this, but the continued exclusion of me speaks volumes. I do not makes noises to be noticed because I use a wheelchair, but prefer to get on with it unnoticed. However, when treated in this manner, I must stand up and be recognised.

I have waited in vain, since that impersonal mobile telephone call, informing me of my exclusion, hoping someone from the Society would have the decency and courtesy to apologise in writing for this totally despicable behaviour. *'Keep our heads well below the trench top guys - we might be in trouble!'* seems to spring to mind here. It would appear that little thought can be given by our national Society, to someone who, though disabled, promotes and generates massive new interest in the hobby.

Mr Kirby, I do take exception to your inference to another Amateur, that I was **happy** with the exclusion arrangement and I would **not** accept being manhandled up and down stairs by whoever. I was so shocked and dismayed by the 'phone call, I do not remember any reference, if in fact there was any, to being

carried anywhere. Carrying a person in a wheelchair, up stairs or anywhere, is highly skilled work and **cannot** be undertaken by inexperienced operators, imagine the insurance claim against the Society should these untrained persons drop this 17st hulk! If, as you also inferred, you were in the same office as the person making that 'phone call to me, why were you not man enough to make the call yourself?

I have given serious thought to my position, firstly as a member of an organisation that blatantly discriminates against the disabled and secondly as to my future in teaching the hobby at any or all three levels. The former, as yet I am undecided, but I must seriously consider cancelling my membership. As to the latter, I could not discriminate against anyone wishing to join the hobby and learn from my teachings, so I shall continue teaching Amateur Radio to all newcomers approaching CARS.

Is it any wonder the Society is being thought of less and less by the Amateur fraternity? Looking forward to any comments you have on this issue.

John Goodall

Editor's note: In line with the ethical approach adopted at *PW* the opportunity of a response was offered to the RSGB enabling them to provide 'their side' of the situation;

Letter replying to John Goodall from Peter Kirby, RSGB:

Dear Mr Goodall

Thank you for your letter of the 22 October 2003. The contents of which I have noted with some concern. I can understand your disappointment and frustration at being excluded from the Telford 'Train the Trainers' weekend. That disappointment and frustration was mirrored by the Society and myself.

The RSGB takes its responsibilities towards the disabled very seriously and I am fully aware of the Disability Discrimination Act 1995, its provision and implications contained herein. There was no intention on the part of the Society to discriminate against yourself or the other disabled Instructor we had to exclude from the course. The true facts behind the exclusions are as follows:

Priorslee Hall was booked by the RSGB for the course following a visit by myself and a colleague. It was chosen because it fitted the bill completely with regards to running a full self-contained course. The venue that we saw had to have a large conference room with a number of breakout rooms close by. It was the University's recommendation that we view Priorslee Hall and it suited the Society's requirements perfectly.

At the visit we sought assurance that the venue was 'Disabled' friendly and we were told that it was. Having received this assurance we confirmed the booking and went ahead with the planning of the course.

All was going according to plan, when in a routine conversation with the University conference organiser, Mrs Sinapi, the course administrator, on confirming numbers advised the University that there were two disabled persons attending. She was informed at this point that "Priorslee Hall did not have disabled access".

I can assure you that when I was informed of this development, I was extremely angry as I had sought assurance at the first meeting that the building was 'Disabled' friendly. With regards to moving to another building within the University Campus, I can confirm that other facilities were available, however, we were informed that none were self-contained as was Priorslee Hall and that it would be necessary to move from one building to another to facilitate the 'Breakout' sessions.

The scheduling for the course and the sessions were extremely tight and there was a lot to 'pack in' over a very short time scale, so I reluctantly had to take the decision not to disrupt the plans already in place. This was a disagreeable decision for me to have to take, but it was unavoidable in the circumstances.

The RSGB is not a discriminatory organisation, Lambda House fully meets the requirements of the Act with regards disabled access and this is to my knowledge the first time that we have had to exclude disabled persons from any of our courses or events.

Your work as a 'trainer' has not gone unnoticed and this is why it is both disappointing and frustrating to myself and the training staff that you were unable to attend. Your input would have been highly valued.

The intention is to run at least three courses of this nature a year and planning is now underway for the second course in the 'Spring' of next year, which I hope that, despite your disappointment and anger at missing the first course through no fault of your own, you will consider attending. I can assure that next venue **will be** fully 'Disabled' friendly.

You intimate in your letter that there are two sides to any story. Laid before you is the true facts behind your unfortunate exclusion from this event. On closing, may I take this opportunity on behalf of the Society for the frustration and anger that this matter has caused you.

Peter Kirby G0TWW
General Manager
Radio Society of Great Britain

Second World War Radar

Dear Sir

In your travels around the country to various clubs, have you ever had contact with other amateurs or collectors of Second World War Radar gear? The a.c. supply for this equipment was 80V at the high frequency of 2kHz.

I am having a clear out in my garage and I have an aircraft dual generator, 26/28V d.c. with an alternator 80V 2kHz, it would require a motor of around 0.75HP to drive it. If you should know of anyone who would like it, they can contact me to make arrangements to collect, there are other items connected with it, d.c. switchboard meters and the a.c. regulator, etc. It's free to a good home!

E. T. Cloude G7FAQ
Farnham
Surrey

Editor's reply: If any collector has a home for this equipment, please contact me at the *PW* office. Incidentally, the high frequency a.c. was chosen as it minimised the weight of transformers.

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

Letters Received Via E-mail

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

Editor

amateur radio rallies

Radio rallies are held throughout the UK. They're hard work to organise so visit one soon and support your clubs and organisations.

February 8
The Harwell Rally
Contact: **Ann G8NVI**
Tel: **(01235) 816379**
Website: **www.hamradio.harwell.com**
This rally is to be held at the Didcot Leisure Centre, Mereland Road, Didcot, Oxon, signposted from the A34. Bring & Buy, trade stands, special interests, crafts, catering, licensed bar and talk-in on S22. Free car parking. Doors open 1030 (1015 for disabled visitors) and admission is just £1.50.

February 15
The Northern Cross Radio Rally
Contact: **John G7JTH**
Tel: **(01924) 251822**
Website: **www.wdrs.org.uk**
Held at Thornes Athletics Stadium, Wakefield, West Yorkshire. One large hall on ground floor - just out of town on the Horbury Road. There will be ample parking on-site, with easy access from M1 J39 & 40 - well signposted. All the usual attractions and doors open at 1030 (1015 for disabled visitors and Bring & Buy). Admission charge is £2.

February 29
The Cambridge & District Amateur Radio Club Rally
Contact: **Dr. M.D. Addlesse**
Tel: **(01223) 872258**
E-mail: **m0blp@amsat.org**
Held at the Britten Arena, Wood Green Animal Shelter, King's Bush Farm, London Road, Godmanchester.

February 29
The Swansea ARS Amateur Radio & Computer Show
Contact: **Roger Williams GW4HSH**
Tel: **(01792) 404422**
The Swansea Amateur Radio Society's rally is to be held at the Swansea Leisure Centre, on the A4061 Swansea Mumbles Coast Road. There will be trade stands, Bring & Buy, local radio interest and repeater groups, 2m Talk-in and an operational h.f. station. Doors open 1030 till 1600 and entrance fee is £1.50 for adults, 50p for children.

March 14
The Wythall Radio Club's 19th Annual Radio & Computer Show
Contact: **Martin G8VXX**
Tel: **0121-474 2077** (24hr answerphone)
E-mail: **enquiries@wrcrally.co.uk**
Wythall Radio Club's 19th Annual Radio & Computer Rally is to be held at Woodrush Sports Centre, Shawhurst Lane, Hollywood, near Birmingham on the A435, just two miles form Junction 3 of the M42. Doors open 1000 till 1600 and admission is just £1.50. There will be plenty of traders in two large halls and refreshment facilities are available on site. There will also be a Bring & Buy, easy comfortable parking on site. All are welcome. For licensed radio Amateurs, a Talk-in is available on S22.

March 14
The Bournemouth Radio Society's 16th Annual Sale
Contact: **Olive & Frank G0GOX**
Tel: **(01202) 887721**
To be held at Kinson Community Association Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth. Doors open 1000 till 1600. Admission is just £1. Talk-in from G1BRS on 2m S22, Amateur Radio, Computer Traders, Antenna Suppliers, Bring & Buy, also Specialist Group and Clubs and home-made refreshments.

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

amateur radio **news**

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

Next Generation Radio

Go Digital!

If you are looking for a last minute Christmas gift you may like to consider one of the latest digital radios on the market - the A-2000.

Launched by Aria Digital the A-2000 is a desk-top style DAB/f.m./RDS Digital Radio, built into a stylish real cherry wood veneer cabinet making it visually appealing too. The manufacturer's claim that their Aria Acoustic tuning technology means the A-2000: "delivers a 'gloriously rich big system sound' from what is a compact unit - it will blow traditional radio away"!

The unit receives both Band II and L Band, so it can operate anywhere in the World that DAB is broadcast which currently is in more than 30 countries. With its high power amplifier, stereo signal and digital outputs and a price tag of £139, the manufacturer's says the "A-2000 is sure to be popular".

The A-2000 is available now from Nevada, please contact them direct for further information.

Nevada
Tel: 0239 2313 090
Website: www.nevada-radios.co.uk

AKD News

Garex Acquires AKD

Production of AKD TVI filters continues thanks to Garex Electronics.

Following the news in *PW* December 2003, that AKD was closing, the Newsdesk is pleased to report that Garex Electronics have announced that they have acquired the design and manufacturing rights to the AKD range of TVI filters and will continue production. At the time of going to press (late November) the future of other former AKD products was under review.

Garex Electronics can be contacted at:
PO Box 52, Exeter EX4 5FD
Tel: (07714) 198374
Website: www.garex.co.uk

Joining Forces

From Radiocommunications Agency to Ofcom

As from the end of December 2003 the function of the Radiocommunications Agency will transfer to Ofcom. Read on to find out what this means for Amteur Radio.

The Office of Communications (Ofcom) will take over all the regulatory duties, functions and powers of the five exisiting regulatory bodies of the Radio Authority, the Independent Television Commission, the Office of Telecommunications (Oftel), the Broadcasting Standards Commission and the Radiocommunications Agency. Following this change, Wireless Telegraphy Act licences will be issued by Ofcom and not the Secretary of State with effect from the end of December 2003 and all licence holders will be notified to explain how this change will affect exisiting licences on the date of transfer and after.

With effect from 8 December all telephone, FAX, and E-mail enquiries should be made to the Ofcom Contact Centre, based in Southwark Bridge Road in London (details below). All of the Radiocommunications Agency's local offices will undergo changes but Ofcom will still retain a presence in the 'Home Nations' and regions. The changes will be as follows:

- The consumer support units in Leeds, Haydock and Birmingham will be consolidated into a a unit called Ofcom Spectrum Management Office - England (North) and will be housed in the Haydock (Merseyside) Office. **Tel: (01942) 528200**.
- The consumer support units in Bristol and Kenley (Greater London) will become Spectrum Management Office - England (South) and will be housed in the Kenley Office. **Tel: 0208 645 2200.**

The administrative customer support units in Scotland, Wales and Northern Ireland will move to new premises in due course.

Ofcom Headquarters
Riverside House, 2a Southwark Bridge Road, London SE1 9HA
Tel: 0208 7981 3000 FAX: 0208 7981 3333
Website: www.ofcom.org.uk

Ofcom Contact Centre
Tel: 0845 456 3000 FAX: 0845 456 333
E-mail: contact@ofcom.org.uk

RAYNET Trophy

Above & Beyond the Call of Duty

Every year RAYNET acknowledges an indvidual or group who they consider to have provided services over and above the call of duty and this year is no exception.

Bill Mahoney G3TZM, the Public Relations Officer for RAYNET in the West Midlands, was presented with a trophy in recognition of his work in publicising the voluntary organisation. The presentation was made by the Chairman of RAYNET at the Annual General Meeting on 1 November.

Bill got his licence in March 1965 and has been a member of RAYNET for over 30 years. He is a Marine Engineer and has been working as the Regional Energy Efficiency Officer in the West Midlands for a number of years. Recently has been involved in lecturing on the services provided by RAYNET at training sessions for emergency services and voluntary organisations.

Note: RAYNET is an organisation of Amateur Radio operators who give up their free time to provide back-up communications during disasters or emergencies and exercise related emergencies. This is achieved by using their own radio equipment within the terms of their Amateur Radio Licences.

Radio & Antiques

Chelmsford Amateurs on TV

Look out for a group of Radio Amateurs from the Chelmsford Amateur Radio Society on BBC television in March!

When a team from the BBC TV Antiques programme *Flog-It* presented by **Paul Martin** visited Sandford Mill Science and Industrial Museum, the Chelmsford Amateur Radio Society were invited to stage a demonstration contact. The club station **GX0MWT** was set up in the 2MT hut at the museum and successfully contacted **GB2GM** at Poldhu.

To see the QSO in action and find out what antiques were uncovered in the area during the filming of the programme keep an eye on BBC2 this coming March. The Chelmsford Amateur Radio Society meet on the first Tuesday of each month at 0715 hours in the Marconi Social Club, Beehive Lane, Great Baddow.

Chelmsford Amateur Radio Society
E-mail: info@g0mwt.org.uk
Website: www.g0mwt.org.uk

Foundations Keep Growing

No Barriers in Bangor

Since running their first Foundation Course in February 2003, Bangor ARS have helped 64 students gain their licences.

The Bangor & District Amateur Radio Society in Northern Ireland have just completed running their fourth Foundation Licence course. On the latest course the youngest student was eight years old, showing that age is no barrier in getting on the air! The photo below shows the class and tutors, taken by **Bertie Drain GI4POC**.

For details on club activities, monthly meetings and how to get involved take a look at the club website at **www.bdars.com**

Cornish Club news

International Marconi Day

Start preparing now to take part in International Marconi Day 2004, the Cornish Radio Amateur Club already have!

International Marconi Day (IMD) takes place on 24 April 2004, which is the closest Saturday to Marconi's Birthday and for the 17th year in succession members of the Cornish Radio Amateur Club (CRAC) will be on air with the callsign **GB4IMD**. Since 1988 CRAC has taken part in the 24 hour event running 0000UTC to 0000UTC Sunday and once again hope to work as many fellow Amateurs as possible during the event.

It's hoped there will be at least 30 stations taking part world-wide in IMD 2004, all with a historical connection to Marconi. So, it's well worth you taking to the air and trying to work some of the stations taking part. If your club station has a connection to Marconi and would like to be added to the official station list please contact the Cornish Radio Amateur Club.

The Cornish Radio Amateur Club
PO Box 100,
Truro, Cornwall
TR1 1XP
E-mail: ken@jtarry.co.uk
Website: www.gb4imd.co.uk (Webmaster Geoff Chance)

amateur radio clubs

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

ESSEX
Loughton & Epping Forest ARS
Contact: Marc Litchman G0TOC
Tel: 020-8502 1645/(07743) 456058
E-mail: secretary@lefars.org.uk
Website: http://www.lefars.org.uk
The Loughton & Epping Forest Amateur Radio Society meet every other Friday at: All Saints House, Romford Road, Chigwell Row, Essex IG7 4QD.

KENT
Dover Amateur Radio Club
Contact: Brian Cuff G4SAU
Website: www.DARC.org.uk
Meetings of the Dover Amateur Radio Club are held every Wednesday at 1930 hours during term time in the Dover Boy's Grammar School. The club are a centre for the Foundation and Intermediate training courses as well as being the examination centre for the area. Forthcoming meetings include: **Jan 7:** Operating and Natter Night; **14th:** RSGB video, **21st:** Operating and Natter Night and **28th:** 'Behind the Scenes of Broadcast Radio' by **Matt M1CMN**.

LINCOLN
Lincoln Shortwave Club
Contact: Pam Rose G4STO (Secretary) or Baz Matthews M3DMV (Activities Manager)
Tel: (01427) 788257 or 01636-612440
E-mail: m3dmv@btopenworld.com
Website: www.lswc.co.uk
The Lincoln Shortwave Club meet every Wednesday, 2000 hours at the Lincoln Railway Social Club, Ropewalk, Lincoln LN6 7DQ. They offer a varied club programme and welcome new members so why not go along and join in?

MIDDLESEX
The Radio Society of Harrow
Contact: Jim Ballard
Tel: (01895) 476933
E-mail: g0aot@blueyonder.co.uk
The Radio Society of Harrow meets at 2000 hours every Friday at The Harrow Arts Centre, Uxbridge Road, Hatch End, Middlesex. Forthcoming meetings include: **Dec 19:** Christmas Social - Join club members in the Grimsdyke Room for the last meeting before the New Year, contributions to the refreshments welcome; **26th:** No Meeting; **Jan 9:** Members' 'Bring & Show' evening - your opportunity to bring along any unusual or interesting pieces of radio-related equipment.

STAFFORDSHIRE
St. Leonards Amateur Radio Society
Contact: Derek Southey G0EYX
Tel: (01785) 604904
E-mail: g0eyx.derek@ntlworld.com
Website: www.slars.org.uk
The St. Leonards Amateur Radio Society meet every Thursday at Alstom Protection & Control, St. Leonards Works, Stafford at 2000 hours. Why not go along to one of these meetings? **Jan 1:** Happy New Year - Quiet gathering; **9th**: Christmas Party; **15th:** Shack Night; **22nd** Committee Meeting & Shack Night and **29th**: 'VHF Propagation' by **Paul G8IYG.**

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Chimney lashing kit **£12.95**
Double chimney lashing kit **£24.95**
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4-Way Pole Spider for Guy Rope/wire 1" Mast Sleeve/Joiner **£6.95**
1.25" Mast Sleeve/Joiner **£7.95**
1.5" Mast Sleeve/Joiner **£8.95**
2" Mast Sleeve/Joiner **£9.95**
Earth rod including clamp (copper plated) **£9.95**
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Pole to pole clamp 2"-2" **£4.95**
Di-pole centre (for wire) **£4.95**
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Heavy Duty Aluminium (1.2mm wall)
1¼" single 5' ali pole **£7.00**
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1¾" single 5' ali pole **£12.00**
1¾" set of four (20' total approx) **£39.95**
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2" set of four (20' total approx) **£49.95**
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Please phone for special 100 metre discounted price

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BNC Screw type plug (Small entry) **£1.00**
BNC Solder type plug (Small entry) **£1.00**
BNC Solder type plug (Large entry) **£2.50**
N-Type plug (Small entry) **£2.50**
N-Type plug (Large entry) **£2.50**
SO239 Chassis socket (Round) **£1.00**
SO239 Chassis socket (Square) **£1.00**
N-Type Chassis scoket (Round) **£2.50**
N-Type Chassis scoket (Square) **£2.50**
SO239 Double female adapter **£1.00**
PL259 Double male adapter **£1.00**
N-Type Double female **£2.50**
SO239 to BNC adapter **£1.50**
SO239 to N-Type adapter **£3.00**
SO239 to PL259 adapter (Right angle) **£2.50**
SO239 T-Piece adapter (2xPL 1XSO) **£3.00**
N-Type to PL259 adapter (Female to male) **£2.50**
BNC to PL259 adapter (Female to male) **£2.00**
BNC to N-Type adapter (Female to male) **£2.50**
BNC to N-Type adapter (Male to female) **£2.50**
SMA to BNC adapter (Male to female) **£3.95**
SMA to SO239 adapter (Male to SO239) **£3.95**
SO239 to 3/8 adapter (For antennas) **£3.95**
3/8 Whip stud (For 2.5mm whips) **£2.95**
Please add just £2.00 P&P for connector only orders

10/11 METRE ANTENNAS

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

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MD-24 HF or VHF/UHF internal duplexer (1.3-225MHz) (350-540MHz) SO239/PL259 fittings **£22.95**
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CS201-N Same spec as CS201 but with N-type fittings **£28.95**
CS401 Same spec as CS201 but4-way **£49.95**

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YS-130 Medium duty VHF **£79.95**
RC5-1 Heavy duty HF **£349.95**
RG5-3 Heavy Duty HF inc Pre Set Control Box **£449.95**
AR26 Alignment Bearing for the AR300XL **£18.95**
RC26 Alignment Bearing for RC5-1/3 ..... **£49.95**

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Turbo mag mount 7" 4mtrs coax/PL259 3/8 or SO239 ..... **£14.95**
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SO259 fitting **£14.95**
Gutter Mount (cast aluminium) 4mtrs coax/PL259 3/8 fitting **£9.95**
SO259 fitting **£12.95**
Hatch Back Mount 3/8 4mtrs coax/PL259 ..... **£12.95**
Roof stud Mount 4mts coax/PL259 3/8 or SO239 fitting **£12.95**

ANTENNA WIRE & RIBBON

Enamelled copper wire 16 gauge (50mtrs) **£11.95**
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PVC Coated Flexweave high quality (50mtrs) **£37.95**
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HF BALCONY ANTENNA

BAHF-4 FREQ:10-15-20-40 Mtrs LENGTH: 1.70m HEIGHT: 1.20m POWER: 300 Watts **£129.95**

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

TELESCOPIC MASTS (aluminium & fibreglass options)

TMA3 3" to 1¼" heavy duty aluminium telescopic mast set, approx 40ft when errect, 6ft collapsed **£199.95**
TMA2 2¼" to 1¼" heavy duty telescopic mast set, approx 40ft when errect, 9ft collapsed **£149.95**
TMA1 2" to 1¼" heavy duty aluminium telescopic mast set, approx 20ft when errect, 6ft collapsed **£99.95**
TMAF-1 2" to 1¼" heavy duty fibreglass telescopic mast set, approx 20ft when errect, 6ft collapsed **£99.95**
TMAF-2 2¼" to 1¼" heavy duty telescopic fibreglass mast set, approx 40ft when errect, 9ft collapsed **£189.95**

HF YAGI

HBV-2 2 BAND 2 ELEMENT TRAPPED BEAM FREQ:20-40 Mtrs GAIN:4dBd BOOM:5.00m LONGEST ELEMENT:13.00m POWER:1600 Watts **£329.95**

ADEX-3300 3 BAND 3 ELEMENT TRAPPED BEAM FREQ:10-15-20 Mtrs GAIN:8 dBd BOOM:4.42m LONGEST ELE:8.46m POWER:2000 Watts **£269.95**

ADEX-6400 6 BAND 4 ELEMENT TRAPPED BEAM FREQ:10-12-15-17-20-30 Mtrs GAIN:7.5 dBd BOOM:4.27m LONGEST ELE:10.00m POWER:2000 Watts **£499.95**
40 Mtr RADIAL KIT FOR ABOVE **£99.00**

HF VERTICALS

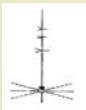
VR3000 3 BAND VERTICAL FREQ: 10-15-20 Mtrs GAIN: 3.5dBi HEIGHT: 3.80m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) **£89.95**
OPTIONAL 10-15-20mtr radial kit **£34.95**

VR5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 4.00m RADIAL LENGTH: 2.30m (included). POWER: 500 Watts **£169.95**

EVX4000 4 BAND VERTICAL FREQ:10-15-20-40 Mtrs GAIN: 3.5dBi HEIGHT: 6.50m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) **£99.95**
OPTIONAL 10-15-20mtr radial kit **£34.95**
OPTIONAL 40mtr radial kit **£12.95**

EVX5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 7.30m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) **£139.95**
OPTIONAL 10-15-20mtr radial kit **£34.95**
OPTIONAL 40mtr radial kit **£12.95**
OPTIONAL 80mtr radial kit **£14.95**

EVX6000 6 BAND VERTICAL FREQ: 10-15-20-30-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 5.00m RADIAL LENGTH: 1.70m(included) POWER: 800 Watts **£249.95**



EVX8000 8 BAND VERTICAL FREQ:10-12-15-17-20-30-40 Mtrs (80m optional) GAIN: 3.5dBi HEIGHT: 4.90m RADIAL LENGTH: 1.80m (included) POWER: 2000 Watts **£269.95**
80 MTR RADIAL KIT FOR ABOVE **£79.00**

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

TRAPPED WIRE DI-POLE ANTENNAS

(Hi Grade Heavy Duty Commercial Antennas)

UTD160 FREQ:160 Mtrs LENGTH:28m POWER:1000 Watts **£44.95**
MTD-1 (3 BAND) FREQ:10-15-20 Mtrs LENGTH:7.40 Mtrs POWER:1000 Watts **£39.95**
MTD-2 (2 BAND) FREQ:40-80 Mtrs LENGTH: 20Mtrs POWER:1000 Watts **£49.95**
MTD-3 (3 BAND) FREQ:40-80-160 Mtrs LENGTH: 32.5m POWER: 1000 Watts **£89.95**
MTD-4 (3 BAND) FREQ: 12-17-30 Mtrs LENGTH: 10.5m POWER: 1000 Watts **£44.95**
MTD-5 (5 BAND) FREQ: 10-15-20-40-80 Mtrs LENGTH: 20m POWER:1000 Watts **£79.95**
(MTD-5 is a crossed di-pole with 4 legs)

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STANDARD LEADS
1mtr RG58 PL259 to PL259 lead **£3.95**
10mtr RG58 PL259 to PL259 lead **£7.95**
30mtr RG58 PL259 to PL259 lead **£14.95**

MILITARY SPECIFICATION LEADS
1mtr RG58 Mil spec PL259 to PL259 lead **£4.95**
10mtr RG58 Mil spec PL259 to PL259 lead **£10.95**
30mtr RG58 Mil spec PL259 to PL259 lead **£24.95**
1mtr RG213 Mil spec PL259 to PL259 lead **£4.95**
10mtr RG213 Mil spec PL259 to PL259 lead **£14.95**
30mtr RG213 Mil spec PL259 to PL259 lead **£29.95**
(All other leads and lengths available, ie. BNC to N-type, etc. Please phone for details)

ZL SPECIALS LIMITED OFFER

2 mtr 5 ele ~~£39.95~~ .....now just **£30.00**
2 mtr 7 ele ~~£49.95~~ .....now just **£40.00**
2 mtr 12 ele ~~£74.95~~ .....now just **£65.00**
70cm 7 ele ~~£34.95~~ .....now just **£30.00**
70cm 12 ele ~~£49.95~~ .....now just **£40.00**

Kenwood Goes Into Orbit!

Kenwood Electronics UK have passed on a fascinating story about a TM-D700E's 'Journey into Space'. And of course we're pleased to assist its 'lift off' on the news pages!

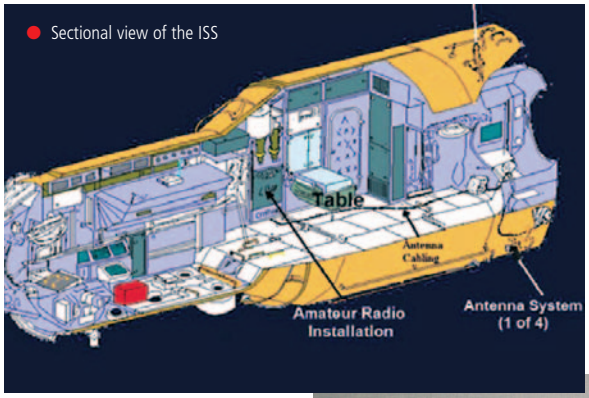
On 31 August 2003 a *Progress* supply craft launched by a *Soyuz* rocket docked with the International Space Station (ISS). This was the 12th unmanned flight scheduled to deliver cargo to the ISS and its 2.5-tonne load included a Kenwood TM-D700E transceiver.

A crew of three is working on the ISS and they will stay on board for three to four months and several have Amateur Radio Licences where they assist the **Amateur Radio on the International Space Station** (ARISS) program. The ARISS program is aimed at developing and operating Amateur Radio in space. Enthusiasts from the member countries - USA, Russia, Japan, Europe and Canada are already 'on the air' during their free time.

Amateur Radio operations on the ISS are divided into three categories and the callsigns used are **NA1SS** and **RS0ISS**.

School contacts: pre-scheduled communications are arranged so students can discover the fun of Amateur Radio. They'll also gain valuable experience in space development and communications technologies.

Applications to join in are received from schools around the World. They're then sorted, taking into account equipment, operating hours and the number of participants, the ISS orbital conditions, and the crew's work schedules.



Sectional view of the ISS

The ARISS Steering Committee then decides which schools can participate and on what days and times. These sessions are scheduled to take place during work shifts.

Incidentally, once on board, Astronauts are free to choose terrestrial stations they'd like to work. The ARISS Steering Committee then arranges a schedule. Additionally, in the same way as everyday Amateur communications, crew members operating in free time - communicate with stations responding to their "CQ" calls.

Kenwood Materials

In 2001 Kenwood Electronics UK received an enquiry from ARISS regarding the materials used in the components of the TM-D700. This is because Energia (the Russian space contractor) and NASA conduct strict checks for flight safety of all the materials, and safety features on the equipment to be brought onto the ISS.

For example...equipment relying on natural convection for cooling can't be used in zero gravity. The TM-D700 satisfied this basic condition, but its many other features helped it to make the 'short list' prepared by ARISS. Later, the TM-D700 was officially adopted for use on the ISS.

Kenwood donated a number of TM-700E units to support the training and orbital operations of the new ARISS radio system. One was on board the ISS, but a total of 15 other units are needed for training Astronauts and ARISS members deployed at various spaceflight centres in the USA and Russia.

Modifications Requested

Early in 2003 Kenwood were asked to modify the TM-D700. The idea was that its advanced features could then be easily controlled by Astronauts with very little previous experience of Amateur Radio.

Japanese-based Kenwood staff then met NASA colleagues at a Hotel close to the Kennedy Space Centre to discuss modifications. Expected to take hours, the meeting lasted all day! The Kenwood staff then returned to Japan, drew up specifications from the discussions and started to construct a prototype.

A final meeting between the American and Russian members in Houston took place in June. Japanese Kenwood staff attended with the prototype transceiver!

The meetings lasted a full three days. It was attended by Russian representatives (who could not speak English) and their interpreters were kept very busy!

One visitor to the meetings was an astronaut (and of course an ARISS member) **Frank Culbertson**. During the 1990s Frank twice rode on the Space Shuttle and was also on the ISS for a time during 2001.

Transceiver Launch

The modified transceiver was 'booked' on the supply vessel - due to be launched at the end of August and had to be submitted for cargo inspection process in July. So there was a rush to have it ready!

It was necessary to modify the nine transceivers for shipping to Russia, and the six units destined for the USA with only a short time to conduct final tests. Thanks to the smooth co-ordination between ARISS-Russia, ARISS-USA, Bermos (Kenwood's Russian distributors) and Kenwood, the flight certification was completed on time.

The TM-D700 used on the ISS is equipped with Velcro strips to secure it safely in zero gravity. Additionally, as a fire safety measure, ARISS uses specially made cables encased in protective fibreglass tubes and the TM-D700 external cables were replaced with these.


Smiles all round as everyone works hard to get a Kenwood TM-D700E into space

When it arrives on board the station, the Kenwood TM-D700 will be set up within the ISS's Russian Service Module. However, there'll be more tests and the transceiver is expected to start regular operation in late November.

So it won't be long before transmissions from the TM-D700 will enthrall students and Radio Amateurs - literally - around the entire World.

Makeover for 1960s Transistor Radio

Radio manufacturer's Bush have tapped into their archives to redesign the most famous radio of the 1960s.

The famous retro Bush TR130 transistor radio has been restyled to give it a contemporary retro look and designers have incorporated the latest DAB digital radio technology. Now called the TR2003DAB, this model has a pale grey, soft-touch rubberised finish with matching handle, making it easy to carry around. Its option of power from batteries or the mains supply adds to its versatility for use at home, outdoors or on holiday.

The restyled contemporary retro TR2003DAB radio.

The original 1966 TR130 model and specifications.

3-Band Portable

The best selling radio in Britain at its price. It covers three wavebands and the sound quality is superb. It comes in a choice of two different finishes.

TR130

Finish: Tan or black leathercloth.
Wavebands: Long, medium, bandspread.
Power Supply: PP9 or equivalent.
Speaker: 6″ × 4″ elliptical.
Output: 1 watt.
Controls: Push buttons for LW, MW, bandspread. Combined volume on/off, tuning, tone.
Sockets: Earpiece, external speaker, tape, car aerial.
Dimensions: Height 6½″, width 9 ⅜″, depth 3″.

The inclusion of DAB digital radio technology in the TR2003 gives the listener a wider choice of radio stations. An added benefit is that the DAB stations are automatically tuned and the scrolling text information means you can read on the display panel exactly what stations you can receive in your area.

The TR2003 also has an f.m. tuner and 10 DAB and 10 f.m. stations can be stored in the memory. Selling at £99.99 the radio is available now from many high street retailers.

