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ICOM IC-7800 NEW £6400 C

HF + 50MHz 200W Transceiver
Latest 'top-of-the-range' transceiver from Icom. 200W output power, built-in ATU and power supply. Two completely independent receivers, four 32-bit floating point DSP units, flexible DSP filter capability. Massive 7in wide (800x400 pixel) colour TFT LCD. Multi-function spectrum scope.

IC-7800-PACK **£6995**
Includes Rig + 17" monitor, keyboard & SM-20 Mic

ICOM IC-756 PRO III NEW £2099 C

The IC-756PRO III marked its debut at the Leicester Amateur Radio Show at Donington. This is Icom's latest HF transceiver and incorporates many of the features from its predecessors and from the new technology used in the IC-7800.

IC-756 PRO II ***Last Few*** **£1899 C**

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 worth £219.

ICOM IC-706 IIG DSP £769 C

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

ICOM IC-703 SPECIAL OFFER £539 C

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

FREE! ***Icom 703 Logbook - while stocks last***

ICOM IC-718 £449 C

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

BUDGET BARGAIN

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 £1099

KENWOOD TS-2000 £1399 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.

TS-2000X + 23CMS £1799

KENWOOD TS-870S DSP £1399 C

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

KENWOOD TS-570DGE £849 C

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

RELIABLE & EASY

YAESU FT-1000 MKV £2349 C

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

YAESU FT-1000 FIELD £1749 C

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

YAESU FT-897D NEW £899 C

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

YAESU FT-857D NEW £649 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 fitted.

YAESU FT-847 £1199 C

Covering 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.

YAESU FT-817ND £499 C

bhi DSP Module now available!

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

NEW DSP Module
bhi 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 £14.95 +£1 P&P

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MFJ *In Tune with MFJ...*

MFJ-993

*Auto ATU with digital data dis[play*1.8-30MHz *Long wire, coax & balanced line *300W SSB, 150W CW *Cross needle metering *Size 255 x 70 x 235mm *Weight 1.8kg

The auto ATU that has a digital data display and can even handle wires!

£249.95 C

MFJ-991

Similar to the MFJ-993 but handles 150W SSB/100W CW and matches 6-3200 Ohms. Does not have digital VSWR meter LCD readout aural VSWR, antenna switch or 4:1 balun.

Auto ATU

£209.95 B

MFJ-941E

A great budget ATU. All the great MFJ features that make it ideal for base station use. *1.8-30MHz *300W *Cross needle meter *VSWR & PWR 30/300W *Terminals for wires and bal. lines *Internal 4:1 balun *Ext. Dummy load socket *SO-239 sockets *Size 260 x 180 x 70mm

Manual ATU

£129.95 B

MFJ-974H

A true balanced line ATU that is ready made for open wire feeder. Extremely accurate balancing provides optimum performance. It can also be used for long wires and coax. Great for all-band doublets. *1.8-54MHz (MFJ-974H) *300W *Balanced, wire or coax *SO-239 sockets *Size 195 x 155 x 220mm *Weight 2.05kg

£179.95 C

MFJ-904H

Just the job for portable use. It's so small! *3.5-30MHz (80 - 10m) *150W wire, coax, balanced *Internal 4:1 balun *SO-239 sockets *Size 180w x 60h x 80d (mm) *Weight 650g

Manual ATU

Mobile and portable use

£129.95 B

MFJ-962D

Ideal for use with linears. Gandles balanced, coax and wire. *1.8-30MHz *1.5kW Roller Coaster *VSWR meter *6-way antenna/load switch *Buit-in 4:1 balun *2 coax positions *Size: 270x375x115mm

Manual ATU

£279.95 C

YAESU FT-7800 NEW — £239 C

Yaesu's Powerful low cost answer!

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

YAESU FT-8900R NEW — £339 C

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

YAESU FT-2800M — £159 C

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

ICOM IC-2200H NEW — £199 B

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

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

KENWOOD TMD-700E — £449 C

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

OTHER MODELS...

ICOM			
IC-2725E	Dual Band FM Transceiver	£269	C
IC-2100H	2m 55W FM Mobile	£229	C
YAESU			
FT-8800E	2m/70cm Mobile	£289	C
KENWOOD			
TM-G707E	2m/70cm Mobile	£289	C
TM-V7E	2m/70cm Mobile	£359	C

YAESU VX-110 — £119 B

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

ICOM IC-E90 — £269 B

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

ICOM IC-T3H — £129 B

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

KENWOOD TH-D7E — £319 B

DATA COMMUNICATOR

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

KENWOOD TH-F7E — £239 B

WITH EXTRA WIDE RX COVERAGE

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

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

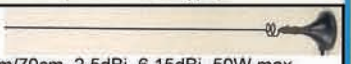
OTHER MODELS...

ICOM			
IC-E208	Dual Band FM Mobile	£219	B
YAESU			
VX-7R	6m/2m/70cm Handheld	£299	B
VX-2E	Dual Band FM Handheld	£139	B
KENWOOD			
TH-G71E	2m/70cm Handheld	£179	B

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

MOBILE BASES

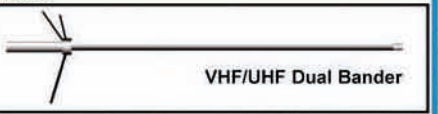
WATSON

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

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

BASE STATION ANTENNAS

DIAMOND



VHF/UHF Dual Bander

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

CHECK OUR WEBSITE FOR FULL DIAMOND RANGE

WATSON

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

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

WATSON W-25XM PSU NEW — £99.95 B

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

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

WATSON W-25SM PSU — £79.95 B

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

WATSON W-25AM PSU — £89.95 C

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

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

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1973 WATERS & STANTON PLC 30th ANNIVERSARY 2003

PRICE MATCH

MFJ-269 ANTENNA ANALYSE

Nothing Else Matches It!

1.8 - 170MHz
410 - 470MHz

* VSWR * Impedance
* Resonance * Reactance
* Coax loss * Distance to coax fault and more!

Operates from AA cells (not supplied) it is totally portable. Connect direct to antenna or to coax. Fault-find in seconds, adjust resonance, create your own design and see the results on the LCD screen. It even tells you how far away any coax short or open circuit is!! Solve your antenna problems in minutes rather than hours.

£349.95 C

NRD-545G DSP RECEIVER

NRD-545G
£1395 C

Japanese Engineered

No more plug-in filters to purchase - the NRD-545 offers 10Hz bandwidth steps from 10Hz to 9.999kHz. And with a digital display down to 10Hz, you can be sure your tuning is spot on. DSP offers state of the art filtering. It's built to last and is a typical master-piece of Japanese design. So - are you ready for a new HF listening experience.

* 100kHz - 29.99MHz
* LSB USB CW RTTY AM FM
* 1000 Memories
* Bandwidths 10Hz - 9.9kHz
* Multi-function display
* Variable AGC
* Tuning steps 1Hz to 100kHz
* Variable tuning speeds
* Auto multi-notch control
* Dual noise blankers
* Adjustable scanning
* Peak/hold S-meter
* IF shift tuning
* Coax and wire terminals
* Clock / timer - terminal
* 32 programmable features
* RS-232 Interface
* Tx Mute socket (For tx/rx)
* Dual IF (70MHz - 455kHz)
* Built-in PSU or 12V Ext.

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	**£369.95**	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 Freq. Counter £59.95 B

SPECIAL PRICE

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

WATSON BASE ANTENNAS

Unbeatable Value!

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

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

Totally weatherproof
Pre-tuned & Unbeatable

MFJ-971 QRP Portable ATU £99.95 C

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

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

HUSTLER ZERO SPACE DX ANTENNAS

No Space Needed!

"Ground Level Wonder"

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

These HF verticals will take **1kW of power**, work at **ground level**, and are **self-supporting.** A single earth rod will get you going. Add buried radials for even better results. These are **rugged, well-built** antennas that American hams have been using for years. Now they are available in the UK from our three stores.

4BTV		
40-20-15-10m. 6.52m high.	**£169.95**	C
5BTV		
80-40-20-15-10m. 7.64m high.	**£199.95**	C
6BTV		
80-40-30-20-15-10m. 7.3m.	**£229.95**	C

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

YAESU VR-120D £139 B

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

RIGBLASTER-PLUS

The Adventure Begins!

~~Was £139.95!~~
£119.95
Order as RB/PL/C

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

NOMIC Similar to above but no 8-pin front panel socket and no CW keyer function. Self-powered. **£59.95**
Code: RB/NO/CU for 8-pin rigs and for RJ-45 rigs

HEIL QUALITY MICROPHONES

Desk Microphones

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

Hand Microphones

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

Headsets & Boom microphones

HST-YM	Traveler single side headset for FT-817	**£79.95**	B
HST-706	Traveler single side headset for IC-706	**£79.95**	B

Headphones & Boom Microphones

PRO-SET-PLUS	Large H/phones with HC-4 & HC-5	**£155.95**	B
PSQP-HC4/HC5	Large H/phones with Quiet Phone	**£189.95**	B
PSQP-IC	Large H/phones with Quiet Phone	**£199.95**	B

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WR-5001 NEARFIELD RECEIVER £79.95 B

30 - 900MHz FM Auto Find Receiver

Auto-tunes the spectrum in a second and locks onto the strongest signal. Locks onto local transmissions, emergency services, security, broadcast etc. Also great bug detector! Built-in speaker and supplied with antenna, charger and batteries.

YAESU FT-60E NEW £189 B

All this for £189!

The FT-60E is a new dual-band FM handheld transceiver from Yaesu. It provides versatile 2-way comms with unmatched monitoring.

Dual Band

*Wide band Reception 108-520MHz & 700-999.990MHz (Cellular blocked)
*New Emergency Automatic ID System
*Huge LCD
*High 5W Power Output
*Ni-MH Long-Life Battery FNB-83 (7.2V, 1400mAh)
*Overnight Charger
*Programmable Keys for user convenience
*Split CTCSS/DCS and DCS Encode-Only Capability.

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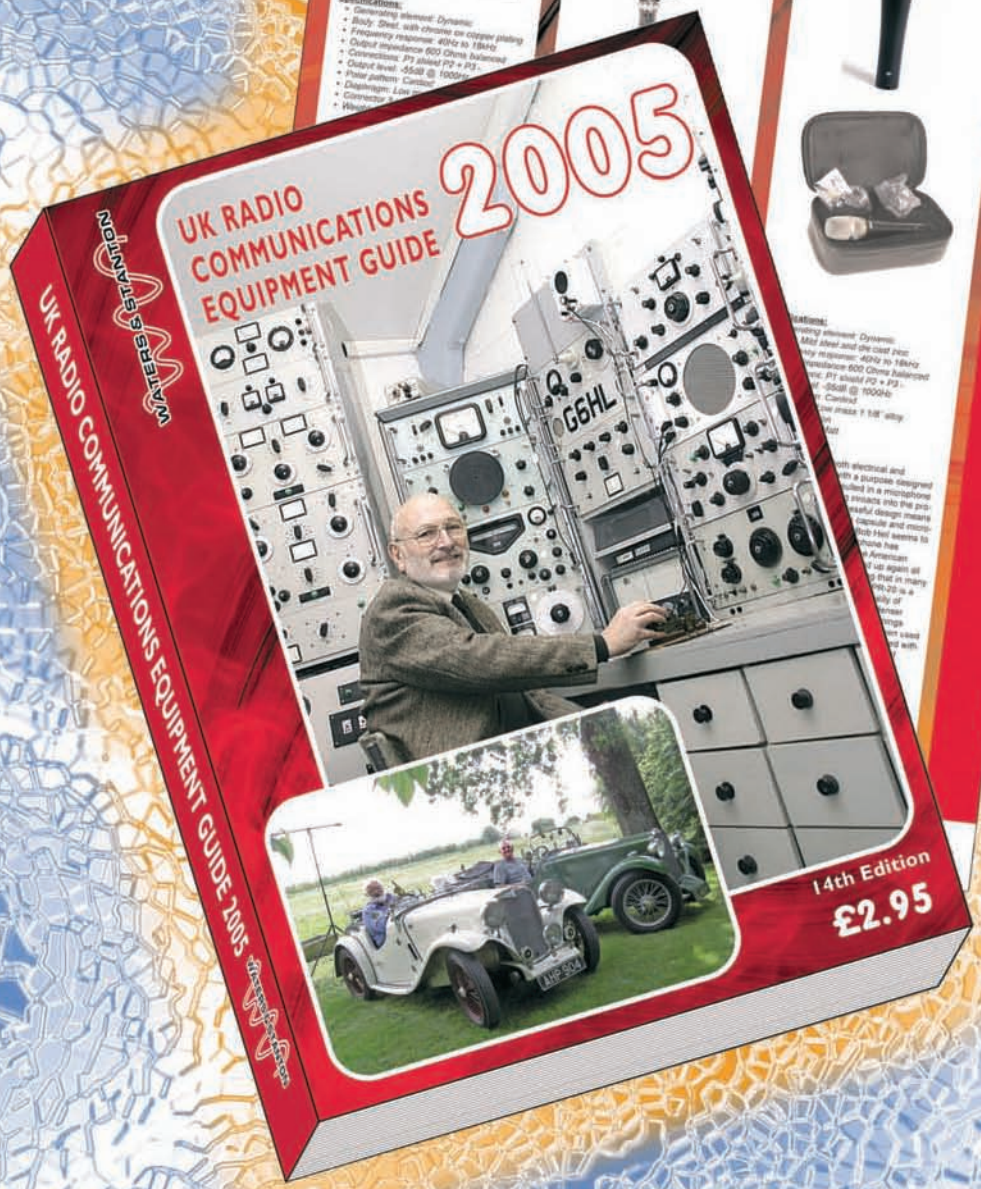

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Editorial Department
☎ 0870 224 7810
Fax: 0870 224 7850

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

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

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

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

Art Department
☎ 0870 224 7820
Fax: 0870 224 7850

Art Editor
Stephen Hunt
steve@pwpublishing.ltd.uk

Layouts
Bob Kemp
bob@pwpublishing.ltd.uk

Typesetting
Peter Eldrett
peter@pwpublishing.ltd.uk

Sales Department
Fax: 0870 224 7850

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

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

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

Subscription Administration
(For all queries regarding exisiting subscriptions)
Kathy Moore
Kat.Subs@btinternet.com
☎ 01590 641148

Finance Department
☎ 0870 224 7840
Fax: 0870 224 7850

Finance Manager
Alan Burgess
alan@pwpublishing.ltd.uk

Finance Assistant
Margaret Hasted
margaret@pwpublishing.ltd.uk

Website
www.pwpublishing.ltd.uk

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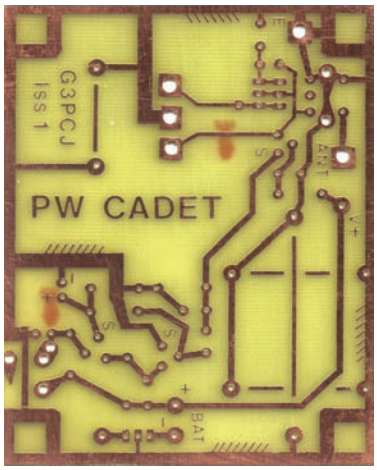
Cover subject

Cover Subject
It may not look like a rad o but this neat little des gn is in fact a 7MHz transmitter built into a sa dine tin. Its a great way to 'fish for frequencies' on the air and if you follow G3RJV's des gn deas you too could build one, if you do please let the *PW* team know how you get on.
Enjoy ths issue and have a happy rad o-filled 2005!
Design: Bob Kemp
Photograph: Tex Swann G1TEX/M3NGS

January features



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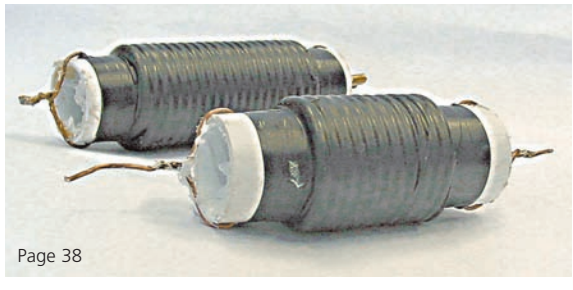

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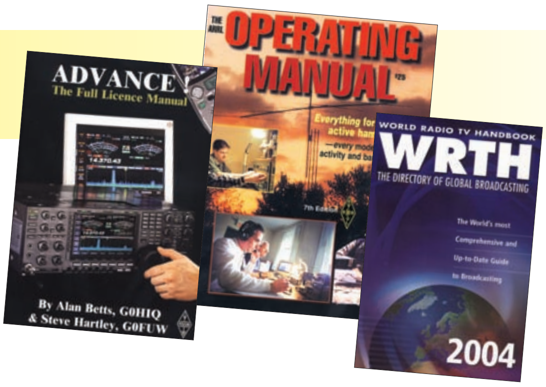
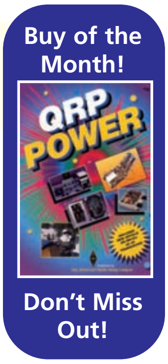
January regulars





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

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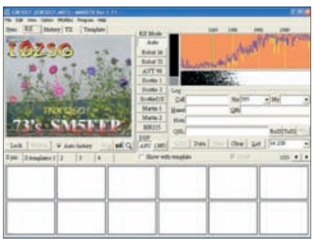

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author info

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

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

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

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

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

Tune-In
Jack Weber
C/O *PW* Editorial Offices
Station Approach
Arrowsmith Court
Broadstone
Dorset
BH18 8PW
E-mail:
tunein@pwpublishing.ltd.uk

In Vision
Graham Hankins G8EMX
17 Cottesbrook Road
Acocks Green
Birmingham
B27 6LE
E-mail: g8emx@tiscali.co.uk

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Great new titles from the RSGB

THE AMATEUR RADIO OPERATING MANUAL

By Don Field

This 6th edition of the RSGB Amateur Radio Operating Manual has been completely updated and redesigned this edition reflects the huge changes in hobby in recent years.

The impact of licensing changes and the ubiquity of PCs and the Internet are just some of the challenges in the hobby in the 21st Century. To deal with these, RSGB Amateur Radio Operating Manual has a completely new look at the content and approach. For example, some of the traditional demarcations between HF and VHF and between the various operating modes have been overturned. New and comprehensive chapters can be found on topics such as PCs in the Shack and Operating Modes. There is also a huge amount of new material included, for example, the 136kHz and 5MHz allocations, new data modes and the WSJT software suite, APRS and VoIP. Much of the book has been heavily updated and there is a complete rewrite of the chapter on Satellites and Space communications.

If you are interested in amateur radio the RSGB Amateur Radio Operating Manual is the book you should not be without. This book provides a comprehensive guide to operating across the amateur radio spectrum. Packed with information and tips this book has long been a standard reference work found on the bookshelf of radio amateurs.The RSGB Amateur Radio Operating Manual is a valuable addition to your bookshelf and the must have book for everyone interested in amateur radio.

Size: 210mm x 297mm, 224 pages, ISBN 1 905086 00 8

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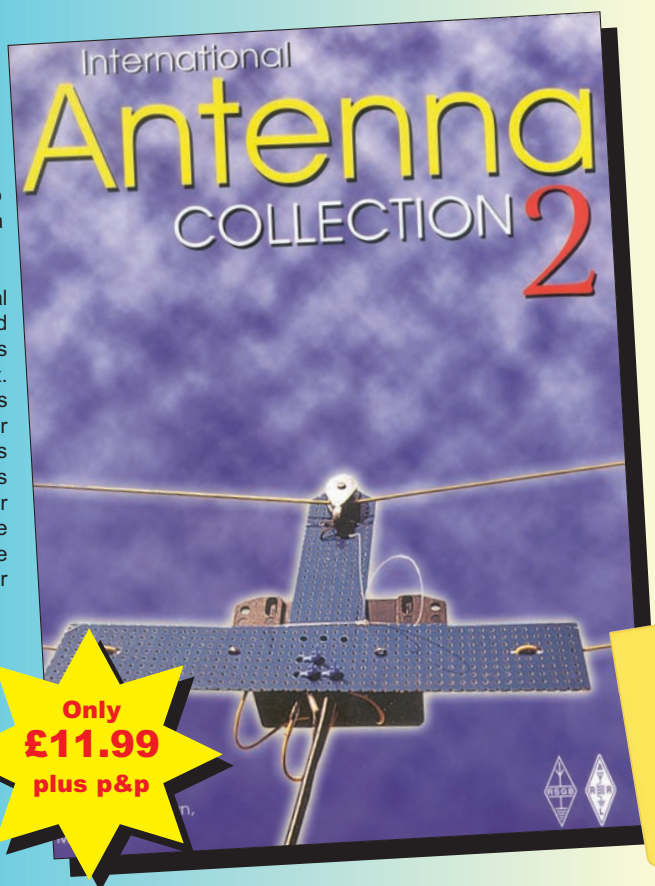
This book is a follow up to the highly successful International Antenna Collection, compiled by the same editor. You will find antennas for most of the amateur bands. Traditional designs and highly original designs are here, simple and complex. Whatever your requirement, you will find something that is directly suited or that sets you thinking about how to solve your problem. Amongst the practical and highly erudite contents is an invited article by one of America's most respected authors on the subject of aerials. He is Kurt N Sterba, the regular 'Aerials' columnist of WorldRadio magazine. He considers one of his pet subjects the much misunderstood interface between transceiver and aerial. Does your ATU really tune your aerial?

All the facts are clearly presented, leaving the author in no doubt as to the correct answer. As before, great care has been taken to ensure that there are antennas to cover almost all the bands between 136kHz and 2.4GHz, receiving and transmitting, mobile and fixed.

Size: 272 x 200mm, 204 Pages, ISBN 190508601 6



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rob mannion's keylines

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

As we publish the January 2005 issue of *PW* I have pleasure in announcing we have the services of **Jack Weber**, a professional journalist, to take over Tune In, the h.f. broadcasting page. Jack is taking over from the late **Tom Walters**.

Although not a Radio Amateur himself, Jack has a strong broadcasting background and worked for the BBC for many years. Like many of us Jack's a keen h.f. broadcast bands listener and I was very pleased indeed when he suggested he started writing for us, re-introducing a column which has been sorely missed. So, welcome Jack and we're all delighted to be working with you in presenting *PW*'s link to where so many of us joined the radio hobby. Short wave broadcast band listening is still great fun and entirely relevant to *PW,* as Jack will surely demonstrate!

● ".....the short wave broadcasters had better watch out... *Practical Wireless* is back on frequency with a new columnist and he's an ex BBC man"!

Note: This cartoon was originally published in March 2002 to poke gentle fun when Thornycrofts, the warship builders, purchased Merlin, who now transmit the BBC World Service on behalf of the Corporation.

'Scope Series

Our new series written especially for anyone who wants to enjoy the mysteries of the oscilloscope starts in this issue. And I'm truly delighted to say that readers are in for a truly enjoyable read. **Gordon King G4VFV** is a long time friend of mine and he seemed the ideal author to write the series and I have a very good reason for this opinion! This is because it was Gordon's articles on oscilloscopes and how to use them that first helped me back in the 1950s and 1960s.

Gordon's writing for the old *Practical Television* (now the trade journal *Television*) and *Practical Wireless* go back to the late 1940s. His total score of books is embarrassingly large (makes me feel inadequate as a writer!) but they all have something in common - simplicity in his thorough, readable approach backed up with an appealing enthusiasm which leads readers on to new discoveries. I hope readers enjoy it and **Donna Vincent G7TZB/M3TZB** tells me she's already thoroughly enjoying working on the series with Gordon. So, let's get those 'scopes switched on and timebases synchronised!

Data Sheet

Again, due to pressure on editorial time I have to apologise for the non-appearance of the oscilloscope data sheet promised some months ago. However, although readers are having to wait - we will get round to it as soon as possible.

In the meantime, does anyone know where I can recruit a technically qualified and willing octopus? I can promise to keep all eight arms very busy indeed!

Terrified Technically?

As a direct result of letters, E-mails and other feedback from readers, it's my pleasure to announce the arrival of a new series for those readers who are somewhat terrified of the technical! The new series - Technical For The Terrified, written by **Tony Nailer G4CFY**, is aimed specifically at those readers who quickly turn the page when they catch the briefest glimpse of a plus or minus sign. Look out for Technical For The Terrified starting in the February issue.

The new series is intended to bridge the gap and help those readers who have the minimum of mathematical experience. We hope to get them to enjoy learning the basics, add to their mental tool kit and ending up being able to fully understand the technical side of our hobby.

Tony G4CFY quickly realised, when he read the letters in *PW*, that there was another series of articles required to help fill the gap between the Foundation Licence training, and what's required to help the keen newcomer to the hobby who wishes to discover more about our fascinating branch of science. In a way the series is a stepping stone between entry level and Doing it by Design. Thanks again Tony G4CFY and to all our authors - we couldn't produce *PW* without your invaluable help.

Price & Subscriptions

Due to ever increasing productions costs the cover price of *PW* has increased by 5p to £3 from this issue. It's some time since we last increased the cost of *PW*, and we always hold on as long as possible. However, I'm a keen reader myself and the cost of my *Railway Magazine*, *New Scientist*, *Scientific American* and the other titles I enjoy each month have been well over the £3 level for a long time. Despite this, we strive to provide good value for money and will continue to do so.

Now comes the good news - the cost of subscriptions to *PW* are being held until the March 2005 issue. So, if you're having difficulty buying the magazine and also enjoy a bargain, now's the time to subscribe! We've many new ideas on the way during 2005 and I'm sure readers will enjoy what we've got in store. Cheerio for now.

Rob G3XFD

practical wireless services

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

Subscriptions

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

Components For *PW* Projects

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

Photocopies & Back Issues

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

Placing An Order

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

Technical Help

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

The Star Letter will receive a voucher worth £20 to

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

Memories from Martti

● **Dear Sir**

The Radio Basics column (November issue) discussing crystal detectors recalled to me the early times when I experimented with crystal detectors. I don't remember the exact year, but it was around 1943-46, during the Second World War and just after it. The circuit was the same as in the Fig. 1 (RB).

The main listening object was our long wave broadcast station at Lahti, working on a wavelength of 1800 metres at that time. My receiver needed a large coil and some information was available, so I spent days winding the low-loss honeycomb coils. Suitable wire and adjustable point-contact crystals were available in a small electricity shop. Also, it was possible to purchase 2000Ω headphones.

Such a long wave receiver needed a long antenna. Luckily our house was located at the edge of a wood, so I put up a long wire using the trees as supports. For the grounding element a broken engine-cooler (radiator) was a really good solution!

The 1800m Lahti station (approximately 100km northwards - inland from Helsinki) came in with a moderate audio strength and my received signal moved up and down following the day and night periods, but the family enjoyed listening to it and I was proud about all that technology. But a greater surprise was still waiting for us!

Sometimes, during the intervals of the Lahti's programme, I heard faint voices speaking in a foreign language with music. Tuning the main capacitor didn't change that signal. It surprised me, but after some thought, it became clear that the origin of that strange signal must be on the shorter wavelengths.

Going toward shorter waves was a painful experience (I remember that clearly) since changing the beautiful honeycomb coil to a smaller one seemed so ineffective! But the results pointed out that I was heading in the right direction. That over-heard station was the BBC and I discovered they also transmitted news in the Finnish language too.

The BBC's signal was much stronger than Lahti's signal. It was really strong! I can still remember the BBC's interval signal. It was a magic four-four timed, bell-drummed tone with echoes. Receiving that with a crystal detector was a fantastic experience!

Later tests showed that 2000Ω headphones didn't give maximum audio output on the short wave crystal detector. A normal telephone's earphone, impedance about 50Ω, improved the audio signal-strength. This indicated that the matching between the detector and audio output is lower in value on short wave crystal receiver.

In spite of the War, I still remember those early radio experiments as 'Golden Good Times'.

Martti Nissinen OH4NV
Finland

Editor's comments: Many readers will recognise that Martti is one of our authors, specialising in antennas. We regularly correspond and when he mentioned his memories, I thought there were ideal for a published letter, especially as crystal sets can be very successful on short waves. It's all too easy to forget just how important the war time broadcasts from the UK were to countries such as Finland and what an important part the simple crystal played for many listeners who regularly risked their lives by listening!

From The Supplier's End

● **Dear Sir**

Denis Spears' letter in your November issue highlights a major problem facing suppliers of specialist components for the home-constructors' market. We have supplied a dedicated battery-eliminator transformer, our type MT-2, which comes with our Application Note No. 10 that gives circuit information, for many years. In fact, together with its companion smoothing choke, type MSC-3, it is our biggest-selling transformer. However, our biggest problem is informing the market of their availability.

We do get mentions in *PW* as suppliers of valve-related components - thanks. We could, of course, take regular full-page advertisements in *PW* and other magazines: the cost of this would have to be added to that of our products. We do, of course, have a website: typing transformers valve 'battery eliminators' UK into Google brings this up amongst a few hundred other suppliers - mainly of mains-plug low-voltage units.

