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MFJ Product Catalogue

TWO Reviews

Kenwood's TS-480SAT & TM-271E

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HUSTLER ZERO SPACE DX ANTENNAS

The answer to your HF Antenna Problem

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

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

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

5BTV
80-40-20-15-10m. 7.64m high. Full coverage* **£199.95 C**

6BTV
80-40-30-20-15-10m. 7.3m. Full band coverage* **£219.95 C**

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

YAESU FT-7800 BRAND NEW

Yaesu's Powerful low cost answer!

£239

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

ICOM IC-756 PRO II SPECIAL OFFER £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. **With *FREE* Watson HP-100 or HP-200 Headphones, state preference when ordering.**

3 Year Warranty
on orders before 11th Mar.

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.**

3 Year Warranty
on orders before 11th Mar.

ICOM IC-706 IIG DSP £789 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.

3 Year Warranty
on orders before 11th Mar.

ICOM IC-703 NEW £599 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)

3 Year Warranty
on orders before 11th Mar.

ICOM IC-718 £499 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.

3 Year Warranty
on orders before 11th Mar.

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

3 Year Warranty
on orders before 11th Mar.

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.

3 Year Warranty
on orders before 11th Mar.

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.

3 Year Warranty
on orders before 11th Mar.

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.

3 Year Warranty
on orders before 11th Mar.

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.

3 Year Warranty
on orders before 11th Mar.

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.

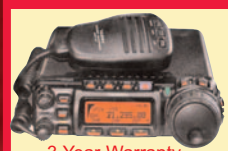
3 Year Warranty
on orders before 11th Mar.

YAESU FT-897 NEW £989 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.

3 Year Warranty
on orders before 11th Mar.

YAESU FT-857 NEW £799 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.

3 Year Warranty
on orders before 11th Mar.

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 seperate antenna sockets.

3 Year Warranty
on orders before 11th Mar.

YAESU FT-817 £539 C

bhi DSP Module now available!

160m - 70cms. Up to 5W output all modes. ***Ours includes*** **battery and charger.** **Add £110 for DSP ready fitted.**

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

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

LINEAR AMP UK RANGER 811H £895 C

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

AMERITRON AL-811 XCE £799 C

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

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

ICOM IC-2725E £269 C

NEW LOWER PRICE!

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

ICOM IC-2100H £229 C

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

YAESU FT-8800E NEW £269 C

NEW LOWER PRICE!

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

YAESU FT-8900R NEW £349 C

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

YAESU FT-2800M £159 C

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

YAESU FT-1500M £139 B

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

NEW LOWER PRICE!

KENWOOD TMD-700E £449 C

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

KENWOOD TM-V7E £359 C

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

KENWOOD TM-G707E £289 C

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

IC-E208 NEW NEW LOWER PRICE! £279 B

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

YAESU VX-7R £299 B

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

Available in Silver or Black

YAESU VX-2E NEW £169 B

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

YAESU VX-110 £109 B

Combining the ruggedness of the VX-150 with the simplicity of 8-Key operation, the VX-110 is a fully featured 2m handheld ideal for the most demanding of applications. It has a die-cast 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 £259 B

WITH EXTRA WIDE RX COVERAGE

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

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

KENWOOD TH-G71E £199 B

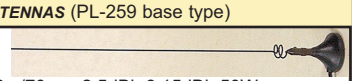
If you want an excellent 2m/70cm dual-bander then you can't go wrong with the TH-G71. Fully functional with three power levels, 200 memories, CTCSS tone encoder/decoder, illuminated keypad and backlit LED.

MOTOROLA T-5512 £69.99 B

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

MOBILE ANTENNAS

WATSON ANTENNAS (PL-259 base type)



Comes with coax & BNC

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

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

MOBILE BASES

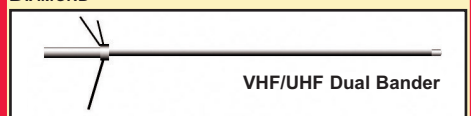
WATSON

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

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

BASE STATION ANTENNAS

DIAMOND

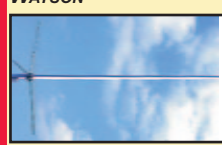


VHF/UHF Dual Bander

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

CHECK OUR WEBSITE FOR FULL DIAMOND RANGE

WATSON



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

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

WATSON W-25SM PSU £79.95 B

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

WATSON W-25AM PSU £89.95 C

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

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

WATERS & STANTON

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PRICE MATCH

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**

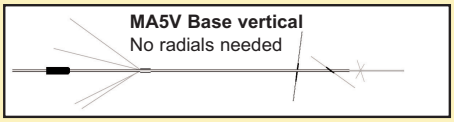
Resonator

Base section → MO-3 or MO-4

CUSHCRAFT BASE ANTENNAS

MA6V *NEW*	20-17-15-12-10-6m 250W PEP	**£269.95**	C
MA5V	20-17-14-12-10m 250W PEP	**£239.95**	C

MA5V Base vertical
No radials needed



R8	40-30-20-17-15-12-10-6m 1.5kW	**£469.95**	C
R6000	20-17-15-12-10-6m 1.5kW PEP	**£329.95**	C

BUTTERNUT BASE ANTENNAS

HF9V-X	80-6m 7.9m 1kW PEP	**£349.00**	C
HF6V-X	80-40-30-20-15-10m 7.9m 2kW	**£299.00**	C
HF2V	80-40m 9.75m (160m opt) 1kW	**£230.00**	C

HY-GAIN BASE ANTENNAS

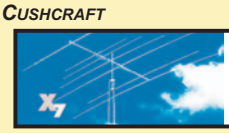
AV-640	40-6m 1.5kW, 300W 6m (PEP)	**£369.95**	C
AV-620	20-6m 1.5kW, 500W 6m (PEP)	**£279.95**	C
AV-14AVQ	40-20-15-10m 1.5kW PEP	**£169.95**	C
AV-12AVQ	20-15-10m 1.5kW PEP	**£139.95**	C
DX-88	80-10m 1.5kW, 250W 30m	**£365.95**	C

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.

X-7	20/15/10m 7 el. Yagi 2kW	**£669.95**	D

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

MA-5B	10-12-15-17-20m 4 el. Yagi 2kW	**£339.95**	C
A4-S	10-15 & 20m 4 el. Yagi 2kW	**£569.95**	D
A3-WS	12 & 17m 3 el. Yagi 2kW	**£379.95**	D
D-3	10-15-20m dipole element 2kW	**£249.95**	C

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

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

RADIO WORKS

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

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

SG-2020 QRP Transceiver £499.95 C

The SG-2020ADSP is also available. Both versions of the SG-2020 have adjustable transmit power from 0 to 20W. The SG-2020 instead of ADSP has a true RF speech processor and VOGAD baseband processing. Built-in iambic 'B' mode keyer is fitted in both models.

SG-2020ADSP : £589.95

bhi NES10-2 & NES-5 DSP Speakers

NES10-2
£99.95 B

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

NES-5
£79.95 B

bhi NEIM1031 £129.95 B

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

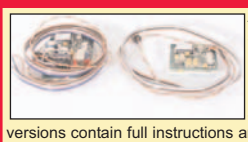
bhi 1042 SWITCH BOX £29.95 B

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

SGC ADSP² SPEAKER NEW £99.95 B

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

SGC ADSP² MODULES NEW £89.95 B



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

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.

WEST MOUNTAIN RIGBLASTER

The Adventure Begins!

~~Was £139.95!~~
£119.95
Order RB/PL/CDC

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


HCL-5/4


GM-4/5


HST-817


PROSET +

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	**£119.95**	B

Headsets & Boom microphones

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

It's a Kenwood double this month as **Kevin Romang G4SKN** and **Richard Newton G0RSN** get the chance to 'play' radio with the latest transceivers to hit the market. As you'll see they both enjoyed the experience and we hope you'll enjoy reading about their findings too!
Design: Steve Hunt
Photograph: Tex Swann G1TEX/M3NGS

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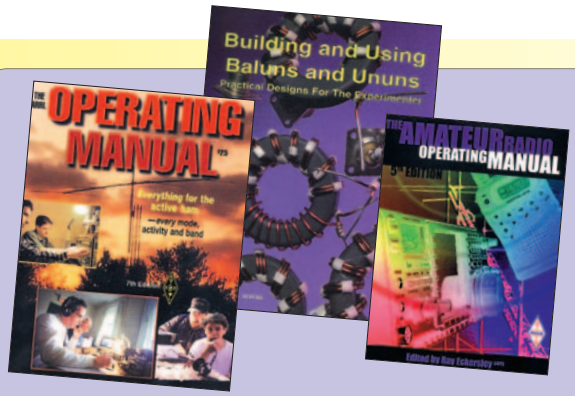

Page 70. The biggest and best selection of radio related books anywhere!

March regulars

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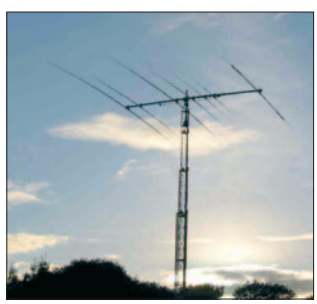

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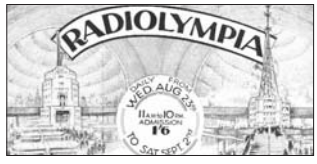

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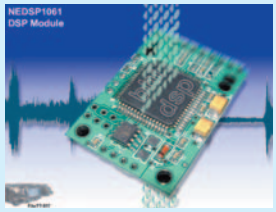

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ANOTHER PACKED ISSUE

rob mannion's keylines

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

Although this issue of *PW* is dated March 2004, I'm writing Keylines in early January 2004. It's the time of year when I'm finalising club visits and attendance at the various rallies, etc.

I also take this opportunity to contact the clubs who are on the waiting list (now around 14 months) for a *PW* club visit. No, I'm not in great demand, it's far less ego-inflating than that! Instead it's because I can only spare a maximum of one or two days out of the office each month. So, I'm already arranging visits for 2005 - and you can be sure that 2004 will fly by!

Being so far south means that most of my visits require at least a day's travelling, an overnight stay and then one day back. Hence the limit to the number of trips - there's just not enough time.

Over the years I've developed a squeeze-as-much-out-of-the-trip as possible strategy. This often means I can attend a club when I'm also due to visit a special rally or event. This is the case with the **Leicester ARS** on **Friday 19 March**, when I'm due to join them while on the way up to **South Normanton** (in north Derbyshire!) to visit the **Junction 28 QRP Rally** on **Saturday 20 March**. I look forward to meeting readers on both occasions.

The LARS visit was made possible because the club kindly agreed to meet on a Friday, rather than their usual day. Such co-operation is very much appreciated and I'm pleased to mention that the **Otley ARS** in Yorkshire have agreed to do the same, with the result being that their *PW* club visit will be on **Thursday 7 October** because I'm due to be in the area to attend the annual **Rochdale QRP Mini-Convention** on **Saturday 9 October**.

Incidentally, it's worth mentioning that the Rochdale trip is usually my last club trip of the year due to the busy November/December Christmas publishing schedules, the club visit 'season' only runs from January to October.

Other club visits are being arranged, and I'm hoping to re-arrange other schedules (not confirmed yet) to attend the **Yeovil QRP Convention** on **Sunday 18 April**. I'm also visiting the **Echelford ARS** on **Thursday 24 June** and another definite is the new **West of England** ('Longleat' replacement) rally at Frome in Somerset in June. Then there's the **Leicester Show** on **September 17/18th**. Let's hope we get the chance to chat!

Editor's Changing Role

Although popular for over 14 years, the club visit talk '*Practical Wireless* - Origins, Past, Present and Future' has been retired. Instead, as this job has changed so dramatically, I've introduced a new talk entitled 'The Changing Role of the *PW* Editor'. But I promise...the talk won't be as heavy as the title!

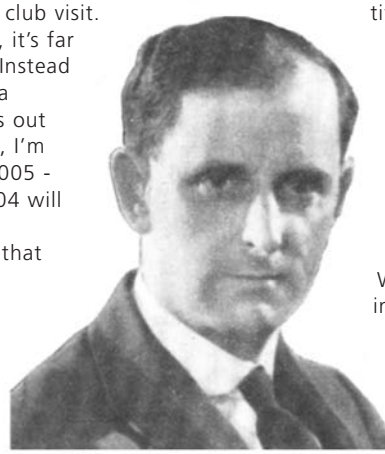

Fig. 1: Fred Camm - the founding Editor of *PW*.

I felt it was time to change, because the magazine of Fred Camm's time, he's pictured in **Fig. 1**, has also dramatically evolved. Incidentally, the photo comes from an extra editorial published in the Wednesday 26 August *PW* in 1939 (please see Topical Talk on page 77). In those days the magazine was weekly - and Fred Camm was promoting the last pre-War Radiolympia show.

The new talk came about because in the 72 years since *PW* as we know it was founded - the Editor has ceased being just a name on the contents page, or beneath an editorial. Instead - even in Fred Camm's time - it started to evolve into a job requiring face-to-face meetings with readers.

However, even though the illustration in Fig. 1 is part of an attempt to link readers to the Editor - I don't know if FJ himself did much 'meeting the readers'. Perhaps you, or someone you know, met him on these occasions. **If you did, we'd like to know!**

I'm already enjoying presenting the new club visit talk. In fact, it's already proving to me just how much the Editor's job has changed, and is still changing, by providing even more feedback.

Finally, along with being grateful to Fred Camm for founding *PW*, I'm also especially thankful this month because by re-using a photograph of him on this page...I've spared inflicting one of me on you again. Thanks Fred!

Calling GM4DHJ

Finally, I'd like to ask readers to help me contact **Jim GM4DHJ**. I don't have his surname, and he's 'Details Withheld' in the RSGB's *Yearbook*, and I need to contact him.

If you know GM4DHJ, or know how I can contact him, please let me know. Alternatively, if you're prepared to contact him on my behalf - please ask him to write to me at the *PW* offices, providing an address so I may reply.

Rob G3XFD

practical wireless services

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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. Back issues for *PW* are £3.35 each (inc. P&P) and photocopies are £3.00 per article. Binders are also available (each binder takes one volume) for £6.50 plus £1.50 P&P for one binder, £2.75 for two or more, UK or overseas. Prices include VAT where appropriate.
A complete review listing for *PW/SWM* is also available from the Editorial Offices for £2 inc. P&P.

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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.

amateur radio waves

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

Vectis Run Not the First!

Dear Sir

It's always a hostage to fortune to claim a 'first' in anything (*The Vectis Run*, January 2004). Can you really have forgotten the long-running series 'In your Workshop', which ran in the 1950s and 1960s in your one-time competitor *The Radio Constructor*?

The articles related, in highly entertaining style, the fictional activities of a young service assistant Dick and his long-suffering mentor Smithy, invariably leading to lucid explanations of some of the finer points of radio and television servicing. I have one in front of me as I write (April 1961) in which an initial April Fool prank by Dick leads entertainingly into an extremely thoughtful account by Smithy of the use of bottom-end coupling condensers (sic) in radio receivers of that era.

These excellent articles were never signed and I have often wondered who wrote them. Can anyone out there tell me? Kind regards to you all!

Roger Dowling G3NKH
Lymm
Cheshire

Editor's comment: Thanks for the letter Roger! How could anyone forget the unique, superbly written, narrative style technical series 'Smithy's Workshop'? We've tried to find out who wrote them - the only technique left now is for me to claim the author is dead...encouraging someone in the know to write in and correct me! *The Vectis Run* on the other hand, is a dramatic fictional serial with a technical bias and we hope readers - the feedback on the serial is encouraging - continue to enjoy the story.

The M3 Prohibited List

Dear Sir

I feel I must comment on **Mike Evan's** letter in the February *PW*. The suggestion of listing **all** the things an M3 cannot do is ridiculous, it would be a very long list but only a few lines longer than a list of things a Full Licence holder cannot do - frequency, power and mode restrictions, no broadcasting, no business use, no 'general' contacts with unlicensed stations, etc. My main concerns are the apparent lack of understanding that was contained in the letter and your lack* of clarification/correction.

***See editorial comment**.

The first point is about frequency allocations. The allocations for the Foundation Licence were the result of a hard fought round of negotiations between the RSGB and the Radiocommunications Agency (now Ofcom). Most Amateurs were amazed at the generosity of the allocations, especially when compared to the old Novice Licence (and the CB bands). The decision was made to make additional frequencies and power privileges of the higher licences - an incentive to progress.

The point about ATV is not well made. The Foundation Licence does not allow any fast scan TV, the 23/70cm issue is therefore irrelevant. Slow scan TV is permitted and is used to good effect by many M3 stations. For the record, there are also r.f. safety differences between operating on 70cm and frequencies approaching those of your microwave oven, which are covered in the Intermediate syllabus.

The next point is about not being able to get involved in organised events other than as a dog's body - not true. Any Licence holder can operate as part of a group contest station, or special event station, under the supervision of a Full Licence holder. The only restrictions are the absence of 'third part messages' from the lower Licences and on the supervision of others.

The supervision restriction is based on the simple fact that the lower Licence exams require less knowledge than the top level and the lack of RAYNET operation is based on the fact that few newcomers would have the necessary skills or confidence to take on the responsibility. I understand that RAYNET are considering their position on that point and may put a case forward for change.

The statement about operating ex-p.m.r. equipment is also untrue. If the p.m.r. rig was designed and type approved to operate in a band that includes an amateur allocation then it would be a perfectly acceptable 'commercial' rig. The restriction, as I understand it, only applies to converting p.m.r. gear from one band to another because the Foundation Licence does not include any demonstration of construction competence.

The final point about M3s not being able to operate in Eire is nothing to do with the RSGB or Ofcom, it is the Irish Licensing authorities that prohibit operation in their country. The UK Foundation and Intermediate Licences are not part of the CEPT agreement, the CB Licence is. At the moment only Gibraltar has an equivalent Licence, but I believe other countries are showing increased interest following the success of the UK system. Watch this space!

The bottom line is that the three-tier Licensing system has provided a basic entry level qualification to encourage newcomers into the hobby and two 'bite-sized' steps to allow individuals to progress at their own pace, gaining additional privileges along the way.

Rather than bemoaning the restrictions, enjoy the privileges, get stuck into the next steps and enjoy that experience too!

Steve Hartley G0FUW
Bath
Avon

Editor's comment: Thanks for your comments Steve. No doubt the debate will continue. However, your point (where I have placed the reference asterisk) - if it is directed at *PW* - highlights a problem which I have when preparing letters for publication. We do our level best to minimise editing/re-writing reader's letters. When we do so - it's for clarity, length and sometimes to assist the author in presenting their point in the best way possible. For example - I would never allow (consciously!) a badly spelt letter to appear, as our aim is not to humiliate anyone - just to assist them to express their views. Even though I read and sub-edited the letter in question - I obviously either thought the point made was clear - or that altering it could have changed the context too much. In other words we have to tread very carefully. Usually in these cases I contact the author - but I've no record in this case that I did this and times passes by very quickly in publishing! So, to help us prepare the *PW* ' speaker's platform' for your use I strongly recommended to individual readers that when you've written a letter for possible publication - that it's put to one side for several days. Then read it again - you have that luxury whereas we don't! A fresh pair of eyes can often spot ambiguities in a letter. It will also help if readers provide a daytime contact telephone number or E-mail address so that we can discuss any perceived problems. Whatever happens - we'll do our best to help you get your point over!

Building The Sidcot

● **Dear Sir**
I'm writing to you, having just built the *PW* Sidcot project. As I had already built a few simple radio kits and keyers, etc., I always intended to build a rig that would really work and be of some practical use. So, after reading the article on the Sidcot I decided to have a go. Following the placing of the order the kit of parts came within a couple of days and within a week this novice constructor had managed it, toroids and all!

The rig is very stable and is a delight to use, it sits side-by-side with my FT-817 and would appear to be its equal on 3.5MHz. c.w. The annotated photographs showing the major components and the placing on the p.c.b. was a very big help in the construction. My first contact was a RST579 Report from **OK1NR**. I would like to thank **Tim Walford G3PCJ** for a very worthwhile project.
Edward Emery GOWDT
Newcastle under Lyme
Staffordshire

Editor: Well done Edward. Take another bow Tim G3PCJ!

Dabbling On 70MHz

● **Dear Sir**
I'm writing in regard to the September 2003 *PW* and the 70MHz project. I hadn't dabbled with 70MHz since the band was first available and when I was in the **Echelford Club**. Bulk crystals were bought and many of us were on a.m. with a design cooked up by **Robin G3TDR**. Happy days!

So, I was immediately tempted by the Radio Basics Special with its 4m f.m. receiver using my style of building (photo enclosed as proof). A problem then surfaced. I hadn't solved it yet - who was there to send me a 70MHz f.m. signal?

I'm sure everything is working okay as I've a Pye Reporter on hand, but it would be nice to make final adjustments to my personal bird's nest. I did expect the next article to detail the dual conversion modifications. So, I'm waiting expectantly.

A couple of comments, the TBA120S has peculiar numbering enough to confuse the tyro and L1 scales up at 1/4in diameter to my 3/16in coil formers are on a square base (Neosid) - again quite confusing. However, I must congratulate you on the nice clear plan view photograph - very helpful.
Mike G3UNV
Skegness
Lincolnshire

Editor's comments: We're all pleased you enjoyed the projects Mike. More of the same soon and hopefully you'll enjoy the two older 70MHz projects we're presenting this month. Your comments have been passed to Phil G4JCP. Note: Very soon we'll also be publishing a new 70MHz down-converter project from Tony G4CFY. Watch this space!

Denco & JAB Components

● **Dear Sir**
In the February 2004 issue of *PW* you have a 'Classic Project' for a d.c. receiver, using Denco coils and also mention that Denco products aren't available. **Are you sure?** Denco resumed limited production a few years ago when the founder's son acquired the company name and manufacturing rights. I haven't seen any comment since then regarding a cessation. The cutting which I have from *SWM*, I think) gave the details as: Denco (Clacton) Ltd., 259/265 Old Road, Clacton on Sea, Essex CO15 3LM, Tel: (01255) 422213. All is not lost, however, see *SWM*, July 1990. This has an article 'Alternatives to Denco Coil' by R.A. Penfold.

One of your correspondents, **Graham Gabbatiss**, also says in his letter that JAB has ceased trading. I have just looked at JAB's website which looks pretty healthy to me! They give their scheduled delivery dates for January so your correspondent seems to be wrong and JAB might lose trade if his comment is believed.
Keith Seddon
Chapel en le Frith
Derbyshire

Editor's comments: Denco coils are certainly no longer manufactured Keith. However, I have apologised personally to JAB Components (their addresses and services are often quoted within articles in *PW,* although they don't advertise in the magazine) for the error. Unfortunately their name was quoted (in passing) within a reader's letter - I'm responsible and should have corrected the mistake.

Letters Received Via E-mail

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

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

amateur radio rallies

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

*February 15
Stevenage Communication & Electronics Show
Contact: RadioSport Ltd.
Tel: (01923) 893929
Website: www.radiosport.co.uk
To be held at the Stevenage Arts & Leisure Centre, Lytton Way, Stevenage, Hertfordshire. Doors open 1000 till 1600 and admission is £3.

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

February 22
Swansea Amateur Radio Society's Amateur Radio & Computer Show
Contact: Roger Williams GW4HSH
Tel: (01792) 404422
This show is to be held at the Afon Lido, Aberavon Seafront, Port Talbot, (one mile from M4, junction 41). **PLEASE NOTE that this is a new venue**, due to the closure of the Swansea Leisure Centre. Doors open at 1030 and admission is £1.50, children 50p. There will be trade stands, Bring & Buy, local radio interest and repeater groups, 2m talk-in and an operational h.f. station.

February 29
Cambridge & District Amateur Radio Club Rally
Contact: John G0GKP
Tel: (01954) 200072
Website: www.cdarc.org.uk
This rally is to be held at the Wood Green Animal Shelter, London Road, Godmanchester, four miles from Huntingdon, take the A1198 off the A14 (J24). The Wood Green Animal Shelter is well signposted and there will be wheelchair access along with free car parking. Bring & Buy, Talk-in on S22, bar and restaurant. Doors open 1000 and admission is £2 (£1.50 for OAP/disabled visitors), children free. There's also the opportunity to visit the animal shelter and 52 acre site including water garden and lake. A great day out for all the family.

March 14
Wythall Radio Club's 19th Annual Radio & Computer Rally
Contact: Martin G8VXX
Tel: 0121-474 2077
Website www.wrcrally.co.uk
Held at Woodrush Sports Centre, Shawhurst Lane, Hollywood, near Birmingham on the A435, just 3km form J3 of the M42. Doors open 1000 till 1600 and admission is just £1.50. There will be plenty of traders in two large halls and refreshment facilities are available on site. There will also be a Bring & Buy, easy comfortable parking on site. All are welcome. For Licensed Radio amateurs, a talk-in is available on S22.

March 14
The Bournemouth Radio Society's 16th Annual Sale
Contact: Olive & Frank G0GOX
Tel: (01202) 887721
This Annual Sale is to be held at Kinson Community Association Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth. Doors open from 1000 to 1600. Talk-in from G1BRS on 2m S22, Amateur Radio, computer traders, accessory traders, antenna suppliers, Bring & Buy, also specialist groups and clubs and home-made refreshments. Admission just £1.

*** PW Publishing Ltd. will be in attendance.**

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

amateur radio news

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

Send all your news and club info to... Donna Vincent G7TZB at the PW editorial offices or e-mail donna@pwpublishing.ltd.uk

Win A TS-480!

Kenwood Challenge

Kenwood UK, in conjunction with the UK's premier DX operating organisation the Chiltern DX Club (CDXC) announce the Kenwood Challenge.

Kenwood and Chiltern DX Club have joined forces in a bid to encourage operation on both the h.f. and 50MHz bands. As an incentive for you to take part Kenwood are donating a TS-480 transceiver for the operator who contacts the most DXCC entities between **1 February** and **31st December 2004.** The Challenge is open to all CDXC members operating from the UK, Isle of Man and the Channel Islands.

The winner will have the choice of either the 200W or 100W version with a.t.u. Kenwood TS-480. A full set of rules will be published in the *CDXC Digest* and on the Internet at **www.cdxc.org.uk** along with regular updates to scores. So, go on why not join in?

An Apology

JAB Components

The Editor, Rob Mannion G3XFD writes.....

Due to a brief - mistaken - reference, by a reader within a published letter in the February issue of *PW*, readers could get the false impression that JAB Components have ceased trading. I'm pleased to confirm - and apologise to JAB - that we know this is not the case, as although JAB do not advertise in *PW*, they are frequently recommended by our authors. Readers wishing to contact the company can do so by writing to them at:

JAB Electronic Components,
PO Box 5774,
Birmingham B44 8PJ
FAX: 0121-681 132
E-mail: Peter@JAB.demon.co.uk

Foundation Course

Sign up in Shefford

If you live in the Shefford area and have been thinking about attending a Foundation course, think no more - a course is now available.

The Shefford ARDS is sponsoring and running a new six week Foundation Licence study course at the Samuel Whitbread Community College, Clifton, Beds. The course, costing £15 starts on Wednesday 25 February 2004 at 1930 and runs until 2130 hours.

To sign-up contact **G3RXQ** via E-mail **baker@nildram.co.uk** or by calling the College on **(01462) 629906**.

Help out your fellow radio enthusiasts

Can You Help?

You may have just what another PW reader wants!

Wanted by **ZS2H**, a handbook or copy for an Eddystone 888 receiver, S/n FH 0084, Type S888. Please contact (his brother) **G. Jackson, 7 Scythe Way, Colchester, Essex CO3 4SJ. Tel: (01206) 543665**. Reimbursement of costs offered.

Special Event Station

Air Force on Windermere

Make a note in your diary to listen out for GB0RAF in August, a joint venture between the Royal Air Force and the Windermere Steamboat Museum.

The **Royal Air Force Amateur Radio Society (RAFARS)** are organising a radio orientated event over the weekend of 7 and 8th August, which will be hosted by the **Steamboat Museum**. The theme of the event is the use of Mobile Radio in the Lake District, by both Professionals and Amateurs.

The event is being well supported and it's hoped that Radio Cumbria will be taking part with the 'Cumbria Bus' (equipped with Internet facilities) and provide an outside broadcast on at least one of the days from the Museum site. The Police, Fire and Ambulance Services have also been invited to show off their vehicles and equipment, as well as the Mountain rescue teams and Army and Cadet forces from the area.

The RAFARS will be running an Amateur Radio Special Event Station throughout the weekend, using the facilities provided by the Museum. The callsign to listen out for will (hopefully) be the special RAFARS callsign **GB0RAF**.

As many Radio Amateurs as possible are being asked to join in by bringing their mobile and portable stations along for the weekend or by 'working' the Special event station. A keen ear will be kept out for low power stations operating from sites around the Lakes, under the Summits on the Air scheme.

For more details or to make enquiries please contact:
Roy Walker 2E1RAF
E-mail: 2e1raf@thersgb.net or
The Windermere Steamboat Museum,
Rayrigg Road,
Windermere,
Cumbria
Tel: (01539) 445565

Ambition Fulfilled

Foundation Success for Auttaviaus Omega

The spirit of our hobby shines through once again proving that Amateur Radio really is accessible to all.

Radio enthusiast, **Auttaviaus Omega** from Poole, Dorset sought a local club to fulfil his ambition to become a licensed Radio Amateur. He eventually made contact with **John Goodall G0SKR**, Lead Instructor for **Christchurch Amateur Radio Society (CARS)** and following them chatting it was decided that as Auttaviaus was confined to a wheelchair, he wouldn't be able to attend CARS, even though they have wheelchair access.

John then agreed to conduct a Foundation Course at Auttaviaus' home and on the 14 October 2004 the course began. To help him get on the air John parked his vehicle, fully equipped for h.f., v.h.f. and u.h.f., in the driveway so Auttaviaus could take his wheelchair alongside John's car and operate via the open front passenger door.

The Foundation Examination was booked and due to be held at Auttaviaus' home on 29 November 2003. Unfortunately, as the date loomed Auttaviaus was admitted to Poole Hospital for the foreseeable future.

John set about making enquiries as to whether the exam could be held at the Hospital, which in due course was confirmed it could. The Radiocommunications Agency (Ofcom) and the Radio Society of Great Britain were then contacted and before long all was in place for the exam to go ahead.

At 1600 on Saturday 29 November 2003, **Rob Burrows G6DUN**, First Named Invigilator and **Martin G6GDT** as second Invigilator, attended Poole Hospital where Auttaviaus duly took the Foundation Examination. The result speaks for itself, he passed, narrowly missing out on 100% by just one question!

Special thanks go to Poole Hospital, the RA and the RSGB for permitting Auttaviaus to take his Foundation Course in the way he did. The photograph shows Auttaviaus **M3FIG** on the left, Rob G6DUN in the centre and John GØSKR on the right.

Back-To-Basics

Yaesu FT-7800E

Looking for a one-touch, back-to-basics mobile? Take a look at the latest offering from Yaesu - the FT-7800E.

The FT-7800E is a dual-band f.m. mobile radio, which although 'billed' as a back-to-basics has a range of comprehensive features and even offers WIRES™ Internet Linking compatibility, as well as wide receive coverage from 108-520MHz and 700-999.99MHz. Other features include:

- High power output - 50W on 144MHz/40W on 430MHz
- Large, easy-to-read l.c.d
- 1000 Memory channels
- One touch Hyper Memories
- Direct Keypad frequency entry
- Programmable microphone keys

With a recommended price tag of £239 this feature packed rig is sure to be worth a second look! Don't miss next month's *PW* for a review of the FT-7800E and news of how you could win one.

Yaesu UK Ltd.,
Unit 12 Sun Valley Business Park
Winall Close
Winchester
Hants
SO23 0LB
E-mail: sales@yaesu.co.uk
Website: www.yaesu.co.uk

Mills and Radio

Open Weekend

The Denby Dale and District Amateur Radio Society are once again co-ordinating the Amateur Radio side of the National Mills' Weekend, which is taking place over the weekend of 9 & 10th May.

It's hoped that over 400 wind and watermills will be open to the public over the Mills Weekend, as this is a great opportunity to tell people where these mills are and what they are doing by putting on a special event station from mills around the country.

The **Denby Dale and District ARS** will be active at Thwaite Mills near Leeds. This huge water powered mill sits on an island between the River Aire, which drives the wheels and the Aire and Calder Navigation. Much of the mill machinery is still in working order and visitors can still see that the 'Two great swishing wheels continually drive a mass of cogs and grinding wheels which crushed stone for putty and paint in the nineteenth century'.

In addition to the hundreds of Mills being on air over the weekend anyone 'working' the special event stations will be eligible to apply for The Mills' Award. All you have to do is work or hear 10 mill stations and send a copy of your log and a donation of £3 payable to Denby Dale ARS, to Brian G0BFJ. Brian can be contacted via E-mail at **g0bfj@ntlworld.com**

More details of Radio Clubs and Mills taking part will be published here as soon as the Newsdesk has them.

News from the Midlands

Charlie Delta ARC

Looking for a radio club to join in the Midlands? Then the Charlie Delta ARC is ready to welcome you!

The Charlie Delta ARC is a new club for radio enthusiasts in the Midlands and is based at The Woodcross Club, Woodcross Lane, Bilston, West Midlands WV14 9BW. The Club meets every Monday from 2000hours and is well underway with its first Foundation Course, which is run by **Barry G0OJR** and are hoping to get an Intermediate Course underway very soon.

The Club's website address is **www.cqdx.co.uk** and further information on either the Foundation Course or general information on the club is invited to contact **Dave M0DCM** on **01902 635244** or via E-mail at **m0dcm@blueyonder.co.uk**

News From CARS

Annual Awards

Every year the Chelmsford Amateur Radio Society present two awards within the club for Amateur of the Year and Technical Excellence.

The Awards presented by the Chelmsford Amateur Radio Society (CARS) are decided by a ballot of club members every year. This year's deserved winners are **Trevor M5AKA** who was presented with the Amateur of the Year Award by CARS President **Harry G5HFA** (pictured here) and **Anthony M1FDE**, a keen constructor and Foundation and Intermediate tutor, was presented with the Roy Martyr G3PMX Shield for Technical Excellence by **Ela Martyr G6HKM**.

The Chelmsford Amateur Radio Society meet on the 1st Tuesday of the month in the Marconi Social Club, Beehive Lane, Great Baddow. The doors open at 1915hours and visitors are most welcome. They are a very active club offering courses and activities and will be running an Advanced course for those wanting the Full Amateur Licence starting on 2 September. Places are limited though so if you are interested you need to book **now**.

During the Spring months the Chelmsford club will also be running both Foundation and Intermediate courses. To book a place for any of the courses contact the training officer **Clive Ward M0SIX** on **(01245) 224577** or via E-mail at: **training@g0mwt.org.uk**
Chelmsford Amateur Radio Society
George G3UTC Secretary
Tel: (01277) 622707
E-mail: info@g0mwt.org.uk
Website: www.g0mwt.org.uk

In Memory

Tom Walters - A Tribute

Tom Walters, the Practical Wireless h.f. broadcast bands, Tune In, columnist died in early December. The Editor invited his widow to provide the background on a columnist who was passionate on his subject, kept his readers thoroughly informed and entertained, while not mincing his words!


