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# PW

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## Classic Project Beginner's Short Wave Two



**Kit Review**  
**KRC-A-6 Hi-Fi Audio  
Adaptor**

**Feature**  
**Discovering your Dipper!**

**Yaesu Photo Comp**  
**Where will yours take you?**



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August 2004

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£200	3 months
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£400	5 months
£500	6 months

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**Conditions:** You must be over 18 years, be in regular employment - min 16 hrs per week- or have an acceptable pension or live with an earning partner or proof of other income, and must be able to provide 3 years residential history.

## ICOM IC-756 PRO II

£1899 C



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



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

£769 C



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 SPECIAL OFFER

£589 C



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)

FREE! Icom 703 Logbook - while stocks last

## ICOM IC-718

£449 C



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



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



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



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



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



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



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

£899 C



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

£729 C



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



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-817ND

£499 C



bhi DSP Module now available!

£89.95

160m - 70cms. Up to 5W output all modes. Now with Ni-MH battery, charger & DC lead. £589 with 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

## YAESU FT-7800 NEW

£239 C

Yaesu's Powerful low cost answer!



- \* 2m/70cms Dual Band Mobile
- \* High power 50W 2m /40W 70cms
- \* Wide receive inc. civil & military airband
- \* CTCSS & DCS with direct keypadd mic.
- \* Detachable front panel
- \* 1000 memories plus five one-touch

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## How we saved Bill **£148** on his FT-847 even at the discount price of **£1199!**

Bill wanted to purchase an FT-847 at the discount price of **£1199** from Waters & Stanton. He was going to pay on his credit card which would have cost him **1.583%** per month. **Doesn't sound much does it?** However, paying back at £100 per month would have taken him 14 months and cost him a massive **£148 in interest**. We signed him up for **Buy Now Pay Later**. He got his radio **but paid nothing for twelve months**. Instead he deposited £100 per month into a savings account, earned some interest and used the accumulated savings to pay for the radio at the end of the twelve months. He saved himself **£148** and was even left with some cash over for a meal!

Similar terms available on all sales over **£200**  
@ **Waters & Stanton**

### YAESU FT-8900R NEW

£339 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.



### ICOM IC-2200H NEW

£199 B



The IC-2200H is the latest version of this popular high power 2m mobile rig. It has 207 memories inc 1 call channel & 6 scan edge memory channels.

\*144 - 146MHz FM \*65/25/10/5W RF o/p \*CTCSS & DTCS \*Green/amber display \*Audio: 2.4W o/p Tx 15A (65W) \*Rx 1A (max audio) \*Standby 0.8A \*Power 13.8V DC \*Size: 140x40x146mm

### 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.

### OTHER MODELS...

ICOM		
IC-2725E	Dual Band FM Transceiver	£269 C
IC-2100H	2m 55W FM Mobile	£229 C
YAESU		
FT-8800E	2m/70cm Mobile	£289 C
KENWOOD		
TM-G707E	2m/70cm Mobile	£289 C

### YAESU VX-110

£119 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 case, 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

£249 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.

### OTHER MODELS...

ICOM		
IC-E208	Dual Band FM Mobile	£279 B
YAESU		
VX-7R	6m/2m/70cm Handheld	£299 B
VX-2E	Dual Band FM Handheld	£169 B
KENWOOD		
TH-G71E	2m/70cm Handheld	£199 B

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

### 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	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

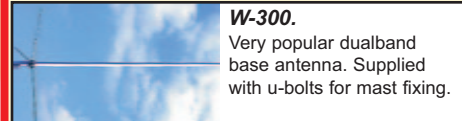


VHF/UHF Dual Bander

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 2.15/6.2/8.4dB 2.5m	£69.95 C

### WATSON W-25XM PSU NEW

£99.95 B



A compact sized switch mode power supply that will run your base HF station with ease.

\*Output Voltage 10 - 18V DC \*Output Current 22A / 25A peak \*Over current protected \*Rubber Feet  
\*Supply 230V / 115V AC 50/60Hz \*Switchable dual voltage input \*Size 220 x 180 x 73mm \*Weight 1.8kg

### 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



## VERTICAL ANTENNAS

### Hustler Mobiles

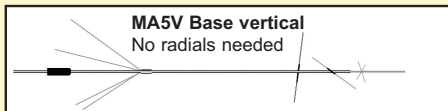
Get top performance when on the move. Purchase the **MO-3 base** (137cm) for **£24.95** or the **MO-4 base** (68cm) for **£22.95**. Then add the resonator of your choice. **RM-10, RM-12, RM-15, all £19.95 ea.** **RM-17, RM-20 £24.95 ea.** **RM-40 £26.95, RM-80 £29.95**



Resonator  
Base section  
MO-3 or MO-4

### CUSHCRAFT BASE ANTENNAS

<b>MA6V</b>	20-17-15-12-10-6m 250W PEP	<b>£269.95</b>	C
<b>MA5V</b>	20-17-14-12-10m 250W PEP	<b>£239.95</b>	C



<b>R8</b>	40-30-20-17-15-12-10-6m 1.5kW	<b>£469.95</b>	C
<b>R6000</b>	20-17-15-12-10-6m 1.5kW PEP	<b>£329.95</b>	C

### BUTTERNUT BASE ANTENNAS

<b>HF9V-X</b>	80-6m 7.9m 1kW PEP	<b>£349.95</b>	C
<b>HF6V-X</b>	80-40-30-20-15-10m 7.9m 2kW	<b>£299.95</b>	C
<b>HF2V</b>	80-40m 9.75m (160m opt) 1kW	<b>£229.95</b>	C

### HY-GAIN BASE ANTENNAS

<b>AV-640</b>	40-6m 1.5kW, 300W 6m (PEP)	<b>£369.95</b>	C
<b>AV-620</b>	20-6m 1.5kW, 500W 6m (PEP)	<b>£279.95</b>	C
<b>AV-14AVQ</b>	40-20-15-10m 1.5kW PEP	<b>£169.95</b>	C
<b>AV-12AVQ</b>	20-15-10m 1.5kW PEP	<b>£139.95</b>	C
<b>DX-88</b>	80-10m 1.5kW, 250W 30m	<b>£369.95</b>	C

### HARI High quality German traps. (Pairs)

200W 20m	£44.95	40m	£49.95	80m	£53.95
1kW 20m	£59.95	40m	£64.95	80m	£73.95

### HARI 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

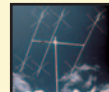
## HORIZONTAL BEAMS & DIPOLES

### CUSHCRAFT



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

<b>X-7</b>	20/15/10m 7 el. Yagi 2kW	<b>£669.95</b>	D
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Not got the space for a full sized HF beam antenna, then the mini beam MA-5B should be considered.

<b>MA-5B</b>	10-12-15-17-20m 4 el. Yagi 2kW	<b>£369.95</b>	C
<b>A4-S</b>	10-15 & 20m 4 el. Yagi 2kW	<b>£569.95</b>	D
<b>A3-WS</b>	12 & 17m 3 el. Yagi 2kW	<b>£379.95</b>	D
<b>D-3</b>	10-15-20m dipole element 2kW	<b>£249.95</b>	C



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

<b>D-3W</b>	12-17-30m dipole element 2kW	<b>£249.95</b>	C
<b>D-4</b>	10-40m dipole element 2kW	<b>£349.95</b>	C
<b>D-40</b>	40m dipole element 2kW	<b>£319.95</b>	C
<b>TEN-3</b>	10m 3 el. Yagi 2kW	<b>£229.95</b>	C
<b>ASL-2010</b>	13.5-32MHz 8 el. log periodic	<b>£749.95</b>	C

### RADIO WORKS



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

<b>CW-160</b>	160-10m 76.8m long	<b>£129.95</b>	C
<b>CWS-160</b>	160-10m 40.5m long	<b>£119.95</b>	C
<b>CW-80</b>	80-10m 40.5m long	<b>£89.95</b>	C
<b>CWS-80</b>	80-10m 20.1m long	<b>£109.95</b>	C
<b>CW-40</b>	40-10m 20.1m long	<b>£84.95</b>	C
<b>CW-20</b>	20-10m 10.36m long	<b>£89.95</b>	C
<b>CW-620</b>	20-6m 9.7m (32ft) long	<b>£89.95</b>	C
<b>G5RV PLUS</b>	80-10m with balun 31m (102ft) long	<b>£59.95</b>	B

## YUPITERU MVT-3300 SCANNER £129 B



The MVT-3300EU covers most of the useful bands in the VHF and UHF spectrum. It has 200 memories as standard with a range of band and security channels as well. It has functions normally associated with more expensive sets such as pre-setting the receiving mode and frequency step, Duplex reception with "One Touch" function, Auto-Write and Search-Pass memory functions. There is also a Decipherment function to receive certain scrambled communications.

## 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.

## WATSON BASE ANTENNAS

### Unbeatable Value!

Model	Freq	L(m)	Db	Price
W-30	2/70	1.15	3/6	39.95 B
W-50	2/70	1.8	4.5/7.2	£49.95 C
W-300	2/70	3.1	6.5/9	£64.95 C
W-2000	6/2/70	2.5	2/6/8.4	£69.95 C

These antennas are solidly made of fibreglass, die-cast alloy and stainless steel. **Guaranteed lowest prices in the UK.**

Totally weatherproof  
Pre-tuned & Unbeatable

## MFJ-971 QRP Portable ATU £99.95 C



\*1.8 - 30MHz \*300W/30W/6W selectable \*Cross needle meter \*12V DC Ext. \*SO-239 sockets \*Tunes wire, coax, balanced line \*Terminals & earth post \*Size 160 x 150 x 60mm \*Weight 870g

The MFJ-971 is the ideal QRP ATU to have on hand. It incorporates a cross needle SWR meter and displays forward or reflected power and SWR simultaneously.

## HUSTLER ZERO SPACE DX ANTENNAS

### No Space Needed!

"Ground Level Wonder"

Run full legal power - 80m to 10m

No masts or guys.

Low VSWR 50 Ohm feed.

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. 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.

<b>4BTV</b>	40-20-15-10m. 6.52m high.	<b>£149.95 C</b>
<b>5BTV</b>	80-40-20-15-10m. 7.64m high.	<b>£179.95 C</b>
<b>6BTV</b>	80-40-30-20-15-10m. 7.3m.	<b>£209.95 C</b>

**NOTE:** 80m coverage limited to 100kHz on 5BTV & 6BTV

## YAESU VR-120D £119 B



The VR-120D handheld scanning receiver covers from 100kHz to 1300MHz. AM/FM/WFM modes (inc. preprogrammed broadcast freqs). The VR-120D's small size and tough polycarbonate case allows you to take it anywhere - hiking, skiing or while walking around town. Power is provided by 2 x AA batteries (not supplied). Ni-Cad batteries and charger are available as options.

## RIGBLASTER-PLUS

### The Adventure Begins!



Was ~~£139.95!~~  
**£119.95**

Order as RB/PL/C

### New Low Price!!

Explore all the new digital modes. All leads provided for computer and radio. Just connect between PC and transceiver. Plugs into 8-pin and RJ-45 radios. Internal jumpers to match your radio. Software on supplied disc for CW, RTTY, PSK-31, SSTV, Packet, AMTOR, DVkeyer, WSJT, Mic EQ, RIG CTL, EchoLink etc. Requires 12V DC

**NOMIC** Similar to above but no 8-pin front panel socket and no CW keyer function. Self-powered. **£59.95**

**Code:** RB/NO/8C for 8-pin rigs RB/NO/RJ for RJ-45 rigs

## HEIL QUALITY MICROPHONES



Desk Microphones

**HCL-5/4** Classic retro-look HC-5/4 desk mic **£199.95 B**

Hand Microphones

**GM-4/5** Goldline HC-4/HC-5 hand mic **£109.95 B**

Headsets & Boom microphones

**HST-YM** Traveler single side headset for FT-817 **£79.95 B**

**HST-706** Traveler single side headset for IC-706 **£79.95 B**

Headphones & Boom Microphones

**PRO-SET-PLUS** Large H/phones with HC-4 & HC-5 **£155.95 B**

## EVEN MORE DISCOUNT!

### B - STOCK

**ALL STOCK IS BRAND NEW & HAS FULL MANUFACTURER'S WARRANTY.**

**CHECK WWW.WSPLC.COM**

**CLICK ON "PRODUCTS" & THEN "B-STOCK"**

## V-1000 BATTERY CHARGER

\*Charge 4 Ni-Cad in 60 mins Uses 230V Mains  
\*Charge 4 Ni-MH in 2 hours or Car 12V



Includes  
AC lead &  
Cigar Lead

**£10.95 A**

## HORA C-150 2M HANDHELD



**£79.95 B**

An amazing price for a 2m Handheld!  
2W output on AA cells and 5W output on external 13.8V. 1750Hz tone, 20 memories, keypad control, 5 steps inc 12.5kHz, dial illumination receive 130 - 170MHz. You won't find a better deal! Includes flexi antenna, belt clip and instruction manual. (AA cells not included)

## DMTR-21 TORCH/RADIO SPECIAL OFFER



**BUY ONE GET ONE FREE!! ONLY £10**

Carriage £2

HOCKLEY ONLY

**Watson Wind-up/Solar Torch & AM/FM Receiver**

\*Torch/Flashlight/Siren  
\*AM 530 - 1600kHz  
\*FM 88 - 108.1MHz  
\*Ferrite Bar Antenna AM  
\*Built-in FM Antenna

\*Solar Power Panel  
\*Hand Crank Dynamo  
\*Spare bulb  
\*Fitted Ni-Cad Battery  
\*3 x AA battery chamber



VoIP INTERNET operation  
with optional Kenwood network  
command software

# KENWOOD



**200W**

HF/50MHz ALL-MODE TRANSCEIVER

## TS-480HX

200W Model

## TS-480SAT

100W Model with Built-in  
Antenna Tuner

## DX Deluxe

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- 100W model available with built-in antenna tuner
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- Compact construction for easy carrying
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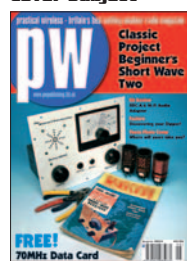
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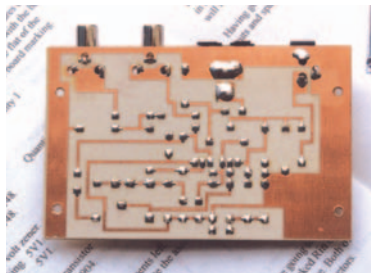


**Cover Subject**  
The Beginner's Short Wave Two is this month's classic project, the fine example shown here, built from Frank Rayer G3OGR's original design, has been kindly loaned by Richard Ayley G6AKG to illustrate the article. Enjoy this issue!  
**Design:** Bob Kemp  
**Photograph:** Tex Swann G1TEX/M3NGS

# August features



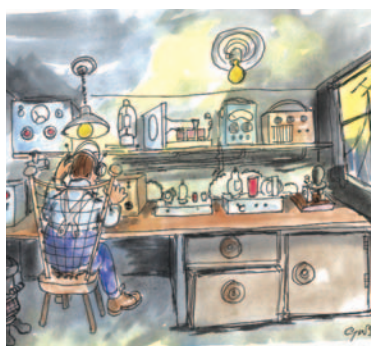
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## 18 Yaesu Photo Competition

We've teamed up with Yaesu UK to give you the chance to win a Yaesu FT-817ND, VX-7R or a VX-2E and the chance to have your photo used in future Yaesu UK Promotions. So what are you waiting for? Enter today!

## 22 Radio Basics

**Rob Mannion G3XFD** encourages you to try an oscilloscope. In the last of his articles providing an overview of the subject, he also suggests you consider buying a modern budget-priced 'scope from Kenwood (Tecstar).

## 24 KRC-A-6 Wide Band FM Unit

If you've got a vintage v.h.f. broadcast receiver, **Phil Cadman G4JCP** says you'll find the KRC-A-6 Wide Band f.m. kit a delight to build and a joy to use, also bringing alive your old '45s' and '78s'.

## 26 Discovering Your Dipper

Following on from his Dip Meter design earlier this year **Tim Walford G3PCJ** expands on the project with some ideas for you to experiment with and 'discover your dipper', revealing what a versatile instrument it really is!

## 30 The Vectis Run Part 8

**Rupert Templeman** continues with his technological thriller series - *The Vectis Run*. Travelling wireless salesman Alan Edwards' monthly visit to the Isle of Wight is becoming increasingly sinister and this episode finds him captured and not knowing where he is.

## 32 A Low-voltage Audio Amplifier

Build a single 1.5V cell self contained audio amplifier from **David Allen's** design, its only limitations are your own ideas!

## 34 Beginner's Short Wave Two

A classic *PW* construction project is 'bought to life' again 41 years on from when it was originally published. The Beginner's Short Wave Two came from the 'pen' of prolific author **Frank Rayer G3OGR**, we hope you enjoy the nostalgia!

## 42 The Indian Experience

**Henryk Kotowski SM0JHF's** article shows that 'Going to Goa' was a true Indian Amateur Radio friendship experience. Share in his trip and 'meet' some of the colourful characters along the way.

## 42 Reviews Reviewed - Looking At The PW Review Policy

To review or not review - that is the burning question! **Rob Mannion G3XFD** sets about putting the record straight and answering questions, as to why *PW* adopts the policy it does in a bid to safeguard the honesty and integrity of reviewer's opinions.

## 44 Crystal Sets - A Good Place to Start!

**Angus (Gus) Malcolm G8DEC** looks back, recalling how he got interested in Amateur Radio in the most traditional way - using a crystal set neatly presented in a mahogany box!

## 46 Antenna Workshop

Antenna farming with verticals, dipoles, baluns and test equipment is the topic in the 'workshop' this month as **Roger Cooke G3LDI** describes and encourages you to create your own array of antennas.

## 50 Carrying on the Practical Way

Wavemeters are maybe one of the most basic pieces of test equipment, but they should not be overlooked. They're one of the most important pieces you should have in your workshop, so says **George Dobbs G3RJV**.

## 52 Valve & Vintage

Avid military set collector **Ben Nock G4BXD** just can't stop the fine vintage radios 'following him home' from the many rallies he attends. In his column this month Ben shows off the latest additions that now adorn his radio collection.





7



## Digital voice transmission



### ARD9800 Reviewed by Chris Lorek in July'04 RadCom...

*"I feel AOR are to be commended in leading the field by launching a ready to use add-on set-top box which instantly transforms any amateur radio transceiver into a digital multimedia (speech, data, and video) transceiver."*

The ARD9800 is a modem unit that connects to the microphone input of virtually any transceiver. The user simply wires a connector for his particular transceiver, connects the speaker output of his transceiver to the modem and then connects the modem to a 12V DC power source... no modification is required.

The ARD9800 provides NEAR FM QUALITY audio using SSB. Even better, the digital signals require no more bandwidth than analogue signals, this is achieved through **OFDM** (Orthogonal Frequency Division Multiplexing).

Normal analogue operation is possible (because the transceiver has not been modified). To use digital voice, simply select the DIGITAL MODE on the ARD9800, incoming signals are automatically decoded, no selection necessary. So, if an analogue signal is encountered, the transceiver operates conventionally, however if a digital signal is encountered, the ARD9800 automatically selects the digital mode so that high quality interference free audio is produced.

The ARD9800 can be used in any mode, SSB, AM and FM, however FM mobile operation could be prone to 'picket fencing' (fast flutter) on VHF/UHF which could result in the loss of data. With the **optional memory board**, images can be easily transferred, similar to SSTV. Currently SSTV images are in NTSC, a PAL version is near completion. **£499.00 inc VAT, UK carriage free**



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**TEN-TEC**  
**ORION 565**

### ORION 565 "Truly awesome performance" says Peter Hart.

Unlike most mainstream transceivers, the amateur band transceiver coverage is optimised for in-band performance while a secondary internal receiver provides general coverage receive capabilities. It features DSP on receive and transmit with multiple IF bandwidths as standard and even two volume controls! 100W output, all mode, 12V DC operation.

**Reviewed by Peter Hart in June'04 RadCom...** *"The Orion lives up to its claim as a high performance radio with exceptional close-in dynamic range. It is likely to appeal particularly to the serious and technically minded DX chaser or contest operator..."*



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## WIRELESS WAVES AT BLETCHLEY PARK

31 July - 1 August 04

This annual event held at the home of the Second World War codebreakers celebrates the importance of the Y Service during the war. 'Wireless Waves around Bletchley' will explain their contribution to the war effort with a number of special events happening across the two days, including:

★ A special display on Y stations and spy sets

*Exclusive lectures including:*

★ Funkers and Sparkers - 13:00 on both days

★ The Importance of Y stations - 14:00 on Sunday by Gwendoline Page, a former Wireless Operator

★ A German field radio station outside the Mansion

MILTON KEYNES AMATEUR RADIO SOCIETY (MKARS) WILL BE RUNNING A TEMPORARY STATION ON THE CROQUET LAWN

Original wireless and landline communications equipment will be on view in the Diplomatic Wireless Service Museum.

The Enigma Cinema will be showing documentaries on the way communications have changed the world.

Admission prices are **£14.00** per adult; **£10.00** for concessions; under 8's are free. Admission includes **FREE GUIDED TOUR** and full access to the Park, the Mansion and many other exhibits.

For more information call Bletchley Park on **01908 640404** or visit **www.bletchleypark.org.uk**

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(As reviewed in PW April 2004)



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## rob mannon's keylines

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

Specialist magazines such as *PW* have always fought for shelf space at the major newsagent's shops. However, it looks as though the over-inveterate 'browsers' amongst our readers are in for a difficult time in the near future.

In the 15 years I've been Editor of *PW* the 'over the counter' sales of the magazine have continually dropped as many regular readers have opted for a subscription instead. Unfortunately, as I explain during my club visits - this is a truly sharp double-edged sword. The less copies of *PW* appearing on the shop shelves means that fewer potential readers will spot the magazine, and be tempted to join the hobby via our pages.

Of course, I've always appreciated that some readers like to 'see before they buy' when browsing at the local WH Smith's store. When the *PW* offices were based in Poole, I often used to walk my Labrador, Mandy, up to the main branch of Smith's to check on the magazines on sale and enjoy a browse of the railway mags on display (my regular copy of *The Railway Magazine* was always 'shop saved' for me at my local newsagent's).

It was always good to see a large cross section of specialist magazines on sale at Smith's, and literally every major hobby/interest was covered. But now unfortunately, due to a major shift of marketing policy - WH Smith's will soon be only selling the 'Top 100' magazines (whatever they may be). But you can be sure that radio hobby magazines won't be amongst them...despite our efforts.

### The Supermarket Chains

The large supermarket chains are rapidly becoming extremely important magazine and newspaper distributors. At the same time, as they expand (particularly the 'Tesco Express' stores) these outlets are forcing the closure of smaller newsagents.

In the near future I'll be writing directly to the Tesco Managing Director and also to the other companies who are now rapidly putting the smaller newsagents out of business - while (in most cases) not providing anything like the superb full 'over the counter' magazine and periodical supply service. I also hope to have an 'Open Letter' letter published in the *UK Press Gazette*, which is the national news magazine for the journalists and all those involved in publishing.

In the meantime I ask readers - particularly those who like to browse before they buy - to seek out the managers of their local large chain supermarkets to enquire whether or not they can increase the number of magazines displayed on their shelves. (All are on 'sale or return' nowadays). By doing so, you'll be safeguarding the future of many specialist magazines - not just *PW*.

I'll be returning to this subject later in the

year with some ideas to help overcome the problems. But with your immediate help (and co-operation from the supermarkets) together we can ensure that newcomers to radio will know that *PW* and other specialist titles exist. That's how I started in the hobby - and by making sure we're on display as much as possible we can help others to enjoy the hobby.

### Family Bereavement

Unfortunately, due to a member of my family suffering from a terminal illness, resulting in a bereavement in mid-June, I was unable to join in with the *PW* 144MHz QRP Contest. And of course...I very much look forward to the next event!

I also had to postpone a *PW* 'club visit' to the **Echelford Amateur Radio Society** (EARS) near London on 24 June. For the same reason, I was unable to attend the new **West of England Rally** at Frome in Somerset (replacement for the Longleat Rally). And I also look forward to re-scheduling the EARS visit soon, and attending the 2nd West of England Rally next year.

I send my grateful "Thanks" to the many readers (who got to hear of my bereavement) and who sent kind messages. My wife and our daughters were overwhelmed by the support from friends in the hobby. **Thank you everyone.**

### Roger's Support!

Thinking of support from the hobby, I think it's a good time to mention that at this year's Blackpool Rally, **Roger Hall G4TNT** (he's one of our publishers and also the Advertising Manager) received some support himself! It took place when - during unpleasant rain and gales - Roger's large American style - Japanese built - pick-up truck (I call it the 'Bob The Builder's Wagon') suffered a puncture.

It's a large vehicle and Roger had no choice but to drive to the rally venue in the freezing weather. However, help was at hand when **Gerald Myers of Chevet Supplies** and his friend **Mark** eventually were able to help Roger change the wheel. It's not that Roger's a weakling - it's a big vehicle and even Mark (who looks as if he 'works out' and keeps fit) had a job to undo those fiendishly tight wheel nuts inflicted on us by tyre depots!

All ended well, and Roger was able to return home safely with a replacement tyre. Another example of how supportive radio hobbyists can be!

**Rob G3XFD**



## practical wireless services

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

### Subscriptions

Subscriptions are available at £32 per annum to UK addresses, £40 Europe Airmail and £49 RoW Airmail. Joint subscriptions to both *Practical Wireless* and *Short Wave Magazine* are available at £61 (UK) £75 Europe Airmail and £92 RoW Airmail.

### Components For *PW* Projects

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

### Photocopies & Back Issues

We have a selection of back issues, covering the past three years of *PW*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. See page 72 for details.

### Placing An Order

Orders for back numbers, binders and items from our Book Store should be sent to: **PW Publishing Ltd., Post Sales Department, Arrowsmith Court, Station Approach, Broadstone Dorset BH18 8PW**, with details of your credit card or a cheque or postal order payable to *PW Publishing Ltd.* Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone **0870 224 7830**. An answering machine will accept your order out of office hours and during busy periods in the office. You can also FAX an order, giving full details to Broadstone **0870 224 7850**. The E-mail address is [clive@pwpublishing.ltd.uk](mailto:clive@pwpublishing.ltd.uk)

### Technical Help

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





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



## Simple Valved Circuit

### Dear Sir

I very much enjoyed our recent telephone chat and I'm writing, as requested, to ask for your help in finding a simple circuit (or kit), from which I may be able to build a single valve short wave receiver, similar to the HAC receiver that I built as a schoolboy in the 1950s.

As discussed, it would probably be better if the project was mains powered rather than one needing an h.t. supply from a battery. I shall be very grateful for any suggestions or components that you may be able to supply from your junk box.

Assuming a successful conclusion, I intend to enter the receiver in our annual Constructors' Contest, which will probably be held on Friday 27 May 2005, and as promised, I will be happy to supply you with a short article chronicling my efforts for the magazine.

As mentioned during our talk, I am the Secretary of the **Mid Sussex Amateur Radio Society**, meeting weekly on Friday evenings at Cyprus Hall, Cyprus Road, Burgess Hill in West Sussex and we would be delighted to welcome you as an honoured guest for our meeting on Friday 27 May 2005. Perhaps you will be good enough to let me know if you may be able to join us the nearer the time.

In the meantime, many thanks for your interest and help in my small project. Kind regards.

**Gavin Keegan G6DGG**  
Lewes  
East Sussex

**Editor's reply:** Gavin's telephone call - backed up by his letter - helped me to decide on a change to the 'classic project' we were due to publish in this issue, so that we could assist him and other readers with the same request. Gavin and I chatted for a while and I realised that the ideal circuit for him to attempt is the Beginner's Short Wave Two, a *PWW* 'blueprint' design first published in the November 1963 magazine. I consider it to be particularly suitable because it's a flexible design and many different valves have proved successful when I've made it. My original project (built in the winter of 1963/64) used an EF91 instead of the 954, and an ECL80 replaced the 12AT7. We have to thank Richard Ayley G6AKG for kindly loaning his own Beginner's Short Wave Two' and this is featured within the article on pages 34 to 37. I've also replied directly to Gavin that I'll be delighted to attend his club to provide a *PWW* talk and join in with the fun. Good luck to anyone who builds the receiver - it shouldn't be a difficult job and will provide much pleasure on the h.f. bands. It's all part of *PWW*'s attempts to provide practical projects for all tastes - whether it be using ultra modern i.c.s, discrete semiconductors or historic thermionic devices.

## Those Glorious Surplus Days

### Dear Sir

I'm writing with reference to the Editor's article Those Glorious Days in the June issue of *PWW* regarding the TR1196. As I was an RAF wireless fitter in the late 1940s, I found the article brings back many

memories.

Rob G3XFD's comment about the receiver unit in Fig. 3 is interesting because it is the same receiver unit in Fig. 2. The 1196 consisted of the Receiver unit 25, a transmitter unit, the number I forget, a channel sector unit and a motor-generator for the h.t. supply, all

mounted on a metal framework.

The Receiver and Transmitter units were four channels designated A, B, C, D. They were crystal controlled, using 10X type crystals, selected from a central box, mounted in the cockpit. The main Transmitter/Receiver unit being mounted somewhere further back in the aircraft.

The power output was only a few watts of a.m. The antenna length, depending on the aircraft, was tuned by a rotary loading coil in the TX unit, one for each channel.

I hope the above is of some use. I too had an 1155, cost me £2/10 (£2.50) - a lot of money out of an AC2's pay! It was new but not working, soon fixed however. I have enjoyed reading *PWW* for many years. Keep up the good work.

**R. S. Wolpern**  
Sidcup  
Kent

**Editor's comments:** Thank you for the information Mr Wolpern and I have been delighted at the response to the article. To be totally honest - the feedback from this simple article has been wonderful. It proves to everyone working on *PWW* - and from what readers have written to say - that the historical adverts often have fascinating stories attached to them. We've already received offers of articles based on material purchased from adverts in the magazine, and I hope that when the next article (dealing with adverts from the late 1950s and up to the mid-1960's, will bring the same response. I am particularly interested in hearing from readers who still own receivers, or modified projects which originated from material originally advertised in *PWW*. Finally, don't forget - we also welcome your comments and feedback from other ideas along the same lines.

## Home-Brew Green TV!

### Dear Sir

After reading the article Those Glorious Surplus Days it brought back memories when I built a TV using a VCR97 - the picture was all shades of green! If I remember rightly it was a sort of kit from Sterns or Premier Radio of Fleet Street (London), which I built in time to watch the Coronation with my young lady.

I can remember the i.f. strip was all EF50s - the mains transformer was lethal, with the mains derived e.h.t. literally flying around in the open. I built it open fashion on a board 2ft 6in square, a bit deadly really!

A friend of my father saw it and bought it on the spot, carrying it home like a waiter with a tray. I used this breadboard method later building a transistor superhet circuit, laid out like a circuit diagram for demonstration purposes (OC 44/455) - a *Practical Wireless* circuit of course!

**B. J. Godfrey G0OVC**  
Romford  
Essex

**Editor's applause:** A fascinating story Mr Godfrey! I once had a 240V to 2kV mains e.h.t. transformer but was too frightened to use it in a project. Thank goodness for modern e.h.t. circuitry eh? Incidentally, since I wrote the article it's become obvious from readers' letters that there were a number of different phosphors used on the VCR97. I have two in my collection and one is a standard bright green, while the other is a blue-grey. It would be interesting to hear from readers what other variations there were and which one was preferred for Airborne Interception use. (In the Fleet Air Arm we seemed to have mostly blue-grey phosphors, but it did



seem to vary, depending on the model/mark of each equipment).

### Manchester Wireless Society Practical!

#### ● Dear Sir

"It's not how it used to be". I've heard this statement from so many in recent years in reference to our hobby of Amateur Radio. Amateur Radio has changed and it is a far cry from the hobby I entered into as a short wave listener and home constructor back in 1958.

Many concepts have reshaped Amateur Radio since the days when I cut holes in aluminium chassis for valve holders and modified ex war surplus wireless receivers and the like. The hobby that greets newcomers today, runs alongside of more efficient and faster methods of communicating and getting in contact with friends, such as the home computer, which like it or not, has now gained a firm foothold within the hobby and of course today, we have the very popular mobile telephone that offers a no licence, no exam way to chat.

However, the Amateur Radio Licence does offer a unique advantage, the privilege to experiment on the air with antennas and home-made equipment, as envisaged by the early pioneers of our hobby, who by their efforts have made today's futuristic ventures in communication possible.

With the majority of today's Radio Amateurs preferring the mysteries of factory manufactured grey boxes, the art of home construction is fading and along with it, the thrill of experimenting and the real concept of ones own ingenuity in radio know how.

It was 18 months ago when I entered the hallowed halls of the **Manchester Wireless Society** and was greeted by the friendliest group of Radio Amateurs it has been my privilege to meet in all my years in the hobby.

The Manchester Wireless Society, established in 1911 as 5MS and 2FZ is steeped in wireless history and know how. The members contribute a wealth of knowledge in all aspects of the hobby that goes together to make this a place of learning.

The Society, in keeping with modern radio clubs, offers tuition in the Foundation, Intermediate and Full Licence

along with tuition in Morse code for the foundation licence. The Society has an operational Radio station (**G5MS**) and a construction group.

Yes, Amateur Radio has changed over the years, but the Manchester Wireless Society, while embracing new ideas, retains the spark of ingenuity and traditions within this wonderful world of 'practical wireless'.

**Frank G6TNO  
Heywood  
Lancashire**

**Editor's comment: Sounds a wonderful club Frank - and they're also famous for making visiting speakers welcome. Take a bow MWS.**

### Small Dealer Closures

#### ● Dear Sir

There has been, over the past few months, an increasing closure of those small outlets that supply home-brew components and kits to the Radio Amateur. At the same time, many Radio Amateurs shacks have more and more the appearance of radio retail outlets.

I think it's advantageous that continuing home-brewing should be encouraged alongside the use of the excellent commercial equipment available to us nowadays. It would be very sad if the situation arose where there was a continually decreasing number of outlets dealing in home construction components, leading eventually to a decreasing opportunity to practice home-brewing, particularly among our newly licensed colleagues, who have not yet had time 'to build' up their junk boxes.

Could it be suggested to some of the big names in the Amateur retail trade, that at this point they step in and try and alleviate the situation. With their global connections, it is possible that they could obtain (even get manufactured) and offer to the present day constructors some of the components that are becoming so hard to obtain. The profits to them would perhaps be minimal, but the profits to them in terms of goodwill could be large.

I for one, when buying my next commercial piece of equipment would be delighted to support the retailer who had made an effort to support the home constructor. So, which

retailer is going to be first to offer, for example a set of plug-in coils, so useful to the home-brewer?

We as Amateurs can do 'our bit' by supporting outfits like the marvellous G-QRP Club (with its magazine *Sprat*) and of course our own *Practical Wireless*, which I've been avidly reading since the mid-1930s.

**Myles Hely G2CYN  
Olney  
Buckinghamshire**

**Editor's comments: What an excellent idea Myles! This has been tried before but with no results - let's hope some company will take up the idea. I often get E-mails from Taiwanese based manufacturers who can produce resistors, headphones, etc. However, if all else fails - what's wrong with Amateurs themselves forming a 'buying 'co-operative' to get difficult-to-get components made? I'd join and support such an idea and it's appropriate that the Rev. George Dobbs G3RJV be involved as Rochdale is the home of the original 'Co-op' shop!**

### Equipment Reviews In PW

#### ● Dear Sir

I have been reading *PW* for many years and have always enjoyed the wide cross section of subjects which the magazine caters for. Earlier in 2004 though, I decided to try writing an article for you, but my short review was turned down by the Editor. The rebuff was disappointing, and although the Editor politely explained in his letter to me why my review of a kit I had bought and built was refused, it seems to me that a public explanation of the policy via the letters pages might stop other potential reviewers from wasting their time.

I should also point out that although I was put out, to say the least, regarding the refusal to even consider my article, the Editor sent me an Author's Guide to encourage me to write other articles. Of course, I would like to do this and already have some ideas - but it would be helpful to myself and others to know what the guidelines are for reviews? Thank you.