Looking At...

The capture of a Radio Wave Part 1

Gordon King G4VFV starts looking at the capturing of radio waves.

The subject of this month's Looking At is written as a sequel to The Birth of a Radio Wave that appeared in the May 2003 issue. Its an inspiration stemmed from feedback from readers of various others of my writings, to whom I send my sincere thanks and good wishes. It's written in two parts.

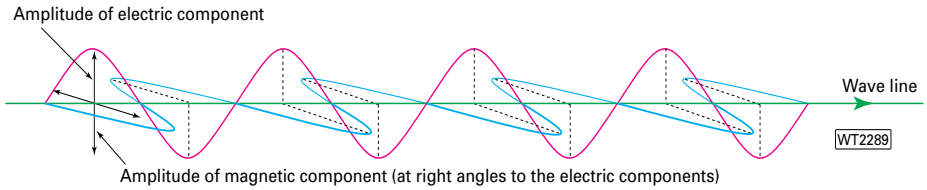
Part 1 recapulates on the radio wave itself, its nature, strength and basic propagation, while **Part 2** will look at how the wave is captured by the receiving antenna and how it's transformed into the signal voltage, which appears at the antenna input terminals of our receivers. Some formula manoeuvring has been necessary, but I've done my best to minimise the mathematics.

Although the electromagnetic (EM) wave spectrum includes waves extending from kilometres right down to small fractions of a micro-metre of the shortest wavelength cosmic-rays, radio waves occupy only a small part of the spectrum, having wavelengths from around 10 kilometres down to one millimetre. All EM waves obey the same physical laws and they all travel through free space at the same velocity.

Frequency & Wavelength

The frequency (f) or the wavelength (λ) of an EM wave can be found respectively by dividing the velocity (v) by the wavelength in metres or by the frequency in Hz, where the velocity in space is 300 million metres per second. The frequency spectrum of radio waves therefore extends from around 30kHz up to 300GHz.

Above 300GHz the radiation is generally expressed in wavelength rather than frequency. This includes the visible spectrum and ultraviolet



that marks the onset of ionising radiation, where the length of the wave reduces to a diminutive 100 nanometres (nm), which is a 10 millionth of a metre.

Although all EM waves follow the same fundamental laws, it's only in the radio spectrum where an antenna can be used to capture the energy of a wave to provide an electrical signal for radio reception (and in recent times to supply electrical power to the tourist village of Grand Bassin on the Island of La Reunion in the Southern Indian Ocean ***1**).

Electromagnetic waves comprise two forces or fields - electric and magnetic, equivalents being the electrostatic force which exists between the plates of a charged capacitor and the magnetic force encircling an energised inductor or solenoid.

Because the electric (E) and magnetic (H) fields are co-existing, radio waves need no supporting capacitor or inductor. Close to the transmitting antenna the two fields are in phase opposition, but after a short distance they become phase coincident and go on their way as a self-supporting radio wave.

Basic Propagation

Radio waves travel along straight lines, but with decreasing wavelength they become more prone to diffraction, refraction and obstruction, leading to bending, reflections and shadowing. The Earth's lower atmosphere, known as the troposphere, also has a refractive or bending influence on waves of very short wavelength. This allows the waves to travel a little over the optical horizon (depending on the prevailing refractive index), a happening that's marginally enhanced by diffraction of the waves around the curved Earth.

Ground-reflected waves, though, tend partially to cancel the direct wave, so that the distant field strength will be less than that calculated for the direct wave in empty space. This is a primary characteristic of very-high and ultra-high frequency propagation.

In the ionosphere, some 50-500 kilometres above the Earth's surface, longer wavelength waves are refracted and turned back to Earth over quite substantial distances, while waves of much shorter wavelengths penetrate the ionised layers and continue their journey into outer space. This is just as well when you come to think about it, otherwise there would be a dark, cold Earth and no such thing as space communication!

Polarisation

The E and H fields travel at right-angles to each other and at right-angles to the direction of travel, as shown at (a) and (b) in **Fig. 1**, with the plane of polarisation corresponding to the direction of the vector of the E field. To capture as much of the radio wave as possible it is necessary for the orientation of the receiving antenna to correspond to the polarisation of the wave.

The E field is measured in volts per metre (V/m), the H field in amperes per metre (A/m), and the power flux density (the power carried by the wave) in watts per square metre (W/m^2), while the characteristic impedance (Z) of the medium through which a wave is travelling is equal to E/H. This has a free-space value of 337Ω (Ohms), which means that the power flux density of a wave flowing through a unit area of space is given by

$$P_d = \frac{E^2}{377} \quad (W/m^2)$$

Isotropic Source

Waves radiated from a point source into empty space spread out spherically with diminishing intensity, as shown in **Fig. 2**. This is known as an isotropic source because the radiation is identical in all directions, such that at any radial distance r the power flux density is equal to ,

$$P_d = \frac{W}{4\pi r^2} \quad (W/m^2)$$

where W is the power of the radiation in watts. By relating this equation to ,

$$P_d = \frac{E^2}{377} \quad (W/m^2)$$

we obtain the basic field strength equation, which is:

$$E = \sqrt{\left(\frac{377}{4\pi}\right)}\left(\sqrt{\frac{W}{r}}\right) \quad (V/m)$$

Although no antenna is able to radiate equally in all directions, the isotropic concept is useful as a power gain reference for practical antennas. The power gain of a half-wave dipole in its maximum direction, for example, exceeds that of an isotropic antenna by 1.635 times (or 2.13dB).

The reason for this is rather like a squeezed spherical rubber balloon in which the air inside remains constant while the dimensions diminish in one plane and elongate in another! The power gain of an antenna can therefore be expressed as relative either to an isotropic source (dBi) or to a dipole (dBd).

By taking the power gain of a dipole into account, and changing the r to d, the field strength formula neatly reduces to:
where W is the power in watts fed to the

$$E = \frac{7\sqrt{WG}}{d} \quad (V/m)$$

antenna, G the power gain of the antenna in a particular direction relative to a half-wave dipole (as an arithmetic ratio, not dB), and E the field strength in V/m at distance d from the antenna in metres. The product WxG corresponds to the equivalent radiated power (ERP).

Each time the distance is doubled the field strength halves and the power flux density falls

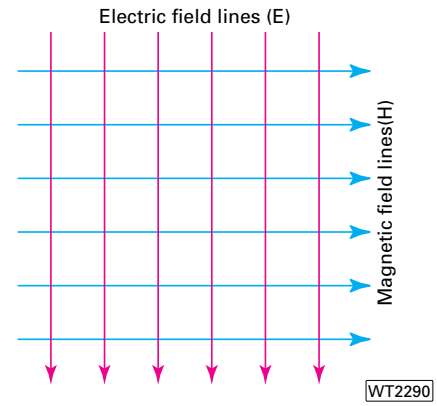


Fig. 1: (a) Once in the far field, the electric field (E) and the magnetic field (H) of a radio wave keep in phase while travelling at right angles to each other and at right angles to the direction of wave travel at a velocity of 300 metres per millionth of a second. (b) Elementary impression of a wave front approaching an observer. Since the polarisation corresponds to the vector of the electric field, the wave illustrated is shown to be vertically polarised.

by four times (the law of inverse squares), but because this formula relates to the direct wave in empty space, the field strength at the receiving location is likely to be significantly different owing to the influences of propagation and the local environment.

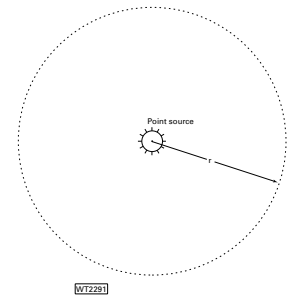


Fig. 2: From an isotropic source radio waves travel outwards spherically in empty space, progressively losing energy as they go.

Well, that just about uses up my canvas for this month, but the story of the capture of a radio wave will unfold completely in Part 2. Until then keep the power gain of the antenna high and the ears tuned for signs of troposphere enhancement!

*** Reference 1:** Microwaves to Power Tourist Village, *The IEE Review* June 2003, p19

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DB-7900	2m/70cm (5.5 - 7.2dB) 1.6m PL-259	£39.95
PL-62M	6m + 2m (1.4m) PL-259	£19.99
PLT-20	20m mobile whip (56" long)	£24.95
PLT-40	40m mobile whip (64" long)	£24.95
PLT-80	80m mobile whip (64" long)	£24.95
PLT-259	PL-259 converter for above	£5.95

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P&P £10.00

X-30 GF	144/70, 3/6dB (1.1m) glassfibre	£39.95
X-50 GF	144/70, 4.5/7.2dB (1.7m) glassfibre	£54.95
X-300 GF	144/70,6.5/9dB (3m) glassfibre	£69.95
X-500 GF	144/70, 8.5/11dB (5.4m) glassfibre	£149.95
X-627 GF	50/144/70, 2.15/6.2/8.4dBi (2.4m)	£69.95

Q-TEK YAGIS

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2m	5ele (boom 63"/10.5dBd)	£49.95
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2m	11ele (boom 156"/13.5dBd)	£94.95
2m	5ele crossed (boom 64"/10.5dBd)	£79.95
2m	8ele crossed (boom 126"/13dBd)	£99.95
4m	3ele (boom 45"/8.5dBd)	£56.95
4m	5ele (boom 128"/11.5dBd)	£69.95
6m	3ele (boom 72"/8.5dBd)	£59.95
6m	5ele (boom 142"/11.5dBd)	£79.95
70cm	13ele (boom 76"/14.9dBd)	£46.95
70cm	13ele crossed (boom 83"/14.9dBd)	£79.95

NEW 80-10M TRAP DIPOLE KIT

Covers 80-10m (1Kw PEP) 102ft long (34m).

Complete kit (requires feeder) £69.95 del £7.50

DELUXE G5RV

P&P on either full/half size £6.50

Multi-stranded heavy duty flexweave wire. All parts replaceable. Stainless steel and galvanised fittings.

Double size - 200ft (160-10m) £84.95

Full size - 102ft (80-10m) £42.95

Half size 51ft. (40-10m) £36.95

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STANDARD G5RV

Full size	102ft (now includes heavy duty 300Ω ribbon)	£28.95 P&P £6
Half size	51ft (now includes heavy duty 300Ω ribbon)	£24.95 P&P £6

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80mtr inductors + wire to convert ½ size G5RV into full size. (Adds 8ft either end) £24.95 P&P £2.50 (a pair)

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Open wire	£5.99
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5m length	£5.00 P&P £3.00
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1.1 Balun				£25.00 P&P £2
4.1 Balun				£25.00 P&P £2
6.1 Balun				£25.00 P&P £2
40 mtrs	Traps	1Kw Handling	(a pair)	£25.00 P&P £4
80 mtrs	Traps	1Kw Handling	(a pair)	£25.00 P&P £4
10 mtrs	Traps	1Kw Handling	(a pair)	£25.00 P&P £4
15 mtrs	Traps	1Kw Handling	(a pair)	£25.00 P&P £4
20 mtrs	Traps	1Kw Handling	(a pair)	£25.00 P&P £4
5.35MHz	Traps			£25.00 (a pair)

CUSHCRAFT BARGAINS

MA5V	New vertical 10, 12, 15, 17, 20m	~~£229.95~~	£215.00
MA5B	Mini beam 10, 12, 15, 17, 20m	~~£349.00~~	£299.95
A3S	3 ele beam 10, 15, 20m	SPECIAL ~~£499.95~~	£349.00
A4S	4 ele beam (10-20m)	SPECIAL ~~£599.95~~	£429.00
R-6000	Vertical 6, 10, 12, 15, 17, 20m	~~£349.95~~	£315.95
R-8E	Vertical (40-10m) "special"	~~£499.95~~	£399.00
X-7	7 ele 10, 15, 20m	SPECIAL ~~£699.00~~	£529.95

CAROLINA WINDOM

CW-160S	(160-10m) 40m long	£139.00 P&P £8.50
CW-160	(160-10m) 80m long	£134.95 P&P £8.50
CW-80	(80-10m) 40m long	£99.95 P&P £8.50
CW-80S	(80-10m) 20m long	£119.95 P&P £8.50
CW-40	(40-10m) 20m long	£94.95 P&P £8.50

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COAX BARGAINS

Genuine high quality coax

MILITARY SPEC

RG-213 Mil spec x 100m.

ONLY **£69.95** P&P £10

RG-58 Mil spec x 100m.

ONLY **£35.00** P&P £10.00

Coax stripping tool (for RG-58) £4.50

SP-350 STATIC PROTECTOR

Designed to reduce static build-up during electrical storms. (Gas discharge fuse is replaceable). DC-500MHz (SO-239 sockets). PWR up to 400W.

£24.95 P&P £2.50

LOW LOSS PATCH LEADS

£2.50 P&P

Connectors	Length	Price
PL-259 - PL-259	0.6m	£5.99
PL-259 - PL-259	4m	£9.99
BNC - BNC	1m	£6.99
BNC - BNC	5m	£10.00

COPPER ANTENNA WIRE ETC

Enamelled (50m roll)	£12.95 P&P £5
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Multi-Stranded (Grey PVC) (50m roll)	£11.95 P&P £5
Flexweave (H/duty 50 mtrs)	£30.00 P&P £5
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'Smallest version to date' now with cigar socket.

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2 year Icom warranty

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LATEST UK VERSION

The ultimate HF excitement in a small package. HF + 6m + 2m + 70cm

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Optional case £20.00
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hf specials

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100W HF + 6m transceiver. RRP £699.99

LATEST UK VERSION

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Optional extended receive available which includes AM airband

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Rx:- 0.5-999MHz.
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'BEST VALUE HANDIE 2003'

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ALINCO DJ-596

2m + 70cm Handie. Includes: (NIMH) Battery/Charger. High + narrow switchable. High power (4.5W) OP as standard. Alpha Numeric channeling.

SUPERB VALUE

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Extra heavy duty rotator for large HF beams, etc. Supplied with circular display control box and 25mtr of rotator cable.

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(with up/down). Many amateurs using this mic (over 4000) have expressed extreme pleasure with it's performance. Includes 8-pin round Yaesu mic lead.

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I-08 8 pin "Icom" round.....£9.95
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HF digital SWR analyser + 1.8-170MHz counter/resistance meter.

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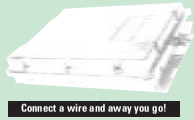
SGC-230



200W instant auto ATU. Tune any length of wire with this superb ATU. (Minimum length applies.)

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SGC-237 HF+6m Tuner.....£289.95
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New SCG MAC-200.....our price £319.95

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The ultimate short wave receiver with DSP - for the real perfectionist.

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Send SAE for review

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OUR BEST SELLING LOW PRICED RECEIVER

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desktop - scanners - handhelds

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IC-R8500 + SP-21 + voice synth.....£1189.95

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Optional DSP (audio filter) £79.99
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Includes power supply.

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Software 780XLT £34.99

Alinco DJ-X2000 .....£419.00
Alinco DJ-X10 .....£269.95
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AOR AR8200 MkIII £379.00
Bearcat UBC-280XLT £139.99
Icom IC-R5 .....£149.99
Icom IC-R3 .....£299.00
Yaesu VR-500 .....£199.00
Yupiteru MVT-9000 MkII.....£325.00
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OUR PRICE **£149.95**

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RRP £49.99.

OUR PRICE **£19.95** P&P £4.50

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ALKALINE STARTER KIT

Starter kit includes charger & 4 x AA cells.

Was £12.99 **£6.99**

+ £3.00 P&P.

Please note that only the special cells can be recharged with this charger.

Extra cells available @
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£1 P&P. 4 x AA pack £5.99 £1 P&P. 4 x AAA £6.25 £1 P&P. Rechargeable Alkaline. No memory effects. 1.5V cells. 3 x capacity of nicads.

KENWOOD HS-5

Superb padded professional communications headphones. Designed specifically for SWL. 1/4" jack.

PRICE **£56.99** Del £5.00

KENWOOD HS-6

A professional lightweight pair of dedicated short wave listening headphones. 1/4" and 3.5mm jack.

PRICE **£36.99** Del £5.00

Radio Basics

This month Rob Mannion G3XFD provides the first long-promised article on making and using headphones. Rob also has an important announcement regarding the proposed Radio Basics 70MHz

The 70MHz Converter & Kits

Readers who regular follow the Radio Basics (RB) column will be aware that I've gradually been introducing a v.h.f. theme in recent months. The choice of band - 70MHz - for the proposed 'down' converter project reflected my own interest in 4 metres. The choice of this low v.h.f. band was also made because the techniques required are relatively easy and ready-to-go (other than surplus p.m.r. equipment) is not that easy to find.

The idea of the 70MHz converter was to provide RB readers with an item of equipment they could build easily, would be cheap on the pocket and also be easier to get than a commercial ready-to-go unit. However, because of a radical change of circumstances - the appointment of a new specialist author - I'm willingly handing over the project to him. (For full information on the new author - **G4CFY** - I ask you to see Keylines and Topical Talk this month).

The 70MHz converter will now appear later in 2004, hopefully in the Spring. However, for those of you who enjoy the 'keep it simple' themed approach of RB I'm pleased to assure you that the other simple v.h.f. projects I've promised - are on their way!

Full kit: However, the most important change (in my opinion) is the fact that a full kit for the 70MHz project will be available to readers direct from the author. This in itself is literally a dream come true for me because for a number of years I've been striving to encourage readers to 'have a go' at home-brewing for themselves, while at the same time knowing just how difficult it is to get specialised components.

The circuit-with-kit idea first began in *PW* (it was common practice in the 1930s) many years ago and helped many a constructor to start in the hobby. The last major articles, which had kits to accompany them were the *Rugby* and *Daventry* h.f. projects from Howe's kits.

The re-introduction of the projects with kits available idea started again recently when we featured the interesting Tiny Tim (3.5MHZ s.s.b. transceiver and the Sidcot 3.5MHz transceiver project from **Tim Walford G3PCJ**. (Tim will be publishing other especially commissioned projects later in 2004).

The introduction of articles/projects written by authors who can also provide 'kits and bits' is, as I see it, the way forward. I say this because regretfully, the specialised designer/kit and project supplier is becoming very rare find nowadays and by supporting each other we can produce the ideas you want to see, read and build.

It's my intention to encourage and promote the publishing of articles and projects, which are also accompanied by a suitable kit. With the fast disappearing kit specialist vanishing over the horizon, we need to work together if we are to publish anything other than really simple projects.

However, if you're an intending author - please don't be put off considering offering a project to *PW* because you can't offer 'kits and bits'. We're still interested in any project or article, which will appeal to our readers. And of course, it goes without saying - if your club has conceived/built/or organised a project...it may well be suitable for *PW* readers too! Additionally, although the setting up, organising, sorting out and 'bagging up' of kits and bits may be beyond the individual - it's certainly possible for a group of club members to seriously consider. So, what about it, have you **got** any ideas? Antenna projects? Test equipment circuits? If you have - let me know. You could become part of the renaissance of Amateur Radio home-brewing through *PW* - to everyone's benefit!

G3XFD

Welcome to this month's Radio Basics where I'm pleased this time to be returning to the subject of home-brewing headphones and associated circuitry. And in doing so, I have to admit that there must be a lot of appeal in this subject because readers often write into me. The result has been some fascinating correspondence!

Owning a good pair of headphones was always exceptionally important to me as a young lad. In those days (fade in sorrowful violin music) I just didn't have the pocket money for a really good pair of high impedance (Z) headphones. Instead I often spent my money on the single dynamic earphone units, which were then available for around 12.5p - 'Half a crown' to people of a certain age!

The single earphone insets - in Bakelite casings - were superbly made. They were also extremely sensitive and found many uses. One regular advertiser in *PW* during the late 1950s and 1960s used to market them as miniature loudspeakers to accompany their kits!

Often working on the balanced armature principle the inserts used a corrugated (aluminium or very thin, flexible brass) as the diaphragm. Made for use during the Second World War they were exceptionally sturdy and many are still in use today. Interestingly, the dynamic inserts were the precursors of the dynamic microphone inserts used on public address systems today.

When used in headphones, the inserts often carried the marking 'DLR - which stood for 'Dynamic Low Resistance'. Very often, this form of headphone was of the type which could be worn under a steel helmet- with a cloth strap going over the head and a spring steel wire behind the user's head. (I don't know about other users but I can say I always found them very comfortable).

Unfortunately for me, the only way I could find to mount the single headphone was to use a wire coat hanger. The wire was bent to shape and to fit over my head as best as I could, with the two ends bent at right angles.

The two stub ends (bent at 90°) with approximately a quarter of an inch of stub, fitted conveniently into the holes which were meant originally for the clips attached to the cloth strip for use under the helmet. Although I now realise that such a crude system (I never thought of padding the wire framework) must have been

extremely uncomfortable, they were often worn for very long periods. I must have been tougher in those days!

Buy On Sight!

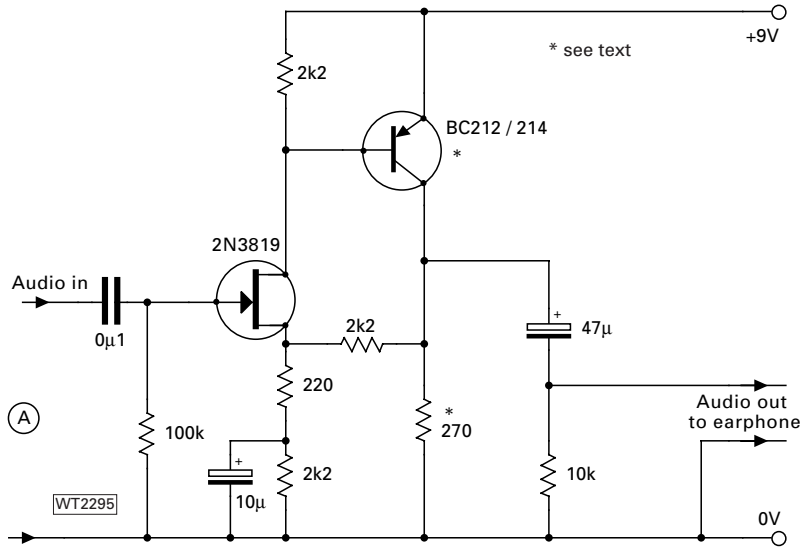
The DLR type of headphones still turns up at rallies – sometimes as complete sets of headphones or as single earpieces. My advice is that if you see them on offer - don't hesitate – buy them!

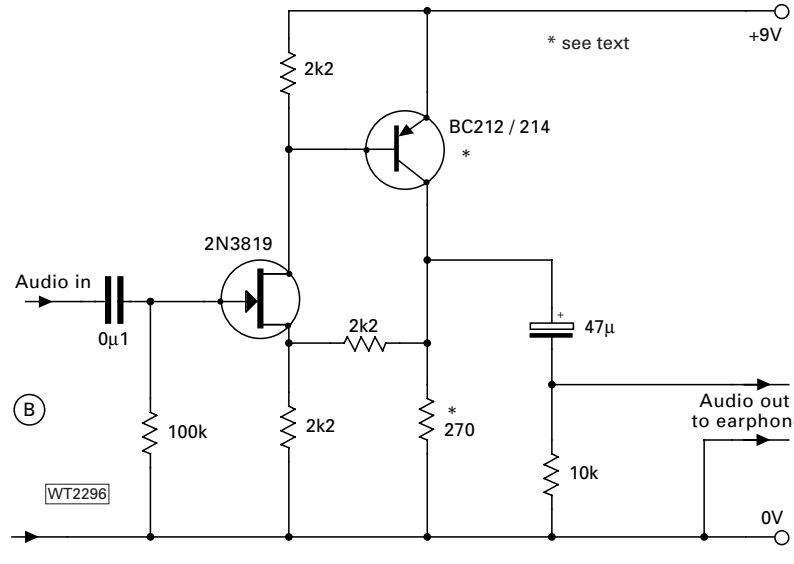
You'll be able to use the DLR insert as a small loudspeaker, headphone insert or microphone. In fact, my grandchildren are fascinated when I connect a DLR insert to my oscilloscope and show them their 'voiceprint' waveforms on the instrument.

Another trick of course is to link two DLR headphones with a pair of wires to make an electronic version of the taut-string-and-tin-can telephones. The difference will be that our electronic version will go round corners!

Additionally, for the teaching and instructive natures that seem to be latent in most Radio Amateurs using the DLR inserts in this way helps you explain how a transducer works; speech into electrical signals as you speak into the insert, and at the other end electrical currents (developed by the voice at the other end) into mechanical vibrations, producing acoustic pulses. In other words turning the signal back into speech.

I've seen many youngsters led into an abiding interest in electronics by using these simple telephones. In fact at the **Clayesmore School Radio Society**, Near Blandford Forum in Dorset (we had the callsign **G0RSC** – **G0 R**adio **S**ociety **C**layesmore) member's enthusiasm got me into trouble! Such was the enthusiasm of the boys (and girls) in setting up telephone systems - wires were strewn everywhere between dormitories and school houses. They even arranged a simple 'telephone exchange' between dormitories by acoustically coupling headphone units. Ten years later – several of the youngsters now work in electronics and at least one in the telecommunications industry!





● Simple circuit providing a high impedance input and a low impedance output. A small amount of gain is achieved, with circuit A providing the best results. Both circuits will permit the use of modern moving coil headphones, along with the popular surplus dynamic low resistance (DLR) types where higher sensitivity is required (see text).

Modern Alternatives

Nowadays there are many modern alternatives to the older DLR and high impedance traditional headphones. In proportion to the original costs when I was a schoolboy they're also very cheap indeed.

Reasonably priced headphones can be purchased from as cheap as £8 or so right up to £50 where the luxury end of the market is reached. A far cry from my 12.5p earpiece and coat hanger arrangement! However, they come with a built-in disadvantage!

Modern 'headphones' are – almost without exception nothing other than miniature moving coil loudspeakers mounted in a convenient mounting for the head. As such they're nowhere near as sensitive as traditional high impedance metal diaphragm headphones, or the DLR types.

The lack of sensitivity means that although you may well be receiving a broadcast station on a crystal set on modern headphones – the resultant audio voltage may be less than 2mV from a local medium wave station. Sensitive older headphones will reproduce a signal level such as this but the modern 'head mounted min-loudspeaker' system (almost invariably provided with a 3.5mm 'stereo' jack plug) is looking for milliwatts of power rather than millivolts or microvolts!

Fortunately, thanks to the help of the circuits in **Fig. 1**, modern 'stereo' headphones can be used very successfully. **Tex Swann G1TEX/M3NGS** and I discussed what was required and after a few minutes at his desk he came up with the circuits shown. Both provide a little gain, match high impedance to low impedance and use cheap semiconductors.

Circuit A provides more gain and slightly better audio quality. Both designs are viable though, and will enable you to use the modern headphones in place of traditional high impedance types. All you'll need to do is to either remove the three contact (tip common, with the two sleeve contacts providing left and right earphone connections) jack plug and connect a 'shorting' wire between the left and right earphone connections. This effectively places the small loudspeakers into parallel.

Have fun! Next time I'll be describing how you can use the amplifier when we make our own home-brewed headphones. In the meantime I wish you all a very happy Christmas and New Year!

PW

The Yaesu VX-2E Dual-Band Hand-Held Transceiver

Our keen reviewer John Goodall G0SKR has been thoroughly enjoying himself again. This time our busy friend has been trying out the Yaesu VX-2E hand-held!

Close-up front view of the Yaesu VX-2E, showing the large l.c.d. main panel and the prominent easy-to-use main rotary encoder (see text).

A hand-held transceiver is exactly what it says; a hand-held two-way radio and this takes me back a bit! Do you remember the old fashioned talking bricks? They were huge devices that with two hands you could just about manage to hold, as long as you had the muscles of Charles Atlas or some other muscle bound weight lifter!

Carrying the older, larger transceiver in your pocket was totally out of the question. A suitcase on wheels would have been more appropriate. However, the new Yaesu VX-2E falls into another completely different category of hand-held device. It must be good, if only I could find the thing (it's that small!).

Opening the now standard Yaesu re-cyclable cardboard box reveals a well written manual, along with loads of brown cardboard packing. Aha! The rig itself must be in the white cardboard box enclosed therein. No, fooled again, that's the mains charger!

Now where oh where can it be? – a song springs to mind at this point. Ooooh there it is – doing an impression of a small plastic bag! No, fooled again, that's only the Lithium-ion battery pack.

I was beginning to think Yaesu had forgotten to include in this box the all-important bit with the knobs and buttons on. Then suddenly I found it lurking underneath a bit of packing. Hey come on you guys, this has to be some kind of 'demo' item, it weighs next to nothing and really can't do what it claims to do! But (Goodall ...Oh ye of little faith) was wrong and to find out why read on!

Little Monster!

The VX-2 is a huge 'little' monster, measuring 81 x 48 x 23mm (HWD). The rotary encoder and volume controls protrude a massive 17mm above that.

The dual-band flexible antenna is 110mm in length and has an SMA connection to the radio. The complete unit weighs in at less than a mug of tea, in fact 130gm!

The weight I've mentioned is with a fully charged Lithium Ion Battery. The fully charged version being heavier than its discharged version because it is full of electrical power! Everyone agree? Anyway, the battery is a Lithium Ion 1Ah capacity at 3.7V d.c. Not really heavier, but it sounds impressive doesn't it?

The VX-2E has wide band coverage for receive, 500kHz to 999MHz, and is capable of transmitting on 144–146MHz and 430–440MHz. On 144–145MHz the unit has a maximum power of 1.5W, and 1W on 430 – 440MHz, when operating from its own Lithium Ion internal battery.

Power output can be increased to 3W on v.h.f. and 2W on u.h.f. when connected to an external 6V d.c. supply. It's also packed with extra very useful goodies which I'll describe later.

Liquid Crystal Display

The radio itself has a large liquid crystal display (l.c.d.) panel on the front, this being around 30 x 27mm. Also found on the front of the radio, below the l.c.d. and alongside the front facing speaker grill, are the seven main operating buttons.

Above the l.c.d. is the **Transmit/Receive** indicating light emitting diode (l.e.d.). This shows red for both transmit and also when charging from the external power supply. Green is displayed during receive and also when fully charged and when connected to the external power supply. The **Push-to-Talk** (p.t.t.), **Tone** and **Power** buttons are found on the left-hand side edge, whereas the d.c. charging input is on the right-hand side.

On the upper edge of the unit

With the help of our 'little people' we've provided an indication of the size of the small but impressive Yaesu VX-2E hand-held transceiver. John G0SKR was most impressed with what he called the 'Mighty Little Beast'!

are located the rotary encoder, volume control, SMA connector for antenna and the four conductor socket for speaker/microphone connection.

Switching the VX-2E on is a simple matter of holding the orange **Power** button on the left hand edge of the unit. As the unit powers up, it gives a pleasant two tone bleep. Next the screen displays the battery voltage briefly before displaying the mode, band, memory number (if in memory mode), power setting and frequency in use.

Directly below the l.c.d. screen are located the three most often used buttons These are (left) **Band**, centre **H/L** and to the right **V/M**. To the left of the speaker grill are another three buttons; **FW**, **Function** and **Memory Write** button; **HM/RV** (**Home** and **Reverse**) button; the lower button operates the **Internet Wires**™ function (not reviewed). To the right of the speaker grill can be found a single button marked **MD**. This is simply used for mode switching.

Band Coverage

The **Band** button, when it's in **VFO** mode, toggles through the various coverage ranges. There are 11 such bands being available. They're numbered 1–9 and A & B.

Band 1 covers broadcast m.w. coverage up to 1.8MHz; **Band 2** covers the h.f. bands up to 30MHz. **Band 3** covers up to 88MHz, including 6m 50MHz receive.

Band 4 covers broadcast

reception on 88–108MHz. **Band 5** covers Airband reception 108–137MHz; **Band 6** covers the 144MHz Amateur band with receive from 137–174MHz.

Band 7 covers 174–222 MHz; Band 8 covers 222–420MHz and **Band 9** covers the 430MHz

With the battery pack removed the VX-2E's robust diecast chassis/heat sink can` be seen.

Amateur band and receive from 420–470MHz. **Band A** covers u.h.f. TV reception from 470–800MHz; and finally Band B covers the so called 'Active Band 2', from 800–999MHz, probably called so because I found difficulty finding **any activity** between these frequencies! Still, what an impressive reception coverage this little monster is really capable of.

The VX-2E has no less than 48 menus in the easy to access **Set Mode**. These cover from Auto Power Off to WX (Weather) alert mode, which isn't available in the UK. All the menus available are itemised in the very easy to read manual supplied with the review model.