Tom Walters
1936 - 2003.

Everyone in the *PW* office was extremely saddened to hear of the sudden death of Tom Walters. We knew Tom was ill and was struggling to keep to his deadlines, even writing from his bed - but nobody here realised just how ill he was. It was a feature of his approach that at times Tom could be late with his copy, but the wait was always worth it! His copy was always alive, sparkling with enthusiasm and often flavoured with the taste of mild, well-considered controversy because of his passionately held opinions.

Tom wasn't afraid to let his strongly held support for international broadcasting - particularly on the h.f. 'short wave' broadcasting bands - be known. If a broadcasting organisation did something, or announced some initiative that Tom considered to be a stupid decision - he'd say so. All around the world his name was known and I was always delighted when his column was mentioned by the various broadcasters.

The finest accolade as far as I was concerned was when, several h.f. broadcasters mentioned Tom's comments on their reductions in broadcasting hours. The programme staff involved made sure that Tom's comments were aired - ensuring also that their own financial 'Bean Counters' knew how strongly they felt at the loss of another broadcasting 'voice'!

However, no words of mine can pay sufficient tribute to Tom Walters. With this in mind, I contacted his wife Liz and she quickly replied with the following memories and appreciation of her husband.

Liz Walters writes: "Tom was born in Ringwood, Hampshire in 1936. As only child, and due to the fact his father was in the Army, he went to Hurstpierpoint College as a boarder. After taking his A levels, etc., he left to get a 'Steady job' - as recommended by his father - in the Sun Life Assurance Company which, incidentally, he loathed!

Tom then quickly decided on a change and joined the BBC as an Engineer. He spent all his working life with the broadcaster and took early retirement 10 years ago. By then he was a Senior Producer for the World Service, but continued to work for BBC on a freelance basis reading the news/continuity until 2001.

Eight years ago Tom was one of the founder members of the Association for International Broadcasting, the aim of which is to 'bring together the international broadcasting industry, supplying market intelligence, networking, representation, board-level contacts and a range of other services to members'. He continued as a Director until August 2003.

On the personal and family side of things Tom loved sailing and we've always had a boat of some size around, here in Walton on the Naze in Essex. He also loved singing and belonged to a choral society. Tom was the organist and choir master in our local church, where he's been buried.

Tom was also a keen member of the 'Save the Naze' campaign. Our home is only about 20 yards from the sea and the cliffs, as in many coastal areas, are eroding and disappearing faster than they can be saved - not that they are being saved, due to the lack of local Council money - hence the campaign. He also loved walking - especially in areas of archaeological importance and was a keen reader of travel/sailing books. The photograph which I've provided shows Tom on one of his favourite walks along our local beach. It's one of my favourite photographs.

My late husband was one of the "Good guys", quiet, kind, respected by all who knew him and very funny! He was so positive when ill and just kept going. In fact he was an inspiration.

Tom leaves children Lizzie and Mike from his first marriage, his stepson Mike from my first marriage, and our own son Nick. As I am another Liz, this causes confusion at times! We were a very tight family and at the moment, we're trying to get our combined heads around being 'rudderless".

Thank you for the opportunity of sharing a little more of Tom. We all miss him". **Liz Walters**.

PW

Product News

Abracadabra Antenna!

British manufacturers of d.s.p. noise cancellation products bhi Ltd. have recently launched a British designed and manufactured portable QRP rig mounted Antenna known as the Wonder Wand.

The Wonder Wand is a portable antenna, which provides switchable coverage from 7-430MHz, is compact in design (folding down to approximately 14in) and can handle up to 25W and is suitable for use with most QRP transceivers. The Wonder Wand is priced at £99.95 and is available direct from bhi or from Waters and Stanton PLC.

In addition to the Wonder Wand bhi Ltd. are also now stocking a range of accessories for the the Yaesu FT-817 including the FT-STAND priced at £19.95 to go with their NEDSP1061DSP module. For more information contact them direct at:
bhi Ltd., Tel: 0870 240 7258
Website: www.bhi-ltd.co.uk

amateur radio clubs

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

COUNTY ANTRIM
Glengormley Electronics ARS
Contact: David MI1VOX
E-mail: mi1vox@ntlworld.com
Website: www.gn0xyz.com

Glengormley Electronics Amateur Radio Society was established in 1995. The group is interested in Amateur Radio and electronics and there is a great emphasis on sharing of information and working as a team to help broaden their knowledge and enthusiasm for radio and electronics.

The club callsign is **GN0XYZ** and is the Amateur Radio callsign allocated to the society and is used in special events and group radio broadcasts. Glengormley Electronics Amateur Radio Society is also twinned with the **South Dublin Radio club**, callsign **EI2SDR** and is affiliated to the **Radio Society of Great Britain** and the **Irish Radio Transmitters Society**.

Meetings are held every Monday at 2000hours in the Knockagh Lodge, 236 Upper Road, Greenisland, Co.Antrim BT38 8RP. For full details of the club activity program for 2004 take a look at the club website.

COUNTY DURHAM
Great Lumley AR & E Society
Contact: Nancy Bone, Secretary
By Post: 217 Bensham Road, Gateshead NE8 1US
Tel: 0191-477 0036 (Home)/(07990) 760920 (Mobile)
E-mail: nancybone2001@yahoo.co.uk
Website: www.glares.fsnet.co.uk

The Great Lumley Amateur Radio & Electronics Society meet in the Community Centre, Front Street, Great Lumley, Chester le Street, Co. Durham every Wednesday from 1930-2130hours. The 1st Wednesday of each month is a Net night, the 2nd is Natter Night, the 3rd is a Talk, the 4th is Committee night and the 5th Natter Night. Forthcoming talks include: **Feb 18:** 'The beginnings of television' by Brian Corker G8FBQ and **March 17:** 'Early recording or the dinosaurs of recording' by Brian Corker G8FBQ. Both talks start at 2015 hours.

ESSEX
Chelmsford Amateur Radio Society
Contact: George G3UTC
Tel: (01277) 622707
E-mail: info@g0mwt.org.uk
Website: www.g0mwt.org.uk

On Tuesday 2 March **Alan Boswell G3NOQ** Senior Engineer from the BAE Systems Advanced Technology Centre will be giving a talk on Antennas to the Chelmsford Amateur Radio Society. One of the designs he will be discussing is his h.f. Radar Antenna Array (pictured here). This is a phased array with electronic beam scanning operating on licensed channels in the HF band. The elements are tetrahedrals, a type of wide-band element invented by Alan (patented 1995).

The meeting will take place in the Marconi Social Club, Beehive Lane, Great Baddow. Doors open at 1915hours and visitors are most welcome. Car parking is free and a bar is available for refreshments.

Picture Courtesy of AMS

MID-GLAMORGAN
Mid-Glamorgan ARG
Contact: Tom Beedle GW0TOM
Tel: (01656) 736954.
E-mail: midglam@ntlworld.com
The Mid-Glamorgan Amateur Radio Group meet every Thursday at 1930 hours in the Aberkenfig Sports & Social Club, Aberkenfig. The club is registered for teaching and examination for all Classes of the Amateur Radio Licence and c.w. tuition. The club also has a very active radio station on club nights and at special events. Please note the club room is up stairs and unfortunately there is no lift to this room.

LOOKING AT...

The Capture Of A Radio Wave Part 2

Gordon King G4VFV carries on where he left off last time, as he presents the second part of his look at the capturing of radio waves.

One way of looking at an antenna is as if it's a small aperture in a large screen, which in receive mode is iradiated at right-angles by the incident field of a radio wave. For an isotropic antenna the area of the aperture is given by $\lambda^2/4pi$, where λ is the wavelength of the wave.

This means that the flow of power flux through the effective aperture of an isotropic antenna responding to a field of E V/m would be $(\lambda^2/4pi) \times (E^2/377)$ watts, which corresponds to the power absorbed or captured by the antenna. For practical antennas the effective area of the aperture, or the capture area, as it's called, becomes $(1.635G)\lambda^2/4pi$ which takes account of the factor 1.635 relating the power gain G of the antenna to a half-wave dipole, as explained in Part 1 in the January issue of *PW*.

Fig. 1: This TETRA antenna was recently erected about 1 kilometre from Gordon's home in Brixham. With an operating wavelength around 0.75 metre and a gain of 8.5dBd (about seven times arithmetic ratio) the capture area approximates to 0.5 square metre.

The capture area of a half-wave dipole works out to $0.13\lambda^2$. A beam array of, say, 10dBd gain would boast a capture area of $1.3\lambda^2$, while the TETRA antenna shown in **Fig. 1**, with a gain of 8.5dBd (seven times arithmetic ratio), would have a capture area around $0.9\lambda^2$, or 0.5 square metre at a wavelength of 0.75 metres (400MHz).

The power captured by an antenna from a radio wave, therefore, depends not only on the power gain of the antenna and hence its capture area, but also on the wavelength of the wave. This accounts for the fact what while a simple crystal receiver might be quite effective for long- and medium-wave reception, it becomes less effective with decreasing wavelength.

However, before you can discover the actual signal voltage arriving at your receiver from an intercepted radio wave, you must first explore some other related aspects, starting with antenna radiation resistance. Let's take a look.

Continued on page 18

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5ft POLES H/DUTY (SWAGED)

Heavy Duty Aluminium (1.2mm wall)
1¼" single 5' ali pole **£7.00**
1¼" set of four (20' total approx) **£24.95**
1½" single 5' ali pole **£10.00**
1½" set of four (20' total approx) **£34.95**
1¾" single 5' ali pole **£12.00**
1¾" 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)

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RG58 best quality standard per mt **35p**
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3-core rotator cable per mt **45p**
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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 & 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 scoket (Round) **£2.50**
N-Type Chassis scoket (Square) **£2.50**
SO239 Double female adapter **£1.00**
PL259 Double male adapter **£1.00**
N-Type Double female **£2.50**
SO239 to BNC adapter **£1.50**
SO239 to N-Type adapter **£3.00**
SO239 to PL259 adapter (Right angle) **£2.50**
SO239 T-Piece adapter (2xPL 1XSO) **£3.00**
N-Type to PL259 adapter (Female to male) **£2.50**
BNC to PL259 adapter (Female to male) **£2.00**
BNC to N-Type adapter (Female to male) **£2.50**
BNC to N-Type adapter (Male to female) **£2.50**
SMA to BNC adapter (Male to female) **£3.95**
SMA to SO239 adapter (Male to SO239) **£3.95**
SO239 to 3/8 adapter (For antennas) **£3.95**
3/8 Whip stud (For 2.5mm whips) **£2.95**
Please add just £2.00 P&P for connector only orders

10/11 METRE ANTENNAS

G.A.P.12 1/2 wave alumimum (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 & 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 but4-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 mts 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 sutiable for up to 1inch 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 4mts coax/PL259 3/8 or SO239 fitting **£12.95**

ANTENNA WIRE & 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 **£129.95**

MISCELLANEOUS ITEMS

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

TELESCOPIC MASTS (aluminium & fibreglass options)

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

HF YAGI

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

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

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

HF VERTICALS

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

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

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

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

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

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

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

TRAPPED WIRE DI-POLE ANTENNAS

(Hi Grade Heavy Duty Commercial Antennas)

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

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.

Radiation Resistance

Radiation resistance is **not resistance** in the physical sense, but is the equivalent of a resistance that if connected in place of an antenna would dissipate the same amount of power as the antenna would radiate. It's value at the feeder point is equal to the power W supplied to the antenna, divided by the square of the current I, or $R_a=W/I^2$.

As far as a resonant half-wave dipole is concerned, the voltage at the centre is minimum and the current maximum, which means that the antenna simulates a series-resonant circuit at its tuned frequency, with the inductive and capacitive reactances cancelling each other out. At the feeder point, therefore, the impedance comprises basic resistive losses (normally pretty small) and the radiation resistance, which for a resonant half-wave dipole is close to 73Ω, **Fig. 2(a)**.

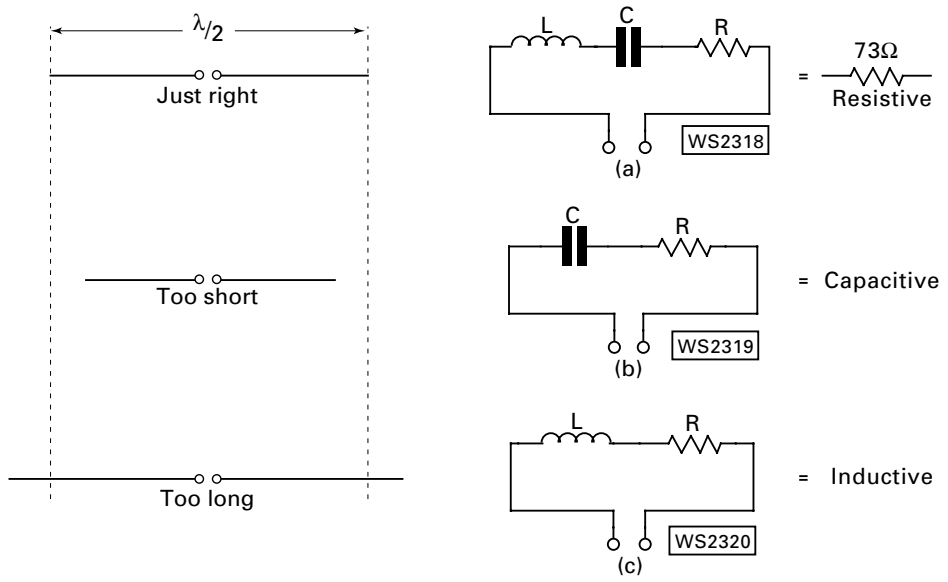

Fig. 2: A half-wave dipole has a terminal impedance close to 73Ω resistive when its length corresponds to the signal half wavelength (a), capacitive when too short (b) and inductive when too long (c). However, owing to the reduction in the velocity of a wave through an antenna, the optimum length will be slightly shorter than the signal half wavelength.

Antenna Matching Impedance

Now, if the length of the antenna is too short for the signal half wavelength, the feeder point will contain a capacitive component as shown in **Fig. 2(b)** or, conversely, an inductive component if too long, **Fig. 2(c)**. This is where antenna matching becomes important, because for maximum radiation and optimum transfer of the power carried by a radio wave to the receiver, the resistive parts of the antenna's impedance and the load should be equal, while the reactive parts should be equal in value but opposite in sign (the conjugate match condition), see **Fig. 3**.

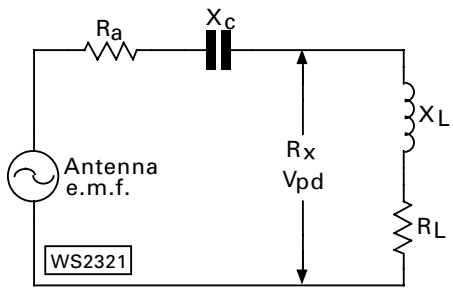

Fig. 3: Maximum signal voltage reaches the receiver when Ra is equal to RL and the reactive parts of the antenna and load are equal in value but opposite in sign.

We are now, at last in a position to calculate the signal voltage (potential difference or p.d.) developed by a practical antenna. When connected to the antenna input of a receiver from

$$V_{pd} = \sqrt{\left(\frac{R_a \cdot 1.635G}{120}\right)} \times \frac{\lambda}{\pi} \times E\left(\frac{Z_L}{Z_a+Z_L}\right)$$

where V_{pd} is the signal voltage across the load, R_a the antenna's radiation resistance, G the power gain of the antenna relative to a half-wave dipole, λ the signal wavelength, Z_L the receiver load impedance, Z_a the antenna impedance and E the field strength of the radio wave in V/m.

While this formula can be used to calculate the signal voltage arising from antenna of known parameters, the simplified version below is applicable for correctly matched antennas

$$V_{pd} = \frac{\lambda E\sqrt{G}}{6.3}$$

As an example, let's say that the power gain G is two times (3dBd) relative to a half-wave dipole (remembering that it's the arithmetic ratio, not the dB ratio, which must be used here), the wavelength λ is 2.06 metres and the field strength E at 250 μV/m. Substituting these values we get an answer approaching 116 μV_{pd}, but we mustn't forget that the signal has to be conveyed from the antenna to the receiver through a feeder. If this has a loss of, say, 2dB, then the signal voltage at the receiver will drop to around 92μV_{pd}.

Effective Height

The effective height (h) of an antenna is the ratio of the signal voltage to the field strength (V_{pd}/V/m), which in the above example works out to 0.46 metres. It has nothing to do with the physical height of the antenna above ground, but is a bit of a 'left-over' from radio past when wavelengths were significantly greater than antenna heights! Anyway, the greater the power gain of the antenna and the wavelength, the greater the effective height. The value for a half-wave dipole works out to λ/2pi, so at a wavelength of 2.06 metres h becomes 0.327 metres.

Magnetic Loops + Ferrite Rods

Although I've been looking at antennas responsive to the E field of the radio wave, the small magnetic loop and ferrite rod antennas, which intercept the H field, must not be forgotten. Antennas of this kind respond to the H field of a radio wave arriving along the length of the ferrite rod and through the loop. This gives them a figure-of-eight polar diagram, rather like that of a half-wave dipole responding to the E field of horizontally polarised waves.

The loops and ferrite rods also have the advantages of small size and E field rejection, the latter leading to enhanced signal-to-interference performance, just the job for receiving, and also useful for transmitting, especially in the attic environment. But the telling of this story must be left to another time! **PW**

HAYDON Communications

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MA5B	Mini beam 10, 12, 15, 17, 20m	~~£349.00~~	£299.95
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A4S	4 ele beam (10-20m)	SPECIAL ~~£599.95~~	£429.00
R-6000	Vertical 6, 10, 12, 15, 17, 20m	~~£349.95~~	£315.95
R-8E	Vertical (40-10m) "special"	SPECIAL ~~£499.95~~	£349.99
X-7	7 ele 10, 15, 20m	SPECIAL ~~£699.00~~	£529.95

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

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

Q-TEK PENETRATOR

"We've sold 100s all over Europe"

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

ONLY **£179.95** delivery £10

SEND SAE FOR LEAFLET

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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, 2.15/6.2/8.4dBi (2.4m) £69.95

Q-TEK YAGIS

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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

NEW 80-10M TRAP DIPOLE KIT

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

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DELUXE G5RV

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

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Full size - 102ft (80-10m) £42.95
Half size 51ft. (40-10m) £36.95

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STANDARD G5RV

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

Q-TEK INDUCTORS

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

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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		£25.00 (a pair)

1Kw Handling

CAROLINA WINDOM

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

MOBILE ANTENNAS

P&P £8.50

DB-770M	2m/70cm (3.5 - 5.8dB) 1m PL-259	£24.95
DB-7900	2m/70cm (5.5 - 7.2dB) 1.6m PL-259	£39.95
PL-62M	6m + 2m (1.4m) PL-259	£19.99
PLT-20	20m mobile whip (56" long)	£24.95
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A superb TDK 'snap fix' ferrite clamp for use in Radio/TV/ Mains/PC/Phone etc. *Simply close shut over cables and notice the difference!* Will fit cables up to 13mm diameter. Ideal on power supply leads/mic leads/audio leads/phone leads.

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RG-58 Mil spec x 100m.
ONLY **£35.00** P&P £10.00

Coax stripping tool (for RG-58) £4.50

SP-350 STATIC PROTECTOR

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

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£2.50 P&P

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

COPPER ANTENNA WIRE ETC

Enamelled (50m roll)	£12.95 P&P £5
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
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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

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4 way CX-401 (0-500MHz) SO239 ..... £69.95
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Pulley will hang freely and take most rope up to 6mm. (Wall bracket not supplied).

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2" x 1.5m length	2mm wall thickness	£12.50 P&P £10
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2" x 20'	Collection only 2mm thick	£39.99 P&P N/A

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6 section telescopic masts. Starting at 2½" in diameter and finishing with a top section of 1¼" diameter we offer a 8 metre and a 12 metre version. Each mast is supplied with guy rings and steel pins for locking the sections when erected. The closed height of the 8 metre mast is just 5 feet and the 12 metre version at 8 feet. All sections are extruded aluminium tube with a 16 gauge wall thickness.

8 mtrs **£109.95** 12 mtrs **£149.95** *Carriage £12.00.*

Tripod for telescopic masts £89.95

BARGAIN MAST SETS

TWO FOR £39

Set A: 5 section 21ft long (1⅛") mast set
£23.95 Del £10.00.

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4 x 5' lengths of approx 2" extruded (16 gauge) heavy duty aluminium, swaged at one end to give a very heavy duty mast set.

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2 for £79.95 Del £12.50
3 for £109.95 Del £15.00

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2"	Mast base plate	£12.95 P&P £5
6"	Stand off	£6.95 P&P £5
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4-way guy ring	£4.95
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1½" mast sleeve	£8.95
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Heavy duty guy kits (with wire)	£29.95 P&P £6
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30m pack nylon guy 4.4mm/B/load 480kg	£12.50 P&P £3
132m roll nylon guy (4.4mm)	£40.00 P&P £7.50
Self amalgamating tape (roll)	£6.50
'Nylon' dog bone insulators	£1.00 each
Chimney lashing kit	£12.99

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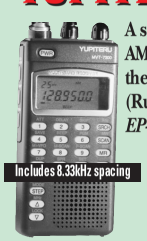

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radio basics

This month Rob Mannion G3XFD finalises his articles on making your own headphones. Rob also previews an article for Radio Basics readers to come from a rather special source!

The feedback I'm receiving from Radio Basics (RB) readers clearly demonstrates that there are a good number of you who really enjoy making things from 'scratch'. In fact, I know of several constructors who are determined to have a go at making complete working valve receivers - using home-made valves and without a single visit to one of the main electronics/radio shops. What a challenge...good luck I say! If you intend to try this yourself – please let me know.

Some of the feedback I've received in the last few days (I'm writing this edition of RB in mid-January) refers to the superb work of **Peter Friedrichs AC7ZL,** whose latest book I reviewed in the February 2004 issue of *PW*. And of course, many readers will remember Peter's original book *The Voice Of The Crystal*, which introduced the reader to the specialised delights of 'scratch building' their own finely polished wooden-cased crystal detector receivers, with telephone type headphones.

Peter, based in far away Tucson in Arizona (it's pronounced Two-son apparently!) was delighted himself with the response from *PW* readers when his original book was published and reviewed several years ago in *PW*. In fact, he was so pleased he sent me a pair of attractive miniature Tequila glasses - complete with tiny green glass cacti - which look interesting when they have a (**rare**) dousing in the amber fluid produced in Ireland and Scotland!

As a result, even though he's extremely busy on his next book, Peter is starting the process of researching, preparing and building an article for *PW* readers. This I hope will appear late in 2004 or early in 2005, and will guide readers through a very thorough approach in building traditionally-styled equipment, particularly the all important telephone/headphone.

I'll provide you with an update on the 'back-to-basics' home-brewing project later this year. However, for myself I'm sorry to say that the only valve I managed to make (using a medicine bottle and an extremely poor vacuum) proved to make a far better neon tube. It glowed very effectively when h.t. and the filament supply was connected...and although noise was generated in my headphones (presumably through the collision of electrons and gas molecules) it wouldn't amplify. My excuse is that I was only 12 years old at the time!

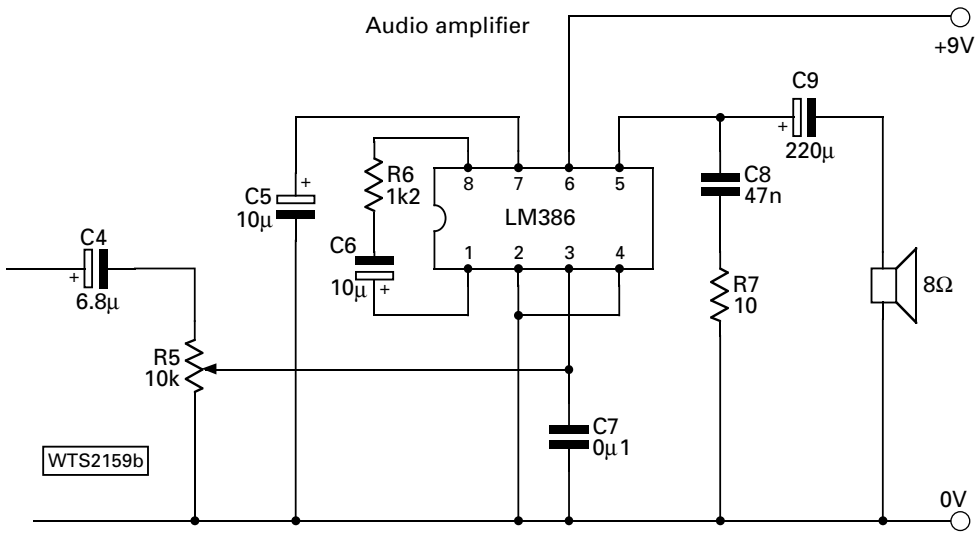


Fig. 1: Circuit of the amplifier suitable for use with home-brewed earpieces and loudspeakers. The low impedance output amplifier, which is designed for low impedance loudspeakers, will also work well with home-brewed headphone inserts (see text).

Plastic Diaphragms

Plastic diaphragms for use in the RB home-brewed headphone inserts can be very effectively made from one of the

many sources of polycarbonate plastic, which abounds in modern packaging (see Information Panel below). However, you may wonder how we can use plastic, which of course isn't (naturally) magnetic. So, let's take a look at a trick we can use to advantage.

Our first problem is that we need a thin and flexible easy-to-work material. This is easily provided by the plastic which although not magnetic can be used in combination with magnetic material!

My preferred method is to use a section of soft iron (or mild steel) sawn and then filed flat, usually from a large nail head. This is then attached using hot-melt glue, or epoxy resin adhesive, to one side of the cut and shaped diaphragm. The metal insert (or stud) is then placed as near to the centre of the assembly as you can get it.

Practical tip: I usually cut the diaphragms from square sections of the polycarbonate. The centre is located using diagonal (very light) score marks across the plastic from the corners. Where they cross will be the centre. Then, before I mount the metal stud in place, I use a geometry drawing compass fitted with a pencil to draw a circle to the same size as required so the external rim for the diaphragm can be mounted above the magnet and field coil assembly.

Incidentally, to ensure it doesn't slip, you'll have to (gently) make the sharp metal point of the compass penetrate the plastic sheet. The resultant hole, along with providing the reference point for scribing the circle of material required, will also make a useful locator for the metal stud.

Another advantage is that (make sure you use the side the compass point entered from) the hole will provide extra bonding for the adhesive by allowing it in effect to end up 'gripping' the sides of the pierced hole. **Warning:** Some of the epoxy resin adhesive is very likely to spread through the hole to the opposite side. **Don't be tempted to remove this!** Instead, it can be very helpful in providing extra 'keying'. When the epoxy resin has cured, and the metal stud is felt to be firmly attached - you can mount it in place on the finished headphone insert.

Centred & Placed

Obviously, it's important to ensure the ferrous magnetic stud is centred and placed as close to the insert's magnet and field winding as possible. You should do your very best to arrange it so that the stud is just clear of the magnet. (Don't forget that it will be pulled in to some extent by magnet's attraction).

Note: In traditional telephone inserts, the diaphragm wasn't fixed. Instead it would rely on the magnet to keep it in place. The main cover would then screw into place leaving a small aperture to allow the reproduced sound to be heard.

In practice, because of many different variables (strength of the magnetic you use, the flexibility of the plastic and the efficiency of the field coils, etc.) you'll have to experiment with the positioning of the diaphragm. However, the technique is very forgiving - your headphone is almost guaranteed to work. The disadvantage is that it's not possible to say (until you've completed the project) how sensitive the insert will be when in use.

Don't despair though! If you've built the extremely useful RB amplifier circuit (featured many times in the series, and shown this month again in **Fig. 1**), it will work well in conjunction with your headphone unit. All you have to do is to use your 'phone instead of the loudspeaker shown connected between the negative end of C9 and 0V in Fig. 1.

Testing & Other ideas

Testing the headphone insert is quite easy - just provide it with source of music or a test tone (Use your Basi-Tester multivibrator signal injector if you built one!). The results can be quite good, but you might find some hardness with some frequencies, and of course this will be because of the natural resonances in the assembly.

If you're involved in teaching students, you can demonstrate that the transducer (because of course that's just what it is) works both ways by connecting it to the input of the amplifier, using ordinary headphones/loudspeaker at the output end. By gently scratching/rubbing the insert you'll make it function as a simple microphone! And - speaking from my own experience - this always seems to amuse and interest anyone new to the radio hobby!

I also suggest you try using a mild steel (tinplate) metal diaphragm. Although more difficult to handle, the steel works well. The audio output may be at a lower level - but you should still hear it. Annealing the plate helps to make the metal more flexible and this can be achieved by holding the cut metal in a gas flame (**hold it in pliers and wear non-flammable gloves**), allowing it to become red hot, and to cool naturally. Make sure you place the cooling metal on to a surface where it won't damage anything.

The next stage of the game is to progress onto home-made loudspeakers! They can prove to be great fun. My daughters (one's a mother to three of her own now!) were fascinated by a large pudding bowl turned into a home-made loudspeaker. The magnet and field coil were mounted on wooden dowelling in the centre of the bowl leaving enough clearance for the assembly to be just under the diaphragm. The 'diaphragm' itself was made from model aircraft wing fabric 'doped' (to make it tight). The reproduced music wasn't hi-fi...but it worked extremely well, dwarfing the transistor radio providing the audio signal!

Try the ideas yourself - they'll prove instructional, enjoyable and add much fun to your radio hobby.

PW

Information Panel

Sources for headphone and loudspeaker diaphragm materials: Most of us nowadays really get annoyed with the plethora of modern packaging materials, it's real problem getting into some of the modern plastic-encased boxes (especially if you're 'digitally comprised' so to speak!). However, the large amounts of plastic see through material - polycarbonate - that seems to be employed just to stop us getting access - can be very useful indeed to the model maker and even the radio constructor. The thick type of polycarbonate, often used to protect small to medium items but allowing prospective purchasers to see what's on offer, along with being extremely light, is also strong and flexible. It's not difficult to find really flat sections, and this can be used to protect home-brewed tuning scales, make tuning pointers and also headphone and small loudspeaker diaphragms (see text).

My advice is that when you see it re-cycle polycarbonate or thin translucent plastic...put it to one side for use later! Warning: Despite being made from polycarbonate - the material can be deceptively sharp edged. My advice is that when preparing recovered polycarbonate - you wear some form of protective glove. It's not an exaggerated danger - and those who have sliced open a fingertip on sheets of paper will agree!

Thin sheet steel - from drinks can (that from food 'tins' tends to be much thicker and less flexible) is an ideal flexible ferrous magnetic material, ideal for traditional diaphragms.

Note: Several readers have suggested model maker's catalogues as being suitable sources for thin (magnetic) metal sheets. Model makers often use very thin soft iron/thin steel sheets as 'shims' - and they're ideal for use in headphones in particularly.

Editor.

Kevin Romang G4SKN was impressed by the styling of the Kenwood TS-480SAT. The transceiver is shown here with the separate front panel (see text).

The Kenw

Kevin Romang G4SKN takes the plunge as he joins *PW*'s review team...looking at the Kenwood TS-480SAT transceiver. Reviewing it over the Christmas holidays, it seems he's reluctant to return it to Kenwood!

When thinking of purchasing a new transceiver, most Radio Amateurs will probably take for granted that the r.f. performance will be adequate. However, before we part with our hard earned cash, specifications will be researched and digested before we take the plunge and order that highly sophisticated radio.

But when that rig arrives only time on air will really confirm our choice. However, one thing is certain, nowadays we have a good number of well-specified radios to choose from.

Maybe we will not need all the facilities on offer, but as the equipment gets more and more technologically advanced many exciting features are made available to us. As far as an h.f./50MHz all-mode 100W rig is concerned (as we will see), the Kenwood TS-480SAT has an ample supply of what's required.

Initial Impressions

The radio arrived with a 'Version 1' manual which might not represent the final customer edition. However, if this version turns out be anything like the final publication then future owners will not be disappointed!

I was impressed by the manual's layout and anything that needed looking up was easily found. Kenwood manuals have had a 'thumbs up' in the past for their readability. Having experienced some not so user-friendly radio literature in the past, I must say it was an 'instruction' manual, rather than the often used on-air term 'destruction manual'!

The review TS-480SAT came fitted with optional extras. A VGS-1 digital voice synthesiser/recorder, an SO-3 TCXO (temperature compensated crystal oscillator), a YF-107CN 270Hz c.w. filter and the YF-107SN 1.8kHz s.s.b. filter. Also provided was software to enable remote control of the radio using a PC, together with a program for Internet control using voice over Internet protocol from another location. (Software will be available free from the Kenwood website).

Kevin Impressed!

Initial impressions while unpacking the radio were favourable and I was impressed by the look of the Kenwood. I was especially impressed by the separate stand-alone control panel, **Fig. 1**, with its multi-curved design and pleasing control layout.

The styling of transceivers seems to be going the same way as cars nowadays. To see what I mean look at the difference between old box shaped models and the curvy new ones!

Joking apart, the Kenwood does look very good indeed. Rooting through the packaging I was amazed at the quantity of mounting hardware provided to enable the rig to be used in a mobile, portable, or fixed station situation.

As I unpacked the robust die-cast main body of the TS-480, I became aware of the two antenna flying lead connectors, **Figs. 2** & **3**, not my preferred approach. I know of one Radio Amateur who rejected a rig purely because it had this feature! Of course to be fair, Kenwood are not the only manufacturer using this system and looking at the entry point for the feeders into the rig, there seems to be no room to chassis mount SO-239 sockets.

The transceiver was quickly set up in the shack and on power-up I was greeted by an impressive large amber display and backlit keypad. I was also treated to a few words from the digital lady lurking within the optional voice synthesiser/recorder!

Features & Specifications

Before I describe my activities on air with the Kenwood, firstly I'll mention some of the main specifications. So, to start - what has the transceiver to offer and what are its main features?

Briefly answering, the TS-480SAT is an all-mode h.f./50MHz 100W d.s.p.-equipped transceiver with 500kHz-60MHz continuous receiver coverage. It appears to incorporate many of the features of its bigger brother - the TS-2000.

The TS-480SAT arrives with a built-in automatic antenna tuner (a.a.t.u.). The receiver is triple-conversion for narrow band f.m. (n.b.f.m.) and double-conversion in other modes. The intermediate frequencies (i.f.s) are at 73.095, 10.695MHz and 455kHz for n.b.f.m.

The rig has a separate remote control panel with an easy to read display, ideal for use in a vehicle. A comprehensive mounting kit for mobile, portable and base station set-ups is provided. In my opinion the rig would appear to be at home if used in either situation.

A separate carrying handle is provided to attach to the main body of the transceiver using its portable mounting bracket. This converts the separate items of the radio into a self-contained portable package, very neat!

The main transmitting-receiving unit is 179mm long and 278mm wide. It stands 69.5mm high and weighs in at 3.2kg.