Some valve-radio enthusiasts websites carry links to ours. Our printed price lists are free. However, finding us still requires some effort on behalf of the customer, which we regret. The fact is that, these days, products we don't need are pushed at us from all quarters 24/7, but those we do want have to be found.

With regard to the supply of complete units or even kits, here we run into problems. Since this would be a mains-power equipment, invoking the CE 50V rule, complete units or even kits would have to be 'approved'. This is a major and, in the context of the likely market, prohibitively-expensive exercise, (which is why some much modern equipment runs off separate, standard, power supplies).

However, we do stock the critical components and our Application Note lists suppliers of the common items: capacitors, rectifiers, cells. Suitable aluminium boxes are available from Maplin, amongst others. Where a 'special' is required, our custom chassis service is available.

Home-constructors' are our chosen customers, and we are always pleased to receive suggestions of new items that we should be making, but this is only half the story. Then we have to rely on our customers finding that we make them. Any suggestions?

Tim Christian
Isoplethics
North Walsham
Norfolk
http://www.isoplethics.co.uk

Editor's comments: We're always pleased to support small, specialist suppliers Tim and mention sources of whatever is required wherever appropriate and we'll continue to do so, even if they don't advertise in *PW*. However, without the support of our advertisers - large and small - *PW* couldn't survive for long. In return we support all our advertisers as much as possible and even a small panel advert would keep your readers informed of what's on offer.

Unfamiliar Chinese Transistors - A Solution

● **Dear Sir**

In reply to **Frank Bailey F1VFG/M1EYH's** letter (*PW* December 2004) regarding 'Unfamiliar Chinese Transistors' - I would like to recommend the **Atlas Component Analyser** I have been using for a while. Not only will it identify the leads of the most obscure components, it will also give some of the characteristics too. A real boon when trying to identify the weird transistors!

I think I bought mine from **Mainline Electronics**, but I'm sure I've seen them in **Greenweld** too. These little instruments are a real asset to

the constructor and at around £50 or so is money well invested. Regards.
Mark Tuttle G0TMT
Norwich
Norfolk

Editor's comment: What an excellent idea Mark! The units are also available from Maplin Electronics and they are featured in the latest catalogue.

Metal Supply Sources

● **Dear Sir**
I've just read Topical Talk in December's *PW* and noticed the Editor's comments about material sources, especially metals. Browsing in our local (Exeter) **B&Q Warehouse**, I was delighted to find a rack with a superb selection of metal goodies - tubing (in round and box form), angle, rod, channel, strip, etc., in brass, aluminium and steel. It was a home-constructor's Eldorado and as good a range as the non-ferrous metal dealer I have usually dealt with.

I don't know whether it's just the larger stores that stock this range; we have a smaller B&Q on the other side of the City of Exeter, I'll look next time I'm in there. All power to your elbow on the 'junk' recycling topic, something I've always specialised in as you may know!
Pete G3ZVI
Garex Electronics
Exeter
Devon

Editor's comments: Garex Electronics...there's a real blast from the past! Thanks for the information Peter. I still use the 12V to 300V inverters (removed from scrap Pye radiotelephones), which I bought from you over 20 years ago. Keep the information coming in readers, I'm delighted with the response so far and it'll help provide a very helpful edition of Radio Basics. Thanks for your help everyone!

Dumbed Down?

● **Dear Sir**
I am amazed to read the 'Dumbed Down' letter from **Jon Robson G7MQL** (*PW* Letters November 2004) the more so since he claims not to have been a subscriber to *PW* for "a few years" and is using just one copy upon which to base his views.

It's a great pity that his experience of *PW* only started in 1970. If he had read *PW* from earlier years, also under the editorship of F.J. Camm, he would have found construction techniques akin to the very ones he's condemning. He would also find that FG. Rayer was not the only person to produce designs suitable for the home constructor. Jon would also do well to broaden his understanding of Amateur construction by reading construction articles presented in *Sprat*, the G QRP magazine, *RadCom*, the RSGB members' magazine and especially *QST*, the magazine of the American Radio Relay League (ARRL).

Surely in the pursuit of our hobby we use the skills we have and the resources available to us. We each have different objectives in producing a piece of equipment although the all encompassing one is to make it work. Certainly, producing a 'professional' looking piece of equipment is not something that can be tackled without suitable workshop facilities as he rightly says. However, the quality of woodwork has nothing whatsoever to do with the quality and performance of the electronics sitting on it!

In his letter Jon seems to miss the point completely in his third paragraph. I am surprised to read that he thinks the 'use of hot glue quite frankly defies belief'. He should be aware that hot glue is used in the manufacture of some of the most up-to-date 'professional' Amateur equipment. I invite him to inspect, for example, the inside of an Icom IC-706MkIIG or the Icom AH4 - in both of which he will find a form of glue used in their manufacture. He might also take the time to look at construction articles in *QST* in which he will find hot melt glue commonly used in the production of home-brewed equipment.

Enjoying radio as a hobby offers very many different aspects. One of these is construction of a working piece of equipment. *PW* and *Sprat* are about the only magazines that fill the niche not covered by *RadCom*, *QST*, *CQ*, *QEX,* etc. They at least give projects which can be constructed with limited tools and test equipment and which are suitable for both the beginner and the experienced radio hobbyist.

Mr Editor, keep doing just what you are doing. Don't be put off by letters condemning your efforts, particularly when they seek to add weight to their opinion by the hackneyed and meaningless 'a lot of people think this way'. It is important to any hobby, especially a technical one, that newcomers are encouraged by simple and easily produced projects spelt out in simple terms. 'Dumb down' as much as you like if it encourages readers to develop a knowledge and love for radio, provided of course that you don't forget the more experienced readers too. Editors walk a tight-rope and no-one envies their task of appealing to a wide membership: they can do without discouragement Mr Robson!
David Simmonds G3JKB
Binbrook
Lincolnshire

Tony's Dismayed!

● **Dear Sir**
As a retired medical Professional and a Radio Amateur for 47 years I was dismayed at the tone of the letter from Jon G7MQL in November's *PW*. Very few Amateurs are likely to construct equipment and master soldering techniques at the standard reached by professionally trained Amateurs.

I feel that Jon Robson G7MQL has not thought this through. Rob G3XFD, like a considerable number of Amateurs, suffers from a disability and as such does not enjoy the degree of bi-manual dexterity that most of us do. I think that the equipment he builds and shows in this magazine do him **great** credit.

It encourages others who are disabled to 'have a go' and this is an important aspect of our hobby. Surely, as long as it works does it really matter what it looks like? (I am sure many of us have 'knocked-up a prototype' and because it works well have not rebuilt it.) Rob, **please** continue to build and show your circuits in *PW* to encourage the many people who, because of their disability, are reluctant to 'have a go'.
Tony Wilson G3MAE
Appleton Wiske
North Yorkshire

Editor's comment: Thank you Tony G3MAE and David G3JKB. Your letters reflect the opinion of the vast majority who have taken the trouble to write or E-mail me in support of my stance on constructional projects published in the RB series (which will continue!). However, nothing would please me more than to see - as most writers have suggested - keen new constructors progress rapidly onwards from the Radio Basics constructional approach to produce the best engineered project they can manage. Whatever happens, remember that we should be enjoying ourselves and achieve whatever level we can from our unique hobby.

Thessalonica Hamfest

● **Dear Sir**
Such a long time has passed without E-mails passing between Broadstone and

Athens! In the meantime I have enjoyed the last four *PW*s, they arrived together! Also I enjoyed in September the Hamfest held in the city of Thessaloniki (SV2 area), with my club the **Radio Amateur Society Hellas** (GRC).

I am sending you a photo from the Hamfest. They are, from left to right **SV1GSA**, **SV2BZM**, a friend, the **Prefect of Thessaloniki**, **SV1AWL** (President of GRC), **SV1HMH**, **SV1FYX** and myself **SV1GRN** sitting. I was sitting in both photos due to tiredness only!

Yours truly.
Panagiotis Dadis
SV1GRN
Athens
Greece

Editor's comments: Panos (as he's known to friends) often E-mails me with comments on *PW*. He'd been assuring me (for many months) that the Greek Olympic infrastructure would be finished on time and he was quite correct! Incidentally, I've asked Panos to write us a feature on the Amateur Radio scene in Greece - and I've no doubt it will be very interesting.

The CQ2 Re-visited

● **Dear Sir**
Many thanks for the November 2004 *PW*. I was interested to see the CQ2 receiver article appear again, as I first built this whilst still at school in the mid-1970s. I've been fascinated by super-regens ever since and have used the basic detector in many different incarnations - usually for aircraft band, where it can make a very simple and effective receiver.

I found that an untuned r.f. buffer stage ahead of the detector is generally a good idea. Not so much to reduce re-radiation as to isolate the detector from antenna loading effects which can otherwise cause problems.

More recently, **Charles Kitchin N1TEV**, has produced a number of designs in the USA using this same f.e.t. detector circuit as the core. Many of these designs are available on the web and incorporate added extras such as improved n.b.f.m. detection and squelch.

I was also delighted to read your note on page 55 of the November issue that you're going to encourage a.m. operation on v.h.f. by publishing some circuits next year. I've always had a soft spot for 'ancient modulation', to the point where some might say I'm obsessive about it! At any rate I think it's a valid and useful mode which deserves much more attention than it gets nowadays.

I've played around with home-brew a.m. kits on 10m, 6m, 4m and 2m at various times and I especially like the idea of v.h.f. a.m. portable operation, as astonishing things can be achieved from a decent hilltop. You can have just as much fun with simple home-brew gear on v.h.f. as you can on h.f. you know!

Due to commercial pressures the future for many of our v.h.f./u.h.f. bands is uncertain - now, more than ever, we need to 'use or lose'. In my opinion, anything which leads to increased activity on v.h.f./u.h.f. is to be welcomed.

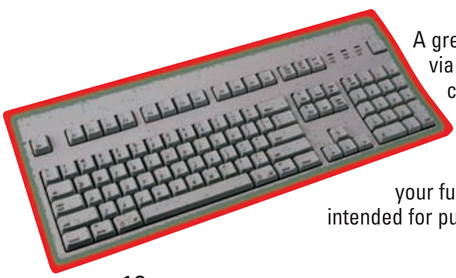
On a different note, thanks for sending the *PW Authors Guide* as requested. I had a brief conversation with Rob G3XFD the Editor at the Yeovil QRP convention earlier this year, during which he mentioned *PW* might be interested in an article about conversion of the MFJ-9406 6m s.s.b. rig to 4m. Would you still be interested in this? I'll soon have more time to be able to write articles. It's something I've been wanting to do for a while, but as yet have not really had the time for.

As well as the MFJ-9406 you've now inspired me to think again about simple v.h.f. gear (including super-regens!). I've got a number of ideas for articles. How about it?
Kevin G1HDQ
Axminster
Devon

Editor's encouragement: Thanks for the fascinating letter Kevin. As soon as you've prepared the articles send them in - I'm sure readers will be as keen as I am to see them! I look forward to working you on 70MHz a.m., instead of our usual n.b.f.m. mode. I now invite readers to turn to Topical Talk on page 76.

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

Letters Received Via E-mail



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

amateur radio rallies

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

2005

March 13
The Wythall Radio Club's 20th Annual Radio & Computer Rally
Contact: **Chris G0EYO**
Tel: **(07710) 412819**
E-mail: **g0eyo@blueyonder.co.uk**
The 20th Annual Radio & Computer Rally is to be held at the Woodrush Sports Centre, Shawhurst Lane, Hollywood, near Wythall, Birmingham. Book early as this is a popular rally.

March 20
The Cambridge & District Amateur Radio Club's Rally
Contact: **John Bonner G0GKP**
Tel: **(01954) 200072**
E-mail: **j.bonner@ntlworld.com**
The rally is to be held at Britten Arena, Wood Green Animal Shelter, King's Bush Farm, London Road, Godmanchester. Doors open at 1000 and entrance fee is just £2 (concession for OAP/disabled, children free). There will be free parking for up to 2000 cars, along with a bar and restaurant on site. There will also be a Bring & Buy and a Talk-in on S22.

April 3
The Northern Mobile Rally (Harrogate Rally)
Contact: **Gerald Brady G0UFI**
Tel: **(07734) 478080**
Website: **www.harrogaterally.co.uk**
To be held at the Harrogate Ladies College, Clarence Drive, Harrogate, North Yorkshire. There will be all the usual facilities plus a Bring & Buy, catering and transport for any disabled visitors, etc.

April 10
The Yeovil ARC's 21st QRP Convention
E-mail: **george@mudford.fstnet.co.uk**
The Yeovil ARC have booked the Digby Hall, Sherbourne for their 21st QRP Convention, the popular get together of QRPers from the South and West of England. Doors open at 1000 and car parking is free in the town centre car parks, which adjoin the hall. Follow the black and white Town Centre signs, off the A30 Yeovil to Salisbury Road. There will be two talks in the morning and another after visitors have enjoyed the excellent food available and browsed the many trade stands. Also, the Construction Challenge will be adjudicated and certificates will be presented to winners of the QRP Convention CW Funrun, which takes place prior to the Convention on the evenings 14-18th March, 1900-2100. (Rules available from G3ICO).

May 2
The 21st Dartmoor Radio Rally
Contact: **Ron G7LLG**
Tel: **(01822) 852586**
To be held at Tavistock College, Tavistock, Devon. This is the same location as last year, with plenty of space for traders to display their wares and for visitors to see them and talk to old friends. There is access for disabled visitors, but due to extensive building works, there will be no dedicated disabled parking. However, there is adequate car parking around the college site. There will be trade stands, a Bring & Buy and refreshments, etc. Doors open 1030 (1015 for disabled visitors), Talk-in on S22. Come and visit beautiful Dartmoor, ideal for picnics, so why not bring the family along?

June 19
The Annual Newbury & District Amateur Radio Society's Car Boot Sale
Website: **www.ndars.org.uk**
The Boot Sale is taking place at the Ackland Memorial Hall, near Thatcham, Berkshire. Directions and a map can be found on the club's website, see above.

June 26
The West of England Radio Rally
Contact: **Shaun G8VPG**
Tel: **(01225) 873098**
Website: **www.westrally.org.uk**
To be held in Frome, Somerset. Contact the above for more information.

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.

HAVERING & DISTRICT RADIO CLUB

Shedding Some Light

Members of the Havering & District Radio Club were recently treated to a talk on the black art of television lighting.

On Wednesday 27 October, one of ITN's lighting directors, Martin Foster G3VOF, a member of the Havering and District Radio Cub gave a talk to his fellow members entitled 'Basic TV Lighting'. Unfortunately, the club's video player had the gremlins that evening and so Martin was unable to show his 10 minute video tape at the beginning of the session as he'd hoped. The tape was intended as a base to start the lecture from. So, instead he decided to explain the fundamentals, while showing the slides.

Martin's explanation of the fundamentals of lighting included the differences between focused/hard, versus soft/diffused light. Some practical examples and slides of different lamps used in TV studios were also demonstrated.

The talk was well received by the club members and if you'd like to find out more about it or the club in general take a look at **www.thehaveringradioclub.co.uk** If you'd like to join the club please contact **Oliver G3TPJ Honorary Secretary** on **(01708) 746677**.

COLLECTORS ITEM!

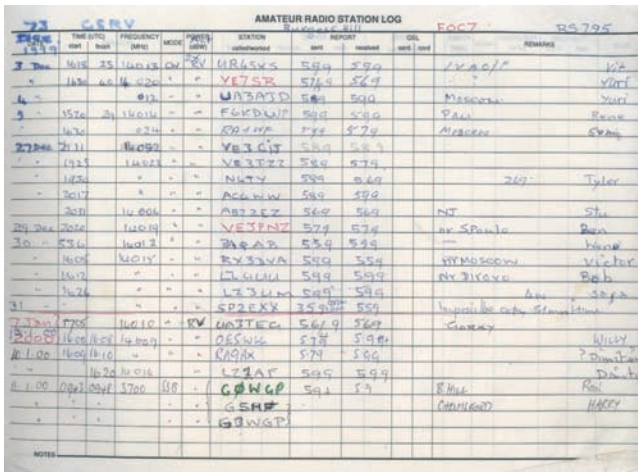
Saved by E-bay!

Eagle-eyed Duncan M0KGK spotted an item on E-bay that belonged to one of the Chelmsford ARS founder members.

The late **Louis Varney G5RV** was one of the **Founder** Members of the **Chelmsford Amateur Radio Society** (CARS) in April 1936 so, when CARS member Duncan M0KGK spotted that G5RV's last ever logbook was being auctioned on E-bay the club decided to bid for it. Duncan did the bidding on behalf of the club and despite fierce competition managed to secure the logbook in the last eight seconds of the auction!

The photographs show Duncan presenting the logbook to the Chairman of CARS, John Bowen G8DET as well as a scan of page 73 (below).

The logbook showed that G5RV's last ever QSO on 11 January 2000 was with CARS President **Harry Heap G5HF** and **G0WGP** on appropriately page 73. The club have now scanned the logbook and put it onto the club CD-ROM.



If you'd like to join the Chelmsford club they meet on the 1st Tuesday of each month in the Marconi Social Club, Beehive Lane, Great Baddow. The doors open at 1915 hours and visitors are very welcome. Car parking is free and a bar is available for refreshments. For further information contact the secretary:
Martyn Medcalf G1EFL
Tel: (01245) 469008
E-mail:
info2005@g0mwt.org.uk
Website:
www.g0mwt.org.uk

DAB NEWS

Sanyo Joins Digital Race

Sanyo has launched its first digital radio, the DC-DAB01 Radio Micro hi-fi system

The latest DAB product to hit the market has been manufactured in a bid to expand the existing consumer demographic of the slightly older market and also appeal to younger generations, through superior sound and additional specifications.

Research carried out by the Digital Radio Development Bureau (DRDB) shows that most current consumers purchase digital radios to listen to BBC Radio 4, BBC Radio 2, Classic FM and BBC Radio Five Live, positioning them in the older age bracket. Sanyo has recognised this by producing a classic design, with elegent wooden-cased speakers and a chrome and black finish. However, Sanyo has also identified that the range of younger radio stations through digital is expanding and has therefore boosted the DAB01's superior sound with a digital amplifier and a 'Bass Xpander'.

The unit also features a front loading CD player and an audio input, which enables games consoles to be fed through the system. Sanyo aims to introduce a whole series of digital radios in the coming months. Features of the DAB01 include:

- Total RM Output 100W
- Bass Xpander
- Four modes - rock, pop, jazz and classic
- Front loading CD player
- Audio input
- Headphones socket
- DAB tuner
- FM digital tuner

The Sanyo DAB01 costs in the region of £160 and is available from all good electrical high street dealers.

Sanyo House,
Otterspool Way,
Watford,
Herts
WD25 8JX
Tel: (01923) 246363
Website: www.sanyo.co.uk

STOP PRESS!

Band Extension In UK on 7MHz

Just too late for the December 2004 issue's news - the expected announcement of the extension to the much valued 7MHz band was made. The Editor reports on what turned out to be a weekend of fun and a little confusion for some Amateurs.

Rob G3XFD writes: On Friday 29 October we received a Radio Society of Great Britain (RSGB) Press Bulletin dated 27 October. In the bulletin the RSGB announced that they and Ofcom (the non-Governmental regulator, which replaced the Radiocommunications Agency) were pleased to announce that "all necessary procedures required for early access to the 7.1 to 7.2MHz spectrum for all UK Radio Amateurs had been finalised and that access would be allowed from 0100UTC on Sunday 31 October. Early access would be granted on a Secondary (non interference) basis using a maximum of 26dBW (400W) p.e.p.

The press bulletin went on to explain the restrictions and the continuing review policy and to acknowledge those involved in the consultation process (the broadcasting industry, UK Ministry of Defence, The RA and its successor - Ofcom).

Delighted as everyone was at the news, some confusion reigned due to a number of misunderstandings. First, despite many attempts over the weekend I could not find any notification on the Ofcom website. Neither had the *PW* offices been informed by Ofcom - although we do receive many E-mails from them each week.

The announcement did not appear on the UK Government's *Gazette* website. **Note:** Many readers will remember that historically, changes and amendments to the UK Amateur Radio Licence were published by being 'Gazetted' in the London, Edinburgh and Belfast editions of the Government's official 'notice board'.

Over the weekend of 29/30 and 31 October **Tex Swann G1TEX/M3NGS** (*PW*), **Elaine Richards G4LFM** (Editor of *Radio Active* magazine) and I attempted to clarify matters, checking that all was well. Unfortunately, over the weekend no one was able to confirm the information. However, on Monday morning, 1 November, I spoke directly to **Peter Kirby G0TWW**, General Manager of the RSGB.

Peter confirmed he'd been assured by Ofcom that the information had been made available by Ofcom on their website before the news was published by the RSGB. On further enquiry with Ofcom, on behalf of readers who had contacted us with concerns on the matter, I was told by an official at Ofcom that an error had been made entering the information on the non-governmental agency's website. But I was assured the information was present, as we spoke.

Soon, Elaine G4LFM telephoned the *PW* offices to report she'd made several discoveries regarding partial information on 7MHz relating to individual Licence Classes. A further update from Elaine arrived soon after, and told us that the full information was there, but was 'hidden' deep within the Ofcom website. It seemed that for many readers - and *PW* editorial staff - it had obviously proved very difficult to locate the announcement.

Several of the readers who telephoned or E-mailed the *PW* offices to express their concerns that the RSGB seemed to have 'exclusive' information were re-assured of the situation by myself, following my conversation with Peter Kirkby G0TWW. It seems as though - due to an oversight at Ofcom - that the RSGB's honourable intentions that the announcement had been published before their own announcement, had been stymied by accessibility problems on the Ofcom website.

Additionally, I discovered that since the RA (as a Government Department) gave way to Ofcom (essentially a non-Governmental Agency acting for the Government) the requirement to publish changes in the various editions of the *Gazette* have ceased. Along with many other readers I was also caught out by this change - although I should have been aware. My apologies go to those readers who also shared my confusion!

However, despite several days of confusion I'm pleased to say that Radio Amateurs in the UK, generally seem to be enjoying the extended, very useful 7MHz band. So, let's hope that in future the Ofcom website will be much more 'user friendly' and that they do keep everyone who needs to know - in the know!

Rob Mannion G3XFD

A DRY SOLUTION

Get Waterlogged!

Are you fed-up with soggy log sheets when operating outdoors in damp UK weather conditions? It seems SOTA Beams have the answer!

Specialists in developing products for the outdoor Radio Amateur, SOTA Beams have developed specially printed waterproof logsheets, known as the Water Log. Designed to meet the needs of Radio Amateurs operating outdoors in less-than-perfect conditions, the WaterLog sheets are made from a waterproof paper printed with a logging grid (10 contacts on each side) and presented on a metal aluminium alloy backboard, which is very light and strong. The type of paper used enables pencil logging to be erased so the sheets can be used several times.

The WaterLog system measures 110 x 150mm, weighs just 95gms and comes complete with five log sheets (enough for 100 contacts) and a pencil that's firmly attached. Priced at £6.50 plus £1 P&P the Water Log is available now from SOTA Beams. Replacement packs of logsheets are available for £2 plus 50p P&P.

SOTA Beams,
89 Victoria Road, Macclesfield, Cheshire
SK10 3JA
Website: www.sotabeams.co.uk

OUT OF THIS WORLD

Digital Signals from World Space Receiver

WorldSpace launch a portable receiver that picks up signals from outer space!

The WorldSpace Satellite Radio from AMI, allows you to choose what you want to hear in the language or the country that suits you and can receive digital signals from satellites positioned 34,000km out in Space. So, if you're travelling to Africa, the AMI WS201 offers programming not just in English, French and German, but Hindi, Urdu and Swahili, too!

The WorldSpace digital-satellite sends signals to the compact dish attached to the radio and means that there's no fading, noise or interference. The radio delivers near CD quality sound in a coverage area of 14 million square kilometres across the world.

As long as you're in line-of-sight with the satellite, you'll never lose the WorldSpace high-quality sound. There are over 40 channels of crystal clear, fade-free digital audio programming direct from the satellites.

The WorldSpace WS201 Radio comes with the option of additional programmes available via subscription, to give you a wider choice. The WS201 costs £119 and is available now from Nevada who are the official UK distributor of a range of receivers for the WorldSpace system.

For more information on the WS201 or range of WorldSpace receivers take a look at **www.worldspaceradios.co.uk**

Nevada
Unit 1 Fitzherbert Spur, Farlington,
Portsmouth PO6 1TT
Tel: (02392) 313090
Website: www.nevada-radios.co.uk

PMR NEWS

Kenwood To The Rescue!

Kenwood Electronics Comms Department recently came to the rescue and saved the day for one young couple thanks to their range of p.m.r. equipment.

Vicky and **Rhys** planned to marry on the London Eye and it was only after the date was set and the invitations issued that they realised that each pod only took 25 people – and they had invited nearly twice that number. Half the wedding party would miss the ceremony! A friend of the bride mentioned it to the girlfriend of someone who works at Kenwood, who mentioned it to her boyfriend who mentioned it to **Dave Divecha**, who is an engineer at Kenwood. Dave mentioned it to his boss and Kenwood (knights on white chargers division) sprang into action.

To avoid licensing issues, the new TK3201 which uses PMR 446 frequencies was chosen and using the dealer software, it was programmed to use DCS tones, so that interruption would be extremely unlikely. Two handsets were programmed for VOX and fitted with tiny lapel microphones, the other was linked to a loudspeaker from the Kenwood mobile range.

On the happy day, the groom and the registrar were 'wired up with mics and the handsets attached to their belts. The other radio and the speaker were taken into the second pod where all the guests were so they could hear the ceremony clearly.

Mike Atkins, Sales and Marketing Director for Kenwood said, "Helping Vicky and Rhys made everyone involved feel great. We are delighted to have provided this solution and would like to wish the happy couple all the best for the future".

This just goes to prove that the applications for radio are endless. For more information on the Kenwood range of p.m.r. products, 'phone **(01923) 655292** or E-mail: **andy.dawson@kenwood-electronics.co.uk**

M3 SHARES HIS KNOWLEDGE

Essex Morse Practice Group

Alex M3HSK may have only been licenced for short while but he can send and receive Morse at 15 words per minute and in a bid to share his new found mode he's helping others...

There are many new M3's in Essex who are keen to learn Morse but up until recently there have been no classes available. So, when **Alex M3HSK g**ot his M3 licence he decided to do something about it and has recently set up the Essex Morse Practice Group to help others learn the code.

The group operates a Morse net for beginners and also plans to hire a room for tuition evenings. Anyone interested in joining in or wishing to help with the teaching can contact Alex on **(07973) 210057** or via E-mail at **morse.code@bouncylandings**

FOUNDATION COURSE

Get Your Licence

The Shefford and District Radio Club is preparing a new series of weekly two hour evening courses for the Foundation Licence.

Encouraged by the success and 100% pass rate of their 2004 course, the **Shefford and District Radio Club** Instructors invite interested readers, who live in the Bedfordshire and Hertfordshire areas to contact **Stewart Baker G3RXQ** for details on **(01908) 585284** or Email him at **baker@nildram.co.uk**

amateur radio clubs

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

BASINGSTOKE
Basingstoke Amateur Radio Club
Contact: **Frank Heritage M0AEU**
E-mail: **barc@2lo.info**
Members of the Basingstoke Amateur Radio Club meet on the first Monday of the month at 1930 for a 2000 start at the Gems Sports & Social Club, The Club Hut, Lister Road, Basingstoke, Hamsphire. The club is also a registered exam centre for Amateur Radio Licensing, providing training courses for Amateur Radio exams with a comprehensive program of monthly presentations also. Up-to-date information regarding the new committee and up and coming events can be found on the club's website, visit **www.basingstokearc.co.uk**

BRISTOL
Thornbury & South Glos. Amateur Radio Club
Contact: **Stan G0RYM**
Tel: **(01454) 413177**
E-mail: **stang@talkgas.net**
Members of the Thornbury & South Gloscestershire Amateur Radio Club meet at 1930 every Wednesday at the United Reformed Church Hall, Rock Street, Thornbury, Bristol. Contact Stan G0RYM on the above details for more information on forthcoming club activities.

DEVON
Exeter Amateur Radio Society
Contact: **Steven Webber M3WRS**
Tel: **(01392) 498934**
E-mail: **stvenwebber@tiscali.co.uk**
The Exeter Amateur Radio Society have recently elected a new Secretary, Steven Webber M3WRS. Members of the Society meet at the Moose Lodge, Spinning Path Lane, Blackboy Road, Exeter, every Monday from 1930. The Society have a variety of activities from guest lectures, learning Morse Code to fault finding evenings. New members are always most welcome to attend.