Now let's look at a few of the more regularly used items; **Set Mode** is accessed by pressing and holding for one second, the **H/L** button (under the l.c.d. screen).

Note: Once accessed, the menus can be scrolled through, by simply turning the encoder knob. The encoder is the larger of the two knobs on the upper edge of the radio.

The first menu I accessed was **No.7**, that being simply called **Beep**. With the item needed to be changed displayed on the l.c.d. screen, simply giving the H/L a short press accesses the available options. In the case of Beep – simply turning the encoder gives the options – **On** or **Off**.

It was very quickly set to **Off** for no other reason than to save it from being thrown up the garden path by my tolerant (licensed) wife! With another short press of the H/L button the new setting was saved.

On The Air

Having listened around the various bands the VX-2E could listen to, I was now ready to start and operate the beast in earnest. First thing I had to do was to program the memories with useful Amateur frequencies.

Although in effect a miniaturised transceiver, all the VX-2E's controls are conveniently positioned. The SMA antenna connector is seen (far left) with the main push-to-talk (p.t.t.) control immediately to its right (see text).

The VX-2E has a whole library full of memory space available; 900 standard memories; 100 frequency skip memories; 11 **Home** channel memories, one for each band; 50 sets of band edge or **Programmable Memory Scan** memories; 20 **Memory Banks** capable of being programmed each with up to 100 memories.

First I selected Band 6, giving access to 144–146MHz and using the encoder, simply turning to the first frequency I wished to enter into one of the memories. It was at this point that I noticed the offset for UK repeaters on both v.h.f. and u.h.f. was already programmed into the VX-2E.

(Very useful when programming memories, saves you having to remember to put in the shift and which way – plus or minus. I've found that many Amateurs get this wrong when setting up their own equipment).

Having set the frequency on the display, pressing and holding the **FW** control**,** selects the memory write mode, displaying on the screen the next available blank memory, and by simply momentarily pressing this FW button again, the frequency is stored into the designated memory. It took me less than three minutes to store all frequencies, 144–146MHz and 430–440MHz for both simplex and repeater operation.

One interesting listening band of frequencies for both Amateur and listener is that of the Marine Band. Here, the VX-2E has a unique little feature that lists all 281 frequencies used on v.h.f. Marine Band.

A short press of the FW button followed by the **Internet Wires™** key, allows the operator to then toggle between **Radio**, **WX CH** (**Weather Channel**) and **Marine**, by single presses of the **Band** button. The pre-programmed radio channels cover 89 set frequency slots from **VOA** (Voice of America) to Radio Australia.

The **WX CH** covers 10 frequency slots for weather transmissions (not available in the UK). The **Marine** selector has 281 pre-programmed frequencies from Channel 00 on 156 to channel 281 on 155MHz.

Excellent & Versatile

The VX-2E is a mighty little beast that these few paragraphs cannot do fair justice providing, as it does, an excellent versatile hand-held. It also has unbelievably wide band reception, a very reasonable power output from its own battery pack, and at a price of £199, a bargain I feel even I could afford.

Small it is indeed but size isn't everything. Anyway, I would like to thank Yaesu UK for the loan of the review model - and so if I could find which pocket I have put it in – I'll return it!

PW

Product

The Yaesu VX-2E

Company

Yaesu UK Ltd

Contact

Tel: (01962) 866667

Pros

Pros: The VX-2E is a mighty little beast that these few paragraphs cannot do fair justice providing, as it does, an excellent versatile hand-held.

Cons

Cons: You might lose it in your briefcase!

Price

£199 r.r.p.

Summary

The VX-2E also has unbelievably wide-band reception, a very reasonable power output from its own battery pack. And at a price of £199, a bargain I feel even I could afford!

Thanks

My thanks go to **Yaesu UK Ltd., Unit 12, Sun Valley Business Park, Winnal Close, Winchester, Hampshire SO23 0LB**.

Software Information
There is some excellent software available on the internet at **www.http://www.qsl.net/kc8unj/VX2R.html** that makes managing the memories real easy!

The Reference Loop

Martti Nissinen OH4NV from Finland, decided that he and his friends needed a comparison antenna for use in their experiments. So, the Reference Loop for DX was created!

Some years ago when a VK friend and I were experimenting intensively with small antennas, it became clear to us, that for more accurate comparisons, we need a fixed reference antenna. The horizontal length of such reference antenna should be somewhere between full size (λ/2) and really short (λ/20). Study of the antenna books showed that a loop having horizontal side length of around λ/8 could be an optimum compromise between radiation resistance (R_r) and size.

After many prototypes, the non resonant loop described here was 'born'. This loop has been a very good reference antenna for a number of experimental small antennas we've built. Also, I have enjoyed its exceptional performance as a DX antenna. So, should you not have room for full size dipoles, beams or big antennas, or if you just enjoy building wire systems, then try this non-resonant loop.

Many of the properties of this simple loop will surprise you and the design should cost almost nothing to build. To make adjustments, you need nothing more than your rig and a little r.f. output power from it.

Loop Dimensions

The illustration shown in **Fig. 1**, shows the dimensions of the loop for the 14MHz (20m) band. The horizontal sides are 2.66m long and the vertical sides 6.5m. Total circumference is 18.32m, which is less than one wavelength (21.3m) at the design frequency (14MHz) so the loop is non-resonant.

Dimensions for the loop are not critical so, you could easily make the sides somewhat shorter, or longer, but for now try to keep to the dimensions shown. The upper horizontal part of the antenna is made from three wires in parallel. These three wires minimise the ohmic resistance at the centre of the upper horizontal element of the loop (the current maximum) so, reducing losses at this point.

The upper horizontal element and the top four metres down each of the vertical sides, form a full half-wave long dipole. This layout has the advantage that the high impedance (or high voltage) points are well separated from the supporting parts of the loop. This separation of support and high voltage point, minimises both losses and any detuning effect that there may be on rainy days.

The lower part of the loop (2.66m + 2×2.5m) remains shorter than λ/2, making the feed terminals impedance (Z_a) reactive - it's actually capacitive reactance. Also, the resistive component of this impedance is comparatively high, which means that the lower element carries less current than the upper element. The voltage levels present on the lower section are rather higher to compensate though.

The direction of the r.f. currents (flowing in the lower limb), although smaller than the upper limb currents, flow in the same direction as those in the upper part. As it's the r.f. current flowing that generates the outgoing radiation, the lower horizontal element has lesser role in the radiation from the loop. Because of this reduced effect, we may leave the lower element at a low level without a great detrimental effect to the loop's overall radiation pattern.

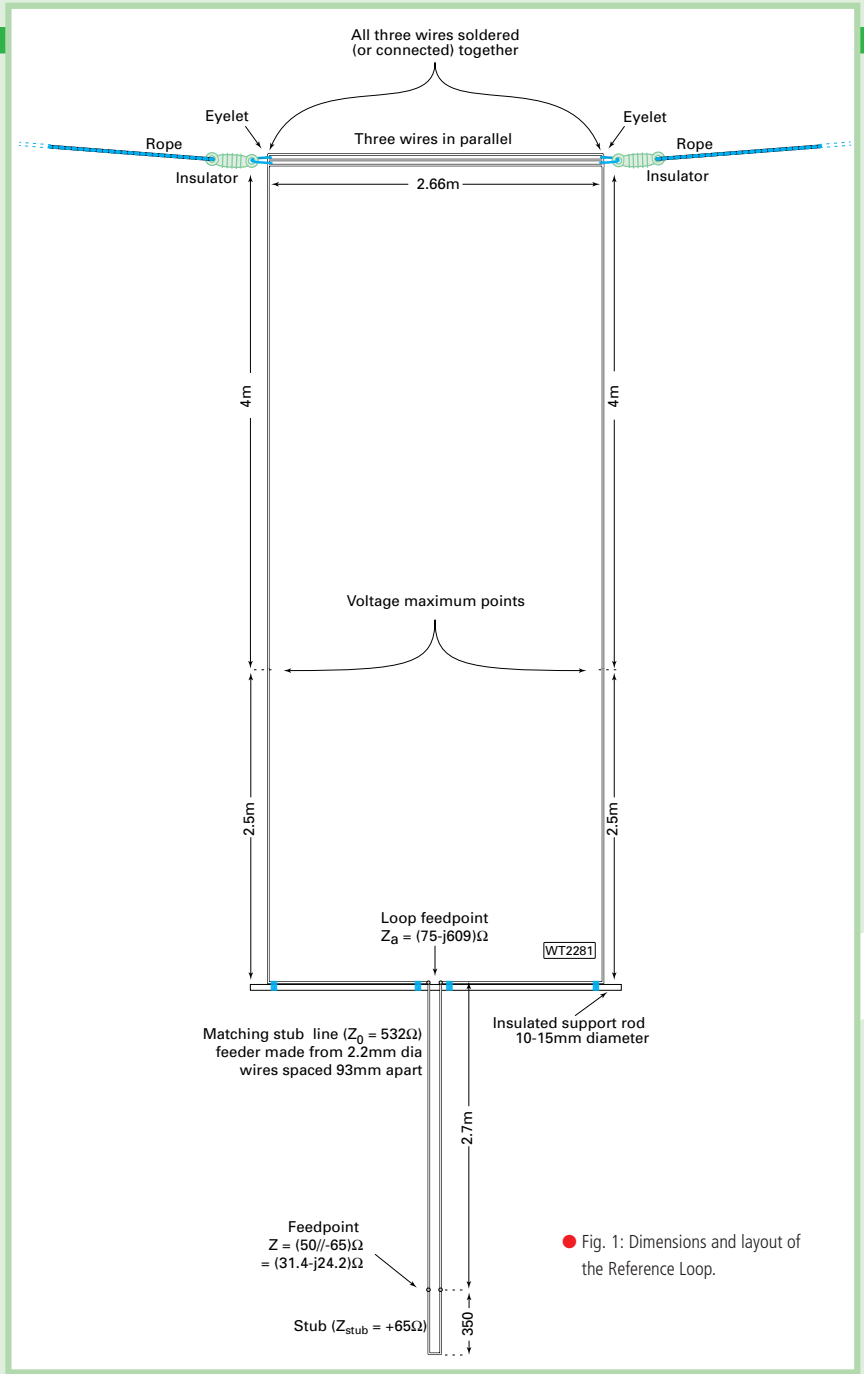
It's interesting to see that the upper four metre sections of the vertical sides act as 180° out of phase λ/8 spaced radiators. In practice, this property makes this kind of loop a very interesting DX antenna. The radiation pattern of this loop has both horizontally and vertically polarised radiation lobes. This combination of polarisation could be useful under some DX propagation conditions.

Quick Summary

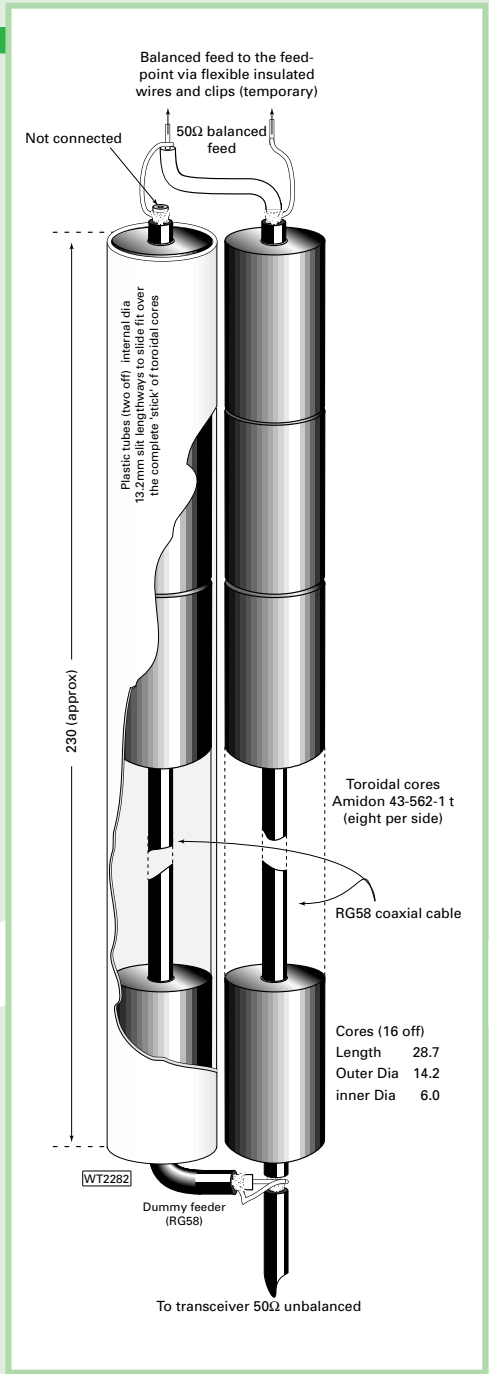
To quickly summarise the form design of this loop, you will see that it consists of one short horizontal element and two phased short vertical elements in series. The main radiating part of the loop is like an inverted U. The lower part of the loop acts as a wide spaced feeder. Yes, I know, the lower part isn't just a feeder - in that it also radiates. But as can be shown, it's radiation capability is well below the upper part's capability.

Now we've completed the form analysis of the Reference Loop! At this point, you may have started to consider building your own. I'm sure that you'll appreciate its simple non resonant design, physically small horizontal size and easy erection possibilities. I can also assure you that it'll work, I know this since I've found that most loops work well. But the design here promises a little more than most loops!

The loop may be suitably constructed from any wire having diameter of about 1.5 to 2.5mm in cross section. The wire I used in the test model is pvc insulated multi-strand wire, with a diameter of 1.55mm. Triple the upper horizontal wire to minimise its ohmic resistance. Only the bottom horizontal element needs support. A glass fibre reinforced (g.r.p.) or water-proofed wooden rod is an ideal support. That's all! Then cut the wire and measure the corner points.



● Fig. 1: Dimensions and layout of the Reference Loop.



● Fig. 2: The feeder balun is made from two parallel runs of RG-58 coaxial cable shrouded with ferrite toroids.

Next form a small eyelet to both upper corners for nylon type ropes. (An open knotted rope ring works well). Using a proper insulator at each upper corner improves the construction and working. Fasten the open-wire line to the support rod and solder the loop wires to the open-wire feedline's ends.

Tape, or tie the loop's bottom horizontal run to the rod with the self-amalgamating, or other waterproof tape. Secure the corner fastening points with a piece of tying wire. Now, your new small loop is ready. As simple as that! But now you'll have to arrange to feed it properly!

The loop's terminal impedance R-jX must be matched to the coaxial cable's characteristic impedance Z_0 (which should be taken as 50±j0Ω). The open wire line works as a matching line. If you follow the suggested dimensions of my version, you'll need to build up a 532Ω line.

Impedance Chosen

The open wire line's impedance Z_0 = 532Ω, was chosen, although other impedance values (around 500-5kΩ) would work as well. However, the designed dimensions shown here have been calculated using a line with the Z_0 of 532Ω. Construction of this open wire line is, perhaps, the hardest job with this loop. But you will like this low-loss matching element in your loop.

Take the two 3.3m long and 2.2mm diameter multi-strand base antenna wires, or equal diameter solid copper wires and space them 93mm. This dimension produces a Z_0 of 532Ω. For the spacers, I use 16.3mm wireman's PE-tube and saw the sides open. Each piece of the tube gives four spacers of the total number needed for the complete run.

Don't try your nice loop without an effective balun! For enjoyable and trouble-free operation the loop must be well balanced against ground. A good wideband sleeve-balun is shown in Fig. 2. I used the Amidon ferrites, type 43-562-1. The inner hole diameter of the ferrites is just about right for RG-58. The length of these ferrites is 28.8mm and the outer diameter is 14.2mm. Use eight ferrites per branch, total 16 pieces.

The construction of the Sleeve Balun is shown in **Fig. 2**, which shows the idea in skeletal form. Amidon ferrites, type 43-562-1 or equal other ferrites are inserted into the two plastic tubes. The tubes I used have an inner diameter around one millimetre smaller than the outer diameter of the ferrites. However, I put

a sawcut slit along the length of each of the tubes, which allows the ferrite sleeves to be inserted. The resulting mechanical tension keeps the ferrites firmly in place.

Mounting Plate

Place both the plastic tubes with the ferrites on the insulated material mounting plate (34×260mm and not shown in the diagram) and tape them together (lightly). Couple the feeder and the dummy feeder as shown in Fig. 2. Don't overheat the bottom soldering point. Solder the clips to the ends of the pvc insulated flexible wires at the balanced end of the balun.

The clips are needed during the tuning. After the correct match is obtained and after many 'rainy days' testing, the clips have to be replaced by the screw joints. Do the same with the shorting link clips on the stub. After soldering all the joints, place a piece of good r.f. insulating material (as a cover) over the upper coaxial cable joints.

Finally, tape the finished balun with self-amalgamating insulating tape. Start the wrapping at the bottom end (coaxial feeder end) and finish with about 10mm beyond the output (balanced) wires. Thus, the whole balun becomes waterproofed. Then check to ensure that you have a good seal all around.

During the setting-up phase crocodile clips are used to make the connections.

The weight of the made-up balun is about 450-500g and obviously the loop cannot carry that without a vertical support rope. But because of the low elevations (the upper element at 12m or lower), a supporting pole under the feed-point would be a good solution for the balun's weight problem.

The supporting pole should be mounted below the loop, to support the balun and allow the balanced output leads to be connected and changed along the matching line. The idea of this ferrite covered 'two branch' balun is to prevent r.f. currents flowing on the outer surface of the feeder's braid and to balance the feed-point physically.

During my tests, I found that the dummy 'feeder' is necessary for complete balance. The inner of the dummy feeder coaxial cable can either be left unconnected, or it may be soldered together with its braid at the balanced end too. In some tests this latter method improved the balance still further.

At the bottom end the dummy coaxial lead both conductors are soldered to the braid of the feeder. This two branch ferrite balun is a low loss wideband balun. It keeps both feeding terminals well isolated from the ground over the frequency band 0.1 - 145MHz. Response is flat (at least over this band). I have carried out tests using a sensitive bridge instrument to verify the response.

Tuning Matching

Now, the initial set-up for matching is ready. But before the final tuning, match your rig to 50Ω dummy load using the c.w. mode. Use the minimum r.f. power, just enough to give good s.w.r. meter operation. Normally a few watts is enough. Next, you can erect the ready loop to the height of 10m for example. Not too high, as you've got to have easy access to the feed point clips and the shorting bar clips.

To begin the impedance transforming check, start with a length of the open wire feedline a little longer than you will need (I found that a length of about 3.2m is ideal). Connect the coaxial feed line, RG58 for example, and the balancing 1:1 balun with clips, to the points 2.7m from the loop's terminals Z_a. The connect a shorting bar, again using clips, a further 350mm down from the balanced feed-point (a distance of of 3.05m from the loop's terminals Z_a).

Now transfer the rig's output from the dummy load to the loop's RG58 coaxial line feeder (**remembering not to transmit while doing it**) and apply a low power into the feeder. The s.w.r. meter will probably indicate a reading above 1:1 at this this point, whatever the figure is, write the reading down. Now go out and move the stub feed-point clips about 10mm up or down.

If after moving the feed-point connections, the s.w.r. reading decreases, the direction of the change was correct. Again write this new reading down, and continue the procedure by moving the feed-point clips a similar amount again in the same direction.

If you arrive at a position where the movement of the feed-point clips has no affect on the s.w.r. reading (but it's still above 1:1), then try changing the position of the end shorting clips too. By sequential change of the either, or both clip pairs, you should be able to achieve a complete match with an s.w.r. reading of 1:1. This point is the correct match situation.

Somewhat Exhausting

The task of tuning the antenna can be somewhat exhausting if the coaxial cable run is quite long and you're on your own. It's easier with two people, one operating the rig, the other making changes. **However, r.f. energy can cause nasty flesh burns - even at comparatively low power.** Effective communications must be used to minimise the chances of this happening!

If you're working alone, I've found that tuning can become very easy if you make some arrangements for extending the key line and the s.w.r. meter lines. With these extensions you can obtain the wanted tuning situation easily, without running out and back in continuously. If you can't manage to extend the lines, look on the bright side - the physical exercise is very good for the experimenter too!

The horizontal main radiator of this loop has the length of 2.66m. This element (even though there are three wires side-by-side) looks very small when comparing it to a beam and many dipoles in the backyard. Even with the vertical sides at 6.5m in length, the whole loop still looks small when comparing it to the other h.f. antennas. The Reference Loop is a small antenna. We all like small and effective combinations with antennas ... but is this loop effective?

To find out if the loop's effective, we can first do a 'noise test'. DX hunters know that when the band is open for long exotic distances, the basic band noise has a little different tone. If an antenna system is working correctly, then surely you can distinguish that. The stronger the 'DX noise' is the more capable of receiving distant stations the antenna will be.

Compare the noise by setting your receiver's a.g.c. to fast and then switching between dummy load - your best beam - loop - dipole, etc. At this location, the Reference Loop (top run at around 11m high) sounds very much the same as my 3-element beam at the height of 26m, though not the same all the time. Sometimes the beam out performs the loop in this special test.

Note: If the balance of your loop is poor, because you may not be using the balun, you may not be able to distinguish that special component of the noise. Under these conditions, anything special usually sinks into the surrounding rough man-made noise.

Our 'real QSO' results with the Reference Loop have been very good, sometimes surprising. I tested the loop mainly with W and VK stations (from here in Finland). The loop works well in the pile up situations too. My best report to date, was from a W station giving is RST599. Confirmation results came from a VK station, when I received an RST579 report. Both of these contacts were with a power output of 100W.

I have liked and enjoyed working with the Reference Loop. Sometimes I feel it's operating like my beam. But generally, with DX operation, the 3-element beam (at 26m) is 6-10dB (1-2 S-points) better than the loop. Though sometimes there's no difference, which can be explained by the wave angle under certain conditions.

You may consider this non resonant loop as being a quite normal loop having the circumference close to 18m. But more detailed study shows that it differs completely from the ordinary design. To help, I'll list some points where the Reference Loop has advantages (even superiority) over ordinary loops.

- Due to its non-resonant design, the upper half of the Reference Loop radiates the majority of the outgoing power. It fulfils every antenna designer's goal. With ordinary loops both the loop halves radiate equally, forcing higher mount points. The price paid with the non-resonant design is a little more complicated matching.
- The radiation pattern of the Loop has both horizontally and vertically polarised lobes. So, the loop is almost omnidirectional.
- The bonus bandwidth of the Reference Loop for an s.w.r. 2:1 ratio is 350kHz (using Bird 43 power measurements and the HP803A impedance measurements). The half power bandwidth s.w.r. at 5.82:1 is much wider. So, tune it on one middle frequency and then all of the band is yours!

A Little Theory

For those with an interest, here's a little theory of the matching method. After the correct match is obtained, we know that the parallel impedance at the feeder's connecting point (on the 532Ω line) Z_S has value of R_p in parallel with X_p (R_p//X_pF). When, the shorted parallel stub Xp= +j65Ω.

The Smith chart shows that the equivalent series impedance at the same point is Z_S = (31.4 - j24.2)Ω. The distance between the feed-point connection and the loop's terminal point (Z_a) is 0.129λ. By Smith's Calculator we can now solve Z_a = (75 - j609)Ω.

So, let's go through all this once again starting from the loop's terminals. The loop's terminal impedance is Za = (75-j609)Ω. The open wire line (0.129λ section) transforms it to (31.4 - j24.2)Ω. The equivalent parallel impedance of the latter is (50//-j65)Ω. We cancel the parallel -j65Ω by the parallel short circuited stub of +j65Ω. Now the correct match to the pure 50Ω coaxial cable is obtained.

It's interesting to see that in practice this procedure progressed in opposite order, firstly we solved, by s.w.r. meter, the parallel impedance R_p//$X_{p\text{-stub}}$ = (50//+j65)Ω.

We understand that the line's parallel impedance at the feed point is (50//-j65)Ω. The equivalence calculation and the Smith's Chart show that the series impedance at the same point is (31.4-j24.2)Ω. Then, going backward to Za point on Smith's Chart we can read Z_a=(75-j609)Ω.
(‡ the '//' characters are used to show that the values are considered to be in parallel)

Technical Merit

I feel that this study has only some technical merit. For the correct match we need only the s.w.r. measurement, as I said at the beginning of this article, but let's consider the meaning of the matching line losses. The s.w.r. on the open wire feedline section averages out at 16.4:1. The length of the line is 3.05m (the stub included).

A typical loss figure for matched open wire (at 14MHz) is around 0.07dB per 30m run. So, for the length of 3.05m the matching line loss is 0.007dB. Now knowing this loss and the s.w.r. at the input end of the of the matching stub line, we can calculate the total loss, which works out as 0.06dB.

Such a small loss figure puts only a small need for loss-correction of the impedance values obtained by the Smith Chart for example. So, for all practical purpose, the loss of the relative short open wire line may be completely ignored. Another thought to keep in mind is the quality of the open wire line matching actually outperforming a matching system using coaxial line.

Now, after we know the antenna feed point impedance Z_a = (75-j609)Ω - we can also ask is the matching line's impedance Z_0 (at 532Ω) the optimum relative to Z_a? The optimum should be Z_0 of 613Ω, since this would give a minimum s.w.r. on the matching line. In our case however, the optimum s.w.r. is only marginally smaller with a 613Ω line so, our line is still very close to the optimum.

Radiation Resistance

The question of the loop's radiation resistance R_r is interesting, but a difficult question at the same time. When referring to formulas for the calculation of R_r in textbooks, we can infer the loop's R_r value. By extrapolation, we get the radiation resistance of the Reference Loop as around 18Ω.

Where can we find this radiation resistance value? The only current maximum exists at the centre of the upper horizontal element, so the R_r should in essence be there. On the other hand, when we cancel the input reactance of Z_a, the centre point resistance of the bottom element is 75Ω.

Since the power fed into the loop must be the same independent of the feed point, only the impedance values change. The centre of the upper element carries twice the current than the centre of the bottom element. Hence, the directive power radiated along the middle line normal to the horizontal elements is about four times higher at the upper element.

The result was a design goal, so that the bottom element's elevation isn't a significant factor. **Note:** this kind of simplified calculation may easily generate pros and cons. Thinking of the normal dipole fed with a constant power at different points along its axis will clarify the idea.

Up the ladder - Martti makes some adjustments. And with trees that tall, any antenna would have to be effective.

It's possible to reduce the bottom element's directive radiation still more by reducing the circumference of the loop. Taking off lets say, half a metre per side, increases both resistive and reactive values of Z_a. This, in turn will decrease the loop's R_r and the bottom element's current. It also increases the s.w.r. on the matching open line and brings the side high voltage points closer to the supporting rod, etc. The non-resonant loop is a continuous challenge to a designer.

I've taken the description of this loop antenna a little further than was really needed, but I think that sometimes a little theory is a good thing! However, the loop still works well without all that. Enjoy your own building and testing! *PW*

The Vectis Run Part 1

By Rupert Templeman

It's January 1939. Travelling Wireless Technician-Salesman Alan Edwards regards his monthly visit to the Isle of Wight, 'The Vectis Run', to be an enjoyable five days of seeing friends and customers. As he waits to board the ferry in Lymington little does he realise he's about to drive into the world of technical espionage, political intrigue and murder.

It was a relief to turn the van's ignition off and immediately the engine stopped the faint blue haze of oil and exhaust fumes started to disperse. After the drive through the New Forest from Christchurch it was pleasant to sit for a few minutes watching the 'roll-on roll-off' ferry being prepared to accept its next load.

The Southern Railway's recently introduced motor ferry *Lymington* was one of the new vessels that made life much easier for professional travellers such as 27-year old Alan Edwards. Based in Bournemouth with Southern Wireless Services, he considered his was an ideal job for a radio enthusiast.

The first week in the month would see him on the Island from Monday afternoon to Friday, returning home to Christchurch on the evening ferry. The following Monday he'd be on the road as far away as south Devon. In fact anywhere in the southwest where new valves, wireless spares and technical information were needed. Then the Vectis Run would come round once again. That was a trip he enjoyed, even though he was no sailor the new ferry made it much easier.

Alan was in a deep reverie thinking about the many miles he and the old van had travelled together. Along with preferring the popular term 'Radio' he also wished for a more modern vehicle rather than the worn out 1935 rattletrap he nursed along bumpy country roads.

No wonder the old van's engine was burning oil, it worked hard enough he thought to himself. Then his eye was caught by one of the smart sleek and very modern French Citroën *Traction Avant* cars immediately behind him in the queue for the ferry.

In fact, it wasn't the Citroën that caught his attention first, it was the foreign number plate. Smiling to himself the slightly built, bespectacled Alan thought he was probably the only person on the ferry slipway who recognised the Dutch registration. Not surprising really as he'd been on a training course to the giant Philipp's factory at Eindhoven in that land of dykes, windmills and tulips.

Adjusting the tiny interior mirror, while making an excuse to do so by pushing a straying lock of gingery hair from over his spectacles, Alan smiled inwardly. He wondered what the Dutch driver would say if he realised that the battered old van in front had amongst its cargo several boxes of the remarkable new Philips-made EF50 valves?

A sudden small movement in the dark interior of the Citroën's rear drew Alan's attention. He wasn't able to see much but was sure it was a female figure and it was someone who seemed to be young and seemingly shy.

A sudden sharp knocking sound on the van's window brought him back to earth with a jolt. The smiling face underneath the Southern Railway cap reminded him where he was: "Forgotten where you are Alan"?…said the slipway charge-hand as he beckoned the van and its regular driver on to the ferry's boarding ramp. Alan returned the wave with a slightly embarrassed grin as he carefully nudged the van into first gear, wincing at the inevitable grating sound.

The sleek Citroën followed silently behind and drew up directly behind him. It was then that Alan could see that the Dutch registered vehicle carried three people; an older male driver, a slightly younger man and an attractive young woman.

While he gathered his thoughts about him, Alan covertly watched through the van's small door mirror. Through this he could see the woman and her companions getting out of the Citroën and making their way to the ferry's small refreshment saloon. It was only then that he thought: "January, what a strange time for

.....his eye was caught by one of the smart sleek and very modern French Citroën *Traction Avant* cars immediately behind him in the queue for the ferry.

foreign tourists to visit the Island. They could have surely chosen a better month and better weather"!

As Alan made his own way over the car deck he could feel the small ferry already rolling slightly as she hit the approaching swell - a sure sign that they were coming abreast of Hurst Castle. Another few minutes and the shallow draught, slab sided ship would be leaving the last shelter of the Hampshire shore to continue the more exposed but short remaining journey into Yarmouth.

Entering the small refreshment saloon Alan saw the Dutch travellers, although his latent shyness meant that his eyes were averted as he approached the counter. The steward nodded an acknowledgment as the diffident young man entered and poured him a mug of tea. "Nice to see you again Sir" the man said, accepting Alan's proferred sixpence.

Alan, grateful he didn't have to pay sixpence for a mug of tea every day watched the Island grow closer and out of the corner of his eye also took in the blonde Dutch girl's good looks. "Just like those girls at Eindhoven" he thought to himself, remembering with fondness the Phillip's course he'd attended in 1937.

Rough Approach

Walking back to the van was difficult even though the *Lymington* was less than half a mile out of Yarmouth. Alan was ready for this because he knew the full force of the wind would be blowing up the Solent from the English Channel

Suddenly, he saw a slim figure ahead of him stagger slightly and almost fall into him. Alan straddled his legs and using his own van as a support managed to stay upright – and hold the person by the right arm. Only then did he recognise the figure he'd stopped from falling onto the deck was the Dutch girl.

"I do beg your pardon"…he found himself apologising, thinking she might take offence at this familiarity.

Suddenly, the blonde head, partly hidden under a patterned silk headscarf – turned to reveal a surprised but not unfriendly face. Although relieved at the response, Alan was totally unprepared for the reply in perfect English.

"Thank you…..A perfect English Gentleman" she smiled.

Recovering from his own surprise Alan recognised it was his own voice answering; "Don't mention it. I hope you enjoy your holiday...but you could have chosen a better time of year for your visit"!

He thought that the girl – for she seemed to be very young - perhaps around 18 years old - was about to speak again. But a surprised look in her face appeared at the same time Alan was aggressively pushed into the side of his van as her two companions squeezed their way past and literally carried her with them.

The clattering of a winch announced that the *Lymington's* bow ramp was being lowered. Engines started and almost immediately vehicles were driving off the ferry and towards Yarmouth town. Unfortunately, as usual, Alan's van wouldn't start. He was still hand-cranking the engine it as the Citroën drove by, but from the corner of his eye the cold, steely stares from the driver and front seat passenger did nothing for the small figure's confidence as he finally got the van's engine running.