The linking and microphone connectors are modular and ample lengths of cabling are supplied. Jack sockets are provided for paddle, straight Morse keys and for an extension speaker. Mini-DIN

wood TS-480SAT

sockets can be found for data and linear amplifier remote control. An RS-232C socket is provided for computer interfacing. Complete specifications are readily available for prospective buyers for comparison purposes.

Having installed the Kenwood in the shack, I then set about exploring some of its many features. It was time to test the rig out on air!

Possible Angle

The radio was set up on a computer desk and I found that it was possible to angle the remote control panel upwards so that I got the best definition from the display. The controls then fell easily to hand.

The first receive test was carried out on 7MHz in the early evening. At that time I could hear a few UK stations but also some very strong European signals as well. The band was very active, with quite a high general noise level.

I could easily switch between the 480SAT and my other h.f. equipment, one is a d.s.p. equipped modern transceiver and there's an older rig, which I knew had a good receiver. All the radios were connected to my doublet antenna and external a.t.u.

The Kenwood soon proved to have a very lively receiver with smooth sounding audio on s.s.b. My own modern transceiver sounded just a little harsh in comparison.

Most radios benefit from the addition of a good extension speaker but the Kenwood's rear mounted driver in the remote control panel, Fig. 1, sounded excellent to my ears. Although I realise that of course mobile operators will probably want to use the rig with an extension speaker directly facing them.

The 7MHz band proved to be a good band on which to try out the d.s.p. filtering. In fact this was almost a necessity, as things were getting quite hectic on the band!

I soon became used to the button pressing needed to change parameters. I must also say that after a short period of time it became quite intuitive and finding my way around the Kenwood's different controls was a much faster learning curve than with some other rigs I have tried.

The menu system has a large number of functions as can be expected in a rig of this complexity. Programming though, is not too daunting and to anyone used to a software-controlled system it will pose no problems.

Two menus are provided, to switch between completely different set-ups. You can also create your own quick menu consisting of your most frequently used functions.

It was a pleasure to use the comprehensive d.s.p. and it would take up most of this review to list all the options! The high and low cut filter frequencies can easily be changed and monitored on the screen, with of course different settings available for different modes. As well as bandwidth control, rejection of noise and beat frequencies are well catered for, with several types of filtering to try.

The i.f. shift on the Kenwood worked well. However, as I've already mentioned, two optional filters were fitted in the review model, one at 1.8kHz for s.s.b. and the c.w. narrow filter at 270Hz. Incidentally, when combining the d.s.p. and i.f. filtering I found it was hard to find a difficult receive situation that couldn't be tamed, or at least greatly improved by using the above features in different modes.

One small gripe, which I personally would have liked to have seen, is a single control for r.f. gain on the front panel like the i.f. shift control. I tend to change my r.f. gain frequently on the lower h.f. bands. To do this on the TS-480SAT required a one second button press and then an adjustment via the 'multi' control knob. I soon got used to this and it didn't take long to execute, but I would have preferred a separate control.

Swedish Report

On my first s.s.b. QSO on 7MHz I asked **Dag SM4SET** (Sweden) for a critical audio report. He said that the audio sounded very good.

At the time I was not using the speech processor. We exchanged 59+ signal reports and I was pleased that my audio sounded okay without any voice compression. I then went on to work more 7MHz stations, receiving good reports and the general opinion was that the '480SAT was sounding fine.

I then had a listen round on some other bands. I missed my own rig's Shuttle Jog facility for quickly tuning up and down, but a quick QSY is possible on the '480SAT using the 'multi' control.

It was also nice to see that VOX had been included on this model. This facility is sadly lacking on my main station rig from another manufacturer's stable. Again, this was very easy to set up on the Kenwood.

The next day I was visited by **Andy M3HLT** and I let him have a look at the review '480SAT. While operating the rig he said that he found the digital voice synthesiser/recorder a little annoying. Having got used to the sound of my 'digital lady' I missed her after turning her off!

We both agreed however, that for blind or disabled operators the speech synthesiser is a fantastic option to have. I thought that her speech pattern was a little slow, but I think it best not to change that parameter. As expected, while you can get her to speak faster, the voice pitch increases dramatically and the 'digital lady' then starts to sound like a very technical chipmunk!

The optional VGS-1 will also record 30 second voice messages, which can be transmitted

Product

The Kenwood TS-480SAT.

Company

Kenwood Electronics UK Ltd.

Contact

Sales & Marketing, Communications Division,
Tel: (01923) 655284.

Pros and Cons

Pros: Superb multi-purpose design packed full of useful features. Great audio on receive and transmit, enhanced by a comprehensive and smooth sounding d.s.p.

Cons: Difficult to find any! But no separate r.f. gain control, and those flying leads can get in the way when moving the rig as a portable set-up.

Price

£ 1000 to £1100 (depending on model).

Summary

I got hooked on the radio and will miss the easy to set-up features. Sure to be a winner for Kenwood!

Supplier

*My thanks go to **Kenwood Electronics UK Ltd., Kenwood House, Dwight Road, Watford, Hertfordshire WD18 9EB** for the loan of the review transceiver.*

Fig. 1: Close-up view of the TS-480SAT separate front panel. The internal loudspeaker is mounted on the rear of this panel (see text for comments).

from three different channels. Incoming audio can also be recorded for later playback.

Using Low Power

Andy then had a tune round on 21MHz and we found a VK6 station at S7-8 finishing a QSO with a European station. I turned the speech processor on and did the quick button press to reduce power to 10W. (**Note:** the minimum power you can select is 5W on c.w., s.s.b., f.s.k. and n.b.f.m. Maximum output on a.m. is 25W, and the lowest is 5W).

Andy got ready to call using **M3HLT/P**. To our surprise he was immediately picked out from the mini 'pile-up' and **VK6NTE** near Perth, gave us a 55 report. Andy asked what the audio sounded like and again the reply was "excellent audio".

It seems that the tradition of Kenwood rigs of the past (like my own first Kenwood rig, the TS-530S) having good audio on transmit and receive, is being sustained with the new breed of Kenwood transceivers.

On The Key

The next evening I thought I would try c.w. And, as I had just bought myself an early Christmas present in the form of a new Iambic paddle key, this was duly plugged in!

Incidentally, all the options available to the c.w. operator, as in other modes, are too numerous to list in this short review. Needless to say everything worked well using the built-in electronic keyer and the semi break-in option that I had selected (full break-in is provided). The three memory channels available for storing c.w. messages are worthy of note and they're ideal for the contest operator of course.

The 270Hz optional i.f. filter for c.w. is selected as the bandwidth of the d.s.p. filter is changed. Serious c.w. operators would find this a useful addition on some of the more crowded bands including 3.5MHz.

The 3.5MHz band was not busy at the time and I soon made contact with a club station **DL0OV** from Bonn in Germany, operated by **Alex** who's own call was **DL3ALX**. Alex gave me a good report although my sending was a bit rusty. My poor Morse was due to me not being used to my keyer and not the fault of the TS-480SAT!

By the next day my sending had improved and I had a nice QSO with **Peter VE1BHH**, in Nova Scotia. I was suffering a little QRM on his signal at times. Again the versatile d.s.p. came to the rescue and all was copied once I had narrowed the pass-band frequency after a few quick button presses.

I found the auto zero-beat function handy during this QSO which automatically netted my transmit frequency quickly onto Peter's exact CQ call frequency. (Note: the DSP filter set-ups are also available for data modes such as PSK31 and RTTY).

Using 28MHz FM

I also had a couple of 28MHz narrow band f.m. (n.b.f.m.) contacts, the first was with local station **Ron G1LJT** not far from me in Wiltshire. Ron reported that my audio sounded a bit 'edgy' on his RS-HTX10. This was rectified by changing to narrow band transmit, although Ron commented that my audio level was a little down even on the high microphone gain setting (adjusted via the menu).

Jon G0IUE/M who was driving in the vicinity was also worked. Jon said that "the audio was fine" on his FT-8900 and as loud as Ron's, who was still on frequency. I then tested out the speech processor in n.b.f.m. and discovered that I could easily put on too much compression. This should be no problem if the set-up instructions are followed in the manual!

All in all I was very taken with the rig during my time on air, especially with the very flexible d.s.p., which in most configurations never sounded tiring on the ears. This sort of feature is essential nowadays on our busy broadcast and h.f. bands.

I also gave my wife **Karen M3KIR,** (not a keen h.f. operator!) a crash course on d.s.p. She was amazed at how a very difficult receive situation could be tamed by a few button pushes!

Notable Features

More notable features include the built-in automatic a.t.u. with pre-sets. Due to the nature of my balanced antenna system I could not try this out in depth, but I managed to load up a very mismatched vertical on several bands with no problems. The '480SAT achieved this in very quick style as well.

Fig. 2: Top view of the main transceiver unit, showing 'flying lead' antenna connectors (see text).

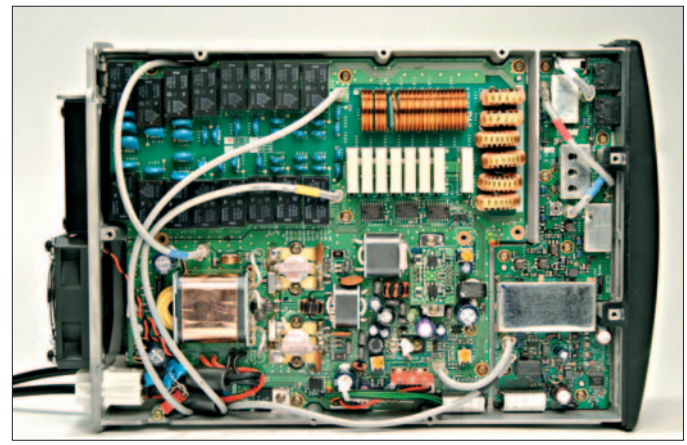


Fig 3: Inside of the TS-480SAT, showing the cooling fan, far left (lower).

Personally, I recommended that you check with your dealer just what can be expected from the a.a.t.u. (especially if used with antennas such as the popular G5RV).

Also worth mentioning is the free software available from the Kenwood website. The ARCP-480 program duplicates the controls of the radio and will enable full control of the '480SAT from your PC and the Kenwood Network Command System. (I did not have the opportunity to try the program out but it looks very comprehensive).

Equaliser settings can also be determined via this software. Also on offer is the exciting new Internet control software ARHP-10, again a free download. This program will control the radio remotely via an Internet connection or LAN, using the Kenwood Network Command System to apply voice over Internet protocol (VoIP).

Imagine having a computer abroad and operating your rig from afar when you feel the urge by going on-line! More than average computer skills will be needed to set up this facility, but as with all new Amateur Radio 'advances' in the past, this feature will probably become widely used in the future.

Kevin's Christmas Present?

I had the transceiver over Christmas to review and one night I dreamt that it was a Christmas present and I could keep it forever! A nice thought and I would gladly accept - the TS-480 certainly deserves to be a big seller.

Use the transceiver in any situation and enjoy that lively receiver and smooth sounding d.s.p. The styling is second-to-none and its ease of use commendable. Lack of v.h.f. and u.h.f. might deter some, but the amount of features included in this h.f./50MHz offering will attract most I am sure.

Hoping I haven't developed a fetish for voice synthesisers I reluctantly say "Goodbye my Digital Lady". But maybe I'll hear you again some day.

PW

doing it by design

We welcome Tony Nailer G4CFY as he presents the first of his new bi-monthly columns where he shares ideas, techniques and the latest projects from his designer's desk. It promises to be a fascinating series!

Welcome to a new bi-monthly series in which I hope to enable enthusiasts to develop their own circuits, systems and antennas by first understanding how they work and then applying simple formulas for component parts. The idea for this series began when I was approached in October 2003 by the Editor when he was preparing an article on receive converters and referring to my original *PW* article from October 1978.

We chatted at length, as Rob is a master of digression! He then suggested that *PW* could use another regular article author, particularly one strong in the v.h.f. field. It was mutually agreed that there are plenty of articles aimed at the beginner and something at a higher level are now needed.

It was also made clear that any attempt to include features heavy with mathematics brought storms of protest from readers. Such articles were not palatable to the general readership.

Designing Professionally

My introduction by the Editor in the (February) issue of *PW* makes clear that I have been designing electronic and radio equipment professionally for 29 years. For 25 of those years I've been designing products for **Spectrum Communications** starting with that 144 - 28MHz receive converter featured from *PW* in October 1978.

In the early 1980s Radio Amateurs started buying commercial equipment for v.h.f. and converting p.m.r. rigs for use with repeaters. The content of communications between stations quickly became less technical. The progressive 'dumbing down' of the RAE by cutting out mathematics removed the incentive from would-be Amateurs to ever bring-up their mathematics to a usable level.

Many Amateurs these days don't want to get involved in any theory and most have some reason why they don't do any construction. More worrying is that many don't even have any usable test equipment.

The articles in this series will include theory and design of receive and transmit modules, antennas and test equipment covering from d.c. to 500MHz. Hopefully all at Secondary School mathematics level.

Most articles will develop a circuit and end with a working design. This can be built either as breadboard or with the p.c.b. and parts available from **Spectrum Communications**.

Information Exchange

To start the series off, I wish to consider the information we exchange in radio contacts and attempt to encourage Amateurs to make it meaningful. So let's take a look at S units, dBs, Watts and how we misuse them!

I can remember that a typical contact, when I was last active on the bands about 10 years ago, went along the lines of; "PA0XXX this is G9XXX you are 5 & 9 here is Southern England, etc., …. I am running 50W from a 'commercial' rig to a 'commercial' 8-element Yagi at seven metres. How do you copy, PA0XXX this is G9XXX".

However, what does all this mean? Is any of it true? Has G9XXX ever measured any of the levels of data he has quoted? Unfortunately, the answer is probably no!

The phrase, "You are 5 & 9, can you repeat your callsign" is now a common joke amongst Amateurs. This is because everyone using 'phone assumes that if you hear them they are readable and hence Readability 5. Obviously this is not true, but when in contact with foreign stations it's presumed to be an insult if you give them anything less than R5.

Maybe the system is too complicated? Indeed I can't remember what each of the readability strengths are myself - in fact I would have to look them up. Perhaps we should have just two levels of readability, say 3 for 'with difficulty' and 5 for 'perfectly readable'?

Considering S-Units

Let's now start considering the S-units, where the commonly used S9 is usually accepted to be 50µV at the receiver input terminals. Now comes the tricky part!

Each unit on the meter scale below S9 is in 6dB steps. These are voltage dBs which means each 6dB step represents a factor of two. So S8 means half of S9 which is then 25µV, S7 means 12.5µV, S6 means 6.25µV and so on.

Above S9 the meter is usually calibrated as +20dB and +40dB and I've even seen one with +30dB. Now, a power change of 20dB is a factor of 10 in voltage terms, 30dB is a factor of just over 30, and 40dB is a factor of 100.

Let's now imagine a signal of "40 over 9". (I'm sure you've all heard it at some time,

and may even have quoted it yourself). If S9 is 50µV, then 40 over S9 is 100 times 50µV which is 5mV!! This represents such a strong signal that it's only likely to occur within 10 wavelengths of a transmit antenna emitting 100W.

Signal Levels and S Units

S1	S3	S5	S7	S9	+20
3µV	6µV	12µV	25µV	50µV	500µV

Incidentally, whenever I was talking to the Americans I found that if you gave them less than strength 9 they wouldn't come back for a second over! They were obviously insulted. In the end I started quoting them the number of microvolts I had received from them.

The American stations usually asked if my report was a good level. To which I could honestly answer that it was the strongest, or second strongest, station I had received from their part of the World recently. This usually made them feel really good and truth, and honour had been preserved!

However, in order to give a true report in either microvolts or S units it is necessary to calibrate the receiver. The only way to do this is to have a signal generator with accurately calibrated output levels.

You should use the generator to apply 50µV to the antenna terminals and adjust the S-meter to read S9. At the same time it makes sense to check the levels corresponding to lower calibration points on the meter and record them. Do this for each band as it's likely that the receiver has different sensitivity on each band.

Thereafter with the aid of the calibration chart it is possible to give an accurate report to any station on any band. There's a further complication though! The signal level is that at the receiver input terminals. So, now it's important to know the feeder loss on each band together with the gain of the antenna on each band.

Volts ratio	dB	Power ratio
1.12	1	1.26
1.26	2	1.58
1.41	3	2.00
1.58	4	2.51
1.78	5	3.16
2	6	4.00
2.24	7	5.01
2.51	8	6.31
2.82	9	7.94
3.16	10	10.00
4	12	16.00
5.01	14	25.12
6.31	16	39.81
7.94	18	63.10
10	20	100

Fig. 1: A 'Look up' table for dB to voltage and power ratios.

The Decibel

Apart from the word Engineer, the term decibel is probably one of the most abused terms in the technical world! It's a convenient tool used to express logarithmic ratios. And - importantly - the unit dB should be suffixed with another letter **to define to what it refers**. In the case of voltage it should be **dBV** and is determined by; dBV = 20log (voltage out/voltage in).

Now, if we have an input wave of 0.5V peak-to-peak (p-p) entering an amplifier and 2V p-p from the output of the amplifier, then the voltage gain is; dBV = 20log(2/0.5) = 20log(4) = 12.04dBV

The sequence used on the calculator is; enter 2, press divide, enter .5, press equals, check the ratio is about right before proceeding (maybe even jot it down) press 'log' (this is log10 and not ln), press times, enter 20, press equals*.

The same procedure can be used for voltage loss or step down. In this case the input might be 2, the output 0.5, so the ratio is 0.25. When the log is taken and then multiplied 20 it becomes -12.04dBV.

Power dBs are similar in operation to voltage dBs but the **multiplying factor is 10 instead of 20** so the dBW is determined by; dBW = 10 log (power out/power in).

To get back from dBs to voltage or power ratio the method is; voltage ratio = antilog (dBV/20).

Some calculators have antilog as 10 to the power x and it's usually as a second function of the log button.

To apply this to the voltage gain of 12.04dB is done as follows; voltage ratio = antilog (12.04/20) = antilog (0.602) = 3.999.

A chart of ratios and their corresponding dBV and dBW is provided, **Table 1**. I suggest that it's kept handy for future reference.

*** Some calculators need to be 'driven' slightly differently - check up in its handbook.**

Antenna Gains

Let's now take a look at antenna gains, starting off with single band v.h.f. antennas. Here, antenna gain is straightforward but on the h.f. bands where often a G5RV, or trapped dipole, or other multiband antenna is used it becomes more complicated.

Probably the easiest way is to first determine the feeder loss and then estimate the antenna gain or look up typical gains in the RSGB or ARRL handbooks.

A half size antenna with loading coils will produce a low standing wave ratio (s.w.r.) on several harmonically related frequencies. However, it will only give the gain of a dipole on the inner sections between the traps on one specific band. On the lower frequency band, where the traps form part of the electrical length, it will be physically shorter than it should be.

Physically short antennas **do not intercept a full free space halfwave or quarter wave**. They don't therefore, have as much gain as a full size dipole. If you want the full gain of a dipole you have to have a full sized dipole. Alternately, you can use more than one shortened element to make up the gain.

The gain of an antenna is quoted in power dBs which must be relative to either a point source or to a dipole. The point source is called an Isotropic Radiator and emits a signal in every direction.

Additionally, any wire or element used for the antenna emits or receives electromagnetic radiation at right angles to the wire. **This means it does not go to all points of the compass as well as above and below**. Because of this concentration of signal into certain directions, the dipole has gain with respect to an Isotropic Radiator.

Depending which book you read, a dipole has somewhere between 2.1 and 2.4dB gain relative to an isotropic source. Assume for argument sake 2.25dB. When path loss calculations are investigated mathematically, in order to determine effective radiated power from an antenna, the isotropic value is used.

In practice it's not possible to make an isotropic radiator, so the dipole is the commonly used reference. To distinguish between the two, the terms dBi (**i**sotropic) and dBd (**d**ipole) are used. Antenna manufacturers usually quote dBi though they often leave off the 'i' so you think it might be dBd. Watch out for that trick!

Incidentally, CB radio antenna manufacturers go even further and quote quite fictitious gains such as "7dB for loaded quarter-wave antennas". In reality these usually have gains of -3dB relative to a dipole, that is -3dBd.

So, if you read of an antenna with a gain of 5dBi, it will be about 2.75dBd and so almost

twice as good as a dipole. A Yagi antenna with 7dBi gain represents a power gain ratio of five times. This is also 4.75dBd and hence three times that of a dipole. Putting a signal of 10W into this would give you 50W effective radiated power (e.r.p.) off the front of the beam.

Feeder Losses

Now it's time to look at feeding the antenna. Here, it seems that everyone in Amateur Radio seems to believe that you must use the biggest diameter and most expensive feeder to achieve reasonable performance from an antenna system. As a first approximation this **is true** but it's often an un-necessary expense. So, that H100 and Heliax may not be justified.

Experiments I've done with feeders have still not been concluded. But I am reasonably confident that RG58 has the highest losses, followed by RG213, RG8, & URM67, followed by MINI 8.

Cable losses per metre (in dB)

Cable	50MHz	70MHz	100MHz	144MHz
RG58	0.134	0.158	0.188	0.212
RG213	0.1	0.124	0.152	0.176
MINI 8	0.082	0.106	0.126	0.143

My results indicate that if you have a run of 10 metres of cable on 50MHz, it will give a loss of 1.34dB using RG58, 1.0dB using RG213, and 0.82dB using MINI 8. In the case of the RG58, if you put 25W in at the transceiver, you would get 18.5W at the antenna terminals. Even if you changed to MINI 8 you would have 20.7W at the antenna terminals. (Not a lot more!).

At 144MHz my tests suggest the power would be 25W in to the RG58 and 15.3W out, and 18W out with MINI 8. Not really a lot of difference with a short feeder run as far as the transmitter is concerned. More importantly though, is the effect on receive noise figure which can be significant.

Output Power

Finally, for this month, I want you to consider how much power is being transmitted. In the old valve days, particularly when working on v.h.f., many Amateurs didn't have an accurate power meter. All stations had a multimeter however, so the current and voltage used by the power amplifier (p.a.) stage was measured, multiplied and a figure for d.c. power input obtained.

It was assumed that for a Class C stage an efficiency of 66% would be achieved, so the r.f. output could be simply calculated. This was often in error because Amateurs used old surplus valves which had lost much of their efficiency. When I finally had the equipment to measure my 30W d.c. input 144MHz transmitter, it turned out to be producing only 6W r.f. output!

Running 100W?

When an Amateur station states on the air that they're "Running 100W" ...just what does this mean? Does the statement refer to the d.c. input, or the r.f. output quoted in the handbook for the rig? Additionally, has the operator taken into consideration feeder loss or antenna gain?

Looking at the statement again, let's assume a station transmitter is running 100W d.c. input on the 7MHz band and has an efficiency of 66%. The power entering the feeder will then be 66W. The long feeder has a 2dB loss and the antenna is half size with traps.

The antenna might be -3dBd (which is about -0.75dBi). The losses total 2.75dB which is a reducing factor of 1.88. So, the actual emitted power from the antenna will be only 35W.

Down the road from our hypothetical station, another Amateur has a different transmitter which actually produces 120W r.f. output on 7MHz. This operator has a shorter cable run with a loss of only 1dB and is using a full size dipole with a gain of 2.25dBi. The system has a total gain of 1.25dB, an increasing factor of 1.33. So the emitted power from the antenna is 160W.

The ratio of received power from the two stations is 160/35 = 4.57, which is 13dBW. Now we can explain why two nearby stations both apparently running 100W, one with a trapped dipole and the other with a full dipole are two S-points different at a remote receiving station.

Equip Adequately!

To equip their stations adequately, Radio Amateurs should obtain the use of a signal generator, and an r.f. power meter with a proper 50Ω load. By measuring power in and out of the feeder, its loss can then be calculated. The gain or loss of the antenna should then be added to this figure.

By following the advice I've provided, it will be possible to work out the meaning and levels of received signals at the antenna and the true value of emitted radiated power from our stations. Wouldn't it be nice if when we gave information to another station it really meant something? Otherwise we might as well not bother to exchange data at all in my opinion!

PW

In the Pipeline!

In his first column **Tony Nailer G4CFY** has had to concentrate on 'setting the scene' for his innovative new series. However, I'm pleased to report that because we're working together with Tony and the years of experience he's gained with the well known **Spectrum Communications** company, there are some interesting projects at the planning stages.

As readers know, from *PW* December 2003, I featured the Spectrum 28 to 70MHz transverter. In fact, it's this unit which has launched me into a very enjoyable mode, using s.s.b. This is because although I've had much fun on 70MHz since 1968, using the s.s.b. mode was a joy waiting to be discovered. And I thoroughly recommend that readers join us on the band!

The first project from G4CFY specifically for readers, is to be the *PW* Whitcombe 70 to 28MHz receiving down converter. This is aimed at getting you on the band and is due to be published in the April issue. The designer, together with myself are sure you'll find the temptation too much- and will 'have a go' for yourself. We can't make it much easier - there'll be a kit on offer and I fervently hope readers will take advantage of this facility.

A 70MHz SSB Project

During my travels in the UK and Ireland visiting clubs, or just on holiday, I have often been asked: "When is *PW* aiming to present us with a 70MHz s.s.b. transmitter project". In fact, I must say that there seems to be a great deal of interest in Ireland and Scotland on this subject. Of course, having access to s.s.b. will make QSOs that much easier to achieve for our friends who can be quite exotic 'DX' to the rest of us, especially if they live in - for example - County Kerry or Perthshire!

Without pre-empting what Tony G4CFY is planning (obviously we work closely together, and I'll be providing up-dates in conjunction with the designer) I'm pleased to announce that an s.s.b. transmitting project of some form is under way. Although in its early developmental stages, the project will be of great benefit to 70MHz operators. At this stage it would be very helpful indeed to the designer and the Editorial staff - to hear from readers what type of projects and equipment they'd like to see in *PW*. Obviously, we don't publish a 'Dream Machine' magazine - but wherever possible we do our very best to listen to what readers require from *PW*.

Incidentally, it's well worth reminding those of you who have taken the trouble to enter suggestions, ideas and even criticisms in the PW Club Visit *Comments Book* - **that they are all read**. Indeed, several of the columns we now run in *PW* come directly from suggestions in the *Comments Book*. So, whether you're a digital modes fan, a keen v.h.f. operator or just like home-brewing your own equipment- if you get the chance to write your comments in the said book - do so! (I have it with me at major rallies and shows).

Alternatively, you could write a letter for publication, or just write in to keep me up to date. You may have to wait a long time for a personal reply, or I'll do so via Keylines, Topical Talk or the letters pages to keep you all informed. But you can be sure that we'll read your comments. Indeed - some of letters may well end up on Tony G4VFV's Designer's Desk!

Editor

The Vectis Run Part 3

By Rupert Templeman

It's January 1939 and travelling Wireless Technician-Salesman Alan Edwards is finding his monthly visit to the Isle of Wight - 'The Vectis Run'- to be traumatic. Suddenly there seems to be danger lurking around every corner on the previously peaceful Island!

Alan had stayed with Joe Primmer right up until the time his friend had to leave for work just before 8pm. Joe had to prepare his permanent way engineering work train, which was due to leave Ventnor just after the last train departed for Ryde. This was normally just after 1030pm, but Alan – even though he was only a 'Overner' as the Islanders called visitors – knew all train departure times were dependent on the arrival of the ferries at Ryde Pier head station where they connected with the extensive Island railway network. In fact, everything on the Island seemed to depend on ferries and tides and friends often joked that visitors left the calendar behind on the mainland and picked up a tide table on arrival at Yarmouth!

Before he left for work, Joe Primmer had confided to Alan that the Permanent Way Section Ganger Pat Dunne - who had been found dead at the Wroxall end of the Ventnor tunnel the previous afternoon - had seemingly not died immediately from his injuries. An incredulous Alan had then learned that when his body was found, Pat Dunne had managed to crawl clear of the track and had pulled himself right to the base of the signal controlling the entrance to the single track tunnel.

"It's strange though Alan" said Joe "although his head injuries were quite bad and he was obviously bleeding a great deal – he actually managed to scrawl a note on his maintenance pad before he died. That was odd in itself, especially as the signal had a telephone he could have used to call Ventnor box. But what was really strange was what he managed to write on the pad just the words 'Verdun Lager'!

Alan's eyes narrowed with concentration and his usually thoughtful face deepened into a fixed expression for a moment before flickering back into life. "Verdun's a place in France isn't it Joe, but why mention a French beer"?

Alan then went on to explain to Joe – a traditional English bitter drinker - that lager was a continental beer and a brew he'd enjoyed while working in Holland while taking the course at Philips, at their factory in Eindhoven. Despite this, as he was describing the taste of Dutch lager, deep in the back of his keen crossword solving brain the seed was growing that the words were significant in some way.

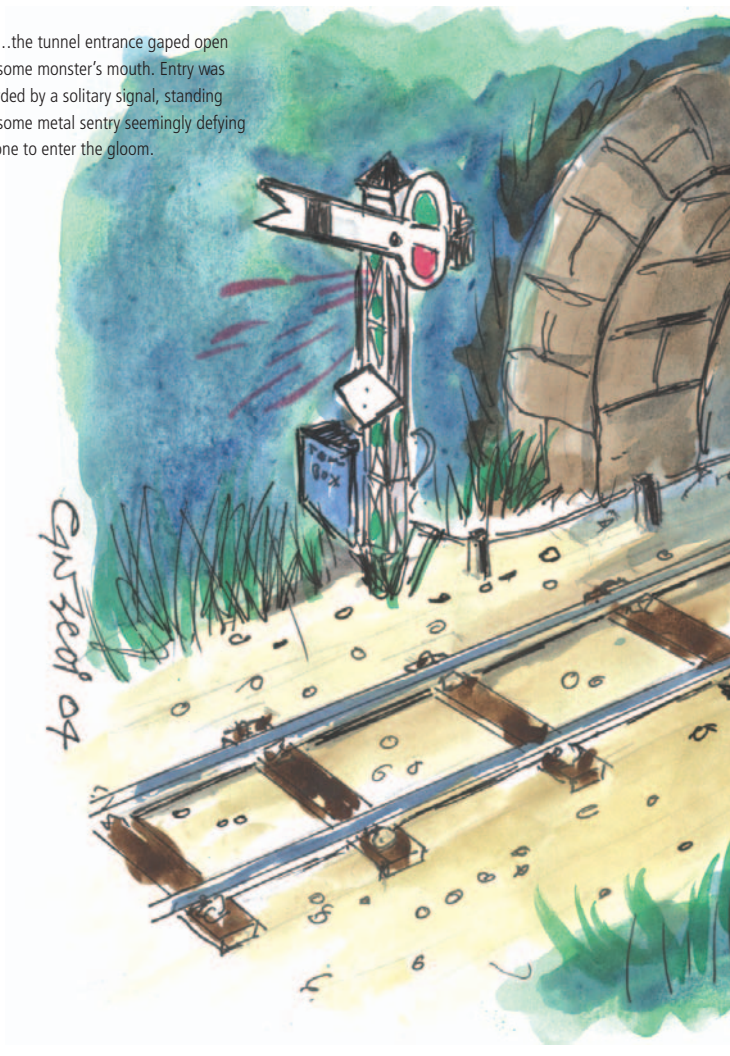
At that moment they were joined by the cheery figure of Mike Coley who had been passing by the guesthouse when he spotted Alan's distinctively battered old van. Mike, although living with his parents in Ventnor travelled by train to work in Shanklin. Along with being Alan's good friend, he also represented the best customer on the Island in his capacity as Wireless Repair & Service Manager for Clarke's who had shops in all the larger towns.

Along with Amateur wireless, Mike also had a keen interest in the new BBC television service and wanted to discuss the recent heavy interference he too had been suffering on the vision signal. No-one seemed able or willing to help him find the source! However, living in Ventnor meant that Mike was unable to receive the Alexandria Palace transmissions due to the huge bulk of St. Boniface Down screening the weak signals from London. Instead he had to 'Look in' from work in Shanklin whenever possible. He was encouraged to do so because despite being so far from the transmitter, several customers had enquired about the new service and Clarke's were actively setting up the necessary v.h.f. aerial systems. They were spurred on by the recent news that – due to some little known atmospheric phenomena effecting the normally expected line-of-sight transmissions – pictures and sound from Alexandra Palace had been received as far away as Australia.

In fact, Mike was so keen on the new television service he'd entered the debate in the technical press to help decide the term to be adopted for televisor owners. "I'm not a 'Looker in' on anyone" he had firmly protested - "It makes me sound like a 'Peeping Tom' and I'm not – I prefer the term used in the American television magazines; "I'm a 'viewer' and I know it"!

Hard Frost

Next morning Alan felt very tired, having suffered a sleepless night. Additionally, because of the hard frost even his hot water bottle had turned to icy earthenware. He'd tossed and turned and kept dreaming of large bottles of Dutch Lager, and equally large



.....the tunnel entrance gaped open like some monster's mouth. Entry was guarded by a solitary signal, standing like some metal sentry seemingly defying anyone to enter the gloom.

but attractive bar maids, all served in a bar in the French town of Verdun. He had woken up at around 3am and found himself sitting upright in bed wondering just what was so significant about Verdun and lager?

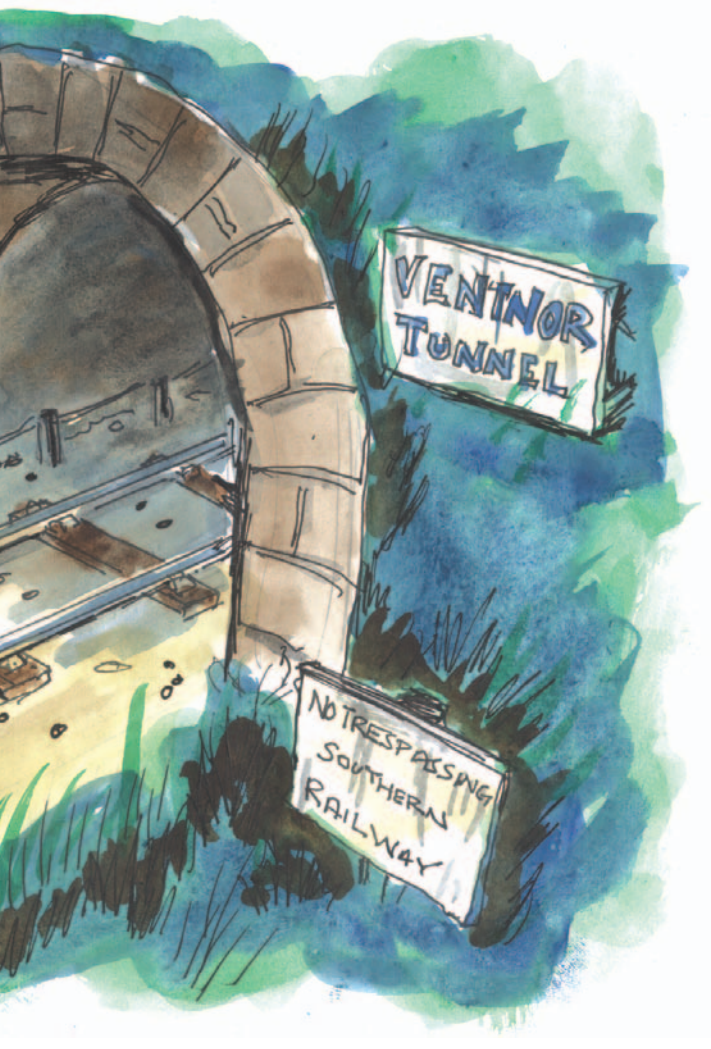
The sleepless night and the overwhelming impression that he should be going to bed rather than getting up, was made worse when he couldn't get the van to start. Despite much hand-cranking, and a great deal of sweat he had to give up. Just as he did so Mike Coley paused on his way to the station to catch the 8.10am to Shanklin and suggested that Alan join him.