NORTHERN IRELAND
Bangor & District Amateur Radio Society
Contact: **Mike GI4XSF**
Tel: **0284-277 2383**
Website: **www.bdars.com**
The Bangor and District Amateur Radio Society (BDARS) was formed over 30 years ago in Bangor County Down. Bangor is a seaside town about 19km (12 miles) east from Belfast. The club is the largest radio club in Northern Ireland with over 80 members. Meetings take place on the 1st Wednesday of each month in 'The Stables', Groomsport, at 2000. New members and visitors are always made most welcome, so if you're not already a member, check out the website address given above and go along to the next meeting.

SHROPSHIRE
Telford & District Amateur Radio Society
Contact: **Mike Street G3JKX**
Tel: **(01952) 299677**
Website: **www.tdars.org.uk**
The Telford & District Amateur Radio Society meet at 2000 every Wednesday evening at the Dawley Bank Community Centre. Bank Road, Telford. Lots of events are planned throughout the coming year, so log on to the website above and see what's happening in 2005!

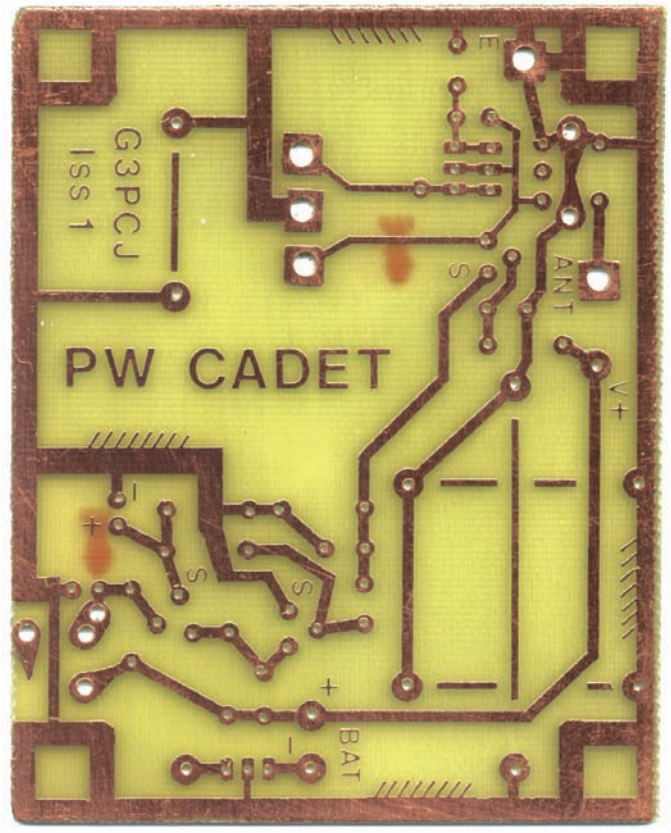
Keep those details coming in!

radio basics

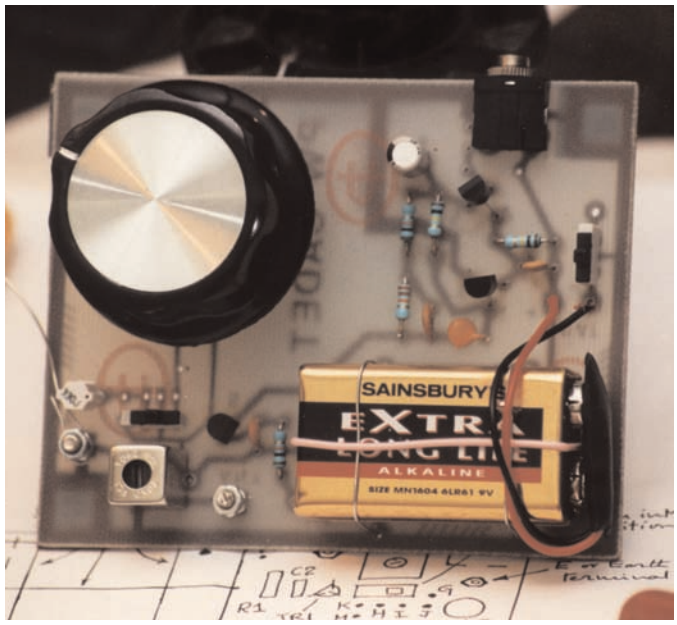
This month Rob Mannion G3XFD finalises his overview of the different forms of detector by looking at a particularly successful circuit produced by Tim Walford G3PCJ.

Recently I've been providing an overview of the type of detector circuit that I've found to be useful and practical. In fact, many of the circuits discussed in Radio Basics (RB) have been successfully used to form group constructional projects, or for individual use by keen beginners I've enjoyed helping over the years. There's nothing more pleasing than to see their eyes literally light up as a circuit works and the exclamation; "It works" is uttered!

Over the years I've come across many circuits that have particularly appealed to me and in this list I include the *PW* Cadet kit project, which featured in the very earliest of the RB series. Working closely with **Tim Walford G3PCJ** of Walford Electronics in Somerset, together we produced a kit aimed at the beginner.



● Fig. 2: The full size pattern for the PW Cadet p.c.b. (see text).



● A fully built *PW* Cadet kit, as originally suplied by Walford Electronics (see text).

I built one of Tim's kits myself and it proved to be extremely successful and very reliable, providing excellent reception on medium waves and the main short wave broadcasting band around 6MHz using only a very short antenna. The actual coverage is the medium wave band, together with coverage from (approximately) 3.5 to around 7MHz or so.

So, to end the series of articles on detectors I thought it would be a good idea to finish with the Cadet circuit - with Tim's permission - so that anyone interested can try it out for themselves now that kit itself is no longer available and Tim cannot supply components.

The Cadet Circuit

The circuit for the *PW* Cadet, reproduced in his style and with the permission of Tim Walford G3PCJ, is shown in **Fig. 1**. The circuit, pin-out diagrams and the block diagrams are reproduced directly from the Walford Electronics instruction sheet.

Incidentally, some RB readers will have the instruction sheets already because when the kit was superseded Tim very kindly donated the remaining p.c.b.s and instructions to give to readers. These were then offered as a gift on behalf of RB several years ago. Although I no longer have any p.c.b.s to give to readers, the full instructions, together with the components placing diagram, are still available and I can provide photocopies (please contact me directly at the *PW* offices) if necessary.

For those readers who enjoy making their own p.c.b. the layout is shown in **Fig. 2**. It's an easy design to follow and it's a simple matter to relate the copper tracks to the circuit.

The only real component problem is likely to be that the Toko inductor (Type 331208) is not commonly available nowadays*. Despite the inductor difficulty, because the inductance of the main winding 330µH is known - to make your own inductor. The short wave winding has a known inductance of 33µH.

* **Robin Sykes** of Sycom confirms that he has a limited number of these inductors in stock. Please see advert on page 76 in this issue.

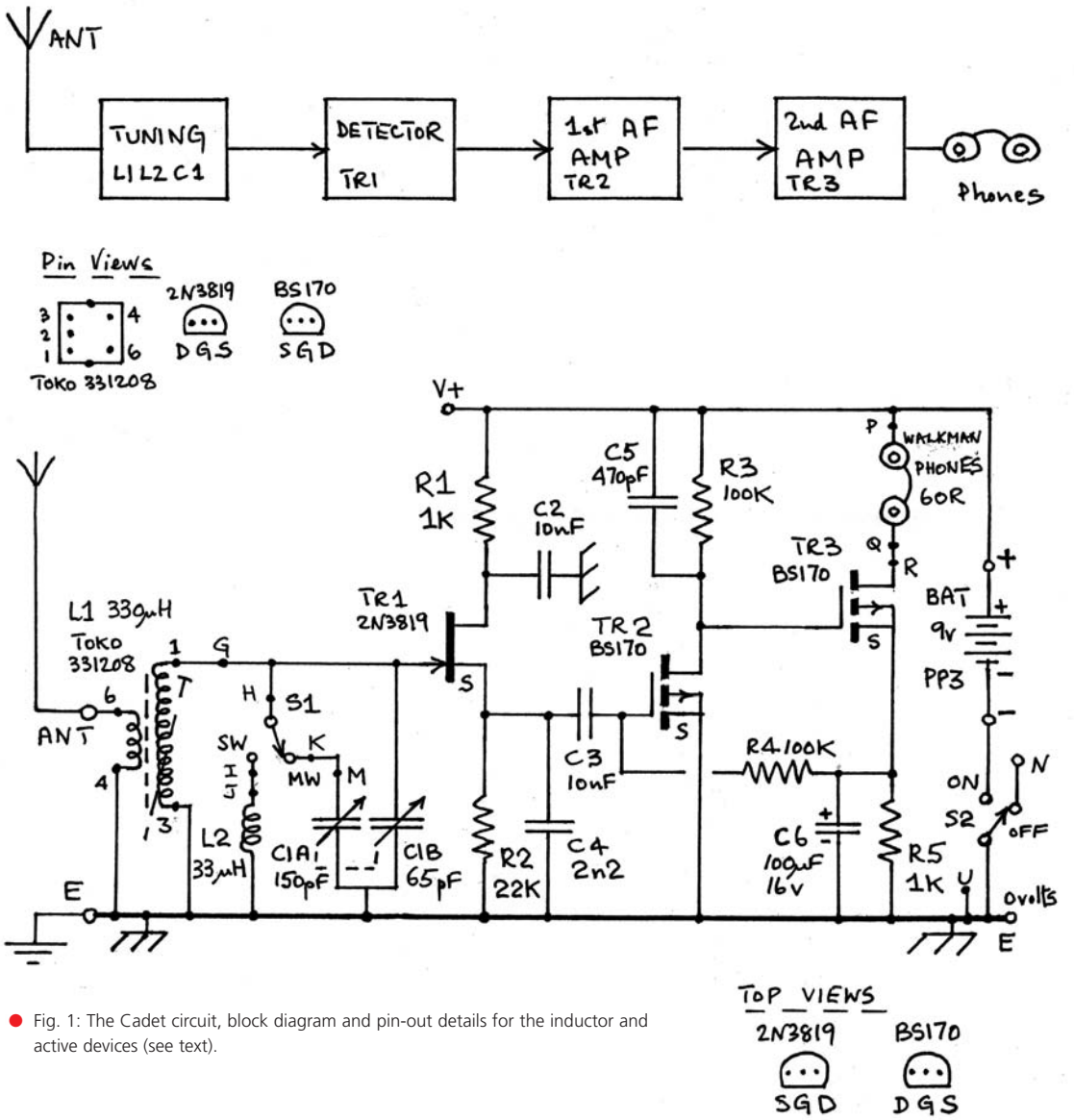
Technical Description

The following technical description of the Cadet project is taken directly from Tim G3PCJ's information sheet.

"The input transformer, L1, matches radio frequency (r.f.) signals from the normal low impedance antenna input up to the high impedance of the tuned circuit, which selects the wanted station. This resonant circuit is formed by L1 and both sections of C1 (a polyvaricon

double gang variable capacitor) when the Cadet is switched to medium waves. When S1 is set for short waves then only once section of C1 is used and the inductance L2 is placed across L1 so that the resonant frequency is decided primarily by L2 and C1b only.

Detector: This stage uses a junction field effect transistor (j.f.e.t.) for Tr1 working as an infinite impedance detector. This has the action of a diode amplitude detector but without the loading effects that would ruin the selectivity of the input tuned circuits to which it is connected. The time constant of R2 and C4 determines the highest audio frequency that can be passed to the following stages and hence the receiver's nominal bandwidth. This is set for about 3kHz to pass the important audio frequencies (a.f.), including Morse, speech and medium quality music. The purpose of R1 is to prevent damage from a reverse connected supply. The stage runs with a very low current in Tr1 with the required gate bias being developed across R2.



● Fig. 1: The Cadet circuit, block diagram and pin-out details for the inductor and active devices (see text).

First a.f. amplifier: Both this stage and the next use a metal oxide semiconductor f.e.t. (m.o.s.f.e.t.), which need a d.c. bias of about 2V between gate and source to make it work in addition to the normal drain supply voltage). This gate bias voltage for the first stage Tr2 is derived from the second a.f. stage Tr3 in a feedback arrangement, which stabilises the voltage across R5 at about 2V. The transistor Tr2 operates in a common source mode with a voltage gain set by its load resistor R3. Capacitor C5 and resistor R3 are also set to only pass signal below 3kHz. The transistor Tr2 operates with a very low supply current.

Second a.f. amplifier: The output stage Tr3 is also in common source configuration but with the source about 2V above ground or 0V; the capacitor C6 decouples the source resistor R5 so that the source appears to be 0V for the wanted audio signals. The gain is determined by the load impedance of the headphones; the circuit is intended for medium impedance headphone of the type used for portable cassette player or CD players, but with both earpieces connected in series so that the load is about 64Ω instead of the normal 32Ω for each earpiece. The supply current of this stage is set by the 2V across R5 at about 2mA. On the original design, there's provision for other output connections so that the kit can be used with other equipment".

***Note:** There's provision for a wire link on the p.c.b. design to make a permanent setting for S1, so that it can be used for other purposes (not relevant in this application of the kit. **Editor**.*

Ideal Project

From personal experience I can assure RB readers that the *PW* Cadet is an effective design. Surrounded at home (as I am) with some really good up-to-date transceivers and communication equipment I have to say that I thoroughly enjoyed listening on headphone to the output of the Cadet. There's something really satisfying about listening to a receiver you've made yourself.

Although the original p.c.b. and kit aren't available from Tim Walford G3PCJ anymore (please don't ask him - I can assure you they're not!) there's no reason why RB readers can't build this delightful little project themselves. I spent nay happy hours listening to the receiver and it provided much pleasure. Why not build one yourself?

Anyone who is prepared to make their own p.c.b. can contact me (as suggested earlier) and I'll be pleased to photocopy the component placement diagram to help. However, on the other hand I have no doubt it would be possible to build the project using a wire and Perfboard layout. And although I normally avoid using Veroboard when r.f. circuitry is involved - as there are no high gain r.f. circuits used here (with the possibility of coupling/feedback between the Veroboard tracks). I see no reason why such a layout couldn't be used. **PW**

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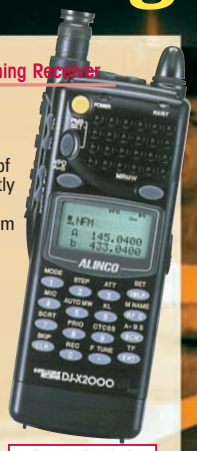

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The Centre of Sound was very successful for a period and Fred G2BCX contributed much to it success (see text).

Freda Judd shares the fascinating story of her late husband - Fred Judd G2BCX. He was a great character and radio engineer but there was much more to this greatly missed character than antenna designs. So, it's over to you Freda!

Fred Judd G2BCX

-A Life In Radio & Electronics

It's a long story and there's much to tell about F.C. Judd the prolific writer – Fred G2BCX the well known Radio Amateur, not forgetting Lester Rands, one of Fred's pen names. The name of Fred Judd is also synonymous with the Big Jim 27MHz and the Slim Jim for 144MHz but antennas were only part of his prolific work.

Fred was born in Woodford, Essex on 5 June 1915 and at the tender age of seven visited what passed for a radio shack belonging to a neighbour. From that day onwards his whole life was dedicated to radio communication and electronics.

As he passed from his teens to his twenties Fred realised he could design and write for home construction journals, his first publisher being *Radio Constructor* for whom he designed circuits for radio controlled boats and planes. He constructed a 4ft boat of his own and a scale model *Spitfire*. All this attention to the design of radio control for models brought about his first book *Radio Control for Models* published by Data Publications, the publishers of *Radio Constructor*.

Fred's radio controlled boat was tested many times to the delight of all children at The Round Pond in Kensington, in London. *The Spitfire* was taken to Chingford Plains, in Essex on a Sunday morning, along with youngest son Peter, giving Fred an excuse for flying radio controlled model aeroplanes. This often turned into a workshop on radio control for other enthusiasts - Peter enjoyed it as well, and he sometimes got to fly the aeroplane.

Became Radio Amateur

Fred obtained his full Licence as a Radio Amateur around 1946, although the interest was there at least 10 years earlier, when he had obtained his Artificial Aerial (AA) Licence 2BCX. He was given the callsign of G2BCX, along with many other Amateurs who had held a pre-Second World War AA Licence.

The new licence galvanised Fred into action designing circuits to improve things in that field. His main interest was in propagation, getting

better results through better antennas.

On one occasion in the late 1950s Fred designed a kite antenna, which fitted onto the back of our very old car. We had to put up with very peculiar looks as we drove through towns flying a kite behind us with the driver babbling into a microphone and myself trying to control the kite!

Around 1960-61 there were a considerable number of pirate radio stations about, once again Fred came to the fore and designed direction finding circuitry, which fitted into a cigar box. Naturally a good loop antenna was required to accompany this device.

We would go out in the evening with one or two other amateurs such as **Jimmy Hunter G6HU** and **Ted Rule G3FEW** tracking down the pirates. I would be in charge of mapping, not the easiest job in a moving vehicle! Quite a few addresses were turned over to the Post Office Radio Branch and a number of pirates were persuaded to take the hobby seriously and attend classes to get a Licence. At the end of a pirate hunting evening, we would decamp to the pub, usually the *Bee Hive* in Ilford in Essex, or *Charlie Brown's* in Woodford, also in Essex.

Happy Marriage

Fred Judd married me, Freda, (his second wife) in 1955, a partnership that lasted until his death in 1992, a long, happy, eventful and satisfying marriage. We met in Leytonstone, Essex, where I lived.

Fred and his friend had gate-crashed a club where a private dance was going on. He told me that he and his friend looked through the door, he saw me and decided to gate-crash and try his luck!

We soon fell in love and I was introduced to Amateur Radio. Over the years we visited many clubs up and down the country and some in Holland and Belgium. Fred was always being asked to talk on a subject to do with Amateur Radio. We met some wonderful people and made many good friends.

Fred had served with the RAF during the Second World War and because of his radio knowledge was assigned to Radar research and installation. He loved the work, carrying this on into civilian life with Kelvin Hughes of Barkingside in Essex, joining them around 1950.

Prior to joining Kelvin Hughes he worked for several radio and TV repair companies, one of which was Alba Radio. He always disliked this work, wanting to design things not repair them! Thus, after joining Kelvin Hughes he became one of their senior research engineers in the field of radar.

As he told me later, Fred would often have to repair or refit new radars on to ships and train the sparks (the radio officers) on the ships to handle the more sophisticated radar sets. He left Kelvin Hughes in 1960 to become a Consultant Electronics Engineer and Writer.

My husband ended up writing for all the popular magazines of the day such as *Practical Wireless*, *Practical Electronics*, *Practical Hi-Fi*, *Short Wave Magazine* and of course *Radio Constructor*, and others. He was also Technical Editor for *Amateur Tape Recording* and *Hi-Fi Magazine,* another very popular magazine in its heyday.

● Fred G2BCX's station in 1946. Even the microphone was home-made.

● Fred playing the organ, Peter Judd on the drums and Freda singing. Fred G2BCX did much pioneering work on multi-track audio recording.

● Fred G2BCX in his element - on the Norfolk Broads enjoying boating and audio recording at the same time. It was his "Getting away from it all" holidays.

Centre Of Sound

Around 1968 Fred became the Technical Director for the Centre of Sound, a very up-market and forward looking recording centre in London's West End - packed with the most modern technology of the day.

For a while the Centre of Sound was a huge success and saw many large contracts from artistes, radio stations, commercial businesses, etc. From this association came Fred's second book *Tape Recording for Everyone,* again showing circuit designs for extras such as mixer units, sound for cine films, microphone pre-amplifiers, multi-track recording.

Around 1970 Fred was commissioned by the Radiophonics Department of the BBC and was asked to make a set of sound effects records for many of their TV presentations. This was because not only could he produce top quality recordings, but he also had an arrangement with a colleague in Walthamstow - **John Ratcliffe** - who had a record company alongside his photographic processing business.

The record label went under the name of Castle Records and of all the places we visited collecting sounds - I enjoyed London Zoo the most. Here we were accompanied by zoo keepers all day, plus staff from their technical department.

I got to hold a Lion cub, had a very close encounter with a crocodile and had to hold a screeching parrot! The keepers had to encourage their charges to make a noise, some of which were deafening.

Fred went into the elephant house, accompanied by the keeper but one of the elephants did not like the microphone. The animal showed his distaste in a most unfriendly way and the keeper had a nasty few minutes but the ensuing recordings of angry elephants were excellent! He was also part of a team making the sounds for the first *Thunderbird*

Fred Judd G2BCX

Fred G2BCX (centre) handing over one of the sound effects master tapes to Castle Records, at their studio. He had many adventures recording the sound - including a noisy meeting with an elephant! John Ratcliffe (proprietor of Castle Records) is shown seated.

marionette animation series, later to become a cult programme.

As time went by Fred was also a regular guest on the BBC's *Sound* programme, which went out on Sunday afternoons on the Home programme (now BBC Radio 4), hosted by Douglas Brown, Editor of *Tape Recording* and *Hi-Fi Magazine*. Fred also appeared once or twice on the famous and long running Jack De-Manio's morning show on what's now Radio 4.

Amateur Emergency Network

Fred never lost interest in his hobby and was one of the pioneers of the Radio Amateur Emergency Network (RAYNET). At the same time he was busily writing and among his eight published books, the highest sales came from *The Two-Metre Antenna Handbook*. This was published in four languages, it's still to be found mentioned on the Internet, on the Amazon website.

Very often my late husband's work and hobbies became one and the same thing and the best example of this was music. He played guitar and keyboards, including the steel guitar, which he designed and built. Fred found electronics and music went together and they were both things he loved, thus he brought his electronic expertise into music, making multi-track recordings using an eight track Ferrograph professional recorder.

He would play two guitars, piano and organ, then add the bass, all on different integrated tracks, and everything was mixed with a specially designed mixer. In fact he was using a smaller version of today's huge multi-mixers to be found in music studios.

Around 1975 Fred purchased his first of two manual organs and then proceeded to build a third keyboard to give a greater range of sounds! He then improved the amplifier unit and added other gadgets such as tape loops which came in at the press of a button.

As I was a singer, I added the vocals, singing with myself to give two voices in harmony! I also played drums, thus sometimes we used proper drum rhythms and sometimes cheated by using modern electronic systems, many of which Fred designed long before they became commercially viable.

Designed Amplifiers

Later, Fred designed his own microphone pre-amps and main amplifiers. The recordings were of excellent, almost professional quality – I say 'almost' because some of today's methods of electronic wizardry were not known then.

Fred's knowledge of electronics within the field of music took him to Dartington Summer School of Music, in Devon, three years in succession (circa) 1961 to 1964 as a Lecturer in Electronic Music and Music Concrete. Much of the research has prepared the way for today's electronic gadgetry in music and many of today's sophisticated equipment stems from the research of Fred and other pioneers in this field.

automatically, dogs would bark (where no dogs existed), lights would go on and ear shattering siren sounds would emanate from the bowels of the house.

I once touched a jewellery box and started a wailing siren off, in fact it was sometimes like entering the house of horrors! Fred would just say that; "All prototypes have to be tried out to see if they are viable"!

When he started on car alarms, I never knew what would happen. Once, when we had three cars in our driveway, our cat jumped on a bonnet. However, the screech that came from the car, made the cat run a mile. For days

"Where are we I wonder"? Fred G2BCX adjusts a direction finding receiver on the Norfolk Broads.

One example of Fred's innovations are today's modern flat electric guitars. Some of the early electronics on the Gibson guitar were designed by Fred, initially for his own use, then later commercialised.

Electronic music enabled us to have a month's holiday three years running in the beautiful Devon countryside in a perfect venue. Of course a book came from all this – namely *Electronic Music & Music Concrete* published by Neville Spearman.

Electronic Alarms

Around 1984 Fred made a brief foray into the field of electronic alarms for a company who were designing security equipment for the crime fighting departments of Police Forces. At times when someone entered a suitably equipped house, alarms would go off, doors would open afterwards he wouldn't go near any car.

Norfolk Broads

Fred's 'getting away from it all hobby' was boating and the Norfolk Broads. He'd had a boat for many years, cruising the rivers and venturing out of Great Yarmouth into the open sea.

Naturally, the boat *Frith II* was packed with electronic equipment, including of course a radar set. There was also a depth finder, Amateur Radio, ship-to-shore radio, and lots of small but useful gadgets. These included an electronic switchover from one large outboard engine to the other when the fuel was getting low, enabling him to re-fuel easily whilst at sea.

Our love for Norfolk encouraged us to move to Cantley in 1979. Our new home was midway between Norwich and Great Yarmouth

and visitors were guided by the aroma of boiling sugar beet from the giant factory a mile or so away.

Any house in which we lived very soon came to look like a radio tracking station! There were antennas of every description on the roof and against the walls. Some had pulleys, stay wires with the tallest having its own winch. Fred also made a tracking station for his over the horizon radar, which was installed in a small housing on stilts on the lawn. Hanging out washing could be a nightmare, and walking through the garden at night a death trap.

Neighbours could often see Fred walking about on the roof, checking, adjusting, repairing or just admiring his handiwork. One friend said he always knocked on our door and if no one answered he would stand back and look on the roof!

Perhaps Fred G2BCX was at his happiest when sharing his interests with like minded enthusiasts. Here, he's shown lecturing on audio recording to an attentive audience and obviously enjoying himself. It's how his many friends will remember him.

Monitoring Two Metres

Fred's Amateur Radio v.h.f. equipment was always tuned to 144MHz and was on all day. In practice it was used like a telephone and Fred would call someone and almost immediately a voice would come back and a conversation would ensue. It was faster than today's E-mail and cheaper than a telephone call.

Whenever he travelled or was out for the day I would hear Fred on and off all day, letting me know where he was and what he was doing. If I was at work I only had to leave a recorder running and I could monitor the day's progress later.

Every car my husband bought had Amateur Radio installed immediately. We would chat to people in the UK and from all over Europe whilst driving. It made interesting journeys and of course there was also somebody to guide you around a town when lost in the one-way system!

Many invitations from local Amateurs came our way and almost every journey we ever made someone would invite us in for tea and a chat. We attended most of the Amateur Radio rallies round the country and made many, many friends.

Questions & Answers

Over the years Fred G2BCX was asked literally millions of questions by would be Radio Amateurs and indeed Amateurs of long standing. From this interest came two small books *Questions & Answers on Amateur Radio* published by Newnes Technical Books.

In the 1960s and 1970s Fred belonged to the **Silverthorn Radio Club** in Chingford, Essex and gave many talks on Amateur Radio and later lectured extensively on tape recording for the amateur and professional users alike. He was also an honorary member of the **Lowestoft Radio Club,** which we often visited whilst being Marine Mobile. We would moor in Oulton Broad, be collected by a member and driven to the Lighthouse in Lowestoft for the meeting.

When CB Radio came into fashion in the 1980s Fred was up the front with his antenna design for 27MHz* (named *The Big Jim)*. Again one of the most popular antennas for that band, they were first manufactured in Norfolk and sold countrywide.

As a constant reviewer of new equipment in the fields of hi-fi, tape recording and Amateur Radio, all reviews being printed in leading magazines. Fred was also asked on several occasions to be a guest at the various factories. He visited Tandberg in Norway, several companies in Germany and the furthest he travelled was to Japan as a guest of the Hitachi company.

Fred was also commissioned by the Department of Trade & Industry, becoming closely involved with the development of suitable antennas and equipment as a consultant on the introduction of CB radio.* ***Editor.*

Ionospheric Research

Communications was always his forte including over-the-horizon radar and research into the ionosphere, not forgetting his contribution to Amateur Radio. In his latter days, when physical exertion wasn't possible he spent most of his time writing, for magazines such as *Practical Wireless*.

However, much of the research which Fred carried out and developed during these latter days were as a result of his interest in sunspot activity and its affect on our atmosphere, including its effect on radio. His interest in the ionosphere (the ionised region in the upper atmosphere and its affects) in this field was always great.

In 1989, after a serious heart attack Fred was more confined to the home he developed a specialised radar transmitter-receiver coupled to pen recorders*, amplifiers, tape recorders and many other things in order that he could study sunspot activity and its relationship to radio waves, which was more noticeable during heightened sunspot activity. Also the over-the-horizon radar that was being or had been developed at the time He designed and built many pieces of equipment to further his interest. After his death the equipment was donated to the University of East Anglia (UEA) in Norwich for the interest of students.

**Fred's ionospheric sounder (using the same principles as radar) worked on frequencies adjacent to the 49 metre h.f. broadcasting band. It was one of the very few licensed to a private individual and I was very privileged to see it working on one of my visits to see Fred and Freda. One of the extra pleasures was meeting the family's pet goose! Editor.*

Silent Key 1992

Fred passed away in April 1992 after his second heart attack and many Amateurs and friends attended the service at Norwich Crematorium, including **Dick Ganderton G8VFH**, Editor of *Short Wave Magazine* and **Rob G3XFD**, Editor of *PW*.