Passing through the outskirts of Yarmouth, Alan headed towards the Freshwater. He was due to see Arthur Cotton in Freshwater first and deliver some the precious EF50 valves. A visit to Cotton's Wireless & Television Shop was always a highlight of the Vectis Run because Arthur, like Alan, was receiving the BBC's Alexandra Palace television transmissions from London on a regular basis.

However, just before Alan had left his base Arthur had telephoned an extra order and and reported strange interference on the received television pictures. This had intrigued them both and Alan was looking forward to discussing the problem with his old friend and staying overnight as Freda, Arthur's wife was a splendid cook.

Crossing over the River *Yar* and onto the short stretch of toll road, the van mounted what was once a regularly used lifting bridge. From this vantage point Alan was very surprised to see the Dutch registered Citroën only about 400 yards ahead and muttered to himself; "Odd at this time of year, nothing will be open in West Wight and there'll be nothing to see either".

As the van left the bridge Alan caught a glimpse of a whisp of steam and clouds of smoke, as the late afternoon train from Newport headed into Freshwater after calling at Yarmouth station. It was getting dark and he was disappointed that he couldn't see which locomotive was heading the short train.

"Oh well" he thought "at least I should see the railway at Ventnor during daylight tomorrow". He then mentally checked on his customer list for the next day.

As he approached the outskirts of Freshwater, Alan decided to pull into a lay-by to use the last of the daylight to check his customer list. In the back of his mind there was a suspicion that a late order - for Clarke's of Sandown and Shanklin - had been forgotten and they were very important customers.

It wasn't until the list was checked and Alan had re-assured himself the order was on the van that he saw that the vehicle parked in front was the Citroën. But just as he was about to drive off, crunching the gears again, the car moved off, did a U-turn and ended up behind him.

The larger car then drove by slowly and Alan felt as though the steely eyes of the driver were boring into him again, before it accelerated away into the gloom. The last thing he heard was the girl's voice shouting something – it sounded like a disagreement- but it wasn't in Dutch, it seemed more like German. The argument was very loud and the girl seemed to be fighting her corner; "And winning by the sounds of it!" Alan thought.

The rest of the short journey to Freshwater was usually a brief interlude before the Cotton's warm apartment above the wireless shop was usually uneventful. But this time Alan was convinced someone was watching him all the way.

Strange Interference

Arthur Cotton was waiting just outside the shop door. Smiling as usual, the Great War veteran wheezed slightly – a legacy of being gassed in the trenches and greeted him.

"The wife's got the meal on Alan" – he said unnecessarily as his visitor had smelt the aroma of Freda's famous steak and kidney pudding wafting out of the open door.

Alan shook his friend's hand as he got out of the van carrying his overnight bag. Arthur then immediately brought up the subject of the strange interference on the Alexandra Palace vision signals as they closed the door behind them, entering the warm shop and chatting animatedly on the new science of television.

Meanwhile, outside as the door closed, the large Citroën moved slowly past the shop front, before accelerating away into the winter's night. As it disappeared the only sound to be heard was the almost imperceptible hiss of air escaping from the two offside van tyres.

To be continued...

Åland

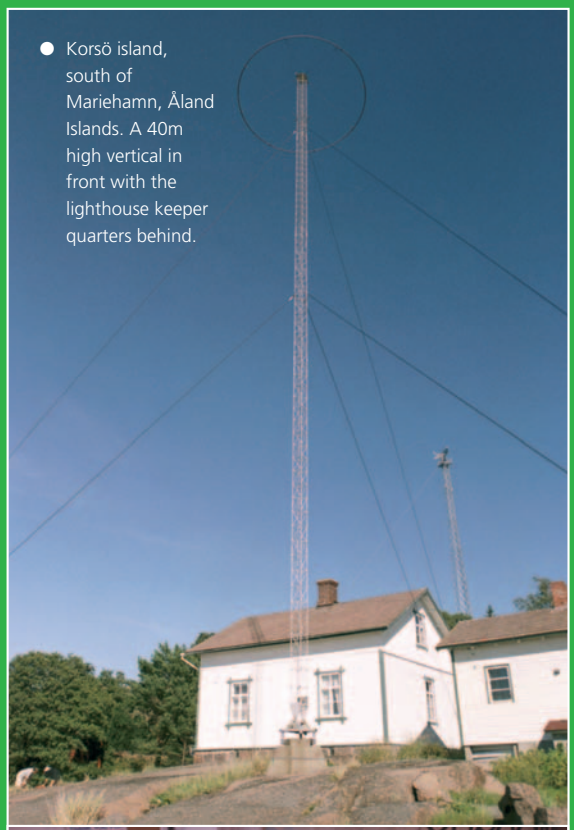
Island Adventure

Squeezed in between Sweden and Finland, lies an archipelago of 6500 islands called the Åland Islands. Considering the permanent population of only 25,000 people, the number of permanent Amateur Radio operators is high. The number of visiting Amateur Radio operators is also large. There are two factors that I can think of, which could explain the elevated degree of Amateur Radio activity from the Åland Islands. One is, apart from the general rule that islanders, given an opportunity, find Amateur Radio an attractive way of feeling less isolated!

The main reason I can think of is for the large amount of Amateur Radio activity is that the Åland Islands are basically Swedish, yet formally belong to Finland. The islands have a high degree of autonomy, so they are qualified as a separate DXCC entity and a separate DXCC entity always creates demand for radio contacts.

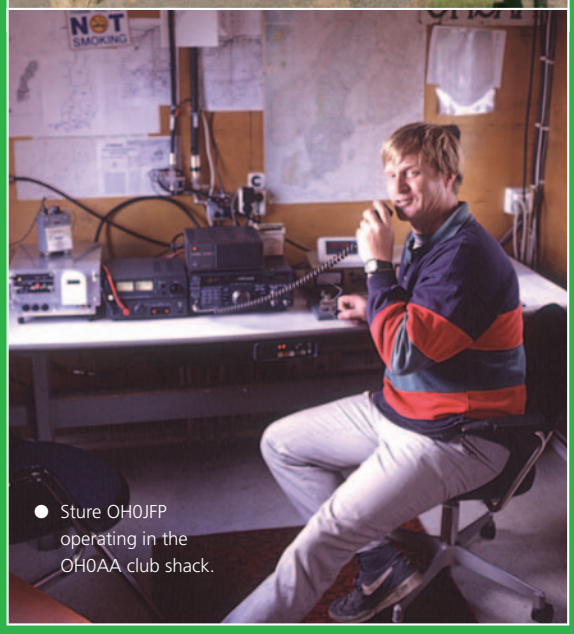
The other reason, I think, is that both Sweden and Finland are high-tech countries, competing on the cellular 'phone market (Nokia is Finnish and Ericsson is Swedish). So, the islands inbetween are influenced by the high-tech 'winds', even though there is no electronics industry in Åland Islands. And as a matter of fact, there is no industry at all.

Tourism has replaced fishing and shipping as main sources of income. Even the European Union still permits sales of so called 'Tax Free booze' in a bid to to attract tourists. Personally, I don't go there for the Tax Free booze or cigarettes, I just find these islands very relaxing in the late summer or early autumn.



● Korsö island, south of Mariehamn, Åland Islands. A 40m high vertical in front with the lighthouse keeper quarters behind.

● A ferry-boat terminal in Eckerö, Åland. The Åland flag is in the middle, with the Finnish one on the left and the swedish on the right.



● Sture OH0JFP operating in the OH0AA club shack.

● Kee OH0NA calling "CQ, CQ this OH0A" at Korsö lighthouse.

Henryk Kotowski SM0JHF gives a brief account of Amateur Radio operating from the Åland Islands, 'sandwiched', between Sweden and Finland and encourages you to sample it for yourself.

It's usually warmer on the Åland Islands than in Stockholm, where I live, due to fact that waters of the Baltic Sea get quite warm in the summer. Instead we refer to them as the Eastern Sea, Bothnia Sea, Finnish Sea and Åland Sea. Everybody else refers to all these waters as Baltic Sea but not the locals.

Island Life

Karl-Erik Ericsson OH0NA has spent most of his life in the Ålands Sea! He was a nautical pilot, before becoming a lighthouse keeper. In the 1960s, while sitting in the Market Reef lighthouse he was confronted with the first DXpedition and that was how he became interested in Amateur Radio. Now he is retired and the president of **OH0AA** radio club of which there are some 50 members. And the last time I visited the islands in August 2001 I managed to meet a few of them.

One of the OH0AA club members, **Sture OH0JFP**, used to be a fisherman but not any more and now has plenty of leisure time for Amateur Radio operating. During the past year or so, starting from scratch, Sture built a v.h.f./u.h.f. contesting station for himself. He was one of the main operators of the OH0AA contesting team but when support from other members subsided, he found a place on a hill, not far from his home, which would give an advantage when operating on the v.h.f. and u.h.f. bands.

Sture is basically interested in operating on 50MHz and above. Within a year of starting his project he had constructed rotary directional antennas for the 50, 144, 430 and 1296MHz bands, a warm shack, a simple guest-shack and a generator shelter. He is a wizard of getting things done and getting things for free!

Most of the hardware came from junkyards of the local power company or an electronics scrapping firm. Sture plans for more antennas, for the h.f. bands and with his persistence, I'm sure I will be guest operating on short wave bands from his 'kiosk-like' guest-shack on my next visit.

Lighthouse Activity

A good time for me to go to the Åland Islands for Amateur Operating is during The Lighthouse Activity Weekend in August. This is because the majority of the summer tourists from Sweden have gone home because school starts there in the middle of this month. Additionally the weather is usually stable, ferry boats are cheaper then and Karl-Erik OH0NA can take you to virtually any lighthouse there.

A few years ago Karl-Erik took me to a lighthouse called Nyhamn and a couple of years ago we went to another one, Korsö. Karl-Erik, (nicknamed Kee on the air) had selected a lighthouse with electricity, so we did not have to carry a heavy petrol generator with us. It also has a 40m high vertical antenna, previously used for radio navigation. He even convinced a new member of the club, **Gey OH0GG**, to come along with us. Gey is middle-aged and received his licence in June 2001, but has been interested in radio since the age of eight.

On our trip we took two radios, a 50MHz Yagi, a lot of wire and two antenna tuners. I suspended a long wire and orientated it towards the south. And while Kee and Gey assembled the 50MHz Yagi, I tuned the 40 metre high vertical on almost all bands but the propagation was poor. A solar flare or some other disturbance made us feel as if we were calling "CQ this is OH0A" as if we had dummy loads instead of antennas.

The 50MHz band was dead, we had to use 144MHz f.m. radio to make a schedule with someone in Mariehamn, the main town of the islands, to confirm that we really had an antenna for 50MHz! On the other hand, two years earlier, I made 1500 contacts, on c.w. only, while being on a lighthouse. Sometimes you win, sometimes you lose.

The Sunday morning of my trip to Korsö lighthouse was something I'll never forget. At 0600 hours I went out to see the sunrise and the sea was mirror-like, the air was still, huge ferry boats passing by a mile away. The light was incredible, the colours of the water and the sky were unreal. The silence was total and it's something I want to experience again.

Sture OH0JFP at his contest site outside of town.

Experience Åland

You can experience Amateur Radio operating and the beauty of the the Åland Islands too. Visitors are very welcome and there's no need to apply for a temporary operating licence as the Åland Islands are included in the CEPT agreement.

Many visitors come here from all over the world, but the vast number are from Sweden and Finland. Many ambitious Finnish Amateur Radio operators have more or less permanent stations in the islands.

Contesting is easier when you are in effect 'a multiplier'. Those visitors influence local operators and consequently the technologies applied here are modern, the level of know-how is increasing all the time and the membership figures of the local radio club are healthy.

No one in the League of Nations could have predicted this result of ruling for Ålands autonomy in the 1918 dispute. This proves that decisions taken today can give unexpected outcomes for tomorrow especially when Amateur Radio helps. It really is a hobby that brings great enjoyment to so many.

PW

The Åland Islands have distinctive car registration plates, their own postage stamps and a local government.

This is the guest-shack at OH0JFP's contest site, Sture says "Welcome".

The KIF700 Keyboard Interface for the Kenwood TM-D700

The KIF700 Keyboard Interface unit for the Kenwood TM-D700. Richard G0RSN found this dedicated unit to be very helpful when using APRS.

Richard Newton G0RSN has been busy keeping his typing skills up to scratch by trying out a very interesting accessory! So, if you own a Kenwood TM-D700, read on!

"Following my experience with the KIF700 I can say it's a wonderful and versatile bit of kit"

The Kenwood TM-D700 is a dual-band f.m. transceiver with built-in TNC and automatic packet reporting system (APRS) firmware. To appreciate the full benefit of the KIF700 Keyboard Interface unit I'm reviewing a basic understanding of the Kenwood TM-D700 is needed. So, I'll provide a quick insight into what the TM-D700 can do and how the KIF700 can benefit the operator.

The story starts in the May 2000 issue of *PW,* where I enjoyed reviewing the Kenwood TM-D700. The transceiver has integrated data facilities including DX Cluster reception, packet radio and stand-alone APRS operation with its own firmware.

I was so impressed with the Kenwood TM-D700 I bought one! However, there's one drawback - the rather tedious way text messages are entered when operating in APRS mode (I commented on this in the original review).

Internal TNC

The TM-D700 can use its internal Terminal Node Controller (TNC) in the same way as an external unit. You can then connect a PC or laptop computer to the rig using a serial lead and use any third party packet or APRS software. However, this may not be possible because of their situation, location or even budget!

The transceiver has its own internal APRS firmware and this can fully automate all - or some of - the APRS functions. It also offers the user some extended functions such as sending text messages to other stations with an APRS set-up.

Unfortunately, the only way to input the text messages is by using the front panel keys and the main tuning knob. As you can imagine, this is very time consuming and rather laborious.

You may ask; "Why would you want to send text messages while mobile"? Obviously, if you were driving you would not! But there are many other occasions when being able to easily compile and send a message would be of benefit. So, let's take a look!

Network Of Nodes

A network of nodes maintained by the **Dorset Police Amateur Radio Society** and local Radio Amateurs has created excellent APRS coverage in our region. This means that data text messages can be exchanged over the APRS system on 144.800MHz over distances far exceeding 160km (100 miles) with relatively low power and a modest antenna. It's used by local Amateurs and RAYNET.

Even my family have found the APRS useful! For instance when I've been travelling to see my brother **William G7GMZ** and my sister-in-law **Carolyn M3CSK** they'll have been following my progress on the map using UI-View software. Messages are sent to us over distances far out-ranging ordinary f.m. v.h.f. voice signals.

William and Carolyn communicate from home using a computer and keyboard. And I thought; "Wouldn't it be wonderful if we could just as easily send messages back, to inform of delays due to road or weather conditions"? Likewise, I'm sure that the mobile keyboard facility would be extremely useful during RAYNET exercises when an operator had a easy-to-use text message facility available for use with the TM-D700.

As readers will know...I'm keen on Caravanning and combining it with Amateur Radio and the TM-D7000 can be used to great advantage. But an easier way of inputting messages would make life more enjoyable.

In the past I've set the TM-D700 in the car to 'beacon' less frequently, as if it were a home station. I change the icon to a tent (unfortunately I don't have a caravan icon on my TM-D700) and then I've a ready-made portable APRS packet station.

The problem is of course that if I want to send a message to another station, it takes me ages just to send a short abbreviated message. This is where the wonderful **KIF700 Keyboard**

Interface Unit developed by **Geedev Ltd.** from Wareham in Dorset comes in.

Keyboard Interface

The KIF700 Keyboard Interface unit for the Kenwood TM-D700 has been designed around a Motorola micro-controller chip. It's made to enable a PS/2 keyboard to be connected to the Kenwood TM-D700 in APRS mode.

The KIF700 basically allows the operator to quickly and easily input text using the keyboard by converting the keyboard strikes into DTMF tones and transferring them to the radio via the microphone socket. The DTMF tones are then recognised by the TM-D700 and converted back into characters on the radio's display (the interface supports all characters displayed by the TM-D700).

The Interface can be used with any PS/2 keyboard **but it must have less than 40mA current consumption**. To save any potential problems the unit will be supplied with a compact keyboard. This will easily fit into most glove boxes and doesn't exceed the required current consumption of 40mA. (It will also be available without the miniature keyboard).

Completely self-contained, the interface is powered from the 8V supply available on the TM-D700 microphone socket. A suitable lead is provided and it also comes with a well-written, illustrated handbook.

The KIF700 measures approx 85 x 36 x 80mm and is enclosed in a black plastic case and seems to be well-made and good quality. The mini keyboard supplied with the review model seemed to be a perfect size for mobile operating and of excellent quality.

Sockets & Connections

The KIF700 has three sockets, two modular RJ45 sockets; one of these is connected to the microphone socket on the rig. The other socket is for connecting a microphone to the KIF700 should you want to continue to use the microphone for voice contacts. The other socket is the PS/2 mini DIN type for the keyboard.

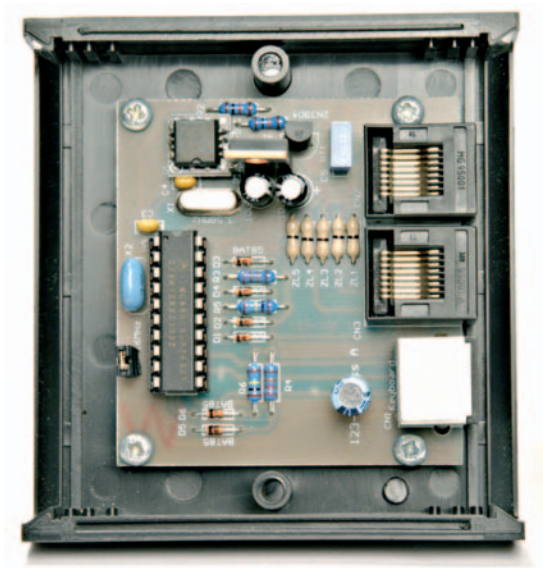
To ensure that electrical noise from the keyboard doesn't affect the TM-D700 or the audio signals, the 5V output to the mini DIN socket is filtered. This is important and it's pleasing to report I didn't experience any interference problems when using the KIF700 and mini keyboard.

The interface is very easy to install, all you do is just plug it into the microphone socket! However, in line with good practice this should be done while the radio is switched off.

On The Air

When I started to use the KIF700 on the air I found that it wasn't as fast and seamless as a keyboard connected to a PC. In fact it could take up to 1.8 seconds to send the @ character. However, if you think that's slow, please consider that compared with the alternative of in-putting via the front panel controls, the KIF700 Keyboard Interface Unit goes like a rocket!

The full benefit of the KIF700 can be seen using a simple message such as; "This is a test using the KIF700>>" as an illustration which took me over two minutes to send using the front panel knob and keys. Using the Interface Unit the same message took about 30 seconds! I guess that speaks for itself and needless to say, **I was impressed**.



Although it looks very simple - the interface can save you much time (see text).

Two Modes

The KIF700 Interface has two modes, with the default being the simple **TEXT** mode. This allows the operator to use the keyboard for text input after first using the rig's front panel keys to call up the message screen.

I used the KIF700 in TEXT mode while caravanning and found no problems whatsoever. It worked extremely well and became a great asset, turning my mobile set-up into a really enjoyable portable Amateur Radio experience.

When using the KIF700 I was able to send and receive messages far more simply than I've been able to do on similar trips. In fact, thanks to the KIF700 the rig has shown even greater potential.

Despite my enthusiasm for the interface it's important to be aware that the KIF700 **does not allow fast typing**. But if you are a one or two finger typist I don't think there will be any problem at all!

The Interface Unit also allows for a second mode, called **CONTROL** and this is accessed by removing a jumper wire inside the unit. Explicit instructions for this are contained in the handbook with pictures to provide extra guidance.

In order to use control mode you'll have to set the TM-D700's **Programmable Function** menu to values found in the handbook. The handbook also gives full details of how to access the required menu on the TM-D700.

Once set, the Programmable Function then allows the KIF700 to be used to control functions on the TM-D700. These include calling up the station list, message list and send message screens on the rig without using the front panel keys at all. It also allows the operator to store and recall up to six messages of 60 characters long (these are stored in the **FLASH** memory in the KIF700).

Word Of Warning

Although it's far more versatile than the simple text mode, there's a word of warning when using the **Control Mode**. You must be made aware that the TM-D700 is only capable of one-way communication via the microphone socket. There's no error correction and no 'handshaking'. This means that when operating some of the more complex instructions issued by the KIF700 in control mode there's a danger of a 'clash'.

For example, while in CONTROL mode, if I were to press the F7 key on the keyboard, this should bring up the APRS message input screen on the rig. This will work without glitch **unless the rig receives a beacon or message or transmits at the same time**. If this happens you'll see unexpected responses to subsequent key strikes, although the handbook gives simple instructions on how to resume correct operation.

Wonderful & Versatile!

Following my experience with the KIF700 I can say it's a wonderful and versatile bit of kit. In my opinion it enhances the Kenwood TM-D700 APRS function for those who, for whatever reason, aren't able to use a computer.

As long as the unit is realistically priced I should imagine it would become a 'must-have' addition for the majority of TM-D700 owners. And you've probably guessed already that I'll be getting one for my own use!

PW

Product

The KIF700 Keyboard Interface

Company

Company: Geedev Ltd., Wareham, Dorset. (Product marketed by The Shortwave Shop).
Contact: Shortwave Shop
Tel: (01202) 490099

Pros & Cons

Pros: Without the interface a simple message such as; "This is a test using the KIF700>>" took me over two minutes to send using the Kenwood's front panel knob and keys. Using the Interface Unit the same message took about 30 seconds! I guess that speaks for itself and needless to say, **I was impressed**.

Cons: Despite my enthusiasm for the interface it's important to be aware that the KIF700 **does not allow fast typing**. But if you are a one or two finger typist I don't think there will be any problem at all!

Price

£89 inc. P&P

Summary

I should imagine it would become a 'must-have' addition for the majority of TM-D700 owners. I'll be getting one for my own use!

Thanks

My thanks go to **The Shortwave Shop, 18 Fairmile Road, Christchurch, Dorset BH23 2LJ. Tel/FAX: (01202) 490099**.

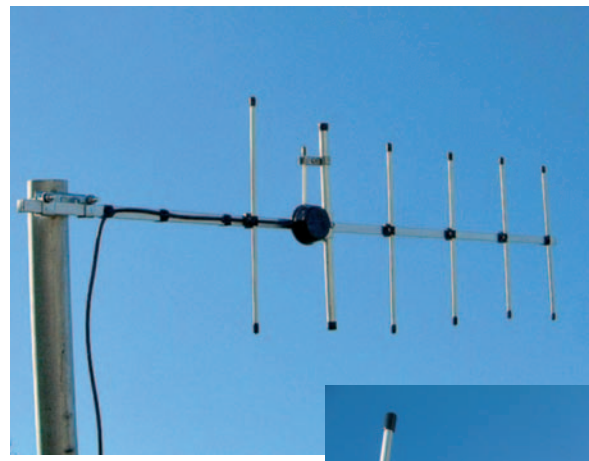
Antenna Workshop

A 6-Element Yagi Antenna For The 430MHz Band

David Butler G4ASR, a keen v.h.f. operator and VHF DXER columnist, describes a Yagi antenna for the popular 430MHz band.

An antenna should suit the job it's designed to do. So, if you are planning to build a moonbounce array, don't use this antenna! But if you need a directional Yagi for general communication modes, satellite operation or packet radio access then this 430MHz antenna might suit your requirements.

This antenna comprises of six elements mounted on a boom that is less than one metre long, yet it can provide a gain of around 10dBd. The Yagi antenna consists of the conventional reflector behind a gamma-matched driven element, with four director elements mounted on a boom about 1.2m long.



This antenna with its element and boom dimensions, is based on information contained in the American National Bureau of Standards (NBS) Technical Note 688. Written by **Peter Viezbicke** in 1976, this classic 30-page Yagi antenna design document can be viewed at **www.boulder.nist.gov/timefreq/general/pdf/451.pdf**

In this design all elements are directly fixed to the top surface of the boom by plastic clamps. Elements connected in this way possess a slight advantage in terms of noise and discharge of static build-up. As the Yagi is only 825mm long it can conveniently be attached to the support mast close to the reflector end of the boom, as you can see from the heading shot.

The coaxial cable, which should ideally be low-loss and have an impedance of 50Ω, is also routed out towards the back. This method ensures that neither the support mast or cabling interferes with any of the Yagi elements thus maintaining the integrity of the antenna pattern.

Number Of Sources

All materials for the antenna are available from a number of sources and I've found **Sandpiper Aerial Technology** one of the best suppliers for these specialised antenna components. The antenna, shown diagrammatically in **Fig. 1**, has a boom made from 15mm square aluminium tubing, parasitic elements from 6mm (1/4in) aluminium tubing and the driven element from 12mm (1/2in) aluminium tubing.

The gamma match assembly, **Fig. 2**, is constructed from 2mm brass rod and ptfe tube attached to a waterproof cable terminating box. Plastic clamps are used to fix the parasitic elements and a metal clamp to fix the driven element onto the square boom.

The easiest way to carry out s.w.r. adjustment is at ground level with the antenna pointing straight up and the reflector element a metre or so above the ground. However, for optimum performance you should always check the performance of the Yagi within your particular installation as it may also have other v.h.f. antennas within its capture area and these may cause detuning. Check the s.w.r. with the shorting clip initially set at 100mm from the centre line of the main boom.

Fig. 2: The gamma match bar is covered in ptfe making a capacitive contact through the clamp to the driven element.

If the match is not sufficiently low, slightly reposition the shorting clip by a few millimetres until the lowest reflected power is obtained. A gamma match can induce currents on the shield of

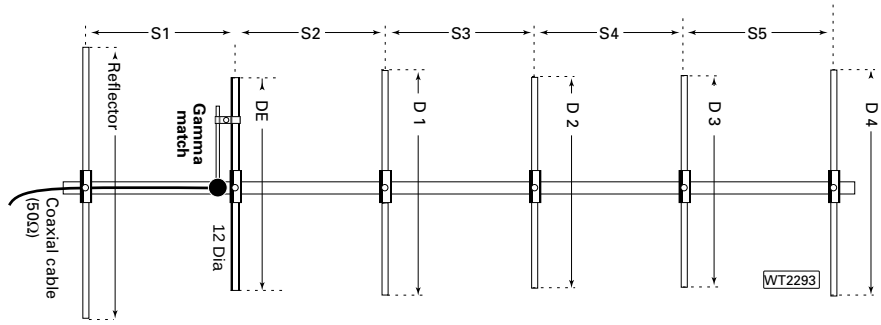


Fig. 1: The overall dimensions and layout of the 6-element Yagi antenna for 430MHz, dimensions are given in Table 1

the coaxial cable feed line (which can degrade the beam polar pattern) since it is an unbalanced system.

Pattern Distortion

The polar pattern distortion is more noticeable at u.h.f. but if an antenna is constructed with care there should be negligible effect to the polar pattern. This matching method however can be prone to moisture getting into the tubing so, it is necessary to seal the open end of the arm with heat-shrink sleeving.

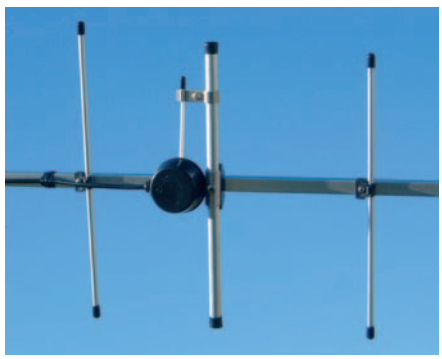


Fig. 3: A closer look at the rear three elements showing the gamma match system and coaxial cable run.

The table of dimensions, **Table 1**, should be read in conjunction with Fig. 1, which shows the general layout of the Yagi antenna. Start construction by cutting a one metre length of square aluminium tubing. Measure, mark out and drill holes to suit the element spacing as shown in Table 1. A tip here is to measure all spacing dimensions from the reflector position rather than marking out between each element.

An advantage of using only one reference point, is that by referring all dimensions to one starting position you reduce inaccuracies along the length of the boom. Now the reflector, directors and driven element are cut to length and attached to the main boom with the relevant clamps.

The driven element is matched to the 50Ω coaxial feeder cable by a gamma matching system shown in the photograph **Fig. 3**, where you can see the reflector, driven element and the first director. The gamma element is in effect a capacitor connected in series between the inner of the coaxial cable to a matching point on the driven element.

To provide the small amount of series capacitance (approximately 5pf) a 100mm length of 2mm diameter brass rod is covered with ptfe sleeve. The capacitor is formed between the brass rod, the ptfe dielectric and the stainless steel shorting clip. The end of the gamma rod is clamped to the driven element 100mm from the centre line of the main boom. The spacing between the rod and the driven element is set at 30mm by the stainless steel fixing clamp (see **Fig. 4** for more detail).

Table 1

Element	Ref	DE	D1	D2	D3	D4
Diameter	6	12	6	6	6	6
Length(mm)	330	302	305	298	298	305
Spacing(mm) (from rear)	0	152	309	481	653	825

Spacing(mm)	S1	S2	S3	S4	S5
	152	157	172	172	172

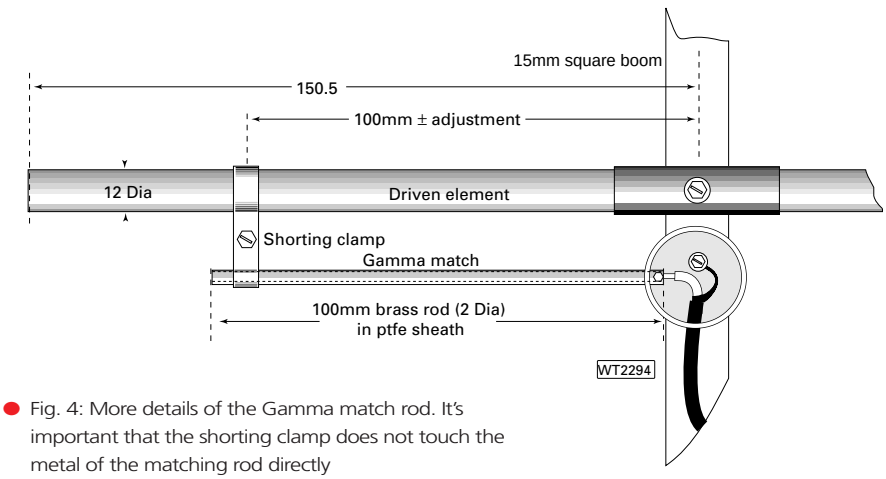


Fig. 4: More details of the Gamma match rod. It's important that the shorting clamp does not touch the metal of the matching rod directly

Coaxial Cable

This 6-element Yagi design is self-supporting from the rear and is fixed to the mast with a suitable clamp. The 50Ω coaxial cable is connected inside the waterproof junction box. The cable shielding is soldered to a tag and securely connected by a fixing screw to the centre line of the boom as close as possible to the driven element mounting.

The coaxial inner conductor is attached with a small solder tag to the gamma match brass terminal. The coaxial cable should be routed away from the driven element to the rear of the antenna boom. To complete the job fit rubberised caps to the ends of the boom and the antenna elements.

So, there you have it, a simple but effective antenna for the u.h.f. band. And you can claim to have built it yourself! *PW*

Sandpiper Aerial Technology can supply element fixing clamps, aluminium tubing, gamma match assemblies and other antenna mechanical items. Please check with **Chris, Mark** or **Jane** for prices and availability of individual antenna items.
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A Direct Reading Frequency Meter

First published in *PW* May 1970, T. J. Melville's project proved exceptionally useful to many readers, including the present Editor! So, with this in mind it's been chosen as the first 'Classic' project to be republished in 2004.

The Direct Frequency Meter taken from an electronically scanned photograph of the original project from the *PW* archives.

Classic Project

A reliable direct reading frequency meter has various uses in the home workshop. It can for example, check the frequency of oscilloscope timebases, bias oscillators in tape recorders and of course, the output from signal generators.

To be of any value, such an instrument should be capable of giving accurate readings regardless of the waveform and amplitude of the signal presented to it. The meter to be described is, in fact, capable of a high level of accuracy from 10Hz to 200kHz, providing the input signal is above a certain minimum level. This is typically 50mV r.m.s. (for sine waves) at the extreme frequencies and somewhat less for those in between.

Readers with little or no other test gear should have few difficulties in building or using this meter. Setting-up requires the adjustment of only one pre-set potentiometer and the microammeter remains in its linear 0-200 calibration.