"You needn't tell your boss Alan – he wouldn't believe you anyway" Mike suggested. "We can get our van out here by the time the sun's up a bit more and melted the frost and we'll get yours going. In the meantime you can join me on the train – it's only a 20 minute journey and when we get to my office we'll sort out the orders. We could even come back at lunchtime to collect your van. You'll get a ride on the train and no-one except us would the wiser".

It only took a moment for Alan to make up his mind. "Yes, we'll do it" he said looking intently at his friend. "I've had a terrible night, I don't feel like driving very far and I'll get a chance to look at the place where Pat Dunne was killed".

"Killed?" The surprised reply from Mike was accompanied by a stunned expression. "I thought, from what the police said, it was an accident – he was hit by something on the train, or got in the way of it as it passed by"!

"No Mike" Alan replied grimly; "I don't think this was an accident. Ever since I arrived on the Island I've had a creepy feeling something's wrong. Apart from that – from what I heard from Joe Primmer last night, remember we were still talking about it when you joined us, I think that Pat Dunne was desperately trying to pass a message over before he died. It really strikes me as being extremely unusual that such an experienced railwayman should die in that fashion and try to leave a message of some sort.



It all seems very suspicious, even if the local police don't think so".

As they walked towards Ventnor station Mike was surprised to find that his friend was either unwilling or unable to chat as usual. "Alan was never a truly outgoing type" he thought to himself "but he'll always chat about work at least. He must really be worried this time".

They had to board the Ventnor to Ryde train at the station's isolated island platform by the unusual wooden drawbridge which was such a distinctive feature of Ventnor station. Alan remembered that on his first visit the previous year he'd thought it was yet another indication of the Island's individuality.

On the far side of the station, next to some chalk caves carved out of the hillside by the railway company itself and the resident coal merchants, Alan could see the wagons of the engineering train which Joe Primmer had been in charge of the previous night. The station complex looked cramped and extremely busy. It seemed that the original railway builders had literally carved a great slice out of the lower slopes of St. Boniface Down to gain access for their railway, leaving the wooden towers of the Air Ministry radio station seemingly perched on the edge of a precipice high above.

Having seen the intensive summer Saturday Service in action on the Island Alan knew that the single line between Brading and Ryde at the far end of the railway carried the most intensive service of any single track railway in the world. But at the moment - he and Mike Coley and several other local people also travelling to work – were the only passengers on this frosty morning.

Seating himself on the deep, faded plush cushions in the narrow, ancient carriages – definitely from the Victorian era Alan thought – the train lurched into motion and was almost immediately swallowed whole by the almost one mile long single track bore. Alan only got a brief glimpse of the signalman looking down from his box sited at the mouth of the tunnel and a flash of green as they passed by the only colour light signal on the Island railways. "Nothing modern on this line" he thought –"But what a marvellous system the Island's got"!

Into The Daylight

It seemed an age before the dim carriage lights were overpowered by the still weak winter morning's sun as the train and four ancient narrow bodied carriages roared into the daylight at the Wroxhall end of the tunnel. Then suddenly, the train's moderate progress slowed to a pedestrian crawl.

Looking at his friend Mike Coley explained the reason for the drop in speed; "This is where the track work has started – just outside the tunnel mouth", he said as Alan got up to look out of the window. "Tonight they start inside the tunnel proper after the last train's passed".

Alan thrust his head out of the window to look at the site where Pat Dunne had been found. The tunnel entrance gaped open like some monster's mouth. He'd only just got his head out of the window when he was pulled – almost violently - back into the compartment. Turning, he saw it was Mike who'd pulled him back.

Mike, realising he'd probably overstepped the marks of friendship explained in an embarrassed voice that the cutting was so narrow he though Alan was in danger of hitting his head on chalk or brickwork. "In fact", he went on to explain "in a semi-open saloon coach the morning before, I saw someone have an extremely narrow escape. Some sort of foreigners they were".

Alan stared intently at his friend who then continued his story. "The eldest man literally fell backwards as he tried to dodge something as we went by and boy didn't he seem to be swearing in his language at the young lady and the other gentleman. Even though I couldn't understand a word of what was said, it made my ears hot"!

Three of them…and speaking in a foreign language? Surely there must be a connection with the 'Mystery Three' in the Citroën Alan thought to to himself. It was then he made his mind to find out more about Pat Dunne and any possible connection between him, the trio, lager and Verdun.

To be continued……..

Classic Transmitters For 70MHz
A Simple Two Valve Project & A Transistor Design

Rob Mannion G3XFD has been trawling through the archives again! With the generous support of Kevin Nice G7TZC, Editor of *Short Wave Magazine*, Rob's found two 'classic' 70MHz projects from the late 1960s to get you on the air.

Editorial note: The following two projects are republished from the April and October 1967 issue of *SWM* during a period of great interest in 70MHz. With minor editorial changes they're republished unchanged. The valve project formed the basis of my first n.b.f.m. transmitter, with the modulation for f.m. being applied at pin 9 on the ECF80/82. Incidentally, I have even used an ECL86 and ECL82 in this project - valves are very forgiving in this respect and even audio types can work remarkably efficiently on v.h.f. The EL85 specified for the project can be replaced by the EL84. I have also used the delightful little (B9A based) 6CH6 pentode as the p.a. stage, together with the equally remarkable (B7G based) N78 (which is used as an audio output valve in some Eddystone receivers). The 6CH6 valve will work well up to 144MHz - as will the N78 - and if you want to consider using a.m. (no reason why not on this band) clamp or choke modulation will work very well indeed. Please don't dismiss clamp or choke modulation - although not as efficient as 100% anode and screen modulation - it's very effective for simple equipment. An information panel is provided with the transistor transmitter - so there's no excuse for you not to have a go as you've got a choice of two projects! I built both and the transistorised transmitter was built in to my very first hand-held portable rig - working on 70.26MHz.

Rob G3XFD

QRP Transmitter For Four Metres

By R.S. Hewes G3TDR

(Original introduction)

As in the case of the Four metre converter described in our February issue, this article is also based on material appearing in the Echelford Amateur Radio Society Newsletter. The two units, RX and TX, together enable to start to be made on the 70Mc/s band, on which there is now a high level of activity, especially in the more populated areas of the country. It is an ideal band for local net working (with everybody involved having a crystal of the same frequency) and for mobile operation. Frequency changing is easy by the use of switched crystals.

This transmitter design, **Fig. 1**, is the companion to the 70MHz converter described in the February 1967 issue of *Short Wave Magazine*. It's a low power job, involving only two valves, an ECF82 and an EL85 as p.a. Physically, it's similar in size to the receiver unit. By crystal switching, a choice of operating frequency is possible. The EL85 in the p.a. can be run comfortably at 6W input, with plate and screen modulation using an external modulator (like the type used for 'Top Band').

Circuit Points

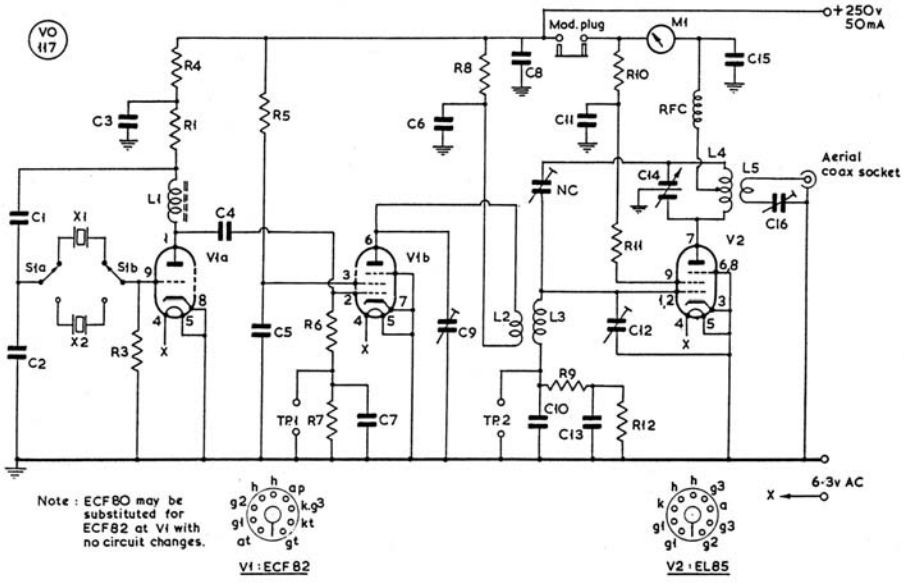
The valve, V1, with either X1 or X2 and associated circuitry, functions as an overtone oscillator, with a capacity tap, for the adjustment of feed back (values as given). Crystals X1 and X2 can be either FT-243 types in the 7.8MHz region, or an HC6U miniature 3rd harmonic (over-tone) crystal for some specified frequency for net working.

The V1b section of the ECF82 is inductively coupled into the neutralised p.a. stage V2, via L2/L3, wound on separate formers and spaced to just under an inch between centres. Test point TP2 is included in the grid circuit for setting up L2/C9 and L3/C12 to obtain optimum grid drive, which is about 1.1mA.

On the p.a. side, the tank L4 consists of a centre-trapped coil with associated split-stator capacitor C14, to enable a neutralising condenser NC to be fitted. (This neutralising device is no more than a pair of parallel wires - see table of values). Anti-phase voltages with respect to the p.a. anode are applied to its grid, through NC. It should be noted that the 'hot method' of neutralising (with the p.a. on) can be used and the neutralising. adjustment can be made effective over the whole 500kHz of the 70MHz band.

The antenna coupling coil L5 is positioned in the centre of L4 (not quite as suggested by the diagram). The antenna reactance is tuned out by C16, 75Ω coaxial cable being used to feed out to the beam.

For continuous monitoring of anode current, a 0-50mA meter is



● Fig. 1: Circuit diagram for the two valve (V1a and b are within the same glass envelope) 70MHz transmitter. Valve pin-out details are shown below the main circuit. (See text and Editorial note for further information)

Component List

Resistors
(Note: All are 0.25W unless indicated otherwise)

R1	33kΩ, 0.5W
R3	10kΩ
R4	12kΩ
R5	56kΩ
R6	47kΩ
R7, R12	1kΩ
R8	22kΩ
R9	22kΩ
R10	27kΩ, 0.5W
R11	100kΩ

Capacitors

C1	470pF
C2	39pF
C3, C5, C7, C8	3nF
C4	47pF
C6, C10, C11, C13	2nF
C9, C12, C16	30pF var.
C14	25pF, split stator
C15	1nF
NC	see Table

Table of Coil Data

L1	35 turns 28g enamelled wire. on 0.3in (8mm) former, with grade 500 iron-dust core
L2, L3	Each 5 turns 18g turns, spaced one wire diam., 0.5in (12mm) i.d., placed opposite at 0.875in (22mm) in between centres L4 4 turns plus 4 turns 18g enam. 0.5in (12mm) i.d., centre tapped with about 0.125in (3mm) in between sections for insertion L5
L5	2 turns p.v.c. 24g inserted at centre L4 mounted to be adjustable
RFC	40 inches (1m) of 38g, on 0.25in (6mm) polystyrene former one inch long
NC	Neutralising capacitor. Formed by two parallel lengths 18g enam. each 1.25in (32mm) long, spaced about 0.375in (10mm) apart (see text)

included in the p.a. anode; this should read about 25mA when L5 is adjusted for optimum coupling with L4. Modulation (anode and screen) is applied to the p.a., about 5W of audio power being required for really full control of the carrier. For this your Top Band modulator will do, or probably could be adapted. Total h.t. load is about 50mA at 250V maximum and LT current 0.65A for heaters parallel-fed at 6.3V.

Setting Up

Apply heater voltage and check that the valves are lighting up. With a crystal inserted in one of the switched sockets, apply h.t. at 250V maximum to the ECF82 only. (The modulator socket can be left open at this stage, thus conveniently disconnecting the h.t. to the p.a.).

With a high resistance voltmeter - preferably something like a 20kΩ ohms per volt (o.p.v.) instrument on its 2.5V range - across TP1, with its + side to chassis, adjust L1 core till a voltmeter reading of 0.75V is obtained, corresponding to 0.75mA through the 1kΩ resistor, R7. Now check that when the h.t. is switched off and on the circuit always oscillates, i.e. that the crystal oscillates easily and with certainty, if it does not, the core of L1 will have to be moved gently till correct functioning of the oscillator is ensured.

Now transfer the voltmeter to TP2, across R9, R12. Provided that L2/C9 and L3/C12 have been resonated near enough with the help of a grid dip oscillator (g.d.o.), the voltmeter should indicate some grid current flow. With the coils at the recommended displacement (see coil table), touch on C9 and C12 till the meter reads about 1.1V indicating grid drive of 1.1mA into the EL85.

Then apply h.t. to the p.a. (by shorting the modulator plug) having previously connected a 6V pea-bulb across the antenna socket, as a dummy load for tune up purposes. With L5 inserted about one third into L4, adjust to resonance with C14.

Anode current to the EL85 should read about 20-25mA, with the load bulb lighting to full brilliance. Then check on the neutralising. With the neutralising capacity NC adjusted as given with the coil data, the anode current should be minimum when grid drive is maximum (1.1V on the meter at TP2). It's when this condition is achieved that neutralising is correct.

If the readings are wildly out, adjust NC by bending the grid wire side either nearer to or further from the anode end. This can be done and it needs to be done very gently, with a pencil or a plastic trimming tool, not an insulated screwdriver, until the correct condition is obtained.

The same operation can be carried out 'cold' (no h.t. on the p.a.) by swinging C14 carefully and watching the grid current, which in this case means the voltmeter across TP2. If a sensitive meter is being used, such as a Heathkit V-7AU Valve Voltmeter on the 1.5V range, a flicker of the meter needle may be seen as C14 goes through resonance.

Note: The objective is so to position the NC wires that no movement of the meter needle can be discerned as C14 goes through resonance. The p.a. can then be regarded as being perfectly neutralised.

Next, with h.t. on the p.a. (via the external modulator) and the pea-bulb still acting as the dummy load, apply (about 5W of) modulating power. Whistling into the microphone should produce a brightening of the bulb, indicating incremental modulation.

Note: If you get decrement ('downwards') modulation, either C16 needs adjusting or you have not achieved correct neutralising of the EL85. All motions will then have to be gone through again, as what you have to see is a brightening of the pea-lamp under modulation. Reference books says "One 25% increase is a measure of 100% modulation'. If your Top Band modulator is providing the required 4-5W of audio output, there should be no difficulty about getting increment modulation when the

p.a. is correctly neutralised.

Incidentally, in case somebody is saying, "Why do I need 4-5W of audio for a 6W carrier input", the answer is that on v.h.f. * it's found that in practice rather more audio power than the usually accepted '50% of d.c. input' is required for full modulation.

*Though it has never been fully explained, the seemingly odd modulation anomaly is probably due to the fact that as the frequency goes up, it begins to relate to electron speed within the valve and its associated circuitry. In the present context, we need to take it no further than saying that by the time you get to 145MHz band, something like 80W of audio is needed to swing 100W of d.c. carrier to give the appearance of full modulation at that power input. Whatever the theory may propose, this is the fact. **Editor** *SWM (*1967).

Air Testing

While correct procedure is to use a reflected power meter to make sure that full r.f. is going into the antenna, if you have a resonant array outside, such as a 4-element Yagi proportioned for the 70MHz band, you should be able to take it that reasonable radiating efficiency is being achieved.

The transmitter as described here has been in use at G3TDR for some months and many favourable reports have been received, with contacts up to 25 miles or so. The beam at G3TDR (Staines, Middlesex) is a 4-element Yagi at 34ft.

This transmitter is now being used as it stands to drive a 6146 r.f. amplifier to 50W. The EL85 will push this p.a. hard enough to produce with ease 4mA through 22kΩ in the 6146 grid, representing 88V r.m.s. (the advantages of this approach are obvious - bags of drive without having to fight for it, two more tuned circuits at 70MHz helping to reduce unwanted harmonic radiation and of course a much bigger signal).

Finally

While construction can be in any reasonable shape or form, the G3TDR version of the QRP rig described here is built on a chassis about 7 by 4in with a 2in sub-space. Front and rear panels 7.5 by 3in enable the whole thing to be turned upside down without damaging anything in the upper chassis space.

The front panel carries the meter, centrally mounted, the crystal switch and the p.a. tank. The rear panel has the antenna socket in line with the tank coil, and L5 is connected directly to the antenna socket and C16.

On the rear drop of the chassis are the heater and h.t. supply inputs and the modulator socket. All other components are accommodated sub-chassis. If these general principles are followed, the circuit can be built up in the sequence suggested by the circuit layout.

PW

QRP Transistor Transmitter For Four Metres

This project, described as being "For Local Working, Using Transistors Throughout" by G.V. Entwisle G3MXT, was published in October 1967. It provided G3XFD with the transmitter side of his first home-brew 'hand-held' 70MHz transmitter-receiver. The article is re-published with minimal changes.

The circuit diagram, **Fig. 2**, shows a transmitter designed for the 70MHz (4m) band, using cheap and easily available transistors. Several of these rigs have been constructed and have proved to be easily repeatable and fairly tolerant of component values.

A piece of Lectrokit pin-board* measuring 4 3/4in x 4in provides ample space for an experimental layout. In fact two models, one for 70MHz and one for 144MHz were constructed without difficulty on Lectrokit strips measuring 4in x 2.5in, the miniature capacitors and resistors of the audio amplifier being closely grouped and mounted vertically.

A copper screen 1.5in or so high was placed between the modulator and r.f. section, **Fig. 3**, with a screen between the driver and p.a. stages. Coils and chokes are mounted at right angles to each other to reduce couplings. Inductances L1, L2 and L3 are air cored and self-supporting.

* Lectro Kit pin-board was a matrix board with a regular grid of holes, though which retaining pins could be fixed.

Circuit Points

The oscillator is of the overtone type and was found to produce third or fifth

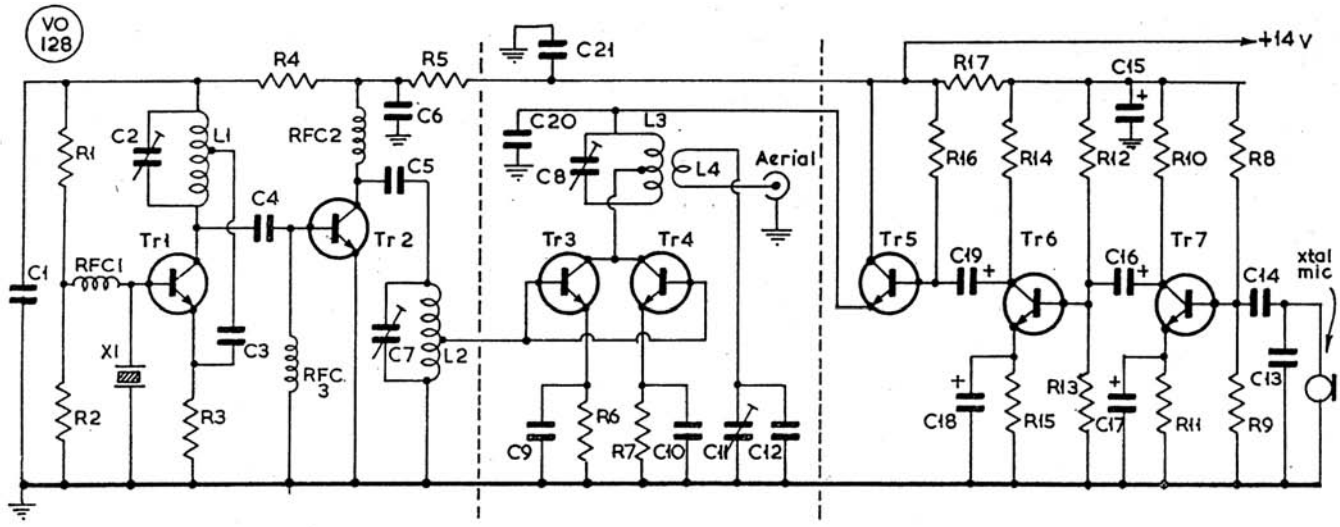


Fig. 2: Circuit of the QRP 70MHz transmitter design by G3MXT.

Fig. 1. Circuit of the G3MXT Transistor Transmitter for Four Metres.

Tex Swann G1TEX/M3NGS suggests alternative transistors for use in 2004: The actual devices used in the original project have long since disappeared from 'normal' view. All I've been able to find out about the P346A device is that it was made by SGS-ATES and that it was a switching transistor with an Ft (or Fab) of around 400MHz. The maximum Ic seems to have been quite low at around 10-15mA and no indication of a maximum Vce voltage.

As replacements on the r.f. side of things, an educated guess, would suggest that 2N918, BF199, BF494 or BFX73 along with ZTX320/321 or ZTX327 all seem to be possibilities. For the audio side, I believe that almost any general purpose audio transistor such as BC108/9, with a maximum current of at least 50mA would be adequate.

overtone oscillation quite readily, using 7MHz fundamental FT-243 crystals, i.e. 7.040MHz, fifth overtone 35.2MHz, 7.850MHz, third over-tone 23.55MHz. The circuit also works well with third or fifth overtone type crystals produced for the purpose.

The capacitors C2 and L1 resonate at the desired overtone frequency. The r.f. choke, RFC1, is nominally 1mH but values down to half this may be used equally well. Capacitor C3 can be any value between 47pF and 100pF and should be tapped to L1 at a point where the setting of C2 is not too critical. Progressively moving the tap towards the collector increases the output until a condition is reached where the crystal can no longer maintain control.

The transistor Tr2 operates as a frequency doubler or tripler, C7 and L2 resonate at 70MHz. The position of the tap on L2 determines the level of drive to the p.a. and the amount of loading on Tr2.

During experiments with this circuit, the driver and p.a. transistors were run at quite high temperatures, the driver in particular being almost too hot to touch - which says a lot for the ruggedness of the P346A! **(Editorial note - this transistor is no longer available, please see informtion panel for possible substitutes).** As the base tap is bought closer to its optimum position, the driver transistor runs cooler and the p.a. transistors warmer.

Setting Up

Initial tuning up may be carried out using a calibrated receiver with an S-meter, a 100Ω resistor should be temporarily connected across the transmitter antenna socket, as a load.

The combined value of C11 plus C12 should normally be between 50 and 150pF, depending on the antenna arrangements. At G3MXT a λ/4 wave whip has been used, as well as a coaxial cable fed 4-element beam. Note: Changing the antenna requirements readjustment of C11 and probably C8 as well, as there is some interaction between the two. Therefore, final tuning must be done with the antenna connected and with the aid of an indicating absorption wavemeter.

The method of applying modulation, though very simple, is nevertheless quite effective and reports on the air have been very favourable. The microphone in use was crystal insert and nothing more than the simple two stage audio amplifier show was required for adequate output.

With a 14V supply, the voltage of the p.a. was about 10V. When the transmitter was tuned up and operating, the p.a. current was in the region of 30mA.

The r.f. chokes RFC2 and RFC3 were made by close winding 36g enamelled wire on small 500kΩ resistors, using the resistor wire ends for connecting.

Though the input is of the order of only 300mW, good contacts are possible over local distances, e.g. RS-59 at 15 miles when using the 4-element Yagi and even with an indoor dipole, the signal gets out round the town. The author would like to record his thanks to G3RIK and G3SXT for their assistance, mentioning also that the same basic circuit can be used for the 144MHz band providing that a 72MHz overtone crystal is used.

PW

Table of Values

R1, R13	3.3kΩ
R2, R10, R14	4.7kΩ
R3	470Ω
R4	270Ω
R5	27Ω
R6, R7	47Ω
R8	82kΩ
R9	18kΩ
R11, R15	1kΩ
R12	22kΩ
R16	10kΩ
R17	1.5kΩ

Capacitors

C1, C6, C9, C10, C20, C21	10nF
C2, C7, C8	40pF, ceramic trimmer
C3, C13	100pF, s/mica
C4	4.7pF, s/mica
C5	220pF s/mica
C14	4,7nF
C15	20µF
C16, C17, C18, C19	6.4µF
C11, C12	see text

Transistors

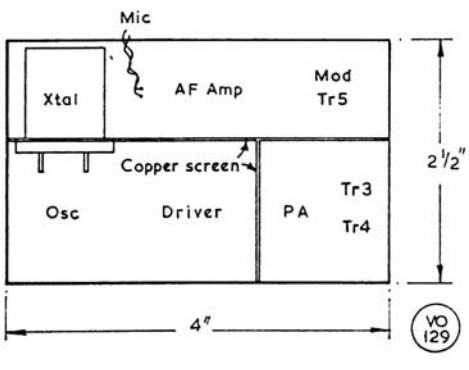
(See information panel)

Tr1, Tr2, Tr3, Tr4	See separate panel
Tr5	C426, 2N1302 or similar
Tr6	2N2926, orange
Tr7	2N2926 green

Table of Coil Data

L1	12 turns 22g. tinned copper, 0.5in (12mm) dia. by 0.75in (19mm) long, tapped 2.25 turns from cold end
L2	8 turns 22g tinned copper, 0.3in (8mm) dia by 0.5in (12mm) long centre tapped
L3	6 turns 20g. tinned, copper, 0.5in (12mm) by 5/8in long, collector tap, 3.5 turns from cold end
L4	4 turns 22g. p.v.c. close wound over cold end L3
RFC1, RFC2, RFC3	Wound on resistor bodies, see text

● Fig. 3: Suggested screened chassis assembly for the project (see text).



Project Goodwill

Professor John Share G3OKA, in response to an appeal by the RSGB for help in running an RAE course in Albania, recently spent three weeks in Tirana as part of Project Goodwill. Read on ...

For far too many decades Albania has been an isolated country located within the heart of Europe. Covering an area almost the equivalent of Wales it has a population of three million people but there are only 55 ZA Radio Amateurs.

For 40 years or so there was no Amateur Radio activity from Albania and as a consequence it became one of the most sought after DXCC countries. In 1991 following a political upheaval **Martti Laine OH2BH** made a breakthrough in obtaining permission to operate. He also succeeded in getting the first Albanian nationals to take-up Amateur Radio and obtain their own callsigns, many of this original group are still very active.

In early 2003 moves were made to inject renewed enthusiasm into the Albanian Amateur Radio scene by convincing the authorities of the benefits of international communication in the English language and the career opportunities it would provide for their young people. Thanks to incredible commitment and ceaseless effort by a number of people led by **Geni Mema ZA1B** and Martti OH2BH, the Albanian Ministry of Communication, the Ministry of Education and the University of Tirana agreed to run an undergraduate course based on the Radio Society of Great Britain's (RSGB) publication *The Radio Amateurs Examination Manual*.

The idea of the course was that it would lead participants onto gaining the CEPT level 1 Certificate, the internationally recognised qualification for an Amateur Radio Licence that's valid in all countries of the ITU. To give you an idea of the difficulties that had to be overcome it should be noted that Albania is not even a member of CEPT at this time!

Not surprisingly, the University of Tirana laid down strict conditions regarding the individual who was to be responsible for the day-to-day management of the course, be in daily contact with their students and direct their studies. It was my response to an appeal by the RSGB for such a person that led to the invitation for me to go to Tirana, Albania for three weeks in November 2003.

The RSGB kindly donated 50 copies of the *RAE Manual,* which were carried out to Tirana as excess baggage by **Roger Brown G3LQP** to ensure that they were directly to hand on the opening day of the course. The package weighed nearly 40kg - I know because Roger and I carried them in a holdall the 500 yards from the Hotel to the University! We didn't have enough energy to carry them up the steps and had to 'volunteer' two students in the best traditions of British Military Service - "you and you"!

On Air As ZA/G3OKA

One of the perks of accepting the invitation to travel to Tirana was a ZA Licence and the opportunity to operate the Amateur Radio station that had been set up at the Rogner Europapark Hotel for the many overseas visitors who were contributing to the program. It took me almost two months to obtain the Licences, partly because there is no reciprocal agreement and Geni ZA1B seemed to be knocking on the door of the Licencing Authority every day until one evening he appeared smiling like a 'Cheshire Cat'. A decade ago the Licence shown in this article would have been dismissed as a total forgery. However, I can assure you this one is absolutely genuine!

The demands of the course took a great toll on my spare time but I did manage a few sessions on 10MHz during the evenings. Using a dipole at 30m above street level resulted in Worked All Continents in just eight minutes on one occasion!

I spent the one completely free weekend I had operating on the 14 and 21MHz bands using a 6-element Yagi. This was placed 36m high on the roof of the hotel, and really put out a fantastic signal. I also spent

Albania

some time on the QRP frequency of 14.060MHz and many QRP stations were given their first contact with Albania.

When operating on s.s.b. it quickly became an instant 'pile-up' and no matter how I tried to split up the hoards that were calling, I ended up resorting to working the strongest of the pile. The pages of my log filled up at an incredible rate, ultimately I wearied of the 59 QRZ and decided to have a few 'home' contacts and a little chat with each one. Maybe you were fortunate and you're one of the list of UK stations I managed to work?

Albanians On Air?

If you are wondering why you don't hear or work many Albanians on the air, there are a couple of reasons for this. The first is likely do with the fact that the power supply has a nasty habit of dropping from a nominal 220V to as low as 90V. Almost daily it simply vanishes altogether without warning. No one can predict what the voltage will be when it is restored!

The effect on the power disappearing has a catastrophic effect on Amateur Radio, as there appears to be no outlets for spare parts anywhere in the entire country, so if the power supply becomes faulty due to the fluctuating mains supply then repair is almost impossible. However, I was fortunate during my operating in that the Hotel where I was staying had a massive generator that cut in automatically when the power failed.

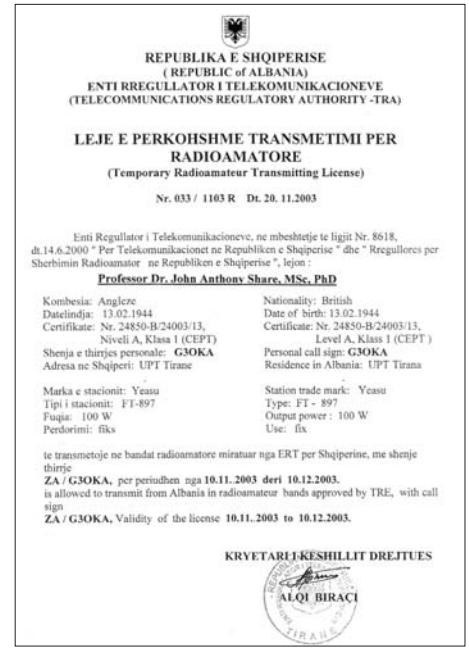
The other reason for the lack of activity is that the cost of even the most modest piece of Amateur Radio equipment is equivalent to the total earnings of the average family man for several months. It's only due to the generosity of Yaesu and the Northern California DX Federation (NCDF) that there are any rigs in Albania at all! Of the original consignment of rigs donated some ten years ago many are still being shared between the Licence holders on a rotating basis.

Excellent Students

The students I was teaching during my time in Tirana proved to be excellent. Their knowledge of electronics and telecommunications was superb and they enthusiastically learnt the special topics related to Amateur Radio. The theory section of the course was made-up of three weeks of intensive lectures in addition to their normal studies. The examination was to UK standard, Class A, CEPT level 1, as set out in the RAE Manual and was in English (not Albanian) - one student achieved a result of 100%

Yaesu, NCDXF and the IARU are still working to provide further equipment and have already donated an FT-1000MkV, Quadra Amplifier and a Yagi for a Club Station at the University of Tirana with the special callsign **ZA1UT**. So, listen out for them and if you hear a ZA station make sure you work them. Further information can be found at **www.ZA1A.COM**

● (Left to right): John G3OKA, Martti OH2BH, News reporter, Dedi ZA1D, Theo ZA1S being interviewed for article in *The Balkan*, a daily national newspaper. Photographed at the Rogner Hotel, Tirana, Albania.



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Professor Dr. John Anthony Share, MSc, PhD

Kombesia: Angleze	Nationality: British
Datelindja: 13.02.1944	Date of birth: 13.02.1944
Certifikate: Nr. 24850-B/24003/13, Niveli A, Klasa 1 (CEPT)	Certificate: Nr. 24850-B/24003/13, Level A, Klass 1 (CEPT)
Shenja e thirrjes personale: G3OKA	Personal call sign: G3OKA
Adresa ne Shqiperi: UPT Tirane	Residence in Albania: UPT Tirana
Marka e stacionit: Yeasu	Station trade mark: Yeasu
Tipi i stacionit: FT-897	Type: FT - 897
Fuqia: 100 W	Output power : 100 W
Perdorimi: fiks	Use: fix

te transmetoje ne bandat radioamatore miratuar nga ERT per Shqiperine, me shenje thirrje
ZA / G3OKA, per periudhen nga 10.11. 2003 deri 10.12.2003.
is allowed to transmit from Albania in radioamateur bands approved by TRE, with call sign
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KRYETARI I KESHILLIT DREJTUES
ALQI BIRAÇI

● John G30KA's licence was finally granted for him to operate as ZA/G30KA during his time spent in Tirana helping with Project Goodwill.

Thanks

My personal thanks for such a wonderful experience go to ZA1B, ZA1E, ZA1D, ZA1S, OH2BH, G3LQP, DJ7AJA, K9LA, AE9YL, K7WX, OH2PT, EA1QF, DJ2YA, I2KMP, ZA/Z35M, ZA/UT7DW and the dozens of other people I met and had the pleasure of working with in Albania as part of the project. Last but not least my thanks go to our very good friends at the University of Tirana. **PW**

Following his involvement with the Project Goodwill Albania 2003 project Professor John Share G3OKA University of Liverpool, has been made a Fellow of The University of Tirana.

The Dipper

Tim Walford G3PCJ describes his latest project...a dip meter which is designed to work from low frequencies up through to the h.f. bands. It's a versatile instrument, which will eventually include an optional digital frequency counter - making it even more versatile!

Welcome to the Dipper project! No, this is not about those delightful little birds associated with rivers – interesting as they are! Instead, the Editor, **Rob G3XFD**, has encouraged me to produce a modern version of the traditional valved grid dip oscillator, which would suit readers and help with future projects.

The Dipper has two modes of operation, firstly, when it's oscillating at a radio frequency (r.f.), to detect and indicate the unknown resonance point of a tuned circuit loosely coupled to the Dipper's own tuned circuits. Secondly, when not oscillating it can be used to absorb and indicate the frequency of some external source of r.f., such as a transmitter.

The design uses either ready-wound standard value moulded inductors to cover the range of about 180kHz* to over 30MHz, or your own 'specials'. The heading photograph shows the Dipper complete with its battery, etc.