As I sit at home now using my modern computer with E-mail and Internet facilities, my mobile 'phone next to me in case someone should call, and my digital camera ready for instant pictures, I often think to myself; "What would Fred do with all this technology"? I know the answer, he would have a ball – it would be almost impossible to tear him away from his 'work shack' as he called it. He'd be inventing better ways of doing this and that, and would be designing even more electronic gadgetry and publishing the circuitry.

There were many ideas and designs Fred had developed at the end of his life that he never got round to writing about. Much of it just stayed in his head, but I know one thing for sure, he would love and embrace all things new, but still the old two-metre radio would take pride of place for the 7am breakfast chat with the locals and the evening chat after work.

I listened to the 144MHz band for a long time after he had passed away and the airways did not seem the same. There was always one voice missing, his - Gemini, my communicator Fred G2BCX. **PW**

The Oscilloscope

Part 1 - Basic Principles

Gordon King G4VFV explains the basic principles of the oscilloscope, a piece of test equipment that he says should be every Radio Amateur's bench companion.

I remember writing in one of my early books entitled *Servicing with the Oscilloscope,* first published in 1969 by Newnes-Butterworth, that the oscilloscope is a 'measuring and diagnostic instrument of prodigious versatility'. Some 35 years later I still regard the instrument in exactly the same light.

The oscilloscope has been my bench companion since as far back as I can remember. I think my very first 'feel' of the oscilloscope's potential was after I had improvised a very basic hook-up for examining the mains supply waveform and its harmonics. That must have been just before the start of The Second World War, before I had emerged from my apprenticeship (as a typewriter mechanic!).

No Financial Excuse!

As **Rob G3XFD**, the Editor, has taken pains to emphasise in the May to September issues of *PW* in his excellent on-running Radio Basics (RB) series, the oscilloscope (or 'scope for short) is most definitely the primary of all instruments that should always be at hand to the enthusiastic experimenter and Radio Amateur in his or her workshop or shack. There's not really any financial excuse nowadays for not being equipped bearing in mind the incredibly low price for which 'scopes of earlier specifications can now be acquired from rallies and car boot sales, etc.

Once you are conversant with any reasonable 'scope, regardless of its age, then if nothing else, it can be put into immediate use for gauging the magnitude of a voltage and the repetition frequency of a waveform. In other words, a couple of the basic applications of the 'scope are those of a high-resistance voltmeter and a frequency indicator. However, before we get too carried away let's first have a look at how the 'scope works and its principles of operation.

The heart of the analogue 'scope, the type of instrument that we shall be investigating in this series, is the cathode-ray tube (c.r.t.). The 'scope c.r.t. includes many of the basic principles of the television picture tube; but there are differences.

For Radio Amateur use we would not normally expect our 'scope to provide colour displays; and a screen the size of that in television receivers would be going a bit over the top too! There are other technical differences, including magnetic deflection, but we shall pick these up as we go along.

Cathode Ray Tube

A good idea now would be to look again at the skeleton presentation of a 'scope's c.r.t. that appeared in RB in the June 2004 issue of *PW* (**Fig. 1**). Right at the narrow end of the tube's glass envelope you will see the electrode conglomeration from which the electron beam is 'fired' at high velocity. This is known as the 'electron gun' for obvious reasons.

The beam from the gun then passes through the space between two pairs of plates, known as the X and Y deflection plates, before arriving at the screen at the front of the tube where it impinges at a remarkable velocity upon the luminescent screen phosphors with which the inside of the screen surface is coated. The glass 'tube' in which all these things are contained is airtight and a virtual vacuum.

Did You Know?

The afterglow effect on a 'scope screen is caused by the time taken for the light to decay after the electron beam has moved away?

The cathode in the gun assembly produces the electrons, which eventually form the electron beam. This is brought up to temperature by the heater, which is the same sort of thing as used in a thermionic valve, and the electrons thus emitted pass through the gun electrodes that effectively concentrate them into a forward flowing beam.

Almost completely surrounding the

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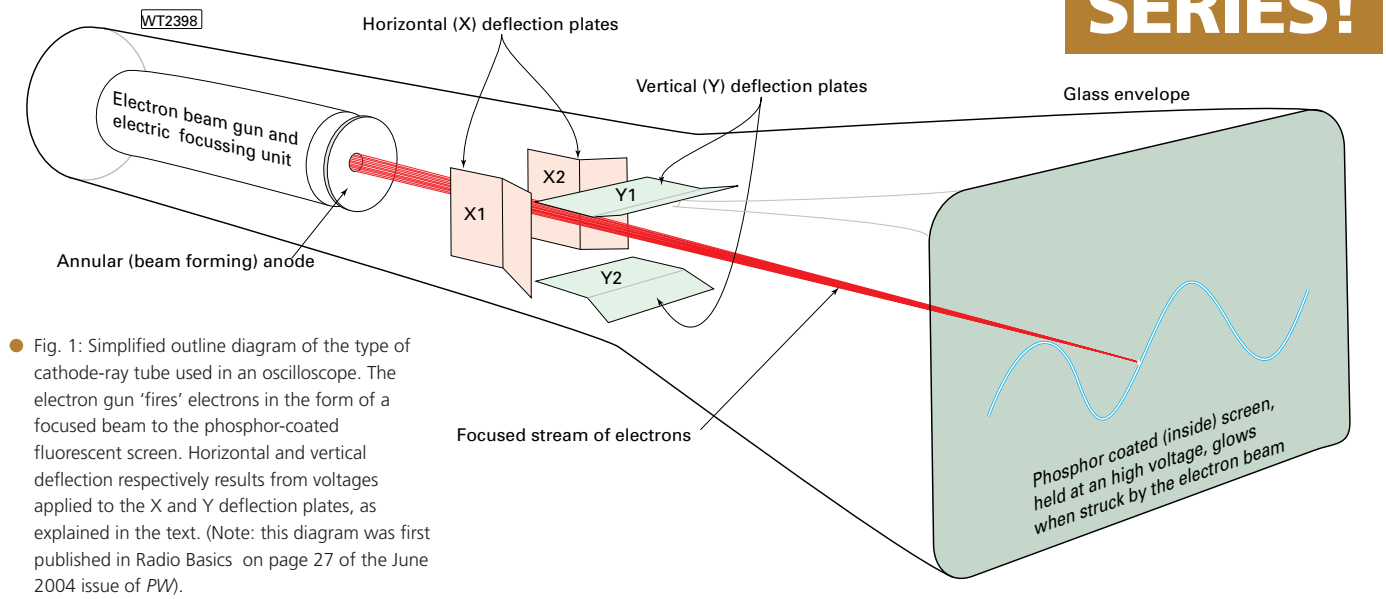


Fig. 1: Simplified outline diagram of the type of cathode-ray tube used in an oscilloscope. The electron gun 'fires' electrons in the form of a focused beam to the phosphor-coated fluorescent screen. Horizontal and vertical deflection respectively results from voltages applied to the X and Y deflection plates, as explained in the text. (Note: this diagram was first published in Radio Basics on page 27 of the June 2004 issue of *PW*).

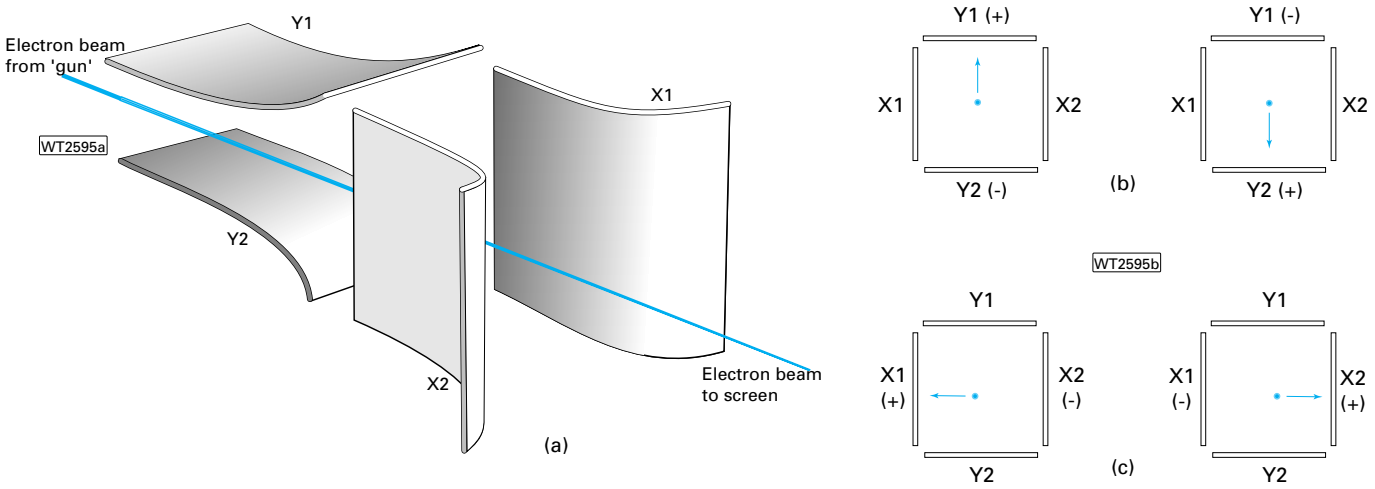


Fig. 2: Showing above the vertical Y and the horizontal X deflection plates through which the electron beam passes from the electron gun to the fluorescent screen, and (right) the directions of beam deflection resulting from the indicated polarity of the potentials applied to the deflection plates.

cathode is the grid that contains a small aperture at its far end from which the electrons emerge. An anode positioned after the grid prevents undue divergence of the beam, while a second anode serves as a sort of 'converging lens' that allows the beam focus to be optimised at its impinging point on the screen. Operating controls on the front panel of the 'scope work in relation to the electrodes to provide adjustment of brightness and focus - there are many other controls, of course, as we shall later discover!

Post Deflection Acceleration

The velocity at which the electrons are initially fired towards the screen, and hence the pre-deflection 'stiffness' of the beam, is related to the voltage applied to the third anode of the electron gun. The higher the voltage here the greater the velocity and therefore the stiffer the beam.

Now, because the sensitivity of the beam deflection plates (see later) decreases as the beam becomes 'stiffer' and the display brighter, further beam acceleration might well be provided after the deflection has taken place. This is known as post deflection acceleration (p.d.a.) and neatly bestows the c.r.t. with a higher display brightness without compromising deflection sensitivity. It's achieved by an effective forth anode that consists of a conductive coating in the form of a helix inside the flare of the tube, between the deflection plates and the screen. One end is held at the voltage of anode three and the other end at an even higher voltage, the ratio between the two being known as the p.d.a. ratio.

Did You Know?

A photograph taken of an oscilloscope screen is called an oscillogram?

Beware High Voltages!

To provide the required beam velocity and display brightness the potentials on anodes three and four, relative to the tube's cathode, might well be in the order of thousands of volts. Such high voltages should not be regarded lightly!

High voltages could cause more than a nasty jolt if touched by the human body, so be warned when fiddling about inside any 'scope. Make sure it's switched off, any high voltage capacitors discharged (including the feed from the high voltage supply) and the mains supply disconnected.

Screen Phosphors

Now, because electrons have a definite mass, even though remarkably diminutive, the high velocity at which they are accelerated results in them acquiring kinetic energy (energy possessed by a body in virtue of its motion) on their travel from the electron gun to the

Fig. 3. One of the author's early 'scopes set up for action in his Brixham laboratory/shack.

fluorescent screen. This energy is released in the form of light radiation immediately the electrons hit the screen. The colour temperature of the radiation and hence the actual colour of the display, is governed by the chemical characteristics of the phosphors.

For optimum effect, different applications may require phosphors of different colour temperatures. While the phosphors of a television screen are required separately to produce the three primary colours of red, green and blue light, the aim being to achieve 'white light' with the right mix of the three colours, the phosphor characteristics chosen for the screen of the type of oscilloscope c.r.t. we are considering would normally be for a single colour only, such as green or blue/green for a general-purpose instrument.

Did You Know?

The white light for the television screen is known as 'illuminant D', and that its colour temperature is equivalent to the light radiated from a solid when raised to a temperature of 6,500°K?

It's worth noting that the white light for the television screen is known as 'illuminant D', and that its colour temperature is equivalent to the light radiated from a solid when raised to a temperature of 6,500° Kelvin. Phosphors of silver-activated zinc sulphide radiate blue light and of silver-activated zinc-cadmium sulphite produce yellow light, the proportions being chosen for the required colour-temperature.

We shall see later that for maximum definition of the display the electron beam needs to be sharply focused at the point of impact with the fluorescent screen. However, let's assume for now that this has actually been achieved and that the beam is striking the centre of the screen. This would be indicated by the presence of a small, round bright spot at the centre of the display area. We certainly shouldn't let this remain for any length of time, at high brightness, anyway, because all the energy of the beam would be concentrated in that little (very) bright spot and the light-producing properties of the phosphors around that area might then suffer as a result, and eventually appear on a full-screen display as a patch of reduced brightness.

To prevent the screen from retaining secondary electrons as it is struck by the beam electrons, the phosphors are nowadays backed by a thin layer of aluminium connected to the conductive layer inside the flare of the tube. The aluminium layer also helps to prevent the phosphors from being unduly damaged by the electron beam, while also reflecting phosphor illumination (active as a metal mirror) forward to the front of the screen, thereby enhancing display brightness.

The light produced by the phosphors doesn't immediately vanish when the electron beam is suddenly extinguished, or quickly shifted from the centre to some other area of the screen. An important characteristic of the fluorescent screen is the time taken for the light to decay after the beam has moved away. This is of the persistence phosphor, sometimes called 'afterglow'.

For general applications a medium-persistence phosphor is generally adopted, but when it's required to investigate displays of relatively short duration a phosphor of longer persistence would be more suitable. Blur or smear is reduced when very high speed displays are investigated by a screen composed of short-persistence phosphors. Phosphors are classified in terms of persistence (in the range from less than a microsecond to greater than a second), fluorescent colour and designation.

Oscillograms & Photography

Over the years I have taken many off-screen photographs to illustrate my books and magazine articles, and although it has been said that a short-persistence phosphor of bluish hue is the best bet, most of my photographs (called oscillograms) have been taken from 'scopes with screens of green, medium-persistent phosphor. A camera that I've used very successfully for such shots is the Polaroid CR-9 Land Camera For Oscilloscope Trace Recording. However, with the advent of digital photography, Polaroid films for this camera are now extinct, which is a shame!

Did You Know?

The heart of the analogue oscilloscope is the cathode-ray tube?

Let's start to round off this opening instalment with a look at how the electron beam is actually deflected. In **Fig. 2** are illustrations of (a) the two Y deflection plates (Y1 and Y2) and the two X deflection plates (X1 and X2) through which the electron beam passes from the gun to the screen. The reason for the plates being curved outwards at their ends is to avoid the beam from striking them when it is fully deflected.

At this point it is important to note that in conformity with conventional graphs the Y plates are responsible for the vertical deflection of the beam and the X plates for the horizontal deflection. The diagrams at (b) show the path taken by the beam through the two pairs of plates, and the positive and negative potentials required for the indicated directions of deflection.

As with television, it is our persistence of vision that makes it possible for us to discern an oscilloscope display. In one of his RB articles about the 'scope, Rob illustrates persistence of vision as the subjective disappearance of the spokes in a bicycle wheel when the wheel is rotated fast .

Another analogy would be the reflection of sunlight through a small mirror onto a wall. The resulting patch of bright light would be seen to move up and down the wall as the mirror is twisted slowly in the hand. By increasing the twisting rate the eye would perceive the moving bright patch of light as a continuous bright line.

Exactly the same effect results from the fast moving bright dot on the c.r.t. screen. This is because of the relatively slow decay time (about 80 milliseconds) of the eye/brain response when the light stimulus is removed or moved from one point to another.

Dual Display Oscilloscopes

Finally, for this month it should be mentioned that pretty well all but the most basic of 'scopes nowadays have provision for at least two simultaneous displays on the one c.r.t. screen. This can be extremely useful, for example, to display the primary waveform on one trace and the harmonic content of that very same signal on the other trace.

I shall be having more to say about dual display 'scopes as this series progresses, but for now it's worth noting that 'scopes with dual display facilities can be provided either by a c.r.t. with two beams, or by a single beam tube and electronic beam switching. Such 'scopes are known respectively as dual beam and dual trace.

Well, that about ties things up for this time. Cheerio for now and I'm looking forward to catching up with you again next month. **PW**

High Voltages!

When fiddling inside an Oscilloscope beware of high voltages, make sure:

- ***The 'scope is switched off***
- ***Any high voltage capacitors are discharged (including the feed from the high voltage supply)***
- ***The mains supply is disconnected***

You have been warned!

doing it by design

In the first of his popular series to be published in 2005 Tony Nailer G4CFY looks at the biasing and other essential design factors for amplifiers using field effect transistors. And, as usual there's a project to build!

Welcome to Doing It By Design where I'm starting the new year by presenting an introduction to the field effect transistors (f.e.t.s). There's nothing to be frightened of though - the junction f.e.t. is like a valve and will pass high current unless it's biased not to do so (biased off). On the other hand, the bipolar transistor will pass no current unless biased to do so (biased on).

To control the source-to-drain current of an f.e.t. the gate is biased negative with respect to the source. This produces a field which reduces the size of the channel through which the current flows between source and drain. The control gate is in the form of a reverse biased diode, so only a minute current flows through it.

One of the characteristics of the f.e.t. is the drain current, which flows when the gate is the same voltage as the source. This is given the notation I_{dss}. Another characteristic is the value of voltage between gate and source which causes the drain current to just cease flowing. This is known as the pinch-off voltage and is given the notation V_{pgs} or V_{gs} off.

A typical characteristic of drain current I_d against negative gate-to-source voltage V_{gs} for an f.e.t. is shown in **Fig. 1**. Although the relationship is close to a square law curve, it's almost a straight line for three quarters of its negative gate voltage range.

The slope of the straight part of the characteristic is found by dividing the change in drain current by the change in gate-to-source voltage, I/V_{gs}. This is the inverse of resistance and is called **Conductance** with the symbol G. It's the forward transfer conductance and in a common source arrangement is given the notation Gfs, and has units of mA/V.

Widespread Characteristics

In practice f.e.t.s have a wide spread of characteristics, even for a particular marked and identified type, and very few constructors have data books! The diagram, **Fig. 2**, shows a simple test setup, which is used to determine V_{pgs} and I_{dss} and the quiescent current at a chosen operating point.

To help, I've included the diagram, **Fig. 3**, showing the pin-outs of many popular f.e.t.s. When connecting the f.e.t. to the test jig connect the source first, then the gate and finally the drain. Turn the potentiometer fully round so the wiper in at the 0V end and measure the drain current I_{dss}.

Next. you should turn the potentiometer completely the other way so that the drain current is off. Then, rotate the wiper of the potentiometer while observing the drain current until it just starts to rise, then back it off slightly again. This is the pinch-off voltage V_{pgs}.

I used this method to test a number of common f.e.t.s and found the results varied widely even between manufacturers for the same part number. I've also included the table, **Fig. 4**, showing the results of tests on five or six devices of each type by Siliconix, Philips, Motorola and Texas Instruments.

It 's worth noting that parts, which have been further selected and are marked with a suffix such as **a** or **b**, show a much tighter range of characteristics from a specific manufacturer.

Setting Operating Point.

Referring to the graph in Fig. 1, the straight portion of the slope corresponds to a V_{gs} from 0 to -3V. For large signal operation a quiescent point would be with V_{gs} at -1.5V at a drain current Id of 7mA. From this, we can say that a good rule of thumb would be to choose a quiescent point corresponding to 0.375 x V_{pgs} for large signal work.

For small signal work, a good rule of thumb would be to choose 0.6 x Vpgs as the operating point. With the same device it would be with Vgs at -2.4V and an Id of 3mA. Whichever operating point is chosen, the test jig needs to be used again to measure the I_d at that value of source-gate voltage.

Calculating Circuit Values

A typical circuit of a common source amplifier is shown in **Fig. 5**. As the current flow into the gate is that of a reverse biased diode, less than 1μA, the value of R_g can be anything from 0 to 100kΩ without noticeably affecting the d.c. conditions.

The value of Rs is calculated directly from the chosen operating point, and the corresponding value of drain current measured in the test jig. For my device and for small signal work I will choose V_{gs} = -2.4V and I_d = 3mA. For large signal work I would select V_{gs} = -1.5V and I_d = 7mA.

The value of R_d is strictly limited by the value of drain current. For large signal work it has to be chosen to drop half of the voltage between supply rail and source. If the supply rail is 12V and the source voltage is 1.5V, then Rd should have 5.25V across it with a current of 7mA.

For small signal work the value of R_d can be much higher and is determined by the expected peak swing of the output voltage. If for example a signal of 1V p-p is expected, then the drain voltage need only be just over 0.5V above the source voltage. For my device with a source voltage of 2.4V the drain could be at 3V. R_d has 9V across it and 3mA flowing through it. Please refer to **Part 1** for calculations.

Determining Gain

The gain factor, G_{fs}, is the slope of the straight part of the characteristic of Fig. 1. This is found by using the current difference between the operating point I_{dop} and the I_{dss} and then dividing it by the voltage V_{gs} at the operating point. $G_{fs} = (I_{dss} - I_{dop})/V_{gs}$.

The a.c. voltage gain Av of a common source amplifier is given by $A_v = G_{fs} \times R_d$ (provided that the source resistor R_S is decoupled at the operating frequency). Please refer to **Part 2** for calculations.

Practical Small Signal LF Amplifier

Now let's look at a practical small signal l.f. amplifier. A suitable common source circuit is shown in **Fig. 6**, where R1 is chosen to be 47kΩ, R2 820Ω and R3 2.7kΩ. If the circuit can be run from a 13.5V bench supply, then we can drop 1.5V across R4 (470Ω) with a quiescent current of 3mA.

The reactance of C1 needs to be less than

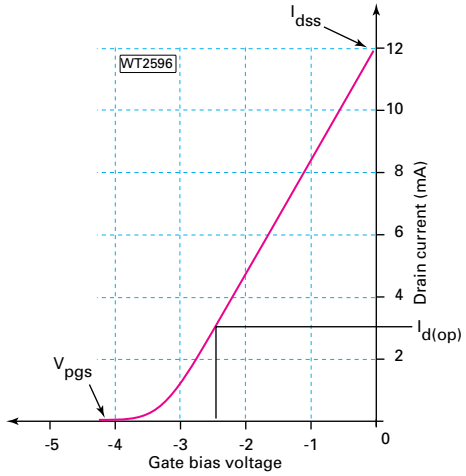


Fig. 1: A typical characteristic curve of drain current Id against negative gate-to-source voltage V_{gs} for a f e.t. (see text).

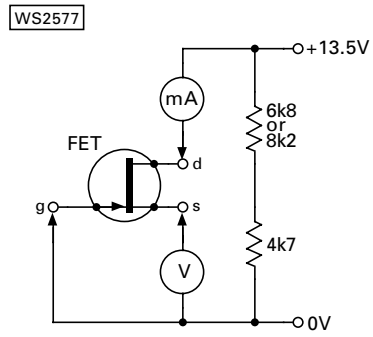


Fig 2: A simple test set-up which is used to determine V_{pgs} and I_{dss} and the quiescent current at a chosen operating point.

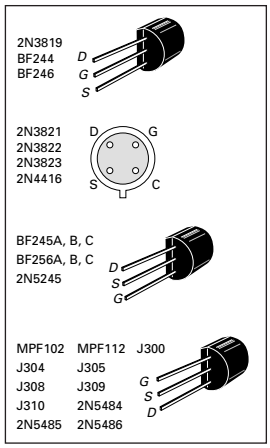


Fig. 3: Pin-outs of many popular f.e.t.s. When connecting the f e.t. to the test jig connect the source first, then the gate and finally the drain.

Device	J304	BF256a	BF256a	MPF102	2N3819
I_{dss} (mA)	6.3 - 14	5.8 - 6.3	3.7 - 4.1	14.5 - 17	2.6 - 12
V_{pgs} (V)	-2.6 to -3.8	-2.2 to -2.6	-1.5 to -2.1	-4.2 to -5.3	-2.0 to -4.1

Note:
Devices from some manufacturers may vary from the above values that have been taken from the orginal makers' documentation

Fig. 4 (right): Table showing the results of tests on five or six devices of each type by Siliconix, Philips, Motorola, and Texas Instruments (see text).

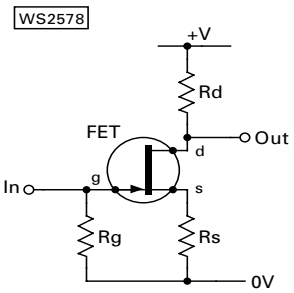


Fig: 5: A typical circuit of a common source amplifier (see text).

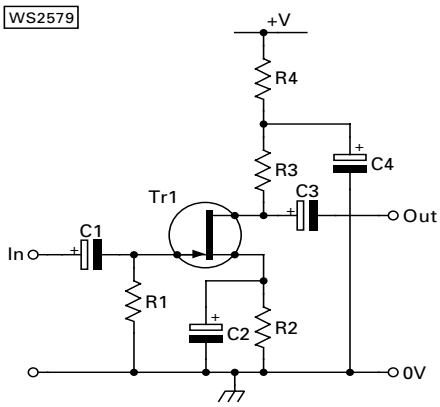


Fig. 6: A suitable common source circuit a practical small signal l.f. amplifier (see text).

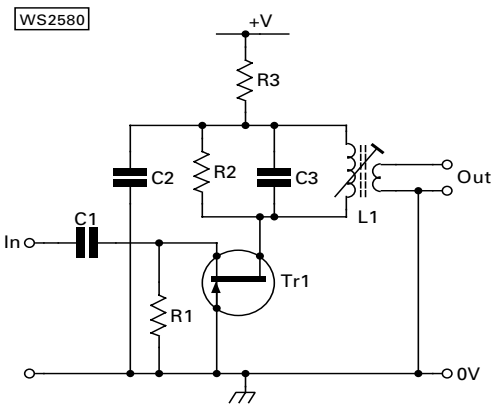
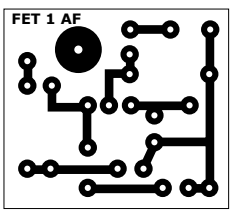


Fig. 7: The use of tuned input and tuned output common source f.e.t. amplifiers are not recommended for the constructor. An alternative, much more stable arrangement, is the common gate mode shown (see text).



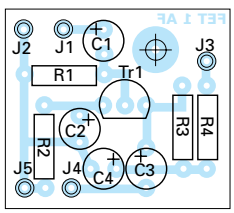


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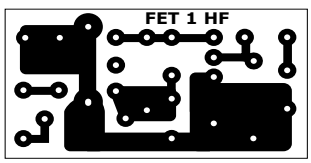
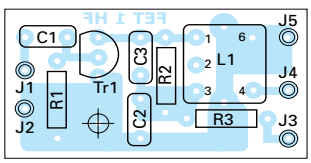
Fig. 8 (left): A practical a.f. amplifier,. **Note**: J1, J5 are 0V, J3 is the +V connection, J1 is the input and J4 is the output.





WT2597b

Fig. 9: A practical h.f. amplifier. **Note:** J2, J5 are 0V, J3 is the +V connection, J1 is the input and J4 the output connections.

a tenth of 47kΩ at the lowest operating frequency, i.e., less than 4.7kΩ at 50Hz. The decoupling capacitor C2 has to have a reactance of about one hundredth of R2 or the gain will be reduced by negative feed back in the source circuit. Let X_{C2} = 27Ω.

The output capacitor C3 needs to be a tenth of the value of the input resistance of the following stage. As this is unknown, it's sensible to use a tenth of the value of R3, i.e., 270Ω.

Note: For really effective supply line decoupling a value of one hundredth of R4 should be chosen as the capacitive reactance of C4, i.e., 4.7Ω. Please refer to **Part 3** for calculations.

With a device having a measured and calculated conductance of 3.75mA/V the amplifier developed along the lines I've just suggested would have a small signal gain of 10x over the normal audio range 50Hz to 15kHz. It will also work as an amplifier at up to 10MHz provided the coupling and decoupling capacitors are changed according to operating frequency.

High Frequency Amplifiers

Let's now look at h.f. amplifiers using the f.e.t. In this application, as the f.e.t. has a relatively high capacitance between gate and drain, when operating as a common source tuned amplifier it's inherently unstable. Though neutralisation can be arranged with anti-phase capacitive feedback, it's critical to set up.