The Design

The design incorporates a device known as a 'diode transistor pump'. This was originally developed a few years ago to operate as an f.m. discriminator, frequency divider or (as used in this meter) a linear frequency to voltage converter.

The basic design and theoretical operation of the system have been described by D. E. O'N. Waddington (*Wireless World*, July 1966), so I can claim no particular credit for the present design.

The block diagram, **Fig. 1** illustrates schematically the various stages of the circuit and **Fig. 2** shows the circuit in component form. The pre-amplifier is a straightforward single transistor stage (Tr1 of Fig. 2), using a silicon *npn* transistor in the common emitter mode and enabling the instrument to test low-level signals.

The mark/space ratio 'standardiser' is D1 of Fig. 2. This diode comprises the base-emitter junction of an *npn* transistor connected in reverse across the base-emitter junction of Tr2. The negative-going portion of the waveform reaching D1 will therefore be earthed, leaving only the positive going pulses to be amplified by Tr2. In practice, D1 will maintain the mark/space ratio of the waveform at a constant 1:1.

Squarewave Needed

Since a squarewave is needed to drive the diode-transistor pump part of the circuit, the next stage required is the waveform standardiser, or square-wave converter. This is in effect, an overdriven amplifier stage consisting of Tr2.

Assuming for the moment that sinusoidal pulses are being fed into Tr2's base, the collector current available for the transistor in its given circuit reaches the maximum well before the input pulses reach their peak. Hence the corresponding pulses appearing at the collector of Tr2 will have their tops clipped and if the input pulses are of sufficient amplitude, a square wave output will be obtained.

Clearly, sawtooth wave-forms will be modified in the same way as sine waves. And squarewaves (not requiring any modification) will come out as they went in. It also follows that once full limiting of Tr2 has been reached, any increase in signal input amplitude cannot affect the pulses appearing at the oscillator.

Although Tr2 has been described as an overdriven amplifier, it could just as well be thought of as an electronic switch. This is appropriate, especially as the box labelled switch, S1, operating at input frequency in Fig. 1 is operated by this transistor.

The Tr2 bias resistor, R4, provides only a small amount of

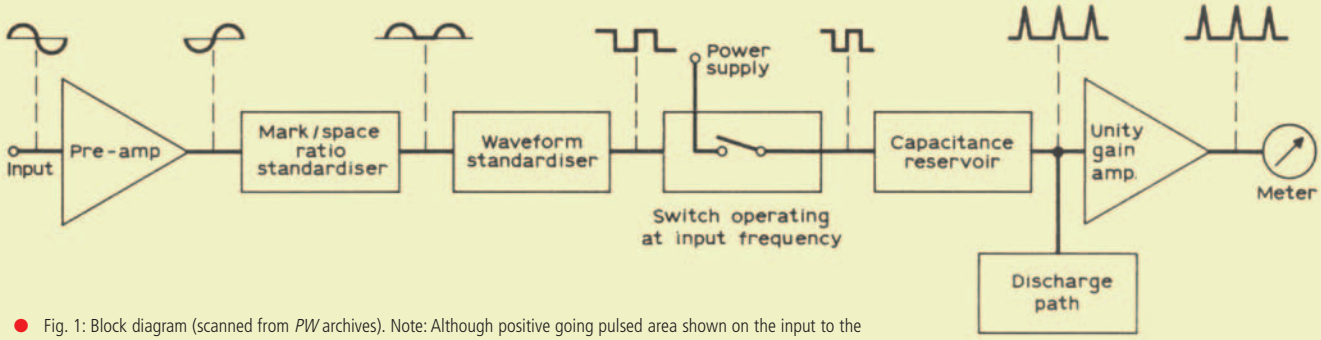

Fig. 1: Block diagram (scanned from *PW* archives). Note: Although positive going pulsed area shown on the input to the unity gain amplifier (convention at that time), it is only the negative going pulses that are used.

base current and the transistor is, in practice, switched on and off by the pulses reaching it from the previous stage. When the transistor is 'off' very little current passes through R5, enabling whichever of the capacitors C3-6 that is in circuit to charge up to almost the full supply voltage.

However, with Tr2 in the 'on' state, current through R5 increases and a larger voltage is dropped across it. Hence, the voltage charge available for C3-6 varies square-wave fashion and is directly related to the square wave of the original signal that reaches Tr2's collector.

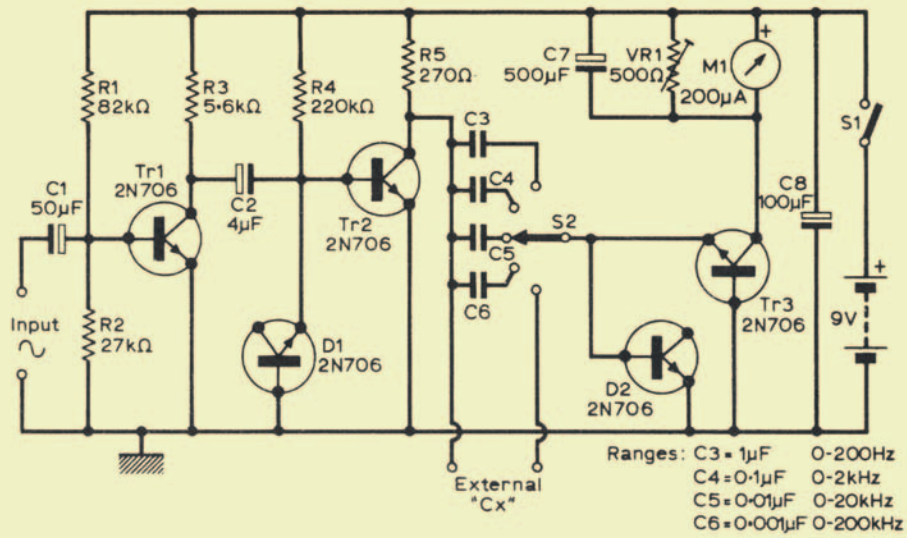

Fig. 2: The original circuit diagram from the May 1970 *PW*. Despite the age of the project, it's still viable and 2N706 transistors are still available.

Reference Level

As the supply voltage is the nominal reference level for the charge stored in C3-6, the resistor R5 must have a low value. Ideally, there should be no resistance at all in between the power supply and the capacitor to be charged, but obviously the circuit could not function if this were the case.

If I'd had the inclination (or more likely the wit!) to produce pages of theoretical calculations on the effect of different time constants for the combinations R5/C3-6, it could no doubt be shown mathematically that R5 must be well under 500Ω for measurements at different frequencies to be reasonably accurate.

Experimentally, it was found that 470Ω was the maximum permissible value of R5 before non-linearity of readings on the meter became apparent. To put it simply, since capacitors C3-6 draw current initially on charging up (Tr2 off) a large blocking resistor would prevent them from attaining their full charge before Tr2 switched on again.

To allow for 'experimental error', the value chosen for R5 is 270Ω, as indicated in Fig. 2. This value allows for more than an adequate output to drive the pump, which comprises the reservoir capacitors D2 and Tr3. These two semiconductors also constitute the discharge path for the reservoir and D1 the resistive emitter load for Tr3.

The charging and discharging of a capacitor is momentary of course, so although the switching voltage available for charging C3-6 would look like a square wave on a graph, the actual current flow in and out of these reservoirs would graphically look like a row of spikes. The spikes or pulses reaching D2 and Tr3 switch from a positive potential to zero and back again. When positive, D2 conducts and prevents current flowing in Tr3. When zero, Tr3 conducts and a proportion of the average collector current is registered on the scale of the meter M1.

Common Base Amplifier

As indicated in the block diagram, Tr3 operates as a common base amplifier, with a current gain of almost unity. In fact, the gain is slightly under that, the emitter driven current must be shared by both the collector and base, with the base current being a small proportion of the total current.

The power gain of the final stage is however greater than unity, enabling a pulsed d.c. voltage to appear across the transistor's collector load. The meter M1 can thus be considered to be either a voltmeter measuring the average voltage drop across VR1, or as a current meter sharing the collector load with the pre-set potentiometer. In either case, the current flow and output voltage of Tr3 are linearly related to the number and size of the pulses at its emitter.

Increasing the frequency of the input signal obviously increases the number of pulses reaching Tr3 and if only one reservoir capacitor, say 1µF were used, the meter's pointer would reach full scale at 200Hz and the instrument would be unable to check higher frequencies.

Fortunately, the substitution of different value capacitors for the reservoir is quite straightforward, since the average current flow in Tr3's collector remains unchanged when the pulse count at the emitter is increases, provided that the current amplitude of the pulse

Continued on page 42

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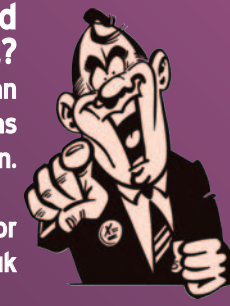

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Classic Project

Continued from page 39

is reduced by the same amount. So, if our 1µF reservoir is reduced by a factor of ten to 0.1µF, pulse size will be similarly reduced and full scale deflection (f.s.d.) will be achieved with an input signal of 2kHz.

Practical Considerations

The accuracy of readings obtainable on the meter over the four ranges depends on the absolute values of the reservoir capacitors C3-6. These should have a tolerance of ±1% or better.

Polyester or silver mica types are preferable, though old fashioned, large paper types with a high voltage rating may be suitable if they can be tested for low leakage. But on this score, most modern miniature paper capacitors have to be ruled out and miniature disc ceramics are equally suspect.

However, 1% 1µF polyester types are usually unobtainable and if they were they would be inordinately expensive. The usual solution to this problem is to select a capacitor with a nominal tolerance of 10% or 20% which turns out to be slightly under 1µF and then wire an extra small capacitor in parallel, using a capacitance bridge as a check. Alternatively, the frequency meter can be used to test its own 1µF capacitor, preferably with a suitable signal generator and this process will be described below.

The accuracy of the meter also depends on the semiconductors used. Transistors with a high cut off frequency are essential (the F_r of the types specified) is 200MHz, but their current gain is relatively un-important and so almost any silicon planar epitaxial transistors would do.

A high gain type for Tr1 will improve sensitivity somewhat. But little advantage is to be gained by using high gain transistors for Tr2 and Tr3.

The reverse connected diode pairs (D1/Tr2 base emitter and D2/Tr3 base emitter) must be fairly accurately matched, not only for different forward Volt drops at different currents, but also for frequency dependent characteristics. The easiest way to achieve this is to use the base emitter junctions of transistors of the same type as Tr2 and Tr3.

In any case, general purpose diodes, such as the germanium OA81 and silicon OA200 have been found to be unsuitable. The 2N706's used in the final version of the prototype were 'untested' types obtained from advertisers in *PW* at very low prices. Providing some preliminary testing (for short and open circuits) is undertaken, these types appear to be eminently suitable for this design.

The capacitor connected across the meter M1 needs to be large, certainly at least 100µF. The wave form at Tr3's collector is pulsed d.c. and so the varying inductance reactance of the meter winding will produce inaccurate readings if this current is not smoothed. Additionally, at very low frequencies, the vibration of the meter's pointer would make readings impossible without a large amount of smoothing.

Building With Veroboard

Most of the components I used in building the prototype are accommodated on a small piece of 0.15in matrix Veroboard (normally advertised as 2.5 x 1in) and the layout is shown in **Fig. 3** and **Fig. 4**. Please note the breaks in the copper strip at holes D9, D15 and E4.

Layout is not particularly critical and I more or less followed the 'layout' of the circuit diagram. Two holes are provided in the module for fixing purposes.

The capacitors C3-6 are connected directly to the tags on S2 and to a thick copper busbar (1.5mm tinned copper) secured to one of the Cx terminals. Capacitor C7 is wired directly across M1 and C8 in the prototype is a largish type requiring a separate securing clip.

The power supply is a small battery mounted inside the metal case housing the instrument. The minimum supply voltage has been found to be 4V and the maximum 9V.

It should be noted that higher voltages increase the collector current of Tr3 to the point where linearity is not maintained. A battery of 6 or 9V (PP3, PP4 types, etc.) would be quite suitable and should have a long life, since the quiescent current drain is only 1.5mA. This, however, will increase up to 20mA when a hefty input signal is applied.

Incidentally, the maximum input signal should be limited to about 4V r.m.s. or 6V peak. The maximum can be roughly determined from the maximum reverse voltage that can be applied to Tr1's base emitter junction, in the case of the 2N706 this is 3V. With the prototype, signals of up to 10V r.m.s. have been applied without any ill effects, apart from Tr1 getting rather warm, but such experimenting is inadvisable.

Metal Box

From my own experience I strongly recommended that the whole instrument is housed in a metal box. This is because powerful magnetic fields from domestic mains wiring will otherwise affect the instrument's performance.

Far less than the nominal limiting input voltage is needed at the input terminals for 'things to happen'! And if a length of unshielded wire is connected up and allowed to 'float' around near a mains cable or an unscreened oscillator, the behaviour of the meter's pointer can only be described as berserk!

Incidentally the point 'berserk' activity will in fact tell the user without access to a millivoltmeter when full input limiting has occurred. When fully limited, the needle will stay motionless at some point on the scale, while when the input is just below limiting, a higher meter reading will be indicated, but the pointer tends to waver about. At lower input levels still, the meter movement becomes more erratic until it finally settles at zero when the input is removed.

Providing suitable components have been used, the pre-set pot VR1 need only be adjusted on one range. An accurate signal generator can of course be used to check all four ranges, but with the prototype it is sufficient to set VR1 for a reading of 50Hz on the lowest range with a mains derived input. With this method I then obtain an accurate reading of *200kHz on the top range on connecting the instrument up to a signal generator tuned to Radio 2.

Since the article was first published, changes have taken place at the Droitwich (Wychbold, Worcestershire)) long wave transmitter. The BBC Radio 4 service transmits on the 198kHz frequency. **Editor.*

Adding Extra Ranges

Since a single pole 12-way switch will normally have to be purchased for S2, the constructor can add extra ranges if desired. For example, a 0.2µF capacitor will give a f.s.d. of 1kHz. A 20Hz range could theoretically be provided if a close tolerance 10µF

capacitor could be acquired.

However, even modern electrolytic capacitors are quite unsuitable as a rule. This is because they have a poor leakage factor, a typical +100-20% tolerance and frequently do not assume their maximum capacitance until an unpredictable fraction of the stated working voltage is applied to them.

Unfortunately, a 2MHz range seems to be an equally unlikely possibility from the extensive experiments I've carried out. The a.c. gain of most 'r.f.' can 'fast switching' transistors (F_t 100-300MHz) falls quite rapidly above 100kHz so that the input signal level required for limiting of Tr2 increases to several volts even at 1MHz.

Moving Coil Meter

To help, I'll explain the main reason why a 200µA moving coil meter was chosen for M1 instead of a more standard 100µA type. This was in fact because the useful response of the instrument with a 50mV or so input almost abruptly stopped at about 300kHz.

A claimed response of up to 200kHz might therefore seem rather presumptuous! Certainly no 'guarantee' is offered but various types of high F_t silicon transistors have been tried and the equipment demolished and rebuilt several times without affecting the response at this frequency.

An additional reason for making 200kHz* the top frequency was that even with an uncalibrated home made signal generator, an accurate check can be made using a radio tuned to Radio 2* to check the signal generator.

**Please refer to the Editorial note regarding 198kHz and BBC programme changes.*

Capacitance Meter

Using the project as a capacitance meter is merely a logical refinement to the basic frequency meter design. If a wide range low frequency signal generator is available, the 'standard' capacitors incorporated in the frequency meter may as well be put to good use.

The only extra cost incurred is that of buying four instead of two connecting terminals. The extra two are marked Cx in Fig. 2. The unknown capacitor is simply connected across them and the range selector S2 switched to the appropriate position.

The signal generator is connected to the input terminals of the meter and the test frequency increased from the lowest available up to 200Hz, 2, 20 or 200kHz. The frequency selected being the one at which a reading somewhere between 20 and 200 is obtained on the meter.

One of the capacitors, C3-6 is then switched into circuit as appropriate and the signal generator adjusted, if necessary, to obtain an exact reading of 200. The reading given by 'Cx' is then rechecked. If, for example, 'Cx' gives a reading of 100 on the 20kHz range, the value of the capacitor can be readily calculated as 100/2% of 0.01µF or 0.005µF. Suspect capacitors can be checked against any other close tolerance types in a similar fashion of course, not only against the four in the meter.

Junk Box Standard

As I mentioned earlier, it's possible to use a non-descript capacitor fished out of the junk box for the 1µF 'standard' in the meter, using the 0.1µF ±1% already acquired as a reference and using furthermore only a 50Hz input, if no signal generator is available. If a mains derived input is to be used, a high resistance pit should be temporarily substituted for VR1 (1-5kΩ should do).

With a 9V supply, adjust this so that the meter reads 20 (instead of 5) on the 2kHz range. You should then 'pad up' a capacitor slightly under 1µF connected to the Cx terminals so that a reading of 200 is obtained with S2 in the Cx position.

The reliability of the procedure depends on the meters being accurately calibrated and having a hairline pointer (and the constructor having good eyesight!). A somewhat more dependable but more laborious or expensive method would be to use ten close tolerance 0.1µF capacitors - each one could be an ordinary type checked against C4, if necessary.

The tolerance of this cumulative capacitor would still be ±1% if C4 was of that rating. A less bulky 1µF could then be assembled and checked against this.

PW

Shopping List

Resistors

All resistors are 0.25W, sub miniature types.

R1	82kΩ
R2	27kΩ
R3	5.6kΩ
R4	220kΩ
R5	270Ω

Capacitors

C1	50µF 6V electrolytic
C2	4µF 6V electrolytic
C3	1µF 1%
C4	0.1µF 1%
C5	0.01µF 1%
C6	0.001µF 1%
C7	500µF 4V electrolytic
C8	100µF 12V electrolytic

Semiconductors

Tr1, Tr2, Tr3, D1 and D2, all Type 2N706

Miscellaneous

VR1	500Ω pre-set, panel mounting
S1	s.p.s.t. toggle switch
S2	1-pole, 5-way rotary switch
M1	200µA moving coil meter

Battery, Veroboard, terminals, metal case

Looking Back At The May 1970 *PW*

Researching for this article led our keen Editor into the archives (we didn't see him for days!). But it seems that Rob G3XFD found so much to interest him in the May 1970 issue of *PW*!

Looking back at the contents page of the May 1970 issue for the direct reading frequency meter project reminded me that it was a particular good 'vintage issue'. One article FM Stereo Decoder by **W. Cameron,** proved to be my first attempt at receiving stereophonic transmissions on Band II v.h.f. f.m. **Frank Rayer G3OGR**, was as prolific as ever and had two projects that month. The first was the 3-Band TRF 4 Receiver using Weyrad coils and transistors (rather than his preferred Denco coils and valves!).

The second project, Electronic Receive Switch for Transmit-Receive (using a 6C4 valve), was more of an 'idea and discussion article' than a project. It led me on to make my first TR-switching project using 6J5 valves (all I had in the junk box then!).

Other projects included a Beginners' AF Amplifier by **A. S. Ellis**. Using an OC72 and an OC22 this little amplifier was used as a bench test amplifier in my shack for many years.

Do you have any special memories of this issue of *PW*? What was your 'classic' project? Let us know, we may be able to feature it again! **Editor**

A Kit Challenge!

Building The Ten-Tec 1340 7MHz QRP CW Transceiver

● The completed Ten-Tec 1340 7MHz QRP c.w. transceiver. The simple exterior hides a very effective and delightfully easy-to-use rig. This unit was built by Kevin Nice G7TZC, the Editor of *Short Wave Magazine* and has been on loan to G3XFD who has yet to complete either of his kits! The front panel controls include main tuning, volume control, RIT, and On/Off switch.

Rob Mannion G3XFD has enjoyed using and building the Ten-Tec 1340 on the 7MHz band. Read on to find out why and how he's been influenced by BBC television's *Blue Peter* programme!

Before I start this kit review...I must explain that this is a 'Use & Build' experience rather than a 'Build & Use' feature! This is because I have to confess that I've been fortunate enough to adopt the "And this is one I've already prepared" technique made famous by the BBC television programme *Blue Peter*.

In my case I have to thank **Kevin Nice G7TZC**, Editor of *Short Wave Magazine* for the long-term loan of the 1340 transceiver he completed some time ago. (Kevin reviewed it in the April 2003 issue of *SWM*). I was so impressed by the kit that Kevin received and the performance on the air that I ordered a 1340 for myself.

My own kit arrived within several months – the delay was because the importers had sold out! In the meantime I'd been enjoying using Kevin's completed kit on the air.

However, in mid-summer 2003 I was fortunate enough to be offered a Ten-Tec 1340 kit from someone who'd bought one but had decided (due to failing eyesight) not to attempt to build it himself. I then had two kits to finish!

● The simple rear panel on the Ten-Tec 1340. Note that Phono (Cinch) sockets are used for power and keying connections. An SO-239 socket is provided for antenna connection (see text).

When completed, the second transceiver is to be kept at my friend's home near Westport in County Mayo. It would form a 'ready to go' 7MHz station for **EI5IW** whenever I could get over to see them for a short break, travelling light, courtesy of Mr Ryanair.

At the time of writing this article (mid-November 2003) I've got to the inductor winding stage with my first kit. Being completely honest, my problem in completing the kit is two-fold; I had completely underestimated the time it would take me, and the second is that I took on something, which I should not have done because of my busy schedule.

The kit itself is not difficult, even for someone in my physical situation. But like any kit building, the 1340 transceiver requires dedication. Kevin estimated his time to be around 25 hours for completion and managed it in not much over 20 hours. I'm a good bit slower and I estimate about 40 hours.

So, I'll concentrate on describing the pleasure I have enjoyed from the labour of some else's fingers, brain and time!

Originally I hesitated to present the article to readers without completing my own projects. However, after a great deal of thought, I've come to the conclusion that readers require my opinion on the kit itself and how the completed transceiver works on the air. When I eventually do manage to complete my kits (216 components including four integrated circuits, 19 transistors and 13 diodes you'll be able to ask me how well the kits I've completed work, during our QSO!

Finally, I perhaps should explain why I originally chose a 7MHz 1340 kit. I did so because it's normally possible to get a c.w. QSO at any time of the day or night on the band.

Additionally, during the early hours it's entirely possible (as you'll read in the On The Air section later) to work across the Atlantic on a regular basis using this rig.

Circuit Design

The Ten-Tec 13XX series of transceiver kits are designed around a single-conversion superhet and a transmitter with a typical 3W output. Models are produced for 3.5MHz (1380), 7MHz (1340), 10MHz (1330), 14MHz (1320), 21MHz (1315). (There's no 18MHz version). Final frequency coverage is any 50kHz section of the c.w. portion of the chosen band. (Selection of the 50kHz range is made during construction, during one winding of one toroid in the v.f.o. circuitry).

The frequency control is provided by a varicap (varactor) tuned v.f.o., itself controlled by a potentiometer. Temperature compensated LC components effectively stabilise the v.f.o. The transceivers are provided with receive incremental tuning (RIT) control with a ±1.50kHz.

The transceiver is provided with a 50Ω-unbalanced output, the antenna connection is via the rear panel SO-239 socket. Also on the rear panel are the Phono type sockets, provided for 12V power input, and output (for auxiliary equipment such as an external keyer). There's also a connection for the external Morse key.

Power requirements are 12–14V d.c. with 35mA on receive (no signal) and 80mA on receiving an S9 signal. On transmit a maximum 800mA is

quoted by the manufacturers. No external transmitter adjustment is provided for.

Transmit-receive switching is solid state, with full break-in (a nice smooth action). The c.w. offset and side tone is fully adjustable from 400Hz to 1kHz, and once set the sidetone automatically tracks the offset frequency. (The sinewave sidetone output level can be adjusted by an internal control).

The Receiver

The superhet receiver, equipped with a 11MHz* i.f. frequency on the 1340 7MHz model, employs a j.f.e.t. mixer. Sensitivity is quoted by the manufacturers as 25µV (typical) for 10dB S/N. A 4-pole crystal ladder filter (nominal 1kHz bandwidth) is provided in the design, and the a.g.c. is audio derived.

Audio output is quoted at 300mW into 4Ω. The transceiver is fitted with a 3inch loudspeaker which copes very well with the generous output (very helpful for portable use as I found). Audio output is also more than generous for headphone use.

**Frequencies differ according to the model*.

On The Air

As I've already explained, all I had to do was to enjoy the fruits of Kevin G7TZC's labours and go straight on the air. Kevin had already listened on the band and told me it worked very well indeed, but once I'd connected the power supply and antenna at home, I soon found out for myself!

Tuning with the large knob is very smooth, and once on air I quickly lost any doubts that the relatively low intermediate frequency and single conversion receiver would struggle to handle the QRM On 7MHz. In fact it didn't struggle - it kept up with the best of them and during prolonged listening periods I often compared the 1340's performance with my favourite Alinco DX-70TH, and the far cheaper, simpler kit managed very well indeed.

Obviously, I'm used to a modern numerical frequency read-out nowadays but in practice with a little 'slip over' (behind the tuning knob) calibration card you'll always know where you are frequency-wise. Additionally, as (most!) constructors will have assembled the kit themselves I don't see it as a problem.

The nominal 1kHz bandwidth of the crystal filter is quite adequate for working on 7MHz. In fact, the only thing missing in my opinion, was the ability to vary the selectivity...but you can't have it all in a rig costing less than £100!

Over the months I've had the transceiver, over 700 QSOs have been logged. I've worked all over Europe and have also worked some of the East Coast Canadian enthusiasts who seem to like this rig very much indeed!

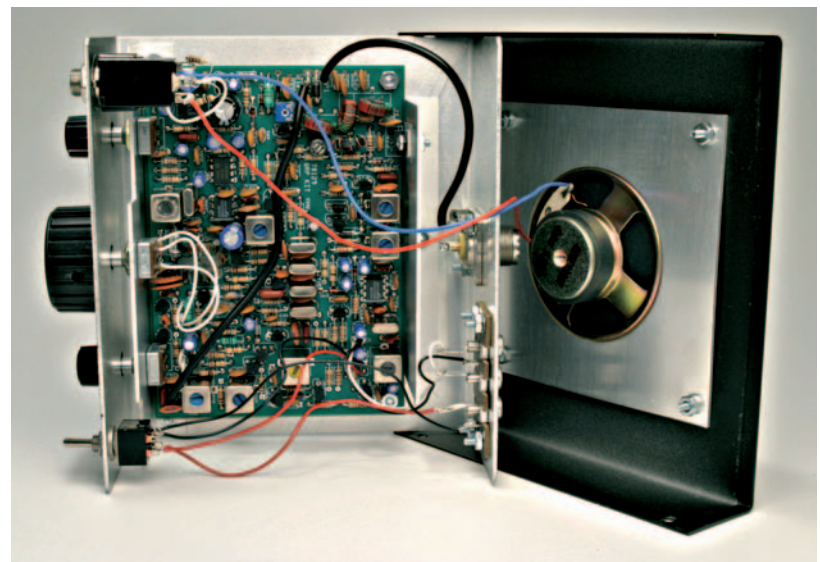
To receive a 569/579 report from a transceiver operating at 3W into a glass fibre fishing rod vertical antenna, tuned by my SG-230 automatic antenna tuner unit (a.t.u.) was a delight. All through the late summer I used the 1340 on the air, both at home and portable.

When using the 1340 /P the rig was tuned into the antenna of choice using my MFJ-945E Mobile antenna tuning unit (a.t.u.). Occasionally I had time to set up my long wire or portable trap dipole - but for convenience I often ended up using my Pro-Am 7MHz mobile whip – very successfully too!

My best contact (under difficult conditions on a far from ideal site) using the Pro-Am was while waiting at the Dentist's while my wife Carol was receiving treatment. To provide distraction (forgive choice of word!) I listened on 7MHz and heard **Norleif Bjørneseth LA9FG** from Telemark in Norway (a *PW* reader, a great friend and supporter of the magazine) calling "CQ".

Despite the QRM on a summer's afternoon and the fact I was parked immediately underneath a huge Cedar of Lebanon tree and very badly screened in all directions - I called Norlief and we worked each other. We were both very pleased - especially as it was our first QSO together! I got 569 and I gave Norleif 579. Our previous 'QSO' that day had been via e-mail – so the 7MHz c.w. contact rounded off the day nicely!

The Ten-Tec 1340 7MHz transceiver kit as supplied. The sturdy ready-painted steel case acts as storage box for the components and everything is clearly identified by the high quality manual. The main printed circuit board (p.c.b.) is silk screen over-printed with component placement locations (see text). The completed kit weighs just over 1kg (2.25lbs) and measures 70 x 152 x 152mm (HWD).



Photograph of the 1340 transceiver kit as completed by Kevin Nice G7TZC. The controls are mounted on an aluminium 'chassis' frame'. The relatively high density of the components on the p.c.b. can clearly be seen (see text).

Try It Yourself!

Even though I've yet to complete my own Ten-Tec 1340 I thoroughly recommended keen c.w. operators to have a go for themselves as it's a lovely little rig. If you've not tried c.w. yet - this is an ideal rig to start you off.

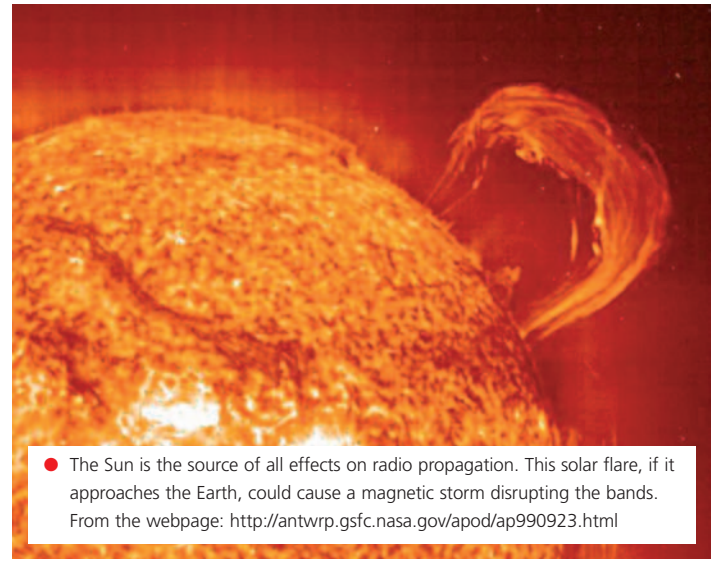
The elation of working a station perhaps at 1600km (1000 miles) away on a rig you've built yourself has to be felt to be appreciated. Thanks for loaning me yours Kevin! Now...where's my soldering iron got to? *PW*

Ten-Tec Direct Kits

You can obtain a 1340 kit for £88.50 (plus £8 P&P) from **Ten-Tec** direct by contacting them on (**01773**) **880788**. Further information is available on the website **www.aoruk.com/tentec/**

Patrick Allely GW3KJW says there's no need to fear the propagation figures. They all make sense when you know how to interpret them - and that's easier than you think!

Making Sense Of The Flux Figures & Weird Numbers



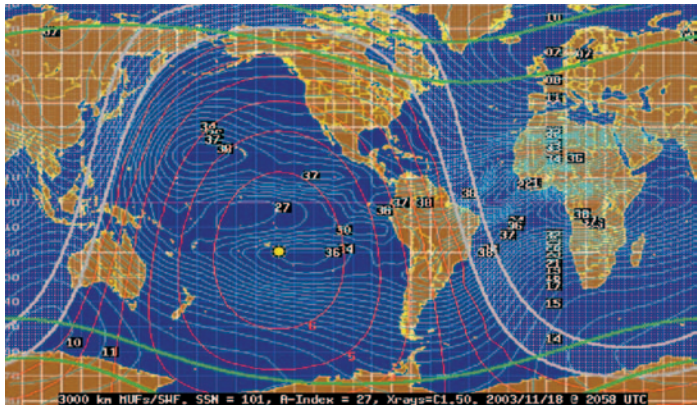
The Sun is the source of all effects on radio propagation. This solar flare, if it approaches the Earth, could cause a magnetic storm disrupting the bands. From the webpage: http://antwrp.gsfc.nasa.gov/apod/ap990923.html

Have you ever wondered, when listening to the GB2RS news broadcasts, what those mysterious Flux A, Ap and MUF numbers might mean? I have a belief, that most listeners to these bulletins mentally switch off when the propagation section is read out and I speak from the experience of having read the GB2RS news for 19 years.

In actual fact, if you are interested in working long distance (DX) on the h.f. bands, some study of these propagation figures will help enormously in your understanding of the working of radio waves and your degree of success in achieving contacts or hearing far away stations.