***Note**: The Editor's opinion, based on his own experience, is that the lower frequency coverage increases the dipper's versatility. It's rare to see a dip meter with coverage below 1.6MHz nowadays and the Editor and I think the extra coverage will be very useful.

This article describes the Dipper itself. A second article will describe a specially designed matching frequency counter. (See panel on page 42 for details of both kits).

Principle of Operation

Let's now take a look at the principles of operation. The various stages are shown in the block diagram, **Fig. 1**, with the full circuit in **Fig. 2**.

Basically speaking, in the project's circuitry there's a free running r.f. oscillator that's connected to a sensitive r.f. voltmeter. This is arranged such that when r.f. energy is either 'sucked out', or injected into the Dippers resonant circuit, the changes in the r.f. voltage is displayed on the meter.

The r.f. oscillator in this dip meter has to cover a very wide frequency range so it's necessary to change the inductors using plug-in coils. And although the eight ready-made coils all have ferrite cores, nevertheless, sufficient magnetic field escapes outside the cores to be able to couple to unknown circuits.

However, after completing the project with the supplied inductors, you can substitute your own air-cored coils. These will much improve the sensitivity, allowing looser (desirable) coupling to the unknown circuit. Incidentally, the coils have only two connections making it much easier to build your own!

The oscillator uses two source coupled 2N3819 j.f.e.t. transistors. This allows Tr1 to be switched off by S1 for the absorption mode, while still allowing Tr2 to buffer the resonant circuit and drive the r.f. detector. At low frequencies, the gain of the oscillator loop is reduced, leading to stronger 'dips'.

The source of Tr2 has a low

The prototype *PW* Dipper as designed and built by Tim Walford G3PCJ. This dip meter, especially aimed at PW readers and home constructors, will be available as a kit. An add-on frequency counter project is to be published in *PW* and another kit will also be available.

- With A Difference!

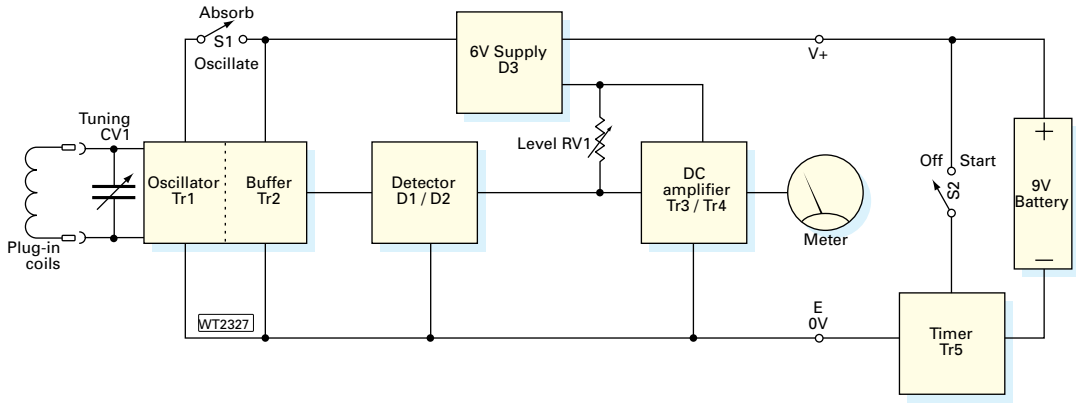

Fig. 1: Block diagram of the G3PCJ designed *PW* Dipper. The author provides a comprehensive description of the design within the text.

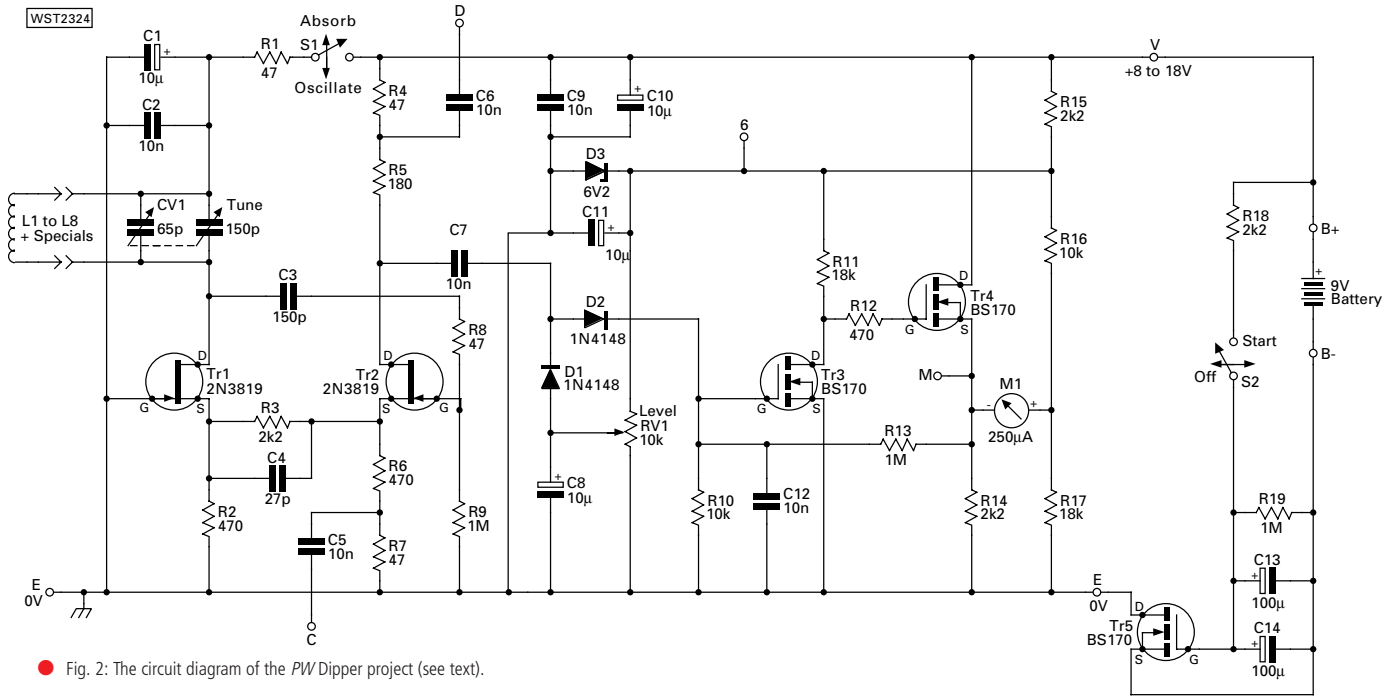

Fig. 2: The circuit diagram of the *PW* Dipper project (see text).

impedance output at point C; this can be connected to a counter indicating frequency for either mode. The r.f. detector itself is fed from the drain of Tr2 but the drain load is split, so that an external load connected to point D can influence the output r.f. voltage (more comments on this point later!).

A full wave r.f. detector, D1/2, is incorporated in the circuit, with a steady forward d.c. bias. This is used so that it can respond to small r.f. voltages below the 'knee' of the diode 'V/I' characteristic.

In practice it's necessary to cater for the wide range of r.f. voltages (high when oscillating, or low when absorbing). This brings the requirement to have a d.c. offset control, RV1, to set the detector's d.c. output level to within the input range of the following d.c. amplifier.

Meter Amplifier

A meter d.c. amplifier is included to improve sensitivity, partly for 'dipping' with the standard ferrite cored coils, but is especially helpful for absorption work with low level external r.f. sources. The amplifier uses two BS170 m.o.s.f.e.t. transistors Tr3 and 4 in a feed-back pair to provide high gain and low output impedance for driving the meter.

The amplifier has a level inversion, so the meter is connected on one side to a 'fixed' positive voltage above the normal amplifier mid-output level. So, when the r.f. level decreases as energy is 'sucked' out of the oscillator's tank circuit (causing the amplifier output to go positive), the actual meter reading actually then decreases in true dipper fashion.

Continued on page 42

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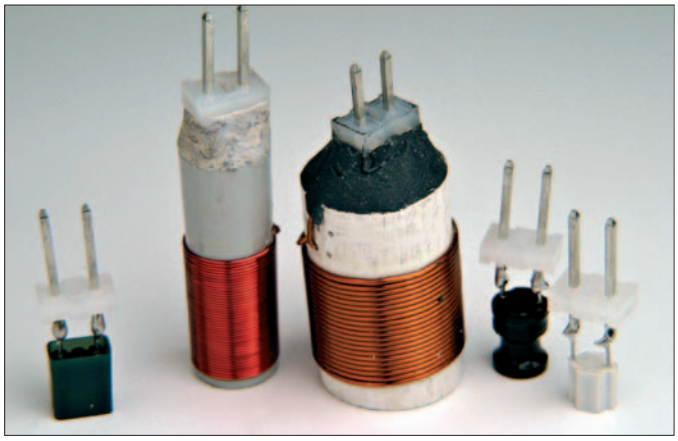


Fig. 3: Two alternative Dipper coils (centre) made by G3PCJ, both of about 9µH, together with examples of the standard coils prior to finishing with 'two part' synthetic resin putty (see text).

L1 (µH)	Markings	F(min) (MHz)	F(max) (MHz)
1	1R0	11.0	37.0
3	3R3	6.0	20.0
10	100	3.6	11 .0
33	330	1.9	6.0
100	101	1.1	3.3
330	331	0.610	2.4
1000	102	0.360	1.0
3300	332	0.1850	0.440

Table 1: Table, indicating the useful overlap between coil ranges achieved in the prototype PW Dipper (see text).

Finally, to make the dip meter easy to use, an integral battery is desirable - but they can go flat quickly if you forget to turn the equipment off! Hence the inclusion of Tr5 as a timer to keep it running for only about 4 minutes after the **On** button is released!

The zener diode, D3, provides a steady 6V supply for the critical circuits. This is to cater for the wide supply range of 8 to 18V required for battery or bench supplies.

Building The Dipper

Using printed circuit board (p.c.b.) material for the 'chassis' of the Dipper, makes it easy to mount the meter and the battery on opposite sides of the board. These are held in place by wire straps passing over the top of the meter face, and then around the battery. The wires are then soldered to pads where they pass through the p.c.b.

Next, the tuning capacitor CV1 is fitted at the opposite end of the p.c.b. However, before fitting the tuning knob, nine calibration marks should be made every 22.5° for the 180° rotation of CV1's shaft. The socket for the plug-in coils is then mounted on the end furthest from the meter.

Electrical assembly starts with the timer and zener reference, followed by the meter amplifier, which is easily checked with the meter and the meter level control RV1. Finally, the oscillator section is built and tested.

You'll need to choose an inductor whose likely coverage will include a frequency that you can easily monitor, preferably with a general coverage receiver having digital frequency readout. I used the standard 10µH coil, which should include the 7MHz band, and possibly others! It actually covered 3.6 to 11MHz indicating the typical 3:1 range for each coil. **Table 1** indicates the useful overlap between ranges achieved in the prototype.

Air Cored Inductors

Although the Dipper will work quite satisfactorily with the standard ferrite cored coils, air cored inductors will allow more field to escape and couple with the unknown circuit. In fact, they'll often produce the same strength 'dip' but at about double the separation between coils.

When the project is working satisfactorily using the standard coils, as I've already suggested, you

Fig. 4: Close up view of the Dipper meter and front panel (see text).

can experiment with your own 'specials'. To help, the photograph, **Fig. 3**, shows two alternatives I made, both of about 9µH, together with examples of the standard coils prior to finishing with 'two part' epoxy putty.

The resin-putty material can be moulded into the ends of the coil formers and over the soldered joints to secure the coil to the two pin plug. But only use it when you are

sure all is correct, as it sets rock hard!

Small diameter formers make it easier to couple with awkwardly placed coils but they do require many more turns! Incidentally, it's worth noting that the Dipper will work beyond the above frequency limits - both higher and lower - if you use smaller or larger inductor values respectively.

However, please bear in mind that you may find that the dipper will not oscillate over the full swing of CV1. This is because of the excessive LC ratios that are implied at both frequency extremes.

Frequency Calibration

If you plan to eventually use your dipper with a counter, accurate frequency calibration wont be required. On the other hand, without a counter, you'll need to draw up a table of frequency for all coils, for each of the 22.5° markings of the rotation of CV1. If necessary, you then are able to interpolate between these markings.

When you're ready to begin the calibration process, using a general coverage receiver whose antenna is near the dipper, you should listen for a strong carrier signal from the oscillator and record its frequency at each marker line position of CV1.

Start the calibration process using the largest inductor whose frequency range you can receive. **Note:** don't forget your domestic broadcast band radios, as well as any Amateur band receivers as possible tuning calibration aids.

In desperation, assume that any un-calibrated point is 1.75 times the value on the range immediately below! Harmonics can also be used with care – don't forget to divide the receiver's frequency by the probable harmonic number. The dipper's own harmonics will have a much higher tuning rate when you alter CV1. For example, the third harmonic of the top 1µH standard coil is likely to be heard near 90MHz on Band II f.m. radio, so you will have to divide the readout by three.

Using The Dipper

For most purposes, inductive coupling between the unknown resonant circuit and the Dipper gives best results. Start with the tightest or closest coupling that you can manage – always keeping the axes of the two coils parallel.

For each range you may need to adjust RV1 to have a comfortable meter reading (a close up view of the meter is provided in **Fig. 4**) before slowly sweeping the tuning when the coils are close together. Try the inductors inside each other, or end-to-end, or side-by-side.

Having a very rough idea of the probable unknown frequency will much reduce the number of coils that have to be tried with the unknown! When you have found a dip, gradually increase the separation of the coils and check that the dip does disappear!

The frequency readout will be most accurate with the least coupling; be aware that with very tight coupling, the unknown circuit may determine the frequency of oscillation causing a sudden jump in the meter reading as the frequencies or coils are separated.

You can also use the Dipper to measure the value of unknown inductors or capacitors, by resonating them with your own known 'standard' component; but then you have to do a little maths! When using the Dipper as an absorption wavemeter, you can couple to output resonant circuits of the transmitter, or add a whip antenna to increase the pick up from the transmitter's antenna.

The Dipper has extra facilities provided at point D. It can act as a simple signal generator, with a 50Ω output of roughly 400mV p-p permitting standard 50Ω switched attenuators to be connected here for lower output levels.

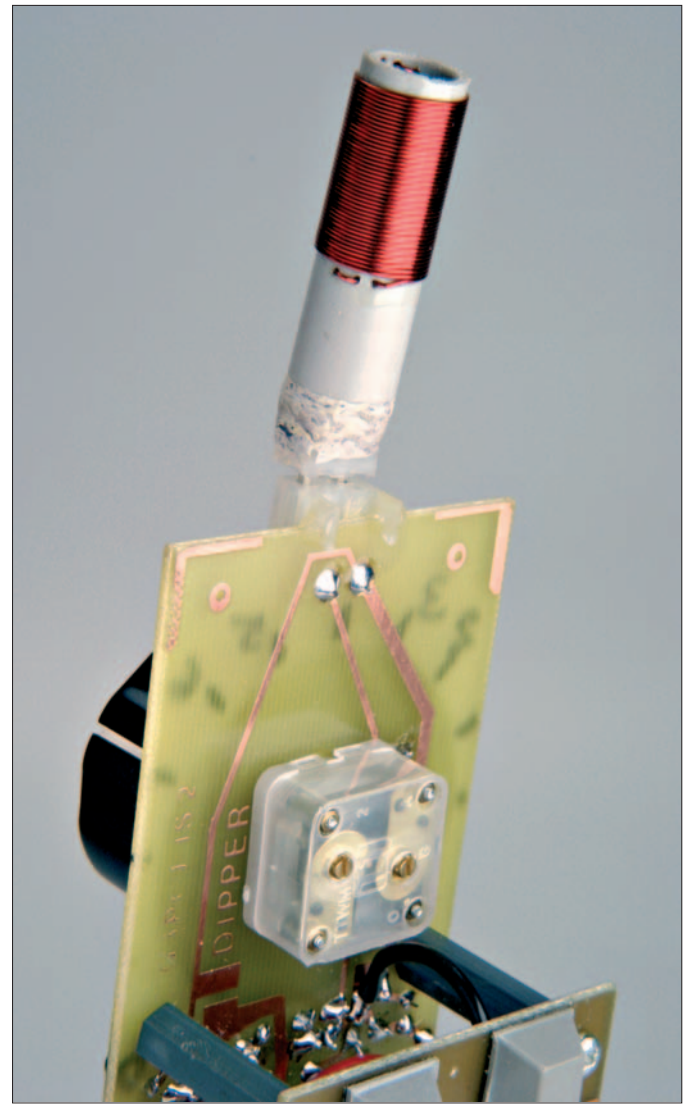


Fig. 5: Rear view of the 'open chassis' style Dipper (built using p.c.b. material) showing a home-made coil and the main tuning capacitor (see text).

The waveform is not sinusoidal, so the harmonics can be used to extend its upper frequency range. Furthermore, the impedance presented across R4 will affect the r.f. level fed to the detector – see what happens if you short D to the E line! This allows you to directly connect to other circuits, whose impedance varies with frequency, such as antennas or small link windings on difficult toroidal inductors, which are often used in resonant circuits.

Coupling an antenna feeder directly to point D (and E) will allow you to directly measure the antenna's resonant frequency. (Do such tests as quickly as possible). The kit instructions explain all aspects rather more fully.

In short, this is a extremely versatile instrument, which is much enhanced with the dedicated counter. And this will be the next stage of the project. Watch this space!

PW

Buying Your Dipper Kit

A complete kit for the Dipper is available from Walford Electronics. The kit includes the 50 x 160mm p.c.b., meter, battery, tuning capacitor, knobs and all parts to build as in the heading photograph (but without the optional frequency display). Eight standard value factory-made coils are included with two spare plugs for your own special coils. The price is £44.

The specially designed three digit counter (to be featured in *PW* as a separate, add-on project), will indicate the frequency as XY.ZMHz, and will mount below the Dipper, uses a 50 x 160mm p.c.b. and will cost £35. If ordered together, the price is discounted to £74. Post and packing is £2. Please send your orders with a cheque direct to **Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ**. Further information is available on the Walford Electronics website at **www.users.globalnet.co.uk/~walfor**

Antenna Workshop

Geoff Cottrell G3XGC needed a low visual impact antenna for the 50MHz band. His antenna of choice? A Moxon Rectangle.

A Moxon Rectangle for Six Metres

I live in a crowded suburban area where the erection of masts and big beam antennas would definitely be frowned upon by the neighbours. With the up and coming spring DX season, I needed an antenna that could deliver good performance on the 'Magic Band' and have low visual impact. For the past couple of years, my simple rotatable dipole has antenna worked reasonably well, except the noise pick-up that came off the 'back' of the antenna.

I found the very attractive antenna designs based on **Fred Caton VK2ABQ**'s design which **Les Moxon G6XN** developed into the 2-element beam known as the Moxon Rectangle. Compared with a conventional two-element Yagi, the Moxon rectangle, **Fig. 1**, has a marginally lower forward gain, a better front-to-back ratio and smaller dimensions. The antenna described here provides a good match to 50Ω coaxial cable, should handle at least 100W and was built in a day with a total cost less than £25.

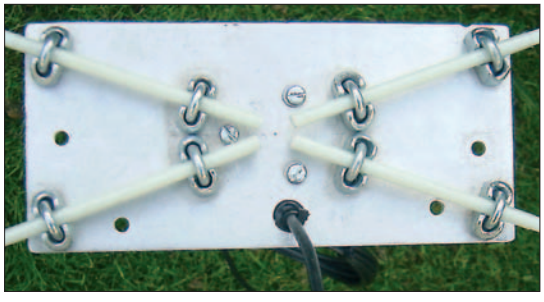
For simplicity, low cost and low visual impact, the wire antenna was designed for 50.15MHz, the centre of the DX end of the band. The wires are supported by four springy glass-fibre (g.r.p.) rods, their springiness keeps the wires in tension and so maintains the rectangular shape. With the minimum amount of the structure held aloft in the sky, weight and wind loading is also kept to a minimum.

I hit on the idea of using 1.5 metre long, 6mm diameter solid g.r.p. rods from cycle safety flags. They're cheap and once the dayglow orange plastic sheath has been carefully removed using a Stanley knife, are exactly what is needed. Carbon fibre rods, often used for kite stiffeners, should **not be used** as their electrical conductivity may affect the antenna pattern.

The assembled wire Moxon Rectangle for 50MHz on its stub-mast, about to be installed 10m up on the roof. Note the upward tensioning curve of the g.r.p. spreaders and the location of the feeder together with its six-turn choke balun. The whole assembly weighs about 1.5kg.

Aluminium Base Plate

Start by cutting the rectangular 3mm thick aluminium base plate. Accurately mark the centre and lines to be followed by the spreaders. The included angle between the spreader pairs is 43° on the narrow side of the plate. The main thing at this stage is to get this angle right so that the rods do not bend out of the vertical plane when the antenna wires are tensioned. Drill 4mm holes as shown for the clamp-down U-bolts.



Top view of the 200mm x 95mm x 3mm thick aluminium base plate. The all-important angle between the spreaders on each of the narrow sides of the beam is 43°. The 50Ω RG58 coaxial cable passes through a hole (+ grommet) in the plate, and is supported by a cable tie. The three bolts near the centre support the mast flange underneath.

The inner four are positioned 35mm and the outer four are 97mm from the centre. Three extra holes are also drilled around the centre of the mounting plate to take a flange for the support pole. In my case, I used a spare piece of 25mm diameter aluminium tube that was in the junk box. Using a hack-saw, the glass-fibre rods are each carefully cut to a length of 1200mm. Before cutting or drilling g.r.p., first wind pvc tape around the area to be cut.

To hold the wires in place, I drilled 2mm holes through the rods, 25mm from the outer ends. Drilling through the centre of the rods is eased by first filing a shallow flat on the rod's surface. Any rough edges around these holes should be removed with a needle file. The holes are just large enough to accept the Teflon-covered wire. Four 50mm lengths of plastic tubing are then heat-shrunk on the ends of the rods and the pre-drilled holes opened up. The heat-shrink is there to prevent any chafing of the wire and de-lamination of the rod.

The antenna wires are cut somewhat over-length to the dimensions given in Fig. 1 and then trimmed them down slightly during tests. A 'chocolate-block' connector is used to physically join the two driven-element wires (and later serves as the 50Ω coaxial cable feed-point connector). It's helpful to carefully measure and mark the positions on the wires where they will pass through the spreader rods. The two insulators were made from the clear plastic barrels of old ball-point pens, cut to 80mm, with 2mm diameter holes drilled through some 5mm in from the ends.

The antenna can now be assembled. Four pieces of heat-shrink tubing, about 80mm long, are slipped over the inner ends of the rods. These are there to spread the load of the U-bolts. The rods are then trial-clamped in position and rotated to align the holes at the far ends in the plane of the base plate. The inner ends of the rods should each be about 10mm from the centre of the plate. The U-bolts can now be tightened to grip the rods, do not to overtighten these clamps.

Flat Surface

With the assembly lying on a flat surface, the antenna wires are next fed through the four holes in the spreaders, following the layout of Fig. 1. One end of each of the plastic insulators is first attached to two free wire ends. The over length is stripped back 50mm and fed through the holes and the end is simply bent back and wound round itself to secure. By bringing together a wire and its corresponding insulator, it will then be possible to join them to complete the rectangle. Note that the spreaders will bend up slightly.

As the second insulator is joined to the wire, the spreaders will lift up to a final height of about 200–400mm, imparting full tension to the rectangle. During this part of the assembly the spreaders can either flip up or down. As every bit of antenna height counts, make sure they flip upwards! Carefully slide the wires through the holes at the ends of the spreaders to align with the reference marks made earlier.

Next you should check all the measurements accurately against the values given in Fig. 1. With accurate wire dimensions, the spreaders, if correctly positioned on the base plate, will simply lift up in the vertical plane, with no sideways twists. There is enough tension in the system to hold the wires securely with very little sag.

For feeder, I used RG-58 50Ω coaxial cable screwed directly into the feed connector. The joint is covered with a good layer of self-amalgamating tape to keep the weather out. The coaxial cable emerges from below a supporting hole drilled in the base plate with the feed point end being supported by the wire tension. For such a short cable span, this did not cause any significant feed point droop.

For heavier feed cables, it would be easy to include a g.r.p. stub support to carry the cable weight. In the cable run back to the shack, I wound a simple six-turn 150mm diameter choke balun just under the base plate. Held together with cable ties, the balun is more than adequate to remove any if from the outer conductor of the coaxial cable.

Trim To Optimise

I had to trim the dimensions to optimise the antenna at my location and I ended up with: A as 2063, B as 304, C as 70, D as 388 and E as 756mm. With these values the s.w.r. was 1:1 at 50.15MHz and the 2:1 s.w.r. bandwidth was more than adequate to cover the DX window portions of the 50MHz band. The computer generated beam pattern is shown in the illustration of **Fig. 2**.

Depending on a particular installation, you will probably also need to fine tune the lengths to obtain the correct resonance. For higher in the 50MHz band, the dimensions need to be reduced from the optimum values given above. You could use the on-line Moxon rectangle calculator‡ to scale the dimensions accordingly. Note that there is no need to re-drill the spreaders as they will automatically bend to the new dimensions.

For portable operation, you could use short metal tubes attached to the base plate to hold the rods. The longest part of the disassembled antenna structure would then be only 1.2m long. The spreaders could then be quickly inserted to assemble the antenna. For long-term fixed use, it would be a good idea to paint the g.r.p. poles with ultra-violet resistant boat paint to prevent any deterioration.

The antenna described here was first used during a Sporadic E opening to Europe in May 2003. Signals were coming in loudest with the antenna pointing broadly towards the european mainland. Rotating the antenna 180° away from this direction caused the signals to all but disappear into the noise, consistent with the expected large front-to-back ratio. On transmit, and using only 8W c.w. and s.s.b. power, I received excellent signal reports from stations as far away as the Ukraine (a new one for me!).

On reception, I found the Moxon Rectangle to be extremely quiet 'off the back' compared with the dipole. I had planned to include a photo of the erected beam on the roof of my house. However, owing to the designed-in low visual impact, the photo I took hardly showed the antenna at all! Let's hope my neighbours agree. **PW**

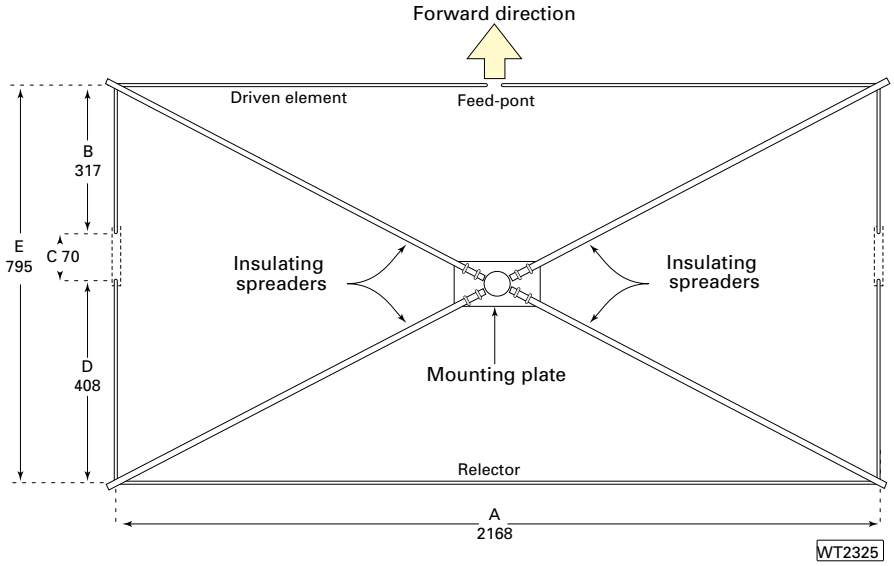


Fig. 1: Plan view of the wire Moxon Rectangle. At the chosen operational frequency of 50.15MHz, the computer model wire dimension may need tweaking to give matching at your location. (See text for my final values).

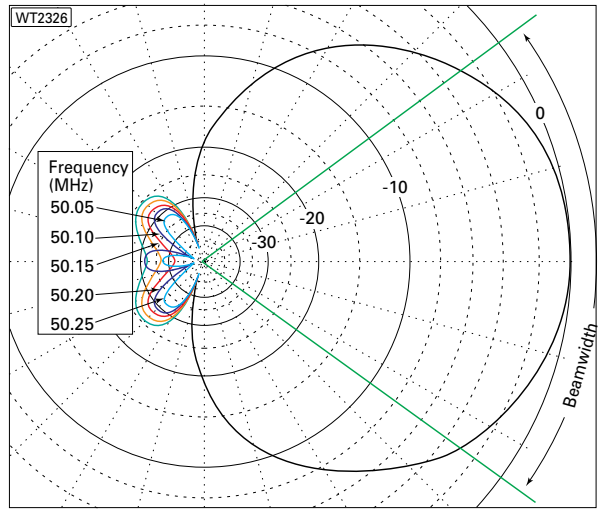


Fig. 2: A graphical representation of the free-space azimuth pattern of the 50MHz Moxon Rectangle. The range of frequencies is shown by the colour legend. The beamwidth at the -3dB points (marked lines) is 78.6°. See p.36 *PW* June 2003 for a description of the EZNEC model used to calculate this pattern.

References:

HF Antennas for All Locations RSGB - Les Moxon G6XN p.197

Weblinks

www.cebik.com/moxpage.html
www.qsl.net/ac6la/moxgen.html

The Kenwood TM-271E 144

The first thing that Richard G0RSN really noticed about this rig was just how much it looked and felt like a transceiver that can be seen on the private mobile radio (p.m.r.) market. But he finishes by saying: "don't be fooled, underneath this rather modest exterior I found a rig packed with punch"!

Richard Newton G0RSN has been enjoying himself on the air with an interesting Kenwood transceiver providing unusual styling and hidden talent. Read on to see what Richard has to say!

I've noticed recently there's a definite return to more 'user-friendly' rigs with simple controls. The Kenwood TM-271E is a good example of this.

The TM-271E impressed me on first glance. It's sleek but rugged in design. It measures 160mm wide, 43mm high and 137mm deep - not including protrusions.

For those who want or need a little extra power you'll be no doubt pleased to learn that the TM-271E offers a rather potent 60W maximum output transmit power. So, I wasn't surprised to find a significant amount of the rig, **Figs. 1** and **2**, was actually the heat sink!

The only other power setting on the rig is the 25W 'low' setting. However, I have to confess that 25W is not really low power in my book, but I guess it is lower than 60W!

The rig is supplied with a rather wonderful DTMF microphone and mounting clip. The microphone can be used for direct entry of frequency into the TM-271E, and I think it's a very useful feature. The rig is also supplied with a very comprehensive instruction manual, d.c. power lead, spare fuse and mobile mounting bracket.

Private Mobile Radio?

The first thing that really struck me about this rig was just how much it looked and felt like a transceiver that can be seen on the private mobile radio (p.m.r.) market. However, the idea of using rugged and uncomplicated p.m.r. kit has not been lost on the Amateur Radio enthusiast. I say this of course, because many Amateurs, including myself, have been converting old p.m.r. kit to Amateur frequencies as an inexpensive way of getting on air.

Perhaps the manufacturers have seen the possible benefits in offering the p.m.r. style option to the Amateur market with brand new equipment? This suggests itself to me because the Kenwood TM-271E for example covers a wide range of frequencies, 136 – 174MHz on receive. But, for the Amateur market it's supplied to only transmit on the 144 – 146MHz band.

In my opinion the TM-271E really does bear a striking resemblance to a p.m.r. radio. Despite this similarity though, you only have to look at the rather impressive array of features and functions listed for the transceiver to clearly see it's definitely a radio designed for the discerning Amateur Radio enthusiast.

The transceiver's push button controls are rubberised and well labelled and the features are geared to a mobile operator. In fact, I was particularly delighted to see the **Reverse** function as a primary use of one of the buttons. This is used for checking the input frequency of a repeater when you want to quickly check whether you're in simplex range of any station. I find this function very useful.

Just imagine how impressed I was to learn that you could even get the TM-271E to automatically check the signal strength of the station you are working via a repeater.

The rig will periodically check the input frequency and if it thinks that simplex contact can be made it flashes an **R** at you on the display to alert you, wow! It is still up to you whether you go simplex of course!

The other functions available at a single push are **Memory** and **VFO** and access to the **Call** channel. The last button can be used to **Lock** the function keys to guard against accidental use by large clumsy fingers or small inquisitive ones!

The only function I would have really liked to see that's not on the front panel, is being able to switch between high and low power. However, the supplied DTMF microphone can easily be programmed with four different functions. So, I just assigned one of the microphone buttons to toggle between high and low power. **Up-date:** Please see note on page 47. **Editor**

Other functions and features offered by the TM-271E are a maximum of 200 memories; this reduces to 100 if you want to assign the memories alphanumeric names. It also offers CTCSS and DCS squelch control systems to minimise unwanted signals.

User Menu

As with most modern rigs almost all the features and functions are programmable via

4MHz FM Transceiver

a user menu. However, as I began to play with the rig I discovered that it was amazingly easy to operate.

The user menu is easily accessed via the front panel keys. Each menu feature is alphanumerically labelled, ensuring navigating and configuring the rig is a real 'breeze'.

The display on the Kenwood TM-271E is relatively large for its size; the read-out is very clear and is complimented by a good back light. The supplied microphone is also backlit, wonderful!

Another feature of the rig's design was that the speaker was situated at the front of the rig. Here I have to say that the audio quality and clarity was excellent and when mounted to a vehicle having the speaker on the front of the rig would be a real bonus. (The rear panel does have a connection for an external speaker if you desire).

The rear panel is also home to the N-type antenna socket, and a short lead for data connection. **Note**: the data connection feature is only available on the E version of the rig. It's a six-pin mini din socket for use with an optional PG-5A data cable. This will enable dedicated connection to a TNC at either 1200 or 9600bps.

The Kenwood TM-271E also offers the user several advanced and flexible scan types for memory and v.f.o. There's also along a 'constant watch' priority channel should you want it.

Owner Programmed

The TM-271E has the ability to be programmed by the owner using a computer and a programming lead. The lead connects to the serial port of the computer and the modular microphone socket on the rig.

The software is basic but very functional and is available as a free download from Kenwood. I was also loaned the programming cable for the review and downloaded the programme from the Kenwood site.

The software is a self-extracting .exe file 1.52MB in size. So, even with my meagre 56kb dial-up Internet connection it would not take too long to download. However, thanks to **Terry 2E1EJC** and his broadband connection, it took very little time indeed!

The cable supplied had a 25 pin serial connector and I haven't seen those in years! Fortunately, I managed to find a 25 to 9 way adapter in my computer bits bin and connected it up to the one serial port on my grand old P75 in the shack.

Installing the software was a dream; I use Windows 95 in the shack and had no problems. Later I installed the software on my laptop using Windows XP, again it worked without a hitch.

The software is simple but easy to navigate and covers most of the menu functions of the rig. Most importantly, the software allows you to configure the memories with consummate ease.

It only took me a few minutes from starting the install to starting to programme the rig. The transfer speed was excellent.