**John Nicholson  
Weston Super Mare  
Somerset**

**Editor's comments: Thank you John, and I appreciate your original approach to talk about this subject during the Yeovil QRP rally in April. During our conversation I asked him to write so that his letter, and my reply could be 'aired' on these pages. However, in order to discuss the subject more deeply, I invite readers to join me on page 42 where the review policies adopted for *PW* are clearly laid out. But I must make it clear in this reply to John that I must refuse any unsolicited equipment reviews. Hopefully our attempts to publish honest, worthwhile equipment evaluations will be explained to his and others readers' satisfaction on pages 43 and 43.**

### Snail Mail From USA

#### ● Dear Sir

I sympathise with **Tony Hawker** (letters, *PW* June) over the experience with Parcel Force. I've recently suffered a similar problem with a shipment of electronic merchandise from the USA. In one sense, Tony was lucky in that his shipment took 'only' 20 days to arrive - my latest order from Fair Radio Sales in Ohio took 12 weeks! According to Parcel Force, it took six weeks just to cross the Atlantic.

As the USA is outside the dreaded EU, both customers' duty (at an unspecified rate) and VAT (at 17.5%) is chargeable on all UK imports, which exceed a specified, very low value. Like Tony, I had to pay the £8 clearance fee and the additional costs on an order of £90 (including US carriage) - came to £25 - roughly the same percentage addition as Tony's consignment.

From past experience, the transatlantic parcels service by 'the UK's leading express carrier' (as their telephone jingle puts it) is always painfully slow. But it's cheaper than other carriers, although a wait of seven to eight weeks seems normal, but 12 weeks is over the top.

From my correspondence with Parcel Force, I get the impression that they share the same degree of operational efficiency as that practised by 'Royal Snail' letter post, as recently exposed on TV. It's an old problem, but it never seems to get any better.

From now on, I intend to have all future orders from Fair



Practical Wireless, August 2004

## ● DAB Developments

# Bigger than Ever!



- Mike has been busy sourcing new products for the company to both stock and manufacture under the Trident and Palstar brand names. The company are planning a large open day in November to showcase the new facilities. They also have just released new catalogues for Scanners and for CB radio and with a new Amateur Radio catalogue due shortly, and it will undoubtedly be an interesting day!

# Design a Satellite Stamp

*Help promote Satellite Amateur Radio by designing a stamp that could end up being produced as a special series for the Royal Mail.*



Entries for the competition should contain the following:

- A short title of no more than approx six words
- A short description of the event of no longer than four sentences
- A graphic - this can be either an original design, a picture, photograph, etc. The graphic should either be in the public domain, or one that the copyright owner is likely to give permission for publication. More than one graphic may be submitted
- The owner and contact details of any copyright
- The name and contact details of the entrant

You may submit multiple entries and entries are invited from any individual, you don't have to be a member of AMSAT, a UK citizen or a Radio Amateur. All entries will be displayed at the AMSAT UK Colloquium and judged by the AMSAT-UK committee. The decision of the committee will be final. The judges will take the following into account:

- Originality
- Quality of graphic
- Suitability to appear on a special issue stamp
- Relevance to the Amateur Satellite Service

There will be a small cash prize awarded to the three best entries. The best 10 entries will be submitted to the Royal Mail and proposed as designs for a special issue stamp series. Entrants must consent to their entry being: Exhibited at the AMSAT-UK Colloquium; Displayed, with their name/callsign on the AMSAT-UK website and submitted to the Royal Mail.

The closing date for entries is midnight 31 July 2004. So go on have a go! You never know your design could soon be adorning stamps all over the UK and in doing so helping to promote Amateur Radio and satellite communications.

☐ Mobile Radio

# Aurora!

*A celebration of the use of mobile radio in the North West is taking place over the weekend of 7 & 8th August in Windermere.*

The **Royal Air Force Amateur Radio Society** (RAFARS) in conjunction with the **Windermere Steamboat Museum** is to stage 'Aurora' in celebration of the use of mobile radio in the North West. The event will be sponsored by Icom UK.

The BBC Radio Cumbria service will be attending the day and will be sending 'Cumbria Bus', which will be hooked, up and on-line for use to demonstrate computer technology. There will also be a live broadcast from the site on one of the days, probably the Saturday. The Cumbria Constabulary are also hoping to attend subject to contingencies, the last time this event was staged they brought a motorway vehicle, a motor cycle and a boat, which was moored alongside the jetty.

On the boating pool there will be demonstrations of radio controlled boats, some of them live steam models whilst the full size steam launch *Aurora* will be sailing from the jetty driven by the owner, **Bob G0TB8**. There will be a micro-light aircraft rigged and displayed on site and a number of similar machines will fly-by during the two days of the event. Regulations do not permit them to do any display flying but they will be in radio contact with the site.

The RAFARS display team will be in the **GB2WSM** ice cream parlour/shack exercising the special callsign **GB0RAF** and sending out QSL cards provided by the Sponsor. Several licensed ATC Cadets will be operating along side the regular team. Particular attention will be given to /M stations, low power operators and RAFARS members. It's hoped that a number of SOTA stations will 'call-in' to the station too.

It's hoped that many Amateur /M and /P operator will attend, as last year the organisers had never seen so many /M equipped vehicles pitched up. So, if you think you will be able to attend please get in touch with **Roy 2E1RAF** via E-mail at: **<mailto:2e1raf@thersgb.net>** to discuss your parking requirements.



*The University of Rhode Island  
announces that one of their employees  
has invented a new antenna  
technology.*

After decades of experimentation, combined with a 30-year engineering career and Yankee ingenuity, Vincent has invented a revolutionary antenna technology. The distributed-load, monopole antennas are smaller, produce high efficiency and retain good to excellent bandwidth, they also have multiple applications. With this technology it will be possible to double, at minimum, the range of p.m.r. sets used by police, fire and

Vincent looked at the techniques that were currently used to reduce antenna size and realised something was missing in the way everyone was approaching the problem. He began to model various



Meanwhile he kept adding power until it reached 100W and then suddenly things went wrong - the antenna had melted! After analysing the failure, Vincent realised that he was able to transform a lot of current along the antenna with even relatively low power.

So it was back to the drawing board for Vincent where he continued to improve the technology. Relying on his nearly 30 years at Raytheon Co. and at KVH Industries in Middletown Rhode Island, Vincent overcame a myriad of problems and eventually succeeded. He established three test sites for various prototypes.

Cumberland, RI, the worst kind of site and at a Warwick site, which is in between the two in terms of grounding.

The antennas, which resemble flagpoles, worked well at all locations. Tests confirmed that Vincent has created antennas at one third to one ninth of their full size counterparts. Normally smaller antennas are only 8 to 15% efficient, Vincent's antennas achieved 80 to 100% efficiency as compared to the larger antennas.

A patent is pending on Vincent's technology and he has made the University of Rhode Island and its Physics Department partners so they will benefit from any revenue his invention earns. "The University and its Physics Department has been very supportive and given me time and space to work on this project," says Vincent who was recently presented the 2004 Outstanding Intellectual Property Award by URI's Research Office. "I couldn't have done this without the University's support. It's only fair that it share in the profits"

For more information on the work of the University of Rhode Island and Vincents project take a look at [www.uri.edu/news/releases/?id=2659](http://www.uri.edu/news/releases/?id=2659)

☐ Down Under

*The Australian Regulatory body the ACA has recently announced what the new Australian Licensing structure will comprise of, read on to find out more...*

The licensing structure will be as follows:

- The Foundation Amateur licensing option, which is the lowest level licence offering basic operating privileges.
- The Standard Amateur licensing option is the middle level licence offering higher privileges than the foundation licence. Existing Novice and Novice limited licensees will translate to this level.
- The Advanced Amateur licensing option is the highest level licence offering the most operating privileges. Existing unrestricted, Intermediate and limited licensees will translate to this level.

None of these licences will require knowledge of Morse code.

The new Foundation licence will have 10W output power restriction on the following bands: 3.5-3.7, 7-7.3, 21-21.45, 28-29.7, 144-148 and 430-450MHz.

For more details on the new Australian Licensing structure take a look at:

**[www.aca.gov.au/aca\\_home/licensing/radcomm/amateur\\_review/amateur\\_review\\_disc\\_paper.htm](http://www.aca.gov.au/aca_home/licensing/radcomm/amateur_review/amateur_review_disc_paper.htm)**

So, listen out for them on the air and make contact if you can!

## ● Propagation News

## Product News



The screenshot shows the homepage of the German Consulate in London. The top navigation bar includes links for 'Home', 'About Us', 'Contact Us', 'FAQ', 'Press', 'Partners', 'Sitemap', and 'Links'. The main heading reads 'Welcome to the French Street Consulate of the City of London'. Below this is a large banner image of the consulate building with the word 'GERMAN' in large letters. To the left of the banner is a sidebar menu with links: 'Home', 'About Us', 'Contact Us', 'FAQ', 'Press', 'Partners', 'Sitemap', and 'Links'. The main content area contains a paragraph about the consulate's services, followed by a link to 'More information about the consulate' and a link to 'Contact us'.

## CORNWALL

**Poldhu Amateur Radio Club**

**Contact:** Keith Matthew GOWYS  
**Tel:** (01326) 574441  
**E-mail:** vickeith@globalnet.co.uk  
**Website:** www.gb2gm.org.uk

Members of the Poldhu ARC meet at The Marconi Centre, Poldhu, near Mullion. Directions: Follow the private road up to the old hotel (now a residential and nursing home) and the car park is on the left, just before the hotel entrance. Club nights are every Tuesday and Friday from approximately 1900-2100hours and everyone is welcome. There is a more formal meeting on the second Tuesday of each month.



## HAMPSHIRE

**Horndean & District Amateur Radio Club**

**Contact:** Stuart Swain  
**Tel:** 0239-247 2846  
**E-mail:** g0fyx@msn.com

Meetings take place on the 1st and 4th Tuesday of each month at the Lovedean Village Hall, 160 Lovedean Lane, Lovedean, Hants, commencing at 1930hours. Visitors are always welcome. **July 10/11:** Club Station GB4QES at the QE Country Park Show, **24th:** Club BBQ, **27th:** Talk on Portsmouth Water Company, **August 1:** Coach trip to Bletchley Park, **3rd:** Social evening/natter night.

## NEWBURY

## Newbury & District Amateur Radio Society

**Contact:** Kevin G6FOP  
**Tel:** (01635) 826397  
**E-mail:** g5xv@ntlworld.com  
**Website:** www.ndars.org.uk

Club meetings are normally held on the 4th Wednesday of each month at the Newbury Rugby Club, Monks Lane, Newbury, commencing at 1930hours. Details of these meetings and other club events are shown on the above website. Prospective new members and visitors are always very welcome.

## SHROPSHIRE

**Telford & District Amateur Radio Society**

**Contact:** Mike Street G3JKX  
**Tel:** (01952) 299677  
**E-mail:** [mjstreetg3jlx@aol.com](mailto:mjstreetg3jlx@aol.com)  
**Website:** [www.tdars.org.uk](http://www.tdars.org.uk)

Members meet at 2000hours every Wednesday at the Community Centre, Bank Road, Dawley Bank, Telford, Shropshire. **July 14:** Club Project - a 2m portable antenna - M1RKH, **21st:** Outing up the Wrekin - take your rig up and use it, **28th:** Antennas In The Field - competition at HQ, **August 4:** Opening evening/HF QTA/Committee meeting.

*Keep those details coming in!* ●




[www.amateurantennas.com](http://www.amateurantennas.com)

TEL: (01908) 281705. FAX: (01908) 281706

## LOG PERIODIC

**MLP32** TX & RX 100-1300MHz one feed, S.W.R. 2:1 and below over whole frequency range professional quality (length 1420mm).....**£99.95**



**MLP62** same spec as MLP32 but with increased freq. range 50-1300 Length 2000mm.....**£169.95**

## MOBILE HF WHIPS (with 3/8 base fitting)

<b>AM-PRO 6</b> mt (Length 4.6' approx).....	<b>£16.95</b>
<b>AM-PRO 10</b> mt (Length 7' approx).....	<b>£16.95</b>
<b>AM-PRO 17</b> mt (Length 7' approx).....	<b>£16.95</b>
<b>AM-PRO 20</b> mt (Length 7' approx).....	<b>£16.95</b>
<b>AM-PRO 40</b> mt (Length 7' approx).....	<b>£16.95</b>
<b>AM-PRO 80</b> mt (Length 7' approx).....	<b>£19.95</b>
<b>AM-PRO 160</b> mt (Length 7' approx).....	<b>£49.95</b>
<b>AM-PRO MB5</b> Multi band 10/15/20/40/80 can use 4 Bands at one time (Length 100").....	<b>£69.95</b>
<b>SPX-100</b> 'plug n go' multiband 6/10/12/15/17/20/30/40/80mtrs. Band changing is easy via a flylead and socket and adjustable telescopic whip section 1.65m when fully extended.....	<b>£49.95</b>

## SLIM JIMS

<b>70cm</b> folded dipole.....	<b>£19.95</b>
<b>2mtr</b> folded dipole.....	<b>£24.95</b>

## VHF/UHF MOBILE ANTENNAS

<b>MICRO MAG</b> Dual band 2/70 antenna complete with 1" magnetic mount 5mtrs of mini coax terminated in BNC.....	<b>£14.95</b>
<b>MR700</b> 2m/70cms, 1/4 wave & 5/8, Gain 2m 0dB/3.0dB 70cms Length 20" 3/8 fitting.....	<b>£7.95</b>
<b>SO239</b> Fitting.....	<b>£9.95</b>
<b>MR 777</b> 2 Metre 70 cms 2.8 & 4.8 dBd Gain (5/8 & 2x5/8 wave) (Length 60") (3/8 fitting).....	<b>£16.95</b>
(SO239 fitting).....	<b>£18.95</b>
<b>MRQ525</b> 2m/70cms, 1/4 wave & 5/8, Gain 2m 0.5dB/3.2dB 70cms Length 17" SO239 fitting commercial quality.....	<b>£19.95</b>
<b>MRQ500</b> 2m/70cms, 1/2 wave & 2x5/8, Gain 2m 3.2dB/5.8dB 70cms Length 38" SO239 fitting commercial quality.....	<b>£24.95</b>
<b>MRQ750</b> 2m/70cms, 6/8 wave & 3x5/8, Gain 2m 5.5dB/8.0dB 70cms Length 60" SO239 fitting commercial quality.....	<b>£39.95</b>
<b>MRQ800</b> 6/270cms 1/4 6/8 & 3 x 5/8, Gain 6m 3.0dB/2m 5.0dB/70 7.5dB Length 60" SO239 fitting commercial quality.....	<b>£39.95</b>
<b>GF151</b> Professional glass mount dual band antenna. Freq: 2/70 Gain: 2.9/4.3dB. Length: 31".....	New low price <b>£29.95</b>

## SINGLE BAND MOBILE ANTENNAS

<b>MR 214</b> 2 metre straight stainless 1/4 wave 3/8 fitting.....	<b>£4.95</b>
SO239 type.....	<b>£5.95</b>
<b>MR 258</b> 2 Metre 5/8 wave 3.2 dBd Gain (3/8 fitting) (Length 58").....	<b>£12.95</b>
<b>MR 268S</b> 2 Metre 5/8 wave 3.5dBd gain Length 51" SO239 fitting.....	<b>£19.95</b>
<b>MR 290</b> 2 Metre (2 x 5/8 Gain: 7.0dBd) (Length: 100"). SO239 fitting, "the best it gets".....	<b>£39.95</b>
<b>MR 625</b> 6 Metre base loaded (1/4 wave) (Length: 50") commercial quality.....	<b>£19.95</b>
<b>MR 614</b> 6 Metre loaded 1/4 wave (Length 56") (3/8 fitting).....	<b>£13.95</b>
<b>MR 644</b> 6 Metre loaded 1/4 wave (Length 40") (3/8 fitting).....	<b>£12.95</b>
(SO239 fitting).....	<b>£15.95</b>

## SINGLE BAND END FED BASE ANTENNAS

<b>70 cms</b> 1/2 wave (Length 26") (Gain: 2.5dB) (Radial free).....	<b>£24.95</b>
<b>2 metre</b> 1/2 wave (Length 52") (Gain 2.5dB) (Radial free).....	<b>£24.95</b>
<b>4 metre</b> 1/2 wave (Length 80") (Gain 2.5dB) (Radial free).....	<b>£39.95</b>
<b>6 metre</b> 1/2 wave (Length 120") (Gain 2.5dB) (Radial free).....	<b>£44.95</b>
<b>6 metre</b> 5/8 wave (Length 150") (Gain 4.5dB) (3 x 28" radials).....	<b>£49.95</b>

## MFJ ATU

<b>MFJ-941E</b> .....	<b>£129.95</b>
<b>MFJ-945</b> .....	<b>£119.95</b>
<b>MFJ-948</b> .....	<b>£139.95</b>
<b>MFJ-949E</b> .....	<b>£159.95</b>
<b>MFJ-969</b> .....	<b>£199.95</b>
<b>MFJ-971</b> .....	<b>£99.95</b>
<b>MFJ-993</b> .....	<b>£249.95</b>
<b>MFJ-974</b> .....	<b>£159.95</b>
<b>MFJ-974H</b> .....	<b>£179.95</b>

## VHF/UHF VERTICAL CO-LINEAR FIBREGLASS BASE ANTENNA

**SQ & BM Range VX 6 Co-linear: Specially Designed Tubular Vertical Coils individually tuned to within 0.05pf (maximum power 100 watts)**

<b>BM100 Dual-Bander</b> .....	<b>£29.95</b>
(2 mts 3dBd) (70cms 6dBd) (Length 39")	
<b>SQBM100 Dual-Bander</b> .....	<b>£39.95</b>
(2 mts 3dBd) (70cms 6dBd) (Length 39")	
<b>BM200 Dual-Bander</b> .....	<b>£39.95</b>
(2 mts 4.5dBd) (70cms 7.5dBd) (Length 62")	
<b>SQBM200 Dual-Bander</b> .....	<b>£49.95</b>
(2 mts 4.5dBd) (70cms 7.5dBd) (Length 62")	
<b>SQBM500 Dual - Bander Super Gainer</b> .....	<b>£59.95</b>
(2 mts 6.8dBd) (70cms 9.2dBd) (Length 100")	
<b>BM1000 Tri-Bander</b> .....	<b>£59.95</b>
(2 mts 6.2dBd) (6 mts 3.0dBd) (70cms 8.4dBd) (Length 100")	
<b>SQBM1000 Tri-Bander</b> .....	<b>£69.95</b>
(2 mts 6.2dBd) (6 mts 3.0dBd) (70cms 8.4dBd) (Length 100")	
<b>SQBM 100/200/500/800/1000</b> are <b>Polyc coated Fibre Glass with Chrome &amp; Stainless Steel Fittings.</b>	

## SINGLE BAND VERTICAL CO-LINEAR BASE ANTENNA

<b>BM33</b> 70 cm 2 X 5/8 wave Length 39" 7.0 dBd Gain.....	<b>£34.95</b>
<b>BM45</b> 70cm 3 X 5/8 wave Length 62" 8.5 dBd Gain.....	<b>£49.95</b>
<b>BM55</b> 70cm 4 X 5/8 wave Length 100" 10 dBd Gain.....	<b>£69.95</b>
<b>BM60</b> 2mtr 5/8 Wave, Length 62", 5.5dBd Gain.....	<b>£49.95</b>
<b>BM65</b> 2mtr 2 X 5/8 Wave, Length 100", 8.0 dBd Gain.....	<b>£69.95</b>

## MINI HF DIPOLES (length 11' approx)

<b>MD020</b> 20mt version approx only 11ft.....	<b>£39.95</b>
<b>MD040</b> 40mt version approx only 11ft.....	<b>£44.95</b>
<b>MDO80</b> 80mt version approx only 11ft.....	<b>£49.95</b>
(aluminium construction)	

## ROTARY HF DI-POLE

<b>RDP-3B</b> 10/15/20mtrs length 7.40m.....	<b>£119.95</b>
<b>RDP-4</b> 12/17/30mtrs length 10.50m.....	<b>£119.95</b>
<b>RDP-40M</b> 40mtrs length 11.20m.....	<b>£169.95</b>
<b>RDP-6B</b> 10/12/15/17/20/30mtrs boom length 1.00m. Length 10.0m.....	<b>£239.95</b>

## HF DELTA LOOPS

<b>DLHF-100</b> 10/15/20mtrs (12/17-30m) Boom length 4.2m. Max height 6.8m. Weight 35kg. Gain 10dB.....	<b>£449.95</b>
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## HAND-HELD ANTENNAS

<b>MRW-310</b> Rubber Duck TX 2 Metre & 70 cms Super Gainer RX 25- 1800 Length 40cm BNC fitting.....	<b>£14.95</b>
<b>MRW-232</b> Mini Miracle TX 2 Metre 70 & 23 cms RX 25-1800 Mhz Length just 4.5cm BNC fitting.....	<b>£19.95</b>
<b>MRW-250</b> Telescopic TX 2 Metre & 70 cms RX 25-1800 Mhz Length 14-41cm BNC fitting.....	<b>£16.95</b>
<b>MRW-200</b> Flexi TX 2 Metre & 70cms RX 25-1800 Mhz Length 21cm SMA fitting.....	<b>£19.95</b>
<b>MRW-210</b> Flexi TX 2 Metre & 70cms Super Gainer RX 25-1800 Mhz Length 37cm SMA fitting.....	<b>£22.95</b>
All of the above are suitable to any transceiver or scanner. Please add £2.00 p+p for hand-held antennas.	

## HB9CV 2 ELEMENT BEAM 3.5 dBd

<b>70cms</b> (Boom 12").....	<b>£19.95</b>
<b>2 metre</b> (Boom 20").....	<b>£24.95</b>
<b>4 metre</b> (Boom 23").....	<b>£29.95</b>
<b>6 metre</b> (Boom 33").....	<b>£34.95</b>
<b>10 metre</b> (Boom 52").....	<b>£64.95</b>
<b>6/2/70 Triband</b> (Boom 45").....	<b>£64.95</b>

## HALO LOOPS

<b>2 metre</b> (size 12" approx).....	<b>£14.95</b>
<b>4 metre</b> (size 20" approx).....	<b>£19.95</b>
<b>6 metre</b> (size 30" approx).....	<b>£26.95</b>

These very popular antennas square folded di-pole type antennas



## CROSSED YAGI BEAMS All fittings Stainless Steel

<b>2 metre 5 Element</b> (Boom 64") (Gain 7.5dBd).....	<b>£74.95</b>
<b>2 metre 8 Element</b> (Boom 126") (Gain 11.5dBd).....	<b>£94.95</b>
<b>70 cms 13 Element</b> (Boom 83") (Gain 12.5dBd).....	<b>£74.95</b>



## YAGI BEAMS All fittings Stainless Steel

<b>2 metre 4 Element</b> (Boom 48") (Gain 7dBd).....	<b>£24.95</b>
<b>2 metre 5 Element</b> (Boom 63") (Gain 10dBd).....	<b>£44.95</b>
<b>2 metre 8 Element</b> (Boom 125") (Gain 12dBd).....	<b>£59.95</b>
<b>2 metre 11 Element</b> (Boom 185") (Gain 13dBd).....	<b>£89.95</b>
<b>4 metre 3 Element</b> (Boom 45") (Gain 8dBd).....	<b>£49.95</b>
<b>4 metre 5 Element</b> (Boom 128") (Gain 10dBd).....	<b>£59.95</b>
<b>6 metre 3 Element</b> (Boom 72") (Gain 7.5dBd).....	<b>£54.95</b>
<b>6 metre 5 Element</b> (Boom 142") (Gain 9.5dBd).....	<b>£74.95</b>
<b>70 cms 13 Element</b> (Boom 76") (Gain 12.5dBd).....	<b>£49.95</b>



## ZL SPECIAL YAGI BEAMS

## ALL FITTINGS STAINLESS STEEL

<b>2 metre 5 Element</b> (Boom 38") (Gain 9.5dBd).....	<b>£39.95</b>
<b>2 metre 7 Element</b> (Boom 60") (Gain 12dBd).....	<b>£49.95</b>
<b>2 metre 12 Element</b> (Boom 126") (Gain 14dBd).....	<b>£74.95</b>
<b>70 cms 7 Element</b> (Boom 28") (Gain 11.5dBd).....	<b>£34.95</b>
<b>70 cms 12 Element</b> (Boom 48") (Gain 14dBd).....	<b>£49.95</b>

The biggest advantage with a ZL-special is that you get massive gain for such a small boom length, making it our most popular beam antenna

## MULTI PURPOSE ANTENNAS

<b>MSS-1</b> Freq RX 25-2000 Mhz, TX 2 mtr 2.5 dBd Gain, TX 70cms 4.0 dBd Gain, Length 39".....	<b>£39.95</b>
<b>MSS-2</b> Freq RX 25-2000 Mhz, TX 2 mtr 4.0 dBd Gain, TX 70cms 6.0 dBd Gain, Length 62".....	<b>£49.95</b>
<b>IVX-2000</b> Freq RX 25-2000 Mhz, TX 6 mtr 2.0 dBd Gain, 2 mtr 4dBd Gain, 70cms 6dBd Gain, Length 100".....	<b>£89.95</b>

Above antennas are suitable for transceivers only

## G5RV Wire Antenna (10-40/80 metre)

## All fittings Stainless Steel

	FULL.....	HALF.....
<b>Standard</b>	<b>£22.95</b>	<b>£19.95</b>
<b>Hard Drawn</b>	<b>£24.95</b>	<b>£22.95</b>
<b>Flex Weave</b>	<b>£32.95</b>	<b>£27.95</b>
<b>PVC Coated Flex Weave</b>	<b>£37.95</b>	<b>£32.95</b>
<b>Deluxe 450 ohm PVC Flexweave</b>	<b>£49.95</b>	<b>£44.95</b>
<b>TS1</b> Stainless Steel Tension Springs (pair) for G5RV.....	<b>£19.95</b>	



## G5RV INDUCTORS

Convert your half size g5rv into a full size with just 8ft either side. Ideal for the small garden.....**£19.95**

## REINFORCED HARDENED FIBRE GLASS MASTS (GRP)

<b>112" Diameter</b> 2 metres long.....	<b>£19.95</b>
<b>134" Diameter</b> 2 metres long.....	<b>£24.95</b>
<b>2" Diameter</b> 2 metres long.....	<b>£29.95</b>

## GUY ROPE 30 METRES

<b>MGR-3</b> 3mm (maximum load 250 kgs).....	<b>£6.95</b>
<b>MGR-4</b> 4mm (maximum load 380 kgs).....	<b>£14.95</b>
<b>MGR-6</b> 6mm (maximum load 620 kgs).....	<b>£29.95</b>



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18" T & K Bracket (complete with U Bolts).....	£17.95
24" T & K Bracket (complete with U Bolts).....	£19.95
36" T & K Bracket (complete with U Bolts).....	£29.95
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
Earth rod including clamp (solid copper).....	£14.95
Pole to pole clamp 2"-2".....	£4.95
Di-pole centre (for wire).....	£4.95
Di-pole centre (for aluminium rod).....	£4.95
Dog bone insulator.....	£1.00
Dog bone insulator heavy duty.....	£2.00

## 5ft POLES H/DUTY (SWAGED)

Heavy Duty Aluminium (1.2mm wall)	
1 1/4" single 5' ali pole.....	£7.00
1 1/4" set of four (20' total approx).....	£24.95
1 1/2" single 5' ali pole.....	£10.00
1 1/2" set of four (20' total approx).....	£34.95
1 3/4" single 5' ali pole.....	£12.00
1 3/4" set of four (20' total approx).....	£39.95
2" single 5' ali pole.....	£15.00
2" set of four (20' total approx).....	£49.95

(All swaged poles have a push fit to give a very strong mast set)

## CABLE &amp; COAX CABLE

RG58 best quality standard per mt.....	35p
RG58 best quality military spec per mt.....	60p
RGMini 8 best quality military spec per mt.....	70p
RG213 best quality military spec per mt.....	85p
H100 best quality military coax cable per mt.....	£1.10
3-core rotator cable per mt.....	45p
7-core rotator cable per mt.....	£1.00
10 amp red/black cable 10 amp per mt.....	40p
20 amp red/black cable 20 amp per mt.....	75p
30 amp red/black cable 30 amp per mt.....	£1.25

Please phone for special 100 metre discounted price

## CONNECTORS &amp; ADAPTERS

PL259/9 plug (Large entry).....	£0.75
PL259 Reducer (For PL259/6 to conv to P1259/6).....	£0.25
PL259/6 plug (Small entry).....	£0.75
PL259/7 plug (For mini 8 cable).....	£1.00
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 socket (Round).....	£2.50
N-Type Chassis socket (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&amp;P for connector only orders

## 10/11 METRE ANTENNAS

G.A.P.12 1/2 wave aluminium (length 18' approx).....	£24.95
G.A.P.58 5/8 wave aluminium (length 21' approx).....	£29.95
S27-3 3-element yagi. Freq: 27-28MHz. Length: 2.5mtrs. Gain: 8.5dB.....	£59.95
S27-4 4-element yagi. Freq: 27-28MHz. Length: 3.8mtrs. Gain: 10.5dB.....	£69.95

## BALUNS

MB-1 1:1 Balun 400 watts power.....	£24.95
MB-4 4:1 Balun 400 watts power.....	£24.95
MB-6 6:1 Balun 400 watts power.....	£24.95
MB-1X 1:1 Balun 1000 watts power.....	£29.95
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

## TRI/DUPLEXER &amp; ANTENNA SWITCHES

MD-24 HF or VHF/UHF internal duplexer (1.3-225MHz) (350-540MHz) SO239/PL259 fittings.....	£22.95
MD-24N same spec as MD-24 but "N-type" fittings.....	£24.95
MX2000 HF/VHF/UHF internal Tri-plexer (1.6-60MHz) (110-170MHz) (300-950MHz).....	£59.95
CS201 Two-way di-cast antenna switch. Freq: 0-1000MHz max 2,500 watts SO239 fittings.....	£18.95
CS201-N Same spec as CS201 but with N-type fittings.....	£28.95
CS401 Same spec as CS201 but 4-way.....	£49.95

## ANTENNA ROTATORS

AR-31050 Very light duty TV/UHF.....	£24.95
AR-300XL Light duty UHF/VHF.....	£49.95
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

## MOBILE MOUNTS

Turbo mag mount 7" 4mtrs coax/PL259 3/8 or SO239.....	£14.95
Tri-mag mount 3 x 5" 4mtrs coax/PL259 3/8 or SO239.....	£39.95
Hatch Back Mount (stainless steel) 4 mtrs coax/PL259 3/8 or SO239 fully adjustable with turn knob.....	£29.95
Gutter Mount (same as above).....	£29.95
Rail Mount (aluminium) 4mtrs coax/PL259 suitable for up to lynch roof bars or poles 3/8 fitting.....	£12.95
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 4mtrs coax/PL259 3/8 or SO239 fitting.....	£12.95

## ANTENNA WIRE &amp; RIBBON

Enamelled copper wire 16 gauge (50mtrs).....	£11.95
Hard Drawn copper wire 16 gauge (50mtrs).....	£12.95
Equipment wire Multi Stranded (50mtrs).....	£9.95
Flexweave high quality (50mtrs).....	£27.95
PVC Coated Flexweave high quality (50mtrs).....	£37.95
300Ω Ladder Ribbon heavy duty USA imported (20mtrs).....	£15.00
450Ω Ladder Ribbon heavy duty USA imported (20mtrs).....	£15.00

(Other lengths available, please phone for details)

## HF BALCONY ANTENNA

BAHF-4 FREQ:10-15-20-40 Mtrs LENGTH: 1.70m HEIGHT: 1.20m POWER: 300 Watts.....	£159.95
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## MISCELLANEOUS ITEMS

CDX Lightning arrester 500 watts.....	£19.95
MDX Lightning arrester 1000 watts.....	£24.95
AKD TV1 filter.....	£9.95
Amalgamating tape (10mtrs).....	£7.50
Desoldering pump.....	£22.99
Alignment 5pc kit.....	£1.99

## TELESCOPIC MASTS (aluminium &amp; fibreglass options)

TMA-1 Aluminium mast ★ 4 sections 170cm each ★ 45mm to 30mm ★ Approx 20ft erect 6ft collapsed.....	£99.95
TMA-2 Aluminium mast ★ 8 sections 170cm each ★ 65mm to 30mm ★ Approx 40ft erect 6ft collapsed.....	£189.95
TMF-1 Fibreglass mast ★ 4 sections 160cm each ★ 50mm to 30mm ★ Approx 20ft erect 6ft collapsed.....	£99.95
TMF-2 Fibreglass mast ★ 5 sections 240cm each ★ 60mm to 30mm ★ Approx 40ft erect 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.....	£399.95
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## 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.....	£329.95
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.....	£599.95
40 Mtr RADIAL KIT FOR ABOVE.....	£99.00

## HF VERTICALS

VR3000 3 BAND VERTICAL FREQ: 10-15-20 Mtrs GAIN: 3.5dB HEIGHT: 3.80m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials).....	£99.95
OPTIONAL 10-15-20mtr radial kit.....	£39.95

VR5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dB HEIGHT: 4.00m RADIAL LENGTH: 2.30m (included). POWER: 500 Watts.....	£189.95
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EVX4000 4 BAND VERTICAL FREQ:10-15-20-40 Mtrs GAIN: 3.5dB HEIGHT: 6.50m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials).....	£119.95
OPTIONAL 10-15-20mtr radial kit.....	£39.95
OPTIONAL 40mtr radial kit.....	£14.95

EVX5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dB HEIGHT: 7.30m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials).....	£169.95
OPTIONAL 10-15-20mtr radial kit.....	£39.95
OPTIONAL 40mtr radial kit.....	£14.95
OPTIONAL 80mtr radial kit.....	£16.95

EVX6000 6 BAND VERTICAL FREQ: 10-15-20-30-40- 80 Mtrs GAIN: 3.5dB HEIGHT: 5.00m RADIAL LENGTH: 1.70m(included) POWER: 800 Watts.....	£299.95
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EVX8000 8 BAND VERTICAL FREQ:10-12-15-17-20- 30-40 Mtrs (80m optional) GAIN: 3.5dB HEIGHT: 4.90m RADIAL LENGTH: 1.80m (included) POWER: 2000 Watts.....	£319.95
80 MTR RADIAL KIT FOR ABOVE.....	£89.00

(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.....	£49.95
MTD-1 (3 BAND) FREQ:10-15-20 Mtrs LENGTH:7.40 Mtrs POWER:1000 Watts.....	£44.95
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)

## PATCH LEADS

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)

## SPX-100 'PLUG N GO'

Normally £49.95. This month **£39.95!!** Plus £6.00 P&P  
6mtrs through to 80mtrs.  
Change band by using a simple fly lead and socket at  
the base coil and fine tune with the adjustable  
telescopic whip.  
Standard 3/8 thread 1.65mtrs fully extended.



# Where will yours take you?

# Yaesu UK Photo Competition

**YAESU**  
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*See inside this issue for details of an easy to enter competition that could win you the chance to see your photograph used in Yaesu promotions as well as winning you a FT-817ND, VX-7R or VX-2E.*

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Amateur Radio opens up a world of opportunities and interesting possibilities and here's your chance to share your experiences and be in with the chance of winning one of three great transceivers kindly donated by Yaesu UK.

All you have to do is send in a photo of you or your fellow Radio Amateur operating a Yaesu Radio in an unusual or impressive location (see the example on this page). Please also include a short description (200 words maximum) of the background to the photograph. Entries must be received by **Monday 13 September 2004** and that's it! Send your entry to **Yaesu/PW Photo Comp, PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.**

All entries will be displayed on the Yaesu UK stand at the Leicester Amateur Radio Show at Donington on 1 & 2 October 2004.

## So, what are you waiting for? Get snapping and send your entry today - Good Luck!

### The Rules

- The photo must be a good quality print measuring at least 7 x 5in (digital images are allowed but must be printed on photo quality paper - no disks please)
- You must ensure you have the negative or original jpeg file available (at least 300dpi) in case you are lucky enough to have your print used in a Yaesu promotion
- Your name, address, Amateur Radio callsign and daytime 'phone number must accompany your photo
- Age is no barrier neither is Licence class - this competition is open to **all**!
- If you have taken the photo but it's not you pictured you must have permission of the person to send it.

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The Editor and Yaesu UK's decision on the winners is final and no correspondence can be entered into.

If you do not wish to be contacted in the future as a result of entering this competition please indicate on your entry.