For this reason use of tuned input and tuned output common source f.e.t. amplifiers **are not recommended** for the constructor. An alternative, much more stable

arrangement, is the common gate mode shown in **Fig. 7**. This circuit has an untuned input and gives useful gain if the dynamic resistance of the drain circuit is high and the input is driven by a low impedance source. However, calculating the gain of the amplifier is more complicated than with the common source configuration.

If the source is very low resistance the voltage gain would be $A_v = G_{fs} \times R_d$, where R_d is the parallel value of R2 with the $Q \times X_L$. In most cases R2 is the dominant factor so its value can be used for R_d. When the source resistance Rin is high the dominating input value is R1 which might be any value from (let's say)100Ω to 1kΩ. Then the signal voltage across the source resistor will be a large proportion of the voltage across the drain resistor and so reduces the gain by the same proportion.

The feedback factor is given the notation B and is found by B = Rin / (Rin + Rd). The formula for the gain of a common base stage is $A_{vb} = A_v / (1 + B \times A_v)$.

Unfortunately, the most common f.e.t.s are inadequate as amplifiers in the circuit shown in Fig. 7 because the voltage gain of the device is almost fully negated by the step down of the output transformer. Devices with a conductance greater than six are usable. (These include J308, J309, & J310).

Practical RF Amplifier

To build a practical r.f. amplifier for 3.65MHz I chose the J309 which has an I_{dss} of 12 to 30mA, V_{pgs} of -1 to -4V, and G_{fs} of typically 12mA/V. For the device chosen, there's an operating point of V_{gs} at -1.5V which has a drain current Id of 7mA. Here, the resistors R1 and R3 can each have 1.5V across them with a current of 7mA.

I chose the TOKO coil 3333R with an inductance of 45μH, a *Q* of 80, primary turns of 55, and secondary turns of 4, for L1. This transformer has a turns ratio of 55:4, or 13.75:1. This will give an impedance transformation of the square of this, i.e., 189:1.

If the output terminals have to match 50Ω then the primary side will have to be 189 x 50 = 9450. (Make R2 10kΩ). The operational *Q* is then R2 divided by the reactance of L1.

Bandwidth B_w to the -3dB points is found from Bw = f/*Q*.

It is important that C1 and C2 are low reactance at the operating frequency, let $X_C = 1\Omega$.

C3 is chosen to resonate with L1 at 3.65MHz. Please refer to **Part 4** for calculations.

The voltage step down of the coil from primary to secondary is 13.75x, or 22.77dB. The overall stage voltage gain will be 37.5 - 22.77 = 14.7dB. This represents a voltage gain of 5.4x and a power gain of 29.5x making it a very useful amplifier to precede a diode ring mixer. Try it out for yourself and enjoy doing it by design. **PW**

Kits and Bits

A p.c.b. for the f.e.t. a.f. amplifier is available and costs £2. A p.c.b. with necessary components costs £3.20.

The p.c.b. for the f.e.t. h.f. amplifier costs £2. The p.c.b. and components to a specified frequency in the range 3 to 30MHz cost £3.45 (plus P&P at 50p). Cheques payable to **A. J. & J. R. Nailer** to **Spectrum Communications, 12 Weatherbury Way, Dorchester, Dorset DT1 2EF**.

Part 1 Calculations

$R_s = -(V_{gs})/I_d$. $R_d = V_{Id}$.

Small signal $R_s = -(-2.4V)/3mA = 800\Omega$. (Use 820Ω).
Rd = 9V 3mA = 3kΩ. (Use 2.7kΩ).

Large signal $R_s = -(-1.5v)/7mA = 214\Omega$. (Use 220Ω).
$R_d = 5.2V / 7mA = 742\Omega$. (Use 680 or 820Ω)

Part 2 Calculations

$G_{fs} = (I_{dss} - I_{dop})/V_{gs}$. G_{fs} = (12 - 3)mA/2.4V = 9mA/2.4V = 3.75mA/V

Large signal gain A_v = 3.75mA/V x 680, A_v = 3.75 x 10 ^ -3 x 680 = 2.55x.

Small signal gain A_v = 3.75mA/V x 2700, A_v = 3.75 x 10 ^ -3 x 2.7 10 ^ 3 = 10.125x.

Part 3 Calculations

$X_C = 1/(2 \times Pi \times f \times C)$, So $C = 1/(2 \times Pi \times f \times X_C)$.

C1 = 1/(2 x Pi x 50 x 4700) = 0.00000067F = 0.67μF. (Use 1μF).

C2 = 1/(2 x Pi x 50 x 27) = 0.0001178F = 11.78μF. (Use 10μF).

C3 = 1/(2 x Pi x 50 x 270) = 0.0000117 = 1.17μF. (Use 1μF).

C4 = 1/(2 x Pi x 50 x 4.7) = 0.0006772F = 67.7μF. (Use 100μF).

R = V/I. So R4 = 1.5V/3mA = 500Ω. (Use 470Ω).

Part 4 Calculations

R1 & R3 = 1.5V/7mA = 214Ω. (Use 220Ω).

X_C = 1 (2 x Pi x f x C). So $C = 1/(2 \times Pi \times f \times X_C)$.
C1 = 1/(2 x Pi x 3.65 x 10 ^ 6 x 1). C1 = 1/(2 x Pi x 3.65)μF.
C1 = 0.0436μF. (Use 0.047μF or 47nF).

C3 = 1/(39.5 x f x f x L)
C3 = 1/(39.5 x 3.65 x 10 ^ 6 x 3.65 x 10 ^ 6 x 45 x 10 ^ -6)
C3 = 1/(39.5 x 3.65 x 3.65 x 45)μF
C3 = 1/ 23680μF = 0.0000422μF = 42.2pF. (Use 39pF).

Q = R2/ XL. Q = R2/2 x Pi x f x L1.
Q = 10 ^ 4/2 x Pi x 3.75 x 10 ^ 6 x 45 x 10 ^ -6
Q = 10000/1060 = 9.43.

Bw = f /Q. Bw = 3.65 x 10 ^ 6 / 9.43 = 387kHz.

$A_v = G_{fs} \times R_d$. A_v = 12 x 10 ^ -3 x 10 x 10 ^ 3 = 120.
$B = R_{in}/(R_{in} + R_d)$. B = 50 /(50 + 10000) = 0.005
A_{vb} = 120/(1 + 0.005 x 120) = 120/1.6 = 75x. (37.5dB).

practical way

This month the Rev. George Dobbs G3RJV is aiming to be really canny. He's describing a simple rig built into a tuna tin!

"Use it up, wear it out, make it do or do without".
A Shaker Aphorism

Before starting my fishy tale, unfortunately I have to begin this month's column on a sad note. This is because recently I was shocked to hear of the death of **Bruce Muscolino W6TOY** aged 64. Although Bruce* was not a household name in British Amateur Radio, I had met him several times at the Dayton HamVention in the USA.

Bruce was one of the founders in 1996 of the popular Four Days in May (FDIM) QRP convention and symposium sponsored by the **QRP Amateur Radio Club International** (QRP ARCI) held each spring to coincide with Dayton HamVention. Bruce was also the first QRP contributing editor to the ARRL (Amateur Radio Relay League) website. The QRP with W6TOY column ran for about a year in 1999 and 2000. He did much to further the appreciation of QRP construction and operating in the United States. He was also part of an interesting story; the revival of the Tuna Tin 2 transmitter.

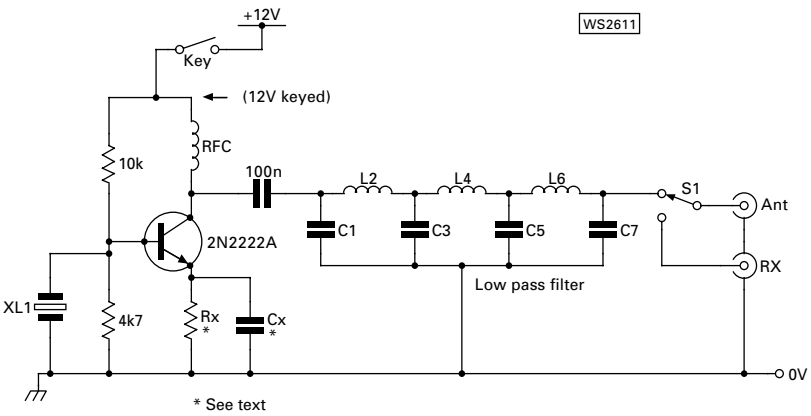
Editorial note:** Bruce W6TOY was a delightful man and great character. Bruce always came over to chat to us at the* PW *stand at the Dayton HamVention. He triumphed over physical adversity and we were all proud to call him a friend. His attitude to life and our hobby can be summed up by his amusing article Operating Abroad, published in the September 1997 issue of PW.* ***Editor*.*

Tuna Tin 2

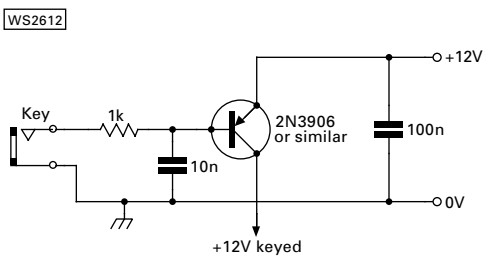
The Tuna Tin 2 low-power transmitter first appeared in an article in the ARRL magazine *QST* in 1976 written by **Doug DeMaw W1CER** (later W1FB). Doug envisaged it as a weekend project that could be used for short-range contacts on the 7MHz band.

Using a simple crystal controlled transmitter, the project was built on a circular printed circuit board (p.c.b.), which fitted into the top of an

● The front cover of the ARRL's May 1976 issue of *QST*, featuring the Tuna Tin 2 transmitter. **Photo courtesy of American Radio Relay League (ARRL).**



● Fig. 1: The circuit tried by G3RJV. The transmitter is the single 2N2222A transistor. It's capable of about 100mW of r.f. output but the transistor does require a heat sink (see text).



● Fig. 2: A *pnp* transistor being used as a d.c. switch so that the key is grounded to switch on the transmitter. Any *pnp* silicon transistor would serve as a switch (see text).

empty tuna fish tin. It used only two transistors, hence Tuna Tin 2, providing an output of approximately 500mW. All the component parts could be bought at local Radio Shack stores in the USA.

The front cover of *QST* used a photograph (heading photograph) of a handsome cat looking longingly at the tuna tin bearing the transmitter. Like many of the early W1FB articles it inspired many readers to have a go at building and using a low power transmitter.

Somehow, the original Tuna Tin 2 transmitter built by W1FB went missing from the ARRL collection of past projects. Subsequently the little transmitter was relocated several years later in the flea market at the New England Division Convention in Boxboro, Massachusetts.

The ARRL Laboratory Supervisor **Ed Hare W1RFI**, spotted the little rig, recognised it as the original, and bought it at a "good flea market price". The rescued transmitter was then restored to its former glory by Bruce W6TOY.

On The Air

Several ARRL staff members thought it would be an appropriate gesture and a fitting memorial to Doug DeMaw to put the Tuna Tin 2 on the air using his W1FB callsign. The **Central Connecticut QRP Club** was formed and, with the permission of Doug DeMaw's family, requested W1FB as the club's callsign.

In an inaugural operating event, on 26 February 2000, from The ARRL headquarters in Newington, the little transmitter took to the air again. Hundreds of two-way QRP contacts were made, including several two way Tuna Tin 2 exchanges. In fact, W1FB's son, Dave DeMaw, who holds his father's former W1CER callsign, made the first contact using the W1FB callsign.

The Tuna Tin 2 maintained its popularity for over 25 years. In 1996, Doug Hendricks of **NorCal** (Northern California QRP Club) asked **Dave Meacham W6EMD** to update the design for modern components and produce a new circular p.c.b. The modified design was issued as a kit by NorCal and later by the New Jersey QRP Club and the Fort Smith QRP group.

The revival heralded a whole new wave of Tune Tin 2 building and operating. It also encouraged a collection of simple modifications for the transmitter.

Originally On 7MHz

When Doug DeMaw designed the Tuna Tin 2, he saw it as a simple transmitter for short range communication on 7MHz. The Tuna Tin 2 revival produced many claims of greater success with the simple transmitter. Perhaps the most worthy is that of **Steve McDonald VE7SL**. Steve has achieved Worked All States (WAS) using about 400mW from his Tuna Tin 2 feeding a sloping dipole on 7.040MHz.

Steve VE7SL went on to build an even simpler version of the transmitter, which he called the Mini-Tuna (perhaps a Sprat eh?). This is a single 2N2222 transistor crystal oscillator giving a power output of some 100mW. He's now on his way to WAS using the simplest of transmitters!

The single stage transmitter is based upon a design sometimes called the Micronaut and made popular by **Dave Ingram K4TWJ**. Many similar designs have appeared from time to time so I thought I would have a try with a single stage transmitter and put it into a fish tin to maintain the tradition. I chose to run the transmitter on 14MHz; a good band for European QRP operation.

The Circuit

The circuit I tried is shown in **Fig. 1**. The whole transmitter is the single 2N2222A transistor oscillator. It's capable of about 100mW of r.f. output but the transistor does require a heat sink.

In practice, the output can be modified by changing the value of Rx. This should be a low value resistor. The lower the value the higher the output.

My suggestion is a comprise; if the resistance is too low the keyed note will be poor and the transistor may even be damaged. However, I found that 270Ω worked well giving an output of 100mW with a cleanly keyed output.

Incidentally, the output may be measured using the ideas in the October 2004 edition of this column. A simple way to check the keying is to run the transmitter into a 50Ω dummy load while you listen to the signal on a nearby receiver.

The crystal is a fundamental frequency type for the required band. A radio frequency choke (r.f.c.) provides the collector load and this is home-made by winding 10 turns of thin enamelled copper wire (about 34s.w.g.) through a small ferrite bead. The value of Cx is varied according to the band in use, see **Table 1** (below). Suitable values are given in the table.

Band (MHz	Value (pF)
14.0	270
10.065	330
7.0	470
3.5	750

● Table 1: Choosing suitable values for Cx (see text also).

Low Pass Filter

Some readers may be amused to see that the low-pass filter circuit is almost as complex as the rest of the transmitter! This is because of the nature of the crystal oscillator which can be a potent source of harmonics.

Commonly, these little transmitters use a single pi-network filter. However, the legal requirements for transmitter spectral purity are quite high and rightly so as we should not cause undue interference from our transmissions. I have once again returned to the W3NQN standardised design for a seven element low-pass filter. The values given below apply to a range of four bands.

Table 2

W3NQN 7-Element low-pass filters

Band (MHz)	C1,7 (pF)	C3,5 (pF)	L2,6 (turns)	L4 (turns)	Core	Wire (mm/s.w.g.)
3.5	470	1200	25	27	T37-2	0.40 / 28
7.0	270	680	19	21	T37-6	0.50 / 26
10.1	270	560	19	20	T37-6	0.50 / 26
14.0	180	390	16	17	T37-6	0.56 / 24

Note:
Wire gauge is not critical. Use a wire size to comfortably fill the core to about three-quarters of the full circumference.
The number of turns has been rounded to the nearest whole number from the calculated value.

● Fig. 2: Table providing data for suitable low-pass filter construction (see text also).

Simple Change Over

Changing over from transmit to receive is very simple. A single-pole change-over switch puts the antenna on to the transmitter or the receiver input.

An electronic change-over could have been added but this would have only added to what is a very simple circuit. Usually when I use a basic change-over like this one, I switch over to transmit, key the transmitter and turn down the receiver volume control until I can just monitor the signal.

In the basic form the transmitter is keyed by switching the power supply on and off. However, it's better to key with reference to ground, and in fact that must be done
if an electronic keyer is to be used.

The circuit, **Fig. 2**, shows a *pnp* transistor being used as a d.c. switch so that the key is grounded to switch on the transmitter. (Any *pnp* silicon transistor would serve as a switch).

Following The Tradition

To follow the tradition, my prototype was build in a tuna tin, not using a p.c.b. but on a piece of perf-board cut to fit the top of the tin. The board is held in place using a single bolt from the centre of the board to the base of the can.

My version included the keying switch, with the key jack mounted on the board. The change-over switch and the antenna and receiver sockets are on the side of the tin. Crystal holders can be difficult to find, so I used a p.c.b. mounting connector block which fits the crystal pin spacing.

No one will conquer the world with this little transmitter. But why not build one and see just what you can work with a handful of parts?

PW

Antenna Workshop

David Butler G4ASR describes how he bent a length of wire to build a WA5VJB Yagi antenna for the 430MHz band.

David Butler says that the WA5VJB design antenna for 432MHz is a very effective beam antenna that will fit easily in the boot of a smaller car.

Last month in my VHF DXer column I reported that **Paul Webster PE7B** (ex-**G7KVE**) had just become active on the 430MHz band and wanted to build a simple Yagi antenna for use whilst operating portable from local hilltops. He needed an antenna that was simple to build, inexpensive, lightweight and that could provide a reasonable amount of forward gain to boost the effective power from his 5W transceiver.

The 430MHz antenna I'm about to describe was originally designed by **Kent Britain WA5VJB** and meets all these requirements. It's very easy to build using simple hand tools, the materials cost about £10, it's less than 700mm long and it provides a gain of around 11dBd. If you need a directional Yagi for DXing from a local hilltop or general home station communications, then this simple 430MHz antenna might just suit your requirements.

Yagi Configuration

The Yagi antenna described here, has been calculated to have its gain peak on 432.2MHz. The array is comprised of 6-elements: a reflector, driven element and four director elements mounted through a wooden boom. The driven element is a J-pole configuration that raises the antenna impedance to 50Ω and allows the use of an unbalanced feed cable. No baluns or gamma matches are used in this design and the feed method is simplified by directly soldering the coaxial cable to the driven element.

As the Yagi is very short, less than 700mm boom length, it's conveniently attached to the support mast at the rear of the reflector element. The coaxial feed cable is also routed out towards the back of the antenna. This method ensures that neither the support mast or cabling interferes with any of the Yagi elements thus maintaining the integrity of the antenna pattern.

The Boom

The boom is made from a 750mm length of 1/2 x 3/4in batten. Select a suitable piece from a local d.i.y. store making sure that it is not warped or has knots in it. Paint or varnish should be applied to the boom to protect it from the weather. There's little reason why fibreglass tubing wouldn't work just as well.

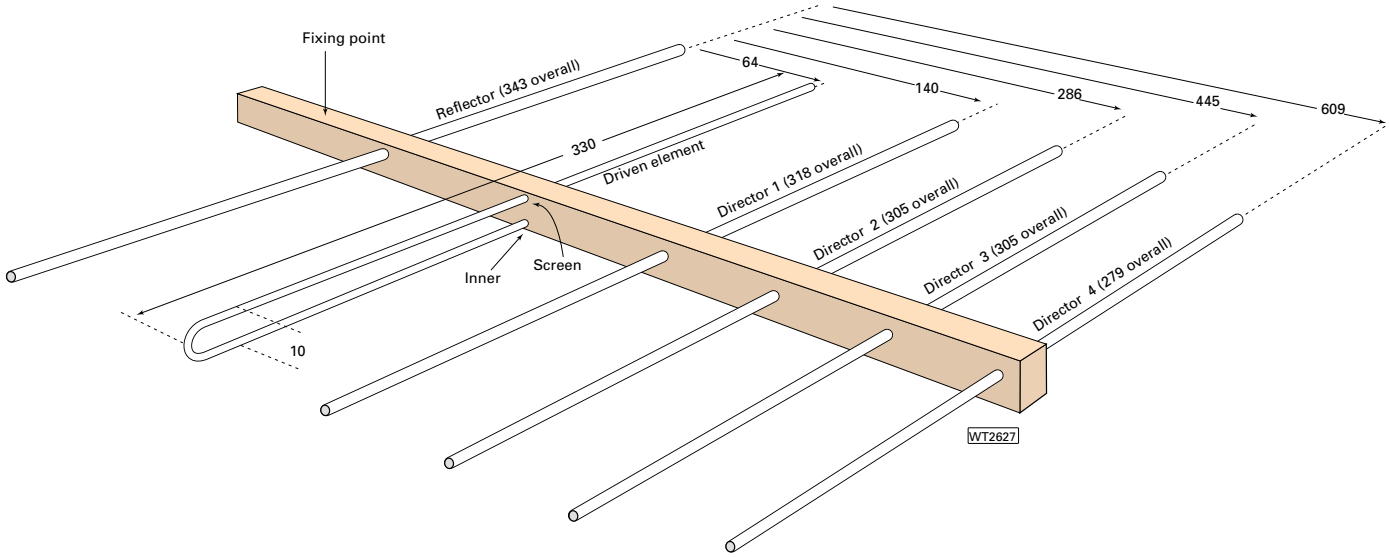
The elements can be made from 1/8in silicon bronze welding rod, hobby tubing and solid grounding wire or aluminium tubing with no change in performance. However, as you need to be able to solder to the driven element it's probably best to use a material for this element that can be easily soldered. Paul was unable to find 1/8in diameter rod in Holland and used 4mm diameter aluminium rod for the parasitic elements instead.

However, as Paul used elements with a diameter slightly larger than the original WA5VJB design, it was necessary to reduce the lengths of the four director elements by 3mm. On the plus side, the reflector and driven element and the other inter-element spacing don't need changing.

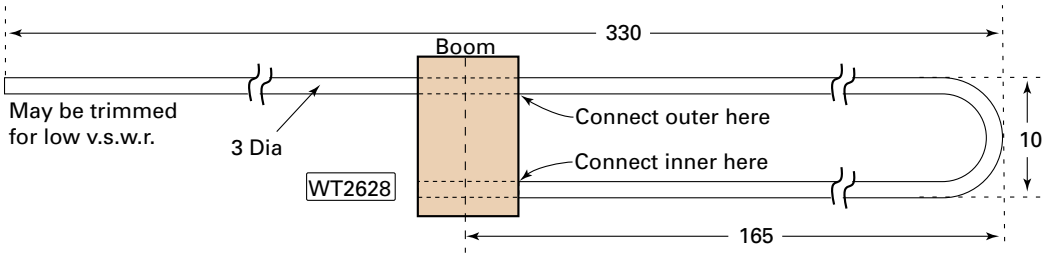
General Layout

The two illustrations, **Fig. 1** and **Fig. 2**, show the general layout of the Yagi antenna and the driven element. All the element spacings are referenced from the reflector position rather than giving individual inter-element dimensions. The measured point is the middle of each element. And by referencing all dimensions to one starting position you reduce inaccuracies along the length of the boom.

Measure, mark out and drill holes in the wooden boom to enable the elements to be secured as a push-fit through the boom. The reflector and driven elements should be cut to length and pushed through the holes in the boom. A drop of superglue or quick-set epoxy resin is used to hold the



● Fig. 1: A simple, but effective Yagi antenna with its optimised point, centred around 432.2MHz, just right for DX working from a local hill top. See Fig. 2 for more details of the driven element.



● Fig. 2: The driven element is constructed as a J-pole, but unlike the normal J-pole, the feed point is nearer to the mid-point. And of course is used horizontally.

elements in place having first made sure that the elements are centrally located about the boom.

The driven element is constructed as shown in the diagram Fig. 2 and then pushed into the wooden boom. Before fixing the driven element in place it is best to solder the coaxial cable to the element. You may either want to connect a short piece of cable with an in-line coaxial connector (so that a larger diameter main feeder may be connected to it) or attach a long piece of cable directly to the driven element. Whatever methods you choose always make sure you use the lowest loss cable that you can get your hands on.

At u.h.f. frequencies, you need to keep losses to a minimum, especially if you are running low power. The cable is soldered to the driven element connecting the inner conductor to the open end of the J-pole and the outer screening to the middle of the element as shown in the diagram Fig. 2.

The cable should be routed to the rear of the antenna fixing it to the wooden boom with tie-wraps or insulating tape, **Fig. 3**. Check the s.w.r. of the antenna and then put a blob of glue over the end of the coaxial cable connection and around the element to fix it to the boom.

The result is that it's a great performer, as Paul Webster PE7B can testify. During a recent tropospheric propagation opening Paul was active from a local hilltop site (JO30) running 5W from a Yaesu FT-817 transceiver into the 6-element 430MHz WA5VJB Yagi. His best DX of the evening was an 880km contact with the station of **GM4ZUK/P**. I hope that more Amateurs will discover the WA5VJB Yagi design and spend an evening or two making a cheap but very effective antenna.

So, what are you waiting for? Get the brazing rod out and make yourself a simple, cheap, but very effective Yagi beam antenna for 430MHz.

PW

● Fig. 3: On the bench, in more detail, viewed from behind the mounting point. This viewpoint had exaggerated the tapering element lengths.

Adding Top Band to the inverted-L Antenna

Len Paget GM0ONX

extends the coverage of his inverted-L antenna, which he first described in the February 2004 issue of *PW*.

As sunspot activity slowly declines to its 11-year minimum, more and more h.f. activity drifts towards the l.f. bands. Although fairly active on 3.5 and 7MHz, until very recently I had never the opportunity to work 'Top Band' (1.8MHz or 160m). Having a small garden, traditional full size antennas such as dipoles, long wires and Beverages for this band are out of the question leaving me to believe that working Top Band was alas only for the fortunate few with big gardens and not possible from my QTH.

In the *ARRL Handbook* **A.C. Buxton W8NX** describes one possible solution to the problem in the form of a compact trapped dipole for 1.8, 3.5 and 7MHz, but at nearly 38m long, it was still far to big for my QTH. However, the concept of adding an additional trap to what was basically a W3DZZ antenna planted the question: could a similar solution work with my inverted-L?

Considerably Shortened

The W8NX antenna used a special high *Q* 3.5MHz coaxial trap, which although it considerably shortened the overall length of the antenna it also reduced the bandwidth on 3.5MHz to a mere 75kHz. I considered this compromise undesirable as my original inverted L antenna had an excellent performance on 3.5MHz and I didn't wish to compromise this too much. Instead I elected to leave the original design of my inverted-L antenna featured in February 2004 *Practical Wireless* virtually unchanged and add a conventional 3.5MHz coaxial trap and pay the penalty in extra antenna length.

The coaxial trap for 3.5MHz follows the same format as the 7MHz trap previously described in *PW*. It's constructed from 20 turns of RG58 cable on a 40mm pvc water pipe former. If you've not got that issue to hand, I've shown both traps, in **Fig. 1**, which shows the construction of them. These traps are capable of power limits well in excess of the UK limits.

In making up the traps, the 3.5MHz trap, like the 7MHz trap, I described in the first article, is sealed with silicon bathroom caulking, and wrapped with insulating tape (**Fig. 2**). It's added to the end of the original inverted-L antenna, along with an additional 8.54m length of 2mm diameter (14s.w.g.) wire - see **Fig. 3**. The final length will vary a bit from location to location because not only is there a shorting effect caused by the inductance in the 3.5MHz trap, there will also be a significant capacitance effect on 1.8MHz as the antenna is close to ground.

At my location, it was also necessary to install it with a slight 'dogleg' in the antenna, run as you may well be able to see in the heading photograph. So, I have most of the additional section running over the roof of the house - further adding to the capacitance effect.

Tuning The Antenna

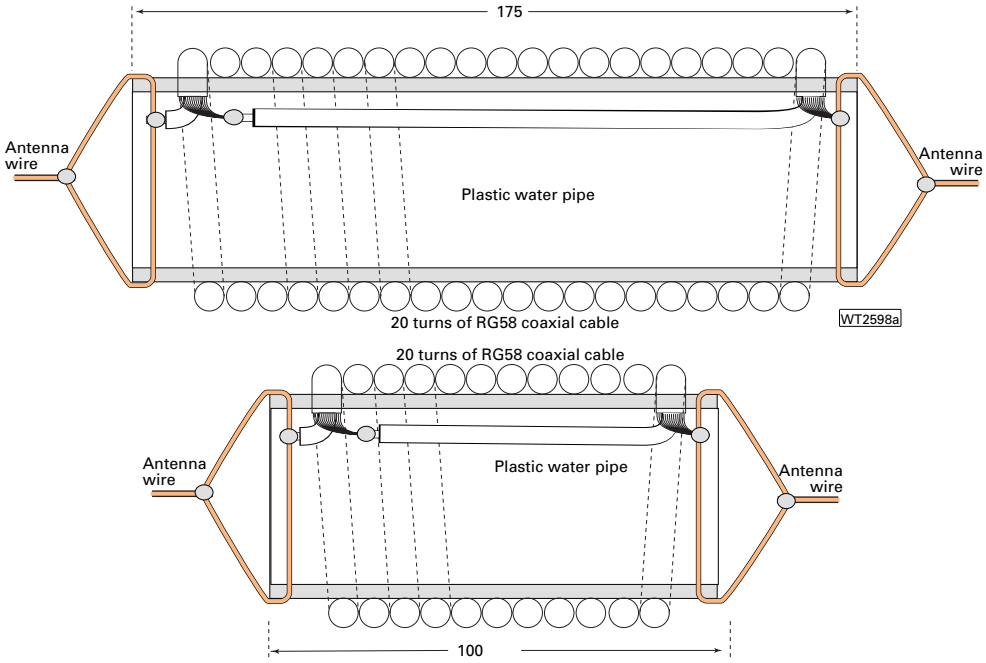
Tuning the antenna is quite simple and is basically a repeat of the process described in the February 2004 article, except it shouldn't be necessary normally to revisit the 7MHz section. The 3.5MHz section of the antenna should be checked for resonance and you will probably find that the resonant frequency has moved slightly due to the presence of the 3.5MHz trap. My principal area of interest is the s.s.b. and DX window end of 3.5MHz so I retrimmed that section of the antenna to bring it back into resonance at this end of the band.