Tip: I'll now pass on a useful tip that I learned the hard way when using programming software. From experience I've found that it's important to read from the rig first, before you do anything, then use the save as menu and then use that file as a template.

The advice may seem like common sense to some of you but I really do speak from experience! For example, I have in the past fired up the software and been keen to try it out and have changed default settings on the software, added

Fig. 1: Close-up view of the massive heat-sinking for the 60W transceiver (see text).

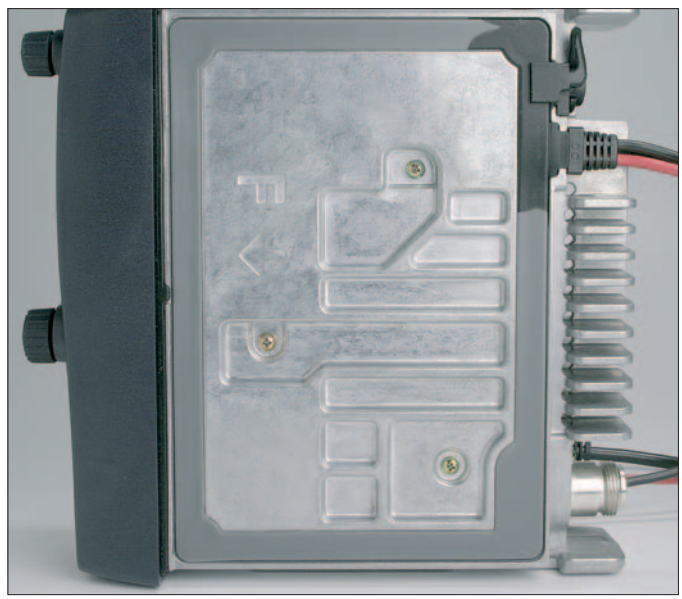


Fig. 2: Underside view of the TM-271E, clearly showing the die-cast aluminium chassis and heat-sinking.

Continued on page 48

Product

Kenwood TM-271E

Company

Kenwood Electronics UK Ltd.

Contact

Sales & Marketing, Communications Division
Tel: (01923) 655284

Pros and Cons

Pros: I wouldn't say the receiver was completely immune to interference but it did very well indeed! Actually, the feature that helped in rejecting unwanted signals was the TM-271E's Narrow function. The TM-271E is a force to be reckoned with.

Cons: The TM-271E doesn't have a detachable control panel 'head' (see text).

Price

Available in the £200 range.

Summary

What a breath of fresh air the Kenwood TM-271E is! It's simple and easy to use, professionally finished and rugged looking with the minimum of controls. So, don't be fooled, underneath this rather modest exterior I found a rig packed with punch.

Supplier

*My thanks go to **Kenwood Electronics UK Ltd., Kenwood House, Dwight Road, Watford, Hertfordshire WD18 9EB**, for the loan of the review transceiver.*

Power level up-date from Kenwood

Dave Wilkins G5HY (from Kenwood) acting on Richard's comments, checked regarding the facilities for low power adjustment on early models to arrive in the UK. Lower power setting is possible, and the procedure should be quite straightforward via software adjustments from the front panel controls. Anyone requiring the lower power options, are advised to check with their supplying dealer for advice, who will themselves be up-dated by Kenwood. **Editor.**

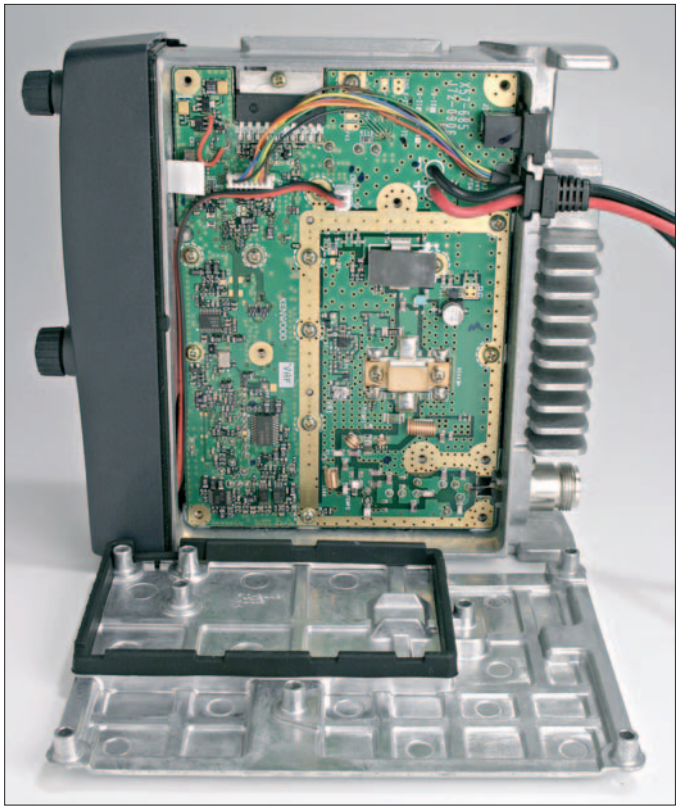


Fig 3: Inside (under chassis view) of the transceiver.

memories and then just written to the rig before doing anything else. My TM-D700E didn't like this treatment one little bit!

On the Air

After I had the rig all programmed up I decided to try it on air. I had already used it to listen to the local Marine Band, which is another radio themed hobby of mine. For a non-dedicated rig I was impressed with the results.

The TM-271E doesn't have a detachable control panel 'head' and because of this I found it difficult to install it into my car. Had the rig been mine to keep, I may have been able to find a place for it but as it was only a temporary addition to the family, I ended up strapping it down to the seat beside me. As a result I didn't, therefore, do much mobile 'on the move' operating.

The most important factor for me is to report how the TM-271E coped with the myriad of troublesome pager 'nests' that are around in my part of Dorset. And I'm pleased to confirm I was impressed with the results. I wouldn't say the receiver was completely immune to interference but it did very well indeed!

Actually, the feature that helped in rejecting unwanted signals was the TM-271E's **Narrow** function. This actually changes some of the default settings on the TM-721E on both transmit and receive.

For example, the default ±5kHz maximum frequency deviation on transmit is reduced to ±2.5 kHz when in Narrow mode. The sensitivity (12dB SINAD) changes from the default 0.18µV or less to 0.22µV or less. The selectivity (-6dB) changes from 12kHz or more in **Wide** to 10kHz or more in Narrow mode. (The selectivity (-60dB) is 30kHz or less in Wide but is 24kHz or less in Narrow).

Note: Due to the power of this transceiver there's one important rule to remember - don't transmit for long periods from the car without the engine running! However, when evaluating the rig at home, I used my Manson EP925 variable voltage power supply.

The EP925 has a voltmeter and Ammeter on it. I set it to 13.8 volts d.c. and measured the current consumption of the TM-271E on transmit into a dummy load. On high power it was 11A and on the lower power setting, the transmit current was 6-7A.

Controlled Environment

Although the mobile tests had gone well I wanted to get some reports on the TM-271E in a more controlled environment than the car. So, I set it up in my temporary shack in the garage and connected it to my WX2 vertical collinear antenna

I called up on the local net frequency on 145MHz and my father-in-law, **Terry G7VJJ** who was on his hand-held about 6km down the road from me answered. Terry told me that the audio from the TM-271E was "really good". He also went on to say that it was "lovely and clear, not too 'basey' like your normal rig is"! (Thanks Terry!).

My next contact was with **Terry 2E1EJC** in Blandford Forum, about 20km from my home north of Bournemouth. Terry was using a mobile rig in his shack and a WX1 on the side of the house. He was very complimentary about the TM-271E and reported that I was "a wonderful signal, with good audio".

Having received good reports from two Amateurs I knew, I thought it was important to get the opinion of someone I didn't know. So, I called on 145.5MHz and a mobile station replied.

My contact was **Steve G7EXZ/M,** who was in Salisbury some 35km from me. The topography between us is not good for radio but Steve reported that "my signal was terrific". He said, "I returned your call because I thought you were local, sounds like you are just round the corner from me".

Incidentally, I had noticed that Steve's audio was good but sounded just a bit thin, conversely he told me that, "your audio has a bit of a punch Richard, my poor old speaker is rattling"!

It transpired that Steve was using an old p.m.r. rig in his car with a 5λ/8 wave for 144MHz. Steve had converted an Icom IC-F1010 to Amateur frequencies. I immediately thought of the Narrow feature on the TM-271E. So, I asked Steve to standby and changed to Narrow mode. The results were amazing. Steve's audio now sounded perfect and in return reported that my received signal had also improved dramatically.

Fresh Air

In conclusion, what a breath of fresh air the Kenwood TM-271E is! It's simple and easy to use, professionally finished and rugged looking with the minimum of controls.

So, don't be fooled, underneath this rather modest exterior I found a rig packed with punch. The TM-271E is a force to be reckoned with.

PW

Fig. 4: Richard G0RSN busy on the air using the Kenwood TM-271E (see text).

Turn on the Toroids

Walter Farrar G3ESP says that winding toroidal inductors isn't such a difficult job. Here he presents some information that makes it even easier!

The winding of inductors on toroid cores was a wonderful innovation for the Amateur Radio constructor, marred only by an apparent lack of immediate information. For example, a circuit specifies a 6.8µH (microhenry) coil, but perhaps gives no other information. The following notes aim to rectify any omissions in this respect.

The toroid cores considered here are made from powdered iron of various qualities and form a shape somewhat like a mint with a hole. The type numbers start with T, followed by a number which, when divided by 100, is approximately the outside diameter in inches, e.g. T50 is 0.5in in diameter while a T68 core is 0.68in across.

The magnetic property of the toroid material adds, after a dash, a further figure (e.g. T50-2, T68-6), and for ease of recognition, the cores are 'painted' in various colours. The two materials I'll consider are: red for type 2 material and yellow for type 6. The type of material indicates a measure of the preferred frequency range. Type 2 (red) is good up to 30MHz, while the Type 6 (yellow) range serves from 10 to 250MHz (though these figures are far from fixed).

There are many variations of physical size and of core type, but for the Amateur Radio purposes, the most popular cores are T37-2, T37-6, T50-2, T50-6, T68-2 and T68-6 with external diameters respectively of 0.37, 0.5 and 0.68in (9.4, 12.7 and 17.3mm).

The Radio Amateur 'Bible' *Solid State Design for the Radio Amateur* gives a formula for calculating either the turns required for a given inductance or the inductance provided by a given number of turns.

$$L + KN^2 \quad \text{or} \quad N = \sqrt{\frac{L}{K}}$$

Where **L** is the inductance in nH (nanohenrys), **N** is the number of turns, **K** is a constant for the core material. However, it is a bind having to do these calculations every time, so I have produced a large table‡ to save you the trouble!

However, first a word (or two) of warning. If you carefully wind, say, 30 turns of wire on a toroid core, then, on a similar toroid wind another 30 turns, have you made two 'identical' inductors? Most likely not, because the inductance depends not only on the calculated value, but also on the spacing of the turns, the tightness of the winding, the thickness (gauge) of the wire the amount of core 'covered' by the wire. So the inductance values given in the table are theoretical values, but provide a good approximation to the actual inductance achieved by the winding.

By the way, to avoid wasting wire, you need to cut the required length. So, to help here are the lengths for one turn, using 26s.w.g. (0.45mm) wire (which I usually use). On the T37 core you need 13mm, on a T50 you'll need 16mm and on a T68 core 19mm for each turn. Multiply this figure by the number of turns, then add a little (say 200mm or so) to be on the safe side. Then, if after winding, you have long ends, you can always cut some off, but if the wire is too short...!

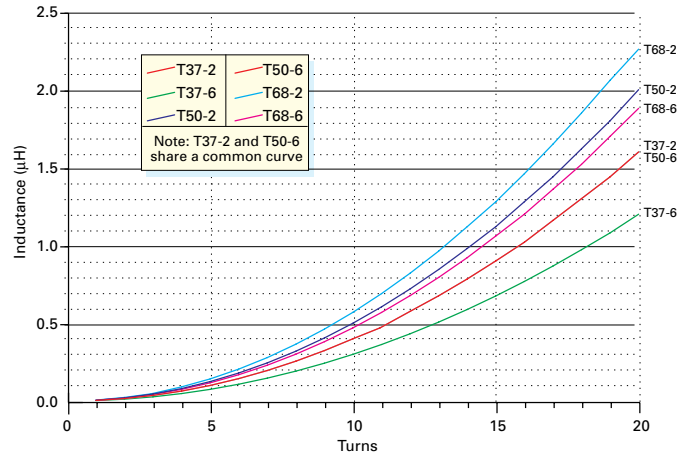


Fig. 1: The approximate value of inductance formed when winding between one and 20 turns on various toroidal cores. See text for more detail.

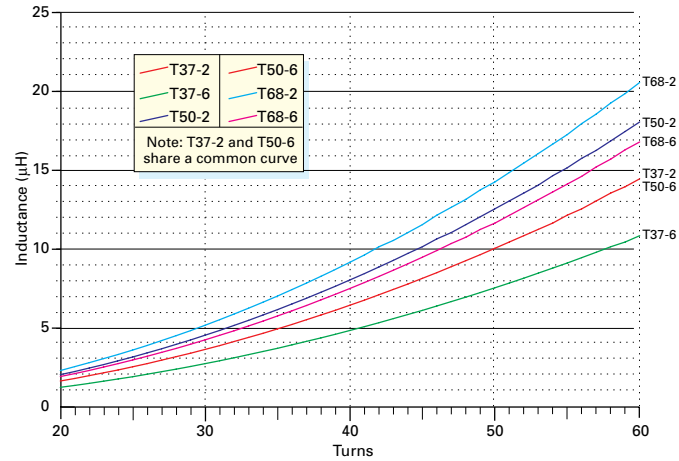


Fig. 2: Similar to Fig. 1, but this time winding between 20 and 60 turns on various toroidal cores. See text for more detail.

So, there you have it. A short 'course' on toroid winding, anyhow you no longer have an excuse to ignore them so, make your next coil a toroidal one!

PW

‡ Table of inductance values.

To obtain a copy of Walter's original large table presented as text, please send a stamped self addressed envelope to the editorial offices marked 'Toroidal Table'.

carrying on the practical way

"There are three principal means of acquiring knowledge ... observation of nature, reflection, and experimentation. Observation collects facts; reflection combines them; experimentation verifies the result of that combination".
Denis Diderot (1713 - 1784)

This month the Rev. George Dobbs G3RJV provides what he describes as "A Few Transistor Facts". The idea is to help his many keen readers identify semiconductors suitable for projects. Armed with the information George provides you should also identify some bargain devices...after reading the quotation!

This month, at the suggestion of our noble Editor, I'm devoting the column to looking into some of the transistors I use in COTPW projects. Incidentally, there's nothing (usually) esoteric or special about the devices I use!

More often than not my choice merely depends upon what I have to hand. And what's actually 'handy' is mainly the result of what I've been able to buy cheaply.

As readers will have noted, I often describe the transistor types used for COTPW projects as 'generic' in the sense that any transistor that would do a similar job could be used in the circuit. That's fine of course, as long as the reader knows what might serve the purpose.

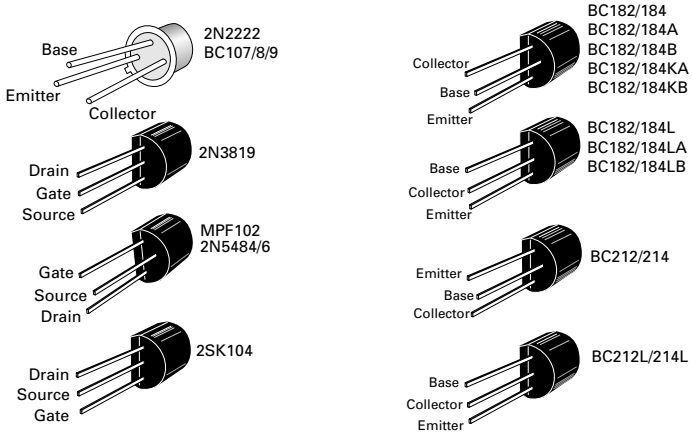
For example, I've often used the 2N2222A transistor in projects simply because I once bought a bag of 100 of them at a 'couldn't refuse' price. The 2N2222A is a general purpose *npn* transistor suitable for audio and higher frequency work. There are many equivalent types, the commonest being BC109, BC107, BC107A and the 2N2222 in most cases.

Whenever a field effect transistor (f.e.t.) appears in this column, I tend to use the MPF102, again because I have lots of them. Suitable equivalents could be 2N5484, 2N5486, TIS58, 2SK104, 2SK161 and 2SK168 (the latter three are of Japanese origin).

However, for most of the circuits featured in *PW* the common 2N3819 would do the job although this has a different pin arrangement. On this point I recommend readers who have Internet facilities to try the excellent website **www.ee.washington.edu/cgi-bin/circuit_archive/cross.cgi** which has an extensive transistor cross reference database.

Careful Constructor!

In all of the choices, the constructor has to be careful to use the appropriate transistor leads. To help, a general purpose transistor reference book is a useful tool for including in your library. There are several to be had, ranging from huge, multi-sectioned, loose leaf guides to simpler books which only list the commonest types.



● Fig. 1: The diagram showing the lead placements of some of the common transistor types discussed in the text.

● This transistor tester has provided G3RJV with over 20 years sterling service and George recommends that you build your own version this month!

Some guides include transistor equivalents but the most useful information is the lead placement of each device. There are many transistor data sheets available on the Internet usually in PDF format. The diagram **Fig. 1** shows the lead placements of some of the common transistor types discussed above.

Transistor Markings

Identifying a transistor can often be quite straightforward. This is because it's possible to tell quite a lot about a device from the markings.

There are three main marking systems. Here in the UK many of the transistor types use the Pro-Electron standard which takes the form of two letters and a serial number. For most practical purposes the order is as shown in **Table 1**.

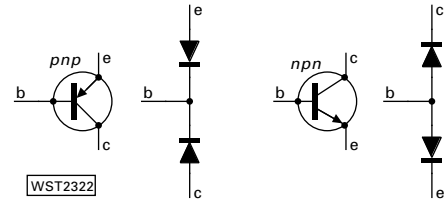
More commonly found in the USA is the JEDEC Standard (Joint Electronic Device Engineering Council) which takes the form of a digit, a letter and a serial number. As the serial numbers were issued sequentially the numbers are a guide to the transistor age only, see **Table 2**.

Testing & Comparing

Testing and comparing transistors is a relatively easy task even in the workshop with limited test equipment. For a start, many of the modern, inexpensive, digital multi-meters have a built-in transistor tester.

The functions may vary from meter to meter, so check the maker's manual. Most of them measure the small signal gain of bipolar *npn* and *pnp* transistors.

However, the simplest transistor tester is an analogue multi-meter; a meter with an indicating needle. So let's now look at how we can use the meter to test transistors.



● Fig. 2: The diagram shows how a bipolar transistor can be represented as two back-to-back diodes. In the *pnp* transistor the cathodes are connected to the base. In the text G3RJV describes the use of the meter to test transistors.

The diagram, **Fig. 2**, shows how a bipolar transistor can be represented as two back-to-back diodes. In the *npn* transistor the cathodes are connected to the collector and emitter.

An analogue multi-meter, set to read a high ohms range, may be used to test that these diode functions are working within the transistor. This is possible because in analogue multi-meters an internal battery is used to power the meter for the Ω (ohms) ranges.

Such meters will have a zero adjustment control that adjusts the battery voltage to give full scale deflection on the scale when zero ohms (a direct short circuit) is applied across the probes. This scale will read in reverse – from right to left.

To test diode function, the user needs to know which lead has a positive or negative voltage. In most analogue meters this is simple to confirm because the convention is for the negative voltage to be at the red lead. Should this **not be the case**, it will become obvious and the leads should be used the other way round.

Note: *Please be aware that the red lead is Positive (+) on digital voltmeters. However, on the traditional analogue scale, moving coil indicator (needle pointer and scale) types the Black lead is Positive (+).* ***Editor****.*

Carrying Out A Test

To perform a transistor test, set the meter on a high ohms range (500kΩ is a common range and is very suitable). The probes are applied to the leads of the transistor. Try to avoid touching the test probes or transistor leads with the fingers or you may be measuring skin resistance rather than the diode properties!

To help with the testing I made a very simple little test jig using a transistor holder and small piece of printed circuit board (p.c.b.) material. This divided into four segments with a hack saw blade, as in **Fig. 3**.

To test an *npn* transistor with an analogue meter, apply the black probe to the base of the transistor and touch the red lead on the emitter. This should give a relatively low reading, depending on the device, between a few hundred to a few thousand ohms.

Touching the red lead on the collector will give a similar reading. Any other combination of the probes will result in a much higher reading. For testing a *pnp* transistor, apply the red probe to the base of the transistor and touch the black lead on the emitter and then the collector which should give similar results to the ones above.

The readings tell you, at the very least, that the diode function of the transistor is good. This method can also be used to sort out *npn* and *pnp* transistors when the type is not known.

Fig. 3: A simple jig which G3RJV uses to tests transistors in conjuction with his simple tester (see text).

Finger Bias

Another simple transistor test is sometimes called the 'finger bias test' and this will show the transistor is functioning. In this test you should connect the positive lead (red) to the collector and the back lead to the emitter on a *npn* transistor.

For a *pnp* transistor you should reverse the leads. No connection is made to the base. This should produce a very high reading. If the reading is low the transistor may have a leakage problem.

Now wet your finger and thumb and apply one to the base and the other to the collector. The reading should go down. (The leakage from collector to base provided by the wetted finger and thumb provide a small amount of base current). This small bias will be shown by the change of reading.

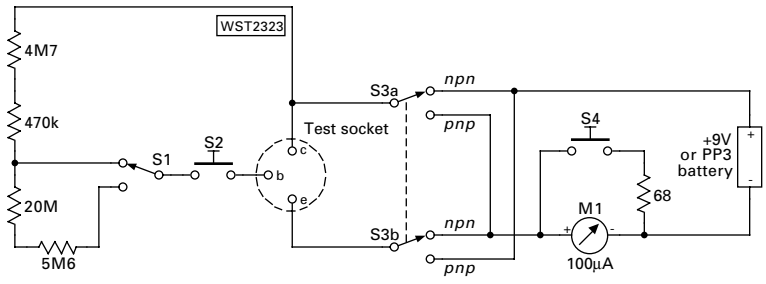


Fig. 4: The circuit of G3RJV's home-brewed transistor tester which he admits as being at least 20 years old. The simple instrument measures the small signal gain (Hfe) of *npn* and *pnp* bipolar transistors (see text).

1st Letter *Semiconductor material*	2nd Letter *Device type/use*	Serial number *(of the type)*
A - Germanium **B** - Silicon **C** - Gallium Arsenide **R** - Compound Materials	**A** Diode **B** Diode (variable capacitance) **C** Transistor – audio – low power **D** Transistor – audio – power **F** Transistor – r.f.- low power **L** Transistor – r.f. - power **S** Transistor - switching **U** Transistor - switching - power	
Examples	BC108 – low power audio silicon transistor BF239 – low power (signal) r.f. silicon transistor	
For more details see:	**www.eeca.org/pro_elec.htm**	

Table. 1: The Pro-Electron (European) method of identifying semiconductors.

Number *Type of device*	2nd character *(just a letter)*	Serial N°. *(registration)*
1 Diodes **2** Junction transistors **3** Four terminal devices	N - Guide to the age of device only	
Examples	2N2222 – Bipolar transistor 2N904 Bipolar transistor (an older device)	
Other information	**http://www.elexp.com/t_tranmk.htm**	

Table. 2: The Jedec (US) method of identifying semiconductors.

On The Shelf

On a shelf above my workbench is a home-brewed transistor tester which is at least 20 years old. The circuit is shown in **Fig. 4**.

The simple instrument measures the small signal gain (H_{fe}) of *npn* and *pnp* bipolar transistors. In operation the switch, S1, selects a gain of 100 or 500 as the full scale deflection (f.s.d.) of the meter.

A press button switch, S2, allows the reading of the gain to be taken. The double pole changeover (DPCO) switch, S3a and b, changes over the battery polarity to enable *npn* or *pnp* types to be tested. Another presss button switch, S4, is added to increase the full scale reading 10 times, should this be required

The meter has a f.s.d. of 100µA. This actual value should be used for accurate readings in the 100 and 500 scale. In practice using one of the cheap CB or audio level Volume Units (VU) edgewise meters will do the job and provide relative readings of the gain.

Device Leakage

Merely plugging the transistor into the meter will show the leakage of the device, hopefully low in the case of silicon transistors. The polarity (*npn* or *pnp*) of the transistor will be shown as soon as S2 is pressed.

The use of the tester is self-explanatory. It's a useful little unit to build if a suitable meter is available. The resistance values are high so some constructors may have to buy some of the values. I hope you make one for yourself - mine has served me well for over 20 years!

PW

valve & vintage

The *Eagle* comics and copies of *Radio Times* from the 1950s and 1960s, tell us it's Phil Cadman G4JCP who's in charge of the 'wireless shop' this month. Now that he's put his brown dustcoat on...is that a PCL805 valve he's holding?

Welcome, one and all, to my first Valve and Vintage column of 2004! I do hope you all had a good Christmas and New Year? Right, I've lots to get through this time and lots of questions, so on with the show.

I'm sorry to say that a wayward finger hovering over a keyboard caused a tiny error in my last column. In the part where I was talking about the HN309; it is, of course, the **LN309** that's a direct equivalent to the PCL83.

Adding to what I said last time, it seems the triode section of the HN309 is unique. I certainly can't find any other triode which has the same characteristics. Given that the HN309 appears to have been made by **Mullard** for **M-OV**, I wonder why Mullard didn't simply copy the ECL/UCL83 design and use a 300mA heater?

My question about the reliability - or otherwise - of the PCL85 and its replacement, the PCL805/85, was kindly answered by **Hans Volz**. He told me that the PCL85 did indeed have very poor reliability. Thanks Hans.

This view was supported by **M. A. Harris** in the August 1973 issue of (*Practical*, as was) *Television* magazine. Harris describes the PCL85 as a "bad valve generally". My grateful thanks to **Tim Packer** of **Llangammarch Wells**, for very kindly sending me a copy of the August issue of *Television*.

Clearly, there must have been some flaw in the original PCL85 which needed addressing, but why the new number? The only apparent change to the electrical characteristics was a decrease in mutual conductance from 7.5 to 7.25mA/V, as pointed out by eagle-eyed reader **Godfrey Manning G4GLM**.

Oh, there was (at least) one television set that used the PCL805/85 as a sound amplifier/output valve. **John Reeve G8ATS** informs me that the 1962 **Baird** models 492, 494 and 496 all used the PCL805/85 in the sound stages. My thanks to John for that and for a sketch of the circuit. Seems I may now have a use for all those PCL805/85s I've collected over the years....

Curious Letter

A curious letter appeared in the December 2003 issue of *Electronics World* (the publication formerly known as *Wireless World*). The writer asserted that the 'O' in OA81, OC71, etc., is really the figure zero, because diodes and transistors were initially regarded as heater-less (cold-cathode) valves.

Well, in reply I can confirm the first character is definitely the letter 'O' and not a zero. This fact is explicitly stated in many Mullard data books. Still, the *Electronics World* letter did get me thinking.

The valve nomenclature introduced by the **Radio Manufacturers Association** (in the USA) **did indeed use** the figure zero as the first character of cold-cathode tubes; as in 0Z4 and 0A2. However, the Mullard system of valve numbering adheres closely to the European **Pro-Electron** scheme; a common method of identifying valves, introduced in the 1930s by a number of manufacturers, including Mullard.

There are so-called Pro-Electron lists available which state that the letter 'O' was used for both cold-cathode valves and for semiconductors. But as far as I can tell, Mullard only ever used a leading letter 'O' for their early semiconductors. And despite what some lists say, I can't find any evidence to suggest that the Pro-Electron scheme used the letter 'O' for anything.

In fact, both the letters 'O' and 'I' seem to have been deliberately avoided to prevent confusion with the figures '0' and '1'. Unfortunately, the Pro-Electron people (now based in Brussels) have not responded to my E-mails, so I'd like to know whether anyone has any **primary** documentation which could clear-up this mystery.

The HAC Receiver

My mention, last time, of the **H.A.C.** model **DX MkII** receiver reminded **Arthur Davies G3IIV** of a book he'd once read which mentioned the set. Fortunately, Arthur had photocopied some pages from the book, and amongst them was a description of the Mk.II receiver.

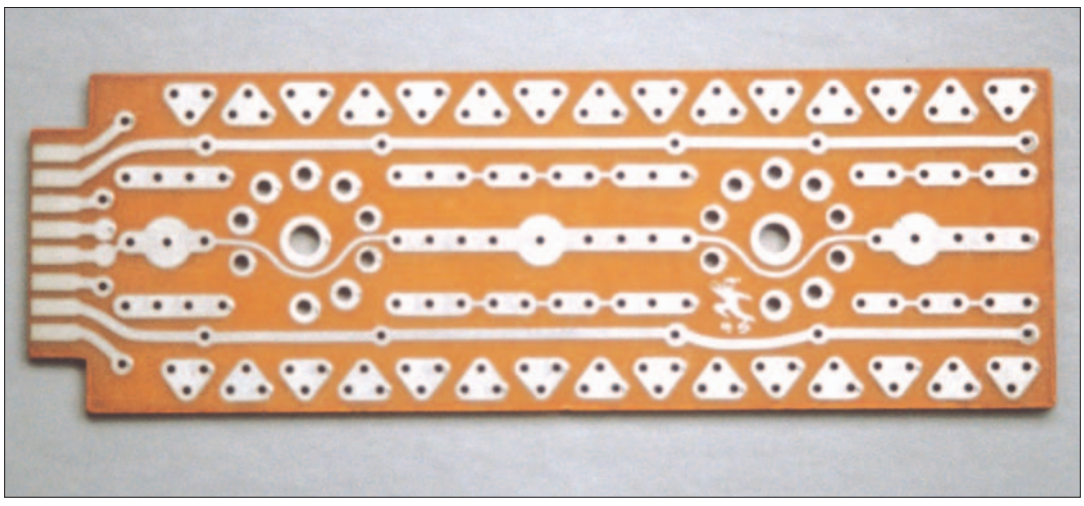


Fig. 1: Phil G4JCP says Vero weren't the first company to produce a readily-available prototyping board. More 'mature' readers - like me, will remember Radiospares Printed Circuit Panels for valves and transistors". (See text).

The valve used in the set was a Government Surplus **AR8**, otherwise known as a **Mazda HL23DD**; a double-diode triode. It may be that H.A.C. bought a number of these valves (probably at a rather good price) around the time they were running-out of the 4-pin triode used in the MkI set.

The HL23DD is still available from valve suppliers and it does seem to be a good choice for a simple regenerative detector. Not least because its 2V filament only draws

50mA. But please be aware it uses a Mazda-Octal base, slightly different to the International Octal base. (Thank you Arthur, for the information).

Radiospares Printed Panels

I think every electronic enthusiast has heard of - even used - Veroboard, but Vero weren't the first company to produce a readily-available prototyping board. More 'mature' readers (like me), will remember **Radiospares' Printed Circuit Panels** for valves and transistors, **Fig. 1**.

As you can see, the boards were laid-out to accept two B9A p.c.b. valve sockets, plus associated components. Three traces - for ground and heater supplies - ran the length of the board, while one end was formed so as to plug into a Radiospares 8-way, 0.150-inch connector. A paper template was included with each board to help with planning a layout.

The boards were made from high-quality Synthetic Resin Paper Board (SRPB) laminate and the copper traces were hot tinned; so it says in my Radiospares catalogue from November 1964. They were still listed in the December 1970 catalogue; at just under 50p (excluding tax) for a pack of three. Which seems good value, even allowing for inflation. Hmm, I wonder if anybody would be willing to make some new ones?

Old Resistor

Going further back in time the photograph, **Fig. 2**, shows a rather old-fashioned resistor; one of two examples I have. It's marked 0.025 Megohm and is made from a 40mm-long, blue-coloured glass tube.

The connecting wires are silver in colour and quite stiff, so they're not copper. The actual resistive element is a coarse, self-supporting spiral of some metallic material. It looks shiny-black, although it's difficult to be sure because of the blue glass.

The resistance is now a little high - measuring around 36kΩ - but as there's no tolerance marked, I can't say too much about that! Still, I would like to know how old the resistor is and exactly what it's made from.

I believe that in the early days of radio, high-value grid-leaks and low-value wire-wound resistors were readily available. But that wasn't necessarily true when it came to cheap, medium-value resistors. Was this an early attempt to produce such a resistor?

I hate to admit it, but my knowledge of resistors - other than wire-wound types - extends no further back than carbon composition types; the old 'body-ring-spot' so familiar to us *Eagle* comic era types! Likewise, early (paper?) capacitors are also a bit of a mystery to me. Other, of course, than the ones I used to take apart to get at the strips of foil inside.

Early resistors and capacitors are certainly not as 'glamorous' as early valves, although some are indeed collectable. Yet they were just as essential to the development of radio and other branches of electronics as any valve or transistor.

Is there a published history of the technical development of passive components? I'd be interested in hearing from anyone who knows of an authoritative work.

Incidentally, I discovered something interesting while looking through my collection of Mullard publications for more information about early transistor and valve coding. I came across the very first Mullard book I ever bought - see **Fig. 3**.

These little data books were published, more or less annually, for a number of years. The earliest edition I have in my collection is from 1963; the last is from 1976. Actually, the 1976 edition **may have been** the last one published, but I'm not sure enough to put money on it!

Fig. 2: A rather old-fashioned resistor in the G4JCP collection. One of two examples Phil has, it's marked 0.025 Megohm and is made from a 40mm-long, blue-coloured glass tube (see text).

Each book contained brief details on current valves and semiconductors, and later on, selected passive components. Early editions included a separate price list and a comprehensive equivalents list. These supplements were discontinued after the 1965/66 edition, although equivalents lists continued to be included - to a greater or lesser extent - as sections within each book.

Paradoxically, the 1966/67 edition only covered semiconductors (!), but the next edition - 1968 - went back to the traditional pattern. Notably, in 1969, an integrated circuit - the TAD100 a.m. receiver chip - made its appearance.

Although the information contained within the books was necessarily brief, it was useful and the books were popular with both the trade and with enthusiasts, myself included. Indeed, my copy was always to hand and even accompanied me to school. Yes, even back then there was no hope for me!

Mullard were not alone in producing these small data books, although they were, I think, the most widely publicised and easiest to get hold of. If you ever see one for sale, do try and buy it; the price being acceptable, of course.

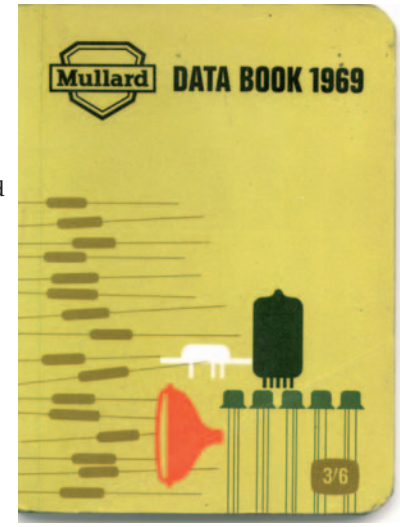


Fig. 3: Searching for reference material, G4JCP came across the very first Mullard book he ever bought - shown here. The earliest edition he has is from 1963; the last is from 1976. The 1963 copy even went to school with him!