**1st FT-817ND £599**

**2nd VX-7R £359**



**3rd VX-2E  
£199**

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

ONLY **£179.95** delivery £10

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### MOBILE PENETRATOR

1.8-30MHz (200W PEP) mobile antenna - no ATU required. Length 102" (52" collapsed). Fits 3/8 mount (SO239 feed point)

OUR PRICE **£139.95** delivery £10.00

New improved 'Wire Penetrator' 1.8-60MHz end-fed wire antenna (45ft long).....£159.95

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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, 2.15/6.2/8.4dB (2.4m).....	£69.95

### Q-TEK 6m end-fed half wave....£49.95

### Q-TEK YAGIS

2m	5ele (boom 63"/10.5dBd).....	£49.95
2m	8ele (boom 125"/13dBd).....	£64.95
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

### 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

Choke Balun Inline balun for G5RV.....£24.95 P&P £3

### STANDARD G5RV

Full size 102ft (now includes heavy duty 300Ω ribbon).....	£28.95 P&P £5
Half size 51ft (now includes heavy duty 300Ω ribbon).....	£24.95 P&P £5

### Q-TEK INDUCTORS

80mtr inductors + wire to convert ½ size G5RV into full size. (Adds 8ft either end).....£25.00 P&P £4.00 (a pair)

### DIPOLE CENTRE PIECES

Open wire.....	£5.99
SO-239.....	£5.99

### 300Ω HEAVY DUTY FEEDER

5m length.....	£5.00 P&P £3.00
10m length.....	£10.00 P&P £3.00
300m roll "club special buy".....	£135.00 P&P £10.00

### BALUNS & TRAPS

1.1 Balun.....	£25.00 P&P £4
4.1 Balun.....	£25.00 P&P £4
6.1 Balun.....	£25.00 P&P £4
40 mtrs Traps.....	(a pair) £25.00 P&P £4
80 mtrs Traps.....	(a pair) £25.00 P&P £4
10 mtrs Traps.....	(a pair) £25.00 P&P £4
15 mtrs Traps.....	(a pair) £25.00 P&P £4
20 mtrs Traps.....	(a pair) £25.00 P&P £4
5.35MHz Traps.....	(a pair) £25.00 (a pair)

### REPLACEMENT POWER LEADS

DC-1 Standard 6-pin/20A fits most HF.....	£20.00
DC-2 Standard 2-pin/15A fits most VHF/UHF.....	£10.00

### CUSHCRAFT BARGAINS

MA5B Mini beam 10, 12, 15, 17, 20m.....	£389.00 £329.95
A3S 3 ele beam 10, 15, 20m.....	£499.00 £379.00
A4S 4 ele beam (10-20m).....	£599.00 £449.99
R6000 Vertical 6, 10, 12, 15, 17, 20m.....	£349.00 £315.95
R8E Vertical (40-10m) "special".....	SPECIAL £499.00 £399.99

Practical Wireless, August 2004

### CAROLINA WINDOW

CW-160S (160-10m) 40m long.....	£129.95 P&P £8.50
CW-160 (160-10m) 80m long.....	£119.95 P&P £8.50
CW-80 (80-10m) 40m long.....	£89.95 P&P £8.50
CW-80S (80-10m) 20m long.....	£109.95 P&P £8.50
CW-40 (40-10m) 20m long.....	£84.95 P&P £8.50

### COPPER ANTENNA WIRE ETC

Enamelled (50m roll).....	£12.95 P&P £5
Hard drawn (50m roll).....	£13.95 P&P £5
Multi-Stranded (Grey PVC) (50m roll).....	£11.95 P&P £5
Flexweave H/duty 50 mtrs.....	£30.00 P&P £5
Flexweave H/duty (18 mtrs).....	£15.95 P&P £5
Flexweave (PVC coated 18 mtrs).....	£18.95 P&P £5
Flexweave (PVC coated 50 mtrs).....	£40.00 P&P £6
Special 200mtr roll PVC coated flexweave.....	£99.00 P&P £10
Copper plated earth rod (4ft).....	£13.00 P&P £6
Copper plated earth rod (4ft) + earth wire.....	£18.99 P&P £6
New RF grounded wire (10m pack) PVC coated.....	£12.50 P&P £5

### COAX SWITCHES

2 way CX-201 (0-1GHz) SO239.....	£19.95
2 way CX-201 'N' (0-1GHz) 'N'.....	£24.95
4 way CX-401 (0-500MHz) SO239.....	£69.95
4 way CX-401 'N' (0-500MHz) 'N'.....	£79.95

### NISSEI PWR/SWR METERS

RS-502 1.8-525MHz (200W).....	£79.95 P&P £5
RS-102 1.8-150MHz (200W).....	£59.95 P&P £5
RS-402 125-525MHz (200W).....	£59.95 P&P £5
RS-3000 1.8-60MHz (3kW) Incls mod meter.....	£79.95 P&P £5
RS-40 144/430MHz Pocket PWR/SWR.....	£34.95 P&P £2
DL-30 diamond dummy load (100W max).....	£26.99 P&P £3

Uses 5D-SFB low loss coax	Connectors.....	Length.....	Price
	PL-259 - PL-259.....	0.6m.....	£5.99
	PL-259 - PL-259.....	4m.....	£11.99
	BNC - BNC.....	1m.....	£6.99
	BNC - BNC.....	5m.....	£10.00

### LOW LOSS PATCH LEADS

Uses 5D-SFB low loss coax	Connectors.....	Length.....	Price
	PL-259 - PL-259.....	0.6m.....	£5.99
	PL-259 - PL-259.....	4m.....	£11.99
	BNC - BNC.....	1m.....	£6.99
	BNC - BNC.....	5m.....	£10.00

### COAX BARGAINS

RG-213 Mil spec x 100m. ONLY <b>£69.95</b> P&P £10	Genuine high quality coax
RG-58 Mil spec x 100m. ONLY <b>£35.00</b> P&P £10.00	MILITARY SPEC
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Wall bracket, screws not supplied. Simply screw to outside wall and hang pulley on

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A simple to fit but very handy mast pulley with rope guides to avoid tangling. (Fits up to 2" mast).

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Ground fixing spikes (3 set) powdered coated.....	£24.00 P&P £8
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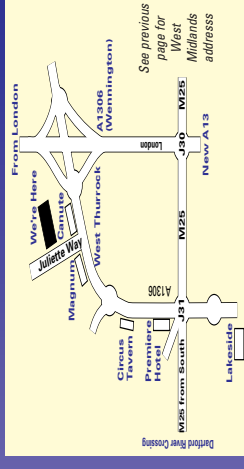
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TRUE IF DSP TRANSCIVER  
When only the best will do!  
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Ideal for home or car use.  
Includes auto tuner.

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OUR PRICE £999.00



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HF-6m-2m, All mode,  
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IC-7400 + SP-21 + SM-20  
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This classic all-band  
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No. 1 best seller. HF +  
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IC-706 + MS-1228.....£799.00

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The ultimate HF  
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up to 5W. £299.00.

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In our opinion, the best  
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£1200.

INCLUDES ATU  
OUR PRICE  
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PS-53 matching power supply.....£229.00  
MC-60A Desk mic.....£119.95  
MC-90 DSP desktop mic.....£79.95  
SP-23 matching speaker.....£68.95

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HF (100W) with general  
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(Optional DSP).....£85.00

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£549.00

### power supplies

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Features: ★ Over voltage protection ★ Short circuit  
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RRP £79.95

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"Smallest version to date" now with cigar socket.

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A superb (diamond quality) 6 band trap  
vertical antenna with trap radials - unique trap  
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80m/50m/20m/15m/10m/6m. 200W SSB,  
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SEND SAE FOR DATA SHEET

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counterpoise kit).

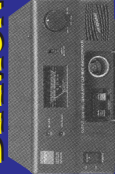
OUR PRICE  
£229.00

Counterpoise kit (for home use).....£69.00  
Universal boot mount.....£24.95

#### DIAMOND GZV-4000

Diamond quality power  
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40 amp version £139.99



Model	Input voltage	Output voltage	Output current	Dimensions (W x H x D)mm	Weight	Price
GZV4000 (w/switching)	5-15VDC variable	40A	continuous	210x110x300	3.5kg	£139.99
GZV2500 (w/switching)	5-15VDC variable	25A	continuous	210x110x220	2.5kg	£119.99

# vhf-uhf radios, etc. - never a problem

## YAESU FT-7800



Yaesu's latest high spec, low cost mobile. 2m/70cm 50W-2m/40W-70cm.

**INC.'S WIDE BAND RECEIVER. £229.00**

FT-1000MP MKV.....£289.00  
FT-8800 Quad bander.....£329.00  
Quadr amp.....£339.00

## ICOM IC-2725



OUR PRICE  
**£265.00**  
*Optimised for mobile use, includes 40W output*

## ICOM BARGAINS

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IC-910X 2m/70/23.....£1199.00  
E-90 handie.....£265.00

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Tx: 2m/70cm.  
Rx: 0.5-99MHz. Includes battery (Li-on) + charger.

**OUR PRICE £159.00**

Optional case.....£16.95  
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2m + 70cm Handie. Includes: (NIMH) Battery/Charger. High + narrow switchable. High power (4.5W) OP as standard. Alpha Numeric channeling. INCL'S FREE REMOTE MIC.

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Transceiver & scanner 2m/70cm Tx (5W). Rx: 0.1-1300MHz, all mode (incl SSB). Lithium ion battery & charger.

**£249.00**

Optional case.....£19.99  
TH-D7E MkII 2m/70cm + TNC.....£299.99

## YAESU VX-7R



Yaesu heavy duty tri-bander 50/144/430MHz. (Lithium ion battery) high power (5W) as standard. Includes charger.

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Farhaven RD-500VX.....	£699.99	Alinco DJ-X3.....	£39.95
AOR AR-8600MkII.....	£589.00	AOR AR-8200MkII.....	£379.00
Yaesu VR-5000.....	£35.00	Yupiterra MYT-7100.....	£199.99
GRE PSR-225.....	£199.99	Icom R5.....	£149.99

## SECONDHAND SELECTION

Yaesu VR-5000.....	£399.00	Icom IC-R5.....	£129.00
Icom IC-R8500.....	£849.00	Yupiterra MYT-7100.....	£199.00
Yaesu FRG-100.....	£299.00	Icom IC-R3.....	£249.00
Icom IC-R72.....	£299.00	Alinco DJ-X2000.....	£349.00
Farhaven RD-500VX.....	£599.00	Alinco DJ-X10.....	£199.00

# when it comes to gadgets - where else would you look

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Hanging type earphone with boom mic & in line PTT box. Available for Kenwood (EP-320K), also (EP-320). Will fit Alinco, most of Icom and Yaesu and ADi.

**OUR PRICE £24.95** P&P £3.00

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Superb headset for most handies. 887K (fits Kenwood) £24.95. 887 (fits most twin socket-Alinco, Icom, Yaesu, etc. £24.95 P&P £3. Optional adapter boxes available for Icom, Yaesu, Kenwood & Alinco VHF-UHF mobiles & HF Tcrrs (£18.95)

**OUR PRICE £21.95** P&P £1.50

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SMA 40cm flexible whip that is ideal as replacement. **OUR PRICE £26.95** P&P £1.50

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Easy, rapid fit aerial rotator for domestic and mobile application. Ideal for lightweight antennas/cameras. Supplied with: fitting hardware, 10m cable & control box. (requires 4AA or 6V DC).

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500kg brake winch. **BARGAIN PRICE £59.95** Del £8.50

Winch wall bracket.....£19.99  
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350kg brake.....£69.95  
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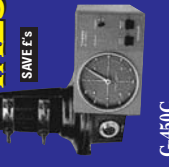


Quality rotator for VHF/UHF. Superb for most VHF-UHF yagis, 3 core cable required. 3 core cable 50p per mtr.

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Yaesu 8 pin round to modular adapter (FT-100, etc.).....£19.99  
A-08 8 pin "Alinco" round.....£9.95  
K-08 8 pin "Kenwood" round.....£9.95  
I-08 8 pin "Icom" round.....£9.95  
IM-08 Modular phone "com".....£9.95  
KM-08 Kenwood modular lead.....£9.95

## 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

In the last of his articles encouraging you to try an oscilloscope, Rob Mannion G3XFD provides an overview of the subject. He also suggests you consider buying a modern budget-priced 'scope from Kenwood (Tecstar).

**T**he response, from the recent Radio Basics (RB) article on oscilloscopes, from readers has been very encouraging indeed! In fact, the feedback has made us sit back and think about the whole subject very carefully.

One of the feedback aspects is that RB readers have been requesting the photocopies of the series on oscilloscopes by the late **Fred Judd G2BCX**, published in *PW* during the early 1990s. **Clive Hardy G4SLU** - he deals with your enquiries in our Book Service - has told me your interest shows that there's obviously a need for us to up-date Fred's original article and represent it for you. To that end I'm planning to discuss the subject with an author very soon.

So, as usual I'll say 'watch this space!' We may even be able to present the articles as a small booklet - together with other information you've been asking for - including a re-print featuring the RB series itself. I'll keep you up-dated and you can be sure we'll do our best on your behalf.

## Readers' Requests

A number of readers have written in to me asking questions on oscilloscopes which I should have covered in the earlier part of this short RB series, but due to the lack of space had not been included. I fully realise of course, that we have to cater for levels of knowledge and to help as many readers as possible, in

conjunction with **Tex Swann G1TEX**, I'm planning to prepare an Oscilloscope Information sheet. This will carry basic details on 'scopes,



● Rob G3XFD says he's used this photograph (taken at the Dayton HamVention in the USA - the man wearing the Stetson on the right provides a clue!) before. But, as Rob says - it seems appropriate to re-use it as the picture clearly demonstrates what's available at larger rallies. In fact, on this particular trip to the Dayton HamVention two Danish readers joined the *PW* trip. They were University lecturers from Copenhagen and a large proportion of the equipment shown in this photograph returned to Europe - heading for their university!

what to look for, a little more on their basic specifications and what they mean.

The information will be available free, and should be

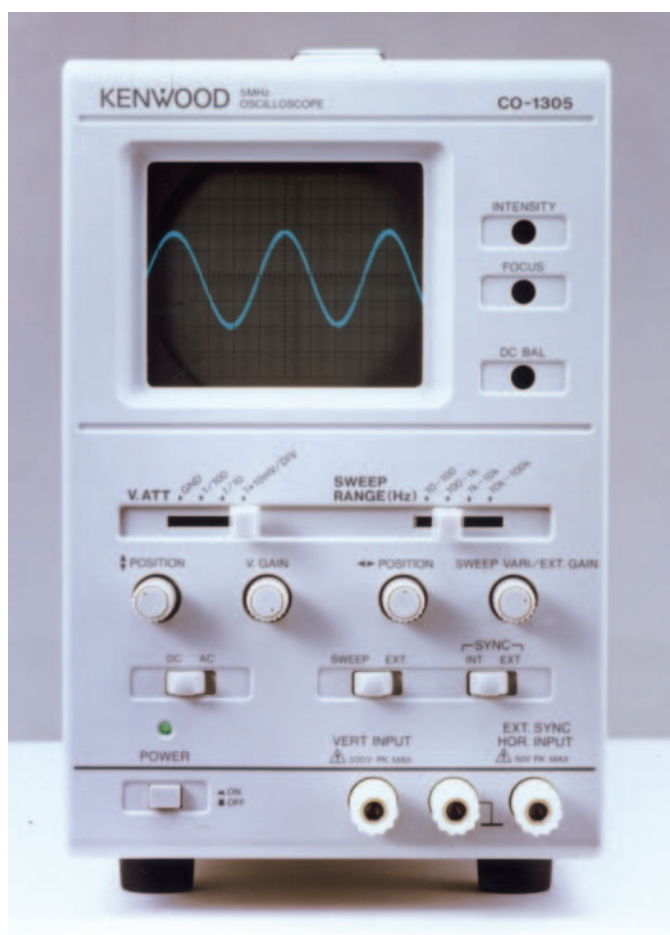
ready by the end of July. All I ask you to do is to send a first class stamped address A5 sized (this takes a folded A4 sheet) envelope, into which we'll enclose the information. Please note that the level of requests will help me judge what's required in future when I write about test equipment in RB. **But please remember - no s.a.e. - no free sheet!**

## Recommended 'Scope?

One of the most frequently asked questions I'm asked - is 'What oscilloscope do you recommend Rob?' In reply I usually have to say... "how much have you got to spend and how long is a piece of string"? In other words, my answer depends on your budget and what you want to do (and how familiar you are) with your new oscilloscope.

Despite the apparently vague - but honest, I've been looking around for reasonably priced instruments which I feel would be suitable for readers. Here I'm pleased to say that a familiar name - Kenwood - provides one option. Kenwood manufacture a range of interesting and reasonably priced 'scopes. The CO-1305, **Fig. 1**, being one of them.

The CS-1305 5MHz bandwidth 'scope has been on sale for a number of years and although still available (look out for a second-hand model, which should cost less than £100) the recently introduced CS-1010, **Fig. 2**, not only has better specifications than the earlier model - it's cheaper!



● **Fig. 1:** The Kenwood C-1305 single trace unit provided 'entry level' basic oscilloscope. The instrument has all the facilities for basic fault finding in the workshop and it's easy to use and - most importantly is inexpensive on the second-hand market. The 'scope is still available new although it has been replaced by newer models (see **Fig. 3**). However, the advice from G3XFD is that if you see a CO-1305 for sale second-hand - you should be able to get it for around the £100 mark. (See text).

(Definitely a bonus for radio hobbyists who can't resist a bargain!).

The Kenwood CS-1010, marketed by the Tecstar division of Kenwood, has a better timebase than that provided on the earlier instrument. Importantly, the newer 'scope has an improved bandwidth of 10MHz, rather than 5MHz.

**Note:** It's important to be aware that the figure quoted (i.e. 10MHz) is usually the point where the oscilloscope's internal amplifiers have reached their 'half way' sensitivity point - usually quoted in deciBels (dB) in direct relation to a voltage. This is an over simplification but will suffice here.

However, once you're familiar with your bench 'scope you'll soon realise that it will often work at far higher frequencies - but with less response on the observed screen trace, which in addition will often also not be as bright as it is on lower frequencies. In practice this will often mean that a 'scope which has a specification published as (let's say 20MHz) will still provide a useful trace, measurement and waveform evaluation facilities up to around 50MHz. Again, perhaps I've over-simplified things, but only to encourage you to try things for yourself!

## The Kenwood CS-1010

In my search for suitable reasonably priced oscilloscopes for RB readers I ended up chatting to Tecstar, the test equipment marketing division of Kenwood. I originally spoke to them to check on the availability of the CS-1305 as I know that 'scope has proved popular with schools and colleges wherever basic training is carried out. This is where I learned that the CS-1010 has rapidly overtaken the earlier model in popularity because of improvements in the timebase and bandwidth. It's also mentioning that the price has dropped because of bulk production due to its popularity - a nice surprise!

Kenwood's promotional material describes the CS-1010 as easy to operate and highly reliable. It is an ideal instrument for research,



● Fig. 2: Another Kenwood 'scope! Readers may end up thinking that *PW* has a 'bias' towards Kenwood's oscilloscope range and in fact this is partly true as their range of instruments provide good value and reliability. This model is the CS-4125, one of the dual channel (double trace) instruments. Although more expensive than the basic 1305 and 1010, this 'scope offer two channel display and has a specification including a 20MHz bandwidth.

production, education and development. It's compact and portable with a frequency bandwidth of 10MHz and sensitivity of 5mV - 5V/div. The instrument is equipped as

horizontal timebase is 0.1S/div to 0.1μS/div.

Features on the CS-1010 include a high brightness cathode ray tube (c.r.t.), a calibration output and variable

Y attenuation. As standard there's also a.c. and d.c. ground, automatic, normal and TV triggering, and the trigger level is variable with +ve or -ve external trigger modes, along with internal, external or line trigger capability. The built-in calibration test waveform is provided by a symmetrical 0.5V ( $\pm 2\%$ ) 1kHz ( $\pm 2\%$ ) waveform.

The CS-1010 costs £149 plus VAT and is available direct from **Tecstar Electronics Ltd., Tecstar House, Bramley Road, St. Ives, Cambridgeshire PE27 3WS. Tel: (01480) 399499., E-mail: sales@tecstar.co.uk** and their

website is [www.tecstar.co.uk](http://www.tecstar.co.uk)

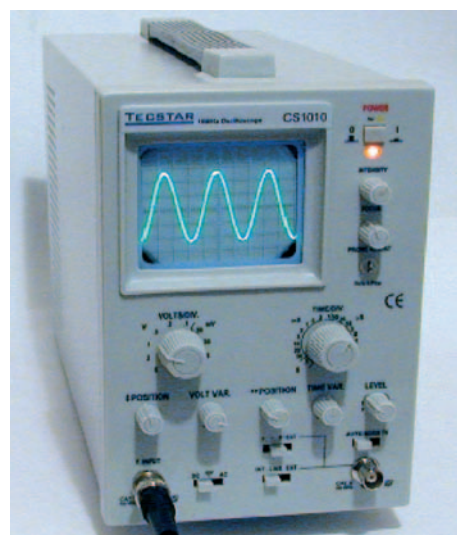
## In The Workshop

Now I've moved home my new workshop will soon be 'up and running' and I'm planning to install a basic 'scope (most likely a CS-1010) as a standard reference instrument for the RB series. It will join my other test equipment - including the dip meter and more sophisticated equipment - as part of the essential items as we work together to discuss their use on the bench.

The idea of using a basic reference instrument such as the CS-1010 is in line with my use of other 'standards' in this series. Those of you who have a copy of the (excellent) ARRL *Understanding Basic Electronics* will already know that I often refer to it - and I take this opportunity to remind you not to neglect your reference library. Please don't...you should always be on the look-out for books and article to add to your collection.

It may be mid-summer when you read this - but I'm already preparing ideas for the darker evenings. You too can take the opportunity by looking out for the rally and show test equipment bargains. Don't let them slip through your fingers!

**PW**



● Fig. 3: The Kenwood CS-1010 single-trace oscilloscope is the replacement for the CS-010. It not only has increased bandwidth (up to 10MHz) this instrument also features a better, easier-to-use timebase which doesn't rely on triggering. Surprisingly, the new 'scope is also cheaper new, than its predecessor! See text for details on buying a CS-1010.

standard with a switchable x10:1 probe which extends the sensitivity up to 50V/div. The



Phil Cadman  
G4JCP has briefly  
slipped away from  
the PW 'vintage  
wireless' shop's  
counter into the  
rear test bench.  
Why? He's  
discovered an  
interesting little kit  
project, which will  
be useful if you've  
got a vintage v.h.f.  
broadcast receiver.

**T**he KRC-A-6 from the Kent-based **Kit Radio Company**, is described as an hi-fi audio adapter, and is, in essence, a tiny wide band f.m. transmitter. The idea is that you connect your personal CD/MD/MP3 player to the KRC-A-6 and listen to the output through your hi-fi system.

The unit will also accept the output from a crystal or ceramic cartridge - the types frequently fitted to low-cost record decks. So, you can listen to all your old '45s' and '78s' through your new audio system.

All very good perhaps, but what's this got to do with vintage radio you may ask? Well, in answering possible questions I can confirm there's another use that makes the KRC-A-6 especially attractive to anyone who has an old broadcast f.m. radio.

You see, when v.h.f. f.m. broadcasting began, Band II extended from 87.5MHz only as far as 100MHz. Consequently, most old v.h.f. radios - and that includes almost all valved sets - only cover 87.5 to 100MHz.

In time it was realised that the v.h.f. broadcast band

needed to expand, and so the upper band edge was moved to 108MHz. This is why you'll find the long-established BBC services and the first commercial stations at the bottom of the band, while the newer BBC local radio stations and the rest of the commercial stations compete for space at the top of the band.

The band expansion causes a real problem for those of us who have old valved f.m. radios. We can listen to the BBC national network - plus a few local stations - but any transmission above 100MHz is out of reach. Enter, the KRC-A-6 to help overcome the loss!

I'm sure by now you've realised that the beauty of the KRC-A-6 is that it can re-transmit the output of a modern v.h.f. radio on a frequency that old f.m. sets can tune to. So, having decided that such a unit is highly desirable,



● The KRC-A-6 will allow you to make the most out of older v.h.f. Band II f.m. receivers. Phil Cadman G4JCP enjoyed making the unit so much he bought one!

Actually, **Tony Westbrook**, who runs the Kit Radio Company and does the design work, has used one of my favourite 'varicap' diodes: a 1N4005 rectifier!

I've found that once reverse biased by a couple of volts, the junction capacitance of a typical

The KRC-A-6 comes with a drilled case which has a printed overlay to identify the four external connections: audio in (L+R), r.f. out and power. The components are supplied in two plastic bags, **Fig. 1**, each with a list of their contents. This makes checking that you have all the

# Building The KRC-A-6 Wide Band FM Unit

how does it work, and how easy is it to build? Let's have a look.

## Simple & Effective

The KRC-A-6's circuit is remarkably simple, yet very effective. At its heart is a 20MHz (nominal) oscillator which feeds a diode harmonic generator. The fifth harmonic (the one we want, at around 100MHz) is right in the middle of the v.h.f. Band II f.m. broadcast band. **Note:** the oscillator frequency can be varied by means of a trimmer capacitor, which provides enough adjustment to place the KRC-A-6's signal anywhere between 95 and 105MHz.

The audio from the two p.c.b.-mounted phono sockets is amplified by a single transistor and is then fed to a varicap diode which forms part of the 20MHz oscillator circuit.

1N4000-series rectifier changes quite linearly with applied voltage, albeit over a small range. But this is precisely what's required if only a small change in frequency is needed. And for f.m. broadcasting,  $\pm 75\text{kHz}$  is all we want.

The entire circuit is powered from a Zener-regulated supply of 5.1V, the specified input voltage range being 6 to 12V. During construction, you're given a choice between two values of audio input resistors; 1k $\Omega$  for high sensitivity and 470k $\Omega$  for low sensitivity.

## Phil's Kind Of Kit!

Well, I must admit, this is my kind of kit; it really is complete. If you have a few simple tools, a soldering iron and some fine-gauge solder, then you can have the kit built and working well within the suggested two hours build time.

correct components very easy indeed.

Unlike the Kit Radio Company's 90V battery kit I featured in a past V&V column which used Veroboard, this kit has a genuine printed circuit board (p.c.b.), **Fig. 2**. However, a paper overlay is used instead of silk screen printing the board. Actually, I found this just as effective as a silk screen, and easier to read. Accurately drilling holes in enclosures is not my favourite pastime, so I was very pleased to see that all the necessary holes had already been drilled.

I think this kit would make an excellent project for anyone wanting some experience in home construction. The manual that accompanies the kit is detailed and well thought out. It seems that Tony has taken a leaf out of Heathkit's book (almost literally).

## Step-By-Step

Following a brief description of the circuit and a block diagram, together with a detailed step-by-step construction guide. It's presented very much in the manner popularised by the much lamented Heathkit company.

Each component is amply described, so beginners need have no fear of fitting the wrong value resistor, for example. Added to which, the manual gives each component its electrical description, its component marking and its marking on the p.c.b. layout. This really ought to ensure that even raw beginners don't get mixed up.

The semiconductors used in the kit are sketched to help with identification. That's quite useful as there is the possibility of confusion between the 5V1 Zener and a 1N4148 diode.

As each component is soldered into the p.c.b., you're invited to tick off each step. Small components are fitted first with progressively larger components following, concluding with the four connectors. And it was here that I ran into a little bit of trouble. The holes drilled in the p.c.b. were too small for the phono connectors and for the power connector.

To be fair, p.c.b. mounted connectors do vary and it's not always possible for small firms to use the same component from the same manufacturer every time. Enlarging the holes took only a few minutes, and after completing the p.c.b., **Fig. 3**, it was time to switch on. A regulated (and current limited) 12V supply serving as my power source.

Having checked that there was no smoke, I tuned a hand-held scanner to 20MHz and adjusted the KRC-A-6's trimmer capacitor. An S-9 signal proved that the oscillator was running and on the correct frequency.

A portable f.m. broadcast radio positioned close by and tuned to 100MHz picked up a healthy signal. Enough with the cautious approach; it was time

to connect a personal CD player and 'get with the beat'!

## Honest & Surprised

Well, I have to be honest and tell you I was surprised at just how well the unit worked! The sound quality was very good, and much as you would expect from a genuine broadcast station.

Moving the portable f.m. receiver away from the KRC-A-6 caused the signal to quickly disappear, so r.f. leakage through the plastic case shouldn't be a problem. But there's enough stray r.f. around to make a direct cable connection to a portable receiver unnecessary providing the unit can be placed adjacent to the radio.

Music centres and hi-fi tuners which don't have a built-in aerial will need an electrical

60% modulation with 1k $\Omega$  input resistors, and 0.5V for 60% modulation with 470k $\Omega$  input resistors. I found the review unit needed a little more than that; 2.4mV and 0.9V respectively. The discrepancy is hardly surprising given the gain spread of the amplifier transistor, and the fact that the junction capacitance of 1N4005 rectifiers probably varies considerably between examples.

Actually, with 1k $\Omega$  input resistors fitted, the unit has more than enough gain, and I found it very easy to over-modulate the transmission. I'd be inclined to perhaps fit 22k $\Omega$  (even 47k $\Omega$ ) input resistors if the unit is going to be fed with a personal cassette-type or portable radio source. Alternatively, a pair of 470k $\Omega$  pre-set pots could be fitted to provide whatever sensitivity you want.

## Low Distortion

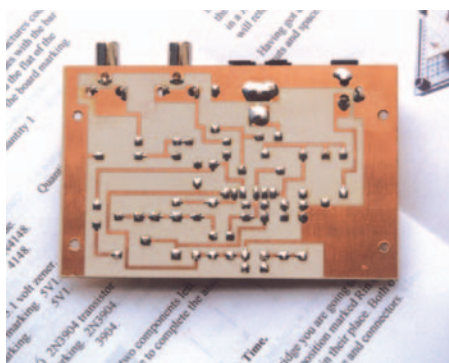
Although I didn't make exhaustive measurements, the frequency response of the KRC-A-6 appeared flat over the entire audio spectrum, and distortion was low. A 1kHz sine wave looked exactly the same at the output of my hi-fi tuner as it did at the input to the KRC-A-6.

Please be aware that it's possible that the KRC-A-6 may show up deficiencies in the source material when old recordings or records are played through a modern system via the unit. So, if something sounds awful, then do please check the signal source before blaming Tony Westbrook and the KRC!

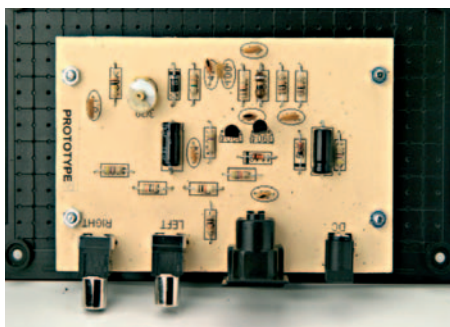
I should mention one point: f.m. transmitters apply a little top lift (50 $\mu$ s pre-emphasis) to the audio before transmission, with the corresponding de-emphasis applied at the receiver. The KRC-A-6 does not apply any pre-emphasis, and so there will be some loss of high audio frequencies when a conventional f.m. receiver is



● Fig. 1: The components are supplied in two plastic bags, each with a list of their contents. This makes checking that you have all the correct components very easy indeed. Phil G4JCP remarks that it all reminds him of the through Heathkit approach (see text).



● Fig. 2: The completed p.c.b., showing underside ready for final installation and testing (see text).



● Fig. 3: The completed board ready for installation into the supplied case. Phil G4JCP very much enjoyed building the project which took him approximately two hours to complete (see text).

connection, but a standard 75 $\Omega$  TV antenna lead is all that's needed. Older tuners with 300 $\Omega$  balanced inputs should (technically speaking) be fed through a balun, but you can usually get away without one.

The KRC-A-6's specification says that it needs 1.2mV for

used. However, this isn't likely to be a problem in practice. Indeed, a little top cut may actually help with poor-quality signal sources.

The supply current is around 5mA (plus any excess current flowing through the Zener). That's commendably low, and it's perfectly possible to run the unit from a PP3-type battery or a 'six-pack' of AAA cells. These could easily be fitted (with a switch, of course) within the unit as there's plenty of room.

## Stabilised Supply

Throughout the time I was testing the unit, drift never seemed to be a problem. However, I was operating the unit from a stabilised supply. When using a battery, drift may become more noticeable as the terminal voltage falls below 7.5V and the Zener diode ceases to 'Zener' effectively.

All-in-all, I think the KRC-A-6 is a most useful accessory for any vintage radio enthusiast who has an old f.m. broadcast radio. It's definitely one that's going on my shopping list. Now I wonder if the Kitting Radio Company would consider making one for a.m. radios... **PW**

### Kit Radio Company

Our thanks go to the KRC for the loan of the review unit. The KRC-A-6 costs £29.99, and the optional a.c. adaptor costs £5.99. Postage and Packing (for UK and Ireland) is £4.99 and the kit is available from **KRC, Unit 11, Marlborough Court, Westerham, Kent TN16 1EU. Tel: (01959) 563023.**



Earlier this year Tim Walford G3PCJ presented his design for a 'Dipper With A Difference'. Continuing the theme Tim now explains just how versatile this much neglected simple instrument is!



● Fig. 1: The PW Dipper and counter

The Editor tells me that a number of readers have asked about how to use a 'dipper' – so he gave me the title

'Discovering Your Dipper'.

However, I'm left

wondering....does he really know something about the organised chaos that presently conceals what's actually on my bench including my dipper!

Dip meters are actually simple instruments with many uses – these range from tuning resonant circuits and antennas, measuring components, acting as signal generators, to looking for unwanted harmonics. Most constructors should have one!

### Active Oscillator

The basis of all the dipper instruments is that when an 'active' oscillator is coupled to a second 'passive' circuit resonant at the same frequency, radio

side panel and **Fig. 1**), the techniques can be used with any 'dipping' style instrument irrespective of whether it uses valves or semiconductors.

Incidentally, a digital readout of frequency, such as that described in the May 2004 *PW* for the DWAD, is a great asset. It will help you avoid all the hassle of calibration and scale/frequency charts!

However, the key to effective use of any dipper is mastery of the coupling techniques between the resonant circuits. So, let's take a look at those techniques.

### Inductive Coupling

In my experience, inductive coupling between the coils of the two circuits is much more likely to be successful than capacitive coupling. So, I would always attempt this approach first when investigating an unknown circuit.

Initially, I recommend that you

actual windings are close to each other. If this doesn't give a good dip then try the 'side by side' approach as in **Fig. 4**.

The approach, shown in **Fig. 5** is not recommended for inductive coupling, and is that actually used for capacitive coupling. Note that the 'r.f. hot' ends of both coils are closest together – just like the small capacitor linking the two parallel resonant circuits in a receiver front-end filter.

**Note:** The guidance applies directly for air-cored coils but is also generally the best approach if either or both have ferrite slug cores. Incidentally, despite the ferrite core, sufficient field will escape to permit satisfactory coupling, although the sensitivity will be reduced implying a less pronounced dip for a given physical separation.

**Toroids:** Coupling to toroidal inductors needs a special technique which will be

# Discovering Your Dipper

frequency (r.f.) energy is extracted from the active circuit. This causes a change in voltages that can be indicated on a meter.

In practice the changes maybe either in d.c. conditions as in a classic valved grid dip oscillator or in r.f. levels as is the case for the 'Dipper With A Difference' (DWAD), published in the March 2004 *PW*. For both types of instrument, the meter reading goes down when the two circuits are tuned to the same frequency – hence the informal name of 'dipper'.

When it comes to using your dipper, for determining the resonant frequency of the unknown circuit, maybe all that's needed, or that information can be used in further calculations. And although I shall write in terms of using the DWAD (see

should practice the technique of using the instrument while it's oscillating to energise the unknown circuit. (The following points about coupling technique do also apply when absorbing energy from an active circuit, but that comes later!).

You should start by trying to achieve high or 'tight' coupling to make certain that you do have a definite dip. The magnetic flux linkages will be greatest when one inductor is physically inside the other as shown for the ideal situation in **Fig. 2**.

It doesn't matter whether the unknown circuit's inductor is inside or outside that of the instrument! If this is not possible because the coils are similar sized or inaccessible, the next best situation is generally aligned 'end to end' as in **Fig. 3** provided the

explained later. First, let's get some practice in!

### Practice Your Techniques

To gain the essential experience it's a good idea to practice the coupling and frequency sweeping techniques using a known test circuit. So to start, I suggest you dig a variable capacitor (never throw them away!) out of your junk box and connect it to both ends of a moderately sized inductor. I used 11 turns of 16s.w.g. enamelled wire close wound initially on a 25mm diameter broom handle – the exact number of turns is not important!