The extended 1.8MHz section was cut to resonate at 1.9MHz and gives a standing wave ratio

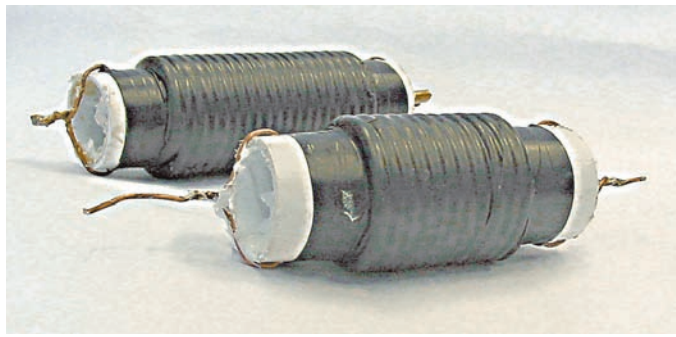
(s.w.r.) no greater than 1.5:1 over most of the band. But enough of the rag-chewing, does the additional section work? Well yes it does - surprisingly well considering its size and the low mounting height. Like all inverted-L antennas, it really needs a good r.f. ground however, dependent on your soil type, it's not always essential to install a earth mat or ground planes.

The original prototype of this antenna was dependent on a single earth rod into clay soil as its r.f. ground, but even with these limitations I managed to work in my first week ON4 (Belgium), LX1 (Luxembourg), OZ8 (Denmark) PA0 (Netherlands), LY2 (Lithuania) and I5 (Italy) plus most parts of the UK. However, after speaking to a number of stations on 1.8MHz it became clear that the received wisdom dictated that I should install 'ground plane' wires below the ground to further improve performance.

Ideally, groundplane wires, or radials, should be at least λ/4 long and run out radially in a circular pattern, but it's not possible to do this at my QTH. So, I went for what I could get, which was about half a dozen ground plane wires no longer than 10-15m in a 90° arc. It's difficult to say if it made any difference as I had a good natural r.f. earth and it was not practical to switch them in and out for a comparison. If however, you have dry sandy soil you will certainly require some kind of additional r.f. earthing to get an acceptable performance on Top Band.

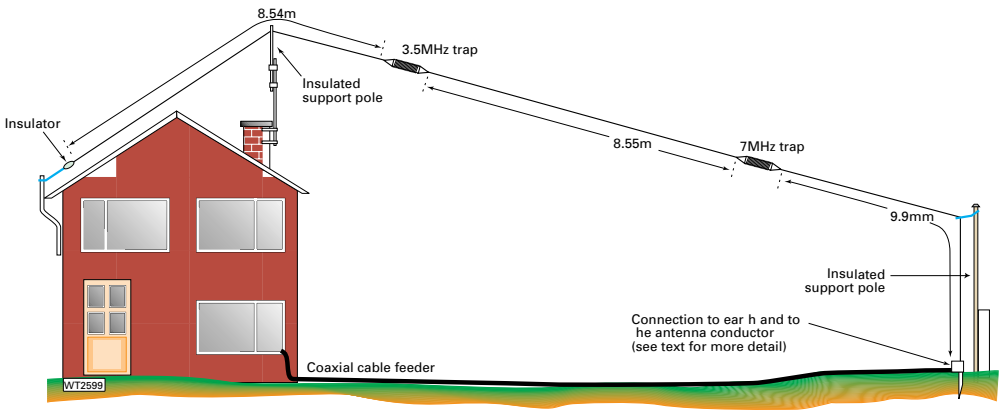


● Fig. 1 (above): The 'new' 3.5MHz trap is constructed along the same lines as the 7MHz trap (bottom) that I've described previously. For the new trap (top), some 20 turns of RG58 are made on a piece of 40mm diameter water pipe. The ends are sealed as shown in Fig. 2.



● Fig. 2 (above): On checking the traps for resonance, they are sealed with bathroom sealant and covered in pvc insulating tape to weatherproof them.

● Fig. 3 (below): A slightly more idealised layout that the 'dogleg' that I have to take around the roof of my house. A good r.f. earth should be employed at the feed-point.



Not Familiar?

For those not familiar with Top Band, most of the inter-G sideband voice 'rag chewing' activity takes place above 1.90MHz (typically 1.930-1.950MHz) with s.s.b. DX activity being below this, particularly the window between 1.840 and 1.850MHz. The usual bottom 30kHz as usual is reserved for Morse. Readers are reminded that in the UK we are only Primary User in the 1.810MHz to 1.850MHz section with a power level of 26dBW (400W) peak envelope power (p.e.p.) and that we are Secondary Users with a reduced power output of 15 dBW (32W) on the rest of the band. Foundation and Intermediate Licensees are of course restricted to their usual power limits of 10 and 17dBW (10 and 50W respectively). Even with the low power limits on most of the band, it's amazing how far you can get when your not competing against high powered stations.

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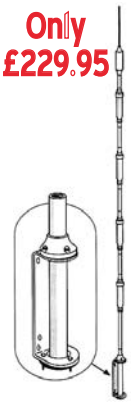

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Thirty Years of IC Audio Amplifiers

Howard Vicary G0RJN celebrates 30 years of the integrated circuit audio amplifier. Howard clearly remembers that he felt quite liberated when they arrived - thanks to the help of some colleagues!

Thirty years ago I gave up the crossover distortion, thermal runaway, adjusting quiescent currents and using driver transformers. How did this happen - at a stroke? It took place when the first integrated circuit (i.c.) audio amplifiers became available.

This article examines the huge impact that audio integrated circuits made in all fields of radio about 30 years ago. Integrated audio amplification greatly reduced the physical size of amplifiers, which enabled smaller hand-held equipment to be manufactured, more rugged and reliable mobile communications to be produced and tiny stereo radios and audio players to be manufactured.

Pre-Semiconductor Days

In the pre-semiconductor days valves were good, and still are good at audio amplification. The basic valve output stage required about 300V d.c. of high tension (h.t.) and a heater supply of typical 6.3V, **Fig. 1.** The relatively high output impedance of the valve (circa 3000Ω) required impedance matching to the loudspeaker (3 to 16Ω) mostly by the use of a step-down transformer.

WS2581

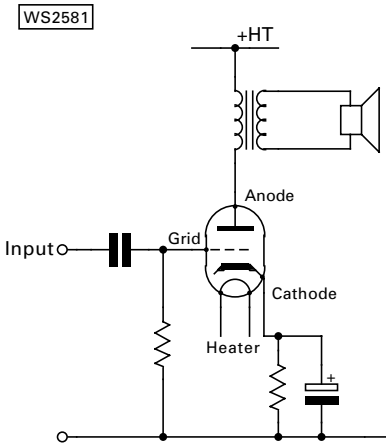


Fig.1: A simple triode valved amplifier offered gain but often at the expense of less than perfect audio quality.

Early gramophone records (78r.p.m. pressings) only achieved a useful frequency response from 50Hz-8kHz. This was improved to some 20Hz-15kHz by the early 1950s, requiring better amplifiers.

Higher power output required push-pull circuitry and the application of negative feedback to reduce distortion, see **Fig. 2**. The Williamson amplifier design established the rules for high fidelity amplification, frequency response and distortion. The standard became 10Hz to 20kHz frequency response ±3dB with harmonic distortion of less than 0.1%.

The frequency response for a.m. broadcast radio is still only 5kHz and less for Amateur Radio and p.m.r. Broadcasting on Band II (80-108MHz) using wideband frequency modulation achieved virtually record quality, and later the transmissions were available in stereo.

Valve mobile radio equipment used mechanical vibrating reed switches to step-up the 12V vehicle supplies to the 300V required by the anodes. Some dual valves had twin 6.3V heaters designed so that they could be operated at either 6.3V in parallel or 12.6V in series - straight across the battery supply (e.g. ECC83/12AX7 USA double triodes), see **Fig. 3**.

WS2582

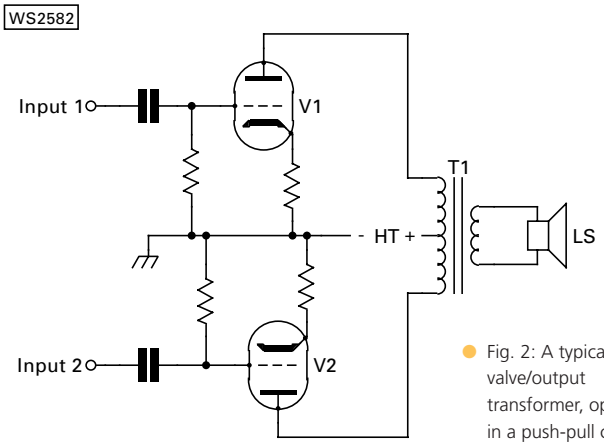


Fig. 2: A typical valve/output transformer, operating in a push-pull circuit

WS2583

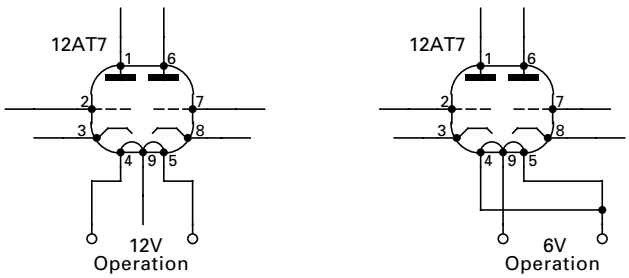


Fig. 3: A double-triode. These useful valves could be used in circuits ranging from audio to radio frequency.

Valves & Semiconductors

Valves were developed to operate with a 12V h.t. supply, but were only suitable for small signal applications such as r.f. and i.f. gain stages for which the early germanium transistors were generally poor performers. No appreciable output power was available from valves running at 12V, so mobile radio equipment often resorted to using a single power transistor as the output stage. These were germanium power transistors, which were difficult to impedance match and also to thermally balance for a mobile environment, see **Fig. 4**.

Germanium Transistors

The first generation of small broadcast receivers used all germanium transistors (because nothing else was available). These were of *pnp* alloy-diffused construction. The normal broadcast superhet configuration would use four germanium transistors in the audio amplifier stage. These would be confined as pre-amplifier (after the diode

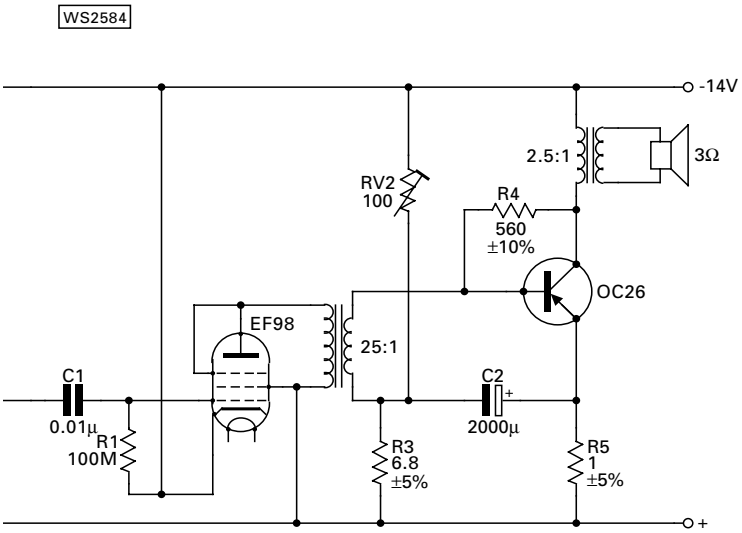


Fig. 4: Circuit diagram of hybrid valve-transistor output stage. Note: The valve is, in effect, upside down to its usual way of being seen!

detector), push-pull driver stage with the driver transformer and then two in push-pull output.

Matching to the loudspeaker would be by an output transformer. Thermal stability was poor with germanium devices, and thermal runaway was a common problem, leading to destruction of the device (see **Fig. 5**).

Silicon Transistors

When the mass production of silicon increased and low cost plastic encapsulation was perfected, silicon transistors were used in broadcast receivers. The audio output stages were then able to complementary *npn-pnp* transistors and did away with the need for the bulky and heavy driver and output transformers.

In practice the quiescent current was often preset with a small variable resistor and thermal stability was achieved with diodes. Incorrect currents lead to cross-over distortion giving a very harsh sound, see **Fig. 6**.

Early Integrated Circuits

The first generation of integrated circuits (i.c.s.) to be mass-produced consisted mostly of digital logic and operational amplifiers. The early generation of audio i.c.s were often produced in multi-legged TO5 transistor size cans, and contained a relatively low component count. This was because the yield of good i.c.s. during the manufacturing process was proportional to the area of the chip, i.e. smaller the better and cheaper.

Early linear circuits only performed one function such as i.f. amplification, audio pre-amplification, or audio driver stage. The maximum output was usually 250-350mW.

The Plessey Company then developed high performance linear i.c.s for use in h.f. and v.h.f. military man-pack transceivers that performed more than one function, e.g. i.f. amplifier and demodulator. This functional integration process was actually carried on during the colour TV boom.

The introduction of Band IV and V u.h.f. 625-line colour television using the PAL system (Phase Alternate Line) with its increased signal processing requirements brought about the need for greater functionality. It also brought the need for better quality and higher power audio sound for the new intercarrier f.m. sound modulation. (The black and white 405-line TV system used a.m. sound modulation).

Those engineers working in television saw for the first time integrated i.f. amplifier/demodulator/volume control/a.f. pre-amplifier and a.f. power amplifier on one silicon chip. It was all very exciting to see the specifications and performance improve, especially when it was also accompanied by a significant decrease in physical size.

At the same time Plessey developed their 3/5W audio i.c.s

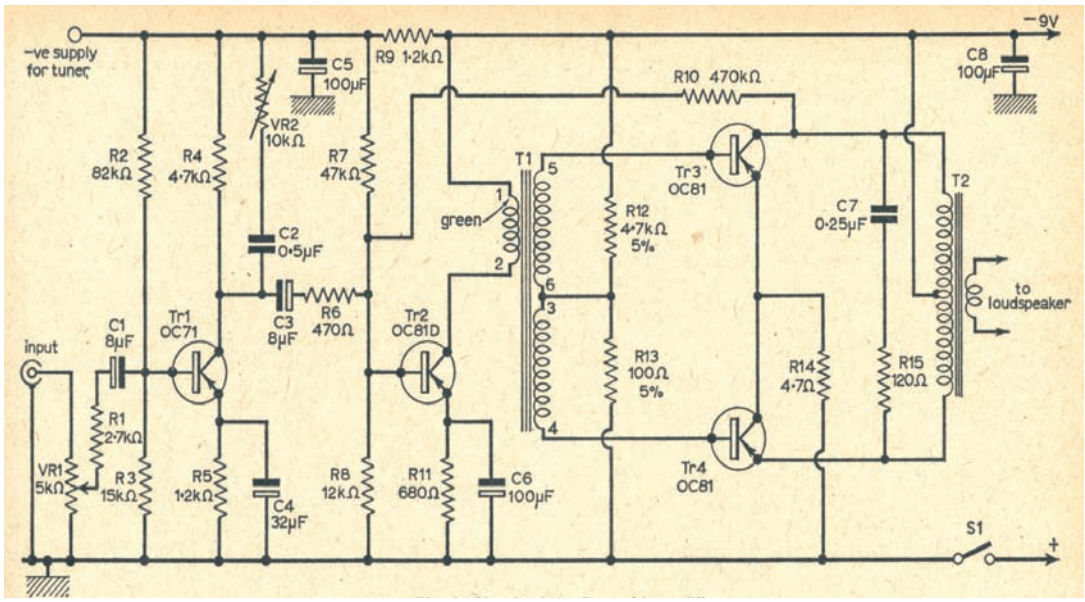


Fig. 5: Circuit diagram of portable radio audio stages using germanium pnp transistors (see text).

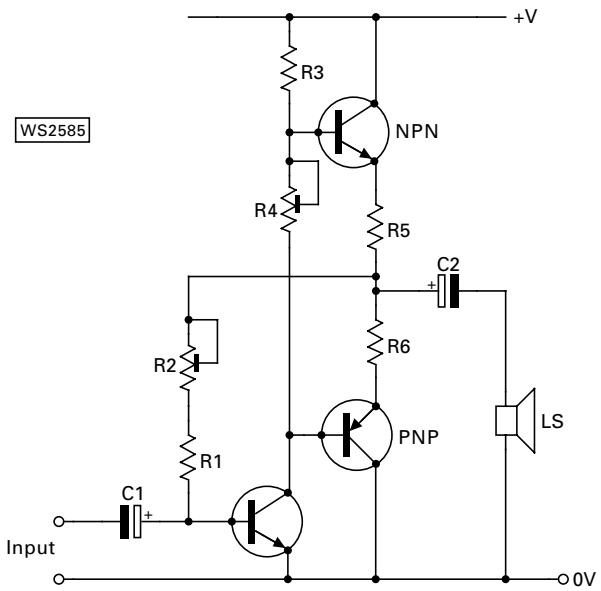


Fig 6: Circuit of complementary output stage using *pnp-npn* transistors (see text).

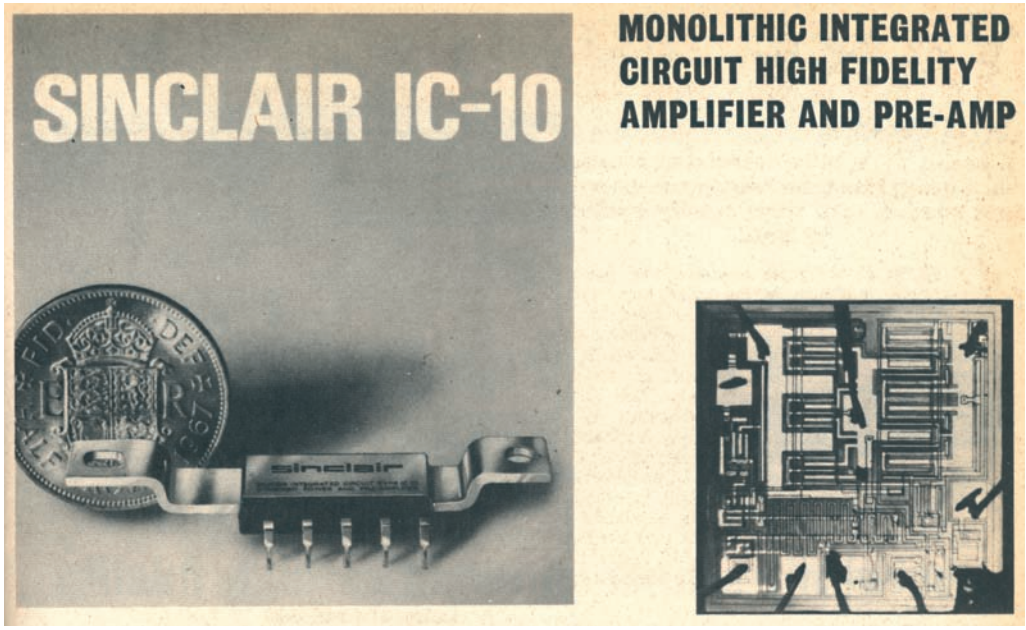


Fig. 7: Photograph of Plessey audio i.c. and heat sink under its guise as the Sinclair IC-10.

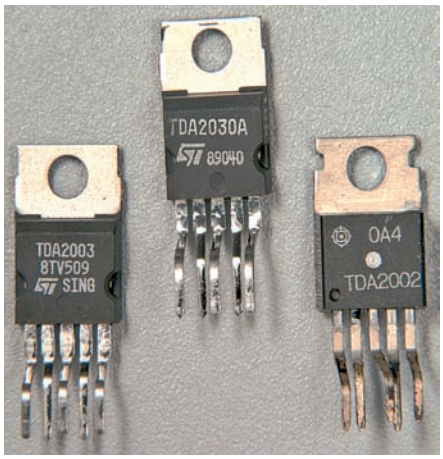


Fig. 8: The TDA2000 series in the 'Pentawatt' package.

Fig. 9: Incorporating both i.c.s and discrete transistors, some amplifiers offered up to 50W output with low distortion.

type SL402/SL403. This was a huge step forward in i.c. technology. Earlier i.c.s (logic and op-amps) typically handled currents of up to 25mA so could be small and not dissipate much power and not get too hot.

However, the new power audio amplifiers needed to handle 1A of current and to dissipate 2 to 3W of heat. The chip output transistors had to be made about 40 times bigger than typical op-amp transistors of the day. The silicon chip had then to be bonded to a metal bar to enable the heat to be transferred to the air or an external heat-sink.

As a young engineer I remember trying to buy one of the Plessey audio amplifiers. The company I was working for could only buy a minimum of 10, so I asked all my colleagues if they were interested!

Several colleagues opted for a stereo pair, so we quickly got to the minimum order quantity. While I waited for delivery I carefully bent a piece of aluminium into the recommended 'U' shape for the heat-sink and found some Veroboard for the associated components.

A 'phone call alerted me to the fact that the new fangled amplifiers had arrived. They certainly looked like no other i.c.s around at that time, with the large metal bar through the middle and black plastic covering the 'clever bit'.

Printed on the plastic was the Plessey 'sine-wave' logo and the part number SL 402. Two long 4BA bolts and lots of nuts held the home-made heat-sink onto the i.c. and the device itself onto the Veroboard. A few resistors, capacitors, volume control and large electrolytic output capacitor were soon soldered in place.

Then I checked and double-checked that the components were all in the right places, the Veroboard tracks were cut where needed and the heat-sink was earthed to the negative supply/ground. A quick check with the AVO meter confirmed continuity was correct in the circuit board. Connect suitable 8Ω loudspeaker and all was ready.

I carefully wound the stabilised supply up from zero, whilst watching the supply current on the AVO. All was well, a small hiss from the output and a loud noise when a finger (the digital test!) was put on the input. I then did sine-wave testing and power out measurements trying all the time not to get the heat-sink too hot.

The frequency response was so much better than germanium transistors could provide at that time. **Clive Sinclair** (now of course Sir Clive) must have realised how exciting these audio amplifiers were by marketing and advertising his own badged version with great success, **Fig. 7**.

Designs Stimulated

Other semiconductor firms were stimulated to design and produce audio amplifiers for the fast growing colour TV market. These included SGS and Texas Instruments, to name only two, produced amplifiers in Gull wing packages. The wings were inserted into slots in the p.c.b.s and soldered to the copper track, which then acted as a small heat-sink.

The TBA 800 audio amp was very widely used in television receivers, giving 5W output. It was quite a robust device. The biggest colour TV at that time had a 'massive' 26in (660mm) screen.

Multitude Of Choices

Nowadays when selecting a suitable i.c. there are multitude of choices at our disposal. They are also quick and easy to use, with a whole range of power outputs.

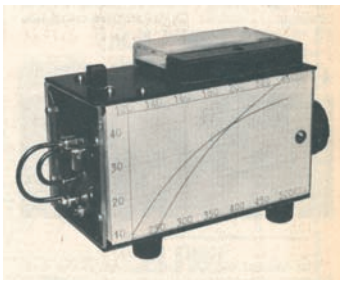
Newer packages offer stereo pairs, bridge connected quads and class D switch mode amplifiers. Everybody has their favourites and I particularly like 8-legged packages for small amplifiers, (including the LM380 and LM 386) and the TO-220 package devices with five legs for higher power, such as the TDA2003 and TDA2030 series. There were some (**Fig. 8**) hybrid ic and discrete packages , Fig. 9. offering up to 50W output with few external components needed. Both types are easy to mount and use few additional components.

Finally though, I must admit that I have not totally done away with all harmonic distortion. But life is so much easier and fun at the audio section of all my radio equipment!

PW

Building a UHF Wavemeter

Continuing the re-publishing of *PW* v.h.f. and u.h.f. classic projects, Rob Mannion G3XFD introduces a simple u.h.f. wavemeter and a pre-amplifier project.



The author's original prototype as shown in the July 1975 issue of *PW*.

The first project this month was originally published in the July 1975 issue of *PW* and the author was R. Longden. This author's project is just as relevant today as it was in 1975 and I thoroughly recommend that if you don't have a u.h.f. meter in your workshop - you can build one now! **Editor**

The 1975 Article

A wavemeter is an essential item of equipment required to check the order of multiplication obtained in the various tuned circuits of a transmitter. For example, consider a 144MHz transmitter using an 8MHz oscillator. The oscillator is usually followed by a stage tuned to the third harmonic, to obtain 24MHz. This is followed by a 3x harmonic amplifier, then a doubler, giving 24 x 3 x 2 or 144MHz.

Wrong tuning could give 2 x 4 or 4 x 2 in the early stages, providing 64MHz, doubled to 128MHz. Tuning the p.a. to this would cause out-of-band operation and this of course would mean you're breaking the conditions of your Amateur Radio Licence.

A calibrated wavemeter will ensure that the output is at 144MHz. It can also be used to check for possible harmonic output on 288, 432MHz, or other related frequencies. So, let's look at how a wavemeter can help you keep within your Licence conditions

Indicating Harmonics

A wavemeter is not intended to show the exact frequency, but to indicate that the correct harmonic or band is in use. If a large graph is prepared to show wavemeter dial, readings and frequency, good accuracy is obtainable. However, a much smaller graph is quite adequate for harmonic and similar checks.

For frequencies above about 300MHz a very low minimum tuning capacitance is necessary. It also becomes difficult to use ordinary plug-in coils. Instead a fixed loop L1 is employed and switch S1 allows two ranges to the holder and leads. The circuit and diagram **Fig. 1** and **2,** shows how the smaller loop, L2, is used to couple the energy into the metering circuit.

For the higher range of approximately 220 to 500MHz, the two sections of the butterfly capacitor VC1 are in series. This gives a maximum capacitance of about 12.5pF and a very low minimum.

With S1 closed, one section of 25pF is in use and the range is approximately 120-240MHz. The variable capacitor VC1 is operated by a small reduction drive. The dipole is coupled by the loop L2 to avoid loading L1 and rectification by diode D1 provides current for the 100µA meter. Resonance is indicated by the maximum meter reading.

Construction & Layout

The layout I adopted is as shown in Fig. 2. The sides of the case are 4 x 2in flanged universal chassis members. A further 4 x 2in member is cut in two. One part of this provides the end, on which the slow motion ball drive is mounted. The other part is used to mount VC1. The end flanges of the sides are cut off at the ball drive end. On my prototype the top of the box is made from Paxolin, 4 1/16 x 2in and cut to take the meter and S1.

Assembly is most easily carried out by fitting together the top, one side and parts to take VC1 and the drive. A length of 1/4in rod fits between the drive and insulated flexible coupling. The shaft of VC1 occupies a clearance hole and VC1 is fixed by two short 6BA bolts into the 'dead' bushes provided.

As the VC1 spindle is slightly smaller, a piece of tinplate is cut and bent round it to bring it up to about 1/4in diameter. Wiring can then be done as in Fig. 2, except for L12 and L2, C1, D1 and the meter lead are anchored at an insulated tag.

The case end was 1/16in thick Perspex (available from companies making advertising signs, etc.), so that drilling positions can be seen. Clearance holes are drilled for the four studs of VC1. Two holes are also drilled for the ends of L2.

About one half the width is cut off the end flanges of the metal sides members and these and the ends are drilled for four 8BA bolts. L1 is 16s.w.g. or other stout wire and is 22mm (7/8in) across and 19mm (3/4in) long, see Fig. 2. Using a medium duty soldering iron* (50-75W). It's then soldered to the projecting studs of VC1, near the position for L2. L2 is of similar wire, 13mm (1/2in) across the projecting about 13mm (1/2in) with ends long enough to reach the MC

continued on page 48

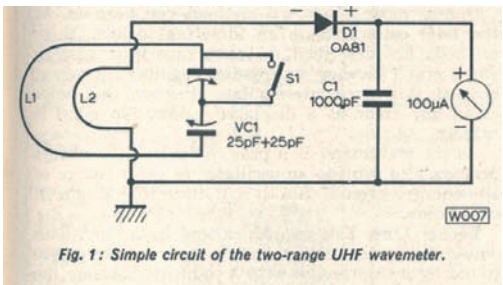


Fig. 1: Simple circuit of the two-range UHF wavemeter.

Fig. 1: Circuit of the u.h.f. wavemeter (see text).