Television Magazine

Before I put the shutters up on the Valve and Vintage 'shop' for this time, I must mention a piece I found in that issue of *Television* magazine I mentioned earlier. It was called **Miller's Miscellany** and was written by one **Chas. E. Miller** - who of course shares the duties in V&V.

The *TVM* article was a regular column, I believe, which described life in an engineer's workshop. Coincidentally, in this episode, the PCL805 was mentioned. I wonder if Chas remembers writing it, all those years ago?

Well so long for now. Remember, please send your comments and letters to me, either via E-mail to **phil@ezlxq.freeserve.co.uk** (yes, a new address) or by mail to: **21 Scotts Green Close, Scotts Green, Dudley, West Midlands DY1 2DX**. See you next time! **PW**

VHF DXER

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REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

Contacting stations in far-away places - 'working DX' - is one of Amateur Radio's greatest challenges, especially if you choose to do it on the v.h.f., u.h.f. and microwave bands. Various propagation modes regularly 'open up' these bands over considerable distances and produce some truly exotic signals. Once you get interested in working v.h.f. DX you will hear the thrilling sound of signals reflected back from an aurora, the stunning strength of Sporadic-E signals or the startling bursts of s.s.b. and high-speed Morse from ionised meteor trails.

STATION TRANSCEIVER

There are two pieces of hardware that determine your success as a v.h.f. DXer. One is the station transceiver and the other is the antenna and associated cabling.

The transceiver **must** be capable of providing c.w. (Morse) and s.s.b. (telephony) as these are the communication modes used for serious DX work. But the transceiver needs to be sensitive enough to winkle out very weak signals buried in the noise. I personally don't think that any commercially made transceiver is particularly good in this department and none are too happy with strong adjacent signals either.

THIS MONTH DAVID BUTLER G4ASR SUGGESTS SOME IDEAS OF HOW TO BECOME A VHF DXER!

If you are already a seasoned DX operator then you''ll have already realised that ranges of at least 500km are attainable every day by weak-signal tropo and up to 2000km via meteor scatter. The horizons of v.h.f. and u.h.f. are expanding beyond Europe too.

A growing number of stations are claiming operating awards that were originally conceived as h.f. only. At the peak of the sunspot cycle you can quickly claim a certificate for contacting 100 countries (DXCC) on the 50MHz band. There are a number of UK operators who have now contacted 200 countries on the 'Magic Band'.

Some operators have earned the Worked All Continents award on 144MHz and above by 'echoing' signals off the surface of the Moon and a few have even achieved 144MHz DXCC! But all of this takes place against a background of widespread belief that v.h.f. and u.h.f. are only for chatting to the locals via the nearest f.m. repeater, or sadly that 'real DX' is only worked on h.f.

Unlike the short wave DX operator who relies almost completely on ionospheric F-layer reflection, v.h.f. DXers can use a multitude of propagation modes that occur both in the troposphere and the ionosphere thereby considerably increasing their range beyond the horizon. Nowadays with better antennas, new digital transmission systems and an improved knowledge of propagation, operators are realising the true DX potentials of the v.h.f., u.h.f. and microwave bands.

So, how much sensitivity do you actually require for normal DX communications? The limiting factor is effectively the amount of background sky noise arriving at the antenna.

On the lower v.h.f. bands of 50 and 70MHz man-made noise often exceeds the background noise by 10dB or so. Consequently receiver noise figures as high as 12 and 10dB respectively are quite adequate for these bands. At 144MHz however, the sky noise is much less and a receiver noise figure of around 2.2dB will be quite adequate for most types of terrestrial communication.

Unfortunately you probably won't find out what the overall noise figure of your commercially made transceiver is because it's never given. Normally the specification is given in terms of so many µV for a Signal:Noise (S/N) ratio of so many dB. Its very difficult without knowing other parameters exactly what you are buying.

In my opinion there's another problem when it comes to buying a transceiver. In the short wave models the manufacturer's have recognised our requirements for strong-signal performance, as well as sensitivity and 'high dynamic range' is now a strong selling point. But at v.h.f. and u.h.f. all the design effort seems to have gone into digital features such as a 32-colour display, scanning, memories, air-band receive facilities, computer control and displays that say "Hello"! These are all very well but what about the **receiver** performance?

As purchasers and users of v.h.f. Amateur Radio equipment we need to resist the notion that other operators aren't entitled to put strong signals into our receivers, or that we shouldn't expect manufacturers to produce clean local oscillators (l.o.), or that any transceiver is acceptable merely because the importer has sold a lot of them! So, read the technical reviews carefully, look out for reports of poor sensitivity, dynamic range or reciprocal mixing performance and then use your power of choice. If it isn't good enough, then don't buy it.

If you already possess a modern h.f. rig, the alternative to buying a complete v.h.f. or u.h.f. transceiver is to buy a transverter. A transverter is actually a transmitting converter, a receiving converter and a l.o. source all combined into one unit. It connects to the antenna socket of an existing transceiver, which provides the driving signal, typically at 28MHz. The transverter then mixes the drive signal from the transceiver with its own l.o. to produce an output on the v.h.f. band of your choice.

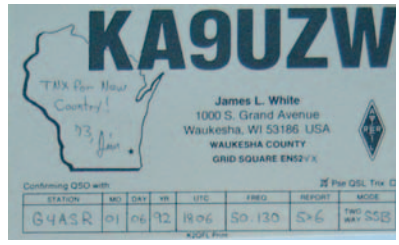
On receive a similar process takes place, the v.h.f. signals are down-converted to provide an output signal in the 28MHz band. Nowadays you can buy or build a top performance unit for every band from 50MHz through to 24GHz and with a variety of drive frequencies. Although the majority will be at 28MHz you'll also find models that will accept drive at 144MHz.

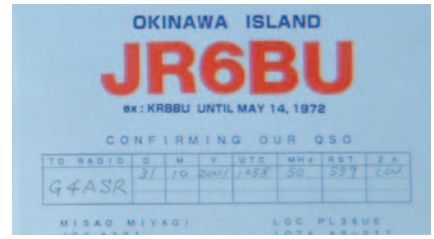
So, if you already have a transceiver on 28MHz you should have no problem finding a transverter that will allow you to operate on 50MHz. Transverters are well worth a second look because the front-ends of commercial h.f. transceivers have improved greatly in the last few years, far more than those of v.h.f. and u.h.f. transceivers. The i.f. performance has always been a few steps ahead with switchable filters possessing excellent stopband rejection, variable bandwidth, i.f. shift, notch filtering, digital signal processing, etc. Another advantage of using a transverter is that additional bands may be added as and when required.

DIRECTIONAL YAGI

For v.h.f. DX work a directional Yagi antenna is essential. There are many types of beam antennas available, some very good and some not so good. If you look at the claimed gains of antennas, for example those of between 9 to 18-elements, the difference between the poorest design and the very best may only amount to 3dB or so.

One point to consider is that if you're only





● One of Amateur Radio's greatest challenges is contacting stations in exotic locations.

interested in working occasional DX when the band is open what 'real' difference does a few decibels make when propagation conditions may vary by many ten's of dB's? However, if you're a serious DX operator then only the very best optimised antenna designs will do.

The easiest way to find the 'best' antenna designs is by recommendation from active v.h.f. operators or winning contest groups. Unless you really want to stretch out the very last vestige of antenna gain I would suggest that the most important criteria is not ultimate gain but build quality. After all a long boom antenna is no good if it folds in half during the winter gales.

Similarly, the longer the antenna boom the sharper the directivity of the array becomes. The possibility of missing stations away from the main antenna lobe becomes increasingly likely. So, you might consider trading off some gain for an increase in beamwidth. Taking all these factors into account you might find that a single short-boom Yagi (or better still a pair of stacked Yagis) might provide a more practical solution than using a single long-boom array.

The siting of an antenna is just as important as the type used. Unless you have restrictions imposed at your QTH the best location for a v.h.f. antenna is always outside in an uncluttered location.

If possible mount your antenna on a suitable pole, elevating it above the roof and away from nearby television aerials. The coaxial feeder connecting the antenna to the transceiver should have a low-loss at the frequency in use and this is especially important on the v.h.f. bands.

A poor quality cable will lose valuable transmit and receive signal power. So be prepared to spend more money on the main feeder than on the antenna. It really will be an investment.

I recommend that as a minimum you use 10.3mm diameter cable such as URM67 or RG213. If you really want to go for the very lowest loss then I suggest you choose a hardline cable such as Andrews heliax or equivalent. This can often be obtained on the surplus market and provided it has been treated with respect by the previous owner it will provide you with many years of use.

PROFICIENT OPERATOR

So now that you've got the right equipment how do you become a proficient v.h.f. operator? The answer to that is two-fold; firstly you need knowledge of the correct operating methods and a basic understanding of all the propagation modes you are likely to encounter. Even if you could predict every DX opening, you still won't work much unless you're a good operator.

The essence of good operating is very simple. You just need to do exactly the right thing at any given moment. For that reason some modes of propagation require more specialised operating techniques, which I'll deal with those over the next few months.

To make long-distance contacts from an average site requires patience and determination. You've got to find your DX stations because unless you live in a rare locator square they won't come looking for you. So, the most important lesson when trying to make long-distance or rare contacts is to listen. Almost every keen v.h.f. DXer eventually learns that although blasting away with full power to a group of Yagis will net you shoals of medium DX it doesn't always produce the prize DX contacts.

Apart from listening, your first big step in effective DXing is a willingness to put up with some noise on the received signal. Regrettably some operators never even get this far. If they ever progress beyond switching f.m. channels, they tune the band with great sweeps of the wrist, stopping only for the really big signals. They're missing a lot because if all the DX is S9 then you're missing the **real** DX! Skill in listening for very weak signals comes with practice and everyone can learn it.

DIFFERENT CHARACTERISTICS

Each of the popular v.h.f./u.h.f. bands, 50, 144 and 430MHz, have different propagation characteristics. Positioned at the lower end of the v.h.f. spectrum the 50MHz band exhibits propagation modes appropriate to both h.f. and v.h.f. wavelengths. The band is therefore very suitable for DX working using c.w./s.s.b. and the new machine generated modes (m.g.m.) such as JT6M and JT44.

During the summer months Sporadic-E (Sp-E) propagation will be prevalent with numerous openings nearly every day. Signals are very strong and it's possible to work considerable distances with simple antenna systems. During the peak of the sun-spot cycle world-wide communication is possible via F2-layer propagation. All the other modes will also be found here at times throughout the year and include tropospheric refraction and forward scatter (although to a much lesser extent than at 144MHz), aurora, field-aligned irregularities (f.a.i.), auroral-E (Au-Es), trans-equatorial propagation (t.e.p.), ionospheric scatter, moonbounce (rather difficult at this low frequency) and meteor scatter (m.s.).

Although world-wide communication is not possible on 144MHz (with the exception of moonbounce which is relatively easy at this frequency) many c.w. and s.s.b. contacts up to 2000km or more are regularly made each year. Propagation modes most often found at 144MHz are Aurora, Sp-E, ionospheric scatter and meteor scatter.

Tropo openings via forward scatter, ducting and refraction are numerous and will occur at anytime during the year. The UK is also ideally located for the regular 3000km tropo openings to the Canary Islands (EA8) situated off the west coast of Africa. This marine path opens up every year, normally during late July and early August.

Ionospheric modes are not normally observed on frequencies as high as the 430MHz band. The exception to this is Auroral backscatter where DX contacts may be made during larger events. Meteor scatter is possible but it requires very high power and a very good antenna array. Tropospheric openings are plentiful and unlike ionospheric propagation modes such as Sporadic-E or Aurora, tropo openings are usually the culmination of several days build up and may last for many hours, if not days at a time.

Quite often the higher u.h.f. bands, 430MHz and 1.3GHz, exhibit better propagation than the 144MHz band. Indeed it's quite possible for openings to occur on the s.h.f. bands when no effects have been detected on lower frequencies. The 3000km path to EA8 is also workable at these frequencies. Indeed this path probably extends well up into the microwave region.

DEADLINES

That's it for this month, I hope I've encouraged you to make some DX contacts on the v.h.f. and u.h.f. bands. Good luck and don't forget to send me your reports. *73, David G4ASR*

HF HIGHLIGHTS

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REPORTS, INFORMATION AND PHOTOGRAPHS TO ME PLEASE BY THE 15TH OF EACH MONTH.

I begin this month with some news regarding a new bureau. **Victor Loginov UA2FM**, QSL Bureau official, has said that on 6 December 2003 during an annual UA2 meeting the group decided to start their own incoming QSL bureau. This means that they will stop getting their incoming QSL cards from SRR QSL Bureau in Moscow at the well known PO Box 88. The new address for the UA2 bureau is **ROSTO Technical School, ul.Ozyornaya 31, Kaliningrad, 236029, Russia**, so from now on send all QSL cards for UA2 only to this address, otherwise they will not receive them.

Victor also mentions that the UA2 prefix is the second call area of Russia and that they now have the following active prefixes, all UA2, RA2, RK2, RU2, RV2 and RX2. There is also R2MWO which is a permanent special callsign for the Museum of the World Ocean and RW2F which is still the contest call for the UA2 Contest Club, RK2FWA.

DX NEWS

Now for some DX news and the XF4 DXpedition, which is expected to begin on March 3 and run for two weeks from Socorro Island (NA-030) using the callsign **XF4IH**. Most of the paperwork is already completed for the activity by eight operators who are all from Mexico and include **Pepe XE1J**, **Ismael XE1AVM** and **Rafael XE1GRR**. Their activity will be on all bands from 1.8 to 28MHz including the WARC bands using c.w., s.s.b., RTTY and PSK31.

Keep an ear open for an unusual special event station being run by **Jack K9LSB** who will be operating as **K9L** from March 1-14th in celebration of 50 years as a licensed operator. Jack K9LSB and members of the **Hoosierland Amateur Mobile Systems Group** will operate all bands and all modes using a Yaesu FT-1000MP Mark V and Cushcraft A3A antenna from Jack's home in Fort Wayne, Indiana. All QSLs should go to K9LSB and a s.a.s.e. will get you a nice card in return.

In Afghanistan **Johnny LA5IIA** is now active as **YA8G** from Kabul for the next five months or so. Most of his activity will be on c.w. with some RTTY and occasionally some s.s.b. He is there as a UNICEF worker and plans to be active when he can in his spare time. You can QSL via LA4YW, for more details and to see some interesting pictures, look at: **http://www.qsl.net/la8g/YA8G.htm**

Members of the **F6KOP Le Radio Club de Provins 77** near Paris plan to be active from Lome the Capital City of Togo in West Africa as **5V7C** from March 6-12th. Activity will be on all bands using c.w., s.s.b. and digital modes. The QSL Manager will be **Franck Savoldi F5TVG, PO Box 92, F94223 Charenton Cedex, FRANCE**. An E-mail address is available for more information including skeds at **5V7C@free.fr** and the group's web page which is in French is available at **http://5v7c.free.fr**

LOTS OF DX NEWS THIS MONTH, CARL ALSO REPORTS ON A NEW BUREAU

Fig.1: New reporter Dave Cousins G4WBB's Cushcraft X7 beam antenna.

YOUR REPORTS

Onto your reports now and to Top Band where **Ted Trowell G2HKU** worked ZA1A (Albania), OH0Z (Aland Island) and EA8EW (Canary Island). A change to 3.5MHz found OY3QN (Faroe Islands) and OH0Z, once again with all contacts being made around 2100UTC using a Ten-Tec Omni V and Butternut HF-6 vertical or G5RV antennas.

THE 7MHz BAND

The 7MHz band gave **Roy Walker G0TAK** in Kendal, Cumbria an interesting QSO when he worked **John Gillham G3ING** who was operating portable. Roy says "Nothing too remarkable you may think, but John was my Warrant Officer Telegraphist when I joined the Royal Auxiliary Air Force as an aircraftsman in 1972. He was still my WO as I progressed through the ranks until I was commissioned as a Signal Officer in 1981. It was great to work him on the key again and his hand-sent c.w. is a crisp as ever".

I was pleased to work **Martyn Medcalf M3VAM** who lives in Chelmsford, Essex this month on what was an extremely busy band. We managed to hold a reasonable conversation for a few minutes before conditions made it almost impossible for us to hear each other and I closed down. However, Martyn persevered for a while longer and logged DL6JWN (Germany) 1657, RK3AWL (European Russia) 1703, F2PIP/P (France) 1727, OH6IO (Finland) 1738 and 4N25K (Yugoslavia) at 1855UTC using his Icom IC746 with an SGC237 tuner and 8.2m of wire.

THE 14 & 18MHz BANDS

Martyn M3VAM found conditions on 14MHz 'slightly better' and his large log lists the following stations: EA7/G4OGF (Spain) 0858,

IK5RLP (Italy) 1323, 9A2AA/P (Croatia) 1523, UT5UGR (Ukraine) 1554, 4L6AM (Georgia 1611 and YO9WF (Romania) at 1656UTC.

Mark Taylor G0LGJ in Dereham is doing very well with his /Mobile DX tally and has just received his DXCC certificate from the ARRL. Mark has already got 153 countries confirmed and is trying to concentrate on his 7MHz score. However, he did spend a short time on 14MHz finding ZL4PN (New Zealand) at 0902 and VP9/PA3GIO (Bermuda) in the evening at 1859UTC using a Yaesu FT-100 and 100W s.s.b. to a Pro-AM whip antenna.

There was just one contact on 18MHz for Roy G0TAK who had just tuned up his Kenwood TS-570DG on the band and heard the first 'CQ' call from ZF2NT (Cayman Islands) at 1155UTC. At the end of the QSO there was a huge 'pile-up' waiting to work Bruce who was kept busy for sometime.

THE 21 & 24MHz BANDS

Alex Shillito G2FRY in Nottingham enjoyed some s.s.b. operating on 21MHz using his FT-101E and indoor antenna mounted at the side of his wardrobe. Countries making his log included 7X2ARA (Algeria), PY2NA (Brazil), WP2Z (Virgin Islands), V26K (Antigua), PJ2T (Netherlands Antilles), ZS4TX (South Africa), P40TA (Aruba), 8P5A (Barbados), KP3Z (Puerto Rico) and FS5UQ (St. Martin).

In Liverpool **Billy Clayton 2E1WHC** has had a busy month but still found time to work T95LSD (Bosnia-Herzegovina), S50G (Slovenia), UA4SAW (European Russia), YO3CZW (Romania), IK8ARF (Italy) and LZ2WYY (Bulgaria) using s.s.b. from a Kenwood TS-570D into a Cushcraft MA5V vertical antenna.

In Tongue, Sutherland **Gary Macleod MM3SCO** uses a Kenwood TS-50, MFJ-948 tuner and converted CB antenna for all his operating. Countries making his logbook include JW0HS (Svalbard) 1121, FM/T93Y (Martinique) 1123, PJ2/WW9WW (Netherland Antilles) 1353, KB2ELA/HC2 (Ecuador) 1235 XE1REM (Mexico) at 1451, FY/F8DEG/P (French Guiana) at 1539UTC. A switch to 24MHz found PJ2/W9AEB (Netherlands Antilles and 5U7JB (Niger) around 1400UTC.

Also on 24MHz was **Rob Hastings M3AHH** in Chelmsford, Essex who describes conditions as 'quite good' although not much DX was heard. Using 10W s.s.b. at 1340 Rob found CT/G1ADS (Portugal) followed slightly later by CO8LY (Cuba) 1357, ER1RR (Moldova) 1415, YN4SU (Nicaragua) 1457 and OD5LID at 1521UTC using a Kenwood TS-50S, MFJ-945E tuner and inverted Carolina Windom 80 Special.

Bashing the key once again was Ted G2HKU who logged J88DR (St. Vincent), KP2/OK1TN (Virgin Islands) and 9G5ZZ (Ghana) around 1100 and PJ2/K8MFO (Netherlands Antilles) later at 1600UTC.

THE 28MHz BAND

Finally, on to 28MHz and the logbook of **Dave Cowie GM8KSJ** in Kelty, Fife who used s.s.b. and worked UA3QKA (European Russia) at 1130 followed by f.m. contacts with LZ2DO (Bulgaria) and RA1QDY (European Russia) around 1200UTC. The equipment used included a Lincoln transceiver and l/4 base-loaded vertical whip around 1.3m long.

Fig. 3: Lithuanian-based PW reader Jurijus Krivkas LY3QN is a keen h.f. bands operator and has been in correspondence with the Editor as he would like to arrange skeds with readers in the UK and Ireland. Hopefully, Jurijus will soon be working you on the h.f. bands. Rob G3XFD has written back to him to ask for information on the best times (for LY3QN) to be on the air.

In Dublin, Ireland **Tom Kelly EI2AJ** operated his Icom IC-706 Mk1 at 30W to a HB9CV beaming east to work c.w. stations UA3DPM (European Russia), SV1DOJ (Greece) and UT0HA (Ukraine) between 1207 and 1310UTC.

In Scotland **Jim Pedley GM7TUD** found 28MHz wide open when he was able to operate and the large report includes contacts with VK6LC (Australia) 1010, 3W22S (Vietnam) 1119, 3B8/PA3BAG (Mauritius) 1224, BG7TBP (China) 1021, ZS6WAB (South Africa) 1457, 9Y4/DL7AFS (Trinidad and Tobago) 1523 and HJ4OBA (Columbia) 1558UTC.

Also active here was new reporter **Dave Cousins G4WBB, Fig.1** in Barnsley who spends most of his time on this band. Dave's station consists of a Yaesu FT-1000 and a Cushcraft X7 beam antenna. His 150W s.s.b. contacts this month include ZD7MY (St. Helena) 1414, 9H3ZY (Malta) 1423, PY3YD (Brazil) 1458, LU3XPL (Argentina) 1510, CP6XE (Bolivia)1520, VE2GDR (Canada) 1535 and CX5AS (Uruguay) 1541UTC.

SIGNING OFF

Well that about wraps it up for another month. Most bands have been open at sometime during the days although the conditions have been very mixed and not as good as this time last year, although there has still been plenty of DX to work. It is just a matter of being on the right band at the right time.

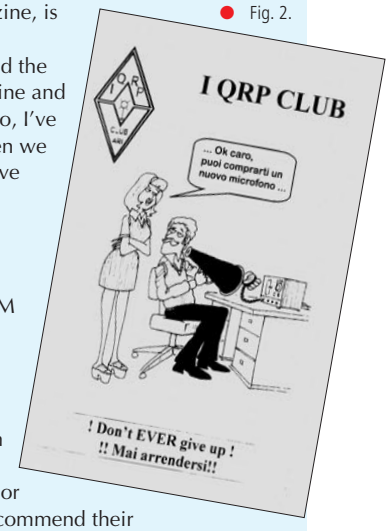
My thanks to all our reporters without whom this column would not be possible. Their reports show what can be done when the bands are not at their best! Thanks also to **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* for the DX information. So until next time, keep up the good work and have a good DX filled month.

73. Carl GW0VSW

ITALIAN QRP OPERATORS!

The Editorial team have sent me some interesting information- and a copy of their magazine - from the **Italian based I QRP Club**. The *I QRP Bulletin* **Fig. 2**, very much from the same mould as the famous G QRP Club's *Sprat* magazine, is packed with information for the Italian QRPers.

Fig. 2.



The Editor tells me that *PW* has quite a following in Italy and the Editorial team have met many readers from the land of good wine and beautiful scenery during trips to the Friedrichshafen Hamfest. So, I've no doubt that they won't mind mentioning the ironic grins when we discovered that not all Italian Amateurs use high power and have splattery signals!

But, before readers start complaining of anti-Italian bias the Editor wrote in the note, which he to me sent along with the information, that the mention of the high power splatter came from an Italian QRP operator who had been suffering from QRM originating from within Italy. Joking apart though, the little magazines which have arrived at the *PW* offices in Broadstone are fascinating. Even if you don't read Italian you'll understand the circuit diagrams. Maybe you'll even have a go at learning and the Editor tells me that he can advise intending students on where to find reasonably priced language courses.

If you want to read more on the I QRP club, arrange skeds, or find out just who is active and where to find them I strongly recommend their website at **www.arimontebelluna.it** and you can also get information via their e-mail service **info@arimontebelluna.it**

You can also write to the I QRP Club at **C/O Sezione ARI di Montebelluna, PO Box 11, 31035 Crocetta del Montello (TV), Italy.**

These keen types seem to be following in the footsteps of an illustrious countryman - Marconi himself. Let me know if you work any QRPers from Italy.

DATA BURST

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ROGER COOKE G3LDI INTRODUCES HIS FIRST COLUMN OF 2004 AND IT'S BURSTING WITH DATA NEWS

Well, another year is upon us. It hardly seems credible that it is now over 20 years since I first became active on Packet Radio. We are still at 1200bauds, so no wonder it's a declining mode!

The Australian Amateur Packet Radio Association (AAPRA) has terminated. Whereas the Victoria Amateur Radio Packet Association (VARPA) is still thriving, but mainly with the interest of APRS most prominent these days.

However, all is not lost! I have recently noticed an increase in users on my BBS. It has climbed from 15 to 25 now and I also received a couple of packet messages from 'old' users who have become disenchanted with the E-mail Spam situation and have refreshed themselves with packet once again. This can only be good - long may it continue!

In my column in, September 2003, I mentioned the packet meeting and what I had suggested for the agenda. It was duly discussed, and for that I am grateful, but the conclusions were a little disappointing. The following is a clip from the meeting.

MINUTES OF THE 2003 PACKET CONFERENCE - PART 4 (OF 4)

8. The future of amateur satellite for carrying packet mail (G3LDI)

By way of introduction, conference was reminded that international packet mail had traditionally been carried by a small group of (GB7) mailboxes, using a combination of h.f. and amateur satellites. The number of these BBS's had dwindled and there was now only one which used satellite, namely GB7LDI in Swardeston, Norfolk.

GB7LDI's sysop (Roger G3LDI, the sponsor of the discussion) reported two issues; firstly that his link with the rest of the UK was suffering difficulties because of an absence of suitable nodes, and secondly that the amount of personal mail had dropped off (probably due to BBS's now forwarding mail by Internet). Although unable to attend the conference, he wanted the future of his satellite operation to be discussed.

Conference's discussion reflected the full range of views within the packet community. Support was expressed in strong terms for Roger G3LDI's commitment to keep using this aspect of amateur communications, but many felt that mail via satellite had had its day. It was clear that the number of BBSs wanting to establish overseas internet links would continue to grow, but it was hoped that sysops would continue to support radio-based links (notably over h.f.) given that r.f. communications should be our prime interest.

Some discussion turned to the urgency of messages' content. It was noted that some mail could take three days to get to the States - and that since satellites only passed over locations a few times a day (and had occasionally proved unreliable) it was possible that mail could suffer undesirable delays. Internet links, it was observed were faster and more reliable and users expect a network that works, and have little interest in the means of a message's delivery.

It was felt, however, that no messages sent over packet should be particularly time-sensitive and that small delays were not likely to worry the majority of users. However, an apparent majority of delegates felt that a network that combined Internet and r.f. links was the best compromise solution for effective mail transfer.

Conference heard that G3LDI is currently investigating a better r.f. link across Norfolk, in order to establish better contact with the rest of the packet network, and delegates wished him success in this venture.

It was felt that data communications were

Fig. 1: Ted Double G8CDW.

to some extent moving towards real-time exchanges, (Eqso, VOIP, DXclusters, convers servers, etc) for which the Internet is a more suitable assistant, given the slowness and unreliability of the r.f. network links. The loss of hilltop sites, as well as other local factors, was cited as a reason for the poor state of the packet network.

There was significant support for the Internet as a means of linking where no realistic r.f. possibility existed. Although many amateurs are using it as a replacement for r.f. Internet linking had meant that many others had been able to keep in touch with other amateurs via a combination of landline and RF - and therefore their interest in amateur radio had been sustained.

Support was also voiced for a new system of regional mail hubs - interlinked by internet-and-radio BBSs who would have these responsibility for further distribution. Mail could then be sent with more confidence to these regional hubs, which would be better informed as to how to reach the intended targets than sysops are currently.

Well, I guess that shoots me down in flames! Wishing me success and then stating that data communications are moving to the Internet is hardly supporting the radio side of the hobby. I suppose this is an inevitability and I am clinging on to a concept of a hobby, which is no longer solely radio.

I would just like to see the odds in favour of radio rather than the other way round. We seem to be opting for the easy way out every time, with Echolink, VOIP, Internet based Cluster and BBSs, etc.

Have you ever wondered why mountaineers climb mountains? One reason is because it is difficult. The satisfaction of climbing Everest for example would be nil if some kind organisation provided a mountain railway from base to summit. Whilst I agree in principle with what was said at the Conference, and after all the facts really speak for themselves, I do not like taking the easy way out. Our hobby is still **radio** based and personally I would like it to stay that way.

Sure, the Internet is an easy option, but then I could also telephone my friends in USA, Canada, Australia and with no QRM could chat all night. It's probably cheaper too, no FT-1000MP needed, no tower and antennas in the garden to buy and maintain, but is it as satisfying? There is certainly little challenge there and with guaranteed results, it all points to us being reliant upon the commercial sponsors of the Internet, leaving the amateur bands to be under-used and perhaps sold off to the highest bidder, especially in the v.h.f./u.h.f. spectrum.

THE RTTY JOURNAL

When I was active using the old Creed 7B in the 1960s, the *RTTY Journal* was a much loved magazine, full of useful articles, latest DX active on the mode, new contests and much more. The *RTTY Journal* ceased publication last year, much to the regret of many. However, you can own the complete library, from day one to the last one, all on nine CDs.

I have recently bought my copy and took great delight in looking at some of the early articles and pictures. I came across one showing **Bill Brennan G3CQE**, one of the first G's on h.f. RTTY, receiving his WAC certificate.

Bill was one of my 'Elmers' in Amateur Radio and also encouraged me onto RTTY. The set of RTTY Journal CDs will provide hours of wallowing in nostalgia for those that remember the early days of RTTY and there are also a lot of useful technical articles, especially for those still using the real teleprinter machinery.

Also around at that time of the Creed 7B was **Ted Double G8CDW** (and now **M3CDW**) his picture is shown in **Fig. 1.** The old UK favourite, the Creed 7B is the main machine and **Fig. 2** shows a close-up of the actual page of print.

Fig. 2: Close-up of the actual page of print produced from a Creed 7B teleprinter.

The terminal unit in Fig. 2, just above the Hammarlund receiver, was a very popular commercial unit most of us used prior to making the very well used ST-5. The rectangular slot just to the right of the two meters is where the polar relay plugged in. This had to be adjusted correctly, or bias would be introduced into the keying circuit and copy would be affected.

WHEN CONTESTING

When contesting, obviously the amount of information exchanged is minimal. I have even seen in print the suggestion that the RST be omitted. The suggested reason for this is that the RST is redundant. I can see the point, as most contest exchanges are 599 for c.w. and Data and 5-9 for s.s.b.

I have never heard a DXpedition issue anything other than 599 or 5-9. The RST reporting system is supposed to be an indication of the other stations signal. Reporting numbers, which are the same all the time, regardless of band, propagation, or power used, renders the system to nothing less than farce in my opinion. The reason for using the same – or indeed omitting it altogether – is to reduce the logging, typing and paperwork.

I tend to think the other way. I feel that we should exchange **more** information, not less. Issuing correct signal reports, referring to the other station by name and a 73 at the end of the contact wouldn't really hurt that much, nor strain the grey matter, but it would be more friendly and personal. I realise, of course, that there are many more RTTY operators these days, and in fact the FRIEND.INI file for Writelog, which has the name of each station, contains over 22,000 entries. However, with the trough of the sunspot cycle coming, there won't be as much activity on 21/28MHz and we will be showing fewer contacts in our logs anyway. I guess we all have our own opinions on this.

DATACOM

Although *RTTY Journal* has bitten the dust, British Amateur Teledata Group's (BARTG) *Datacom* keeps on rolling along. I have just about got used to the new format of this magazine. It is now produced in A4 size and it took a long while for me to accept this change!

Most of the content of *Datacom* these days is devoted to contesting, as RTTY has become a very contest orientated mode. Of course these days most RTTY is software generated, with the old Teleprinters being relegated to the museums, so not too much mechanical information is needed. However, for the RTTY operator, BARTG is into all data modes and it's worthwhile being a member. The secretary is **Ian Brothwell G4EAN** who can be contacted via E-mail at: **ian@bartg.demon.co.uk**

That's all for this month so until next time, keep that data news coming and remember keeping the data modes alive is down to you!

Roger G3LDI

RADIOWORLD

42, Brook Lane, Great Wyrley, Walsall, WS6 6BQ.
Tel: 01922 414796 Fax: 01922 417829
web: www.radioworld.co.uk
e-mail: sales@radioworld.co.uk

Yaesu FT-857 £789.00
Mobile Transceiver with DSP. HF/2m/6m/70cms HF/6m - 100W. 2m - 50W. 70cms - 20W

Yaesu FT-847 £1,149.00
HF/6m/2m/70cms Plus 4m Satellite Transceiver

Yaesu FT-817 £525.00

Mobile / Portable Transceiver HF/6m/2m/70cms
Also available now with DSP from bhi for an extra £89.95

Yaesu FT-897 £975.00
Portable Transceiver HF/6m/2m/70cms HF/6m - 100W. 2m - 50W. 70cms - 20W

Yaesu VX-2E £165.00
2m/70cms, 1.5W Worlds Smallest Handheld Transceiver with Wideband Receive

Yaesu VX-7R £295.00
Submersible Handheld Transceiver 6m/2m/70cms Optional Barometer Available

Kenwood TS-2000 £1,549.00
HF/6m/2m/70cms with built in ATU. Optionial 23cms @ £329

Kenwood TS-870S £1290.00
HF DSP 100W BaseTransceiver

Kenwood TS-570DGE £794.00
HF 100W Transceiver with built in ATU

Kenwood TH-F7E £249.00
Dualband Handheld Transceiver with wideband receive 0-1300MHz

Icom IC-756proII £1,899.00
HF/6m Base Transceiver with Auto ATU

Icom IC-7400 £1,299.00
FREE SM-20, SP-21.
HF/VHF 100W Transceiver. Built in Auto ATU.

Icom IC-910H £1090.00
HF/VHF Transceiver. Optional 23cms Board.

Icom IC-718 £449.00
HF All ModeTransceiver. General Coverage.

Icom IC-706mkIIG £779.00
HF/6m/2m/70cms mobile Transceiver

Icom IC-703 £589.00
HF/6m 10W QRP Mobile Transceiver, with built in Auto ATU

Icom IC-2725E £299.00
2m/70cms Mobile Transceiver

Icom IC-E90 £269.00
2m/6m/70cms, 5W Handheld Transceiver

Alinco DX-70TH £599.00
HF/6m Mobile Transceiver. 100W HF & 6m.