You can use any stiff insulated wire or a single core of the pvc covered copper cable used for permanent mains wiring. When

released the turns will 'spring out' a little so you can remove the wood.

The thick wires will stay in place adequately when soldered to the capacitor – as in **Fig. 6**. I have purposely not made a very tidy job of this to show that coil winding is easy and quite adequate for this experiment!

My variable capacitor was 500pF unit but a smaller one will be fine, provided you start tests at say 10MHz instead of 5MHz. **Note:** Dippers often work best in the 2 to 20MHz range, which is where I suggest you start experimenting.

The broom coil shown in my photograph resonated at 5MHz with about 400pF. Its size allows you to see what happens when one inductor is inside the other!

Once you've made your test coil set the Dipper to oscillate at about 5MHz. Adjust the meter reading control so that the needle shows nearly full scale.

At this stage, place the Dipper and test circuit on the bench so the separation does not alter if your hands are unsteady. Later when you're more proficient, you'll be able to just 'wave' the instrument near to the unknown circuit!

Next, bring the two coils together, preferably one inside the other, and then alter the test tuning capacitor – not the **Dipper tuning!** This makes it much easier to detect the dip because there's no variation due to large changes in the Dipper's frequency – you'll find that they seldom have a constant reading from end to end of any tuning range!

Assuming that the frequency ranges overlap, there will be a noticeable dip in the meter reading as you sweep the variable test circuit across the frequency of the Dipper. It maybe that the reading jumps back up as you tune beyond the dip (in either direction). Don't worry – this is quite normal with tight coupling, because the frequency is temporally being determined by the test circuit until it cannot control

it anymore, when the frequency jumps back to that of the Dipper.

As you increase the separation of the coils, the strength of the dip will decrease, and also the tendency of the test circuit to determine the frequency. With care when using air-cored coils, you might just be able to detect a dip with a separation well over 25mm.

## Altering Dipper Frequency

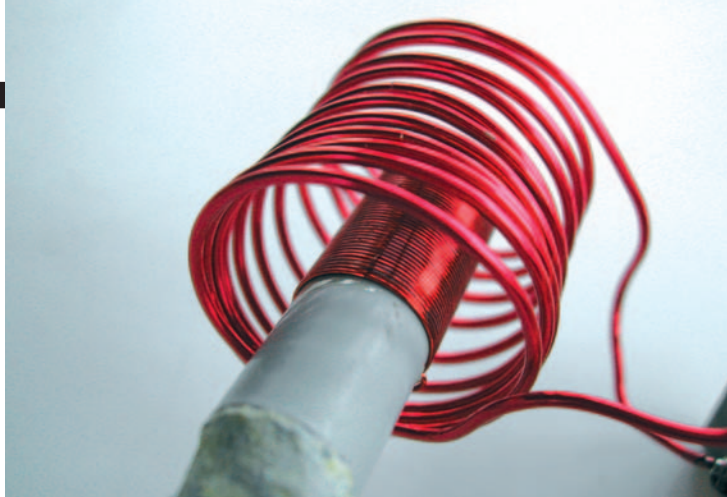
Now we'll practice altering the Dipper's frequency instead! Having found a frequency where the tuning overlaps as already described, I suggest you carefully alter both tuned frequencies so that the dip is now in the middle of the Dipper's tuning range for that coil.

Next, you should then try sweeping the Dipper's frequency – and you'll almost certainly need to first increase the coupling to find the dip again. Then, as before, gingerly separate the dipper and test coils to the point where the dip is still definite but quite small.

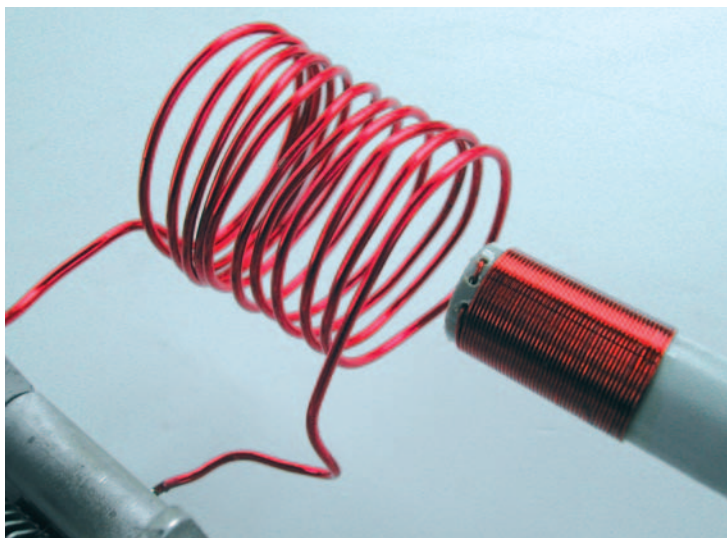
Get used to sweeping the Dipper frequency in both directions and carefully observe the rate of change of the meter. It's the rapid meter changes up and down, getting smaller with larger separation, as you sweep the Dipper frequency that indicates the coincidence of the tuned frequencies.

The frequency at the centre of a small dip is that of the unknown resonant circuit. Try sweeping the Dipper's tuning knob faster or slower to see if this makes it easier to detect the dip. Practice this method with different coupling methods and separation.

**Note:** You'll find that it's harder to find the proper dip setting if it's on either end of a particular coil's tuning range. With this in mind it'll be better to change to the next range and get the dip in the middle of the tuning range – this will make dip detection easier and more accurate.



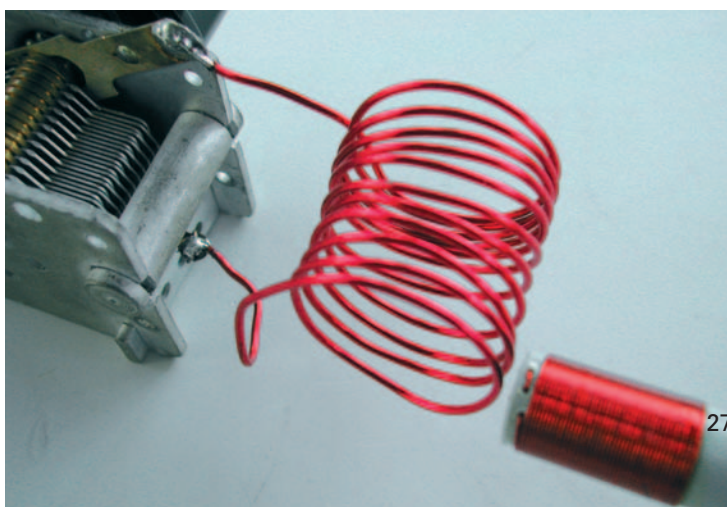
● Fig.2: Inductors inside each other (see text).



● Fig.3: End to end coupling (see text).



● Fig.4 (above): Side by side coupling (see text).



● Fig.5 (below) Capacitive coupling (see text).



## Guess The Frequency

From what I've already discussed, you'll soon realise that 'sweeping' an unknown circuit with a lot of coils to find the resonant frequency will be very time consuming indeed! Hence my suggestion that you should try to guess the likely frequency first - by inspection or otherwise!

'Guessing the frequency' isn't as difficult as you might think. This experience, especially in my case, comes after many years examining resonant circuits. However, a good clue is knowledge of the rig's physical layout, operating band, type (direct conversion or superhet) and intermediate frequency or local oscillator scheme.

If possible you should read or guess the value of the particular coil's resonating capacitor(s). There is a rough rule of thumb for selecting resonating capacitors to suit your own coils - their value in pF should be 1.5 times the operating wavelength in metres!

So, an 3.5MHz receiver front-end filter would have 120pF capacitors. Despite this, modern designs tend to use less L and more C! Turning the rule of thumb around, it gives the very rough frequency in MHz as one 30th of the capacity in pF. This will get you in the right part of the spectrum - at worst you should only need to search with two other coils - either side of the most likely coil!

You should, if possible, closely examine the unknown coil. If it has lots of turns this will suggest low frequencies, while a few wide spaced will of course indicate very high frequencies. **Note:** If the coil is enclosed in a 'can' (Screen can) then it has to be treated in the same way as a toroidal inductor, employing a direct connecting link.

## Checking Toroids

Let's now look at checking those toroidal inductors (and it's not as difficult as many constructors imagine). Here the first thing to bear in mind is that the special shape of a toroid inductor means that almost no field escapes from

the core. This means that (generally) a small extra winding has to be added. This needs to be only a couple of turns and can be made from plastic covered hook-up wire.

The DWAD (March 2004) has a special output (**Point D**) to which the extra winding can be directly connected. For other instruments without this special facility, a few turns need to be wound over the dipper's coil and the two link windings coupled together.

Please now take a look at **Fig. 7**. This shows a winding of 12 turns on a red T68-2 toroid which is resonated by a 180pF silver mica capacitor. Two turns (twice through the middle of the toroid core) have been added to the toroid with a thin blue wire which is then wound three times around the Dipper's inductor, with the ends joined together to form a loop.

When I carried out this test, a quick tune of the dipper's frequency showed a moderate dip at 10MHz. However, the coupling can be reduced by using less turns on either link winding. If the unknown resonant circuit is in a metal can then you should connect its low impedance winding to point D, or to the few link turns over the instrument's coil.

The low impedance winding often can be identified by measuring the resistance between all connections on the inductor. **Note:** the lowest resistance is usually also the lowest impedance winding.

Incidentally, bearing in mind that an antenna is actually a resonant circuit, it's convenient to mention at this point that the same approach used for the toroid inductors can be used to measure the antenna's resonant frequency. The centre of the dipole is connected, if necessary by a low impedance feeder or coaxial cable, direct to the D output of the Dipper or to a few turns wound over the instrument's relevant coil for the desired band.

At the antenna's resonant frequency it will radiate\* (**see note below**) more of the instrument's r.f. energy and the meter reading will go down. If the resonant frequency is too low, then gingerly prune short lengths off both dipole ends - but take care as they are not

easily put back! Pruning an end fed antenna with a Dipper is only for the really experienced!

**Note:** When carrying out these checks, please bear in mind that you will be transmitting a QRP level signal via the antenna. Try to carry them out as quickly as possible - there are no awards for QSOs achieved with dip meters!

### Editor.

Another approach for toroids is to extend one wire of the resonating capacitor (**Fig. 8**) so that a few turns can be added over the instrument's coil in series with the unknown main winding. This forms a coupling coil but its inductance will add to that of the main coil so the resonant frequency will be lower than without the extra loop. Use as few extra turns as possible. For the T68-2 example above, with two turns on the Dipper, the resonant frequency went down from 10 to 9.7MHz.

## Signal Generator

The dipper is extremely versatile - you can use it as a basic signal generator! In this situation the meter reading will be unimportant; and to help the PW Dipper has the special output D which can directly drive 50Ω loads whereas other instruments will need a link winding of a few turns around the relevant coil to provide the desired frequency.

The output amplitude can usually be reduced slightly by sliding the link coil away from the inductor tip towards the main body of the instrument. If this still provides too much signal (let's say for aligning the input stages of a receiver where very weak signals will be required) then I suggest you just drape a wire from the receiver's antenna terminal near to the dipper and either move it away or shorten it as required for a distinct but non-overloading signal.

**Note:** Beware that if the load is tightly coupled to the dipper, then adjustment of that load (as when tuning a filter) might 'pull' the oscillator's frequency slightly. Often a small change does not matter but it's wise to be alert to the possibility!

The mechanical construction

and other variable effects due to link coils, etc., mean that most dippers will have poor frequency stability. Additionally, the oscillators in most dippers are not completely sinusoidal, which means there will be harmonics present which can be used to align v.h.f. receivers. Usefully, the third harmonic will give a very useful extension, but even if present, higher harmonics are not so easy to use.

## Measuring Component Values

You can also use your dipper to find unknown component values. Inductor values, particularly, are frequently unknown and the technique is to resonate the unknown inductor by connecting a known capacitor across it.

The resonant frequency is measured with the dipper as above and the component value calculated from the standard formula for resonant circuits:-

$$\text{From } f = \frac{1}{2\pi\sqrt{LC}} \quad 2\pi f = \frac{1}{\sqrt{LC}}$$

$$(2\pi f)^2 = \frac{1}{LC} \quad L(2\pi f)^2 = \frac{1}{C}$$

$$L = \frac{1}{C(2\pi f)^2} = \frac{1}{C(2\pi)^2 f^2} \\ = \frac{1}{(6.283)^2 C f^2} = \frac{1}{39.5 C f^2}$$

To find the value of L (in μH), when C is expressed in pF and f in MHz, then the solution is as follows:

$$L = \left( \frac{1000000}{39.5 C f^2} \right) = \left( \frac{25316}{C f^2} \right) \mu\text{H}$$

For most h.f. coils I suggest you start with the 220pF capacitor! For the example coil that I used in Fig. 6, the resonant frequency was 10MHz when resonated with the 180pF (= 0.00018μF) capacitor that I had to hand.

The result works out at 1.4μH but note that the turns were close together. So, the measured value will be appreciably higher than the theoretical value derived from the toroid's characteristics - which will assume the turns are spaced equally around the toroid's circumference.

It is quite a good experiment to see how the inductance changes when the turns are bunched up! The above approach is not recommended

for really accurate measurements but is adequate for most Amateur Radio purposes.

**Note:** If you have to measure a capacitor, resonate it with a known inductor or even one you have just measured as above! (Just use similar mathematics as shown on previous page).

## Absorption Wavemeter

When used as an absorption wavemeter the instrument's oscillator is initially turned off. The meter is then adjusted to be just above the zero end stop so that it can increase when some r.f. is found!

When used in the absorption mode your dipper should be coupled to the unknown signal source by any of the methods I've already described. You could, for example, bring the instrument's coil into the vicinity of a transmitter output stage (when operating into a dummy load). Take care though that you don't burn out the instrument on a high power transmitter!

Having found a strong upward meter kick from the transmitter's wanted fundamental as you sweep the tuning, you can read off its frequency on the counter or calibration charts. Then go hunting for the second and third harmonics!

The 2nd and 3rd harmonics should be very much lower in strength. This means that much tighter coupling will be needed but beware that the strong transmitter fundamental may cause the meter reading to slowly change as the tuning is altered.

The harmonics, if present, will cause relatively narrow meter upward blips. If the instrument has a counter, you should briefly turn the instrument so it will oscillate to indicate the unknown frequency.

Most dippers can be used to indicate relative changes in radiated field strength as you make antenna adjustments. However,

because the indicator should be well separated from the antenna under test, the radiated signal may not be strong enough to get a reading without a small whip receiving antenna.

Usually a stiff wire of about 300mm length will prove an adequate antenna when it's directly connected to the hot (or high impedance) end of the instrument's coil; for the *PW* Dipper (this is the inductor side connected to the drain of Tr1).

You should be aware that the whip antenna will 'pull' the frequency slightly downwards in frequency, so you should tune slightly above the expected frequency. Often the physical separation of absorption wavemeter and transmitter/antenna means that two people are needed! The usual advice about minimising transmission time applies.

## Many Hours Experimenting

That's enough experiments to keep you going for many hours! One final point though - when I did eventually discover my bench I found the special dipper shown in **Fig. 9** - it operated to over 450mm just proving that size does matter!

I hope you enjoy 'discovering your dipper'. They're exceptionally useful in the workshop. **PW**

Kits are still available for the Dipper at £44, and the associated three digit counter at £35. If ordered together, the price is discounted to £74. Post and packing is £2 extra. Please send any orders direct to **Walford Electronics at Upton Bridge Farm, Long Sutton, Langport Somerset TA10 9NJ**. For further information see their website at [www.users.globalnet.co.uk/~walfor](http://www.users.globalnet.co.uk/~walfor)

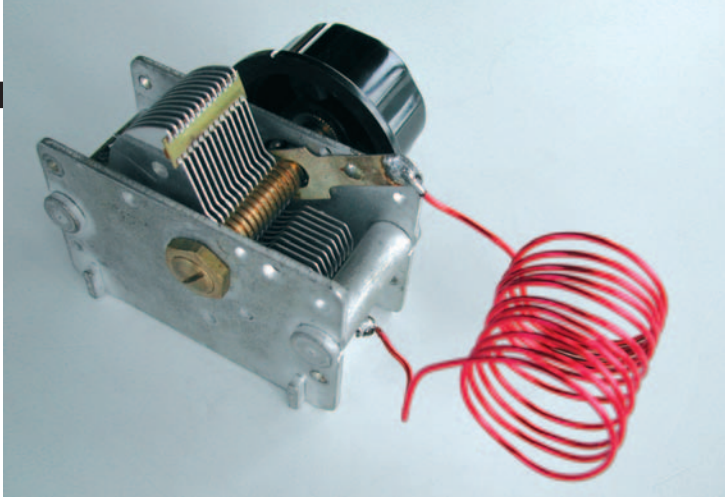


Fig.6: Testing L and C (see text).

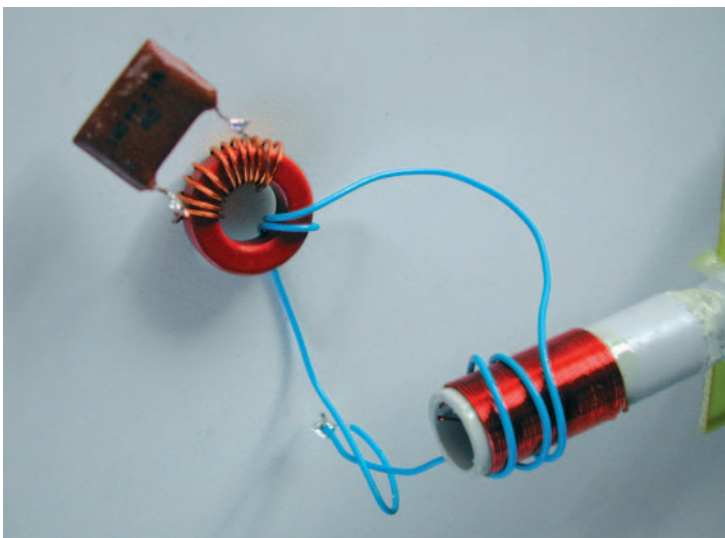


Fig.7: Link coupling to a toroid (see text).

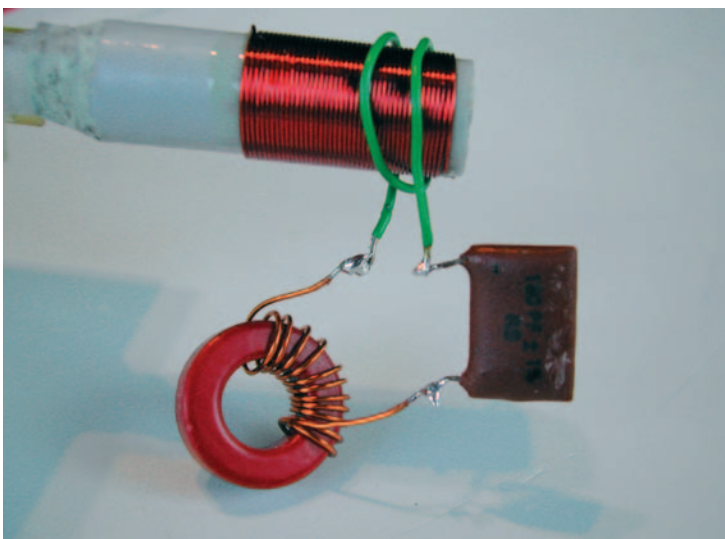


Fig.8 (above): Extra turns in series (see text).

Fig.9 (below): A giant dipper! (see text).





# The Vectis Run Part 8

By Rupert Templeman

**It's January 1939. Travelling Wireless Technician-Salesman Alan Edwards has found his monthly visit to the Isle of Wight, 'The Vectis Run' - to be extremely dangerous. Now he doesn't even know where he is!**

**A**lthough Alan wasn't hurt when he was forced into the furniture lorry – he was extremely shaken. The man who carried him into the huge vehicle struck from behind and literally squeezed the breath from him. At the same time a large sack was placed over his head and his hands were restrained.

The large vehicle shook as his captors started it and moved away. Alan noted it was a diesel engine - meaning the lorry was really large - it must have been to take his van. He hadn't a clue where he was, as it bumped along the country roads with his imagination in overdrive trying to picture where they were going.

Several times he thought the lorry had gone over hump-backed bridges, but in the end Alan had to admit he was totally disorientated. He tried speaking, to ask who his captors were – only to be rewarded by a hand over his face, forcing the coarse sack fibres into his mouth. The hand smelt strongly of tobacco, even through the sack – but of a very strange type.

Once Alan had gathered his thoughts he knew he'd been abducted by the very people he was hoping to meet. Unfortunately, no one – including the Secret Service - had thought of this possibility. He found himself trembling with fear – wishing that Mike Coley had been with him!

At last the vehicle slowed, and was swaying gently from side to side, indicating to Alan that they were on a rough, pot-holed track. He heard tree branches scraping alongside the vehicle's side. At one point he thought the vehicle had stopped to allow another to pass. His mind was racing - where were they?

Soon he could see light glimmering through the rough weave of the sack. Suddenly, he was a lifted bodily upwards, and was half-pushed, half dragged out of the vehicle, and he briefly caught the unmistakable odour of seaweed and salty mud exposed by the falling tide. His protests were again rewarded by a tightening of the tobacco stained hand around his throat. Then he felt himself entering the warmth of a house, and immediately he smelt a pleasing scent - there was a woman present. Alan wondered – assuming it was the same group – if it could possibly be the 'Dutch' girl he'd met on the ferry.

Alarmingly, he felt himself falling – but with relief Alan found he'd been pushed onto a soft sofa. Once there his ankles were securely fastened with rope. Nobody spoke - but he could hear the heavy breathing of the man who'd brought him in from the vehicle. Thoroughly uncomfortable - Alan's trembling was noticed by someone because low mutterings could be heard from another room, and he thought he could hear a female voice. Someone it seemed was protesting something, although he couldn't identify what language was being used.

## Face To Face

Suddenly, with no hint of a warning, the rough sack was taken from his head. The room was dimly lit, but to Alan's eyes the light seemed bright. He immediately started shouting at the top of his voice in the vain hope someone would hear. That effort was a big mistake - because an arm came from behind him and he couldn't breathe - as it was tightened around his throat.

A voice spoke in perfect English; "That was stupid Mr Edwards wasn't it? Stephan isn't the easiest going man - and he could break your neck. Promise not to do it again – and he will fully release you".

Alan, barely able to speak, saw the bright red mist, which had appeared before his eyes, clear enough for him to see. He spluttered a barely audible "Yes", and the man in front of him nodded. The giant arm was released, and he could breathe again.

The man in the shadows spoke again; "For a professionally trained technical agent - you are not very careful are you Mr Edwards? You must think I am a fool – I have seen you so many times – did you want me to see you today?"

The accent was perfect - Alan would have never taken him for a foreigner except that the accent was too good, almost unreal. Then another tingle of fear hit him...as Alan realised the man thought he was some sort of professional intelligence agent. How could he think that? He started to blurt out; "You've got it all wrong Sir!"

"Stop!" the man insisted with such a strong reaction that Alan did so in mid breath; "You are telling lies, you have been seen so many times by me here in England and....", he too then stopped – realising that Alan would learn something. Although in truth at that moment in time the man really couldn't make up his mind about Alan. Was this really a British Agent, or just a technician who appeared to be watching him, accidentally threatening his mission?

Alan peered into the shadows, remembering that now in fact he really was helping the Secret Service. He wasn't as innocent as he was on Monday, oh for Monday and to be able to start the week again! The full impact of his decision to help 'Mr Jones' was beginning to dawn on him and his trembling started again in earnest.

● "Although we've got no other way of finding him at the moment, we'll continue to search. We're also setting up a continual listening watch on the beacon frequency".



"Where am I, and who are you?" Alan asked - fully expecting the question wouldn't be answered. As he did so he reflected that the last time he asked that question - he was in safe hands. What a difference a few hours meant!

The man approached him, his face ending up only a foot or so from Alan's and it was - as he'd expected - the man from the ferry and the driver of the Citroën.

The man spoke; "We have to get to know each other better. I did not expect to see you again, although there is much to talk about, and I want to know why we have seen each other so many times in the last year or so. My friend here"; he nodded in the direction of the pugilistic shape lurking in the background, "will help us in our conversation although he didn't do his job correctly last time..."! He broke off, although it wasn't necessary to complete the sentence to convey what he was referring to.

Alan's trembling grew worse - he was absolutely terrified. He'd seen spy films and knew that this was where he was likely to be tortured. Alan watched the larger man approach, the increasing odour of the continental tobacco stained hands made Alan flinch as he braced himself for the assault.

## The Invisible Van

Mike Coley was chain-smoking and looked very worried. The clock on the wall showed it was almost 9pm, two hours after Alan had planned to arrive in Freshwater, and after being urgently summoned by telephone, he'd joined 'Mr' Jones at Newport Police Headquarters.

It was the very first time that Mike had seen a really concerned look on the Secret Service man's face. Even though they'd only met briefly for the first time earlier in the week - Mike knew that Jones was in deep trouble. He looked - and indeed sounded - very unhappy. "Where's that blasted vehicle got to. Have we really got the first 'Invisible Van' on the Isle of Wight? It must be somewhere, it's not left the Island and isn't an easy thing to hide"; he had thundered to the large group in the room.



The meeting was crowded. Mike was astounded at just how many people were seemingly involved in 'Operation Vectis', as he'd just learned it had been called. Lake, his own 'boss' was there, together with the assistants which Jones had with him during the time Alan and he'd been recruited. There were also some RAF uniforms in evidence, although Mike couldn't be sure what they were doing, or even if they were directly involved in the operation.

Of course, none of Secret Service men were in uniform, but it was obvious they held a great deal of authority. Even the senior Police Officials seemed to be subservient to Jones. In fact, Jones was talking to a high ranking Police Officer at that moment, and a large map of the Island had been spread out over a table. More interesting to Mike was the fact that another officer was talking into a microphone and receiving reports back via a v.h.f. radio-telephone. This was something new for the Island - although it was in use in the London area.

A sudden air of expectancy spread around the room, and the sound of voices died away. Jones was about to make an announcement. He stood up, the desperation showing clearly on his face. "Gentlemen", he announced with tangible authority and obvious concern; "I'm afraid, as you may know already, we've lost track of Mr Edwards and his van. They've completely disappeared and we"; he paused, quickly correcting the word as he considered he alone was responsible; "I am at a loss to what's happened. Mr Coley last spoke to him just after lunch, and he was then seen heading towards Carisbrooke. Also, by complete coincidence, an RAF aircraft crew on a special mission - which cannot be discussed here - saw the van as they were flying low over Carisbrooke. It happened to be the only vehicle in sight on that road and the pilot even returned an acknowledgement when Mr Edwards waved. This news has just been given to me by the RAF people who are also involved in this security operation for reasons which cannot be discussed.

"They must have been very low, thought Mike to himself. What sort of aircraft was it I wonder?" His private thoughts were interrupted as Jones announced to the group that he would now talk privately to what he called "the wireless people", beckoning to Mike, Arthur Cotton, Mr Rheibach and - to his surprise - the cheerful figure of Ivor Richards who had just joined them from Cowes. Mike didn't know Ivor very well, but he was fully aware that if there was a man who could make an excellent v.h.f. aerial - it was Ivor.

## Listening Watch

When the 'Wireless People' had gathered round him Jones quickly came to the point. "We've got no time to lose gentlemen - one or two of you know that these Agents have killed already. They will certainly kill again before they leave if they have to". His audience looked stunned - but remained attentive.

Jones continued; "Mr Edwards didn't have time to activate his beacon transmitter. Although we've got no other way of finding him at the moment, we'll continue to search. We're also setting up a continual listening watch on the beacon frequency. That's where you come in, with Mr Richard's help. He's worked very hard to adjust his special directive aerials to the correct wavelength to ensure you have the best chance of receiving Mike's transmissions - if he manages to get the thing transmitting" - the emphasis on the last few words showed Jones was really worried.

Jones then left the group, to talk to others in the room including - rather mysteriously Mike thought - several uniformed RAF types in the far corner. But the needs of the moment demanded his attention, and the group discussed what they had to do.

Ivor Richards would have a lot of driving to do that night they agreed, as he would ensure that everyone had a directional aerial able to sweep through 360° - without kinking the precious coaxial cables. They were also to be equipped with a real luxury - a crystal calibration meter to ensure they were all listening on the same frequency.

"If Alan's able to activate the beacon we'll hear him", Mike said, watching the group nod in hopeful agreement. They then split up to return to their homes around the Island, although Mike, the only one amongst the group who knew Alan had almost been killed at the tunnel entrance - wondered if the Foreign Agents had already succeeded in a second attempt. Then, with a shaky hand Mike lit another *Woodbine*, trying to quell his worries as he headed homewards.

**To be continued....**



## David Allen describes his self-contained audio amplifier running from a single 1.5V cell.

A small audio amplifier is always a handy item of equipment to have in the workshop for the bench testing of home-made receivers and other items of electronic/radio equipment. Those who are considering constructing such an amplifier may like to ponder the following notes and circuit diagram.

When considering a chip for a small audio amplifier I usually go to the drawer containing my selection of LM386, TBA820 audio i.c.s. I have, however, recently come across an interesting chip made by ST Microelectronics known as a TDA2822M whose main purpose in life is for use in personal cassette or CD players.

The TDA2822M consists of two separate amplifier channels for stereo use. This chip can also be readily configured as a bridge amplifier thus enabling a useful output to be achieved with a low power supply voltage - three volts in this instance.

audio amplifier i.c.s such as the TBA820, LM380 and LM386, etc.

### Power Output

Although the supply for the project is quite low at three volts, nonetheless, with a three volt power supply when 'bridge-connected', the TDA2822M can deliver some useful amounts of power. This useful level of audio power is delivered without any measurable crossover distortion, into a variety of loudspeaker or headphone impedances. \* **Note:** When bridge-connected, two identical amplifiers are used with the load connected between both outputs. The amplifiers are then driven with opposite phase signals creating double the load voltage swing before clipping sets in.

#### Editor.

The power levels listed below are quoted from the application notes for the chip.

Load	Power
32Ω	65mW
16Ω	120mW
8Ω	220mW
4Ω	350mW

The actual power obtained from the completed amplifier, before the onset of clipping and when fully driven, was measured as 140mW into an 8Ω load with an input of approximately 50mV r.m.s. at a frequency of 1kHz.

Although the output's definitely not in the realms of concert hall-filling level, the



quality sound is produced.

The loudspeaker used in my prototype amplifier is an 8Ω type with a cone diameter of 100mm (4in) which was

provide a reasonably good audio output from a single 1.5V D cell. This option makes battery replacement an inexpensive venture as the cell should last

# A Low-Voltage Audio Amplifier

scavenged from a scrap transistor radio chassis. My choice of enclosure, because it was available, is a two part plastic box which can be seen in the heading photograph.

This amplifier project will also drive a variety of headphones at good volume so a socket is provided on the front of the suggested enclosure for this purpose. This socket is a switched stereo type which disables the internal loudspeaker when the headphone plug is inserted.

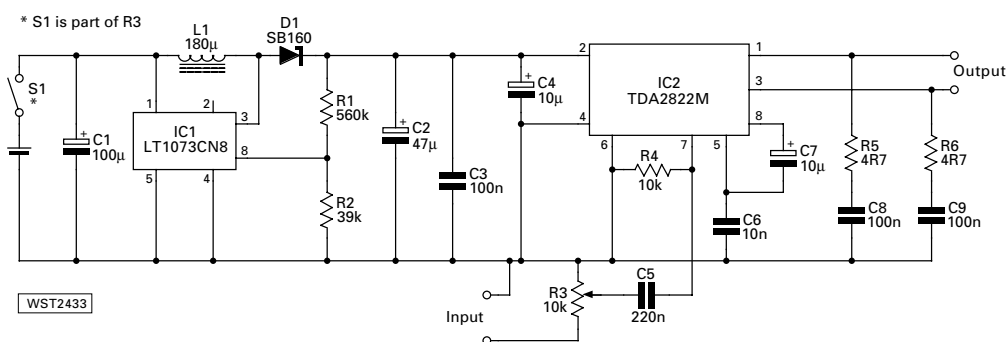
many hours if the amplifier is not left on too loud for too long.

To enable the TDA2822M amplifier to provide some useful amounts of power it's necessary to raise the voltage from that of the D cell alone. This step is achieved by using an LT1073CN8 d.c.-d.c. converter used in voltage boost mode.

The LT1073CN8 is a low-voltage, single inductor, d.c.-d.c. converter i.c. whose performance is optimised to operate from a single or dual alkaline cell. For this project the supply is a single alkaline D cell. In this voltage boost mode, by using a sharply switched signal to store energy in the inductance of L1.

When the signal on pin 3 of IC1 is switched off, the energy stored is transferred through the blocking diode D1, through to the capacitor C2. The filter made up of capacitors C2 and 3, removes most of the ripple created due to the sharply switched signal on pin 3 of IC1.

The output from the converter i.c. (between the cathode of D1 and 0V rail) will start up and maintain a constant supply when fully loaded by the amplifier until the cell voltage falls below one volt. After this point the converter will stop and cease to provide any useful



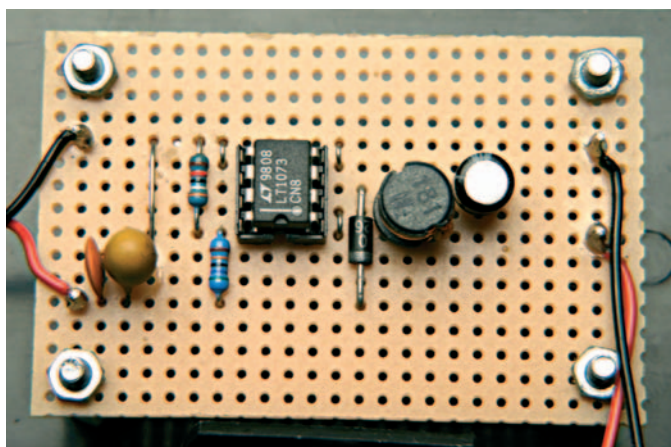
● The 3V supply for the audio amplifier i.c. is derived from a single 1.5V cell and a switch-mode converter.

A bonus to be gained from using the TDA2822M in a bridge configuration is that there are no bulky, high value, electrolytic capacitors necessary for correct operation. This is often one of the drawbacks when using other

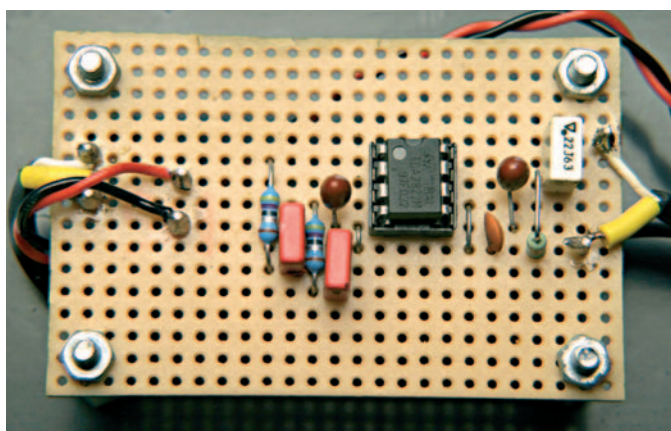
power available from the amplifier may still appear to be quite limited. But if the amplifier is used with a reasonably sensitive loudspeaker mounted in a suitable enclosure a surprising amount of good

### Power Supply

Now I'll deal with the power supply provision for the audio amplifier side of the project. A novel feature of the completed amplifier project is its ability to



● The switch-mode converter circuit on its own piece of stripboard.



● The audio amplifier is also built on a single piece of stripboard.

output and it will be necessary to replace the cell.

The ability of the converter chip to run on such a low voltage is a good feature as it will help to extend the useful life of the D cell thus making cell replacement an economic venture even if the amplifier is accidentally left switched on for any length of time.

## Quiescent Current

Total quiescent current consumption of the amplifier was measured (with a fresh cell) at around 20mA rising to slightly less than 100mA with the amplifier fully driven with a sine wave just before the onset of clipping. It's worth noting that when the amplifier is used with normal programme material e.g. from a radio tuner, crystal set the current demand should be a good deal less than 100mA.

Good low frequency power supply decoupling is provided by C1, C2, and C4 with C2 helping to keep any switching noise from entering the supply rails and in turn the amplifier i.c.

Although I've not tried it, the amplifier should also function with a rechargeable cell such as a NiCad or Nickel metal-hydrate (NiMH) type. So, perhaps with the addition of some small solar power modules, the cell could be trickle charged thus adding to the economic running of the amplifier.