It's all down to the Sun - that variable star 150,000,000km away (with an interesting 11 year cycle of activity) and the movement of our planet in orbit around it. Just think - the Earth's orbiting the sun at over 153,000kph, spinning on its own axis at 1,500kph and wobbling backwards and forwards on the planet's axis. No wonder you're feeling giddy!

Now down to the figures, let's start with the logical one - the Solar Flux figure. This flux figure is a measurement of noise emanating from the Sun due to its nuclear activity and is measured as units of radio noise at the frequency of 2800MHz. At this frequency, the radio Sun looks the same size as the visible Sun. The Dominion Radio Astrophysical Observatory 20km south west of Penticon in British Colombia, Canada, obtains this measurement, which is the world standard.



A diagrammatic view of the MUF (see text) around the world, an aide to find out the best band to use between points. Areas in the Pacific enjoy an MUF of over 30MHz (they're in daylight) while over Europe the MUF has fallen back to around 10MHz. From the webpage: http://solar.spacew.com then follow through to 'Ham Radio'.

Propagation Information

Three times a day, at 1800, 2000 and 2200UTC, a Solar Flux reading is obtained. Although only the 2000UTC reading is given on WWV propagation information when it updates at 2100 daily. The higher the Sun's level of radiation, the more intense the ionospheric F1 and F2 layers are and consequently higher frequencies can be used as these layers reflect back these higher frequencies.

Given a flux level reading of about 300, frequencies up to 50MHz are reflected back to earth giving rise to widespread long distance working in the 50MHz band. Conversely, at the nadir of the 11 year cycle, when the flux figures are below 70, it becomes very difficult, if not impossible to have chordal hop communication above 10MHz as the higher frequencies are being absorbed and passing through the layers.

Now, perhaps you have heard that the flux figure is, say, 200, so conditions on the higher bands will be good. But will they? There's another factor to be considered and this is the geomagnetic activity of the sun.

The sun, which is in continuous nuclear reaction, throws out enormous filaments of radiation and particles, which often pass into the orbit of the earth. These particles and radiation affect the geomagnetic field of the earth, dependent on the intensity of the solar storm and which in turn affects the intensity of the ionospheric layers. A large storm lowers and intensifies the layers, causing a radio 'blackout' on the h.f. bands. But such a storm often induces auroras, allowing communication on 144MHz or higher, by reflecting signals which would normally pass through the E layer, back to earth for long distant contacts.

Planetary Index

Measurement of the geomagnetic activity is known as the 'planetary' or 'a' index

and is measured in Ap units. An Ap index in the range of 0-10 is 'quiet', a reading of 11-20 is termed 'unsettled'. Figures of 21-50, are called 'sub-storm', with readings of 51-80 'storm'. Any reading above 80 is called 'major storm'. Although rare, Ap figures have been known to measure 300 units. Any Ap reading of 25 or more will lead to poor conditions on the h.f. bands.

Another index you may have come across, is the 'k' unit, this is favoured in the USA and is essentially the same as the Ap unit. However, whereas the Ap unit is a linearly scaled measurement, the k unit is given using a logarithmic scale of 1 to 9.

Now we have to know where things stand and ask, can we get on the air and work a bit of DX? Ideally, it would be better to find out the highest frequency that can be used. So, we must consider the propagation conditions prevailing at the time and find out the Maximum Usable Frequency (MUF). As with most things to do with radio, the MUF is not as obvious as it appears.

The MUF is calculated by sending different frequency radio signals straight up to the F1 layer and seeing if they're reflected straight back down to earth. Eventually, a frequency is arrived at which does precisely this. Let's presume that this reflected frequency is 5MHz.

This frequency of 5MHz is not the MUF for communication purposes as h.f. contacts normally bounce off the ionosphere at an angle for a 4800km skip (the chordal hop). The true MUF is three times the vertical measurement so, the MUF in this case would be 15MHz and you would be able to work North America from the UK as long as the MUF halfway along the path was 15MHz.

The MUF is also not constant throughout the world and forms contour lines (like a weather chart) of MUFs across the earth. You do not have to work out where these contour lines are, they are published daily on the Internet and also the predictions published in various radio magazines which are based on past data, will let you know which path should open on various frequencies throughout the 24 hours of the day.

Important Factors

So, we now have the three important factors in h.f. propagation sorted out, or have we? Nasty unexpected things like solar flares occur with little warning and can make a nonsense of predictions. A flare is a sudden eruption of energy from the sun and dependent on its energy, can last up to a few hours.

Solar flares are measured mainly by satellites for their X-Ray energy measured in mega-electron volts (MeV) and are classified according to intensity as 'A', 'B', 'C', 'M' or 'X'. Solar activity can be described as 'very low' (A or B class flares), 'low' (C class flare), 'moderate' (1 to 4 M class isolated flares), 'high' (5 or more M class flares) and 'very high' (M5 flares including X class flares).

Now, this seems rather complicated but A, B and C class flares will not adversely affect propagation. M and X flares cause the problems with sometimes more than 100 MeV of X-Ray being radiated. A major flare can and does affect the short wave frequencies, sometimes causing a complete black out of the entire short wave spectrum.

Fortunately, the advanced techniques incorporated into watching satellites means that we usually have up to two days early warning that problems are going to happen, but it can be very worrying if you are unaware of this and you switch on your receiver only to hear an enhanced background hiss, but no signals. Could World War Three have started without telling you?

When this enormous amount of X-Ray energy hits our ionosphere, the short wave bands close down sequentially, higher frequencies being affected first, then coming down in frequency. They return to normal in the reverse order, the higher frequencies being the last to open and they may take days to recover after a high energy flare.

Now, what do you want to have a chance of working long distance contacts on the higher bands? I would suggest that the flux figure should be 120 or more, that the Ap figure is less than 10 or the k figure is 3 or less. Ideally, the MUF should be at or higher than the frequency you wish to use.

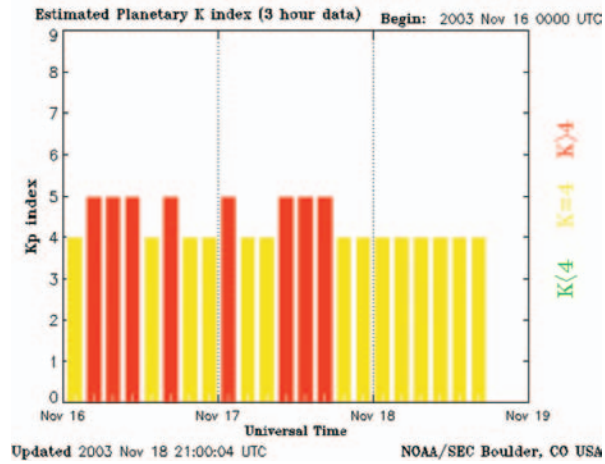
To be on the safe side, the flare activity should be very low or low and finally there should be someone on the other end to be able to receive your signals. I know this last remark sounds obvious, but you can't always guarantee that someone in New Zealand is listening on your frequency.

So, how do you acquire all this advance information? There are a number of sources, the RSGB news broadcast every Sunday contains propagation forecasts and gives details of the previous week's conditions. Also, *RadCom* publishes every month a prediction table of likely openings to various parts of the world with optimum times and frequencies.

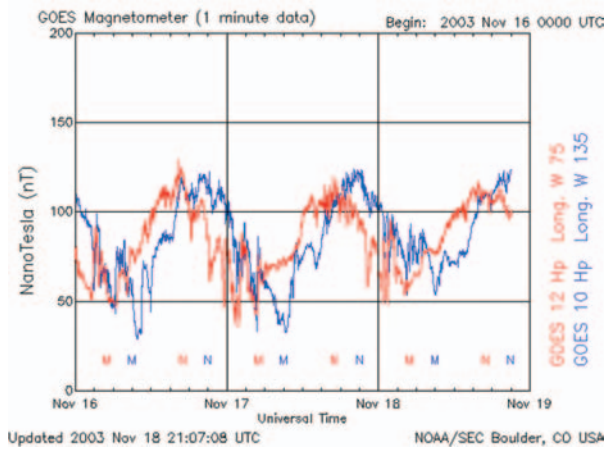
If you have access to the Internet, the DX Cluster which can be found at **http://oh2aq.kolumbus.com/dxs** publishes the last known figures, whilst **http://dx.qsl.net/propagation/propagation** has a complete breakdown on all the current parameters as well as complete MUF maps.

Finally, if after checking all the propagation parameters and finding them to be poor, do not give up, radio propagation being so variable often results in having contacts even when the bands are apparently dead. If you do not call, no one will hear you, so give it a whirl and hope you make the contacts you desire.

PW



● The K index plotted for three days in mid-November 2003, is a logarithmic representation of the Planetary, or Ap index (see text for more detail). From the webpage: http://sec.noaa.gov/rt_plots/kp_3d.html



● Magnetic activity plotted for three days in mid-November 2003, shows rising activity towards local mid-day. From the webpage: http://sec.noaa.gov/rt_plots/mag_3d.html

Competition Time

WIN A YAESU VX-2E HAND-HELD

Yaesu UK Ltd. have very kindly given us not one but **two** VX-2E dual-band (144/430MHz) hand-helds to give away to two lucky *PW* readers. As **John Goodall G0SKR** says in his review on page 24 of this issue the VX-2E is a mighty, fully functional, versatile little beast.

Features of the VX-2E include:

- High Output Power
- Over 1300 Memories
- Wide-band Receive
- Ultra-thin Lithium-ion battery
- WiRES™ Internet linking

For more information on the Yaesu VX-2E contact **Yaesu UK Ltd.** on **(01962) 866667** or take a look at their website at **www.yaesu.co.uk**

To be in with a chance of winning you need to find all the words that have been hidden in the letter grid, mark them, answer the tie-breaker question and then send in your completed entry. **So what are you waiting for? Post your entry today!**

"The Yaesu VX-2E is mighty little beast ... It is an excellent versatile hand-held with unbelievable wide-band reception ..."

Words To Find:

Dual
Band
Hand
Held
Lightweight
Mighty
Power
Receive
Small
Versatile
Wide
Yaesu

R	V	M	E	Z	S	D	G	M	I	G	H	T	Y
E	Y	Y	E	V	Q	X	Z	G	P	J	X	D	K
W	V	U	B	J	I	G	C	Z	R	J	B	T	W
O	T	Y	L	V	H	E	T	S	D	E	H	N	V
P	U	B	N	A	E	H	C	S	M	G	K	S	H
A	Z	S	M	C	U	R	G	E	I	A	V	E	Q
C	T	I	E	J	Z	D	S	E	R	C	L	U	T
T	N	O	S	A	W	F	W	A	Q	D	Y	L	S
Y	D	C	C	L	Y	T	I	N	T	I	A	D	G
N	N	W	Q	P	H	D	D	S	X	I	O	F	S
Q	A	I	I	G	R	E	N	Y	F	S	L	H	K
J	B	W	I	D	D	Q	Q	A	I	L	X	E	U
N	B	L	K	Y	E	Q	F	W	H	F	D	R	W
V	O	Y	L	A	X	H	W	M	K	U	I	S	G

Wordsearch rules:
Twelve different words have been hidden in the letter grid. They have been printed across (forwards or backwards), up and down, diagonally, but they are always in a straight line without odd letters between. You can use the letters in the grid more than once for different words. Once you have found all 12 words, mark them on the grid and send it, along with your name and address (photocopies accepted with the corner flash) to **Yaesu Competition, Practical Wireless January 2004, PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW**. Editor's decision on the winner is final and no correspondence will be entered into.

Tie-Breaker

Q: The Yaesu VX-2E is capable of wide-band receive between which frequencies? (please tick)

☐ 499kHz - 899MHz ☐ 500kHz - 999MHz ☐ 430- 440 MHz

Name.....Callsign.....

Address .....

.....

.....

.....

.....Postcode.....

☐ If you do not wish to receive future correspondence as a result of entering this competition please tick.

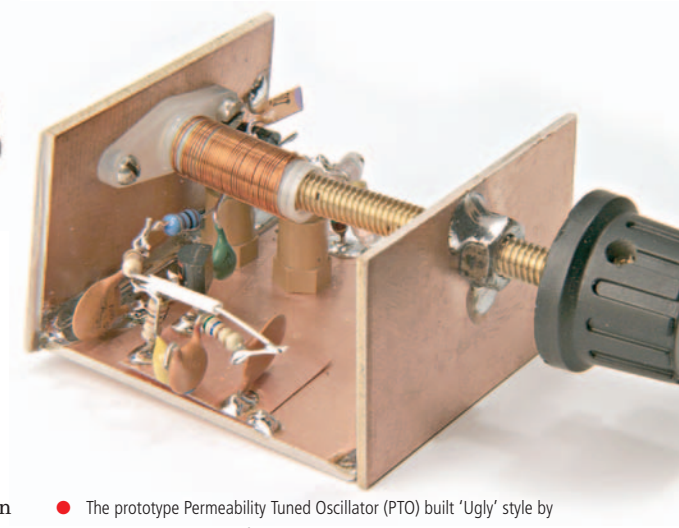
Entries to reach us by Friday 9 January 2004.

PW Jan 2004 Yaesu Competition

Carrying On The Practical Way

"Engineering is the art or science of making practical".

Samuel C. Florman



The prototype Permeability Tuned Oscillator (PTO) built 'Ugly' style by G3RJV. George says he found it to be "surprisingly stable" and urges readers to try the technique.

This time the Rev. George Dobbs G3RJV discusses variable frequency oscillators. George also comments favourably on some of the projects readers have made using ideas from his column.

Welcome once again to Carrying On The Practical Way (COTPW). From time-to-time I'm approached personally by *PW* readers who show me projects they've built from this column. It's a rare occurrence but I 'm delighted when it happens. However, my delight is usually chastened by seeing that they've built it in a far neater and tidier condition than my original project!

Well, this month's idea is one project that almost any *PW* reader will be able to build better than me! It involves some mechanical construction and that's certainly not my forte.

For many years I've noticed that some of my favourite classic Amateur Radio equipment favoured the use of Permeability Tuned Oscillators (PTO) variable frequency oscillators. The Collins S-Line, much Drake equipment, the majority of earlier Ten-Tec equipment, the Japan Radio Company NRD-505 and more recently the Elecraft K2 have all used the PTO v.f.o. as their frequency reference.

Varying Permeability

A Permeability Tuned Oscillator is a v.f.o. where the frequency of the oscillator is changed by varying the permeability of the core in the inductor of the frequency-determining circuit. Most variable frequency oscillators use a 'tuning capacitor', either a mechanically variable capacitor or varicap tuning which produces a capacitance tuned oscillator.

In a PTO circuit the permeability of the inductor is changed by moving a core in and out of the inductor. This is achieved using a screw mechanism which allows precise positioning of the core. The capacitance in the tuned circuit remains constant and the inductance is the variable.

Almost all home-built variable frequency oscillators use capacitive tuning. Recently however, several builders of QRP equipment have been experimenting with PTO oscillators.

One American Amateur, **Jim McNutt WA6OTP**, has done a lot of work in this area and even sells a small kit for building a PTO v.f.o. He runs a fine website which includes several designs using PTO techniques.

Jim uses a brass threaded core moving in and out of an inductor former to vary the frequency of the oscillator and claims good stability using this method. Since good stability at high frequencies is no mean achievement, I decided to try this method for myself.

Circuit Diagram

The diagram, **Fig. 1**, shows the circuit of the PTO oscillator I tried based on the WA6OTP work. In this example, I decided to put the oscillator on the 7MHz Amateur band.

The circuit is a single f.e.t. oscillator with a permeability tuned inductor in the feedback path. The output is taken from the drain, which has an inductive load, a moulded 100µH choke.

The oscillator requires a stable 6V power source and I used a lantern battery. This is because I had one handy, but a 6V regulator chip would probably be more appropriate.

Like all high frequency (h.f.) oscillators, the method of construction is almost as important as the circuit. Most common v.f.o. circuits are capable of good stability but so often the stability depends upon the way the circuit is constructed.

Good mechanical construction, a tidy, compact, layout and the rigid mounting of parts all help to maintain stability in an oscillator circuit. My advice is that you build a v.f.o. as if you intend to kick it around the floor without damage. It will probably then be stable in use!

Another essential is the use of good quality components. The capacitors associated with the tuned circuit can be a source of frequency drift according to the ambient temperature. Cheap ceramic capacitors will almost certainly cause frequency drift in this circuit. So, I suggest you choose temperature stable capacitors.

Like many of my v.f.o. circuits, I used polystyrene capacitors in my prototype. Another good choice are the smaller NPO type disk capacitors.

The NPO types look like normal ceramic capacitors but have a black strip on the top. This form of capacitor have very low temperature drift; typically less than ±100p.p.m. (parts per million) per degree Centigrade. The critical capacitors are the 330pF and the 18pF at the gate of the f.e.t.

Tuned Inductor

Now to the heart of the oscillator circuit; the construction of the permeability tuned inductor. This may require some ingenuity on the part of the reader but I'm sure you'll use your skills to the best advantage.

In my junk box I had several of the 0.25in Aladdin plastic coil formers, so common in the days before toroidial cores became popular. I also had some lengths of threaded brass studding that happened to be a loose slide fit inside the formers.

Readers without such a rich source of radio parts, or, as my wife calls it, "clutter", may have to improvise ***(see note)**. Finding a suitable piece of threaded brass would be a good starting point. The next stage would be to find, or make, an insulated sleeve to fit over the brass core.

The photograph shows my method of construction. I made a base plate with two end pieces from off-cuts of double sided printed circuit board material. One of the end pieces becomes the front panel with a suitable nut soldered around a hole to take the threaded brass core.

The coil former is firmly mounted on the opposite panel and aligned with the brass core (or almost aligned, as in my case!) I'm sure that enterprising *PW* readers will find even better ways to build and secure the mechanics. Essentially, the task is to provide a method of moving a core smoothly in and out of a former.

* **Note:** *Old car radios are a good source of suitable permeability tuning systems. The cores and tuning mechanism can be used complete (with mechanical tuning drive), or the separate components used to make what you need.* **Editor**.

Tuning Over 7MHz

Using the type of former of core I've described and the values in Fig. 1, I found that 45 turns of 32s.w.g. wire enables a tuning range across the 7MHz band. This will vary according to the diameter of the former used and may require a little experimentation.

I built the oscillator below the former using point-to-point 'Ugly' construction techniques. With this form of construction it's helpful to have a firm mounting for the coil winding. To achieve this I used insulated stand-offs to secure each end of the coil.

The circuit of Fig. 1 proved surprisingly stable in its own right. For most applications a buffer amplifier will be required between the oscillator and whatever circuit it's to drive.

The buffer amplifier, shown in **Fig. 2**, is simple and improved the long term stability of the oscillator. Again this was added Ugly style on the other side of the coil former.

In my prototype I used the same lantern battery to power the buffer amplifier. However, the buffer amplifier could be run from a 12V supply with a 6V regulator chip producing the oscillator supply. (This arrangement is shown in **Fig. 3**.).

I was quite impressed by the little PTO v.f.o. So why not join the giants of Amateur Radio manufacturing and go down the PTO oscillator route? Get that soldering iron plugged in and have a go!

PW

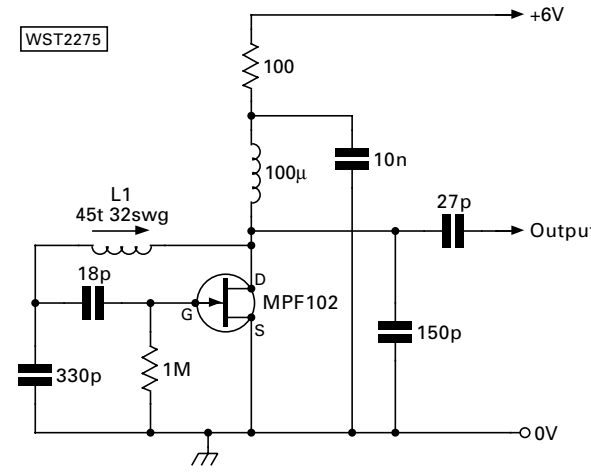


Fig. 1: The circuit of the PTO oscillator G3RJV tried. The circuit is based on the work of WA6OTP work. In this example the oscillator is designed for the 7MHz Amateur band (see text).

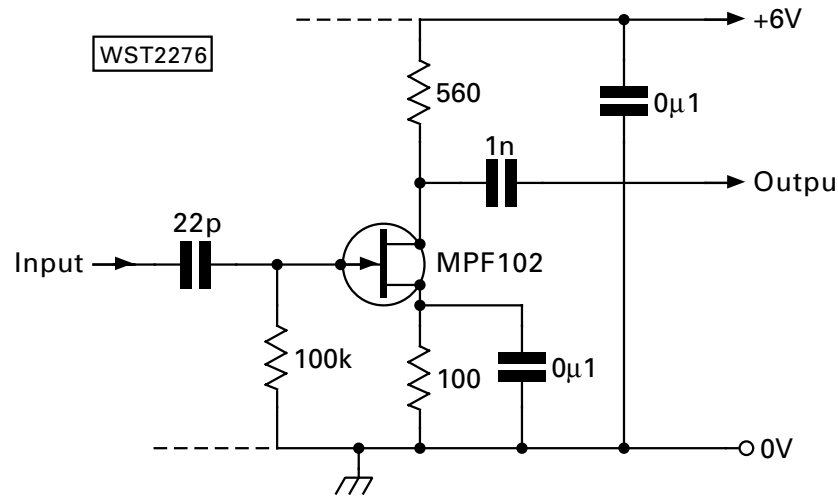


Fig. 2: For most applications a buffer amplifier will be required. The buffer amplifier, shown here is simple and George G3RJV found it improved the long term stability of the oscillator (see text).

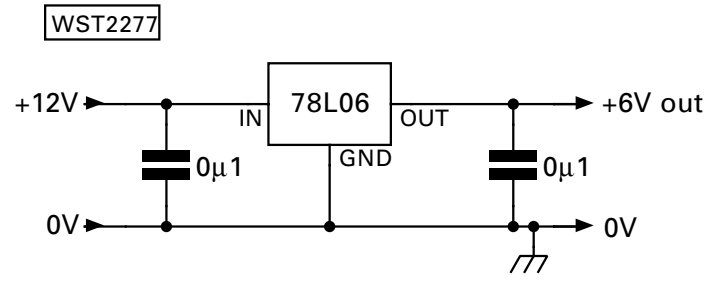


Fig. 3: Although G3RJV used a battery power supply for the prototype, the buffer amplifier could be run from a 12V supply. A suitable circuit is shown here, with a 6V regulator chip producing the oscillator supply (see text).

Valve & Vintage

Charles Miller continues the fascinating story of his life in radio and television servicing in the Miller Memoirs. This gripping instalment recalls imploding cathode ray tubes and other adventures!

Television sets began to get larger in the mid 1950s as the public started to demand bigger pictures. Prior to this, the vast majority of sets had been of the 9, 10 and 12in variety. However, EMI had made some monster 15in sets employing a vast narrow-deflection cathode ray tube (c.r.t.) that stood about three feet high. Changing one of these beasts was a daunting task, when all the warnings we had received about imploding tubes came vividly to mind.

Whilst he and his parents were having a meal in the next room the tube spontaneously 'went off' and blasted fragments of glass in all directions.

We were supposed to wear goggles and gloves when handling c.r.t.s, but what good they might have been is debatable. In fact, in Stoke-on-Trent a dustman had actually received fatal cuts when attempting to deal with a tube that some idiot had put out with the household rubbish and which had 'gone off' like a bomb.

Luckily, I never had any personal experience of dangerous implosion but my assistant 'Big Ken' had an unnerving one. Working at home, he had changed an EMI aluminised 10in tube and had left the old one sitting on the front room table (in those days front rooms were seldom used).

Whilst he and his parents were having a meal in the next room the tube spontaneously 'went off' and blasted fragments of glass in all directions. Ken was retrieving bits from the carpet for weeks and never did get them out of the ceiling, where for ever after they glistened in the lamp-light like a night sky in the tropics.

Doomed Attempts

Two manufacturers, English Electric and Mullard, made doomed attempt to produce non-implodable c.r.t.s with envelopes made not of glass but of steel. These turned out to be one of the most potentially dangerous - and I mean that in all senses of the word - devices ever used in domestic receivers!

On the non-implodable tubes the entire envelope acted as the final anode for the c.r.t and thus carried up to 15kV. This meant that the tube had to be mounted on thick insulating blocks and that it became virtually impossible for an engineer to carry out any above-chassis adjustments with the set running. Thank heaven, that idea sank without trace within a very short time!

A different but equally ill-fated attempt to produce really large pictures without the need for monster c.r.t.s was the projection system whereby a brilliant picture, built up on a tiny 2.5in tube, was magnified optically and thrown onto a screen that could be anything from 20 inches to 4 feet across.

The trouble was that although the picture on the c.r.t. was indeed blindingly bright, by the time it had passed through the optical system and reached the screen it was, in the vernacular of the period, about as dim as a Toc H lantern.

To try to counteract the dim picture the screens were made of a special (alleged) light-enhancing material which appeared to us on the sharp end to make matters worse! This was because the viewers had to sit bang in front of it to be able to see anything - if you moved too far to one side the picture disappeared.

Another problem was that none of the very few firms which essayed projection TVs had never, in our estimation, even made a decent reliable conventional set. If you owned a 'proj' you might as well invite a service engineer to move in as a lodger.

The already complex receiver circuitry favoured by the projection TV firms was made even worse by the need to provide protection for the c.r.t. in the event of one or other of the time bases failing. This was absolutely essential because if either the frame or line scan collapsed, the resulting single bright line would be burned into the c.r.t. screen in a matter of seconds.

The protection circuits were supposed to bias the c.r.t. to cut-off as soon as a time base failed. But they

didn't always work and unless the customer was prepared to put up with a thick black line across or up and down the projected picture the tube had to be changed.

A replacement was not all that dear at around £7. Unfortunately though the work involved in fitting it was considerable, as the optical system had to be dismantled to get the old one out and the new one in.

When this part of the job had been completed the entire optical system had to be realigned and re-focussed at great personal risk to the engineer. The final anode of the tube ran at no less than 25kV and it was virtually impossible to avoid a spectacular corona discharge from around the connector.

In order to get at the optical adjustments you had to place a hand uncomfortably close to the miniature aurora borealis and the whole procedure was fraught with powerful apprehension. Again, thank heaven, projection sets disappeared from the domestic scene within a few years and conventional c.r.t.s again became universal.

Deflection Angle

The bigger tubes that started to appear had a deflection angle of about 70° and were much shorter 'back to front' length than their predecessors. They had moulded front panels that were rectangular in shape and came in 14, 17 and even 21in sizes.

Actually, the quoted dimensions were really a bit of a cheat, because they referred to the diagonal of the front panel and not to its width. The glass itself was around half an inch thick at the front so the actual screen area was a good deal less than might be expected.

In fact, in some cases the actual picture on some so-called 14in tubes was smaller than that on an old 12in round-face type! Try explaining that to a customer who thought he had moved up in the world.

As tubes got bigger, so did the cabinets in which they were housed and it became impossible to fit more than two 14in sets in the little Morris 5cwt van, and only one 17 or 21in model. This caused a lot of extra driving to-and-fro on collection and delivery work and made the acquisition of a larger van essential.

Once again luck came to my aid because at about this time the Attlee government's British Road Services was being denationalised by the new Conservative administration and batches of commercial vehicles were being sold off all around the country. Although I didn't want to buy a lorry, the existing regulations governing road haulage worked in my favour.

In those days, you couldn't just buy a lorry and deliver goods anywhere you wished, your sphere of activity being restricted by the class of licence allocated to the vehicle. It sounds crazy nowadays but some lorries were not permitted to go beyond 25 miles from their bases!

However, in some cases 'Special A' licences were awarded which gave unlimited radius of operation and as may be imagined, these were very much sought after. A haulage contractor I knew slightly, bought two Austin 10cwt vans for £400 each - a large sum of money then - simply to get the Special A licences that went with them and which could be transferred at once to large lorries.

Equipping the lorries with the 'Special A' licences left him with two vans he didn't really want. So he offered me the better one for a nominal £100, to be paid in instalments if I so wished.

I gave him £60 on account and the other £40 when I sold the Morris for only a few pounds less than I had paid for it. The van - registration HXY99 - had been a service engineer's van for the Hay's Wharf Cartage Company and probably had been driven by only one person from when it was new in 1947.

Specially Commissioned Van

The van must have been specially commissioned because unlike the standard Austin 10cwt model it had a chromed radiator grill and other bright work that would otherwise have been painted black. Its engine was a 36 b.h.p. side-valve type which drove through a four-speed gear box.

Although my 'new' vehicle was not particularly fast its excellent top-gear performance combined with good steering and brakes made it very pleasant to drive. It proved to be an excellent investment for its load space was three times as big as the Morris and although its fuel consumption was twice as much it was still a much more economical proposition to run.

The van also provided my first wife and I with some good, cheap holidays. This was because we'd found it was possible to lay out a full-sized mattress in the back and to use it as a camper van!

On one of our trips an unnerving incident occurred, the outcome of which I would dearly like to know. Our route to the sea-side took us through the village of Croxton Kerrial*, just outside what was (and still may be, for all I know) a pull-off from the main road where, from the high hedge bank, jutted out a two-inch pipe which constantly discharged clean water.

We stopped here to refill our several small water-carriers and while I was engaged on the first, with my wife remaining in the passenger seat, a Hillman *Minx* came down the road and turned off into a side lane.

The Hillman's occupants got out and set out an elaborate picnic on the grass. I took my time in filling the other water carriers and as I came to the last I was startled to hear the thunder of approaching hoof beats. Glancing up, I perceived a mad bull charging towards me with its head lowered and steam jetting from its nostrils..... **(To be continued)**

Located on the A607 between Melton Mowbray and Grantham (The water still flows!). **Editor.* *pw*

.....”Although my ‘new’ vehicle’ was not particularly fast, its excellent top-gear performance combined with good steering and brakes made it very pleasant to drive. It proved to be an excellent investment.....”

VHF DXER

DAVID BUTLER G4ASR
YEW TREE COTTAGE
LOWER MAESCOED
HEREFORDSHIRE
HR2 0HP
TEL: (01873) 860679
E-MAIL: g4asr@btinternet.com

REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

DAVID G4ASR REPORTS ON THE VERY LARGE AURORAL OPENINGS WHICH AFFECTED THE VHF AND UHF BANDS

One of the attractions of working DX on the v.h.f. and u.h.f. bands is the multitude of propagation modes that are often encountered, many without any warning. You just don't know what the day will bring and propagation during October provided an excellent example of this. There was 50MHz trans-equatorial propagation (t.e.p.) to Africa, F2-layer conditions to Australia and Sporadic-E (Sp-E) openings throughout Europe.

The *Orionids* meteor shower and other minor streams during the month provided many meteor scatter contacts on the 50, 70 and 144MHz bands. On the 144MHz band there were periods of enhanced tropospheric propagation to Scandinavia and on 430MHz a very large parabolic dish antenna on Svalbard (JW) was activated enabling single-Yagi antenna stations to make moonbounce contacts with this very rare country. All very exciting but then right at the end of the month the Sun exploded with such devastating force that it created one of the best periods of auroral openings in over a decade.

PROPAGATION REPORTS

Before detailing the auroral back-scatter events I'll briefly take a look at your other propagation reports starting with the 50MHz band. Trans-Equatorial openings were reported on October 4 at 1630UTC with reception of the TR0A beacon (Gabon), on October 23 between 1630-1730UTC to the station of ZS6WB (South Africa) who was using JT44 transmission mode, on October 25 around 1115UTC to the station of TY5ZR (Benin) and on October 29 at 1115UTC to the beacon stations TR0A and ZD8SIX (Ascension Island). All these openings were of fairly short duration and restricted to stations in southern England and Wales.

Surprisingly F2-layer propagation was also reported, although in reality it was probably a mixed-mode path with some form of E-layer propagation at the European end. On October 7 at 0945UTC the station of VU2ZAP (India) was heard in south-east England with signals peaking to S9.

Even more surprising was reception on three days between October 27-29 of Australian stations. Between 0845-0900UTC on October 27 the station of VK4ABW was heard on 50.110MHz by operators in south-east England. On October 28 at 1145UTC the station of MW1MFY (IO81) heard a weak unidentified VK6-station calling CQ on 50.110MHz and on October 29 at 1110UTC the VK6RSX beacon (50.304MHz) was heard by stations in south-west England.