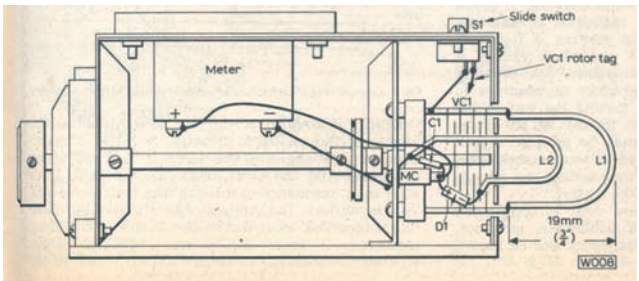


Fig. 2: Physical layout diagram of the wavemeter. Note that two inductors are used with a simple switching (see text).

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tag and D1. When L2 is soldered on, the case bottom can be fixed with self-tapping screws. The dial should read zero with VC1 closed.

** Lightweight (15 to 20W) soldering irons will probably prove inadequate when soldering to the heavy duty lugs on VC1. For best results, a larger iron should be used.* ***Editor***.

Using The Wavemeter

In use, the wavemeter loop or coil is positioned so that it can pick up r.f. energy from the oscillator, amplifier or other coil of the equipment to be tested. The wavemeter is tuned to resonance, as shown by maximum meter indication. The frequency is then found from the wavemeter scale.

The best accuracy is secured when coupling is loose, so that only a small meter indication is obtained. So, as the wavemeter tuning position is found, it is moved away from the r.f. coil when energy is present.

With very low power circuits, close coupling is needed to begin with, inductors or windings in line. Coupling is then reduced by moving the wavemeter away or turning it to place its coil at an angle. Where a few watts of r.f. may be present, a full scale reading may be obtained at some inches spacing, so care is needed when first testing any circuit to avoid possible damage to the meter.

Exactly similar methods are used to couple the wavemeter to a circuit for calibration purposes. The difference in this case is that the frequency will be known already.

Calibration Methods

When it comes to calibrating the instrument - various methods can be used. As the final calibration is an important aspect, I've described three methods. In each case, it's wise to plot a graph showing dial readings against frequency, because this gives intermediate readings and helps avoid any error as a displaced calibration point is suspect.

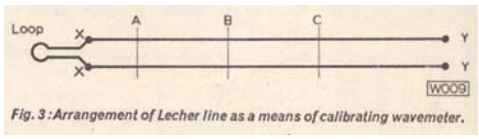


Fig. 3 : Arrangement of Lecher line as a means of calibrating wavemeter.

● Fig. 3: Essential features of a Lecher Line. It can be made on a board about 130 x 25mm (5 x 1in) and 1.85m (6ft) long and the actual dimensions are not important (see text).

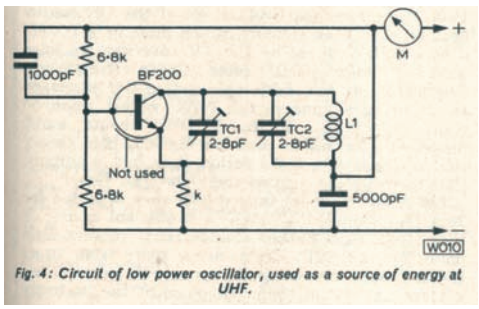
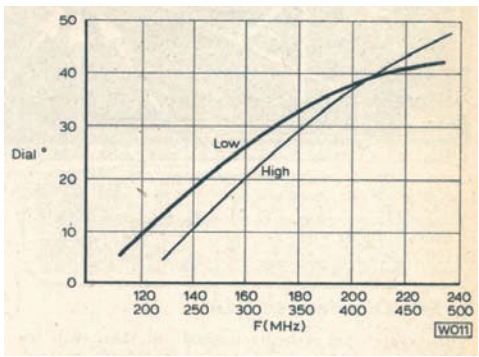


Fig. 4: Circuit of low power oscillator, used as a source of energy at UHF.

● Fig. 4: The circuit diagram of an oscillator found to be suitable for up to 500MHz by the author. Here, the inductor, L1, is three quarters of a turn 8mm (5/16in) in diameter, soldered directly across TC2 (see text).



● Fig. 5: A guide on what to expect when calibrating the circuit in Fig. 1 (see text).

Don't forget the wavemeter is a passive device, it's always necessary to provide an oscillator or other source of r.f. energy. Even if this is not itself the origin of calibration.

Lecher Line: In practice a Lecher Line can be excited by an oscillator whose frequency is not known, and the frequency found by measurement with a ruler, the calibration then being marked on wavemeter. With care, it's usually considered that accuracy can be better than 1%.

The diagram, **Fig. 3**, shows essential features of the line. It can be made on a board about 130 x 25mm (5 x 1in) and 1.85m (6ft) long (actual dimensions are not important). The points X-X can be a strong tag-strip anchoring the wires about 25mm (1in) to 40mm (1.5in) apart. An insulated loop about 13mm (1/2in) in diameter with ends some 50mm (2in) long is soldered on here.

The wires can be 20s.w.g. tinned copper, 25mm (1in) or more clear of the board. Points Y-Y can be long screws with nuts, so that the wires can be drawn taunt. The wires must be parallel but fixing details at X-X and Y-Y do not influence calibration.

Energy is coupled to the line by positioning the loop near the oscillator inductor. A metal straight-edge, at right angles to the wires, is then slid along in contact with the wires, from X-X. At some point, such as A, resonance causes the line to draw power. This is marked. The straight-edge is moved on, until this is repeated, as at B. The distance A to B is then measured. If measured in mm, 150,000/mm = MHz. For example: 300mm = 150,000MHz or 600mm = 250MHz and so on. The measurement can be confirmed as my moving B to C.

Low Power

With low power, resonance with the oscillator is most easily shown by including a meter to show anode or collector current. With the frequency determined, you should tune the wavemeter to it as described and mark the graph. The oscillator frequency is then changed and the procedure repeated for a new point.

The circuit diagram, **Fig. 4**, is an oscillator which I've found to be suitable for up to 500MHz. Here, the inductor, L1, is three quarters of a turn 8mm (5/16in) in diameter, soldered directly across TC2.

The capacitor, TC1, is a miniature tubular pre-set and though this needs to be near minimum capacitance, oscillation was not obtained without it. The whole unit is assembled in any convenient form, but with very short leads for r.f. circuits.

I found that the best indication was obtained using a 1mA meter, with the supply voltage reduced for nearly a full-scale reading. Shorting or holding TC2 should cause a drop in current. If not, the circuit is not oscillating.

The line loop is coupled to L1 so that a dip can be seen on the meter for two positions of the shorting bar. The line is then removed and the wavemeter is loosely coupled and tuned to produce the same dip, and its chart marked with the frequency determined by the line.

Use of a GDO. If a calibrated grid dip oscillator (g.d.o. or f.e.t. gate dip meter) can be used, the wavemeter can be easily calibrated within the range available on the g.d.o. Keep the dipper and wavemeter separated so that only a small wavemeter reading is obtained on resonance.

Using transmitter harmonics: A 144MHz transmitter will provide a calibration mark within the band. With some circuits, second and other harmonics of this or other frequencies may be found. **Note:** With a transmitter where r.f. is generated at 72MHz and followed by three circuits tuned to 144MHz, it may prove difficult to find any harmonic or spurious frequencies, in normal operation, with the wavemeter.

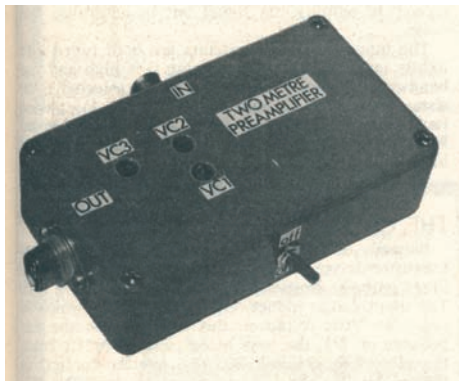
The illustration, **Fig. 5**, is a guide on what to expect when calibrating the circuit in Fig. 1. A larger graph on graph paper is recommended. In this example, calibration was done using a tuneable oscillator, Lecher line and harmonics.

PW

Components List

C1 100pF disc ceramic D1 OA81
VC1 25 + 25pF butterfly type (Jackson C713)
M1 Meter, 100µA, Universal coupling
Slow motion drive (1.5in dia.) Rod 1/4in diameter.
Universal chassis members 4 x 2in (3).
Miniature slide switch for S1.
Possible equivalents for BF200 are: 2N5179, 2N918, 2N4427, BF790, BF494, BF790.

The second Classic Project was originally published in the October 1975 issue of *PW* and the author was W. H. Bond G3XGP. This project was originally published within a series entiled Miniature 2m Equipment - Part 2: Preamplifier.



The 1975 prototype built by G3XGP.

The 1975 Article;

Probably the majority of those interested in radio are not transmitting enthusiasts but listeners. Some of whom may remember that on the lower frequencies, any piece of wire for an antenna with the provision of a good earth, brought the world into the shack, and if one could not hear the signal, this was always due to QSB or QRM. When, however, a converter for the 144MHz band was made, the old antenna was no good and a special one had to be put up!

The antenna would be omni-directional, or directional, the latter would bring in the one wanted signal magnificently, but the other chap, off the beam heading, could hardly be heard. Using the omni-directional antenna, both signals went down so the r.f. gain was turned up, the signal re-appeared but this time with a noise, making listening difficult and unpleasant.

Receiver Noise

The noise is generated in the receiver and represents one essential difference between the lower frequencies and v.h.f. Below about 60MHz the dominant noise limiting the signal received is atmospheric, but above this frequency, this falls so that at v.h.f. and above, thermal and 'shot' noise predominates. Known as 'white noise' it is random in frequency and time and limits the lowest level of signal that can be demodulated in a receiver.

Thermal noise depends on the bandwidth of the receiver, the resistance of the transistor used and two factors over which there is no control, Boltzmann's constant and the absolute temperature. Shot noise on the other hand, depends on the rate of current flow through the device.

As the bandwidth cannot be reduced to a single cycle, a transistor has to be chosen that has the lowest inherent noise factor, coupled with maximum gain at low current flow. The bandwidth, therefore, should be reduced to the minimum necessary, and the input resistance matched to the device resistance in order that the maximum signal is transferred.

Negative Feedback

There is, however, one other trick that can be employed after all the factors have been optimised and that's by using negative feedback. Imagine a signal travelling through a transistor working in common emitter configuration with a positive signal changing into a negative one or a 180° phase change. Then, as the signal travels through, random electron movement adds some odd pulses (noise) first in the emitter base junction and then in the base where some electrons and holes combine and, on the way out, in the base/collector junction.

These noise signals appear in a different phase from the main signal. Some are at 30°, some at 90°, but all are out-of-phase with the input signal.

If the signal now returns from the collector to the base 180° out-of-phase and then the feedback signal reduced by a factor dependent on the gain of the transistor, no signal will appear at the collector. However, the noise generated in the transistor will still be audible because it's not 180° out of phase with the input signal.

If the exact phase of the returned signal is altered, there will be a point where the signal is amplified, but the noise will be returned out-of-phase and not amplified. Both thermal and shot noise therefore being neutralised. This is the principle on which the pre-amplifier in this project was designed, to amplify the signal but to neutralise the noise.

The input and output circuits are both tuned and lightly loaded so that the working *Q* is high and the bandwidth is kept to a minimum. The selected transistor is an AF186 with an inherently low noise factor and an f_T of 900, chosen in preference to an f.e.t., for those equal to it are twice as expensive and have less gain at v.h.f.

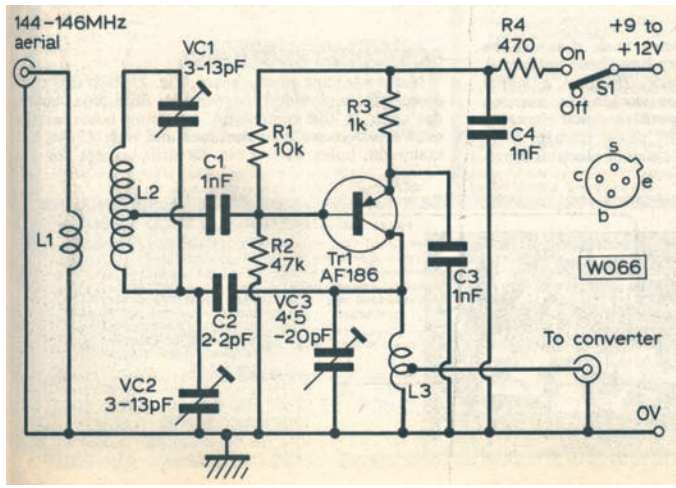


Fig. 1: Circuit of the 144MHz pre-amplifier. Because of both current and voltage gain, the transistor is run in common emitter configuration, with the emitter being tied to the positive rail (see text).

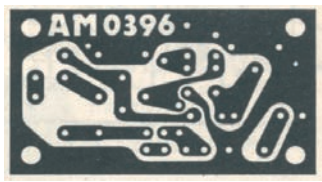
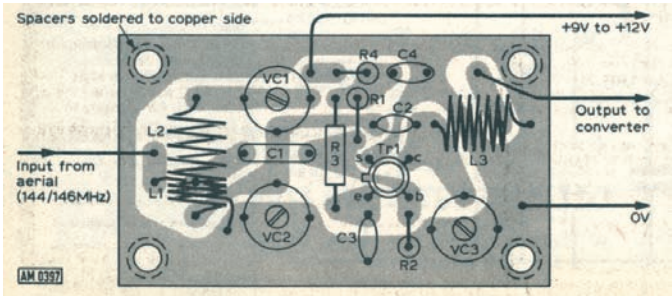


Fig. 2: Full size template for the p.c.b. (see text).

The Circuit

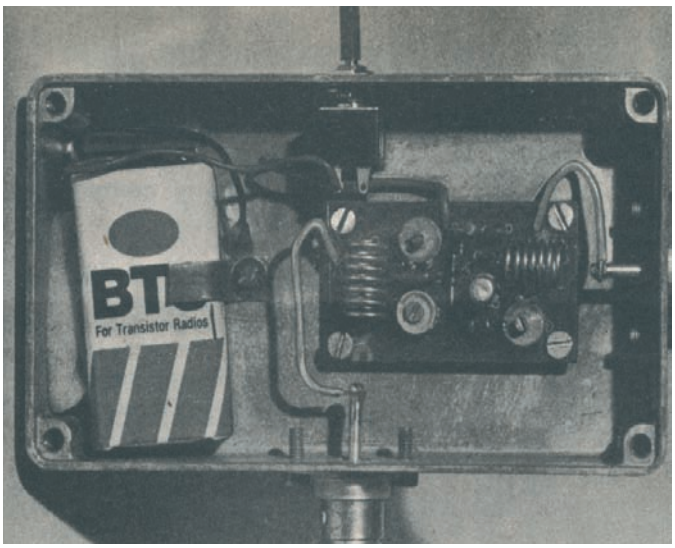
Because of both current and voltage gain, the transistor is run in common emitter configuration, **Fig. 1**, with the emitter being tied to the positive rail. The input coil is inductively coupled to L2, which is tuned by VC1. A tap on this coil matches the impedance of Tr1, the base being isolated by C1 from the bias chain R1 and R2.

The emitter current is



● Fig. 3 (above): Component layout diagram (larger than actual size) for the pre-amplifier.

● Fig. 4 (below): Author's prototype built into an Eddystone die-cast box (see text).



limited by R3, which is bypassed to earth by C3. L3 and VC3 in the collector lead are tuned to the input frequency and a tap lower down on L3 provides a low impedance output to match the following converter. The capacitor C2 and VC2 provide the neutralising phase shift circuit.

PCB Construction

To etch your own p.c.b., first take a tracing of the board, **Fig. 2**. Stick this on a piece of single-sided copper-clad fibreglass board, dot each of the component mounting holes with a centre punch, paint in the lines and etch. Clean and make the holes with a No. 60 drill, except for the mounting lugs of the variable capacitors, where a No. 52 drill must be used.

The coils should be close wound on a 6.3mm (1/4in) drill, stretched to length before forming the leads and the taps fixed. Before mounting them as close as possible to the board, L1 should be wound inside the first three turns of L2 after the latter has been mounted on the p.c.b., putting the drill inside L2 as a former. Finally check the board for solder bridges, give a final clean.

Final Checking

Begin the testing by checking that the current consumption lies between 1 and 1.5mA at 9 to 12V. If it's higher, adjust VC1 and VC2 just in case the circuit is oscillating.

Next, fit the unit in a 115 x 64mm (4.5 x 2.5in) diecast box. Then complete the wiring to switch and coaxial sockets.

Neutralised pre-amplifiers are notoriously difficult to set up, but this unit has proved to be the exception. The simplest method requires a dip meter as a test instrument, a normal converter and receiver together with a tuning wand. **Note:** A tuning wand, made from a thin rod of insulated material with ferrite on one end and brass on the other. It's used to indicate whether more or less capacity should be used with a coil.

To begin, connect the antenna and converter to the unit and, using the g.d.o., dip L3 to the lower part of the band, using VC3 and then by adjusting VC1 and VC2, put L2 into the upper part of the band. Next, switch on, use the g.d.o. as a signal source and watching the S-meter of the receiver, adjust VC3 for maximum deflection, followed by VC2 and VC1.

However, as all three adjustments are inter-dependent, the optimum results are a matter for trial and error. Somewhere near the correct setting of VC1 the adjustment of VC2 will cause the signal to disappear completely and the correct setting of these two capacitors is when the output moves smoothly up and down as VC2 is moved to and fro. The tuning wand is a great help at this stage to indicate which way a capacitor should be moved, for when the setting is just right, both brass and ferrite causes the same dip in the signal.

An off-air signal should be used for the final optimum setting of all three capacitors for optimum signal-to-noise ratio.

Alternative Method

The second method requires a diode probe, a valve or f.e.t. voltmeter, a g.d.o. and a source of r.f. Load the input and output with 75Ω resistors and dip the coils as previously described. Now connect the diode probe to the input and feed a signal to the output, adjust VC2 and VC1 so that no output is indicated by the probe, dip the coils again and repeat the procedure until input and output are isolated and both coils on frequency. Final adjustments are made off-air.

There is still a final adjustment that can be made to improve the signal-to-noise ratio and this is by adjustment of the coupling between L1 and L2. In the prototype, 1.5 turns seemed about right, but it is worthwhile varying the coupling of the coils to find the position giving maximum signal and minimum noise. **PW**

Components List

Resistors

R1	10kΩ	R3	1kΩ
R2	47kΩ	R4	470Ω

All resistors 10% 1/4W

Capacitors

C1	1nF	C3	1nF
C2	2.2pF	C4	1nF
VC1 and VC2		3-13pF variable ceramic capacitor	
VC3		4.5-20pF variable ceramic capacitor	
C1-C4		disc ceramics	

Semiconductor

Tr1 AF186

Possible replacements: AF139, AF239, AF181

Miscellaneous

L1, 1.5 turns enamelled 22s.w.g. wound in first three turns of L2, L2, 7 turns 22s.w.g. tapped at second turn. L3, 7 turns 22s.w.g. tapped at first turn. Aluminium box 115 x 64mm (4.5 x 2.5in), Eddystone 7134P. Single-sided copper-clad fibreglass board 44 x 25mm (1 3/4 x 1in). Four 5mm spacers, two coaxial sockets S1, SPST switch.

valve & vintage

This month Charles Miller shares the adventures he and his colleague enjoyed together when they carried out radio repairs for the trade. It seems it was often a smelly job!

Doing 'trade' work was a useful way of earning extra income from radio repairs without the trouble of having to collect and deliver the sets. This was because they were either delivered to my workshop by the client and payment was made when they were being picked up again, or otherwise I would use the client's own workshop and be paid by the hour. The latter method was particularly attractive because, as with most 'temporary' jobs, the rate was considerably better than for a permanent engineer.

One of my clients was a local garage owner who also advertised radio and television repairs but actually passed them all on to me. It was all pretty routine but the place was once the venue for a curious incident that tested my self-control to the limit.

One Dark Evening

The incident began, unbeknown to me, a week or so before, on a dark evening when I set out from home on a service call taking with me Albert, another of my acolytes. Albert was a rough diamond who had many trades to his name, including watch-mending, despite his short, pudgy fingers, which seemed unsuited to fine work.

We settled ourselves in the van and I had just driven out of the yard when all the hairs on the back of my neck stood up as something grabbed hold of my shoulder from behind. I slammed the brakes on and with a banshee like howl a cat started to leap around in the back of the van. I ran round and threw the door open, upon which the cat went out like a rocket and disappeared into the night. It was a stranger to our neighbourhood and all we could think was that it had been thrown out of a passing car and had taken sanctuary in my van.

A week on and we had all but forgotten this incident and were on our way to call at our garage client's premises to do some repair work. We walked into the front shop with Albert carrying the test meter, which lived in the van. Exchanging pleasantries with the client's wife, I prepared to check out a set with the meter. It was only then that I noticed a strange object lying on the dial. It was roughly tubular, about two inches long, three quarters of an inch in diameter and was pale grey in colour.

"I don't know what that is", I said to Albert, "but get rid of it, will you"?

He picked it up between finger and thumb and looked at it, then realisation dawned on us. Whilst that cat had been in the back of the van it had defecated on the test meter and this was the semi-congealed result!

I don't think I have ever seen such a look of total distaste on anyone's face as the expression Albert wore as he exited with the object still between finger and thumb. This broke me up completely and I nearly injured myself trying to carry on a sensible conversation with the client's wife whilst paralytic with suppressed laughter. I still ached hours later.

Russian Rigondas

One of the most profitable jobs, which came my way resulted from my dealings with a nationally-known radio wholesaler who for reasons best know to themselves had decided to import Rigonda radio sets from Russia. Ostensibly these were marvellous devices with numerous wavebands, motorised tuning, automatic frequency control (a.f.c.) and push-pull output plus a pair of very large loudspeakers, selling at only 39 guineas.

Unfortunately, for the wholesaler, it soon became apparent that the Rigonda's build quality did not match the advanced specification and before long customer returns started to build up in the firm's warehouse. One day when I had dropped in to buy various spares, the manager called me aside and asked me if I would consider coming in a few days a week to repair these rejects and also to check over every new set before it was sold to a customer.

I was offered a flat rate of £5 per set, provided that I completed each job within an hour. The firm must have been pretty desperate because this was at a time when even £3 an hour was well beyond most worker's reach, and I jumped at the opportunity.

Of course, no one could guarantee to repair every dud Rigonda within an hour. Fortunately though, the manager was prepared to take a liberal view of the time factor and if I went in for (say) six hours with the aim of doing six sets, it was quite acceptable to allocate ten minutes each to checking over three new ones and then to spend the remaining five and a half hours on mending three rejects.

I was assisted in the repairs by there being a stack of old sets that had been written off before I started at the firm and that could be plundered for spares. The worst job turned out to be getting the wave change and other switches to work properly because they very quickly went 'noisy' and intermittent.

The trouble was that the switches were made of a poor quality plastic, which melted if sprayed with the usual type of cleaning fluid. If some dealer had already tackled the problem and had been over-generous with the stuff I would be confronted with a sticky mess.

Sometimes it was quicker to fit an entire main p.c.b. board from a written-off set than to try to replace the switch alone. The other horrible job was restringing the drive cord, the designer of which seemingly had set out to outdo his opposite number in Philips for complexity. Nevertheless, this particular trade job was largely not too taxing and it was certainly extremely profitable.

Like most good things, the Rigonda repairs came to a sudden end when the firm's directors must have decided that the game was not worth the candle and gave up importing the sets. Fortunately however, by this time I had another string to my bow!

There was a radio and television firm with branches in two towns several miles distant which was owned by two partners. I had no idea that they

"....taking Albert another of my acolytes. Albert was a rough diamond who had many trades to his name including watch-mending, despite his short, pudgy fingers"!

knew I even existed until a letter arrived from one of them asking if I was interested in doing trade work.

When I first went to the head office to explore the possibilities I found that the service department was, for once, reasonably well equipped and actually had central heating! Apart from that, every available inch of the walls and ceiling was covered with lurid pin-up pictures carefully cut out from *Parade*, the number one titillation (careful there with that term, Mr Editor!) magazine of the day.

I had little more than a few moments to inspect these before I was whisked off to have a cup of tea in a sort of general purpose shed adjoining the service department. Therein was a Creda Corvette water heater above a dirty brown sink in which sat half a dozen once-white mugs now of approximately the same colour.

The waste pipe ran down to a ragged hole in the wooden floor and thence presumably to some soakaway, and the general impression given was that hygiene was not afforded high priority in this establishment. It was not until a toad appeared through the hole in the floor and cast his eye around before returning to its lair that I mentally shrugged and supposed that if the place was good enough for the toad it was good enough for me.

So, I accepted a mug of hell-brew and whilst sipping it took another look around the shed, when on a shelf near the door I spied an enormous bull horn, about two feet long and curly. The director observed my somewhat startled reaction and explained that this was the tea horn, and whoever made the tea summoned the rest of the staff by sounding a blast on it. This place obviously was a madhouse, so I decided it was wholly acceptable, and signed up enthusiastically to do a fortnightly Saturday's work for the firm.

My Saturday job was a curious working arrangement that came about because the resident service engineer didn't work normal shop hours, which would have given him the afternoon off on early closing day. By working on, he reckoned that he was due a complete day off every fortnight and he wanted to take it on Saturdays, hence the need for a locum.

I wasn't the first locum of course, and I doubt I was the last. The pay was generous and the work far from onerous; maybe a few service calls, maybe a few bench repairs and plenty of time to booby-trap the service department in time for the resident engineer's return on the following Monday!

All the bench sockets were switched off at a fuse box by the door when work was finished. This made it convenient for wiring a 25µF bias condenser across the mains immediately before locking up and returning home with that sense of satisfaction that comes with a job well done.

It's really surprising how much noise and choking fumes one little bias condenser can produce when 230V are applied across it. I didn't leave a trap every time, in order to lull the engineer into a sense of false security.

Occasionally, I introduced a time-delayed device such as a huge pre-Second World War American Philco with push-pull output, which I found abandoned on a shelf. After making sure it worked, I tuned it to 1,500 metres and set the volume control at maximum, after which I hid it under one of the benches behind a pile of old television sets. I reckoned it would allow my colleague about two minutes false peace of mind on the Monday before it started bellowing the place down!

Later on I was asked to go in for a few extra days now and again which gave me the opportunity to meet the resident engineer. I was initially a little apprehensive but fortunately he turned out to be a cheery soul with a mad sense of humour, which had made him appreciate the booby traps and he bore me no malice.

Jolly Japes

Inevitably the resident engineer and I began to co-operate in various jolly japes to be played on other workers in the establishment. Eventually we even contrived, quite by accident, to 'corpse' completely the managing director. Incidentally, I bet that there isn't a service engineer in the land who hasn't from time-to-time improved the shining hour by altering or adding to the wording of sales leaflets to introduce lewd or comic effects. And we were adept at this practice!

Now, this story took place at the time when colour TV was slowly beginning to take off and the only place in the establishment where a set could be demonstrated was in our workshop. One day the managing director ushered in a very posh couple (you had to be posh to be able to afford a set in those days) for them to inspect "the best one in the place". (As it was the only one, the choice was not difficult).

The set in question was a 26-inch Sobell and the couple seemed quite impressed. The MD asked me to pass him a leaflet on the set in order to be able to quote prices and I unthinkingly handed him one, which we had been doctoring. He opened it at the centre fold which featured a very attractive picture of a similarly posh couple seated on an expensive-looking settee watching one of the said Sobell sets with expressions of rapt pleasure on their faces.

The MD passed it to the prospective customers. Then his eyes bulged as he saw that the expression of the gentleman in the picture had been altered to one of acute pain. We'd also added a speech bubble coming from his mouth bearing the interesting statement, "My God! these new underpants are tight"! There is, as they say, no answer to that.... **PW**

VHF DXER

DAVID BUTLER G4ASR
YEW TREE COTTAGE
LOWER MAESCOED
HEREFORDSHIRE
HR2 0HP
TEL: (01873) 860679
E-MAIL: g4asr@btinternet.com

REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

I recently mentioned that the autumn period was generally regarded as the time when modes of propagation change on the v.h.f. bands. Although such changes did occur, I didn't think that propagation during October would actually come to a grinding halt!

With cyclonic weather over the UK for much of October it came as no surprise that tropospheric conditions would hit an all time low. It was only stations in the southern extremities of the UK that reported any form of tropo DX and that was for a very few days right at the beginning of October.

Tim Fern G4LOH (Cornwall IO70) reports that on 3 October the weather was windy with very heavy rain, hardly what you would normally expect to produce tropo DX contacts. On that day there was a Spanish v.h.f. contest and Tim thought that despite the weather it might just be possible to hear a few stations on the northern coast of Spain.