## Construction Simple

Construction of the project is simple with the components for the audio and power supply stages fixed to two separate slices of stripboard using solder pins for the off-board connections. These connections are to R3, the battery holder, loudspeaker, input and output connectors and the interconnections between the two circuit boards.

By assembling the two sections on separate boards each stage can be tested individually. This helps to isolate any faults should they arise.

My selected enclosure for the finished amplifier is a two part plastic box that actually comes in four parts. (Maplin, BZ76).

The various sections of the box are dealt with as set out below. The loudspeaker is attached to the lid using some short nuts, bolts and washers after first drilling a pattern of suitable holes in the lid. This allows the sound to escape.

The holder for the D cell is mounted to the base of the unit using some short self-tapping screws. Care should be taken that they are short screws otherwise damage may occur to any surface that it's stood on. A suitable alternative would be to use some form of hot-melt adhesive.

## Rear Panel

The rear panel of the enclosure accommodates the two circuit boards using some suitable bolts, nuts and spacers. The front panel is used to support the volume control with (on my prototype) its on/off switch, along with the amplifier inputs and headphone output connectors. With the major components attached the minimal amount of wiring can be completed with the aid of the circuit diagram.

## Uses

The completed amplifier has many uses and can be used for testing home-made receivers, crystal sets or other radio or electronic projects. It would also (I feel) make a good companion for a basic ZN414/MK484 receiver which also runs from a similar single battery supply.

With this in mind why not assemble a basic ZN414/MK484 receiver and the amplifier in the same enclosure taking care to keep the ferrite rod for the antenna winding and the core of the choke (L1) as far away from each other as possible. Ensure the axes of the two are at a right angle to each other to minimise switching noise that could enter the aerial circuit of the '484.

If desired the amplifier can be used with an r.f. detector probe, which can be handy to pinpoint amplitude modulated r.f. signals at various points throughout an amplification chain whilst providing a detected output for the amplifier to enable the signal to be heard.

So, there you have it a self-contained low-voltage amplifier. Its uses are only limited by your own ideas.

PW

## Shopping List

### Resistors (0,25W Carbon film)

R1	560k $\Omega$
R2	39k $\Omega$
R4	10k $\Omega$
R5, R6	4.7 $\Omega$

### Rotary (logarithmic)

R3	10k $\Omega$ (with switch)
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### Capacitors

#### Disc ceramic

C3	100n/disc
C6	10n/disc
C8, C9	100n/disc

#### Polyester

C5	0.22 $\mu$
----	------------

#### Electrolytic

C1	100 $\mu$ F
C2	47 $\mu$ F (tantalum or electrolytic)
C4, C7	10 $\mu$ F (tantalum or electrolytic)

### Semiconductors

IC1	LT1073CN8 (Farnell, 295-917)
IC2	TDA2822M (Maplin, UJ38)
D1	SB160 1A/160V Schottky diode

### Inductors

L1	180uH (Farnell, 322-7315)
----	---------------------------

### Miscellaneous

One D cell plus holder, stripboard, solder pins, hook-up wire, choice of input connectors. Two 8-pin d.i.l. sockets for the i.c.s: A box and loudspeaker (see text), plugs and sockets to suit, such as 6.35mm (0.25") switched stereo jack socket (headphone output), nuts and bolts, etc.



● The completed project assembled into the box, the loudspeaker is mounted on the lid of the suggested box.



# Beginner's Short Wave Two

This month's classic constructional project is one which will provide many listeners with a great deal of pleasure. Indeed, we're privileged to have a version (featured on the front cover and as the heading photograph on these pages) of the receiver built by **Richard Ayley G6AKG**. Richard (who worked on *PW* as the Technical Projects Sub-editor and much valued colleague until 1989) has kindly loaned us his receiver, which he built for a club construction competition.

We're delighted to have the receiver to hand in the office and hope that many other readers - including **Gavin Keegan G6DGK** (see 'Star Letter' on page 10) will also build one for themselves. Contact details for specialised components will be provided at the end of the article. However, from personal experience I'm pleased to say that this is yet another project where the constructor can modify the design to suit themselves. The version I built used an EF91 as an untuned r.f. amplifier (later modified to a tuned r.f. stage. I also used another EF91 as the oscillating detector. The performance was superb and it particularly appealed to me as I didn't have to buy the expensive (to my young pocket) Denco coils normally so favoured by G3OGR!

However, a few years later I managed to buy several 'Acorn' valve holders. One was used to allow a 954 in place of the EF91 r.f. stage, followed by the 955 oscillating detector. I also built another version where the G3OGR circuit was directly followed except that the Eddystone plug-in coils were replaced by home-brewed octal based types (unable to find Eddystone formers). Latterly, I replaced the original metal rectifiers with silicon types, and of course (if you use an h.t. bridge rectifier - a half-wave secondary transformer can be used.

Altogether, I can confidently say that if you do build this receiver it will reward you with many hours of enjoyment followed by a new experience (perhaps?) - listening to a remarkably simple, but efficient receiver. Good luck - and I hope you get as much pleasure from this project as a very young (I was then!) Rob Mannion and many others did from this delightful project. **Editor.**

**Note:** An A3 sized photocopy of the original blueprint will be available from the *PW* Book Store. Please telephone (0870) 224 7830 for details on price and postage.

This month's 'Classic' *PW* constructional project dates from the November 1963 issue of the magazine. This time the man behind the project is the incredibly prolific author Frank Rayer G3OGR. If you consider 'having a go' yourself - please refer to the information panel.

**O** riginal text from the November 1963 issue of *PW* (with 2004 update notes). All the figure numbers in the original text refer to diagrams on the blueprint.

The Blueprint given away free in this issue (November 1963) provides all the diagrams necessary to build this receiver. Newcomers to radio construction will find this design to be straightforward and inexpensive, thus making it an ideal introduction. F. G. Rayer.

This receiver uses a 954 acorn valve as detector, followed by a 12AT7 twin triode as two-stage audio amplifier. The prototype was constructed on a 7in x 4in x 2.5in chassis (178 x 102 x 63.5mm) and includes a mains power pack and 2.5in (63.5mm) diameter loudspeaker. The panel is approximately 6in x 7.5in. (152 x 190.5mm). The whole receiver is thus of a small size.

The circuit is shown in **Fig. 1**. The receiver may be



● The Beginner's Short Wave Two, as built by Richard Ayley G6AKG, from the original design (Richard spent several years collecting the more difficult-to-find components such as the Eddystone formers to build it as close as possible to the G3OGR design). See text for more details.

used over all frequencies from 1.2 to 100MHz (250 to 3m)\*  
**See important modern update note below.** Efficient results are, of course, obtained

at lower frequencies than 1.2MHz but the small size of VC1 makes waveband coverage rather small.

**\*Note: Possible**

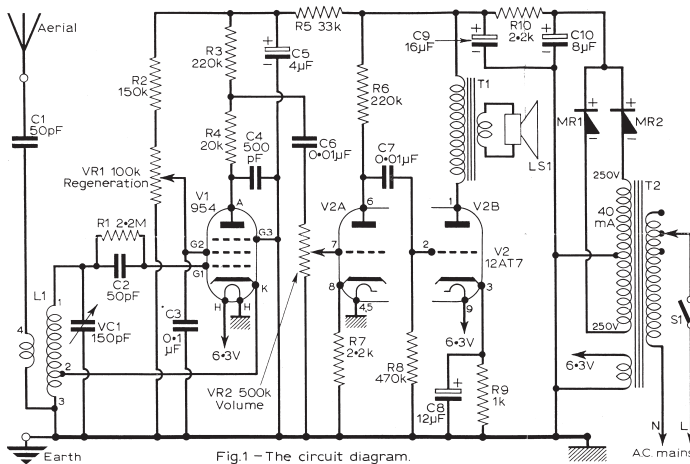


Fig 1 - The circuit diagram.

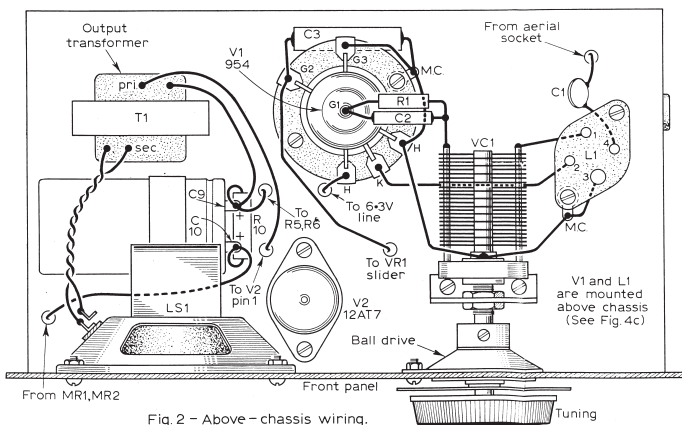


Fig 2 - Above-chassis wiring.

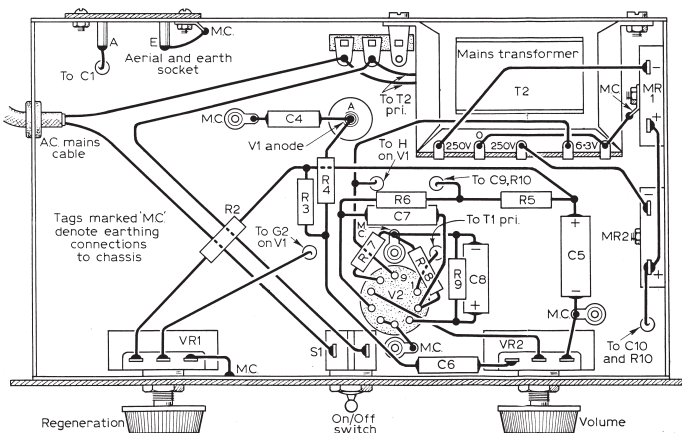
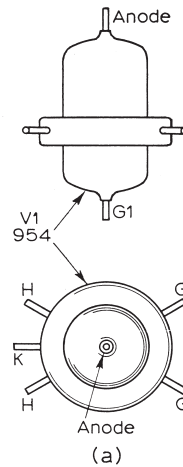
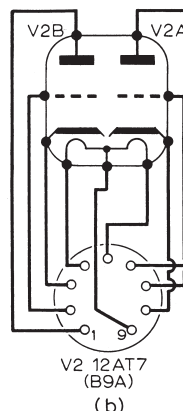


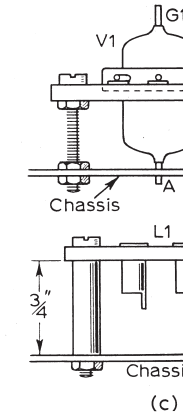
Fig 3 - Below-chassis wiring.



(a)



(b)



(c)

- COMPONENTS LIST**
- Resistors:**
- |                  |                           |
|------------------|---------------------------|
| R1 2.2M $\Omega$ | R6 220k $\Omega$          |
| R2 150k $\Omega$ | R7 2.2k $\Omega$          |
| R3 220k $\Omega$ | R8 470k $\Omega$          |
| R4 20k $\Omega$  | R9 1k $\Omega$            |
| R5 33k $\Omega$  | R10 2.2k $\Omega$ 3W w.w. |
- All 10%, 1/4W carbon, except where otherwise indicated
- VR1 100k $\Omega$  wire-wound potentiometer
- VR2 500k $\Omega$  carbon potentiometer
- Capacitors:**
- |                                      |
|--------------------------------------|
| C1 50pF mica or ceramic              |
| C2 50pF mica or ceramic              |
| C3 0.1 $\mu$ F paper                 |
| C4 500pF mica or ceramic             |
| C5 4 $\mu$ F electrolytic 350V       |
| C6 0.01 $\mu$ F paper                |
| C7 0.01 $\mu$ F paper                |
| C8 12 $\mu$ F electrolytic 25V       |
| C9 16 $\mu$ F dual electrolytic 350V |
| C10 8 $\mu$ F                        |
| VC1 150pF air dielectric variable    |
- Transformers:**
- T1 Output transformer 60 : 1
- T2 Small mains transformer. Tapped primary. Secondaries: 250-0-250V 40mA; 6.3V 1A
- Valves:**
- V1 954
- V2 12AT7
- Other Circuit Components:**
- LS1 2 $\frac{1}{2}$ in. diameter loudspeaker. Tapped primary.
- S1 Toggle switch s.p.s.t.
- MR1 2 Contact cooled rectifier 250V 40mA
- Miscellaneous:**
- Ball drive 6 : 1 ratio. Knobs: one 2in. diameter, two 1in. diameter. One B9A valveholder. Ribbed 4-pin plug-in coil formers (Eddystone). Coil holder (Eddystone). Aerial-earth socket strip. Tag strip (2 insulated). Chassis 7in. x 4in. x 2 $\frac{1}{2}$ in. approx. Panel 6in. x 7 $\frac{1}{2}$ in.

#### COIL WINDING DATA

- 1.2-4Mc/s (250-75 metres)**
- 100 turns 34s.w.g., tap at 2 turns. Aerial coupling, 20 turns.
- 2.5-7.5Mc/s (120-40 metres)**
- 50 turns 32s.w.g., tap at 1 $\frac{1}{2}$  turns. Aerial coupling, 15 turns.
- 6.75-22Mc/s (44-13.6 metres)**
- 16 turns 30s.w.g., tap at  $\frac{1}{2}$  turn. Aerial coupling, five turns.
- 14.5-50Mc/s (20.6-6 metres)**
- 5 $\frac{1}{2}$  turns 30s.w.g., tap  $\frac{1}{2}$  to  $\frac{3}{4}$  turn. Aerial coupling, two turns.
- 40-100Mc/s (7.5-3 metres)**
- 2 $\frac{1}{2}$  turns 20s.w.g., double spaced, tap at  $\frac{1}{2}$  turn. Aerial coupling, one turn.
- The two larger coils are close wound. The other coils are on threaded formers, and spaced 21 turns per inch. Aerial windings are near the tuned winding as indicated in Fig. 4(e).

Fig. 4

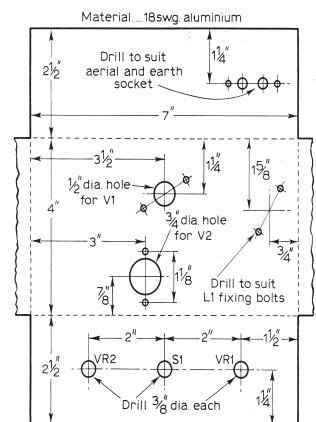


Fig 5 - Chassis drilling details.

Diagrams shown taken from the original free 'Blueprint' provide all the details required for the project (see text). A good quality A3 sized reproduction of the original Blueprint and article is available from the Book Store, for £6 P&P to UK free, Overseas please add £2.75.

**interference source.** This receiver works well right up to (and slightly above) Band II v.h.f. However, constructors are reminded that as the circuit employs an oscillating detector - it can also act as an effective QRP transmitter, especially if it's connected to a directional antenna. My advice is that if you intend to use the project

above 30MHz that an r.f. stage is used to isolate the oscillating detector from the antenna, which should greatly reduce the possibilities of the receiver radiating interference. **Editor.**

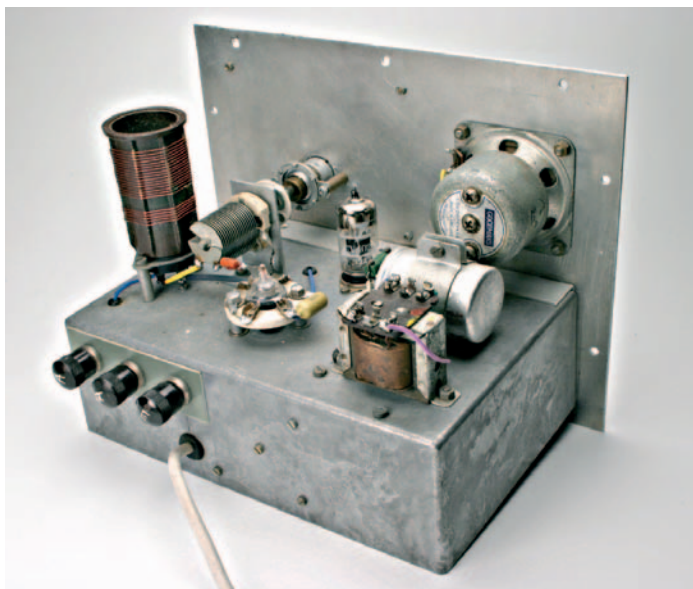
### General Coverage

For general short wave listening, a single coil covering

about 14-40m (7-22MHz) will be very convenient. A second coil will allow coverage to 2.5MHz (120m). Such a pair of coils will allow many of the most useful bands to be tuned. Regeneration is obtained by means of the cathode tap 2 on the coil L1 and is controlled by the potentiometer VR1.

The VR2 potentiometer is





● Rear view of Richard G6AKG's version of the receiver - built as closely to the original design as possible (see information panel).

the audio gain control, or volume control. The second triode section of the 12AT7 drives the loudspeaker through the matching transformer T1 and provides quite a reasonable output. For the power pack, two small metal rectifiers\*(see note below) are employed for full-wave rectification, and complete isolation of the receivers from the mains, is effected by the power transformer T2.

*\*Note: See information panel for advice on the power supply. Editor.*

In a receiver of this type, the layout of components in the audio stages and power supply circuit is of little importance. In the detector stage, however, wiring must be short and direct, and construction must be rigid. A valve rectifier, such as an 6X4 could be used, and also a larger loudspeaker, if so desired.

## Chassis Layout

The chassis layout is shown in **Fig. 2**. The variable capacitor, VC1, is fixed to a stout bracket so that an epicyclic ball drive may be added. Tuning is quite critical and a 2in (51mm) diameter knob is recommended.

In use, the lug on the drive is bolted to the panel and the drive is then fitted with a 0-

100° or 0-180° dial or a pointer. It can be read against scales drawn on card attached to the panel.

The coil holder is mounted about 3/4in (19mm) above the chassis, using long bolts with extra nuts, or spacing sleeves for this purpose. Coil formers and holders other than those listed may be fitted, or a single coil, permanently wired in place.

There's no need for the coils to be of the diameter given and other numbers of turns and gauges of wire can be perfectly satisfactory. Changing the diameter or windings will naturally modify the waveband covered, but provided smooth regeneration is obtained, there will be no loss of efficiency.

It's quite feasible to wind coils on old valve bases or on Paxolin tubes attached to old bases. Larger plug-in coils are also available from some suppliers and can generally be used if to hand.

The diagram, **Fig. 4d**, shows the underside of the coils and pin connections. The tuned winding is between pins 1 and 3, pin 3 being

bases or other coils, the holder is selected to suit and appropriately wired, so that the coil can be inserted.

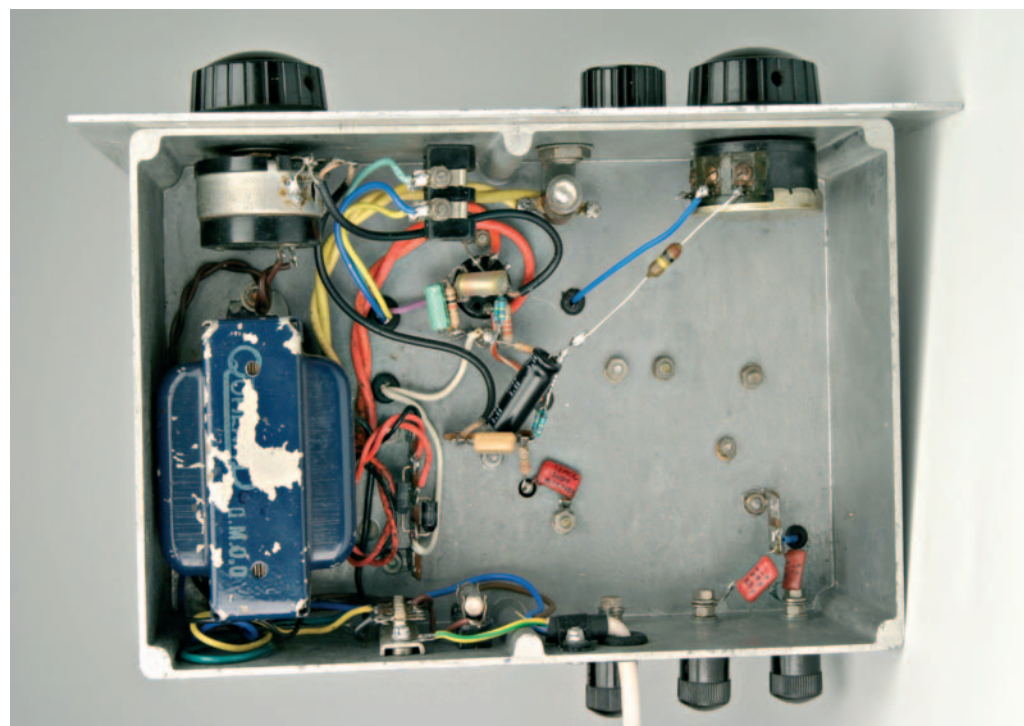
## Coil Winding Details

On the plug-in coils listed, the following numbers of turns may be used, the ranges specified being approximate; For 6.75-22MHz coverage use 16 turns of 30s.w.g., tap at 3/4 turn. Antenna coupling requires five turns.

For 2.5-7.5MHz coverage use 50 turns 32s.w.g., tap at 1.5 turns. Antenna coupling requires 15 turns.

For 1.2-4MHz coverage use 100 turns 34s.w.g., tap at 2 turns. Antenna coupling requires 20 turns.

For 14.5-50MHz coverage use



● Under-chassis view of the G6AKG receiver. Clearly visible is the Eddystone style die-cast box used as the chassis. Richard corrected the sloping side of the box (necessary for the die-casting process) by using an angled 'stand off' adjustment on the front panel.

earth. All cathode taps are made on this winding, at point 2. The remaining winding is for antenna coupling, the antenna itself being connected via C2 to socket 4. The remaining end of the antenna coupling winding is taken to pin 3.

All the coils are made in the same way, except for the number of turns and gauge of wire. If you decide to use valve

5.5 turns 30s.w.g., tap 1/3 turns to 1/2 turns. Required antenna coupling is two turns. For (approximate) 40-100MHz coverage use 2.5 turns 20s.w.g. double spaced, tap at 0.5 turn. Antenna coupling required is one turn.

The two larger coils have turns wound side-by-side. Other coils use threaded formers, with 21 turns per inch (t.p.i.). The antenna

windings are formed near the tuned windings, as in Fig. 4d. The highest frequency range is with VC1 in the half-closed position (75pF).

## Acorn Valve

The pin-out connections for the 954 acorn valve are shown in Fig. 4a, the valve being viewed from the anode (long) end. The valve is mounted over a 0.5in

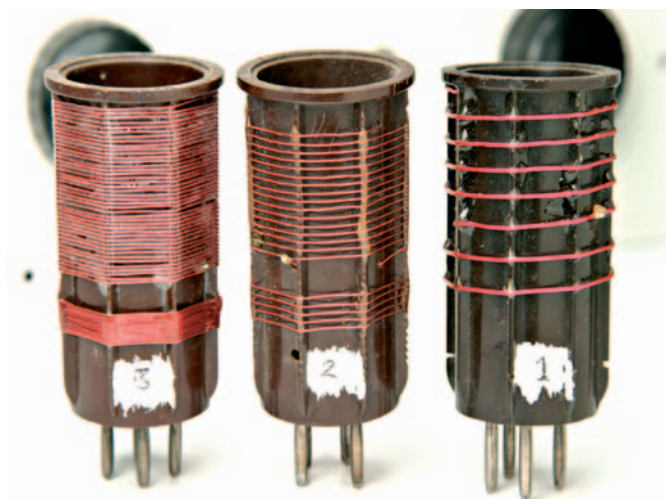
connection has been made.

**\*Note:** *In practice this is a decidedly risky operation! I suggest readers practice on scrap B9A, or B7G all-glass valves, before trying it out on a now much more valuable 954 acorn. I suggest the use of a proper base, or a different valve type. Editor.*

If a valve holder is used, grid and anode connections may be soldered or clipped on.



● The 954 acorn valve (originally designed specifically for v.h.f./u.h.f. operations) mounted on its special holder (see text).



● Coils for the Beginner's Short Wave Two wound onto Eddystone coil formers (see text and Fig. 1, on blueprint.)

diameter hole, so that the grid pin is on top, as in Fig. 2 and the anode pin under the chassis, as in Fig. 3.

The valve can be mounted satisfactorily by soldering wires directly to the pins\* (see note), provided care is taken to avoid breaking the glass seal. Wires must be soldered only to the extreme tips of the pins and the iron must be at full temperature and must be removed promptly when the

The leads from R1 and C2 to the grid pin should be extremely short to avoid hum. If the outside foil of C2 is marked, take this end to VC1.

## Loudspeaker and Panel

The loudspeaker panel may be painted, or left clear. It's held to the front runner of the chassis by the switch and the two potentiometers.

A clip holds the twin

capacitors C9 and C10 to the chassis and if this component does not have a metal can forming the negative connection, and in contact with the chassis, a lead should be added from negative to chassis.

The loudspeaker is just high enough to clear the capacitor and has a matching aperture in the panel. It's secured with countersunk 6BA. bolts. A square piece of expanded metal loudspeaker fret is then cemented to the panel, over the aperture.

## Below The Chassis

Wiring and components are shown in Fig. 3. The two small, contact cooled rectifiers MR1 and MR2 (see information panel) are bolted to one side runner. The mains transformer wiring should be checked as follows:

Primary to mains via on/off switch. One 6.3V tag and centre tap of h.t. winding to chassis. Remaining 6.3V tag to tag 9 of the 12AT7 holder and 954 heater. The h.t. tag to negative on one rectifier. Second h.t. tag to negative on second rectifier.

A tag strip with two insulated tags will be convenient to anchor the mains leads, which pass through a grommet in the chassis. Current is best drawn from a plug fitted with a low rating fuse. The receiver chassis should be earthed.

Various points marked 'MC' in Fig. 2 and Fig. 3 are all solder tags which are bolted securely to the chassis. The negative ends of C5 and C8 must be taken to the chassis.

## Operating

A regenerative receiver of this type is extremely sensitive, provided regeneration is correctly adjusted. If regeneration is not used correctly, only powerful European and similar stations will be heard.

When VR1 is slowly rotated so as to increase the 954 screen grid voltage from zero, a point will be found where oscillation begins. This oscillation is audible if a

station is nearly tuned in and will be heard as a whistle or audio tone, which changes in pitch as tuning is adjusted. For maximum sensitivity, regeneration is kept at the point where such oscillation just fails to arise. In these conditions, extremely weak signals may be picked up.

Regeneration and tuning are critical, with the high frequency coils and when receiving weak signals. With the lower frequency coils, and when tuning in stronger transmissions, the setting of VR1 is less important.

For powerful stations received without interference, VR1 may be turned back somewhat. But in more difficult reception conditions, VR1 is maintained near the oscillation point, as described, because this increases selectivity, and volume is reduced by VR2 if needed.

If regeneration is too violent and abrupt, with any coil, this shows that the tapping 2 needs to be slightly nearer the earthed end of the coil 3. Antenna loading influences results and if the antenna is at all long, C1 should be reduced in capacity. This can be done by fitting a 30pF or 50pF trimmer in this position. For indoor and other short antennas, C1 may be as shown.

PW

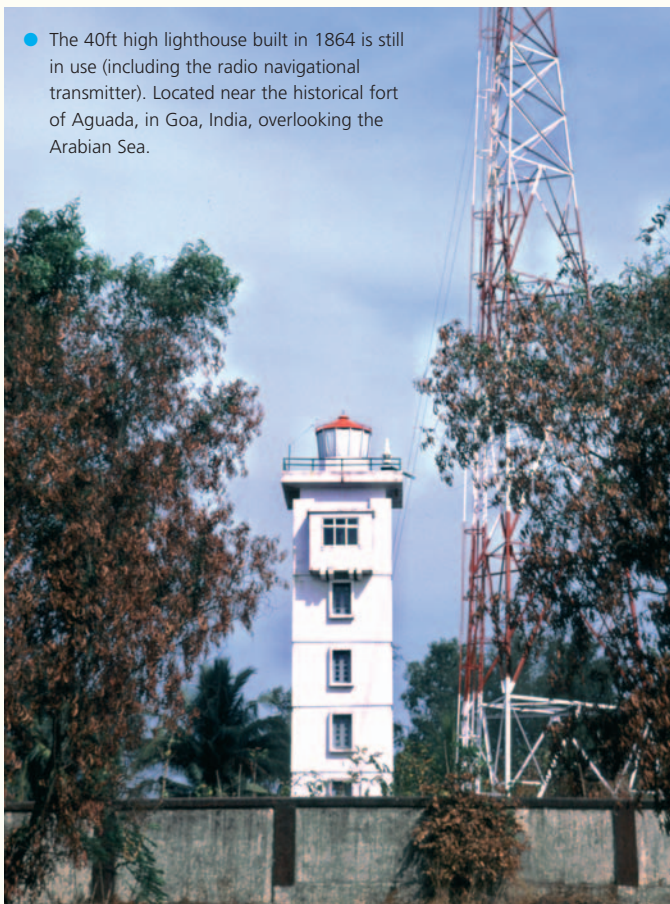
## Specialised Components

Readers intending to build the Beginner's Short Wave Two and aiming to reproduce the original design, but don't have access to plug-in coil formers - need not despair! The Norfolk based Isoplethics company stock various vintage/semi vintage components (including octal based plug in coil formers) together with suitable transformers. For further details please contact **Tim Christian** at Isoplethics on (01692) 403230 for further details and information. The Isoplethics website [www.isoplethics.co.uk](http://www.isoplethics.co.uk) also provides a selection of the material they can supply.

Editor



- The 40ft high lighthouse built in 1864 is still in use (including the radio navigational transmitter). Located near the historical fort of Aguada, in Goa, India, overlooking the Arabian Sea.



woman on the bus told me to follow her and pretty soon I was ringing the doorbell of **Cyril VU2CY**.

Cyril VU2CY is a retired engineer who moved back to Goa after many years in Bombay. When I rang the bell Cyril was actually expecting a postman delivering his Icom radio from a service shop!

We chatted for a while sipping Indian whisky with mineral water. Amazing! An unexpected total stranger gets a cold drink and is invited into the sitting room, the radio shack. I've lived too long in Sweden (28 years) where neighbours won't even talk with me!

Cyril only had wire antennas and a low-power home-made experimental transmitter at his disposal at the time of my visit. The rotary quad antenna had been taken down and the Icom IC-745 became senile and had gone for a memory refreshment treatment in Mumbai (better

**VU2FCX**. Didier lives in the capital, called Panaji, in a large house, 'decorated' with assorted antennas in the very centre of town.

Didier is a friend of Luis Catulo from Lisboa. His roof is decorated with antennas and the wall space above the radio station boasts several Amateur Radio diplomas. Didier says: "The DXCC was hard, getting the QSL cards here is not easy. The VU QSL bureau is not really operative and direct mailing is far too expensive unless one is a Maharaja".

## Onto The South

After a week in North Goa I moved onto the south and Colva Beach, which is very close to Alex VU2FCX's QTH. I took a taxi... but Alex was not at home, yes, I did 'phone before going there but the 'phone number had been changed!

Colva Beach is also very

**Henryk Kotowski SM0JHF visited India for two weeks, during which time he met some interesting characters from the Amateur Radio Community. Read on to share in his experience...**

# The Indian Experience

India, I mean East India, is a distant, mystic and not-so-easy-to-work-on-the-air country. Yet, the number of licensed Amateur Radio operators there, according to reliable sources, is 16,000, which is far more than in Sweden, where I live.

My decision, of the last-minute kind as usual, was actually ignited by **Luis Catulo CT1CTZ** almost a year earlier. He lives in Lisboa, Portugal but was born and lived until the early 1960s in Goa, a Portuguese territory on the western coast of India.

I met Luis in January 2002 when I was going home from the equatorial Island of Sao Tomé in Africa via Lisbon. So, when I spotted a bargain offer for a package deal to Goa on one of the travel websites, I did not

hesitate. India is so intimidatingly huge but Goa is tiny, easy to embrace and European-influenced. It's a good starting point to discover a new subcontinent.

## Adjusting To Goa

When I arrived in Goa it took a couple of days to adjust to the intensive heat, noise and smells. To help me I'd brought with me a short list of addresses of fellow Radio Amateurs I found on the [www.qrz.com](http://www.qrz.com) website.

One day, at the bus station, trying to get back to my beach hotel, I saw a sign on a bus that resembled a name in one of the addresses. I jumped onto the bus, showed my list to the fare-collector. He said "yes, yes" and announced which place I was heading to. Half an hour later a



- Cyril VU2CY at his radio workshop and operating position located in Cnsa, Goa, India.

known as Bombay - one of many name changes in recent years in India).

During my chat with Cyril he told me of other active Amateur Radio operators in Goa including **Didier VU2DM** and **Alex**

close to the main railway station in Goa. So, I 'phoned **Srikanth VU2SBJ** who lives in Manipal, some 350km south and arranged a meeting.

The train is a very common transportation method in India.



● The radio corner at Alex VU2FCX's home.

The Konkan Railway runs from Mumbai in the north to Mangalore in the south, through Srikanth, together with **Bhat VU2NJJN** and **Laxminidhi** were waiting for me in the holy town of Udupi.

Srikanth VU2SBJ, Bhat VU2NJJN and Laxminidhi took me to a good hotel first, later to a famous Hindu temple and at the end of the day to a typical Udupi-food restaurant. Next morning we all sailed to an uninhabited island called St. Mary's (IOTA AS-096). No, no... it's not another IOTA DXpedition!

Access to St. Mary's island is easy and cheap but there is no electricity there and actually a permit from the Police is necessary for both operating the radio and staying there for the night! However, there was an IOTA DXpedition to St. Mary's in May 2001 and my hosts wanted to show me the 'scene of the crime'.

## Afternoon Drive

In the afternoon we all drove to a larger town called Mangalore. We were talking about meeting some members of the Mangalore Radio Club, but when we arrived there were at least a dozen people waiting for us in front of a restaurant, all of them licenced and very eager to meet an exotic fellow from Europe!

I learned quite a lot during that evening about the realities of being an Amateur Radio operator in India. The average level of education is high but the average income is very low compared with Europe.

Radio equipment is hard to get and even harder to get repaired. Antenna restrictions, interference, QSL handling - all these issues tag along with the bureaucratic machinery of Ministry of Telecommunications. In some cases applicants have had to wait up to five years after passing a test to be issued with a Licence! Is there a better way of

discouraging prospective Amateur Radio operators?

I really hope that the situation will change. Particularly, as India is a well developed IT and telecom country. Anyone can have access to the Internet, E-mail, cellphones, satellites so why treat Amateur Radio as if it still was the Second World War?



● Bhat VU2NJJN at the radio in his home in Manipal watched by VU2CT.

The following day I was taken 'up the country' to the family house of **Bhat VU2NJJN**. Srikanth drove the four wheel drive car and asked me when we were approaching the house "Did you see that cobra that crawled just in front of the car?". I only had shorts and sandals covering my legs so I hesitated when we reached our goal and suggested that I would rather stay inside the car! "Cobras are not dangerous, unless you stamp on them" - Srikanth confidently assured me.

Eventually, we were served a meal, which was placed on banana leaves spread on the floor but trying to sit down with my legs crossed and reach for the food was uncomfortable for me. I do too little antenna work, tower climbing, amplifier repairs without moving them, crawling behind computer tables to connect the accessories and so on, to be fit and supple!

It seems to me that having guests is a very important and a pleasant social element of life in India. Later, I was invited to visit the homes of Srikanth VU2SBJ and Bhat VU2NJJN.

They both live in Manipal, a city that is well known for its educational facilities. Bhat teaches at the Manipal Institute of Technology but there are other colleges.

Bhat VU2NJJN has a modern Icom transceiver but the antennas are low-suspended dipoles. We checked the 7MHz band, as it is a popular band here.

As India is far from Europe, North America and Japan so DXing is not easy with simple antennas and so local contacts

are preferred. Luckily the British influence in the shape of the language is still present (in spite of changing names of towns) and communication between different parts of this multi-cultural, multi-religious and multi-lingual country is possible. "We speak Kannada here but in Goa they speak Konkani for example" - Srikanth told me on my arrival in Udupi.

## The Driving Force

The next home I visited was Srikanth's, who is actually the driving force of the local Amateur Radio activity. Apart from arranging meetings like mine, he's engaged in hamfests, classes and DXpeditions.