Sporadic-E openings were reported on eight days during the month, quite a high number considering that the summer Sp-E season had effectively petered out by the middle of August. Some 50MHz openings were widespread and included countries such as Austria (OE), Azores (CU), Croatia (9A), Czech Republic (OK), Germany (DL), Greece (SV), Israel (4X), Italy (I), Malta (9H), Morocco (CN), Poland (SP), Portugal (CT), San Marino (T7), Slovenia (S5), Spain (EH), Sweden (SM), Switzerland (HB9), Ukraine (UR) and Yugoslavia (YU).

On 144 and 430MHz many stations reported enhanced tropo propagation especially in the periods October 11-12 and 17-18. During the first of these openings the bands were open deep into Germany, Austria and Switzerland. Some of the stations worked on c.w. and s.s.b. included DF1CF (JN57), DG2KBC (JN58), DK1FG (JN59), DG5CST (JN60), HB9QQ (JN47) and OE5XBL (JN68).

The tropo opening around October 17-18 enabled stations in Scotland to work into eastern Germany whilst other UK operators in central England and Wales found a path into Scandinavia. Some of the callsigns reported included LA3BO (JO59), OZ0JD (JO47), OZ2LD (JO54), SM6EAN (JO57), SM7RYO (JO76) and SM7WT (JO65).

During the weekend of October 17-18 the large 32m diameter parabolic dish located at the EISCAT Svalbard radar facility at Longyearbyen, Spitzbergen was activated on the 430MHz band. At this frequency the dish has a gain of 42dBi and this enabled stations running 100W and a single Yagi to make c.w. contact with this rare Arctic country. Using the callsign JW/SM2BYA many contacts were completed including those with the stations of G3LTF, G4FUF and G4RGK.

CQ AURORA!

Astronomers can't remember the last time that two Jupiter-sized sunspots crossed the face of the Sun at the same time. Indeed, these sunspots were very easy to see **but you must never look directly at the Sun**. Always use safe solar observing methods instead (interestingly though, one morning when the Sun was low on the horizon behind heavy mist I was clearly able to view the enormous sunspots with the naked eye. I'm not sure how safe this was though!).

Both Sunspots (termed 484 and 486) had complex magnetic fields that harboured energy for X-class solar flares and on October 28 one of the most powerful solar flares in years, a remarkable X17-category explosion, erupted from giant sunspot 486 and as a result a strong solar radiation storm commenced. The explosion hurled a coronal mass ejection (c.m.e.) directly towards Earth and when it left the Sun the cloud was travelling at 2125 km/s (almost 5 million m.p.h!). A day later another c.m.e. was hurled towards Earth by an X10-class explosion again from giant sunspot 486. These two very fast-moving clouds of gas from the Sun swept past Earth, one on October 29 and one on the 30th sparking extreme geomagnetic storms and associated auroral back-scatter openings on all bands up as high as 430MHz.

Propagation was widespread with contacts on the 50 and 144MHz bands being made with stations from Scandinavia in the north, through the ex-Russian Republics, down to Croatia and Italy and as far south as Bordeaux in southern France. Auroral contacts on the 70MHz band were livened up by stations from Denmark (OZ) who have recently gained access to the band and on the 430MHz band UK stations were working as far away as the Czech Republic (OK).

Jamie Ashford GW7SMV (Monmouthshire IO81) was active on both evenings using s.s.b. on the 144MHz band. On October 29 between 1710-2150UTC he made 20 QSOs with stations in DL, EI, F, G, GI, PA and SP. His best DX of the evening were contacts with SP1FPG (JO73) at 1206km, SP2BDR (JO83) 1415km, SP2MSL (JO92) 1513km and SP7TEE (JO91) at 1540km.

On the following evening Jamie was QRV between 2040-2145UTC making 18 s.s.b. contacts with stations in DL, F, G, ON, PA and SP. Most contacts were around the 500km mark with his best DX being the station of SP1IQW (JO94) at 1505km.

● Anto IK4PMB (JN54) was active on the 144MHz band during the aurora on October 29. Equipment from left to right: 8877 1kW amplifier, Icom IC-735 transceiver, Icom IC-275H transceiver and Yaesu FT-225RD transceiver.

I was active from my QTH (Herefordshire IO81) from 1415UTC on October 29. For the first hour I remained on 50MHz making 18 c.w. contacts with stations in DL, EI, G, GM, GW and LA. At 1715UTC I moved up to the 144MHz band staying there (apart from a two-hour break for an Auroral-E opening on the 50MHz band!) until 0230UTC the next morning.

A total of 80 c.w. contacts were made with stations in 20 countries, DL, EI, F, G, GM, HA, HB9, LX, LY, OK, OM, ON, OZ, PA, SM, SP, S5, US, YL and 9A. Most contacts were in excess of 800km as very few local contacts were made. In fact I only worked one station in EI, G and GM and two each in ON and PA. Here's some of the DX stations worked on c.w. over 1500 kilometres, S51ZO (JN86) 1507km, HA2RD (JN87) 1512km, SM0KAK (JO89) 1543km, SK0UX (JO99) 1556km, 9A6WW (JN86) 1557km, OM5KV (JN97) 1576km, SP7OGP (KO01) 1580km, SP4MPB (KO03) 1590km, SM3BEI (JP81) 1597km, HA5KG (JN97) 1666km, HA5CW (JN97) 1667km, LY2FRL (KO16) 1732km, HA8V (KN06) 1795km, HA0HO (KN07) 1805km and YL2LW (KO26) 1830km.

The best DX of the evening came at 2233UTC with the Ukrainian station US5WU (KO20) at 1900km. It's important to note that DX stations **never** come in when beaming due north from the UK. To work stations in SM, LY and YL I beamed between 20-30 degrees, for DL stations it was around 55 degrees and for OK, HA, S5 and 9A stations it was 70 degrees. All auroras are different but you really do need to keep the antenna moving around to pin-point the best reflecting point for the area you want to work.

Gordon GI6ATZ (IO74) had a tremendous time on the 50 and 144MHz bands. On 50MHz he uses an Icom IC-706 MkII transceiver, a 3-500Z amplifier running 400W and a 4-element Yagi. On that band he made 33 s.s.b. contacts with stations in 11 countries, DL, EI, G, GI, GM, OH, OK, OZ, PA, SM and SP. Included in the DX were the stations of OK1AVQ, OZ3ZW, SM3LIC, SM3UZS, SM7DTT, SM7FJE, SP2CNW, SP5ENA, SP5MXL, SP6NVN/3 and SP9HMC/1. All these were in the range 1400-1800km.

Gordon's longest distance contacts however, were with stations located in Finland. These included OH6KTL (KP02) at 1800km, OH1AYQ (KP12) 1877km, OH7TE (KP20) 1931km and OH7PF (KP42) at 2231km. Even better results were made on the 144MHz band. Running an Icom IC-251E transceiver with a replacement MuTek front-end, an amplifier with a pair 4CX250Bs running 400W and a 13-element Cushcraft Yagi he made 86 s.s.b. QSOs with stations in 11 countries, DL, EI, F, G, GW, HB9, OE, OK, ON, PA and SP. On this band his best DX contacts were with OE3FVU (JN78) at 1654km, SP2MSL (JO92) 1665km, OK1COM (JN79) 1669km, SP7TEE (JO91) 1718km, OK2BRD (JN99) 1728km, SP9XLC (JO90) 1738km, SP9APC (JN99) 1783km and SP9APC (JN99) at 1791km.

TRANSATLANTIC BEACONS

Recently I've been discussing the possibility of someone making a terrestrial contact across the Atlantic Ocean to North America on the 144MHz band. **Frank Davis VO1HP** passes on the news that to assist such an experiment, the **Marconi Radio Club** of St. John's and the **Baccalieu Amateur Radio Club** of Carbonear, Newfoundland have recently commissioned a new transatlantic beacon. Using the callsign **VO1ZA** the beacon operates on 144.400MHz from locator square GN37JS. The v.h.f. exciter board and the c.w. identification module were built by **Joe Craig VO1NA** and the transmitter uses the 250W power amplifier previously used by the VE1SMU beacon. An 11-element Cushcraft Yagi, 1/2in hard-line feeder and 35A power supply to run the beacon were donated by Frank VO1HP. The resulting 2.5kW e.r.p. from the beacon is directed towards the UK thus making it very suitable for transatlantic monitoring.

A proposed transatlantic beacon is being sponsored by the German v.h.f. magazine *Dubus*. Located on the island of Bermuda (FM72) it will use the callsign **VP9DUB** on 144.301MHz. A Six Metre beacon on 50.026MHz is already operational. These beacons will complement the European transatlantic beacons of GB3SSS (operated by the Poldhu Radio Club, Cornwall) on 144.407MHz and F5XAR (IN87) on 144.405MHz.

Oliver Dröse DH8BQA mentions that during the night of October 30-31 there was transatlantic auroral propagation between Europe and North America on the 28MHz band with UK stations making contacts with W1 (USA) and VE1 (Canada) stations around midnight. The Canadian beacon VE9BEA was heard peaking 51A, as was the CS3B beacon located on the island of Madeira. Olli wondered if anyone tried listening for transatlantic 144MHz beacons during the auroral openings?

Chris Bartrum GW4DGU (IO71) reports that he spent some time unsuccessfully listening for the VO1ZA beacon (144.400MHz) and mentions that the station of EI5FK (Eire) had also been listening. Chris is well aware that the geometry for auroral back-scatter on the VO1 to GW path doesn't exist. However, he does mention that there is a remote possibility of forward scatter on the 144MHz band and if we don't look for it, particularly during major auroras, we'll never find it!

Recently I reported that on August 8 the station of GM4JJJ (IO86) had heard EA8BPX (IL18) over a tropo path of some 3238km. Interestingly the path length from Newfoundland (GN37) to the west coast of Wales (IO72) is around 3400km. One day the 144MHz transatlantic path **will** be cracked!

DEADLINES

That's it again for another month and what a month it was. Thank you for your reports. Please keep sending them in to the address and by the date given at the top of the column.

Good luck with the DX and see you all again in the New Year. Happy Christmas!

David G4ASR

Trader's Table

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

Practical Wireless reader **John Warburton G4IRN** has returned from a DXpedition to the Seychelles (S79IRN, AF-024) and Mayotte (FH/G4IRN, AF-027) mentioned in the October issue. Although the operation was shorter than planned, John had three nights in the Seychelles where he made around 2400 QSOs followed by just over 7000 QSOs during a week's stay in Mayotte.

John said "The c.w. pile-ups in Mayotte were enormous and exhilarating. The only way to cope with such huge 'pile-ups' was to work split frequency. Some time was spent working s.s.b. and I was very pleased to contact a number of M3s who managed to find a few gaps in between some of the bigger more powerful stations!

Power output was 100W into a SteppIR vertical from both islands and it was interesting to note that the antenna on the beach in Mayotte, its radials running into the sea, was far superior to the installation in Seychelles. This was despite the fact that the latter was on top of a cliff 61m above the sea. The Seychelles location however was surrounded by dense vegetation, which may have absorbed some of the signal.

The majority of contacts were with Europeans, but I also took the time to listen out for the West Coast USA stations and made a number of long path QSOs at their sunrise and my sunset. There were lots of Japanese stations too and at times it seemed like the whole world was calling me. Now that I have returned home I will answer all requests for QSLs whether it be via the bureau (cards can be requested via E-mail) or direct". John's logs and more details about this DXpedition can be found at **www.qsl.net/g4irn**

STATIONARY ENGINE

Colin Topping MM3ACL in Gauldry, Fife has fitted a new head gasket to his 1943 Wolseley Stationary Engine first mentioned in September's column. This has now 'bedded down' so he was able to test run the engine with a load of 25A into three 12V hand lamps.

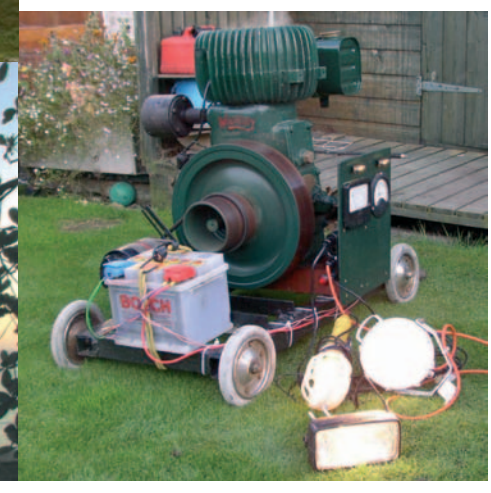
Colin says "A battery provides the initial current for the field coils and also acts as a big smoother. I ran my Icom 706 from it and I worked **Jerry EI9DZ** and **Shaun EI7CV** around 1600UTC on 7MHz. Reports were 59 all round with my power set to around 20W.

Jerry was very interested in the engine as he is an Engineer and has worked on several older stationary engines. The engine provided all the power for my shack supplying 12V d.c. for the radio and via a 12V d.c. - 230V a.c. inverter, the power for the lighting. The engine never noticed the load going on it and has run very smoothly since its overhaul producing 30A at 12.5V without the engine missing a beat! Real home-brew electricity and not bad for an old timer! I wonder just how many Honda or other wee engines will be running like this in fifty years time?

The magneto has also had an overhaul and is now throwing a spark over a gap of about 6mm (0.25in). Maybe I should connect my long wire aerial to the spark plug and run a spark transmitter? I should add that the meters came from my very good friend **Bob W1CNY** who has now retired from the US Navy. The voltmeter reads about 1.5V low, but as it is almost as old as the engine, I can forgive the low reading".

THIS MONTH CARL MASON GW0VSW IS JOINED BY A COUPLE OF NEW REPORTERS.

● Fair Isle Lighthouse.



● Colin Topping MM3ACL's 1943 Wolseley Stationary Engine, now fitted with a new head gasket.

YOUR REPORTS

I'll start this month with some contacts made by new reporter **Quentin Cruise GW3BV** in Aberystwyth who uses a Kenwood TS-570 supplied by the Radio Amateur Invalid and Blind Club (RAIBC). Using PSK31 and 25W to a G5RV antenna on 7MHz Quentin made contact with OE4AHG (Austria), EA5DXB (Spain), DL1RNL (Germany) and I3XUH (Italy).

Incidentally, the RAIBC was founded in 1954 and caters for the special needs of handicapped amateurs and short wave listeners. It provides various services to its members, regular h.f./v.h.f. nets and a magazine called *RADIAL*.

On to **Roy Walker G0TAK** in Kendall, Cumbria who had 10MHz c.w. contacts with LZ2LT (Bulgaria) 1261, EA6BH (Balearic Islands) EU-004 at 1855, SM7FCU (Sweden) 1919, HB9TZ (Switzerland) 1928, IT9/HB9CGA (Italy) on holiday in Scicily at 1931, IM0/HB9ASZ (Sardinia) EU-024 at 2017, PA7UL (Netherlands) 2148 using a Kenwood TS-570DG and G5IJ multi-band loop antenna.

THE 14MHz BAND

Peter Leybourne MM5PSL in Shetland has just returned from a few days on Fair Isle (EU012) working near the South Lighthouse. He had a great time using an Alinco DX-70TH and home-brew groundplane antenna making over 300 QSOs.

The only problem Peter encountered during his visit was the island generator. This shuts down at 2230 every night and restarts 0730 the following morning. With no battery back up he was forced to close down!

However, the highlight of the trip came one evening on 14MHz at 1819UTC when **Willy YI/KV4EB** called him from Northern Iraq (5/6) for a new country. Soon after working his first YI station, **Craig YI/AB8DY/QRP** called from Mosul using just 5W. Peter says "It pays to carefully scan the bands and listen for those weak or unusual callsigns. I have never worked a 'YI' station since I got my licence and then suddenly work two in 30 minutes".

In Chelmsford, Essex **Martyn Medcalf M3VAM** used an IC-746 connected to a SGC237 tuner and 8.2m of wire as the antenna to work OE4B/P (Austria) 1151, HA8RJ (Hungary) 1201, V33DZ (Belize) 1212, LA1K/P (Norway) 1347, SP9LJD (Poland) 1349, I5RFD (Italy) 1724, T91EDK (Bosnia-Herzegovina) 1904 and KQ3F (USA) in Harrisburg, Pennsylvania at 2317UTC.

In Newtonabbey, Northern Ireland **Peter Lowrie MI5JYK** enjoyed some s.s.b. QRP and his large log includes DL5AXX (Germany) 1505, 9A7P (Croatia) 1528, OK2FD (Czech Republic) 1536, ES5TV (Estonia) 1543, LY4AA 1550, EA4AFP (Spain) 1626, RK9CWW a club station in Ekaterinburg (Asiatic Russia) 1647, IS0LLJ (Sardinia) EU-024 at 1658, HB9RDE (Switzerland) 1700, 4L6AM (Georgia) 1725 and best DX A45WD (Oman) at 1736UTC using an MFJ-9420 and 5W to a ground mounted quarter wave antenna.

Band conditions have "improved this month" according to **Owen Williams G0PHY** in Biggleswade with plenty of strong signals from Australia (VK) and New Zealand (ZL) on 14MHz. Highlights include working ZL6QH at 0725 for his first mainland contact in four years of operating and R1ANB (Antarctica) at Mirny Base AN-016 at 1601 and R0PA which is a floating weather station in the Arctic at 1622UTC. All QSOs were made with 100W s.s.b. and a dipole antenna.

THE 18 & 21MHz BANDS

Another new reporter is **Jim GM7TUD** who lives in Dumfries, South West Scotland and used a Kenwood TS-450S, 80W and a G5RV to work some interesting DX on 18MHz. This included NP2BT (US Virgin Islands) NA-106 at 1208, OJ0LA (Market Reef) EU-053 at 1217, AA4V (USA) on NA-110 South Carolina State at 1315, HZ1AB (Saudi Arabia) 1334, YB0A (Indonesia) 1600, 9K2YM (Kuwait) 1635 and SU1SK (Egypt) at 1700UTC.

Welcome to **Billy Clayton 2E1WHC** who lives in Liverpool and used a Kenwood TS-570D with 50W s.s.b. and Crushcraft MA5V vertical on 21MHz working EU6 PW (Belarus), 9A2 ZZ (Croatia), RZ3EV (European Russia), YT1UM (Yugoslavia), UR5 NK (Ukraine) and 7X2DG (Algeria) between 1300 at 1500UTC.

Meanwhile our fourth new reporter **Stephen Welton G7BXU** in Reading also operated on 21MHz logging LB1AF (Norway) 1059, A97ZZ (Bahrain) 1110, VO1XT (Canada) 1141 and JO6XTM (Japan) for a 5/6 report at 1157UTC using a Kenwood TS-570D and 100W to a home-brew G5RV at 20 feet.

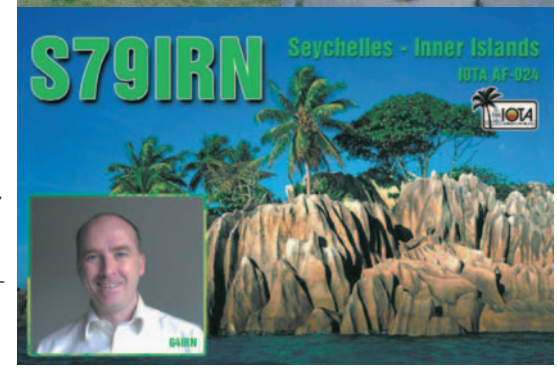
THE 24MHz BAND

On to 24MHz now and the log of an all-c.w. man **Ted Trowell G2HKU** on the Isle of Sheppy in Kent who worked A51AS (Bhutan), FH/G4IRN (Mayotte) and 9G5XA (Ghana) operated by G3XAQ all around 1600UTC and using an Icom 746 and Butternut HF6 vertical antenna.

Experimenting on this band was **Rob Hastings M3AHH** in Chelmsford, Essex who used a slightly different set-up trying out a Solarcom 90 CB antenna instead of his usual inverted Carolina Windom. Stations making the logbook include KB3HRC (USA) in Pennsylvania 1407, CS9C (Madeira Island) AF-014 at 1407, OE3RAA (Austria) 1430 and RN6BY (European Russia) in Novorossiysk near the Black Sea at 1442UTC. The transceiver was a Kenwood TS-50 and 10W s.s.b.

● Setting up the ground mounted quarter wave antenna.

● Peter Lowrie MI5JYK's ground mounted quarter wave antenna.



● QSL card from John Warburton G4IRN's DXpedition to the Seychelles.

THE 28MHz BAND

There has not been much activity on 28MHz over the past few months so I was pleased to see that **Owen G0PHY** made one s.s.b. contact with 5Z4IC (Kenya) at 1236 and Ted G2HKU logged A45WD (Oman), LU2FLN (Argentina) and 7Q7BP (Malawi) on the key slightly later at 1600UTC.

SIGNING OFF

Well, I have run out of space again and that's it for another year. My thanks go to all our reporters for taking the time to send in their logs and supporting the column. As usual it has been a difficult task selecting which contacts to include and I hope that I managed to fit you all in! Their reports just go to show that even though the bands are not at their best, there is still plenty of DX out there waiting to be worked.

As usual thanks to **Tedd Mirgliotta KB8NW**, Editor of the *OPDX Bulletin* for the DX information. I would like to wish you all a Merry Christmas and a Happy 'DX filled' New Year.

73, Carl GW0VSW

DATA BURST

ROBIN TREBILCOCK GW3ZCF
15 BROADMEAD CRESCENT
BISHOPSTON
SWANSEA
SA3 3BA
TEL (01792) 234836
E-MAIL: robin2@clara.co.uk or **gw3zcf@qsl.net**

ROBIN GW3ZCF HAS NEWS OF CW DECODERS, ELECTRONIC QSLS AND RTTY SOUNDCARDS

One of the nice things about writing this column is the interesting letters, E-mails and telephone calls I receive from readers. But I couldn't have been more surprised, after returning from a weekend away, to find a message on my answerphone from **David M0CGI**.

David and I had been physics students together in London, but we had not had any contact with each other since we graduated in 1961. David spent much of his career in New Zealand, where he held a ZL callsign and returned to the UK when he retired in the late 1990s. A reader of *PW*, David had stumbled upon the October Data Burst column and realised that I must be the same Robin Trebilcock he had known all those years ago! We spent a long time on the 'phone catching up on news of mutual friends and hope to have an 'eyeball' QSO one day.

MORE ON CW DECODERS

In October's Data Burst I recommended *CWGet* by UA9OSW, as a very effective soundcard decoder of c.w. signals, but for some reason the screenshot I sent would not print at the *PW* offices. I hope that we will be more successful this time. I was listening to the radio when I heard a CQ call from **John GW3COI** (whose cartoons regularly grace the pages of *PW*). I quickly booted up the copy of *CWGet,* which I have on my computer and John's impeccable Morse was accurately printed out by the software.

In **Fig. 1** you can see the end of a QSO with G3RYZ and the CQ call which John subsequently made. The long and short pulses (green) move across the screen from right to left, whilst the detector threshold (red) can be manually adjusted to separate the signal from the background noise. In this case the S/N ratio was very good, but often the signal drops down below the threshold and garbled characters result. The wide pulses represent dashes and the narrow ones dots, so the pulses on the screen read "cqcqc…", which appears at the end of the text displayed in the receive window above.

John's Morse is very good and is therefore accurately recognised by the software. Many operators develop a characteristic style or 'swing', which, although readable by a skilled human operator, defeats any software program I have ever come across. However, if you want to improve your own Morse speed you might find *CWGet* a useful training tool.

ELECTRONIC QSL CARDS

The old adage 'The final courtesy of a QSO is a QSL' still holds today and we are fortunate in the UK to have a QSL bureau operated by the RSGB which offers a free incoming QSL service to members and non-members alike. Staffed almost entirely by unpaid volunteers, the RSGB bureau handles many thousands of cards each year and is very reliable. This is not the case in every country however, and I often have cards for overseas QSOs returned with the overstamp 'Not a member'.

Because of the bulk posting arrangements between different bureaus there can often be long delays in transit and every envelope I receive from my sub-manager contains some cards for QSOs which are more than three years old. Collecting for awards can require a lot of patience – it was only very recently that I received my 100th country confirmation for PSK31, even though I passed the 100 countries worked landmark some time in 2000!

It's not surprising, therefore, that the growth of computer logging has led to the parallel development of an electronic QSL service. The service called **eQSL.cc** has been operating for several years now and is free of charge for outgoing and incoming electronic QSLs (though they welcome voluntary donations towards meeting the high cost of offering the service).

Signing on for **eQSL.cc** is easy. You need to supply your name, address, callsign and E-mail address to become registered as a user. You also select a QSL card from a range of free designs on offer, or for a small fee you can submit your own design. After that you upload your log in ADI format, which almost all modern computer logging programs will support. Upload time is about 1 minute per 1000 log entries. At that point, as a member, you'll find a lot of eQSLs waiting for you, from other members who have already submitted their logs detailing QSOs with you. You can either view these on-line or download them to make hard copies on your own printer.

An example of an eQSL card is shown in **Fig. 2.** If you don't want to go to the expense of printing all your cards, you can create a folder on your computer to store them in and then view them at your leisure, just as you would with 'real' QSL cards.

Recently, eQSL.cc have been issuing their own awards to mark various achievements. To qualify for one of these (and to allow QSOs with you to count for awards claimed by other members) you have to provide proof of identity. I did this by sending a photocopy of my licence which I scanned and sent as an E-mail attachment. Awards on offer include eDX (for confirmed contacts with 25 or more countries), eDX100 (for 100 or more countries) and eWAS (for all 50 US states).

The certificates are all issued by eQSL.cc. Most of the other awarding organisations are as yet reluctant to accept electronic confirmation. This may change in the future as a result of ARRL's Logbook of the World initiative. I will describe this in my next Data Burst column.

RTTY AND THE SOUNDCARD

After the second World War RTTY came into Amateur use by using surplus electromechanical teleprinters. There was little change until personal computers started to become available in the mid-1970s.

The traditional method of generating RTTY signals is by Frequency Shift Keying (FSK), in which a suitably enabled transmitter receives a simple on-off signal from a Terminal Node Controller (TNC), which is itself controlled by a PC. The signal shifts the transmitted carrier frequency, typically by about 170Hz. So, when the transmitter is not receiving an output from the TNC it might send out a steady carrier at, say, 14080.00kHz (the mark frequency), whilst when the TNC sends an 'on' signal the transmit frequency changes to 14079.83kHz

(the space frequency). By using suitable filters or d.s.p. techniques at the receive end of the link, these two tones can be distinguished from each other and a series of marks and spaces can be received as a digital signal containing a string of 0s and 1s.

For RTTY, the Baudot code is used to represent characters. Each character is defined using 5 bits (plus a start bit and a stop bit). That gives a maximum of 32 different combinations of 0 and 1, each representing a different character – not enough for all the letters of the alphabet plus numerals from 0 to 9. The number of available characters is doubled by introducing a figures shift command which allows a further 32 to be recognised. So, each combination of bits, for example 01010, can represent two different characters (in this case 4 and R) depending on whether the figures shift or letters shift is operational. Even so, fewer characters are available than in PSK or MFSK. Only capital letters can be sent, and symbols such as % and @ are missing – the latter causing problems if sending E-mail addresses using RTTY (though substituting & for @ seems to be well understood).

A more recent trend in RTTY is to use the soundcard of a PC to generate two audio tones, 170Hz apart and to use these to modulate an s.s.b. signal. If the carrier is sufficiently well suppressed, this Audio Frequency Shift Keying (AFSK) version of RTTY is almost indistinguishable from the original FSK method. However, if the transmitter is overdriven, all sorts of spurious signals will be generated in addition to the two required tones. The golden rules are the same as for PSK31 – don't drive your transmitter above 50% of its maximum output, ensure that your speech compressor is off and reduce your audio drive until the ALC reads zero.

In spite of the simplicity of AFSK it was slow to catch on, mainly bcause the receive performance of soundcard based systems did not compare with dedicated FSK detection modes. That all changed when a brilliant piece of free software was made available. The software, called *MMTTY* was written by **Makoto (Mako) Mori JE3HHT** and it offers receive performance, which is comparable with FSK receivers and, so long as you have your soundcard set up for one of the other digital modes, it won't cost you a penny to get onto RTTY.

So good is the performance of the *MMTTY* engine that, thanks to Mako's generosity in making it freely available, it provides the RTTY function in many other authors' multi-mode software. These include *Zakanaka/Logger32, Hamscope, WinWarbler, N1MM Logger, RCKRtty* and *YPLog*.

A picture of the *MMTTY* screen can be seen in **Fig. 3**. There is a waterfall and spectrum display, as well as the traditional XY scope. Signals are decoded digitally and several different algorithms are provided optimised for strong signals, weak signals with flutter, multipath reception conditions, etc. User configuration of all these parameters is possible, but my advice would be to leave well alone unless you really know what you are doing!

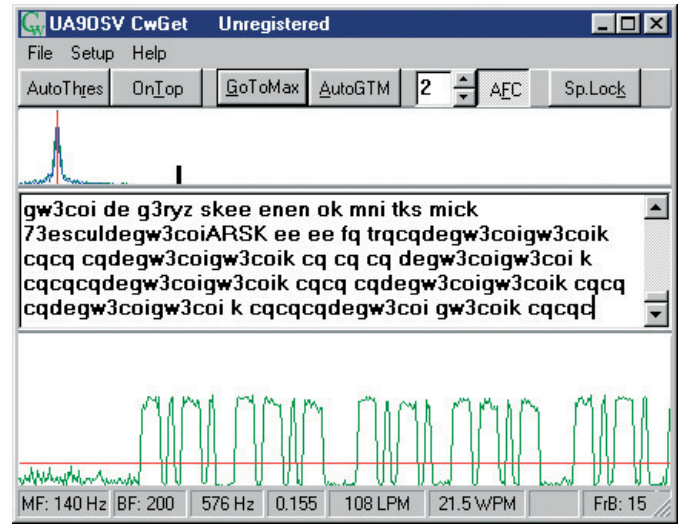
Incorporating a basic logging function, *MMTTY*, but one of its greatest strengths is for contest use. Options are offered for contest stations staying on the same frequency (running mode) and for the self-explanatory search and pounce mode. Standardised contest exchanges for each of these styles of operating are built in, together with automatic logging and incremental increase in QSO number. It really works very smoothly.

Well, my pen has run away with me again this month and I have run out of space. See you all again soon.

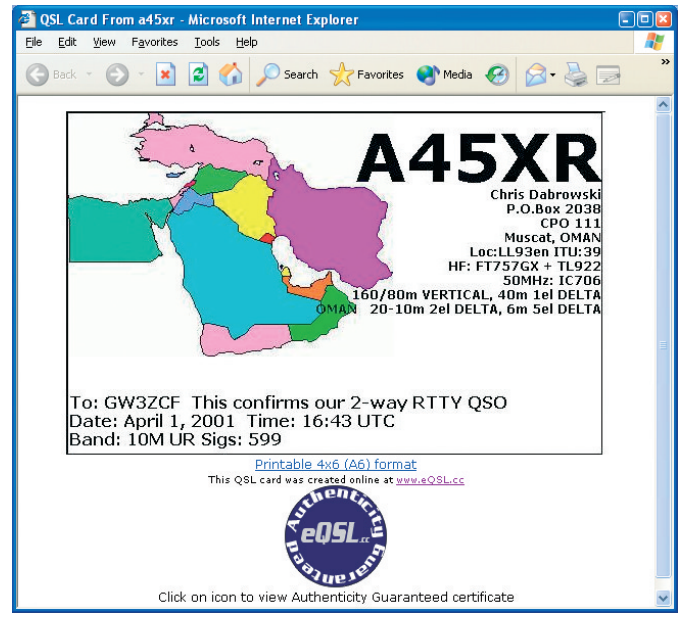
73 Robin
GW3ZCF

URLS FEATURED THIS MONTH

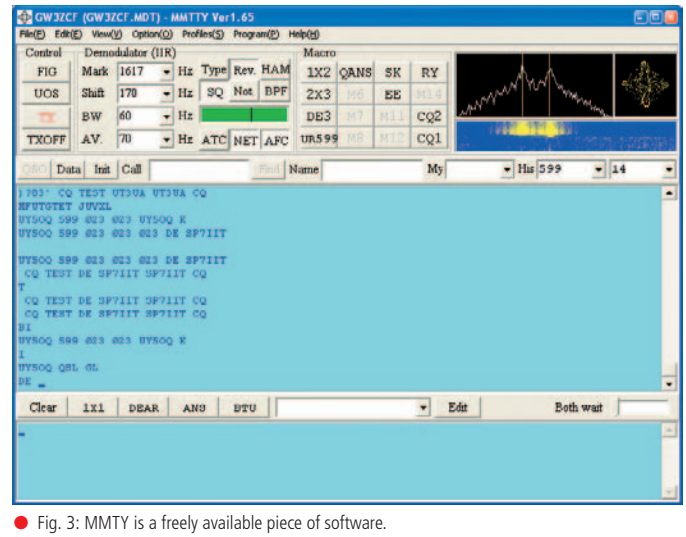
Program	Address
CWGet	http://www.dxsoft.com
MMTTY	http://www.qsl.net/mmhamsoft/
eQSL.cc	http://www.eqsl.org/qslcard/



● Fig. 1: The end of a QSO with G3RYZ and the CQ call which John GW3COI subsequently made (see text).