Alinco DX-77E £499.95
HF Transceiver. Upto 100W Output Power.

bhi NES10-2 £99.95
Noise eliminating speaker with built in DSP Filters

bhi NEIM1031 £129.95
Noise eliminating in-line module

MFJ MFJ-969 £199.95
160 - 6m, 300W Roller Inductor Tuner

MFJ MFJ-949E £159.95
300W, 1.8 - 30MHz Deluxe Versa Tuner II

MFJ MFJ-941E £129.95
300W, 1.8 - 30MHz Manual Antenna Tuner

MFJ MFJ-259B £269.95
HF Digital SWR Analyser
Also available MFJ-269 HF/UHF/VHF @ £349.95

SECOND HAND LIST

PLEASE CALL TO CHECK AVAILABILITY

MAKE	MODEL	DESCRIPTION	PRICE
ADI	AR-446	70cms Mobile Transciever	£130.00
Adonis	AM-805G	Desk Mic, Built In Compressor & VU Meter	£70.00
AEA	PK-232MBX	TNC	£125.00
AEA	PK-900	TNC	£200.00
AEA	PK-96	TNC	£90.00
AKD	6001	6m FM Transceiver	£135.00
Alinco	DJ-560	Dualband Handheld (MINT - BOXED)	£100.00
Alinco	DJ-G5EY	Dual Band Handheld	£199.00
Alinco	DJ-X10	Wide Band Receiver	£200.00
Alinco	DR-150	2m Transceiver with Air-and Receive	£150.00
Alinco	DR-435	70cms Mobile Transceiver	£159.00
Alinco	DR-M10	10 Metre Transceiver	£99.00
Alinco	DX-70	HF & 6m Transceiver	£389.00
Alinco	DX-70TH	HF & 6m Transceiver (100W Output)	£475.00
Alinco	DX-77E	HF Base Station	£399.00
Ameritron	QSK-5	Amplifier Switch / Pre Heat	£200.00
AOR	AR-3000A	Wide Band Receiver	£450.00
AOR	AR-3030	HF Receiver, Including PSU	£350.00
AOR	AR-7030	Top Receiver	£550.00
AOR	AR-7030+	HF Receiver	£625.00
AOR	AR-8600	Base Scanner / Receiver	£399.00
AOR	AR-8600mkII	Base Scanner / Receiver	£499.00
AOR	AR-950	Communications Receiver	£89.00
AOR	ARD-2	Decoder	£200.00
AOR	SDU-5000	Spectrum Display Unit	£399.00
bhi	NEIM1031	Noise Eliminating In-Line Module	£99.00
CapCo	AT-300	Antenna Tuner	£99.00
Comet	CD-270D	SWR Power Meter	£49.00
Cubic	CDR-3550	State of the Art 20 - 1300 MHz Digital Receiver	£4,999.00
Daiwa	CN-103L	2m / 70cms Cross Needle SWR Meter	£40.00
Daiwa	CN-801H	1.8 - 200 MHz Cross Needle SWR Power Meter	£80.00
Datong	ASP	Automatic Speech Processor - FT-817, FT-77 etc.	£70.00
Datong	FL-2	Filter	£60.00
Diamond	SX-100	SWR & Power Meter - 1.6 - 60MHz	£65.00
Drake	MS-8	Speaker	£89.00
Fairhaven	RD-500	Communications Receiver	£500.00
Fairhaven	RD-500VX	Communications Receiver (20kHz - 1.75GHz)	£550.00
FDK	Multi-750	2m Multimode Transceiver	£129.00
Fujion	F-2000A	Radio Direct Finder	£99.00
Global	AT-1000	Manual Short Wave Tuner	£50.00
Hunter	750	Linear Amplifier	£599.00
Icom	IC-2100H	2m FM Mobile Transceiver	£150.00
Icom	IC-2710H	Dual Band Mobile	£225.00
Icom	IC-271E	2m Multimode Transceiver - 25W	£299.00
Icom	IC-471E	70cms Multimode Transceiver	£299.00
Icom	IC-490E	70cms Mobile Transceiver	£250.00
Icom	IC-551E	6m Multimode Base Transceiver	£299.00
Icom	IC-706mkII	HF / 6m / 2m Mobile Transceiver inc. DSP	£499.00
Icom	IC-706mkIIG	HF / 6m / 2m / 70cms Mobile Transceiver	£675.00
Icom	IC-720A	HF & FM Transceiver	£400.00
Icom	IC-726	HF / 6m with CTCSS fitted	£425.00
Icom	IC-735	Base Or Mobile Transceiver	£399.00
Icom	IC-7400	HF / 6m / 2m Built In ATU	£999.00
Icom	IC-746	HF / 6m / 2m Built In ATU	£875.00
Icom	IC-756	HF / 6M All Band Transceiver	£950.00
Icom	IC-775DSP	Icom HF DSP Transceiver	£1,600.00
Icom	IC-910	2m / 70cms Base Transceiver	£999.00
Icom	IC-E90	Tri-Band Handheld	£220.00
Icom	IC-R5	Handheld Scanner	£125.00
Icom	IC-R10	Handheld Scanner	£229.00
Icom	IC-R70	HF Receiver	£299.00
Icom	IC-R7000	MINT CONDITION!!! Receiver	£550.00
Icom	IC-R7100	25 - 2000 RECEIVER	£575.00
Icom	IC-R71E	Receiver	£325.00
Icom	IC-R72	Receiver	£350.00
Icom	IC-R75	Receiver (With DSP Unit)	£499.00
Icom	IC-T21E	2m Handheld Transceiver	£60.00
Icom	IC-T8E	Tri band Handheld Transceiver	£175.00
Icom	IC-W2E	2m / 70cms Handheld Transceiver	£140.00
Icom	PS-125	Power Supply Matching IC-7400, IC-756 etc.	£230.00
Icom	PS-55	Power Supply Matching IC-735	£100.00
Icom	SP-21	External Speaker	£50.00
JPS	NIR-10	Noise / Interference Reduction Unit	£99.00
JRC	JST-245	HF 50MHz 1500w AC Base Transceiver	£1,199.00
JRC	NRD-525	HF Receiver	£375.00
JRC	NRD-545	DSP Receiver	£899.00
Kamtronics	KAM	Multimode TNC	£140.00
Kenwood	23cms	23cms Module for Kenwood TS-790E	£299.00
Kenwood	AT-50	Automatic ATU (Matching TS-50S)	£165.00
Kenwood	MC-80	Desk Microphone	£40.00
Kenwood	PS-10	Power Supply for TR-9130 etc.	£40.00
Kenwood	PS-31	Power Supply (TS-870, TS-850, etc)	£135.00
Kenwood	PS-430	Power Supply	£100.00
Kenwood	PS-50	Power Supply	£140.00
Kenwood	R-2000	Receiver Including Converter	£299.00
Kenwood	R-5000	Receiver	£499.00
Kenwood	R-5000	Receiver With VHF Converter	£600.00
Kenwood	SP-120	External Speaker	£39.00
Kenwood	SW-100E	SWR Meter	£25.00
Kenwood	TH-215E	2m Handheld Transceiver	£99.00
Kenwood	TH-235	2m Handheld Transceiver	£85.00
Kenwood	TH-47E	70cms Handheld Transceiver	£80.00
Kenwood	TH-79E	2m / 70cms Handheld Transceiver	£175.00
Kenwood	TH-D7E	Dual Band Handheld	£219.00
Kenwood	TH-F7E	Dual Band Handheld	£199.00
Kenwood	TL-120	Low Drive Linear Amplifier 100W HF	£150.00
Kenwood	TM-255E	2m Multimode Transceiver (MINT)	£395.00
Kenwood	TM-451E	70cms Mobile Transceiver - Data Ready	£175.00
Kenwood	TR-751E	2m Multimode Transceiver	£250.00
Kenwood	TR-9000	2m Multimode Transceiver	£220.00
Kenwood	TS-450S	HF Base / Mobile	£499.00
Kenwood	TS-450SAT	HF Base / Mobile built in ATU	£549.00
Kenwood	TS-570DGE	Mobile / Base HF Transceiver	£675.00
Kenwood	TS-570S	Mobile / Base HF + 6m Transceiver VERY RARE!	£825.00
Kenwood	TS-790E	Dual Band Base - All Mode	£750.00
Kenwood	TS-850SAT	HF Base Station with Built In ATU	£699.00
Kenwood	TS-950SD	HF 150W DSP Base Station	£1,200.00
Kenwood	YG-455CN-1	270Hz CW Crystal Filer	£100.00
Kenwood	YK-88C-1	500Hz CW Narrow Filter	£40.00
Kenwood	YK-88CN1	270Hz CW Filter 8.83MHz	£40.00
Kenwood	YK-88S-1	2.4KHz SSB Narrow Filer 8.83MHz	£40.00
Kenwood	YK-88SN	1.8K SSB Filter	£40.00
Kenwood	YK-88SN-1	1.8KHz SSB Narrow Filter 8.83MHz	£40.00
Linear Amp	Hunter-Six	6 Meter Amplifier	£500.00
Lowe	HF-150	HF Receiver	£175.00
Lowe	HF-225	HF Receiver	£175.00
Lowe	HF-350	HF Receiver	£295.00
Magnum	M-257	10 Metre, 30 Watt, Mobile Transceiver	£165.00
MFJ	MFJ-1278	TNC All Mode	£175.00
MFJ	MFJ-414	Morse Tutor	£129.00
MFJ	MFJ-722	CW / SSB Filter with 5 Watts Amp	£59.00
MFJ	MFJ-784DSP	DSP Tunable Filter	£140.00
MFJ	MFJ-921	VHF 200 Watt ATU	£50.00
MFJ	MFJ-934	ATU and Built In Artificial Ground	£140.00
Microwave	28/144	28 / 144 MHz Transverter	£125.00
Microwave	MOD-144/30	30 Watt Amplifier	£79.00
Microwave	MML-144/100-S	100W 2m Amplifier	£99.00
Microwave	MML-432/50	50 Watt 70 cms Amp, with Built-In-PreAmp	£85.00
Palstar	PS-15	15 Amp Power Supply	£49.00
Pres. Lincoln	10 METRE	10 Metre Multimode	£175.00
RadioShack	Pro-60	200 Channel Handheld Scanner	£99.00
RevCo	RS-2000	60 - 519 MHz Home Base Scanner	£79.00
Rexon	RL-501	Dualband Handheld Transceiver	£99.00
Roberts	R-9914	Receiver	£69.00
Sangean	ATS-505	Receiver (Boxed AS NEW)	£49.00
SGC	SG-231	Smart Tuner	£275.00
Sommerkamp	FT-290R	2m Multimode Transceiver	£150.00
Sony	CV-21	World band Receiver	£950.00
Sony	ICF-SW100E	FM/SW/MW/LW Portable Receiver	£90.00
Sony	ICF-SW7600GR	World band Receiver	£99.00
Standard	C-156E	2m Handheld Transceiver	£125.00
TenTec	RX-350	HF Receiver	£999.00
Tokyo	HL-30V	2m - 25W Amplifier	£75.00
Tokyo	HL-35V	2m Power Amplifier with Pre-Amp	£89.00
Tokyo	HL-37V	Linear Amplifier	£60.00
Tono	T-777	Communications Terminal	£120.00
Transverter	QM-70	28/144 Transverter	£100.00
Trident	TRX-200	Latest Scanner	£175.00
Trio	TR-9000	2m Multimode	£199.00
Trio	TR-9130	2m All Mode Transceiver	£250.00
Trio	TS-530SP	Mains HF Base Transceiver	£275.00
Uniden	UBC-780XLT	Base Scanner with Trunking Software	£249.00
Uniden	UBC-860XLT	Base Scanner / Receiver	£99.00
Uniden	UBC-9000XLT	Base Scanner	£199.00
Welz	AC-38M	200W Mobile Matching Network	£50.00
Welz	CT-150	Dummy Load	£50.00
WinRadio	WR-1550E	Trunking Software	£450.00
Yaesu	FP-700	Power Supply	£100.00
Yaesu	FP-757GX	Power Unit for FT-757	£300.00
Yaesu	FP-800	Yaesu Power Supply (MINT & BOXED)	£199.00
Yaesu	FR-101	HF, 2m, 6m Base Transceiver	£399.00
Yaesu	FRG-8800	Receiver Including Converter	£399.00
Yaesu	FRG-9600	Communications Receiver	£199.00
Yaesu	FRT-7700	Antenna Tuner for FRG-7700	£60.00
Yaesu	FRV-7700	Converter for FRG-7700	£60.00
Yaesu	FT-100	HF / 6m / 2m / 70cms Mobile Transceiver	£499.00
Yaesu	FT-1000MPmkV	200W DSP HF Transceiver (2 months old)	£1,800.00
Yaesu	FT-1000MPmkV-Field	Top HF Radio - AC	£1,500.00
Yaesu	FT-1500M	2m 50W Mobile Transceiver with DTMF Mic	£129.00
Yaesu	FT-221R	2m Multimode Base Station	£200.00
Yaesu	FT-2600M	Mobile VHF / FM Transceiver	£120.00
Yaesu	FT-290RmkII	2m Multimode Mobile Transceiver	£225.00
Yaesu	FT-41R	Handheld Transceiver	£120.00
Yaesu	FT-470R	Dual Band Handheld	£129.00
Yaesu	FT-480R	2m Multi-mode 10W out put (MINT)	£250.00
Yaesu	FT-50R	Dual Band Handheld	£150.00
Yaesu	FT-5100	Dual Band Transceiver	£199.00
Yaesu	FT-51R	2m / 70cms Handheld Transceiver	£199.00
Yaesu	FT-690R	6m Multimode Mobile Transceiver	£199.00
Yaesu	FT-7	HF Mobile Transceiver	£200.00
Yaesu	FT-7100M	2m / 70cms Mobile Transceiver	£220.00
Yaesu	FT-726R	6m / 2m / 70cms / HF Transceiver	£575.00
Yaesu	FT-726R	2m / 70cms / HF Transceiver	£400.00
Yaesu	FT-76R	70 cms Handheld Transceiver	£99.00
Yaesu	FT-790R	70cms Multimode Transceiver	£175.00
Yaesu	FT-790RmkII	70cms Multimode Transceiver	£250.00
Yaesu	FT-8100R	2m / 70cms Mobile Transceiver	£220.00
Yaesu	FT-817	Mobile HF, VHF, UHF Transceiver	£450.00
Yaesu	FT-847	HF / 6m / 4m / 2m / 70cms Satellite Transceiver	£899.00
Yaesu	FT-8500	Dualband Mobile Transceiver	£199.00
Yaesu	FT-897	Multiband Transceiver	£850.00
Yaesu	FT-900AT	Yaesu HF Transceiver with ATU (MINT, BOXED)	£599.00
Yaesu	FT-920AF	HF / 6M Base Transceiver	£899.00
Yaesu	FTV-101Z	External VFO	£99.00
Yaesu	FTV-1000	200 W Transverter	£475.00
Yaesu	FTV-430MHZ	Module for Transverter	£99.00
Yaesu	FTV-901R	Transverter including 2m Module	£165.00
Yaesu	MW-1	Remote Control Microphone & Infra-Red	£60.00
Yaesu	SP-901	External Speaker	£30.00
Yaesu	SP-980	Speaker	£60.00
Yaesu	System 600	HF Commercial Radio	£600.00
Yaesu	VR-120	FM / WFM / AM Receiver	£99.00
Yaesu	VR-500	Yaesu Handheld Scanner	£149.00
Yaesu	VR-5000	Top Class Base Scanner	£450.00
Yaesu	VX-1R	Handheld Transceiver	£120.00
Yaesu	VX-2E	Dualband Handheld Transceiver	£129.00
Yaesu	VX-5R	Triband Handheld	£220.00
Yaesu	VX-7R	Triband Handheld	£240.00
Yaesu	XF-114SN	2KHz SSB Filter	£60.00
Yupiteru	MVT-3300	Handheld Scanner	£99.00

YAESU Available from RADIOWORLD

42, Brook Lane, Great Wyrley,
Walsall, WS6 6BQ.
Tel: 01922 414796 Fax: 01922 417829
Web: www.radioworld.co.uk
E-mail: sales@radioworld.co.uk

QUADRA £3,725.00
HF & 6m Solid State
Amplifier. 1kW Output.
Built in Tuner.
Auto Bandswitch.

FT-1000MPmkV-Field
£1,739.00
100W HF Transceiver,
220V AC / 13.8 DC.
Auto ATU, Collins Filter

FT-817 £525.00
Mobile/Portable Transceiver.
HF/6m/2m/70cms.
Also available now with
DSP from bhi for an extra
£89.95 plus fitting

FT-2800M
£169.00
2m FM Mobile Transceiver.
65/25/10/5W Power Output

VR-5000
£549.00
0.1 - 2600 MHz All Mode
Receiver.
2000 Memory Channels.
with Bandscope.

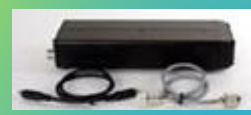
£235.00
ATAS-120
Active Tuning
Antenna System
40m - 70cms.
Max input 120W.
For use with FT-857
FT-100(D), FT-897,
FT-847 etc.

FT-847 £1,149.00
HF/6m/2m/70cms plus
4m Satellite Transceiver,
100W on HF/6m
50W on 2m/70cms

FT-8900R £339.00
Quad-Band
MobileTransceiver.
10m/6m/2m/70cms.
50W on 10m/6m/2m
35W on 70cms.

FT-1500M
£159.00
2m FM Mobile Transceiver.
50/25/10/5W Power Output.

VR-500
£199.00
0.1 - 1300MHz All Mode
Handheld Receiver.
PC Compatable, with
Alpha-Numeric Tagging



FC-30 £225.00
Bolt on auto ATU for use
with FT-897, FT-857.
Covers HF & 6m.
Max Input of 100W.

FT-897 £975.00
Portable Transceiver
HF/6m/2m/70cms
100W on HF/6m
50W on 2m. 20W on 70cms

FT-8800E £299.00
Dual Band
Mobile Transceiver.
2m/70cms. 50W on 2m.
35W on 70cms

FT-7800E
Phone for Price
2m / 70cms Mobile Transceiver
50W Out on 2m. 40W on 70cms
Wide Band Receive

VX-7R
£295.00
Submersible Tri-Band
Handheld Transciever.
6m/2m/70cms. 5W Output.
Also available in Black.

MD-200A8X
£225.00
Deluxe
Desktop
Microphone
Made for DSP
Transcievers.
Broadcast
Audio.

FT-1000MPmkV
£2,290.00
200W HF Transceiver,
220V AC PSU,
auto ATU, Collins Filter

FT-857 £789.00
Mobile Transceiver with
DSP. HF/6m/2m/70cms.
100W on HF/6m
50W on 2m. 20W on 70cms

FT-7100M £289.00
Dual Band
Mobile Transceiver.
2m/70cms. 50W on 2m.
35W on 70cms

FC-20 £225.00
Automatic Antenna Tuner for
FT-100(D), FT-847.
Covers HF & 6m.
Max Input of 100W.

VX-2E
£165.00
Worlds Smallest Handheld
Transceiver. 2m/70cms.
With wide band receive.
1.5W on 2m. 1W on 70cms

MD-100A8X £100.00
Desktop Microphone with
Up/Down/Fast Tuning
Buttons.

Trader's Table

Disclaimer

Advertisements from traders for equipment that is illegal to possess, use or which cannot be licensed in the U.K, will not be accepted. While the publishers will give whatever assistance they can to readers or buyers having complaints, under no circumstance will the magazine accept liability for non-receipt of goods ordered, late delivery or faults in manufacture.

The equipment for sale on this page is secondhand or ex-demonstration

THE SHORTWAVE SHOP

01202 490099

TRANSCEIVERS

ICOM IC 725 HF TRANSCEIVER £325
ICOM IC 745 HF TRANSCEIVER £395
ICOM IC 706Mk1 HF/VHF TCVR £475
ICOM IC471E UHF MULTIMODE TCVR £495
ICOM IC275E VHF MULTIMODE TCVR £325
YAESU FT847 with COLLINS FILTERS £895
YAESU FT 100 TRANSCEIVER £599
YEASU FT1000MP HI SPEC HF TCVR £1099
YEASU FT690R MK2 50Mhz TCVR £255
KENWOOD TS450S HF TRANSCEIVER £425
KENWOOD TS430 HF TRANSCEIVER £350
KENWOOD TS2000B HF/50/144/4340 ..... £999
KENWOOD THD7E DAULBAND HANDIE £199
YAESU VX5R 6M/VHF/UHF HANDIE £169
KWOOD/TRIO TS780 V-UHF TCVR £395
ALINCO DX77 HF TRANSCEIVER £395
ALINCO DX70 MOBILE HF/50Mhz TCVR £399
ALINCO DJ G5 VHF/UHF HANDIE TCVR £145

RECEIVERS

ALINCO DJX-2000 HIGH SPEC RCVR £299
ICOM ICR 75 HF RECEIVER £495
FAIRHAVEN RD500 WITH KEYBOARD £495
ICOM IC-R5 H/H RECEIVER £135
JRC NRD 525 HF RECEIVER £395
JRC NRD 535 HF RECEIVER £525
KENWOOD R1000 HF RECEIVER £145
LOWE HF125 HF RECEIVER £155
AKD HF3 HF RECEIVER £95
AOR AR5000-PLUS HI SPEC RCVR £1099
AOR AR8200 WIDE BAND H/H RCVR £225
AOR AR1500 WIDE BAND H/H RCVR £125
YUPITERU MVT7300 H/H RCVR £185
YUPITERU MVT9000 H/H RECEIVER £265
YAESU FRG100 RECEIVER inc PSU £295
YAESU FRG100 RECEIVER inc K/PAD £250
YEASU FRG 7700 HF RECEIVER £145
YAESU FRG 7 HF RECEIVER £95
YEASU FRG 8800 RECEIVER £195
BEARCAT 9000 XLT BASE SCANNER £165
BEARCAT 280 XLT. H/H SCANNER £95

ACCESSORIES

KENWOOD BC15A CHARGER/TH28/78 ..... £39
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Watson WMM-1 Multimode Modem £49
Welz SP-45M 140-470MHz SWR,PWR meter 100W £39
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For Sale

AVO multimeter M2005, new, boxed, £40. Marconi sig. gen. TF144H, Marconi wide range osc. TF1370A, £10 each. Hendresse Hauser PF meter, as new, £20. Tel: 0780-360 1176.

BC221, choice of three, two in original cases, with int. p.s.u., one in case ext. p.s.u., two with original callbooks, home-brew callbook, £25 each. Buyer to arrange transport. Eric G3KXE, Southampton. Tel: 02380-466506.

Bugcatcher mobile antenna, 80-10 (3.5-28MHz) and 6m (50MHz) adapter, excellent condition, including wooden carry box for coil. Wanted: Icom SM20 base mic. G3NQX on (01772) 703957.

Collection of 40 radios from 1920s & 1930s, including 28 military and civilian communications receiver, including R1155, R107, 19 Set, R106, Bendix, RA1B, BC348, B40, TCS6, CR100, Hallicrafters S27, SX24, S38E, AR88, CR150. Tel: Hants (01243) 379838.

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IC-746, boxed, mint, £725. CW filter FL53A, 455kHz, 250Hz, £80. PSU 22A, WS25SM. FT-690/2 6m (50MHz) portable, £200. TR-751E 2m (144MHz) QRO multi-mode, £250. Paccomm Tiny-2 MkII, £75. All ex SK. G3MCK, QTHR. Tel: (01572) 756444.

Icom IC-718 transceiver, v.g.c., only used a few times, optional s.s.b. filter fitted plus 25A p.s.u. switch mode, £390 o.n.o. Martin, Bromley, Kent. Tel: 0208-290 1520 or E-mail: mwal@lineone.net

Icom IC-PCR1000 communications receiver, 0.01-1300MHz all mode, w.f.m., f.m., a.m., s.s.b., c.w., as new, boxed, £150 plus postage. Vinc on (01487) 823879.

Icom IC-R8500 scanner, unmarked, mint, boxed, £680. Grundig Satellite 2100 with b.f.o., £80. Signal R535, boxed, £100. Quad 303 33, mint, £150. Lowe SRX30, £50. Wanted Drake R4245 - mint only. Tel: Essex (01279) 815020.

Kenwood R-5000, £120. Tel: (01580) 713126.

Kenwood TS-50 plus AT-50 auto a.t.u., buyer to collect, in very good condition, £475 o.v.n.o. Peter, N. Yorks. Tel: (01748) 818479.

Kenwood/Trio TS-120V, PS20, p.s.u., £175. Daiwa 25/30A p.s.u., £55. Altai rotor AR300XL, £30. AVO7 meter, £25. Yaesu YD844A desk mic., £30. Lake PM20 power meter, £15 - carriage extra. Tel: (01745) 570538.

Maldol VK5 h.f. antenna, 80-10m (3.5-28MHz) radial, traps 2m (144MHz), height 6.1m, new July, £80. David G3OEQ, Preston. Tel: (01772) 635533 after 1800 or mobile on (07779) 744108 or E-mail: daviddvdbnn@aol.com

Post office key CR1900 Walters Electrical, offers? Sangamo Weston portable test set model S75 Brown Ebny. Valve radios CR1950s, two CR1930s, AR88D, good condition, case, immaculate condition, £85. Tel: North Cornwall (01840) 770048.

Pye Cambridge 6 valve radio c1950, l.w., m.w. and 9 s.w., world reception, model no. PE60, 100-250V, good working order, £100 Tel: Watford area (01923) 231434.

Realistic DX-394 h.f. receiver, 150kHz to 30MHz, mains/battery, excellent condition, £85 o.n.o. Tel: Gosport 0239-250 3401.

Revex W510 s.w.r./power, £55 o.n.o. Tennamast tiltover 35ft when extended with rotator cage, plus DL800 brake winch, £270 o.n.o. Kenwood low pass filter LF30A, £20. Fluke 87 RMS multimeter, £60 o.n.o. Tel: (07717) 436198 or E-mail: evanmichael@freeola.com

Signal generators, small, 100kHz to 100MHz, another with additional crystal socket, £65, each P&P paid. CR100, £95. Excellent condition AR88D, £175. Overhauled RME six band pre-tuner, model DB20, 1930s unit, £165. Tel: (01872) 862291.

Trio TR-7010 2m (144MHz) s.s.b. transceiver, 12V, good working order, £65. VCI

Electronics VC300D digital bargraph antenna tuner, 1.8-30MHz, 300W continuous built-in s.w.r. meter and dummy load, £65. Neil G3SPN, Worthing. Tel: (01903) 691080.

Two Army 31 sets, both modified, one working, one not working, both with mains p.s.u., handbook and circuit notes, £40. Also small CRT with EHT supply, £15. 'Phone for details. D. Barnes on (01450) 375872 after 1800.

Yaesu 817, stand, carry case, eight months old, £350. Also AOR scanner, Filtec slot cards, the best from AOR. Scanners AR8600, 530kHz, 2040MHz. Ron, Wrexham. Tel: (01978) 365798.

Yaesu 8800 communications receiver, memories, clocks, short waves, Amateurs, h.f., airband, Morse, shipping, u.s.b., l.s.b., c.w., a.m., f.m., 0-30MHz, very clean, good condition, manual, £200. Tel: (01608) 663745.

Yaesu FT-902DM transceiver and matching FT-901DM synthesised scanning v.f.o., like new, in original boxes and packing, unused, £795 plus P&P. Tel: (01872) 862291.

Yaesu YO-100 monoscope, £100. FV-101Z external v.f.o., £80. FTV-250 2m (144MHz) transverter, £80. All with manuals, all o.v.n.o. plus P&P. Chris G7GJZ, Somerset. Tel: (01278) 786621.

Exchange

Fairhaven RD500, new May '03, still under warranty, complete with all accessories, in part exchange for JCR545 d.s.p./f.m. or IC-R8500. Tel: Somerset (01935) 824285.

Wheatstone high speed Morse sender.

Pye 'Rising Sun' radio, KB 2 valve, Marconi 296, crystal set. Early boxed valves, literature swap for high quality 1950s/70s domestic valve amplifiers. Tel: Norfolk (01263) 515732.

Wanted

2m (144MHz) single or dual-band Gum Bumper (hand-held), not into mega buck pvc wonder boxes, £20-70 offered, depending on age and model, preferred with DTFM. Hence any of the following or others, w.h.y.? FT-530 + DTFM, FT-470R + DTFM, FT-280R (1981), Icom IC-02e (1982), Icom IC-W31e + DTFM, Kenwood TH-25e + DTFM and Kenwood TH-45e + DTFM. M. Evans, 85 Hillside Road West, Bungay, Suffolk NR35 1RH.

1155RX, must be in new condition, will pay sensible price. Tel: (01709) 850517.

AVO valve tester wanted, prefer CT-160, but other models considered, also seeking Plessey PV78B converter/keyer for my RTTY collection. Tel: (01482) 887938.

Datong RFA broadband RX amplifier or similar, home-brew not objected to, must be r.f. switched. George, Suffolk. Tel: (01284) 768084.

FT-707 wanted plus FC-707 a.t.u. (cheap please), consider FT-7 or FT-77. On low budget so sensible prices please! Have for sale FV-101 v.f.o., SP101 speaker, £45 and £30 respectively. Martin GW0OUV, Mid-Glamorgan. Tel: (01443) 412695.

Info please on Lowe f.m. scanning receiver, model FS-10 or do you have one for sale? Also wanted Phillips electronic engineering kit, 1970s, your price for either item. Chris on (01438) 871975 after 1800 please.

Old s.w. RX required, free for poor s.w.l. Gebbsqyzz, 35 Pinfold Road, Streatham, London SW16 2SL.

Operating manual for the Yaesu FRG-7700. John on (07818) 210278

R107 receiver, parts, info, power cables, plugs, headphones, anything considered, also good working valve tester with data, also radio designers handbook wanted, will travel. Tel: Dublin 00353 872994006, E-mail: ninyhammer@yahoo.co.uk

Racal receiver wanted. RA17W, RA17L or RA1772, s.s.b. adapter, l.f. adapter and any Racal h.f. accessories. Tel: (01482) 887938.

Surplus radio equipment sought for training Sea Cadet unit in h.f. and v.h.f. communications. Receipt gratefully acknowledged for items already donated by G4HSG and G4HUQ. E-mail: ericg4wmt@telco4u.net or call (01405) 817447.

Urgently wanted old half inch ferrite rods, must be half inch in diameter and be about six inches long or more. Will pay very good money for the rods. Peter on (079314) 63823 from 0900 to 2230.

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Advance! The Full Licence Manual is available from the *PW* Book Store for **£9.95 plus £1.50 P&P UK**, **£2.75 P&P overseas**. To order call **0870 224 7830** or post your order using the order form on **page 73** to: **Book Store, PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW**. Remember to include your payment (in Sterling, cash not accepted), name, address and telephone number with your order.

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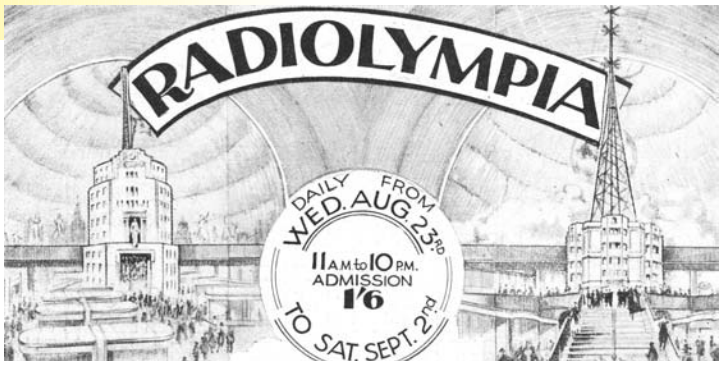
topical talk

Delving into the Archives

In this month's Keylines Editorial, the Editor has featured a photograph of Fred Camm, the long-serving founding Editor of *PW*, from the August 26th issue of 1939. It was published only a few days before the outbreak of the Second World War and so Rob decided to delve further into the magazine.



The photograph featured on the Keylines page owes its presence to **Tex Swann G1TEX/M3NGS**, our resident photographer and unofficial archivist. Originally, I had asked Tex to search for a copy of *PW* with a prominent illustration of F. J. (Fred) Camm, to use in conjunction with the editorial. As usual Tex came up trumps!

The actual issue Tex found in his trawl through the *PW* archives, was actually the last published before the Second World War broke out. Much of the issue is taken over by details of the Radiolympia show which was being held from Wednesday 23 August to Saturday 2 September 1939. Unfortunately, we're all too well aware of what happened on Sunday 3 September!

Show Details

The actual details of the equipment on show at Radiolympia is fascinating to read and perhaps if we ever produce a *PW* CD archive ROM you'll be able to enjoy them yourself. In fact, my colleagues had to drag me out of the archives - I was that reluctant to return to work!

Even though *PW* was a 'general coverage' radio magazine pre-War, I found a very interesting news page entitled 'Radio Clubs and Societies' on page 588 (pages were then sequentially numbered in each volume) of that issue, even despite the fact that Fred Camm didn't like the 'organised hobby' himself, *PW* very much supported the hobby.

Among the clubs featured were the **Slough & District Short Wave Club**, **The Medway Amateur Transmitter Society** and the **Ashton-under-Lyne & District Amateur Radio Society**. The latter society's 56MHz contest station is featured on the page. They were operating from Cown Hill near Glossop, Derbyshire on 30 July 1939 on the old 'Six Metre' band.

Also featuring on the page were the **North Manchester Radio and Television Society** and (appropriately enough) the **Glossop & District Radio Society**. To add to their story a pleasant group photo of the Glossop club was shown, taken during a meeting in the shack of **2LFI**. No names were mentioned - just the then current active 'Artificial Aerial' callsigns **2AJP**, **2DXA**, **2FLI**, **2FXW** and **2HBX**. These could all have become G2 callsigns after the War but a quick look in our office reference 1980 RSGB *Callbook* didn't show any of those mentioned in the news reports. So, did you know any of the Amateurs?

I have no doubt that there are bound to be readers who remember attending the clubs mentioned **at that time** - and we'd be delighted to hear your memories. Judging by our archives - I'm sure you'll have something of interest to share, so let's be hearing from you!

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HF/50MHz ALL-MODE TRANSCEIVER

TS-480HX

200W Model

TS-480SAT

100W Model with Built-in Antenna Tuner

DX Deluxe

- 200W output (50MHz: 100W) DC 13.8V operation
- 100W model available with built-in antenna tuner
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- Compact construction for easy carrying
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■ Built-in automatic antenna tuner (100W model) ■ Terminals for external antenna tuner, linear amp, PC ■ Electronic memory keyer ■ AF DSP features: ● AF DSP filters ● Beat-cancel, noise reduction ● TX/RX equalizer ● CW auto-tune ● Speech processor ■ Optional 500Hz/270Hz band CW narrow IF filters, 1.8kHz band SSB narrow IF filter ■ PSK31 compatible ■ 5W minimum RF output, QRP compatible ■ Electronic keyer ■ Plug-in voice recording/synthesis unit available ■ Packet cluster tune with TM-D700E ■ Supplied with mobile panel bracket, tabletop panel bracket and carrying bracket

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HF EXCITEMENT

FT-857

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