For local Amateurs Srikanth is the 'Santa Claus' and 'The Wizard' of r.f. in one person - namely, Srikanth does, free of charge, repair equipment for his Amateur Radio friends. So, the radio corner in his attic is filled with items waiting to be repaired.

My new friend's roof is filled with numerous antennas - some home-made - for several bands. I checked the 28MHz band as the 10m ARRL contest was taking place that weekend, but propagation was not so hot though, so I only managed to make a handful of contacts with

Europe.

Srikanth's father is also licenced, and so is one of Srikanth's brothers. That partly explains his deep passion for the hobby!

## Positive Conclusions

My conclusions are positive and I feel that Amateur Radio is going to grow in India and there is an increasing curiosity in and need of it. For example local Amateur Radio operators rushed to the north-western state of Gujarat in 2001 after an earthquake and provided communication. I have heard similar testimonies in so many places in recent years - Amateur Radio apart from being such a lot of fun is an asset for every nation.

My two week stay in India passed quickly. I learned much about local foods, spices, drinks (in Goa they make booze out of cashew nuts!) - not only about Amateur Radio.

My flight home left very early in the morning. Alex VU2FCX was on duty that morning at Dabolim airport and



● Bhat VU2NJJN's parents - Henryk SM0JHF is pictured surrounded by the family and VU2NJJN, VU2SBJ and VU2CT.



● Srikanth VU2SBJ checking his home-made 28MHz Yagi antenna.

he found me in the crowd at the check-in counter. He works in exactly the same place that Luis Catulo CT1CTZ worked at until 1962. It was a pleasant *finale* to my Indian experience. **PW**



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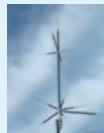
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OPENING AUGUST 2004



- 4000sqft OF DEDICATED SPACE TO HAM RADIO!
- OFF STREET PARKING FOR AT LEAST 30 CARS - RIGHT OUTSIDE THE MAIN ENTRANCE!
- EASY ACCESS VIA MOTORWAY AND RAILWAY
- LOCATED ON THE OUTSKIRTS OF LONDON FOR EASE OF PARKING AND COMMUTING FOR CUSTOMERS
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**Rob Mannion**  
**G3XFD, Editor**  
*of Practical*  
*Wireless* freely  
 admits that  
 given the choice  
 - he wouldn't  
 publish  
 equipment  
 reviews in the  
 magazine.  
 However, as  
 he's 'outvoted'  
 on this topic  
 Rob sets out to  
 explain his  
 reasons and  
 PW's approach  
 to this often  
 difficult subject.

**D**uring my visits to clubs, part of the *PW* 'Club Visit' talk is devoted to a 'Question & Answer' session. In fact, it's more of a two-way chat between readers present in the audience and myself. The Q&A sessions are - for me anyway - one of the most valuable sources of feedback from readers and often there's no holds barred.

I've often been put 'on the spot' so to speak and have been surprised by the variety of questions and topics which come my way. Occasionally, however, the subject of reviews comes to the fore and this is where the audience is often surprised to hear my opinion on the subject.

Given the opportunity - to ensure that everyone would be in no doubt as to the review policy in *PW* - I wouldn't publish them in the magazine! This is because - try as I might - there are a vociferous minority who are unable to understand that in others an honest and ethical

We have to bear in mind the advertising adage 'there's no such thing as bad publicity'...realising that a magazine review of equipment is obviously an extension of the advertising medium. As an Editor I just have to do my very best to ensure it doesn't become 'Advertorial' - doing my best to avoid what's become known as 'spin', and separating free promotion from the essential informed opinion report!

### Amateur Radio Unique

Amateur Radio is a unique pastime and there's no real parallel when it comes to 'trying before buying' the specialised equipment we use. In the motoring world it's possible to 'try before you buy' at most car dealers...but a 'take away' evaluation facility is not freely available in our hobby.

It's even possible to negotiate the loan of a car for 24 hours so you can get a good idea of what's in store for you. I've done it myself - as many

etc. I happened to be in hospital at the time - but they soon got me out of my hospital room and into the driving seat.

The reason why I'm mentioning the Toyota review is that I - having already ordered my own Yaris Verso - changed my mind regarding the colour. I plumped for the Metallic Silver paint work which impressed me on the review model. And, just to show that there were no favours coming my way - Toyota duly charged me the extra costs of the metallic paint on my own new car! I wasn't expecting any favours from Toyota - my writing fee came from the *DT* (that's just how we work on *PW*) working as an author to provide an opinion independently of any influence other than my own specialised instinct.

There are of course well known TV presenters/journalists who review vehicles, crash them and often generally 'rubbish' cars which seem to cost less than £40,000. In fact, the very car I love and rely on was totally 'rubbished' by one famous, high

# Reviews Reviewed- Looking At The PW Review Policy

approach to their work is of paramount importance.

So, rather than causing repeated collisions between my skull and brick-and-mortar structure trying to convince people that neither myself or our publishers 'can be bought' - I'd rather not bother! Instead, I'd prefer to devote the space to a useful constructional project, or something similar.

However, despite my inclinations, reviews are considered by readers to be important. Readers want the knowledge and opinions of reviewers and manufacturers/suppliers want to see their equipment being promoted - **warts and all.**

readers seemed to have noticed when I reported on the Toyota Yaris Verso car (I now own one) in the Saturday Motoring Section of the UK's *Daily Telegraph* newspaper several years ago.

It's worth mentioning the 'review' I did of the Toyota to show what's available in the multi-million pound motoring industry. Their promotional budgets make those in our speciality look like a pauper's purse!

Firstly, I had no contact whatsoever with Toyota - the loan of the vehicle was arranged by the *Daily Telegraph*. It was fitted with the necessary hand controls for me and delivered for photography,

profile TV based motoring commentator/personality who seems to dominate BBC programmes. His presentations are amusing - but I doubt that this type of alternately extremely critical/highly praised reports effects sales in any way.

I wasn't discouraged from buying a Yaris Verso - as I knew it suited my needs. And the parallel is that I feel all we can do in *PW* is to provide an accurate opinion as possible, while trying to avoid the tabloid TV style presentation.

Amateur Radio equipment isn't available for the equivalent of a test drive at home. Yes, you can often use a rig in a dealer's showroom - but it's not the same as familiarising yourself



with it for a few hours. A day would be good - but it's unlikely to happen unless you can borrow a friend's new rig!

## Organising Reviews

So, just how do we set about organising reviews in *PW*? Let's take a look, but before I set about explaining our policy I'd like to acknowledge the letter from **John Nicholson** (letters, this month) which spurred me on to write this long-planned article.

When we met at the Yeovil QRP Convention John was pleased that I had sent him an *Author's Guide*, but unhappy that his unsolicited review was returned unread. I had done so with my customary letter pointing out that it's a very firm rule I've enforced for 15 years to ensure that reviews are free as possible from 'outside influence'. We choose the reviewer ourselves and they have no connections with suppliers/dealers.

In other words getting a favourable article written about by a 'tame' reviewer is made much more difficult. The rule is so firmly applied that even if a regular author has had previous contact with a manufacturer/dealer/supplier with regards to the equipment to be reviewed, they are automatically disqualified from writing a review on it for *PW*.

## What & When

Firstly, it's important to realise that due to *PW* being a small specialist magazine - we cannot do as the American magazines adopt as a policy - go out into the market place and buy equipment in for reviews, even if it was available in the UK at the time of review. Instead, we have to rely on equipment being provided by the manufacturers/dealers/distributors. So, in effect it's the 'trade' who tell us what we can have for review and when we can have it for use in the magazine.

Despite the fact that we don't have any real control over what we have for review, all suppliers are fully aware of the extremely strict approach adopted by myself and my publishers. Simply put it's this;

**You can tell us what we can have, and when we can have it - but not what to say in the published review!**

In my attempts to provide an honest review and to be fair to everyone concerned, no constraints whatever are placed on the reviewers. They are asked to use the equipment and to be honest, write the best 'balanced' opinion report using their genuine opinion and provide the best evaluation possible. We only ask that they mention good and bad points in whatever proportion they are found.

Authors also avoid (another strict rule) contact with the suppliers unless it's via the *PW* offices, by special arrangement. This removes undue and perhaps unintentional influence in the preparation of the review by anyone concerned.

## Reply Panels

Occasionally, readers will notice that a manufacturer/supplier involved in a review will take the opportunity (we always provide a 'right of reply' via a comment panel if it's requested or required) to put their point of view. This is done occasionally when a matter of interest, a suggestion or criticism has been raised by the reviewer and the manufacturer/supplier wishes to comment, etc.

Incidentally, it's important to note that - with few exceptions - the manufacturer/dealer/supplier cannot ask for alterations to the text of a review after they've received a courtesy copy from *PW*. The exceptions are when important technical errors have been made, or there have been genuine misunderstandings. If this occurs, the agreed wording alterations are carried out in conjunction with the author who is kept fully informed of any changes/modifications. The final decision on what's published is decided between the Editor and the author.

## Test Equipment

Evaluating equipment with non-certificated test equipment is a real contention

when the preparation of a review for publication is involved. Obviously, if we had the time or money - and the necessary fully certificated test equipment (and the screened test rooms which cost so much to install and maintain) we would carry out the most thorough tests, as we once did from our old offices in Poole.

Nowadays, to be able to publish cross-check technical specifications obtained from tests in our own laboratories to publish alongside the article, we would need unrestricted access to fully certified facilities. To reach, register and maintain the required standard is in itself extremely expensive and labour intensive. It's the reason why the companies which carry out the 'Type Testing and Approval' for the major manufacturers charge so much for this form of evaluation or specifications checking.

For *PW* to undertake tests with our existing equipment and then have to display within or alongside the published article (to comply with the EU regulations and UK standards law) that the equipment used is **not certificated** and **does not comply** with those regulations - seems utterly pointless.

Another difficulty with the step-by-step technical specification cross check list is that relatively few readers will fully understand exactly what's being done and what the specifications mean in the way they're presented. Again, I have a fundamental problem in that if such check lists are done - they should be presented in comparison with a 'standard' reference rig. In fact, this is something I've done in the past - by comparing results with my own equipment (usually the Alinco DX-70TH).

## Well Equipped

There's another factor to be considered nowadays in that Amateur Radio transceivers are becoming extremely well equipped. This means that an individual reviewer will rarely have the experience (or knowledge) to evaluate all the facilities on a particular rig.

We're now combining

reports from several reviewers wherever required. Each author will report on their general experience with the equipment, in addition to concentrating on their own specialities (data, c.w., etc.).

Another - extremely important factor - is that all the 'mainstream' manufacturers produce superb equipment. They have no choice - the market is so demanding and very, very specialised indeed. As a result it's often very difficult for reviewers to find faults. Sometimes it's just a case of ergonomics and the sheer complexity operating such equipment which draws review comments.

Generally speaking though it's difficult to fault most Japanese-made Amateur Radio equipment. But you can be sure - if there's a problem...our reviewers will comment if any appear during a review.

## Cleft Stick!

Summing up this statement of policy I have to say that we're always in a cleft stick regarding what's said in our reviews. Some readers may doubt what we say - considering we've not been hard enough while others lament the fact a rig hasn't received a glowing report and complain that its resale value will be effected!

We can never please everybody - but you can be sure that whatever happens - the *PW* policy will always be to publish the truth regarding the equipment under review. No manufacturer has ever put undue pressure on myself or our reviewers. They may not be pleased with a particular opinion - but they honour our right to publish it on behalf of the author.

So, if you have the time to evaluate equipment for us - particularly if you enjoy using a 'special' mode - let me know. We'll be pleased to send you a *PW Author's Guide*, along with guidelines for review authors I'm now preparing. You never know - your opinion could be of much interest to our readers....and I'm sure you'll believe your own evaluation!

**PW**



Angus (Gus) Malcolm G8DEC looks back at how he got into radio the traditional way - using a crystal set. Young Angus was fortunate - his arrived in a polished mahogany box!

# Crystal Sets...

## A good place to start!

**W**e all have to start on this Radio hobby of ours somewhere and for me it was back in 1952 and I dearly wanted a crystal set. I was fortunate as my parents came home from Birmingham Rag Market with a set. It was in the shape of a polished mahogany box, with brass handle on top and inside on an Ebonite panel the crystal set itself. There was also a

available on long waves (200kHz in those days). A friend - **Byron Llewellyn** - was the school crystal set expert and with some help I built my first set.

I started a long search for knowledge helped along the way by *PW* and anything else I could read. I still have a copy of F. J. Camm's *The Wireless Constructor's Encyclopaedia* amongst many others and with their help crystal sets were built, altered, modified and dismantled at quite a pace!

My location was ideal for such simple receivers being a mere 10km (six miles) from Wychbold, the home of BBC Droitwich. The giant transmitter still dominates the eastern side of the M5 motorway between Birmingham and Cheltenham.

### Loudspeaker Volume!

I had about 30m (100ft) of antenna wire strung out down the garden. This system, coupled to one of my efforts produced usable 'loudspeaker' volume using a valve output transformer for matching. My parents were worried I was wasting electricity if I left it on - not realising the high field strength from close-by Droitwich was providing 'free' electricity!

By this time I considered I was the 'Expert' and was doing quite a trade in home-built sets, most components being recovered from scrap sets of the 1920s and 1930s. The cheapest set I made was based on the Prisoner Of War (POW) design that seemed to be common knowledge at that time. The detector used a safety pin with the closed end cut off a piece of pencil lead (ordinary HB) and a razor blade.

The pencil lead was tightly bound onto the pin with fine wire, the pointed end stuck into the baseboard. A razor blade was attached to the board using drawing pins, a sliver of match

stick forcing one of the sharp edges clear of the board.

Wires were attached to the pin and the blade (via one of the drawing pins). The sensitive spot usually seemed to be when the pencil lead was brought close to, or actually on the sharp edge. On my most recent effort the blade's etched printing seems best. (Remember most modern blades are plastic coated, so check for a good connection).

Incidentally, if you try an 'exotic' home-brew diode as a detector, I suggest that you get the set to work using a conventional signal diode first. For a 'cat's whisker' I suggest a bristle from a wire brush coiled a couple of times, and then soldered onto the safety pin.

Pieces of crystal\***(See note below)** may be found in the shops selling fossils and gemstones. A quite professional looking crystal holder can be made from a dismantled r.f. connector or plumbing fitting. For example a small piece of crystal jams nicely into the top of a aluminium Belling Lee type coaxial plug.

**\*Note:** Some gemstone or lapidary suppliers can provide Galena (Lead Sulphide), the 'traditional' crystal used for simple receivers. **Editor.**

### Joined GPO

I left school and after a year at college I joined the old General Post Office (GPO) as a 'Y2YC' the then new name for a 'Youth in Training' (The famous 'YITs') what you nowadays may call an Apprentice.

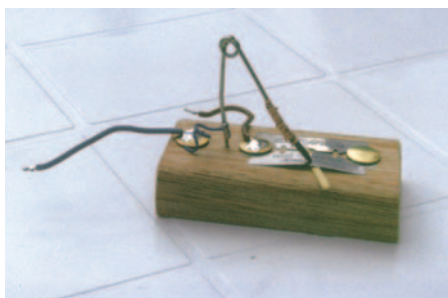
After two years of training I was given a Gladstone bag, a few tools and a coil of wire and became a walking 'Fitter' - an installer of telephones. Soon, after a couple of changes, I had learnt to drive and was the Telephone Line and Instrument maintenance



● 'The Doctor' - Gus Malcolm G8DEC - invites you into the 'Tardis' - in reality a Glasgow Police call box! - to hear his crystal set (see text).

pair of SG Brown Type F headphones...all of this for 10/- (50p!) If only I had kept it!

My set was medium wave only and there was no 'Light' Programme as that was only



● The 'POW' type of 'crystal' set detector built by Gus G8DEC. (It works!).



● The demonstration crystal set built as an entry into the Bromsgrove Amateur Radio Society construction competition (see text).

man (Subs App & line in 'GPO speak') for Bromsgrove and its surrounding areas.

Actually, Bromsgrove is much closer to Wychbold than Droitwich, so perhaps should have been on all the radio dials of the day! Still, the town does have its claims to fame as the 'Guild' made the gates and railings to Buckingham Palace and also (long before Liverpool became the city of culture) the Liver Birds which dominate the waterside in that city of music and Mersey Ferries! But I digress.

My life as the linesman was certainly made interesting by the enormous amount of r.f. energy induced into the telephone lines, not to mention the interference from the BBC transmitter. The field strength was so high that the r.f. voltages could arc and cause burns. Dire warnings were posted on all poles in the near vicinity of the station! My job entailed stopping all manner of GPO telephone equipment from acting as crystal sets and reproducing BBC programmes.

Later I was promoted and became a Radio Investigation Officer. In this job I saw (and heard) many items without any form of loudspeaker clearly reproduce the sound of the BBC.

(At the time I wondered .... "Do you need a Radio Licence for a toaster or a cooker?").

## Club Project

Arriving at more recent times at my local club - the **Bromsgrove Amateur Radio Society (BARS)** construction project featured a crystal set. And of course, I couldn't resist designing a 'throwback' to a bygone age. I used 'breadboard' construction, courtesy of an old chipboard wardrobe!

The basic circuit centred around a 60-turn coil of plastic bell wire tapped every five turns. The former was a piece of plastic rain water pipe about 250mm

long and 65mm in diameter.

I found an easy way to wind the coil. First, I drilled a couple of holes a centimetre or so apart to secure one end of the wire, then proceeded to wind all 60 turns.

I then used a ruler and a marker pen to draw a line along the length of the coil. Then, by unwinding the coil I could (at every 5th black mark) attach a wire for the necessary tapping point.

Next, all I had to do was to rewind the coil and all the tapping points formed a nice straight line. Finally, I secured the end with holes as for the start.

Two 12-way single pole switches with the 'ways' wired together were connected to the taps. One switch was wired to a capacitor of about 300pF to allow tuning and range adjustment. The other was wired to the diode to allow the optimum match with minimum loading. (The antenna could be attached to the top of this coil, or via a coupling winding).

## Useful information

A useful source of information is the *Crystal Set Society's Newsletters* contained in a number of books available from the **PW Book Store**. They make

interesting reading but may be a bit 'technical' in places for some. Most advice is practical, the circuits are easy to follow although not always fully detailed. (Volume 4 makes a particularly good starting point).

My crystal set gives usable volume at home with no antenna or earth attached and easily separates signals. Moving closer to Wychbold, the signals are quite loud and I've also demonstrated it at the **Avoncroft Museum of Historic Buildings** where I am a volunteer.

The museum houses the National Telephone Kiosk Collection! It's a world of working kiosks and automatic telephone exchanges. The museum is only a mile from the BBC transmitter site and visitors, both young and old, are quite amazed at the radio....and even more so as to where the power comes from! The museum is a good point of recruitment into Amateur Radio and the **Radio Society of Great Britain!**

## High Impedance Headphones

High impedance headphones are difficult to obtain new nowadays. And although the piezo-electric 'crystal' earpiece works if shunted with a suitable resistor - in my opinion it doesn't 'look the part'.

From my own experience I've found that sensitive 'rocking armature' ('Balanced Armature') communications headphones of any impedance work. They can also be improved using a valve output transformer to improve the matching.

**Note:** The low sensitivity, low impedance 'hi - fi' variety are unsuitable for use on a crystal set. (Don't even think of using the cheap magnetic earpieces included with transistor radios!).

A high impedance version of the rocking armature headphone was made for the GPO/BT (4800Ω/earpiece) designated 'Receiver insert 3U'. (The common 3T is only 150Ω) A pair of high impedance headphones complete is a 16U. Perhaps it should be something to look out for at the rallies?

## Simple Project

Finally, here's a simple project for the shack. Take a telescopic antenna (1m maximum) and connect a diode to the end. At this junction connect one end of a coil, try 10-15 turns on a 1in former wound in a logarithmic spiral.

The other end of this coil to the earthy side of a small high gain audio amplifier. The other side of the diode goes to the live connection of the amplifier and by doing this you'll have built a broadband

nearfield receiver. It will be capable of chasing any thermostat, small electric motor or any other amplitude modulated (a.m.) signal in the vicinity.

I used the polythene reel from a roll of solder (500g) as the coil former and a microwave diode. The amplifier was from a surplus tape recorder/player from the 1970s and it's still in use today. One of the 'tricks of the trade' so to speak - from my days on the Radio Investigation Service.

A crystal set uses only a few basic components and none can be damaged by incorrect connection. There's no best circuit, it's down to what works best for you at your location. Remember though, that sensitivity and selectivity do not go hand in hand. Be prepared to experiment!

In fact you may even be pleasantly surprised by the result! Even to the extent of being able to say..."I made that"!



● During his telephone engineering days Gus G8DEC worked hard to keep BBC radio from the local telephone system! (Photo shows inside of traditional Strowger-equipped telephone exchange at the Avoncroft Museum of Historic Buildings. Tel: (01257) 831363. Website: [www.avoncroft.org.uk](http://www.avoncroft.org.uk)).



# Antenna Workshop

Roger Cooke  
G3LDI  
continues with  
his description  
of how to create  
your own  
antenna farm,  
touching on  
verticals and  
dipole antennas,  
baluns and test  
equipment.

One of my old friends, now sadly a silent key, **Harry Barnes G3HXM**, once said to me 'This would be a wonderful hobby if we didn't have to have antennas'. Well, I know what he meant, but his signal on h.f. was as if he had antennas at the top of a 35m tower in his garden!

Some newcomers to the hobby think that by investing in the latest 'all-singing, all-dancing' transceiver they can then talk to the world with their radio using a piece of wire hidden near the ground in the flower beds, but below the fence line so the neighbours won't see it. I have news for those people! It doesn't work like that. Any radio is only as good as the antenna it's attached to it.

Every now and then somebody asks for antenna suggestions in the hope that a fancy piece of wire will work a miracle for them. Often (but not always)

antenna. So, rather than agonising over an antenna choice, just put one up and use it on the air. After operating with it for a while you will become aware of your operating habits and the shortcomings of the antenna you erected. Now you should have some hints as to which direction you should go with another antenna. Remember, you can lose a lot of your power in poor antenna system efficiency and only be down an S unit or so.

Antennas mounted at a good height, generally perform better than antennas mounted lower. A vertical on the roof of a house is probably a better choice than one in the garden. A dipole whose end is tied to a medium length mast on top of the house will be better than an antenna whose end is merely fastened to the eaves.

It also doesn't matter what kind of copper wire you use in an antenna. Thick or thin, insulated or

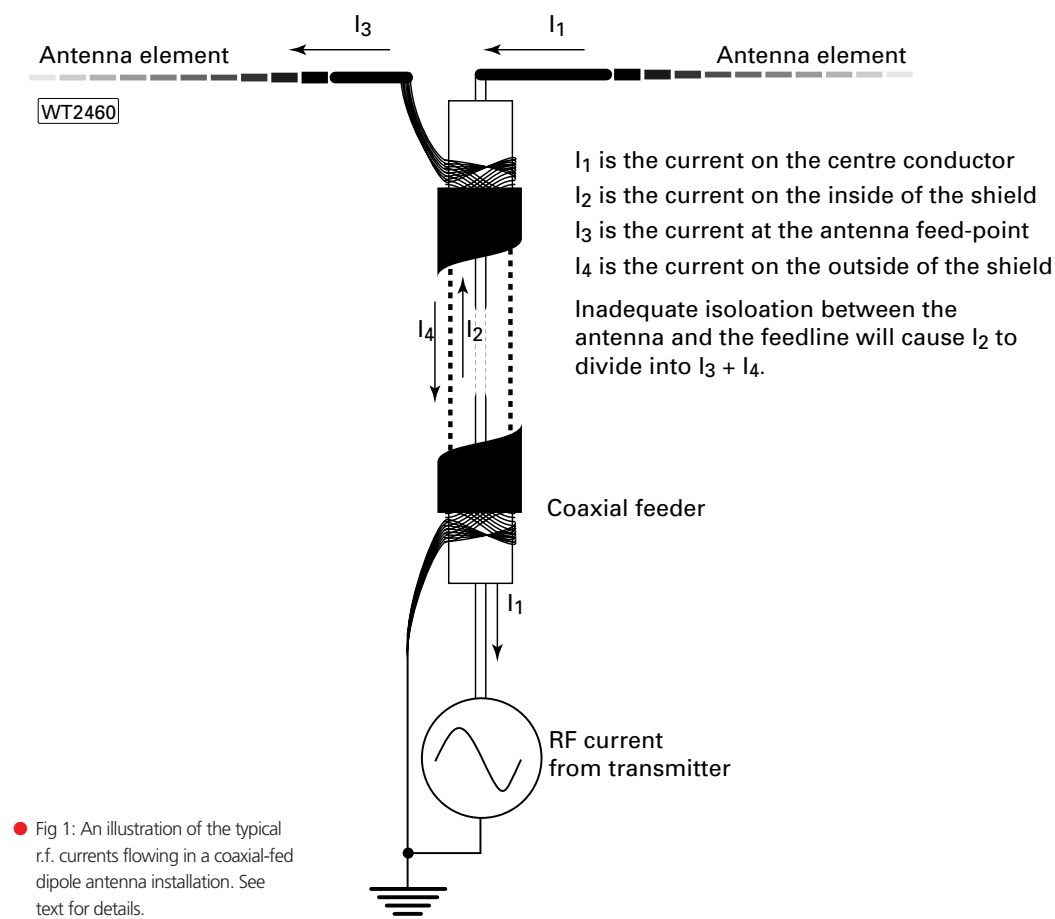


Fig 1: An illustration of the typical r.f. currents flowing in a coaxial-fed dipole antenna installation. See text for details.

those asking are beginners who are afraid of making the wrong choice. There's no 'wrong' choice. Antennas can be anything from a length of wire to a stacked array of six element mono-banders on a 65m tower. Both systems will work, but results will be tremendously different for obvious reasons.

## Prepared To Experiment

Every Radio Amateur should be prepared to experiment with their antennas. Putting up wire shouldn't cost too much money and don't be afraid of failure or poor results, that's what the hobby is about! You learn from experience.

Outdoor antennas perform better than indoor ones. If all you can erect is an indoor antenna, fine, but try to see if there is a way to get an antenna up outside.

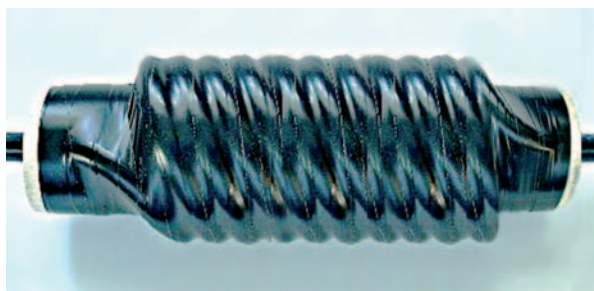
Just remember, any antenna is better than no

bare, stranded or solid, they will all perform fairly well. However, I would advise avoiding some of the coated steel wire, as the losses are rather too high.

The old formula for cutting a half-wave dipole,  $150/\text{frequency (in MHz)}$  will give the  $\lambda/2$  length in metres. The actual antenna dimension may be a bit different for various combinations so, be prepared to adjust. You may find that, having cut a dipole and erected it, the s.w.r. may not be what you expected.

Effects from the ground, surrounding terrain, and so on, all play a part in modifying the s.w.r. reading. So, be prepared to take the dipole down and adjust its length several times. Time spent in 'playing' will pay off later on.

Whatever antenna you've chosen, if it's fed with coaxial cable, you should use an in-line choke balun. This will prevent the feed line from becoming part of the antenna, which can cause all sorts of problems. There are many designs for choke baluns and you



● Fig. 2: A simple choke balun made by winding turns of the coaxial cable around a former, such as a piece of large diameter plastic pipe.

don't have to buy one, there are designs to build to be found in the ARRL *Antenna Book*.

Don't use cheap feeder, as good, low-loss feed line doesn't cost much more! The coaxial cable I consider best to use is RG-213U, and it's often better to purchase a whole reel so, look around for the best price. Alternatively, open-wire feeder can be made quite cheaply as I have already mentioned in previous articles.

## Baluns

Now I'll turn to baluns, a word balun that's a contraction of two words, BALanced and UNbalanced. It merely means that it is a transition from an unbalanced transmission line to a balanced load, such as an antenna. In an antenna such as a simple dipole, it's possible to feed it with coaxial cable. Indeed I've done just this on many an occasion. However, in practice, there will probably be some distortion of the expected radiation pattern. The actual installation of the antenna and feed line will not be perfectly symmetrical.

Look at Fig. 1 where you can see a representation of a coaxial cable fed dipole antenna. The various currents shown in Fig. 1 are those that flow around the different areas of the feeder. The currents  $I_1$ , and  $I_3$  in the two dipole elements may be equal. But they may not be equal, which gives the 'skewing' of the antenna's radiation pattern. Ideally  $I_2$  (and ultimately  $I_3$ ) would be exactly opposite and equal to  $I_1$ , meaning a perfect match and no radiation from the outside of the coaxial cable.

The feed impedance of the antenna is also, depending on height above ground, unlikely to be 50Ω in reality. So, there is likely to be unwanted current flowing, downward, on the outside of the cable's braid. This current is called common-mode current, and it's not a desirable situation but can be alleviated by the use of a balun.

'Voltage-type' baluns produce equal and opposite voltages at the balun's balanced port. Since low impedance antennas are current fed, a balun that produces equal and opposite currents at its output over a wide range of load impedances is desirable. There is little to be gained by forcing the voltages of the two antenna elements, balanced or not, to be equal and opposite compared with the cold side of the balun input. The transmitted signal strength is proportional to the currents in the elements, not the

voltages at the feed point.

Current-type baluns are not a new idea. They have been used in TV receivers for many, many years. This is because TV tuners require a very wide bandwidth balun that works with a severely mismatched system, such as a TV's antenna. The current-type balun was the best choice for that application. These are also known as common-mode choke baluns.

Unfortunately, when baluns were first popularised for use with wire antennas, a voltage-type design was chosen. Other balun makers just followed along. It was years before the first true, current-type baluns appeared on the market.

Baluns will not improve the s.w.r. of an antenna. The antenna still has to be cut and tuned properly. **Note:** A balun will not stand in as lightning arresters either, this is another popular misconception!

A simple method of producing a current or common-mode choke balun for a dipole is to use the actual feed line coaxial cable itself. Nothing could be easier. All you do is wind the coaxial cable into a coiled loop near the centre of the dipole and tape it up.

The coil can be either air spaced and pile wound, or wound onto a former. A piece of plastic water pipe is an ideal former as shown in Fig. 2. This then forms a tightly coupled transmission line transformer, forcing the currents at the output to be equal, and the coil 'chokes' the common-mode current. The coil is not critical, probably made from 6m of coaxial cable for 3.5MHz to about 2m for 28MHz and up.

If you wish to build a ferrite core balun, this presents more problems. A large core is necessary, to prevent saturation, a large wire diameter is also necessary to cope with high power and to reduce  $I^2R$  losses. Another easy solution is to put several ferrite beads over the coaxial cable near the feedpoint of the antenna.

Mechanical considerations, such as weatherproofing, a case and connections all have to be provided. Then ideally, the balun also has to be potted before installation.

## Vertical Antennas

The horizontal antennas we've been discussing work very well for inter-UK and European contacts, but not too well over 4000km. It is possible to work DX, of course, with any antenna, but it really is 'horses for courses'.

A vertical antenna will produce a low angle of radiation, a necessity when trying to work DX on 1.8 or 3.5MHz. If you have a pole or tower to support the beam and/or dipole, then consider using a vertical. If you have a tower, then gamma matching is a possibility, and if you have a pole a wire dropped from the top is all that is needed.

The real work with a vertical antennas comes with installing a good ground mat. If you have an open space surrounding your

support structure, then a radial system of around 250 wires under the ground will provide you with a reasonable ground mat.

Alternatively a radial system above ground as a counterpoise might be an easier answer, around ten are needed at about ten feet above ground. This effectively makes the vertical a ground-plane. With a vertical and the low angle of radiation, your country score will increase on the l.f. bands.

## Test Equipment

Whilst you can get away with very little in the way of test equipment when experimenting with antennas, it's very helpful to have an indication of what you are doing and knowing for sure that what you are doing is correct. This also assumes, of course, that the individual knows what must be measured, and what results are acceptable. Here is where a lot of self-education comes to bear. **Reading matter is essential.**

Antenna and feed line theory is quite involved. It really depends on how deeply you wish to be involved and how much time you will spend on antenna construction. If you intend to go out and buy even a dipole, then probably no test equipment is needed. If, on the other hand, you wish to make your own, then some test gear is mandatory.

I have some test gear that I made myself, many years ago now, and it still provides me with some useful measurements. However, with the march of technology, it is now possible to buy a piece of equipment, like the MFJ 259B antenna analyser. So, it's possible to have one piece of gear that covers most of the measurements you are likely to need.

In our hypothetical dipole, assuming we have cut the antenna elements to length, installed a balun and have hauled the antenna up reasonably high away from buildings and trees etc., then final pruning is quite straightforward, the steps to take are:

- 1) Connect the feed line to the analyser.
- 2) Adjust it to the desired frequency.
- 3) Read and note the s.w.r. at the desired frequency. Then adjust the analyser frequency until the lowest s.w.r. is found. This I call the measured frequency.
- 4) Divide the measured frequency by the desired frequency.
- 5) Multiply the present antenna length by the result of step 4. This will then show you the actual length required and the antenna can be pruned.

Carrying out the process several times can show rewards in performance and will also gain you some useful experience in the pruning and tuning of antennas. Bear in mind, however, that more complex antennas with traps, etc. cannot be adjusted quite so simply.

The MFJ type of analyser will also provide lots of other measurements, another very useful one being the velocity factor of coaxial cable. Over time, you will gradually build an arsenal of test gear. Once you have it, you will wonder how you managed without it.

PW



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# practical way

**“Frugality without creativity is deprivation.”**

**Amy Dacyczyn**

**This month the Rev. George Dobbs G3RJV takes a look at the wavemeter. It's one of the most basic and important items of test equipment and of course you can build one yourself after reading the appropriate quotation!**

**M**any of the projects in this little column are frugal by nature and I do hope some are even creative! Certainly the feedback I get from readers is creative and sometimes it is frugal and I'm sometimes surprised.

For example, I was intrigued by an E-mail I received from PW reader **Dr. Godfrey Manning G4GLM**, in Edgware, Middlesex. Sometimes everyday objects leap out and suggest themselves for a particular Amateur Radio application. It was so, one day, when Godfrey was taking a light lunch. But I'll let him speak for himself.....

Godfrey wrote; “While reading a copy of PW over a cheese-and-crackers lunch I had a sudden moment of inspiration. I recalled your suggestion that bee's wax does not contaminate soldering iron bits and can be melted into drops that, popped onto an inductor, for example, hold things in place and thus prevent unwanted loss of adjustment or coils from unwinding themselves.

As I peeled open a 'Mini Babybel' cheese (source: local J. Sainsbury supermarket) I realised that the red coating was wax\*(see note)and that it separated cleanly from the cheese. The contents I ate but the wrapper I bravely tried against my soldering iron (“After luncheon!” - a quotation

of W.S. Gilbert, from *The Mikado* - I know how you like quotations!) It produced the characteristic wax smell.

The melted liquid dropped obediently onto a piece of scrap p.c.b. and made a neat dome, without harming the iron. Now, it's not just that wax is hard to obtain, the other point is that wax from this source is dyed deep red.

In the past I've noticed how older equipment might have red sealant on components, signifying “Do not adjust”! So, here's how we Amateurs can create a professional-looking red anti-tamper seal, assuming we know someone who likes cheese”!

Thank you Godfrey! What a fine example of frugality with creativity! We will see a suitable application for the technique later in this article.

**\*Note:** *The Dutch Edam cheese is a good source of suitable wax and also provides an excellent lunch!* **Editor.**

## Amateur Inspiration

In the late 1950s I was inspired to become a Radio Amateur mainly by visiting the shacks of local Amateurs. They were a hospitable crowd, always pleased to welcome a schoolboy and show him the wonders of the hobby.

In those days, Amateur Radio was a wonderful thing to behold. Many enthusiasts had completely home-made equipment or stations based



● George G3RJV says that “One day I'll get round to replacing the meter on this classic wavemeter”. Meanwhile it sits proudly in his collection of test equipment (see text).

upon modified Second World War communications gear. It was at such a station I first met the US Navy's BC348 receiver, which was to become the receiver for my first Amateur Radio station.

I soon learned the tricks of modifying war surplus equipment. Incidentally, most of the information was passed around on scraps of paper and not published in manuals or magazines.