● Fig. 2: An example of an eQSL card.



● Fig. 3: MMTY is a freely available piece of software.

RADIOWORLD SECOND HAND LIST

MAKE	MODEL	DESCRIPTION	PRICE
Adonis	AM-805G	Desk Microphone, with Built In Compressor, and VU Meter	£70.00
AEA	PK-232MBX	TNC	£125.00
AEA	PK-900	TNC	£200.00
AEA	PK-96	TNC	£90.00
AKD	6001	6m FM Transceiver	£135.00
ALAN	HQ-2000	2kW 26 - 30MHz SWR / Watt Meter	£25.00
Alinco	DJ-G5EY	Dual Band Handheld	£199.00
Alinco	DJ-X10	Wide Band Receiver	£200.00
Alinco	DJ-X3	Handheld Scanner	£99.00
Alinco	DR-150	2m Transceiver with Air-and Receive	£150.00
Alinco	DX-70	HF & 6m Transceiver	£399.00
Alinco	DX-70TH	HF & 6m Transceiver (100W Output)	£475.00
Alinco	DX-77E	HF Base Station	£399.00
Ameritron	QSK-5	Amplifier Switch / Pre Heat	£200.00
Ameritron	RCS-4X	4 Way Switch	£99.00
AOR	AR-3000A	Wide Band Receiver	£450.00
AOR	AR-3030	HF Receiver, Including PSU	£350.00
AOR	AR-7030	Top Receiver	£550.00
AOR	AR-7030+	HF Receiver	£625.00
AOR	AR-8600	Base Scanner / Receiver	£425.00
AOR	AR-8600mkII	Base Scanner / Receiver	£499.00
AOR	AR-950	Communications Receiver	£89.00
AOR	ARD-2	Decoder	£200.00
AsCom	4 Metre	4 Metre, FM Transceiver, Including PSU. Base Station	£99.00
Comet	CD-270D	SWR Power Meter	£49.00
Cubic	CDR-3550	State of the Art 20 - 1300 MHz Digital Receiver	£4,999.00
Daiwa	CL-22		£20.00
Daiwa	CN-1001	Auto ATU	£99.00
Daiwa	CN-103L	2m / 70cms Cross Needle SWR Meter	£40.00
Daiwa	CN-540		£20.00
Daiwa	DK-210	Electronic Keyer	£60.00
Daiwa	LA-20		£99.00
Datong	ASP	Automatic Speech Processor for FT-817, FT-77 etc.	£70.00
Datong	FL-2	Filter	£60.00
Datong	FL-3	Filter	£75.00
Datong	RFA	Broad Band Amplifier	£20.00
Diamond	SX-100	SWR & Power Meter - 1.6 - 60MHz	£65.00
Drake	SW-8	World Band HF Receiver	£375.00
Fairhaven	RD-500VX	Wide Band Receiver	£525.00
Global	AT-1000	Manual Short Wave Tuner	£50.00
Hunter	750	Linear Amplifier	£599.00
Icom	AT-150	Auto ATU - IC-735 etc.	£175.00
Icom	BC-30	Battery Charger	£25.00
Icom	CM-35	Mains Battery Charger	£20.00
Icom	IC-2100H	2m FM Mobile Transceiver	£150.00
Icom	IC-2710H	Dual Band Mobile	£225.00
Icom	IC-271E	2m Multimode Transceiver - 25W	£299.00
Icom	IC-32E	2m / 70cms Handheld Transceiver	£99.00
Icom	IC-451E	70 cms Base AC	£299.00
Icom	IC-471E	70cms Multimode Transceiver	£299.00
Icom	IC-490E	70cms Mobile Transceiver	£250.00
Icom	IC-505	50 MHz Multimode Transceiver	£275.00
Icom	IC-575A	50 MHz Multimode Transceiver	£450.00
Icom	IC-7100	25 - 2000 RECEIVER	£575.00
Icom	IC-720A	HF & FM Transceiver	£400.00
Icom	IC-735	Base Or Mobile Transceiver	£399.00
Icom	IC-740	HF Base Transceiver	£350.00
Icom	IC-7400	HF / 6m / 2m Built In ATU	£999.00
Icom	IC-746	HF / 6m / 2m Built In ATU	£875.00
Icom	IC-746pro	HF / 6m / 2m Built In ATU Latest DSP Radio	£999.00
Icom	IC-756	HF / 6M All Band Transceiver	£950.00
Icom	IC-756pro	High Class Transceiver	£1,400.00
Icom	IC-821H	Dual Band Base - All Mode	£599.00
Icom	IC-910	2m / 70cms Base Transceiver	£999.00
Icom	IC-E90	Tri-Band Handheld	£220.00
Icom	IC-R2	Handheld Scanner	£99.00
Icom	IC-R5	Handheld Scanner	£125.00
Icom	IC-R10	Handheld Scanner	£229.00
Icom	IC-R70	HF Receiver	£299.00
Icom	IC-R7000	MINT CONDITION!!! Receiver	£550.00
Icom	IC-R71E	Receiver	£325.00
Icom	IC-R72	Receiver	£350.00
Icom	IC-R75	Receiver (With DSP Unit)	£499.00
Icom	IC-T21E	2m Handheld Transceiver	£60.00
Icom	IC-W2E	2m / 70cms Handheld Transceiver	£140.00
Icom	PS-55	Power Supply Matching IC-735	£100.00
Icom	RC-7000	Remote Control	£40.00
Icom	SP-20	External Speaker	£99.00
JPS	NIR-10	Noise / Interference Reduction Unit	£99.00
JRC	JST-245	HF 50MHz 1500w AC Base Transceiver	£1,295.00
JRC	NRD-525	HF Receiver	£375.00
JRC	NRD-545	DSP Receiver	£899.00
JRC	NRD-L2000	1kW Linear Amplifier Solid State (VERY RARE!!!)	£1,600.00
Kamtronics	KAM	Multimode TNC	£140.00
Kent	RA	Morse Paddle Key	£40.00
Kenwood	23cms	23cms Module for Kenwood TS-790E	£299.00
Kenwood	AT-230	ATU for TS-830S etc	£130.00
Kenwood	BC-15	Rapid Charger	£35.00
Kenwood	HS-5	Headphones	£25.00
Kenwood	MC-80	Desk Microphone	£40.00
Kenwood	PS-10	Power Supply for TR-9130 etc.	£40.00
Kenwood	PS-31	Power Supply (TS-870, TS-850, etc)	£135.00
Kenwood	PS-430	Power Supply	£100.00
Kenwood	PS-50	Power Supply	£145.00
Kenwood	R-2000	Receiver Including Converter	£275.00
Kenwood	R-5000	Receiver	£499.00
Kenwood	R-5000	Receiver With VHF Converter	£600.00
Kenwood	R-600	Receiver	£175.00
Kenwood	SP-430	Speaker	£45.00
Kenwood	SP-930	Speaker with Built In Filters	£65.00
Kenwood	SW-100E	SWR Meter	£25.00
Kenwood	TH-215E	2m Handheld Transceiver	£99.00
Kenwood	TH-235	2m Handheld Transceiver	£85.00
Kenwood	TH-47E	70cms Handheld Transceiver	£80.00
Kenwood	TH-79E	2m / 70cms Handheld Transceiver	£175.00
Kenwood	TH-F7E	Dual Band Handheld	£199.00
Kenwood	TL-120	Low Drive Linear Amplifier 100W HF	£150.00
Kenwood	TM-241E	2M Mobile Transceiver	£120.00
Kenwood	TM-251E	Mobile Transceiver	£140.00
Kenwood	TM-255E	2m Multimode Transceiver (Fair Condtion)	£299.00
Kenwood	TM-255E	2m Multimode Transceiver (MINT)	£395.00
Kenwood	TM-451E	70cms Mobile Transceiver - Data Ready	£175.00
Kenwood	TM-V7E	Dualband Mobile	£299.00
Kenwood	TR-2400	2m Handheld Transceiver	£50.00
Kenwood	TR-751E	2m Multimode Transceiver	£250.00
Kenwood	TS-450S	HF Base / Mobile	£499.00
Kenwood	TS-50S	HF Mobile / Base Variable Power	£425.00
Kenwood	TS-570DGE	Mobile / Base HF Transceiver	£675.00
Kenwood	TS-790E	Dual Band Base - All Mode	£750.00
Kenwood	TS-850SAT	HF Base Station with Built In ATU	£699.00
Kenwood	TS-950SD	HF 150W DSP Base Station	£1,200.00
Kenwood	TS-950SDX	Kenwood's Flag Ship	£1,650.00
Kenwood	VC-10	VHF Converter	£99.00
Kenwood	YG-455CN-1	270Hz CW Crystal Filer	£100.00
Kenwood	YK-88C-1	500Hz CW Narrow Filter	£40.00
Kenwood	YK-88CN1	270Hz CW Filter 8.83MHz	£40.00
Kenwood	YK-88S-1	2.4KHz SSB Narrow Filer 8.83MHz	£40.00
Kenwood	YK-88SN	1.8K SSB Filter	£40.00
Kenwood	YK-88SN-1	1.8KHz SSB Narrow Filter 8.83MHz	£40.00
Lowe	HF-225	HF Receiver	£175.00
Lowe	HF-350	HF Receiver	£295.00
MFJ	MFJ-1272B	TNC / Mic Switch	£20.00
MFJ	MFJ-1278	TNC All Mode	£175.00
MFJ	MFJ-207	HF SWR Analyser	£50.00
MFJ	MFJ-722	CW / SSB Filter with 5 Watts Amp	£59.00
MFJ	MFJ-784DSP	DSP Tunable Filter	£140.00
MFJ	MFJ-921	VHF 200 Watt ATU	£50.00
MFJ	MFJ-941E	Versa Tuner	£89.00
Microwave	28/144	28 / 144 MHz Transverter	£125.00
Microwave	MOD-144/30	30 Watt Amplifier	£79.00
Microwave	MML-144/100-S	100W 2m Amplifier	£99.00
Microwave	MML-432/50	50 Watt 70 cms Amp, with Built-In-PreAmp	£85.00
Microwave	Pre-Amp	Low Noise RF Switched Pre-Amp	£25.00
Midland	PowerPack	CB Power Pack (BOXED)	£50.00
Nissei	TM-3000	1.6 - 60MHz, 10W / 3kW, SWR Meter	£49.00
OptoElectronics	MiniScout	Frequency Counter	£129.00
PacCom	TNC-320	TNC	£90.00
Pres. Lincoln	10 METRE	10 Metre Multimode	£175.00
RadioShack	Pro-60	200 Channel Handheld Scanner (30MHz - 999MHz, WITH GAPS)	£99.00
RevCo	RS-2000	60 - 519 MHz Home Base Scanner	£79.00
Revex	V-540	SWR Meter	£25.00
Sangean	ATS-909	World Band Receiver	£130.00
SGC	SG-2020	HF Transceiver	£450.00
Sommerkamp	FT-290R	2m Multimode Transceiver	£150.00
Sony	SW-100E	FM/SW/MW/LW Portable Receiver	£90.00
Spectrum	RP-6S		£20.00
Standard	C-156E	2m Handheld Transceiver	£125.00
Standard	C-500	Dual Band Handheld	£99.00
Standard	C-510	2m / 70cms Handheld Transceiver	£125.00
Standard	C-510E	Dual Band Handheld	£99.00
TenTec	RX-350	HF Receiver	£999.00
Tokyo	HL-30V	2m - 25W Amplifier	£75.00
Tokyo	HL-35V	2m Power Amplifier with Pre-Amp	£89.00
Tokyo	HL-37V	Linear Amplifier	£60.00
Tono	T-777	Communications Terminal	£120.00
Transverter	QM-70	28/144 Transverter	£100.00
Trident	TRX-200	Latest Scanner	£175.00
Trio	TR-9000	2m Multimode	£199.00
Trio	TR-9130	2m All Mode Transceiver	£250.00
Uniden	UBC-860XLT	Base Scanner / Receiver	£99.00
Uniden	UBC-9000XLT	Base Scanner	£199.00
Welz	AC-38M	200W Mobile Matching Network	£50.00
Welz	CH-20A	Antenna Switch	£15.00
Welz	CH-20N	Antenna Switch	£15.00
Welz	CT-150	Dummy Load	£50.00
Welz	SP-15M	SWR Meter	£35.00
Welz	SP-380	SWR & Power Meter 1.8 - 500MHz	£30.00
WinRadio	WR-1550E	Trunking Software	£450.00
Yaesu	ATAS-100	Yaesu Active Tuning Antenna System	£175.00
Yaesu	FL-2025	Amplifier	£90.00
Yaesu	FP-30	Power Supply - FT-897, FT-857	£189.00
Yaesu	FP-700	Power Supply	£100.00
Yaesu	FP-707	Power Supply Unit	£80.00
Yaesu	FP-757GX	Power Unit for FT-757	£300.00
Yaesu	FR-101	HF, 2m, 6m Base Transceiver	£399.00
Yaesu	FRG-8800	Receiver Including Converter	£399.00
Yaesu	FRT-7700	Antenna Tuner for FRG-7700	£60.00
Yaesu	FRV-7700	Converter for FRG-7700	£60.00
Yaesu	FT-100	HF / 6m / 2m / 70cms Mobile Transceiver	£499.00
Yaesu	FT-1000MP	HF Base Station with Built In ATU with DSP	£1,199.00
Yaesu	FT-1000MPmkV	200W DSP HF Transceiver	£1,800.00
Yaesu	FT-1000MPmkV-Field	Top HF Radio - AC	£1,500.00
Yaesu	FT-101ZD	HF Base Transceiver	£275.00
Yaesu	FT-1500M	2m 50W Mobile Transceiver with DTMF Microphone	£129.00
Yaesu	FT-221R	2m Multimode Base Station	£200.00
Yaesu	FT-2600M	Mobile VHF / FM Transceiver	£120.00
Yaesu	FT-290RmkII	2m Multimode Mobile Transceiver	£225.00
Yaesu	FT-41R	Handheld Transceiver	£120.00
Yaesu	FT-50R	Dual Band Handheld	£150.00
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Yaesu	FT-51R	2m / 70cms Handheld Transceiver	£199.00
Yaesu	FT-690R	6m Multimode Mobile Transceiver	£199.00
Yaesu	FT-707	HF 100W Transceiver	£275.00
Yaesu	FT-7100M	2m / 70cms Mobile Transceiver	£220.00
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Yupiteru	MVT-7300	Multiband Handheld Scanner	£199.00
Yupiteru	MVT-8000	Base / Mobile Scanner	£199.00

TUNE-IN

TOM WALTERS
P.O. BOX 4440
WALTON
ESSEX
CO14 8BX
E-mail: tom.walters@aib.org.uk

TOM HAS LOTS OF NEWS THIS MONTH, ALONG WITH BIRTHDAY WISHES TO THE VOICE OF RUSSIA

It's time to sing Happy Birthday first of all to that grand old station that used to hide behind its 'Iron Curtain', endlessly pouring out its thoughts in that strange singsong not-quite English voice, over what seemed like hundreds of frequencies simultaneously. Step forward the one-time **Radio Moscow**, now of course **The Voice of Russia (VOR)**.

Voice of Russia is 74 - it's an odd age, so why are we celebrating? Well, why not? And there are some very good reasons. Voice of Russia is still big - the third largest radio station in terms of size, with 100 million listeners in 160 countries and is very much to the technical forefront, having been very active in helping with long-distance testing of the **DRM** system and now broadcasting daily to Europe using DRM.

You might have heard a distant cheer from the other side of the world, as **Radio New Zealand (RNZI)** finally received and assembled the spare parts for its damaged short wave transmitter. The RNZI service has been helped during the 'down time' on **9.580MHz** by the lease of a transmitter from Radio Australia. Things must be going well, since RNZI was being heard very nicely in the south of France on **11.820MHz**.

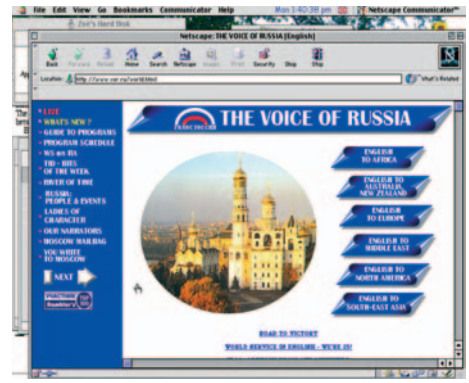
FUTURE OF DRM

Quite a number of stations have decided that **DRM** has got a future, among them is the US organisation **The National Association of Shortwave Broadcasters (NASB).** They are currently running a series of special joint broadcasts produced by the organisation's members and associate member stations.

Members of NASB carry mostly religious content and this is the first time in the NASB's history that it has produced joint broadcasts. Transmission, both in **Digital Radio Mondiale** mode, as well as in traditional analogue form.

The broadcasts, titled 'Voice of the NASB' will be transmitted in the DRM mode each **Sunday at 1330-1400UTC on 9.785MHz**, beamed primarily to Europe from the Rampisham facilities of VT Merlin Communications. Each programme will also be broadcast on **Sunday at 0330-0400 on 7.385MHz**, primarily to North America via WRMI in Miami, Florida. The broadcasts run until 28 March 2004. A special NASB QSL card will be issued for reception reports on these transmissions, both digital and analogue.

Jeff White, NASB President, commented: "We are very pleased to be a member of DRM and very pleased to be in the forefront of digital short wave broadcasting. While we believe that it is important to continue broadcasting in analogue form - especially to certain parts of the world - it is impossible not to see the tremendous advantages that DRM offers short wave broadcasters and listeners. DRM-capable receivers are already on the market place and the number of models is rapidly increasing, while the prices are rapidly decreasing. And with dozens of organisations already broadcasting in DRM, listeners will have more and more variety of programming to tune into".



Of course if we could just wave a magic wand and have wonderful digital services instantly on tap, what a revolution that would be. Unfortunately in the real world there is a bad fairy who must first be placated, and her name is Money.

The DRM system is just beginning the great struggle to get programmes and receivers and an audience. Meanwhile, there are of course several competing systems out there, each incompatible with the other. **XM Satellite Radio**, the US satellite radio service, claims now to be within sight of its goal of cashflow breakeven by the end of 2004. The number of subscribers is said to be growing rapidly and has very nearly reached one million. But how much investment has this required over the past few years, just to keep going?

The DRM facility is free for listeners, but XM charges a subscription. Before both of these came into existence, **WorldSpace** pioneered international digital broadcasting. Their system has been proved to work well, with satellites *Afristar* and *AsiaStar* between them covering a large chunk of the world.

But in spite of endless hype about how fast receiver sales are growing, there are persistent tales that the company is in deep financial trouble. Now comes news that WorldSpace, originally intended as a free service to the underprivileged of the world, is to charge for some programmes. For a package including Virgin Radio and a wide spread of music programmes, totalling about one third of the whole programme range, the annual charge will be £14 ($22). Far from being for the underprivileged, the new package and no doubt others to follow, will be aimed at US and UK expatriates, and military personnel overseas.

Will this strategy bring WorldSpace into profitability? The company needs 2.5 million subscribers to get into the black, but they probably haven't sold anything like that number of receivers, more like 200,000. WorldSpace claims to have sold 50,000 receivers in India. The company has spent at least 1 billion dollars so far and the 300-million dollar *AfriStar* satellite has only eight years' life left.

So what will WorldSpace do to survive? Receiver prices are falling, with Indonesian and Korean factories able to make them at about $US 100 to the public. There may be some mileage in charging the audience for services, although this goes against the grain, as many cross-border services are free. A more desperate measure is to sell off part of the company

It's still looking very shaky though, with more than £1 billion pounds owing to the original Middle Eastern backers. WorldSpace has a far more ambitious plan than XM and needs to move very swiftly to keep its head above water.

Bye for now, Tom

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Please avoid FAXing your advert - it could delay publication.

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You should state clearly in your advert whether equipment is professionally built, home-brewed or modified. The Publishers of *Practical Wireless* also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

For Sale

AOR AR3000A communication receiver, absolutely mint condition, all original packing, etc., £550 o.n.o. F. Gregory, Manchester. Tel: 0161-436 6676.

AOR AR8600 MkI scanner, 530kHz to 2040MHz, all-mode, used condition, p.s.u., manual, ant. not boxed, £300 o.n.o. Steve, W. Sussex. Tel: (01403) 268703.

Approx. 200 mags of *Wireless World* and *Practical Wireless*, dating from 1946, some complete years, fair condition, £150 o.n.o. Andrew on (01794) 368404.

Celestron telescope, model G8AAM, £850 - many extras. ETX90C telescope and web cam, cooled, £550. Tony G0CZV on (01430) 422657 or (01964) 630253.

Eddystone 1650/9, six filters, cabinet, manual, v.g.c., offers. Yaesu FRG-9600 scanner, £130. Icom IC-R10 scanner, £90. Kenwood TS-870, one owner, mint, offers. Wanted Grundig SAT700, 650, Icom IC-R8500 - exchange any of above. Tel: Essex (01279) 815020.

Electronic Iambic keyer, 5-35w.p.m., programmed PIC with auto-sleep, plus easy to build details, very few extra components needed, £10 inclusive. E-mail: chick@chickene.freeserve.co.uk

FT-101E with battery inverter, c/w YC601 digital display, unused for five years, £150 o.v.n.o. Collectors' items, boxed, in good condition. Wanted Yaesu YP150 wattmeter. Chris G7GJZ, Somerset. Tel: (01278) 786621.

Icom 290D, 20W 2m (144MHz) multi-mode, £150. Ian on (01520) 244078.

Icom 746 transceiver with FL-223 s.s.b. filter fitted and matching SP-21 speaker, superb condition, with boxes, mic., manual, leads, etc., £750 o.n.o. Martin G0HRZ, QTHR. Tel: 0208-597 0234.

Kenwood VC-H1 slow scan camera TV visual communicator, as new, boxed with lead and manual, £120 o.n.o. Wanted: manual, circuits for Yaesu FRDX-400 receiver, will pay postage/photocopying. Eric G3KXE, Southampton. Tel: 02380 466506.

KW2000, excellent condition, original boxes, handbook, circuits, spare valves, including p.a., plus KW dummy load, £75 - buyer collects. Bert, Essex. Tel: (01708) 743966.

MFJ-259B h.f./v.h.f. s.w.r. analyser, as new, £100. Heathkit HO-1250 solid state GDO, works well, £25 - both items plus P&P or collect. Tom, Nr. Portsmouth. Tel: 02392 461982 or g0hin@aol.com

Professional bench p.s.u., stabilised 200 to 350V at 0/150mA with three 6.3V windings and an 85V 1mA reference standard. Heavy, must collect, £25 o.n.o. Syd G3AIO on (01892) 822836.

***PW* (1987-2001) and *SWM* (1987-2002)**, Dec '96 and some '97 missing, £10 the lot. Buyer collects, will be skipped if not collected. Peter G4PLW on (01438) 871350 or g4plw@btinternet.com

R109 and R1392A receivers, £45 each, offers considered. Ken, East Sussex. Tel: (01323) 500174.

Radiogram HMV 1930 model 560, by Marconiphone, all working, cabinet, all polished, includes circuit and rare PT625 valve, buyer collects or arranges delivery, (h) 3ft, (w) 2ft, (d) 17in, £350. Tel: (01268) 728396 or E-mail: g0siv@clara.co.uk

Receivers: Plessey PR155G, working, £50. Eddystone 730/4, working, £100. HF-150, working, £80. Yaesu FRDX400, working, £40. Racal RA17 MkII, good condition, not working, £50. John, Kent. Tel: (01634) 817846.

Second World War battery receiver, 2-12MHz, as supplied to Resistance, pair 1920s 2 and 3-valved radios, pair WWII BC611D

walkie-mics, valve receiver Aewi (NZ), 6-25MHz, offers? GW3SIK, Ceredigion. Tel: (01239) 811019.

Silent key sale: TS-850S with Daiwa PS30XMII, Pactor PTC-11, Altai mast rotor AR-300XL and AVO7 Universal, £685 the lot. Tel: (01597) 840294.

Standard C5900 mobile, 6.2 to 40W f.m., like FT-8900R, £160. BNOS 10-50 linear with pre-amp, 2m (144MHz), boxed, £50. Altron 40ft tilt-over tower, all fittings and cage, 10ft section, ready to pick up, £150 in good order. Tel: Beds (01582) 653634.

Two teletypes, also quantity of new teletype paper rolls and tape in original boxes, also Quad valve f.m. receiver module, all sold as seen. Stan Green, W. Midlands. Tel: 0121-422 3654 or (01527) 69997.

Uniden Bearcat 9000XLT, very good condition, 500 channels, boxed, high performance, 25-1300MHz range, telescoping whip antenna and manual, mint condition, £100 o.n.o. Darren, Herts. Tel: 0208-449 7446.

Yaesu 230R 144MHz transceiver, v.g.c. with Slim Jim antenna, £65. Heathkit RA1 Amateur bands receiver, fitted crystal calibrator with G5RV antenna, £50. Bill, Hereford. Tel: (01432) 279641.

Yaesu FT-817, boxed in excellent condition, swap for Icom 706 MkII or Icom 703. Gondu Jim on (01242) 692667 or E-mail: gondu@tiscali.co.uk

Yaesu FT-847, mint, £900. Yaesu FC-20 a.t.u., £195. Yaesu MD100 mic., £70. bhi NES10-2 d.s.p. speaker, £65. MFJ-267 dummy load/s.w.r. wattmeter, £65 - all under one year old. Tel: E. Yorks (01262) 606212.

Wanted

A small to medium size adjustable spark gap, the one with the shiny metal spheres, as found in science laboratories. Also required is a Stylophone (dead or alive). David, Gloucestershire. Tel: (01242) 511750.

ANC4 antenna noise cancellor, alive or dead. David on (01844) 346341 or E-mail: david.r.bowman@talk21.com

AVO valve tester wanted, prefer CT160, but other models considered. Also seeking Plessey PV78B converter/keyer for my RTTY collection. Tel: (01482) 887938.

Push-pull valve audio output transformers, about 20W, w.h.y.? Also, circuit diagram for Codar CR70A communications set. Brian on (07786) 720332.

Racal receiver wanted: RA17W, RA17L or RA1772, also Racal MA79 driver and any Racal h.f. accessories. Tel: (01482) 887938.

Tuner front-end as made by Electroniques Ltd., general s.w. coverage, valve or transistor model. Eddystone tuning dial, slide rule type, good price paid for good condition. James Coubrough, Glasgow. Tel: (0776) 4190395.

Urgently wanted old half inch ferrite rods, must be half inch in diameter and be six inches long or more, will pay very good money for the rods. Peter on (mobile) (07931) 463823 from 0900 to 2230.

Valve regen receiver, full coverage, good working order, must be easily available valve, 90V ok. Also carbon microphone wanted. Tel: Derbyshire (01773) 829029.

Vintage Amateur Radio gear: Codar, Collins, Drake, Eddystone, KW, especially a.m./c.w. transmitters from Labgear LG300, Minimitter, also looking for KW-201, KW-2000E please let me know what you have for sale. Paul G4CCZ, Surrey. Tel: (01932) 342927 or E-mail: g4ccz@6metres.com

Wide band omni-directional or discone antenna, frequency coverage 25-1300MHz, AOR or similar. David on 0141-440 0702.

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NEW IN STOCK NOW!

RSGB Yearbook UK & Ireland Callbook

Published annually by the Radio Society of Great Britain, the *Yearbook* lists all registered Radio Amateurs in the UK & Ireland by callsign, surname and location, providing a useful reference source despite the growing numbers of Details Witheld entries. The *Yearbook* is more than just a directory as it also contains details on local Clubs, Licensing, Operating, a Foreword by Peter Kirby G0TWW and an introduction to the RSGB and the work they do. (Our Editor finds his copy indispensable!)

The *RSGB Yearbook UK & Ireland Callbook* is available from the *PW* Book Store for **£16.95 plus £1.50 P&P UK**, **£2.75 P&P overseas**. To order call **0870 224 7830** or post your order using the order form on **page 73** to: **Book Store, PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW**. Remember to include your payment (in Sterling, cash not accepted), name, address and telephone number with your order.

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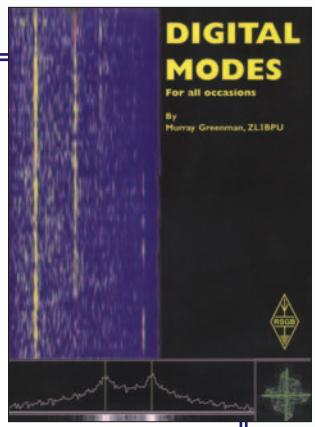

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topical talk

New Author Welcomed

In this month's Keylines, the Editor has welcomed Tony Nailer G4CFY as a new regular author to *PW*. Rob now completes the introduction and pays tribute to the man and the woman behind Spectrum Communications.

I first met **Tony Nailer G4CFY** personally over 12 years ago when I had a CB multi-mode transceiver converted to operate on the 28MHz band. However, even though it was a first meeting I had already heard of his wide ranging activities and expertise aided by the fact that I bought one of his 70 to 28MHz converters around 1982.

In recent years I've often been reminded of Tony's activities through Spectrum Communications - by the number of the low power Restricted Licence Service (RLS) temporary radio stations using his Band II v.h.f. f.m. transmitters and other equipment. These units seem to be long-lived and are popular with the broadcasters. The only problem from Tony's point of view is that as they are so reliable they don't seem to be replaced very often!

Born in Farnborough in Hampshire in 1948 Tony survived a life-threatening mis-diagnosed infection before he was a year old. Despite this set-back he went on to achieve a great deal and the list of achievements is impressive: HNC in Electronic Engineering and a Degree in Physics. Add to this 34 years industrial experience with mechanical, electrical, digital, analogue and r.f. electronics, together with much computer related work...you'll get the picture that Tony really enjoys his work in radio and electronic engineering!

Fig.1: Jean Nailer - Tony G4CFY's essential partner in marriage and business.

Working Partnership

Tony's marriage to **Jean** (neè Frampton) in Weymouth 1970 began a partnership which continues today. This is because Jean, **Fig. 1**, along with being mum to their sons **Adrian** and **Jonathan** (born in 1972/1973 respectively) works with Tony as the essential other 'partner' in the family business.

Chatting to Tony over lunch led me to realise that although I knew something about him and his work...I had only rippled the surface. It turned out to be the surface of a deep pool of experience and knowledge!

Tony served a four year apprenticeship in Electrical & Electronic Engineering, shared between the Royal Aircraft Establishment (RAE) Farnborough and the Admiralty Underwater Weapons Establishment (UWE) in Portland, Dorset.

After six years' service at the UWE, Tony and family went to South Africa where he worked with Racal (South Africa) designing and developing s.s.b. transmitters. He then worked with the South African Post office laboratories before returning to the UK.

Based in Poole, Tony worked for the Electronic Laboratories (Seafarer) designing, amongst other equipment, a direction finding receiver with a c.m.o.s. frequency counter. This work was followed by three years with Sperry Gyroscope in Weymouth where he was involved with designing and developing mine hunting and underwater surveillance equipment.

Spectrum Communications

Tony started working full time with his own company Spectrum Communications in October 1981. The range of products has included the design and development of r.f. amplifiers, pre-amplifiers, converters, transverters, receivers, transmitters and other devices covering the range from d.c. through audio and up to 1GHz.

Despite being so busy, Tony even found time to lecture at schools and colleges. This was of course on top of his own RAE tuition and exam centre operations!

Tony & Jean are now grandparents and actively support their sons. Incidentally, Tony keeps remarkably fit by walking the family dog every day. And from what I've gathered, it's on these walks that he's coming up with inspirational ideas for use in his new column Doing It By Design!

I'm sure Tony and Jean are going to be very busy in the future...and I'm sure that the kits they'll offer to accompany his *PW* projects will prove popular. Everyone on the magazine is delighted to welcome them both 'on board'.

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