The work benches of the friendly 1950s Radio Amateurs were littered with fascinating gadgets and pieces of home-made test equipment. I well remember seeing a short wooden pole supporting a square of Bakelite on which were mounted a variable capacitor, a large coil and a bulb.

The device, which was worthy of a classic *Flash Gordon* film, was an absorption wavemeter. It probably had a circuit similar to that shown in **Fig. 1**.

In the diagram, a tuned circuit, C1 and L1, select Amateur band signals with a link winding on L1 to feed a low voltage bulb. The large coil in the tuned circuit is placed near a radiating transmitter, or

the output stages of a transmitter.

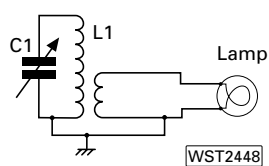
The radio frequency (r.f.) signal, picked up by the tuned circuit, is coupled to the bulb which glows to indicate the presence of a signal. Obviously, an absorption wavemeter is very simple to build and can still be a useful piece of Amateur Radio test equipment. These days the low voltage bulb might be replaced by a high intensity light emitting diode (l.e.d.).

## Practical Wavemeter

A more practical wavemeter is shown in **Fig. 2**. This circuit is capable of detecting a r.f. signal over the whole high frequency (h.f.) range. Again this is a classic Amateur Radio circuit.

Perhaps the oldest item of equipment I have is an old commercial wavemeter given to me many years ago. The black crackle case sports a calibrated dial, a large moving coil meter and a small whip antenna. Sadly the meter movement is damaged, but I still keep it for old time's sake. Perhaps one day I'll replace the meter and restore it to its former working glory.

The circuit, Fig. 2, is really a



● Fig. 1: Looking back, G3RJV says "The work benches of 1950s Radio Amateurs were littered with fascinating gadgets and pieces of home-made test equipment. One device, which was worthy of a classic Flash Gordon film, was an absorption wavemeter. It probably had a circuit similar to that shown here (see text).

crystal set driving a meter. The tuned circuit, L1 and C1, tune the desired frequency. The signals are received by a pick-up wire.

Although my old wavemeter used a telescopic whip a short piece of wire (say 300 – 400mm) works just as well. The sensitivity of the wavemeter can be changed by altering the length and placement of the wire.

The two diodes, D1 and D2, form a voltage doubler detecting circuit and a 10nF capacitor decouples remaining radio frequency signals to ground. The wavemeter requires a moving coil meter with a low current full scale deflection (f.s.d.).

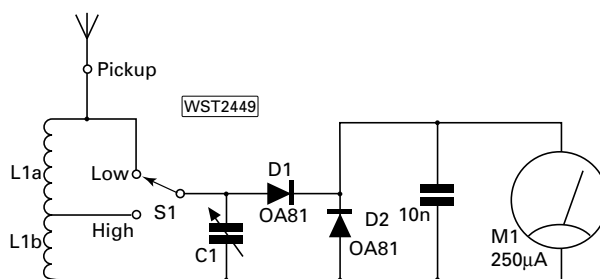
There are still plenty of the small audio VU meters available on the surplus market and these will work well in this circuit. Commonly, these little meters seem to have an f.s.d. in the order of 250µA.

The most difficult part of circuit Fig. 2. is the tuned circuit. It's tempting to have a large variable capacitor with one coil to tune the whole of the h.f. Amateur bands. However, this has two disadvantages; very sharp tuning and the availability of suitable variable capacitors.

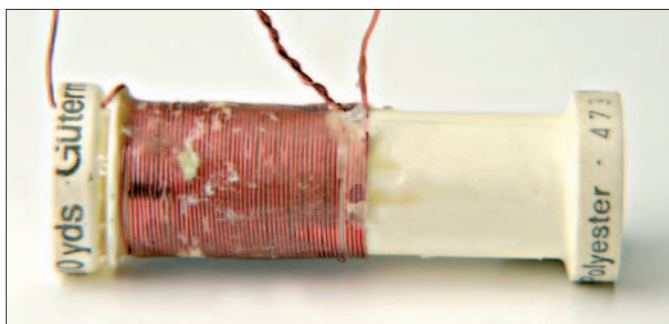
Finally, I decided to use a cheap polyvaricon type variable capacitor and switch the bands in two ranges. There are many types of polyvaricon capacitors available at reasonable prices and most of them appear to have a maximum capacitance value in the order of 140pF. The values given for this circuit are based on a capacitor for C1 with a maximum capacitance of around 140pF.

## Conventional Coil Former

The first version of this circuit that I tried used a conventional



● Fig. 2: A more practical wavemeter. This circuit is capable of detecting a r.f. signal over the whole high frequency (h.f.) range. Again this is a classic Amateur Radio circuit (see text).



● Fig. 3: The practical coil shown photographically.

coil former; a simple cylinder. In fact it was based upon a similar circuit I built some years ago.

The former was stolen from my wife's sewing basket and is a Güterman Thread reel with an outer diameter of 15mm. These make nice little coil formers....but please only use empty reels!

In this version L1a has 40 turns of 28s.w.g. enamelled copper wire and L1b is a further six turns of the same wire. The turns are held in place with wax – Bee's Wax not 'Babybel wax'!

The whole coil provides the 'Low' range and the section L1b provides the 'High' range. In my prototype the 'Low' range was approximately 3 to 11MHz and the 'High' range was 8.5 to 31MHz.

My final testing prototype used a toroidal core, Fig. 3. In this version L1 was wound on a T68-2 core using 28s.w.g. enamelled copper wire...and Bee's Wax! Note: L1 has a total of 60 turns, 52 turns make L1a and a further eight turns are added to make L1b. The best way to do this is to wind L1a first.

Remember that each time the wire passes through the centre of the core counts as one turn. When L1a is completed, pull out a loop of wire (say about 40mm) and twist it until it forms one spiral wire. This

forms the tapping point between L1a and L1b. Then continue the winding to complete L1b.

When the winding is completed (and secured with wax!) enamel is scraped off the ends of the start and finish wire and the twisted tapping wire. This exposes the bare (bright) copper which can be tinned with solder.

## Simple To Build

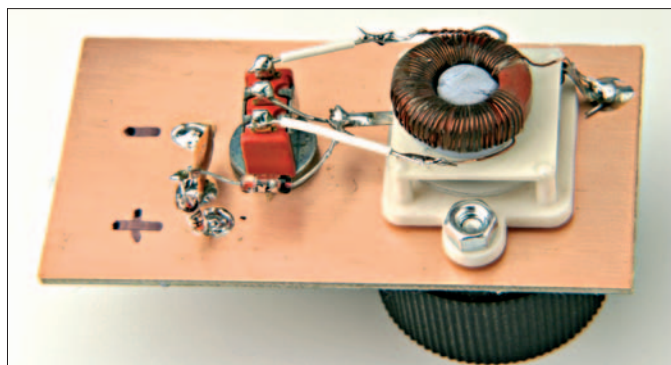
The wavemeter is very simple to build. The photograph, Fig. 4, shows my practical example built to test the circuit. The variable capacitor and the switch are mounted on a small piece of printed circuit board (p.c.b.) material and the rest of the parts are added, 'ugly-style', using the copper clad board as a ground-plane. One day this project will be mounted in a case and calibrated!

One down-side of this circuit is that it takes longer to calibrate than it does to build. Don't forget that usually a wavemeter is not designed to indicate accurate frequency; it only shows that a signal is 'in band' and event that may only be approximate.

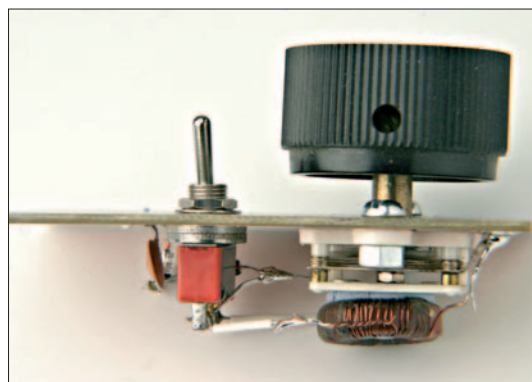
The usual requirement is to at least mark on a calibration scale where the bands occur. This is best done by using the wavemeter. My method is to run a low power transmitter into a dummy load. The wavemeter pick-up wire can be draped over the dummy load and the scale calibrated according to the frequency of the transmitter.

The wavemeter is a classic circuit but still a usable item of test equipment. Have fun building your version!

PW



● Fig. 4: The practical prototype which G3RJV built to demonstrate the circuit (see text).





# valve & vintage

It sounds as though Ben Nock G4BXD has been very busy attending rallies and meeting readers recently and as you'd expect...his museum collection continues to grow!

Welcome to the 'Vintage Wireless' shop as I do another spell of duty. It's been a good summer so far for collecting and I've managed to attend many rallies and had some nice chats with readers whose support I greatly appreciate.

As well as rallies in the UK, several contacts overseas have resulted in numerous additions to the collection here in Kidderminster. So, without further ado...I'll describe a few for you now.

## Australian Radio

Another couple of additions to my Australian and 'Southern hemisphere' section of the collection have arrived. Firstly, there's a ZC1 MkI transmitter receiver, a bit rarer than the more familiar MkII version.

The ZC1 MkI is a 2 - 6MHz, single band, c.w., m.c.w. and telephony radio set suitable for vehicle installation and/or field base operation. The receiver uses a 6U7G radio frequency (r.f.) stage, 6K8G mixer, 6U7G intermediate frequency (i.f.) and 6Q7G detector and first audio stage. Another 6U7G is used as another audio output together with another as a beat frequency oscillator (b.f.o.).

The transmitter uses a 6U7G master oscillator and 6U7G buffer. Also used are a 6V6GT power amplifier, a 6V6GT modulator and 6U7G modulation amplifier.

The power supply employs a non-synchronous vibrator. This provides h.t. with two 6X5GT rectifiers in conjunction with a tapped transformer. This arrangement permits switchable h.t. voltages to provide two different r.f. power outputs.

Power requirements for the ZC1 MkI are 12V at 4 to 6A depending on mode of operation. In transmit mode a maximum of 2.75W r.f. output is obtainable from the set.

Using the military 10.4m (34ft) mast and rod antenna and associated counterpoise earth, the ZC1's working range is typically between 40 to 55km (25 to 34 miles) over rolling

country. However, sky-wave working with dipole antennas (for example) would permit much greater distances to be worked.

Unfortunately, although it wasn't obvious when I purchased the set unseen, there are a few wires off underneath. So, it will need a little 'tender loving care' (t.l.c.) to bring this interesting set back to an operational standard.

Another southern hemisphere set received, this time directly from Australia, was in the shape of the Wireless Set No 108 MkIII. This little manpack type set is similar to the WS18 though the receiver and transmitter are contained on the same chassis.

The '108 was designed and produced by Radio Corporation (Melbourne) during the Second World War. It evolved over some time, and there were three different variants produced including: the 108 MkI, 108 MkII and 108 MkIII, the variation indicates frequency covered (similar to the British WS68).

The different models had the following frequency ranges: 108 MkI 8.5 - 8.9MHz (1941), 108 MkII 6 - 9MHz (1941) and 108 MkIII 2.5 - 3.5MHz (1943).

Valves used were 1N5, 1P5, 1A7, 1D8 and 1Q5. Many of these sets were used by Radio Amateurs after the War, just as the WS18 and 68 were in this country. They were very low powered though and had frequency stability problems that would have tried the patience of even the best operators, just as with the 18 set.

The '108 MkI version is the rarest as only a small number were made. It was discontinued owing to the very restricted frequency range. The MkII had better frequency coverage, although the frequencies covered by this variant aren't really suitable for use in jungle conditions. The MkIII was given the same frequency coverage as the WS 208, which I also happen to have in the collection.

The sets were all battery operated using a 1.5V low tension (l.t.) battery and two 45V batteries connected in series for high tension (h.t.). The power output of the set was between 400 and 450mW depending on frequency and antenna.

The units weights are just above 11kg. Apparently there were circuit differences between the various models, but I've not got that far in checking them out yet.

## A German Set

Achtung, its a German set! Another recent addition to my collection has been the Philips' made Kurzwellenempfänger, short wave receiver - the HMZL 34 OKM. The title itself is impressive...as I'm sure you'll agree.

The receiver is a nine valve standard superhet design which uses a turret type band changing arrangement. Frequency coverage is 1.5 to 23.1MHz in six bands. A standard b.f.o. allows reception of Morse and sideband signals with an additional audio filter for use on c.w. reception.

I found little information on this set on the web, but I did locate a manual available from a supplier in Germany, which I duly sent off for. The manual includes a circuit diagram together with other information and (with my poor German) I think the intermediate frequency (i.f.) is 280kHz.

**Note:** The row of holes along the top right of the receiver are in fact jack sockets. When the receiver is being serviced, they allow the monitoring of the various stages of the set.



Fig. 1: The ZC1 MkI single band, no wavechange switch transmitter-receiver. Note the separate receiver (right) and transmitter tuning dials.

The set uses an external mains powered supply. However, although it's working the b.f.o. needs looking at and hopefully with just a valve change it will be fully operational again.

## Eddystone Additions

Over the past few weeks the Eddystone section of my collection has increased various new items. These include a round speaker, another external S-meter unit, a bug key and a couple of sets.

One of the new arrivals is a Marine receiver, the 659/670. But, in fact this set is just a 670, the dial plate used on the 670 was the same as used on the 659 version as the genuine 659 had a 'magic eye' tuning indicator in the dial's top left window.

The S670 was the first of a very successful line of broadcast receivers especially targeted at ships' officers and passengers. Seven miniature 88A type valves are employed in a single conversion superhet design, with a 450kHz i.f., tuning 520kHz to 30MHz in four bands. There's no b.f.o. provision, as the receivers were designed for domestic broadcast reception.

Though of limited use, the 659/670 is a nice addition to my Eddystone shelf. Other recent additions are a 640 and a 960, Eddystone's first transistorised effort, but more on them another time!

## Fresh From USA

A welcome addition - fresh in from the USA (there's always one!) is a GF-11 Aircraft transmitter, which was used in conjunction with the RU-16 receiver. This little set uses a plug-in coil arrangement (on the side) to remove any problems with wavechange switches, etc.

The GF-11 was equipped for coverage of: 2 - 2.5, 2.5 - 3.2, 3 - 3.675, 3.675 - 4.525, 4 - 4.9, 4.9 - 6, 6 - 7.35 and 7.35 to 9.05MHz. Modes available on this set were a.m., c.w. and modulated continuous wave (m.c.w.). It provided a maximum of 15W output.

it! So, if anyone has the power supply, modulator, RU-16, plugs, leads, etc., I'll be pleased to hear from them. Will this torment never end?

## And Finally....

My thanks go to **Robin Thornton** who sent me a list of Air Ministry part numbers against component values he found in a 1949 issue of the *Radio Constructor*, as requested by **Simon Saunders** in my May edition. I'll pass them on to him.

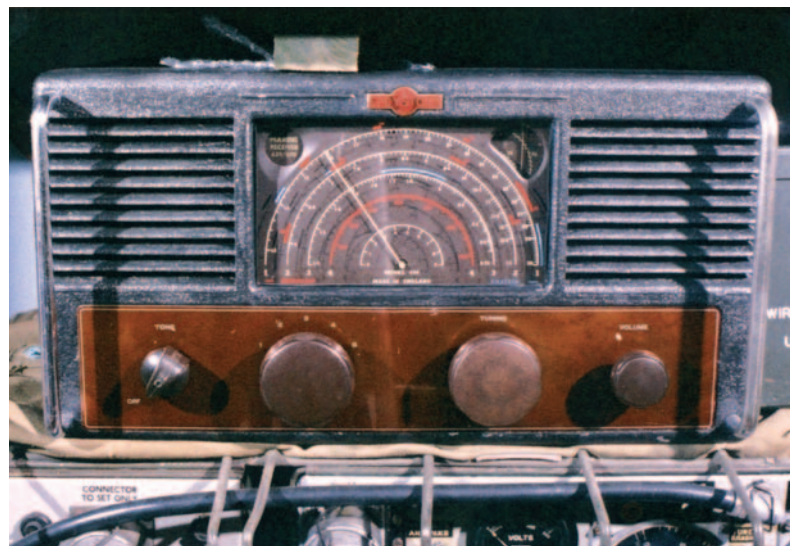
I also obtained some old back copies of *Practical Wireless* recently, around 1957 to about 1965 and I have to admit to really enjoying the format of those old books. There was a lot more construction of course but the detail and layout were also most pleasing (no offence **Mr Editor!**). However, the adverts from those times are hard to read though, but the price of the ex-military equipment as offered in 1957 compared to today's prices would make any



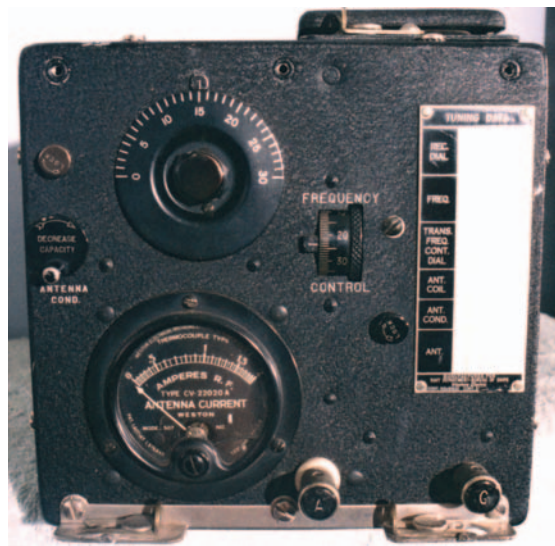
● Fig. 2: The WS No. 108 backpack set, again it has separate tuning dials for receiving and transmitting. The netting switch is at the top centre (see text).



● Fig. 3: The German HMZL receiver, the large handle in the centre is the wavechange switch! The odd knob (top centre) is a later addition and will soon be removed.



● Fig. 4: The Eddystone 670 receiver, note the simple controls, on/off/tones, band, tuning, volume (see text).



● Fig. 5: The GF-11 Aircraft transmitter with simple clean lines. The plug-in coil unit is mounted on the left-hand side of the set (see text).

Supply requirements were 14V d.c. input at 8A and 425V d.c. at 163m.a., obtained from a rotary generator. The set was produced around 1941 by the Aircraft Radio Corp. Using four valves, the transmitter is very similar to the better known Command series of sets. An oscillator, buffer and twin p.a. stages are employed. The modulator for radiotelephone use was externally mounted, along with the power supply.

There's only one problem with acquiring yet another new item - I then need to search for all the other bits that go with

collector weep!

*\*None taken Ben! Please see this month's 'blueprint' project on page 34. Secret note for diary - cross G4BXD off Christmas card list.*

Well that's all for now. I'm looking forward to meeting one or two of you at the various rallies and as always, you can write to me at; **62 Cobden Street, Kidderminster, Worcester DY11 6RP**, or via my new E-mail **military1944@aol.com** The web pages are still at **www.qsl.net/g4bxd** Cheerio for now. **PW**



# VHF DXER

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REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

Last month I reported that Sporadic-E propagation on the 50MHz band had occurred every day during the last two weeks of April. This time around I'm pleased to note that Sp-E openings were also reported every day throughout May. The majority of these openings were single-hop paths enabling contacts to be made all over Europe and into northern Africa. There were also a handful of very brief double-hop openings into the Middle-East and one lengthy transatlantic opening to Canada (VE) and the USA (W).

On seven occasions the maximum usable frequency (m.u.f.) increased up to the 70MHz region allowing contacts to be made on the Four Metre band with stations in Denmark (OZ), Croatia (9A) and Slovenia (S5). But the best was yet to come with six Sp-E openings within Europe reaching the 144MHz band, one of these on 27 May enabled UK stations to make contacts into Albania (ZA), Bulgaria (LZ), Italy (I), Slovenia and Yugoslavia (YU).

Although Sp-E is probably the best mechanism for making numerous DX contacts on the v.h.f. bands, many other propagation modes were also reported during May. These included a small aurora late in the evening of 29 May and an auroral-Es (Au-Es) opening during the same evening with 50MHz stations hearing the OH1SIX, OX3VHF, TF3SIX and VE8BY beacons.

On 15-16 May there were two trans-equatorial propagation (t.e.p.) events to 50MHz stations located in Malawi (7Q) and Zimbabwe (Z2). A rare 144MHz field-aligned irregularities (f.a.i.) opening was reported on 16 May to stations in Croatia (9A) and Slovenia (S5). UK stations needed to beam at a reflecting point located over Belgium to work the DX stations.

Many contacts

were reported via meteor scatter (m.s.) on the 50, 70 and 144MHz bands with European stations up to 2000km away. Tropospheric (tropo) openings occurred on the 144 and 430MHz band, but there were no significant contacts reported. Incidentally, all of these events, apart from tropo, are ionospheric modes which occur in the E-layer region at a height of around 90km.

Because of the height of the scattering medium ionospheric contacts will often cover

ZA/PE1LWT (Albania), Z37M (Macedonia) and 9H1TX (Malta).

From the UK single-hop contacts were also made into northern Africa and the off-lying islands. The stations of CN8IG, CN8KD, CN8TW (Morocco), CT3FT (Madeira Islands) and EH9IB (Ceuta and Melilla) made it into many log books, mainly by operators located in central/southern England and Wales. The beacon stations of JW7SIX (Svalbard 50.047MHz), OX3VHF (Greenland

## THIS MONTH DAVID G4ASR HAS REPORTS OF SPORADIC-E OPENINGS ON THE 50, 70 AND 144MHz BANDS

greater distances, well in excess of 1000km, as opposed to tropospheric modes where contacts are usually under 500km or so. This is obviously a generalisation but it does illustrate the huge difference in DX potential between ionospheric and tropospheric modes.

### THE 50MHz BAND

It has certainly been a terrific start to the summer Sp-E season with 50MHz contacts being reported every day during May with stations in more than 40 European countries. The majority of these openings were single-hop paths and amongst the more unusual or rare stations contacted on c.w. and s.s.b. were those of EH6EHI (Balearic Islands), HF2EU (Poland), IG9/I2ADN (Isole Pelagie, Italy), IH9YMC (Pantelleria, Italy), IM0/I2KQE (Sardinia), LY2004A (Lithuania), OH0JOB (Aland Islands), OJ0SM (Market Reef), OY4TN (Faroe Islands), SX9A (Greece), TA2IJ (Turkey), T77GO (San Marino), T99C (Bosnia-Herzegovina),

50.045MHz) and TF3SIX (Iceland 50.057MHz) were heard on a few occasions via Sp-E but apart from s.s.b. contacts with the station of TF8GX (Iceland) nothing else was worked from this northerly region.

There were openings into the Middle-East on 10, 16, 26 and 28 May, but these were extremely brief and weak affairs. Strangely the beacon station OD5SIX (Lebanon 50.077MHz) was the most consistent being heard on all of these occasions although the stations of 4Z5AO (Israel) and 5B4FL (Cyprus) were also fleetingly heard in the UK on 16 May and 28 May respectively.

A lengthy multi-hop Sp-E opening across the Atlantic Ocean to Canada (VE) and the USA (W) occurred on 9 May between 1300-1700UTC. Stations situated to the west of the UK, such as G8BCG/P (IO70), MW1MFY (IO81), GD0TEP (IO74), GI6ATZ (IO64) and MM0AMW (IO75) appeared to be in the best locations to make the most of the opening.

Initially, the beacon station VO1ZA (Newfoundland 50.039MHz) was the only signal to be heard but this was followed 30 minutes later by stations in the VE1, VO1, W1 and W2 call areas. Among the c.w. and s.s.b. stations reported to have worked into the UK were K1GBX, K1GUN, W1JJ, WV1K, K7BV/1, K2MUB, K2ZD, VE1CSM and VE1YX.

Ally Young MM0LUP reports that at his QTH on the Isle of Skye (IO67) the 50MHz band was open frequently throughout the month. On 10 May he worked over 50 European stations, many of them situated in France, with 59 signals being exchanged.



● Fig. 1: 50MHz Moxon Rectangle antenna at the QTH of Adrian Ball G8PSF. Based on the PW March 2004 construction article by Geoff Cottrell G3XGC.

Contacts on s.s.b. included EH5AX (Spain), HB9CKV (Switzerland), IW2DRM (Italy) and ON5LGS (Belgium). Propagation then swung to the south of the UK with contacts being made with the stations of G1IOV, G3KMA, G4KIT, G7RAU and G8BHD. Ally uses two transceivers, either a Kenwood TS-680S or an Icom IC-726, each feeding a 5-element Yagi with supporting 80W linear amplifiers.

On 15 May he reports further openings into France as well as contacts with stations in Poland and Slovenia. Further Sp-E openings on 17 and 19 May found s.s.b.

contacts with stations in Belgium, Germany, Italy, Poland, Slovakia and Slovenia.

#### Adrian Ball G8PSF

(London IO91) mentions that he is now using a Moxon 50MHz rectangle beam, shown in the photograph **Fig. 1**, based on the design by **Geoff Cottrell G3XGC** as described in *PW* March 2004. His version uses standard 21.5mm pvc overflow pipe for the insulating spreaders rather than g.r.p. rods used for bicycle safety flags.

The Moxon rectangle is located 11m above ground and displays an s.w.r. of 1.3:1 within the c.w./s.s.b. section of the 50MHz band without any specific effort on Adrian's part to tweak the antenna dimensions. He reports that although the antenna is quite small it certainly appears to 'produce the goods'. It is also directional, which helps to reduce local interference from badly screened desktop computers.

On 23 May the new antenna was commissioned using 5W of s.s.b. from an Yaesu FT-817 transceiver. In the first few hours of operation many s.s.b. contacts were made around Europe and included the stations of EH7HG (Spain), ES1A (Estonia), OZ0JD (Denmark) and SM0KCR (Sweden).

#### THE 70MHz BAND

On seven occasions, 15, 16, 23, 25, 26, 27 and 28 May the maximum usable frequency (m.u.f.) increased sufficiently to allow Sp-E contacts to be made on the 70MHz band. Unfortunately only a few countries within Europe currently have authority to use the band and only three, Denmark (OZ), Croatia (9A) and Slovenia (S5), have more than one active operator.

Nevertheless, the stations who are QRV on 70MHz are quite active and appear nearly every time the band opens up. Stations who are reported to have worked into the UK during May include OZ1DJJ, OZ2LD, OZ2M, OZ4EM, OZ7IS, S51DI, S57LM, 9A2EY, 9A2SB and 9A3AB. Due to current restrictions OZ stations running c.w./s.s.b. are generally found around 70.100MHz whereas S5 and 9A

stations can be found around 70.200MHz.

Stations using f.m. equipment should monitor channels around 70.450MHz as all these countries appear to have operators active on this mode. Beacon stations to listen out for include OZ7IGY (IO65) 70.020MHz, S55ZMB (JN76) 70.029MHz and 5B4CY operating on 70.114MHz. However, as I write this the 5B4CY beacon was due to be serviced and relocated in KM64FT locator square.

The very old 4-element Yagi is being replaced by a 6-element beam pointing towards the UK with a very clear take-off. UK

Band II early in the afternoon and suspected there might be an opening on the 144MHz band later. The first signals appeared at 1510UTC with an IZ8 station heard on the s.s.b. calling frequency but he was drowned out by a local station who was having an inter-UK contact! Fortunately, the QRM abated and Dave, running 400W into a 17-element Yagi went on to make s.s.b. contacts with the stations of YZ7NOU (1679km), YU1TT (1697km), YU7KB (1702km), YZ1KU (1740km), YZ1EW (1745km), YU1IO (1770km) and LZ2FO (1958km).

#### Tim G4LOH (Cornwall

IO70) running 300W into a 9-element Yagi had only been active from his new QTH for three hours! Luckily he managed to contact the s.s.b. stations of LZ2FO (KN13) best DX at 2210km, LZ2ZY, S51KK (JN76), S53V (JN76), YT1VV (JN94), YU1IO (KN04), YZ1EW (JN94), YZ1KU (KN04) and YU7KB (JN94).

#### Steve G8IZY (IO91)

reports that the opening was very brief and that he could hear absolutely nothing of the stations being worked by others to the west of his QTH. Suddenly at 1557UTC the station of YU1TT appeared with 59 signals and a snappy contact was made. It was over

just as quickly!

**Richard G4HGI** (IO83) probably made the best QSO of the opening when he contacted the expedition station ZA/PA2CHR (JN91) operating from Albania. **Gordon GW8ASA** (IO81) also heard ZA/PA2CHR but couldn't break the pile-up. However, he did manage to make s.s.b. contacts with the stations of YT1VV, YU1IO, YU1TT, YZ1EW, YU7KB and YU7MTN.

**Geoff GW3LEW** (IO71) mentions that the 144MHz opening was very short at his west Wales QTH. He made QSOs with YT1VV and YU1TT but missed contacting a Hungarian station and two other Yugoslavians. **Chris GW4DGU** (IO71) missed much of the event, coming on right at the end of the event at 1555UTC. Running 400W from a home-made solid-state amplifier into a long Yagi antenna he managed to contact the stations of YZ1EW and 9A4DU. Finally, the station of IC8FAX (JN70) reports making one solitary s.s.b. contact on 144.300MHz with the station of GM4IFC.

#### DEADLINES

That's it again for another month. The Sporadic-E season isn't over yet so take a careful listen to the v.h.f. bands right now! Good luck with making any DX contacts and please let me know what you managed to hear or work. Send your reports or news, preferably by E-mail, to reach me by the last weekend of the month.

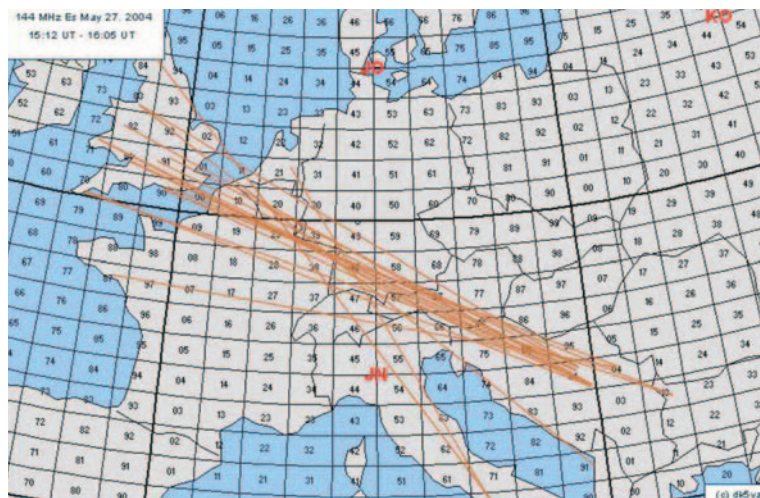


Fig. 2: The 144MHz Sp-E opening on 27 May.

beacons to listen for are GB3BUX (IO93) 70.000MHz, GB3WSX (IO80) 70.007MHz, GB3ANG (IO86) 70.020MHz, GB3MCB (IO70) 70.025MHz and GB3CFG (IO74) which is expected to be operational very soon on 70.027MHz.

#### THE 144MHz BAND

The Sp-E season got off to a very early start with 144MHz openings in parts of Europe being reported on 2, 10, 11, 14, 16 and 23 May. It culminated in an opening on 27 May between 1530-1600UTC with UK stations making contacts into Albania (ZA), Bulgaria (LZ), Italy (I), Slovenia and Yugoslavia (YU) as shown in the diagram, **Fig. 2**.

The 50MHz band was wide open in central Europe from around midday with the m.u.f. reaching 110MHz at times. Broadcast stations from Austria and Italy were heard in Denmark and Sweden in the early afternoon and at 1430UTC Italian f.m. broadcast stations were heard in the UK and Holland. At 1512UTC Yugoslavian stations were heard in western France on the 144MHz band but these faded out quite quickly. Fifteen minutes later the 144MHz band was open again from England and Wales into LZ, S5, YU and 9A while Scottish stations contacted stations in southern Italy.

**Dave Edwards G7RAU** (Isle of Wight IO90) found the Sp-E opening very interesting. He reports hearing Italian broadcast stations on



# HF HIGHLIGHTS

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REPORTS, INFORMATION AND PHOTOGRAPHS TO ME PLEASE BY THE 15TH OF EACH MONTH.

The year is flying by and there are plenty of DXpeditions and Special Event calls to be heard or worked on the h.f. bands. Conditions may not be at their best at this time and it's

amazing just what can be found if you have the time and patience to search for it. There is nothing like the feeling you get when logging that new country or island on what would otherwise have been a dead or noisy band. Keep your ears open - the DX is out there!

## DX NEWS

On to some DX news now, beginning with the French who have recently changed their radio licensing structure so operators that currently hold a v.h.f. only licence can now have h.f. band privileges which will allow them to operate using all modes except A1A, A2A, F1A and F2A. Because of this change **FT1ZL** on Amsterdam Island AF-002 is expected to become active on the h.f. bands by the time you read this.

Keep an ear open for Sebastien who will operate on 14, 18, 21, 24 and 28MHz s.s.b. Suggested frequencies are 14.195, 14.274, 18.138, 18.148, 21.191, 21.271, 24.954, 24.974, 28.485 and 28.495MHz, but remember, **FT1ZL** will be a sought after call so go easy on the operator as he will not be used to pile-ups! Just for information, Amsterdam is a small volcanic island in the Indian Ocean about 3,000km away from any continent and makes it the most secluded isle from any inhabited area!

Russian operators **Serge Konoplev RA3XR**

and **Nick Makerov UA3YH** will be on an expedition to the **Island of Dikson AS-005** until 15 September using a Yaesu FT-897 and various antennas. Nick is on the island participating in a scientific program and will use the call **UA3YH/0** while Serge will be active as **RA3XR/0**. It is hoped that they will both obtain a special callsign for use during their stay, but this was not available as I put the column together.

You can find more information at [http://dx.obninsk.org/dikson\\_en.htm](http://dx.obninsk.org/dikson_en.htm) and if you

work them you can QSL direct to the following addresses **RA3XR/0** via **PO Box 5015, Obninsk-5, 249035 Russia** and **UA3YH/0** via **Blokhintzeva Street 11-15, Obninsk, 249033 Russia** or send your card through the bureau.

## SPECIAL ACTIVITY

**Peter Ekersburger OE3EPW** is President of the **Austrian Military Radio Society (AMRS)** which is part of the **OeVSV** - the Austrian national HAM radio organisation. Peter has said that until 31 October this year, AMRS club stations will sign **/90KK** after their usual callsigns. This is in memory of all the former K/K signal soldiers who did duties during the First World War some 90 years ago.

Until 1918 Austria was a huge Empire

**EU-116** from 1-8 September. The site that they will use is **Scarlett Point**, a discontinued Coast Guard lookout tower which lies approximately 1.5 miles south of Castletown (WAB SC26). Activity will be on all h.f. bands and at full UK power. The team plans to operate simultaneously on three h.f. bands using c.w., s.s.b., RTTY, PSK and SSTV with particular attention being paid to 1.8 and 3.5MHz.

Stations will use a combination of antennas that will include Phased Arrays, Yagi's and Quads at heights of between 40 and 100 feet. The callsigns will be **GB4IOM** (Isle of Man) and **GB4SPT** (Scarlett Point Tower) and some operations are expected from the island's mountain will take place, conditions permitting, for SOTA devotees.

## LOTS OF DX AND SPECIAL ACTIVITY NEWS THIS MONTH FROM CARL GW0VSW

which had been ruled by the Habsburgs for more than 600 years. The Austrian Emperor (Kaiser) was also King (Koenig) of Hungary and his Army consisted of military personnel from all the different crown-lands. This army was called 'Kaiserlich/ Koenigliche Armee' (K/K Army) and that is the reason for the 'KK' used with their callsigns.

Look for the following stations to be on the air during and up until 31 October this year, **OE1XRC/90KK**, **OE4XRC/90KK**, **OE2XRM/90KK**,

**OE5XAM/90KK**, **OE8XRC/90KK**, **OE2XCW/90KK**, **OE5XCL/90KK**, **OE3XRC/90KK** and **OE7XBH/90KK**. All operators are either active or retired military personnel of the Austrian armed forces. The QSL Manager for all these stations is **Robert OE4RGC** and a special QSL will be provided.

## ISLE OF MAN OPERATION

Closer to home now and to the Isle of Man where members of the **Wrexham & District Amateur Radio Society** will be operating from

You will be able to QSL via the Bureau or direct to **M1LCR**. A number of awards are planned for working the station, either multiband/multi mode or a combination and s.w.l. requests are welcome. You can check out the following website [www.gb4iom.co.uk](http://www.gb4iom.co.uk) for more details and updates.

## QSL INFORMATION

If you have worked the United Nations Headquarters Amateur Radio Club station in New York **4U1UN** and want a card you can get one from **Herbert Aeby HB9BOU, Rte. Du Moulin 1, CH-1782 Belfaux, Switzerland** who is the QSL manager for contacts made on or after the 12 March 2004. All QSL requests for past operations should be sent to Station Manager **Mohamed Jendoubi KA2RTD, Grand Central Station, Box 3873, New York, NY 10163, USA** or E-mail **4U1UN@UN.ORG**

The callsign **EM0U** is the club Amateur Radio station of the **Ukrainian State Centre of Radio Frequencies** and the 6th ITU Centre of Excellence. The QSL manager is **Alex I. Arbuzov UT3UZ** who will be pleased to accept cards direct via **PO Box 240, Kiev-232, 02232, Ukraine** or through the **UARL** bureau.

## YOUR REPORTS

On to your reports now and I will begin with the log of **Elgin Mackinway M3BDK** in Kidderminster who uses a Yaesu FT-902 and mini beam, a horizontal 'oblong' wire loop or 5-band vertical for all his h.f. activities. Despite low power operation at 10W or less Elgin has



enjoyed working DX on several bands during the early hours of the morning. 7MHz contacts this month include WP4U (Puerto Rico) 0353, YV5SSB (Venezuela) 0517 and XE1KK (Mexico) 0540 and VE3BY (Canada) in Ontario at 2353UTC.

Meanwhile in Chelmsford, Essex **Martyn Medcalf M3VAM** used his Yaesu FT-897 and Buddipole antenna to work s.s.b. stations MI0AJG (Northern Ireland) EU-115 at 1054, 8S7VEN (Sweden) 1139, 4U1ITU (ITU



● Bill Clayton 2E1WHC with his 23 year old Land Rover as the mount for an 18MHz whip antenna.

Switzerland) in Geneva 1303, RK4FF (European Russia) 1952, ES9A (Estonia) 2018 and LA9RY (Norway) at 2255UTC.

The 10MHz band was the choice of **Ted Trowell G2HKU** on the Isle of Sheppy in Kent. Using his Ten-Tec Omni-5 and G5RV and c.w. of course Ted found Y19ZF (Iraq), SV8/GW3UOF/P (Greece), VK2GWK (Australia) in One Mile Beach, New South Wales, 4X/K2LS (Israel), OY3QN (Faroe Islands) EU-018, S9SS (Sao Tome & Principe), JW0HZ (Svalbard) EU-026 and TF3CW (Iceland) EU-021 between 1900 and 2100UTC.

### THE 14 & 18MHz BANDS

On to the 14MHz log of **Mark Taylor G0LGJ** in Dereham who has been trying out a new 'Outbacker' type of antenna. It appears to be working well as RZ9SWR (Asiatic Russia) 0643, VK2NZ (Australia) in Auburn, New South Wales 0702, D44AC (Cape Verde) AF-005 0803, SX9A/92 (Crete) EU-015 1448, 3V8BB (Tunisia) 1501, A61R (United Arab Emirates) 1954 and ZD8I (Ascension Island) AF-003 2223 all made his log.

Meanwhile, a switch of bands for Elgin M3BDK found PY7ZZ (Brazil) 0227, HC2FN (Ecuador) 0241, VK5AY (Australia) 0917, T70A (San Marino) 1303, ZA5A (Albania) 2138, WZ1Y (USA) at 2324 and CP6XE (Bolivia) at 2333UTC.

Enjoying a well earned break in Ireland was **Colin Topping** operating as **EI/GM6HGW** who says "We stayed in a cottage on the shores of Lough Derg 30km north of Limerick. Conditions on 7MHz varied, but I was able to work into the Royal Navy Amateur Radio Society net most mornings. Surprisingly stations in the north of Scotland and south of England had the strongest signals with very poor signals via short skip. I

put this down to two solar flares that occurred during the week.

The lads at Limerick radio club also struggled while running EI25SL over the May holiday weekend. The antenna I used was a Buddy Pole as featured in *PW* and purchased for me by my wife, **Gail GM7GKE** who thought it would be an ideal way to reduce the amount of radio equipment I carried on holiday. All in, I was very pleased with the Buddy Pole. It will never be a DX pile up buster, but it did perform admirably for an aerial of its size. More so when you consider the high trees surrounded our location.

Although not major DX and considering the band conditions it shows just how well the Buddy Pole coupled with my Icom 706 running 50W s.s.b. performed". Colin lists QSOs with W2HTI (USA) in Franklin, North Carolina 1058, HF1EU (Poland) 1330, RA9XY (Asiatic Russia) 1505, T9/VE6PR (Bosnia-Herzegovina) 1510, Z32AU (Macedonia) 1635 and OH1WX (Finland) at 1644UTC.

Also on the same band was new reporter **Chris Colclough** who has had the call G1VDP since 1986 and spent most of his time as a licensed listener! In January this year he purchased a Yaesu FT-897 and Maldol HVU8V antenna and began his first serious operating on h.f. The antenna farm has since expanded and now includes a half-size G5RV and a Cushcraft MA5B beam which is installed only 13ft above the ground and is working superbly.

During the day Chris worked s.s.b. stations JW/F8DVD (Svalbard), OE6YQW (Austria), SV2ASP/A (Mount Athos), Z33A (Macedonia), LY1BYN (Lithuania), PT2CSM (Brazil), T70A (San Marino), 4L6AM (Georgia), TF3AO (Iceland), EA6/DK5IR (Balearic Islands) EU-004, and CP6XE (Bolivia).

Not content with home operations Chris is also mobile with a Yaesu FT-897 and a multi-band h.f. mobile whip antenna!

Using a 23 year-old Land Rover as the mount for an 18MHz whip antenna kept **Billy Clayton 2E1WHC** busy in Liverpool. He worked a good number of s.s.b. stations from his location on a nearby local beach. With his Kenwood TS-570D set at 50W Billy worked W4UE (USA) in Newport, North Carolina, KP4NC (Puerto Rico), VP5VAV (Turks & Caicos Islands) NA-002, VE2BWL and VE3QT (Canada), EI25EU (Ireland), CT3BD (Madeira Island) AF-014, OK2AOP (Czech Republic), and CO6XN (Cuba) NA-015 between 1100 and 1600UTC.

Following in her father's footsteps was daughter **Jessica M3FGX** who operated from home using 10W and a Cushcraft MA5V antenna. A long conversation with WE2F (USA)

in New York was followed by QSOs with OH8JSZ (Finland) and UR4ZYD (Ukraine).

### THE 21 & 24MHz BANDS

It is an African theme this month with for **Owen Williams G0PHY** who lives in Biggleswade, Bedfordshire. Owen managed QSOs with the following stations on 21MHz s.s.b. using 100W and a simple dipole antenna beginning with 3XDQZ/P (Guinea) IOTA AF-096 at 1443, 7Q7MM (Malawi) 1559 and TT8PK (Chad) at 1745UTC.

The DX has not been at its best for **Jim Pedley GM7TUD** in Dumfries who says "At the times I have had an opportunity to be around radio and 28MHz has been an almost complete waste of time, so I guess we are getting down towards the bottom of the cycle and it will get worse over the next few years before any sign of improvement. Still I suppose the Sporadic-E season is upon us and that should bring some stations on the 28MHz band! I have also been trying RTTY and PSK31 this month for the first time with limited success and with only 25W output and have been amazed at the stations returning to me".

Jim certainly seemed to do well despite the conditions he found. He worked 9K2YM/P (Kuwait) on AS-118 s.s.b. at 0955, JR3NZC (Japan) 1033 and HL2NF (South Korea) 1130 both on RTTY, 3XDQZ/P (Guinea) on AF-096 at 1225 followed by 7Q7MM (Malawi) 1539 and HS0ZDZ (Thailand) at 1537 all with s.s.b. A switch to 24MHz found 3B9C (Rodriguez



● EMØU QSL card.

Island) AF-017 at 1034 using PSK31, D2PFN (Angola) 1137 using RTTY and c.w. contacts with 5H3/SM1TDE (Tanzania) 1057 and 7Q7MM (Malawi) at 1241UTC.

### THE 28MHz BAND

There were only two contacts for Jim on 28MHz and they were both with 7Q7MM. The first at 1017 on the key and later by a s.s.b. contact at 1437UTC. Nothing else was heard because of the poor conditions at the time!

### SIGNING OFF

That's about it for another month. As usual my thanks go to all our reporters for their logs and to **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* for all the DX information. Until next time have a good DX-filled month.

73. Carl GW0VSW



# DATA BURST

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Having last time talked a little about digital cameras it's probable that you'll want to show others the pictures that you've taken. So, how would you do it? Well one answer is to 'put them on the Internet' I suppose and it's a technique that I've used myself to 'share' images. The Internet is a great way of sharing files such as images, but it does have its drawbacks!

Firstly, the Internet isn't free! No matter what you're told in the blurb that accompanies many of the CDROMs offering Internet access. The Internet Suppliers (ISPs) have to get their running costs (and a profit) from somewhere. As it's not easy to get that from those accessing your site remotely by web browsing, you're the obvious target. So, I'll drop that idea for the time being, though I will return to it in a future article.

If all you want to do is show the members of your radio club or family and friends, the photographs that you've taken, then printing them out and offering them round will do. But the catch with that method is that good quality photo paper is also expensive - not to mention the use of even refilled ink cartridges! So, you could put them onto CDROM, taking that to a computer and display them there. Hmm ... not convenient? What other alternatives are there?

The Internet is convenient, but can be expensive as storing photographs can use vast quantities of storage space - I presently have over 40GB of digitally stored images archived on two machines at home. Two machines, so the chances of losing both hard disks at the same time is low. As further back-up, I have the images written to multiple CDROMs held in separate places within the house too. Once lost - they're gone for good!

## STORED IMAGES

As an aside I store images as either TIF files (Tiff) (large - but no loss of detail) or as the largest sized JPG files that I can create. These large JPGs are smaller than Tiff, but with a slight loss of colour detail. This loss can be almost completely repaired. The archived files I do not overwrite again. I immediately create a new working file - that way maintaining the quality of my 'master'.

But back to sharing pictures with others - an ideal medium is to use the radio, after all the running of a radio is largely 'free' (after purchase of course!). One of the methods of sharing images with others over the radio is to use Slow-Scan TV (SSTV). In spite of its name, it's not really TV as BBC and ITV programs (although you could use the Amateur version {ATV} to share images).

Both TV and SSTV share a method of passing the image data to the receiving station. Each image is passed as a series of lines, scanned from left to right and progressing down the actual image itself. Only the speed of this information passing is different, taking up much less band-width as the scanning speed is reduced.

In ATV a video camera carries out the task of scanning in incoming image (scene) and changing the scene to a serial stream of data of light and colour content of each line that is

information can be retrieved. The information is sent as varying tones where a low tone signifies less 'colour' and a higher tone more 'colour'. The sync pulses cause a regular characteristic 'ticking' on the signal. There's usually some activity on or around 14.230MHz most times of the day.

A simple receive-only interface is available, **Fig. 1**, from **Pervisell** ([www.pervisell.com](http://www.pervisell.com)). Or if you fancy having a go at building your own then a good place to start is [www.trunkedradio.net/digital/interface.htm](http://www.trunkedradio.net/digital/interface.htm)

## TEX SWANN G1TEX/M3NGS TAKES HIS TURN TO 'BURST' YOU WITH DATA!



● Fig. 1: The receive-only Pervisell data-mode interface has an audio 'pass-through' lead to connect to the sound-card's input.

part of the picture. Both TV and SSTV have synchronisation (sync) pulses that tells the receiving end that the following data is to go onto another line. There is just one slight difference in the two transmission methods and that's how colour information is passed over.

## COLOUR INFORMATION

To pass colour information, the 'normal' TV signal uses a complex method of combining information about the colours onto the transmitted signal. But when using SSTV, the colour information is sent three times - once for red, green and blue amounts on each line. These values are stored and combined at the receiving ends before displaying them on the computer screen. So, in reality SSTV can be considered as a colour FAX signal, a coloured version of the weather maps that are to be found being transmitted on h.f. by a similar method.

The simple interface that is used is merely an amplifier circuit that cleans up the incoming audio from the rig, and presents it to the serial port so that the original

where, apart from the broken link to the circuit diagram, there's enough details to allow you to build your first interface. Another interface to build was the rather splendid project for a digital mode interface in *QST* November 2000 issue. A PDF of the article is to be downloaded from:

[www.qsl.net/wm2u/images/interface\\_n9art.pdf](http://www.qsl.net/wm2u/images/interface_n9art.pdf) To get an idea of the four-page article, have a look at **Figs. 2** and **3**.

Most of the software that's available runs under one version of *Windows* or other. But even 'lowly' *DOS* hasn't been forgotten, there are still some programs available. Have a look at [www.qsl.net/eu6tv/link/sstv-fax.html](http://www.qsl.net/eu6tv/link/sstv-fax.html) to see some of the available programs. Another site that's useful for matters SSTV is [www.hffax.de](http://www.hffax.de) it's also where you'll find details on h.f. FAX too. The screenshot of **Fig. 4** shows the SSTV software page.

## DOS-BASED PROGRAMS

Another site offering DOS-based programs still can be found at: [www.hampubs.com](http://www.hampubs.com) Here you will find the three programs, *Blaster SSTV*, **Fig. 5**, *Audio Analyzer*, and *Spectrum FFT* on offer. The author, **Gene Harlan WB9MMM**, says on the site that none of the software is presently for sale, but if that's your only option then perhaps he would relent. You can E-mail him: [atvq@hampubs.com](mailto:atvq@hampubs.com) with the subject line of 'attn:Gene Harlan WB9MMM'.

And of course The *Linux* operating system hasn't been forgotten either, one page **Fig. 6**, that promises to supply *QSSTV for Linux* may be found at: <http://users.pandora.be/on1mh> Although this option may not be for the faint-hearted as you have to compile it yourself from the source files. And to help make it easier - or at least less terrorising, look at the help pages to be found at:

<http://users.pandora.be/on1mh/qsstv/doc> A second Linux SSTV program is *HDSSTV* to be found at:

<http://radio.linux.org.au/?sectpat=sstv&ordpat=title>

Another operating system, based on *Unix*, the new *OS X* (pronounced OS 'ten') for the Apple Macintosh computers has apparently far less choice, with only *Multimode*, shown in SSTV mode in Fig. 7, available. Written by **Chris Smolinski N3JLY** and found at [www.blackcatsystems.com/software/multimode.html](http://www.blackcatsystems.com/software/multimode.html) *Multimode* is effectively the only choice - but what a choice!

The program, at around one megabyte in size, decodes/transmits the following modes: CW \*, RTTY \*, SSTV \*, FAX SITOR-A / SITOR-B / NAVTEX, ACARS, Packet \*, PSK31 \*, ALE DTMF \*, EIA \*, CCIR \*, ICAO SELCAL \*, CTCSS \*, LORAN-C, FFT/Spectrum, Hellschreiber \* and Globe Wireless Channel Marker Packets

**Note:** Those with an asterisk (\*) next to them support transmitting.

There's a previous version of *Multimode* available for a (fastish) G3/G4 Macintosh, running under *OS9*, as well as a *Multimode Lite* that has only three modes available. So, who needs more software for datamodes on a recent Macintosh?

## FINDING INFORMATION

The Internet is wonderful for finding software and information. But just to give you a small taste of how difficult it can be to find just the right software, or information about hardware for any one subject. I did a 'Google' search ([www.google.com](http://www.google.com)) just using the 'SSTV' term and I got almost 100 000 'hits', meanings pages, with that combination of letters. Although admittedly there will probably be quite a few that will be on the same page. To narrow the search a little I used 'sstv hardware' and only 6000 hits came back. A further refinement to 'sstv hardware & software' gave only 5200 hits.

## NARROW-BAND TV

As well as information about SSTV, in my preparations for this article I came across the Narrow-Band TV group. Now this is 'real' TV as **John Logie Baird** would have recognised it, using low resolution, monochrome images with a frame rate of only a few frames per second. But moving pictures nonetheless. I'll go a little deeper into this topic in a future article. But if you'd like a 'sneak preview' then have a look at [www.nbtv.org](http://www.nbtv.org) where you will see a page like the screenshot of Fig. 8.

I'm sure that you've noted that I use the Google search 'engine' for almost all of my web searches, and I suppose you may wonder how the engine manages to make so many returns in such a short time. So, to answer that, I'll leave you (my tongue firmly in my cheek) with the explanation to be found at:

[www.google.com/technology/pigeonrank.html](http://www.google.com/technology/pigeonrank.html) I'm indebted to **Kevin Nice G7TZC**, the editor of *Short Wave Magazine* for that link.

73 Tex G1TEX

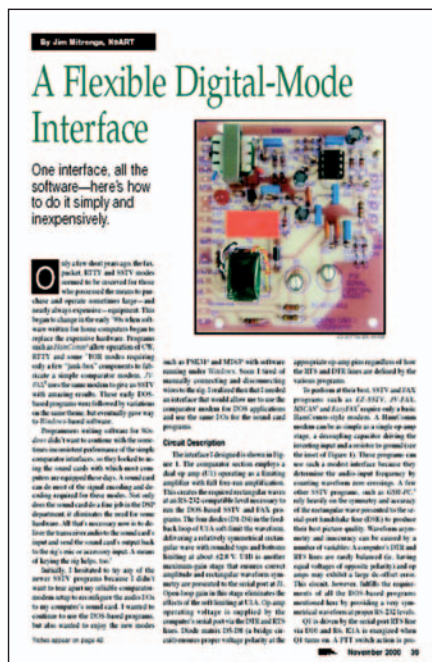


Fig. 2: The front-page of a published data-mode interface. See Fig. 3.

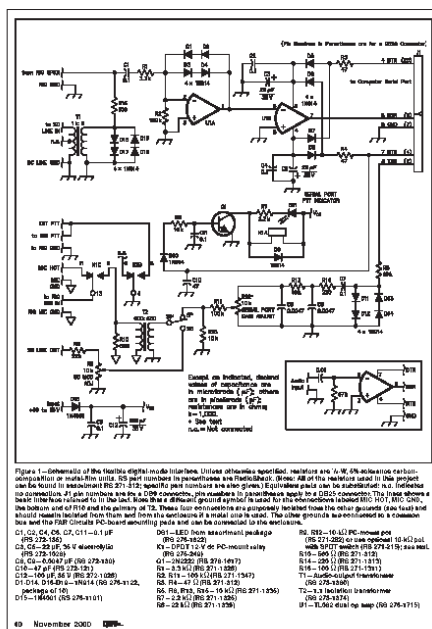


Fig. 3: the comprehensive circuit of the data-mode interface. There's a simpler circuit shown too, if this seems to be too daunting.



Fig. 4: One gateway on the Internet, for information and software to run SSTV.

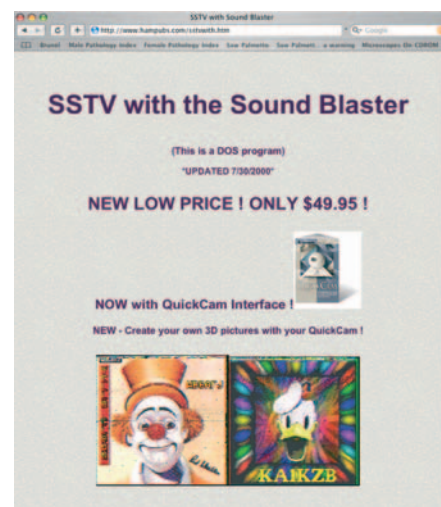


Fig. 5: You may have to convince the author to sell this program to you!



Fig. 6: Start from here compile your own SSTV program to run under the Linux operating system.

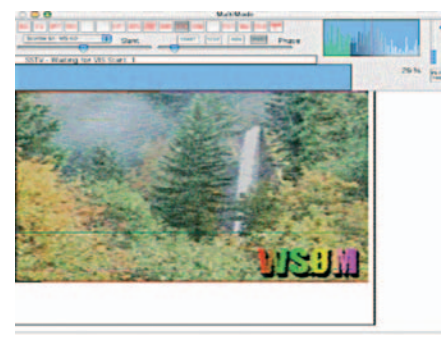


Fig. 7: The Comprehensive Multimode from Chris Smolinski, decodes most modes and runs under OS X on the Macintosh.



Fig. 8: This is the home page for the Narrow-Band TV group - real TV as Logie Baird would have recognised it.



# IN VISION

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**A**t an exceptionally lively General Meeting of the British Amateur Television Club (BATC) held, maybe for the last time, at Shuttleworth College, Bedfordshire in May, it was agreed to introduce 'cyber' membership, initially only to overseas members who may wish to receive their *CQ-TV* magazines as (big!) E-mail attachments at a reduced annual subscription, avoiding postal delays and reducing the print run.

Ian Waters highlighted some 'peculiarities' of receiving digital TV - the picture stays on screen after the transmitter has been turned off, and there is no 'weak signal' image - a picture is there at P5 or not at all. Noel Matthews highlighted the different digital encoding parameters employed by the three delivery systems - satellite, cable and terrestrial and the need for a 'standard' to be adopted and agreed for Amateur digital. A likely set of characteristics was put forward, but any final recommendation or bandplan

you of this remarkable fact. Broadcast colour cameras optically split the scene into R, G and B images focussed onto 'tubes' to produce the three electrical signals required. The three (or sometimes four, but let's not get complicated here) tubes, of course, gave way to three Charge Coupled Devices (CCD), solid state sensors to convert the scene. These were expensive - no problem for the broadcaster but when the domestic camcorder appeared, just a single CCD was employed with an internal 'grid' system to produce R, G and B components. Not ideal, but this produced acceptable pictures for the home market. 'Domestic' 3 CCD camcorders were available but only at the higher ends of the price and specification ranges.

Now, a three CCD camcorder at under £700 has been announced. Even with single CCD analogue camcorders producing very acceptable pictures, an affordable digital camera with three CCDs should have obvious appeal and not just to the technophile purist.

Government ministers continue to suggest 2005 to 2010 as the preferred timescale for switching off the analogue television services.

So, wake up viewers, you could lose some channels as early as next year!

There are currently three 'platforms' for delivery of digital TV, these are: satellite, cable and terrestrial - each has advantages and shortcomings compared with the other two. Here at my QTH in Birmingham I've enjoyed digital TV for a few years; there is no perceptible 'better picture' compared to the analogue signal, but

the majority of the Midlands does enjoy a strong transmission from Sutton Coldfield.

For me, the principal benefit of digital is that most programmes are available in widescreen! This is rarely mentioned within digital publicity, which concentrates on extra channels, but the overwhelming majority of programmes from BBC1, 2 and ITV1 are widescreen and all of the exclusively digital channels - BBC3, 4, ITV2 and many more.

So, come on, move to digital, get as large a widescreen set as your budget and viewing room will allow and enjoy the panoramic vista that digital delivers!

*Graham G8EMX*

## GRAHAM G8EMX REPORTS ON THE BATC AND ENCOURAGES YOU TO GO DIGITAL!

The incumbent officers were re-elected and two new faces joined the committee, these were **Giles Read G1MFG** and **Tony Ashby**. Paul Marshall, continuing as General Secretary, accepted the new Grant Dixon Award - an engraved glass trophy - on behalf of *CQ-TV* magazine editor **Ian Pawson** for services to the club.

There followed much comment and discussion from the floor regarding the future of the BATC and ways of gaining more members. Making entry to on-air ATV simpler and 'reaching out' to those who were not Radio Amateurs were the two principal suggestions. Although the core members of the BATC were Radio Amateurs who transmitted television pictures over the Amateur bands, club membership is and always has been open to anyone with an interest in television as a technical hobby, a science, an art form, a production challenge. And today, that could include every owner of a camcorder?

So, if you use your camera for anything from the short family footage to something more ambitious, consider joining the BATC to find out much more about this fascinating medium. Just point your web browser at <http://www.batc.org.uk> and subscribe on-line.

### DEVELOPMENT OF DIGITAL ATV

The main feature of BATC conventions is always the lecture stream and this year included the development of Digital ATV, presented by **Noel Matthews** and **Ian Waters**. The club has purchased some German DATV board pairs - a digital encoder module and a digital modulator, which Ian had assembled into a casing with power unit and amplifier. These fed a home-brew 2.4GHz dipole, sending a digital link across the lecture room to a readily obtainable digital receiver.

has still to be decided at the time of writing.

What does seem clear is that, using the now familiar multi-pin processor chips and sub-miniature components there is very little scope for digital ATV (DATV) circuit construction at component level. Some experimentation with very linear power amplifiers for digital signals is likely, but judging from the demonstration at Shuttleworth, DATV seems to be very much 'buy, plug and play'. There is nothing wrong with 'plug and play' - indeed it is welcome in domestic entertainment and computing. But will it remove much of the base purpose - self training and experimentation - of Amateur Radio?

There was strong feeling that future BATC meetings would have to move away from Shuttleworth. The college has never been an easy place to find and, with the present size of the club, it may be that combining the event with one of the larger Amateur Radio rallies would bring more visitors and provide attractions for families. **The Kent Television Group**, which was one of the few repeater groups to be at Shuttleworth, has already offered a venue, but it is very 'early days' at the moment.

### RED, GREEN & BLUE

Colour pictures consists of just the red, green and blue (RGB) primary colours and some sets carried an 'RGB' logo on their front to remind



● The single Charged Coupled Device image sensor, about 100mm square, is just visible in the centre when the lens holder of this camcorder is removed.

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Meters,  
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Learn Morse code anywhere, anytime with this MFJ Pocket Morse Code / CW Tutor! Take it everywhere! enjoy code at home, going to work, on vacation, on a plane or in a hotel. A large LCD display reads out letters, numbers and punctuation in plain English.

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W-25SM 25A Supply	£79.95
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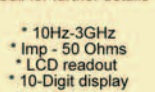
**Diamond Supplies****GZV4000**5-15 VDC  
40A Peak**£154.95**

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CT12DX DX Paddle	£111.95
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**Watson Antennas****Watson W2000**Bands 6m/2m/70cm  
Gain 2.15/6.2/8.4dB  
Power 200W (50W 6m)  
Type 1/2, 2x5/8, 4x5/8  
Length 2.5m**£69.95**

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W-300 2/70	£64.95
W-2000 6/2/70	£69.95
WBV-70 4m 1/2 Wave	£39.95

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

Butternut HF-2V 40/80	£229.95
Butternut HF-6V 80-10	£299.95
Butternut HF-9V 80-6	£349.95
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A-17-12 17&12 ad for HF6V	£49.95
A-6 6m ad for HF6V-X	£14.95
TBR-160S 160m HF2/6/9V	£114.95

**Hustler Antennas****Hustler 5-BTV**5 Bands - 80-10m  
Height 7.64m - Weight 7.7kg  
SWR 1.15:1 - Power 1KW**£209.95**

Hustler 4-BTV 4 Band Vert	£169.95
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23cms (1296 MHz) 55  
element 21.5 dbi gain "N"  
4.64m long

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## LDG Electronics

### AT-1000



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

**£499.95**

### LDG Z-100



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

**£129.95** Best Value!

### LDG AT-11MP



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

**£199.95**

### LDG RT-11



100w Waterproof Auto ATU - 1.8-54MHz  
1-5 seconds Tune

**£179.95**

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



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

**£29.95**

### LDG AT-897

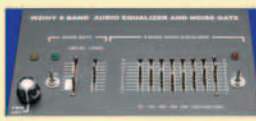


100w Auto ATU for FT-897 - 1.8-54MHz

**£199.95**

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

## W2IHY Technologies



W2IHY  
8 Band  
Audio EQ  
NoiseGate

**£229.95**

Finally, professional audio processing technology is applied to the unique requirements of amateur radio operators! The W2IHY 8 Band Audio Equalizer and Noise Gate is an easy-to-use, sophisticated unit loaded with high-performance features. This thoughtfully-designed, quality-constructed station accessory performs three important functions, all in one good looking, low-profile package. Don't forget you can use your existing desk mike/pro mike etc. For arm chair or DX audio tailored to your own specifications.



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

## W4RT Electronics

### One-Plug-Power

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



OPP-817  
**£54.95**

NEW! 1800 mAh  
Large Capacity  
FT-817 Internal  
Battery Solution  
Still use Internal 817  
Charger

OPP-897  
**£99.95**

One-Plug Power for the  
FT-897  
4500 mAh, Fully  
Compatible with the  
FT-897 and  
Yaesu Charger.



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

### One-Big Punch

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



OBP  
**£49.95**

Speech Compressor  
for the Yaesu MH-31  
mic and FT-817  
FT-857, FT-897,  
Improve the TALK  
POWER.



Hand Mike  
**£57.95**

W4RT Electronics  
Microphone  
with One BIG Punch  
Speech Compressor  
included.

The One BIG Punch is an AF-based speech compressor specifically configured to provide remarkable increase in talk power while maintaining good audio quality. The OBP is NOT a clipper, but a compressor providing great voice compression, high-level limiting, and noise gating. The unit can be mounted inside the MH-31, requires no additional electrical power, and can be turned on or off by using the MH-31's TONE switch.

### One-Board-Filter

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

OBF  
**£229.95**

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



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

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



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

### One-Touch-Tune

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

OTT-817  
**£54.95**

It requires no external  
power and works with  
both manual and  
automatic tuners.



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

### W4RT FT-817 Stand £19.95

Simply snaps into position. Adjust for desired  
height. Complete with non slip feet and allen  
wrench.



Professional-Grade  
FT-817 Stand

## ATX Walkabout



ATX  
Walk-  
about  
PL-259

**£47.95**

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

ATX Walkabout BNC ..... £47.95  
ATX Walkabout PL259 ..... £47.95  
ATX Walkabout Universal ..... £54.95

## The Miracle Whip



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

Power Limits 25W PEP  
10W Cont.

**£127.95**

In Stock!

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

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

## Portable Masts

Telescopic Masts Inc  
Guy Rings



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

## Mobile Mounts



Solarcon MAGZ-17  
TRI-MAG

**£39.95**

An extremely strong magnet base which actually consists of 3 x 5" chrome magnets that are interconnected with metal strips to form one very large mount. Suitable for very large mobile antennae such as 1/4 wave tank whips.

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

## Tokyo Amplifiers



Tokyo HL-50B  
HF / 50MHz  
Power Amplifier  
**£269.95**

Frequency: 3.5 - 28MHz + 50MHz  
Mode: SSB/CW, FM/AM  
RF Drive: 5W (FT817)  
RF Output: 50W PEP (25W AM)  
Power: 13.8V 10A max

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**Challenger MkII 2x3CX800**

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Explorer 1200 HF	£1595.95
Hunter 1000 HF	£1195.95
Ranger 811A HF	£895.95
Discovery 2m 1KW	£1395.95
Discovery 6m 800w	£1395.95
Hunter 6m 800w	£895.95

### SGC. Smartuners



**SGC-230 200Watts (1.6-30 MHz)**

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

The MAC-200 brings together a Smartuner™ and an Antenna Switch in a single compact unit.

### Rotators



**G-2800SDX Top of the Line**

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

### Feeders & Wire



**Military Spec High grade 50 Ohm coaxial Cable**

RG58U	£0.50 per Metre
RG8 Super	£0.70 per Metre
RG213	£0.90 per Metre
W103 Westflex	£1.20 per Metre

**SPECIAL OFFER!**  
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**Limited Stock! ICOM PS-85 20A PSU**

Suits most Icom Radios

**£169.95**

Input voltage: 220V-240VAC  
Output voltage: 13.8VDC ±5%  
Max. output current: 20A (full duty)  
Operating temp. range: -10°C to +60°C  
Dimensions: 111 x 94 x 287 mm  
Weight: only 2.5 kg



### SECOND HAND LIST.

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Adonis AM-805G Desk Microphone £70.00  
AEA Morse Machine Morse Sender £40.00  
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Alinco DR605 2m/70cms £175.00  
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Alinco DR-M10 10 Metre Transceiver £99.00  
Alinco DX-70 HF & 6m Transceiver £349.00  
Alinco DX-70TH HF & 6m Transceiver (100W Output) £475.00  
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AOR AR-3030 HF Receiver including PSU £350.00  
AOR AR5000+A AR5000+A £1,599.00  
AOR AR-7030 Top Receiver £550.00  
AOR AR-8600mkII Base Scanner / Receiver £499.00  
AOR SDU5000 Scope £299.00  
AOR SDU5500 Scope £450.00  
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Bearcat UBC-780XLT RX Trunktracker £220.00  
BNOS 20AMP PSU 20A PSU £89.00  
BNOS 432-25-100M 70cms 100W £199.00  
BNOS CLP430/25/100 70cms 100w Amp £199.00  
BNOS LP50-3-50 6M Amp Solid State £89.00  
Bnos LPM44/10/100 2m 100w Amp £119.00  
Daiwa CN-103L 2/70cms Ground Needle Meter £40.00  
Daiwa CN-801H 1.8-200 MHz SWR+PWR Meter £80.00  
Daiwa PS120 10A PSU £40.00  
Daiwa PS-30 XM II 30A PSU £99.00  
Daiwa DK-10 Electronic Keyer £40.00  
Datong ASP Auto Speech proc £17 etc £70.00  
Datong FL2 Multimeter Filter £99.00  
Diamond SX-100 Meter - 1.6 - 60MHz £85.00  
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Icom IC-2710H Dual Band Mobile £225.00  
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Icom IC-718 HF Mobile/Base £389.00  
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Icom IC7400 HF/6/2 Band / All mode Transceiver £949.00  
Icom IC-746 HF / 6m / 2m Built In ATU £875.00  
Icom IC-821H 2/70cms Base £599.00  
Icom IC901 2m/70cms £175.00  
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Icom IC-R75 Receiver (With DSP Unit) £499.00  
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Icom RC-7000 Remote Control £40.00  
Icom SM-20 Desk Microphone £90.00  
Icom SM6 Icom microphone £75.00  
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JPS NIR10 DSP Filter £75.00  
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Kenwood AT120 ATU matches TS120 £89.00  
Kenwood AT250 Auto ATU £199.00  
Kenwood AT300 Tuner £275.00  
Kenwood DM-81 Dipmeter £70.00  
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Kenwood LP Filter LP Filter £30.00  
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Kenwood TL120 100W Amp £175.00  
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Kenwood TMV7E 2/70 Cool Blue £275.00  
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Kenwood TS850S HF Base £550.00  
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MFJ MFJ-949 ATU £99.00  
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TRADE ENQUIRIES WELCOME



# Trader's Table

The equipment for sale on this page is secondhand or ex-demonstration

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YAESU FT790R MK2 UHF TRANSCEIVER.....	£185
YAESU FT 847 HF/V-UHF TRANSCEIVER.....	£799
YAESU FT1000MP MK5 TRANSCEIVER.....	£1395
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KENWOOD TS140S HF TRANSCEIVER.....	£299
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YAESU FRG 7 HF RECEIVER.....	£99
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MFJ 9402X 7w SSB 2m Transceiver.....	£149
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Icom IC-3230H 2m/70cm FM Mobile 45W, 35W Full Duplex.....	£229
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Lowie HF-225 x2 30kHz-30MHz All Mode Receiver 12V.....	£249
Lowie HF-225 30kHz-30MHz Receiver 12V PC Compatible.....	£329
Realistic DX-394 150kHz-30MHz AM,CW,SSB 160ch. Mains/12V.....	£99
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Sony ICF-SW55 Portable Receiver with FM stereo and SSB.....	£179
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# Practical Wireless

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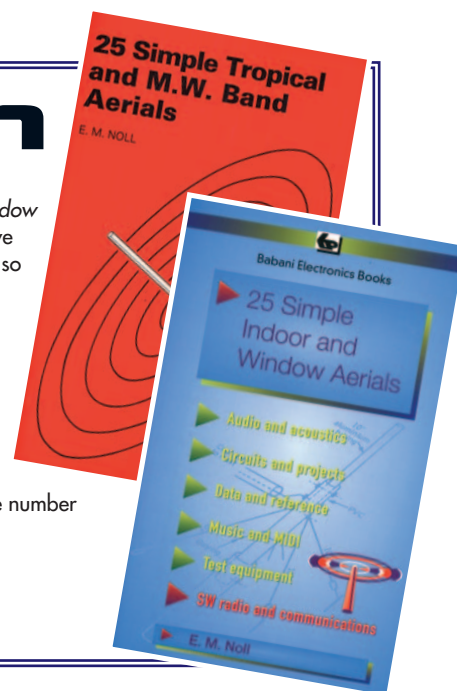
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