Nothing was heard during the first half-hour of the contest apart from the EA1VHF beacon that had been peaking up to 559 at times. However, at 0950UTC a very strong Spanish station was heard on the s.s.b. calling frequency that surprisingly turned out to be EA8BPX on the Canary Islands at 2600km!

A quick contest QSO was made with signal strengths of 59 being exchanged both ways. This was followed a few minutes later with another 2600km contact, this time with the station of EB8BTV (IL18).

Around midday a contact was made over a 2150km path to CT3/CT1DIZ (IM12) situated on the Portuguese Madeira Islands. These are excellent results and it's very likely that no-one else in the UK made similar contacts. That's because the station of G4LOH is located in the very best place to make the most of these sea-duct paths to the Canary Islands and the Madeira Islands. He is situated on a coastal site in south-west England at 150m a.s.l. with a view out to the Atlantic Ocean some 3km away.

● Fig.1 The v.h.f. antennas at the QTH of Sebastian Schumann DG5CS.

Since becoming active on the 144MHz band from his new QTH, Tim has heard or worked EA8 stations on 12 days during a 128-day period. That's nearly 10% of the time with openings around 2600km! Whilst this path is well known in the UK, the amount of time the path is open came as a complete surprise to Tim especially as he thinks he probably missed a number of openings.

From Tim's previous QTH in northern England he has heard DX stations via tropo ducts on numerous occasions deep into Europe, but they seem completely different in nature to the marine path ducting he now experiences. Tim has made a few observations. On several of the openings he appears to have been the only G-station to hear the EA8-stations, the sea ducts do not provide better signals at night and early morning as usually experienced and signals often fade dramatically when the path moves inland.

THIS MONTH DAVID G4ASR REPORTS THAT PROPAGATION HAS ALMOST HIT ROCK BOTTOM

On many occasions stations located a few kilometers inland often give signal reports 30 to 40dB lower than at G4LOH. It's probably to do with the height at which the sea-ducts form. Any land mass that disrupts a low-level duct would cause severe attenuation of the signal. The duct does sometimes extend inland though mostly when it forms reasonably high in the troposphere.

Tim's next target is Cape Verde Islands (D44) at over 4000km! He is also looking for North American stations interested in making regular schedules or at least when conditions look favourable.

SPORADIC-E

Sporadic-E propagation on the 50MHz band was virtually non-existent during October with only two brief openings being reported. However, this **was** expected as it is well past the end of the summer Sp-E season. The openings occurred on 5 October between 1800-1930UTC to Croatia (9A), Italy (I), Sardinia (IS0), Slovenia (S5), Yugoslavia (YU) and on October 25 between 1715-1815UTC to stations in northern Italy.

I've taken a look back at the recent 144MHz Sporadic-E season and come to the

conclusion that activity was considerably lower compared to the many spectacular DX openings that occurred in 2003. Does the absence of Sp-E openings result from a statistical variability or does it reflect the declining solar cycle or alternatively the signature of planetary waves in the generation of Sporadic-E? It seems to me that there are so many variables in the equation that it is impossible to predict when Sp-E openings (certainly at 144MHz) will occur. **Geoff Grayer G3NAQ** (Berkshire IO91) mentions that people have been asking that question ever since the mode was discovered. He explains that much is known about the mechanism which gives rise to Sp-E, but that it still holds some mysteries. It is due to very high concentrations of electrons in the E-layer, the higher the concentration the higher the maximum usable frequency (m.u.f.).

For a mass of electrons to collect in a small volume an equal number of positive ions must be present otherwise they repel each other. Normally the electrons would be attracted by the positive ions and combine to give neutral atoms and therefore produce no reflections. However, it has been shown that the positive ions present are heavy metallic ions that do not easily combine with electrons. The origin of these metallic ions is assumed to be the constant rain of micro-meteorites that hit the Earth.

So, the problem is how are the heavy ions concentrated into what appears to be thin layers or clouds of ionisation? The explanation seems to be the presence of wind shear (that is wind at different heights travelling at different speeds). The effect on these ions as they are blown along is to produce an up-down force due to the horizontal component of the magnetic field and the wind shear then forces them into a thin layer.

To really predict Sp-E you would need knowledge of the winds in the atmosphere at E-layer heights. This is not quite as impossible as you may think. A few vertical sounding arrays (vertical radars) can measure this by looking at the movement of reflections from patches of electrons. Another method is to track the movement of meteor trails in the seconds or fractions of a second before they disperse, measuring the Doppler shift from more than one location. However, both these methods only cover a very small area of the ionosphere and we need a very wide coverage to predict Sp-E propagation.

Geoff mentions that what has been done is to predict the **probability** of Sp-E at a certain time of day and a certain time of year. This of course varies from band-to-band. You can also extrapolate from Sp-E contacts on one band to find out if it extends to a higher band by using the empirical software developed by **Dave Edwards G7RAU** - **www.g7rau.demon.co.uk** However, even if Sp-E is noted on the f.m. broadcast band (88-108MHz), there is no guarantee that it will develop to reach as high as the 144MHz band.

Probably the best way of being aware that a Sp-E opening is about to occur on the 144MHz band is to listen on the s.s.b. calling frequency. Usually frequent and long meteor scatter bursts occur prior to the opening. Geoff believes this is due to the additional ionisation from the meteor trail added to the Sp-E ionisation already present. To summarise, Sp-E is a bit like the weather. You know that there will be more hot days during the summer and that it will usually be hottest around midday, but you can't tell exactly when.

We do have some success predicting the weather a few days in advance, but unlike weather on the ground, Radio Amateurs don't have many observations to work from. So, could we predict Sp-E? Sorry, probably never!

CQ AURORA

Scottish stations reported auroral propagation on 13 October between 1430-1600UTC on both the 50 and 144MHz bands, but the event was rather weak and didn't extend much further south than northern England. The lack of auroral backscatter openings during September and October was rather disappointing as the autumn normally produces a surplus of geomagnetic storms, almost twice the annual average.

In fact, both the spring and autumnal equinox periods are a good time for auroral openings whereas the winter and summer are generally poor. This is an interesting puzzle because auroras are triggered by solar activity and the Sun doesn't know what season it is on Earth! So how could one season yield more auroras than another?

To understand the answer you must first understand what causes auroras themselves. Auroras appear during geomagnetic storms, that is when Earth's magnetic field is vibrating in response to a solar wind gust. Such gusts pose no danger to people on the ground because our magnetic field forms a bubble around Earth called the magnetosphere which protects us.

The magnetosphere is filled with electrons and protons. When a solar wind gust hits the magnetosphere the impact knocks loose some of those trapped particles. They rain down on Earth's atmosphere causing the air to glow where they hit and producing wonderful auroral DX openings. Some solar wind gusts termed coronal mass ejections (c.m.e.) are caused by explosions near sunspots whereas others are caused by coronal holes in the Sun's atmosphere that spew solar wind streams into interplanetary space.

These gusts sweep past Earth all year round, which returns us to the original question: why do auroras appear more often during spring and autumn? The answer probably involves the Sun's magnetic field near Earth. The Sun is a huge magnet and all the planets in the solar system orbit within the Sun's cavernous magnetosphere. Earth's magnetosphere that spans about 50,000km from side-to-side is tiny compared to the Sun's.

The outer boundary of Earth's magnetosphere is called the magnetopause, which is where Earth's magnetic field bumps into the Sun's and fends off the solar wind. If the Sun's magnetic field tilts south near the magnetopause it can partially cancel Earth's magnetic field at the point of contact.

At such times the two fields from the Earth and Sun link up and you can then follow a magnetic field line from Earth directly into the solar wind. The north-south component of the Sun's nearby magnetic field is called 'Bz'. A negative (south-pointing) Bz will open a door through which energy from the solar wind can reach Earth's inner magnetosphere.

Similarly a positive (north-pointing) The Bz will close the door. You can see which way the interplanetary magnetic field Bz is pointing at any particular time by taking a look at **www.spaceweather.com**

In the early 1970s researchers recognised a connection between Bz and Earth's changing seasons and it's all a matter of geometry. Bz is the component of the Sun's magnetic field near Earth that is parallel to Earth's magnetic axis. As viewed from the Sun, Earth's tilted axis seems to wobble slowly back and forth with a one-year period. The wobbling motion is what makes Bz wax and wane in synchronisation with the seasons.

In fact, Bz is always fluttering back and forth between north and south as tangled knots of solar magnetic field drift by Earth. What researchers realised is that the average size of the flutter is greatest in spring and autumn. When Bz turns south during one of those two seasons it sets the door wide open for the solar wind and subsequent auroral back-scatter openings.

DEADLINES

It was a dreadful month for most v.h.f. DXers, but I'm sure that propagation (and activity) will pick up again very soon. When it does please let me know what DX you managed to hear and work on the v.h.f. and u.h.f. bands. Send your reports or any other news, preferably by E-mail, to reach me by the last weekend of the month. Happy Christmas!

73, David G4ASR

HF HIGHLIGHTS

CARL MASON GW0VSW
12 LLWYN-Y-BRYN
CRYMLYN PARC
SKEWEN
WEST GLAMORGAN
SA10 6DZ
Tel: (01792) 817321
E-MAIL: carl@gw0vsw.freeserve.co.uk

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

Is the solar minimum coming sooner than expected? Well solar physicist **David Hathaway** has been observing the sun every day for the last six years and there have always been sunspots. These strange and powerful phenomena are dark spots, some as large as 80450km (50,000 miles) in diameter, which move across the surface of the sun contracting and expanding as they go.

Solar minimum and solar maximum are the two extremes of an eleven year cycle and we are heading for the bottom of cycle 23 now. This has been the subject of many a QSO I have monitored lately on 7MHz. The **solar maximum** is usually when the sun is covered in spots and solar flares erupt out sending large clouds of electrified gas towards the earth. This is normally when we can expect to work DX all over the world with little effort as most bands are open throughout the day and night.

When **solar minimum** occurs there are fewer spots and the flares subside and we as Radio Amateurs suffer very poor band conditions and reduced propagation. Even with the smallest of solar activity you can find one or two spots, but when David looked on 28 January and 11/12th October this year there were none at all. The sun was completely blank! This is a sign says David, "that the solar minimum is coming and coming sooner than expected, which means the new maximum, going on mathematical calculation, could be as early as 2010".

The length of time between these events is usually considered to be eleven years, but this is not strictly correct. The shortest cycles are nine years and the longest ones are nearly fourteen. The problem is you never know how long a cycle is until it is over. Now this is a very complicated subject and one in which it would be impossible to cover here. So, if you would like to know some more and see the latest research try looking at Solar Cycle Update at **www.exploratorium.edu/sunspots/** and the huge site of the Science Directorate, Marshal Flight Centre, which can be found at **science.nasa.gov/ssl/pad/solar/sunspots.htm**

DX NEWS

The Island of Singapore AS-019 will be home for **Enno PF5X** for the next three years operating as **9V1CW**. Singapore is an equatorial country with high humidity and abundant rain and comprises of one main island of 604.2 sq km and a number of islets scattered off its north-east and south coasts. It should make a good base for Enno who plans to operate mainly c.w. as indicated by the suffix of his new call.

Enno plans to be active from 3.5-28MHz but will try to concentrate on 10 and 18MHz in particular. The equipment includes a Yeasu FT-1000MP and a broadband GPM-1500 vertical by WiMo. If the vertical does not work out satisfactorily, he will try to hang out a half-size G5RV. The QSL cards are already printed and are high quality glossy card with a design based upon the Singapore flag. These can be obtained via PA0KHS bureau or direct to: **H van Hensbergen, Smaragdstr 53, NL-6534 WN Nijmegen, Netherlands**.

Minami Torishima or **Marcus Island AS-031** is a very small isolated island in the northwestern Pacific Ocean. It is only 1sq km in size and it is the easternmost territory that belongs to Japan and some 1,900km South East of Tokyo. The island is first mentioned in 1864 and given a geographical position by the US survey ship *Tuscarora* in 1874.

The island was first visited by Kiozaemon Saito in 1879, but it was not until 19 July 1898 that Japan officially claimed the island. During the Second World War there were over 4,000 Japanese soldiers stationed there and the US Navy attacked it in 1943, but an attempt to capture it was never made. It is presently used for weather observation and has a radio station, but very little else.

Because of its isolation it is of some interest to DXers and Itokazu is now active there as **JR6TYH/JD1** until the 20 December and has been heard on 21260kHz between 0600-0900 and again at 2200-0000UTC using a triband Yagi for 14/21 and 28MHz and you can QSL via the JARL Bureau. Check out **http://www.fact-index.com/m/mi/minami_torishima.html** for further information on the island.

CLUB STATION - HZ1AB

For almost six decades the **HZ1AB** club station in Saudi Arabia has been very active on the h.f. bands and was originally known as the **United States Military Training Mission** station. This changed recently to the **Dhahran Amateur Radio Club** and has unfortunately had to shut down because of the new station Licence requirements in Saudi Arabia. The radio club's call has now been reissued to a Saudi national according to DARC Secretary **Thomas Carlsson SM0CXU/AB5CQ.** The QSL Manager **Leo Fry K8PYD** still has all the HZ1AB logbooks and will handle any of your QSL requests.

CHARLIE SIERRA SEVEN TANGO

A new IOTA DVD is now available covering the recent **CS7T** operation to the Estelas Islands, which lie approximately 76.5km (47.6 miles) North West of Lisbon, Portugal. The press release states that this is a professionally produced DVD and an excellent piece of Amateur Radio history directed by **Jose Alberto EA1OS** and includes spectacular footage of these most beautiful Islands. For more details you can take a look at **http://web.newsguy.com/ea12537/Intro_Videos.htm**

The operators are not looking for any sponsorship, so the DVD costs only 10 Euros, which includes postage. For all enquires contact EA1OS at: **cs7t@wanadoo.es** or **Jose Alberto Suarez Rodriguez, C/ Praga 23 - Urb. Valaire, E15008 - A Corunna, Spain.**

CARL GW0VSW HAS NEWS OF SOLAR MINIMUM AND SOLAR MAXIMUM SUNSPOTS THIS MONTH

YOUR REPORTS

On to your reports and first off once again is **Ted Trowell G2FRY** on the Isle of Sheppey in Kent who braved the noise on Top Band to work HB0/ON6UQ (Liechtenstein) at 2100 and then changed to 3.5MHz to work TK/DL4FF and TK5EF (Corsica) EU-014 at 2110 followed by OH0AL (Aland Island) EU-002 at 2130UTC. Moving up to 7MHz Ted worked OY3QN (Faroe Islands) EU-018 and SU8BHI (Eygpt) around 2000UTC using a Ten-Tec Omni V at 70W to a Butternut HF-6 vertical or G5RV antenna.

THE 14MHz BAND

On to the 14MHz band now and the log of **William Clayton 2E1WHC** in Liverpool who has been using his new Yaesu FT-1000MP

and Cushcraft MA5B antenna to work 9K2HN (Kuwait), HS0ZEE (Thailand), JH4UYB (Japan), SP3EWP (Poland), 9A5AVC (Croatia) and OK1APB (Czech Republic) between 1800 and 2205UTC and his log goes to show how varied the propagation has been.

In Scotland **Jim Pedley GM7TUD** who lives in Dumfries found the bands had "Taken a nice lift for a few days and had some very strong DX signals on them". Contacts using s.s.b. include YI1HXH (Iraq) 1630, VP5/AH6HY (Turks & Caicos) 2100, S92BWW (Sao Tome & Principe) AF-023 at 2204 and FR/PA3GIO (Reunion Island) AF-016 at 2215UTC. Jim lists just one c.w. contact with VE7IG/VE1 (Canada) on NA-010 at 1134UTC.

Kevin Haworth M0TNX/2E0XTC lives in Knott-End-on-Sea, Lancashire and has not had too much time for operating this month as he is setting up a new antenna business. This did not stop him firing up his Yaesu FT-107 and Cushcraft D4 dipole one Saturday afternoon to reach W4RRE (USA) in Cumberland, Tennessee and several stations in Kuwait including 9K2SR bringing his DX total to 89 countries is just a few months on the h.f. bands!

THE 18 & 21MHz BANDS

Despite having plenty of room for antennas **Phil Williams G3YPQ** in Whitstone, near Bude, Cornwall does most of his operating mobile on 18MHz. Phil says "I find this band a very nice place to be and with my Icom IC-706 and Pro-Am antenna most stations above, say S4, can be worked with ease. One thing I have noticed here in particular is that you can normally hear the DX and the G-Station they are working.

For example, on 14MHz from North Cornwall I would not expect to hear the UK end of a Transatlantic QSO at all but on this band it is rare if you can't hear them whether they are in Scotland or East Anglia. It seems to be a v.h.f. type back-scatter effect, which appears to work better on 18MHz than any of the other h.f. bands".

In Chelmsford, Essex **Rob Hastings M3AHH** worked the 18MHz band one afternoon and found s.s.b. stations 9H3BW (Malta) EU-023 at 1346 followed by contact with Bob AP2JZB (India) in Karachi at 1520UTC. A change to 21MHz found TA1D (Turkey) at 1314, 7X4AN (Algeria) 1658 and 3V8SF (Tunisia) at 1715UTC.

Also on this band was keen mobile operator **Mark Taylor G0LGJ** in Dereham who used his Yaesu FT-100 at 100W and Outbacker antenna to have voice contacts with JF1EHM (Japan) 1231, JW9DL (Svalbard) EU-026 at 1345 and AC6AA (USA) in Prescott, Arizona at 1605UTC.

In Gauldry, Fife **Colin Topping GM6HGW** used his Icom IC-706 MkII and new LDG auto tuner to work members of the RNARS on a Sunday net. Not many Europeans were heard, but 10W s.s.b. contacts were made with 9H1ZY (Malta) and W1USN (USA) in Boston, Massachusetts with reports of 5/7 from both stations.

In Nuneaton **Chris Colclough G1VDP** used a Yaesu FT-897 and Cushcraft MA5B beam to log 7Q7RB (Malawi) 0812, UA9ZZ (Asiatic Russia) 0850, VE3XD (Canada) 1519, 3B9FR (Rodriguez Island) AF-017 at 1547, HS0/IK4MRH (Thailand) 1705 and 4S7BRG (Sri Lanka) AS-003 at 1804UTC.

THE 24 & 28MHz BANDS

With a change to 24MHz Chris found 'conditions poor' but still found ZP4KFX (Paraguay) at 1445 showing you should listen carefully at all times!

Meanwhile, Jim GM7TUD found this band wide open one afternoon logging HF0QF (Antarctica) AN-010 at 1351, ZY0K (Brazil) on Fernando de Noronha SA-003, CP6XE (Bolivia) 1426, TJ3SP (Cameroon) 1439, VQ9LA (Chagos Islands) AF-006 at 1455, 9L/M0FDH (Sierra Leone) at 1605UTC.

Moving onto 28MHz, Jim worked 9J2KC (Zambia) on RTTY followed by voice contacts with V51AS (Namibia) 1249, CT3IQ (Madeira Island) AF-014 1320, TJ3SP (Cameroon) 1405, CE3CDV (Chile) 1504 and finally EM1HO (Antarctica) AN-016 at 1647UTC.

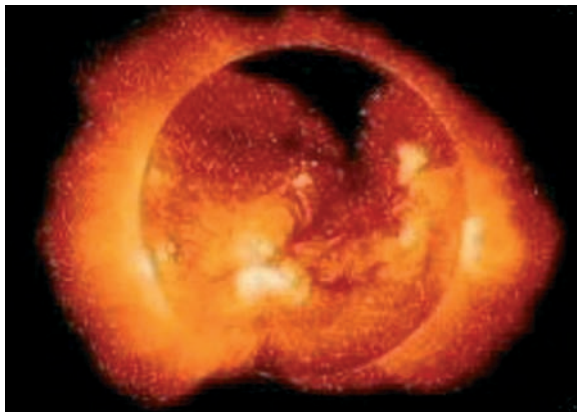
SIGNING OFF

Well, that's about it for this month and indeed this year. It's good to see the h.f. bands opening up a little this month with mid to late-afternoon being the best time to catch the DX! My thanks to all those who have supported the column and for all your letters, E-mails and telephone calls.

This is your column, so don't be shy, send in a report and let us all know what you are up to on the h.f. bands. As usual my thanks go to all our reporters for their logs and to **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* for all the DX information. Until next time have a good DX filled month and may I wish you all a very Happy Christmas. *73, Carl GW0VSW*

● HZ1AB 50th Anniversary QSL card.

● The Minami Torishima-Marcus Japanese Island.



● Sunspots (see text).

● William Clayton 2E1WHC's antenna.

DATA BURST

ROBIN TREBILCOCK GW3ZCF
15 BROADMEAD CRESCENT
BISHOPSTON
SWANSEA
SA3 3BA
TEL: (01792) 234836
E-MAIL: robin2@clara.co.uk

ROBIN GW3ZCF HAS NEWS OF A NEW AMATEUR RADIO SATELLITE, AN INTRODUCTION TO SSTV AND A COUPLE OF PROGRAMS FOR YOU TO TRY.

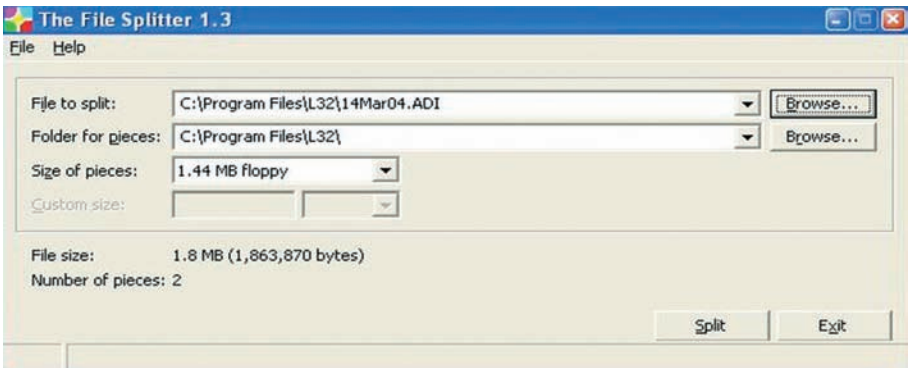
In my last Data Burst column (October 2004) I wrote about Amateur Radio satellites, many of which are now coming to the end of their lifetimes. The good news is that a new satellite, known as *Echo (AO51)* was successfully launched this summer from the Russian Cosmodrome at Baikonur. At the time of writing (late September 2004) the satellite is still in the test phase, but is currently operating in analogue f.m. mode with an uplink frequency of 145.920MHz (with a 67Hz access tone) and a downlink frequency of 435.300MHz. These are regularly changing, so if you want to listen you should find the latest position from the AMSAT website **http://www.amsat.org**

In October I also included a screen shot from the satellite tracking program incorporated in *Logger32*. I have recently updated the Keplerian elements in my version of *Logger32* from the Internet and satellite *AO51* is now included in the predictions. It seems to place a large footprint on the earth's surface and, when positioned above the mid-Atlantic, large swathes of Europe and North America are covered simultaneously, so there should be good opportunities for long distance communications.

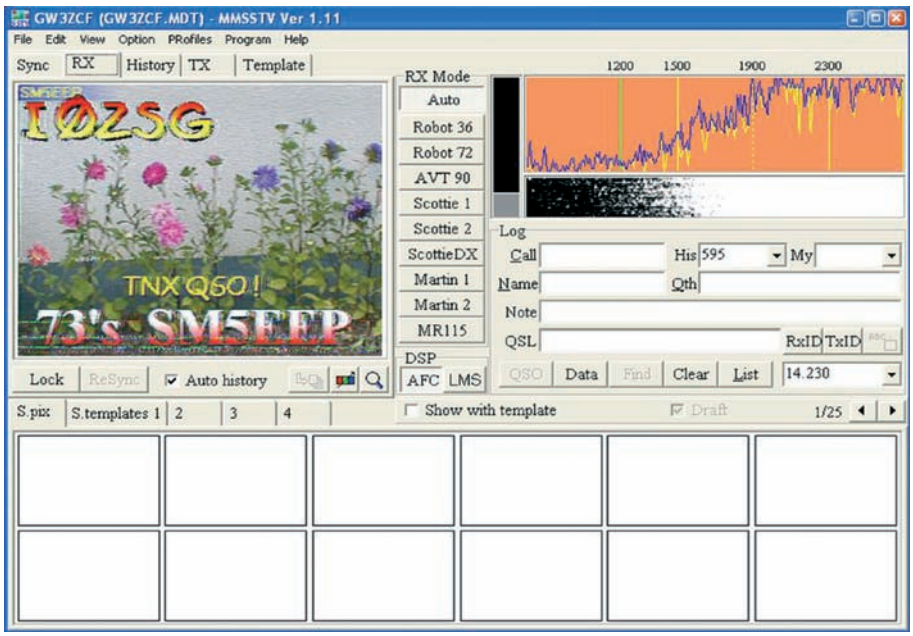
One of the new features of *Echo* is that it offers an experimental 28MHz uplink, which can be used for PSK31. I am baffled as to how this will work. Those of you who have used PSK31 will know how critical the tuning is – stations that drift as little as 1Hz off-frequency become completely unreadable. But as satellites move at extremely high velocity towards and away from the fixed receiving station, very large Doppler frequency shifts occur, amounting to several kHz at 28MHz.

Obviously to use PSK31 through a satellite it will be necessary to have software which can compensate for this frequency shift. I have not seen any available at the present time, but if I do you will be the first to hear about it!

● Fig.1



● Fig.2



FILE SPLITTER

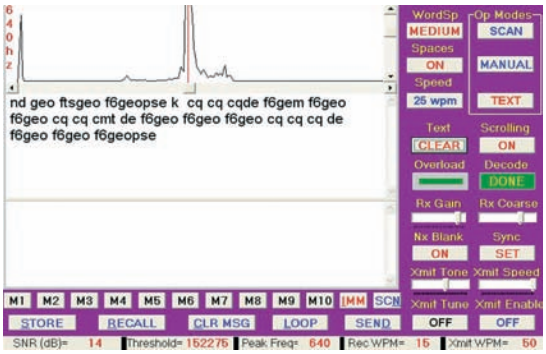
It's always a good idea to make regular back-ups of your critical documents – for example, your Amateur Radio logs. Perhaps I have been spending too long on the radio, as some of my log files are now too large to fit onto a standard floppy disc!

However, I came across a useful free program the other day, which will split programs into segments of any size you choose. **Fig. 1** (left) shows it set up to split a log file of 1.8MB into two floppy disc sized segments. The simple Help File explains how to recombine these to recreate the original file if needed. This is another of those useful programs, which only do one thing, but do it well! You can download it free from **http://www.dekabyte.com/filesplitter**

SLOW SCAN TELEVISION

In all the time I have been writing for Data Burst I have not touched on the topic of Slow Scan Television (SSTV) until now. The SSTV mode is a means of transmitting still pictures by normal h.f. – they have to be still pictures because the bandwidth required for moving TV pictures requires the use of v.h.f. or u.h.f. bands.

● Fig.3



With SSTV, first you create a file for each picture you want to transmit and then the software scans the picture line by line and sends the information over the h.f. bands, taking several minutes to transmit a fairly detailed colour picture. A receiving station possessing suitable software can regenerate the image at this end and see the picture slowly being created.

The process looks very similar to the original flying spot scanner used by John Logie Baird before the Second World War, but instead of the crude opto-mechanical set-up that he used the task is performed by sophisticated computer software. Nevertheless, the slow build up of the picture requires a certain amount of patience. To me it is about as exciting as watching paint dry, but there are many who are totally hooked on the process, and it is in the hope that you may become one of these that I write this piece!

To operate SSTV you need a computer with a soundcard interface to your transceiver. The connection is exactly the same as for PSK31 and all the other digital modes I have written about many times before, so I will not repeat it here.

In order to transmit an SSTV picture, the image stored in your computer is scanned line by line and the light value at any point is converted to audio tones. There is a pulse transmitted at the beginning of each scanned line, to tell the receiving computer to move down a line and move the 'spot'from right to left. These audio tones, which represent the image, then pass to your transmitter via the soundcard and interface unit and modulate the u.s.b. signal, which you are sending out. Receiving a SSTV picture is simply the reverse of this.

First you tune your s.s.b. receiver onto an SSTV signal – you can usually hear these around 14.230kHz on the 20m band. The signal passes through your interface and soundcard and is processed by the software, which you must load into your computer.

The program shows the signal on a spectrum display of your audio passband, and you must line up the pulses, which start each line with a vertical line at the left (low frequency) side of the display. The main audio part of the signal is centred between two further vertical lines on the display by adjusting the tuning dial of your receiver.

Tuning is nowhere near as critical as for PSK31 and you can be 100Hz off frequency without any noticeable degradation of picture quality.

There is no universally accepted standard for the coding/decoding algorithm for converting a visual image into a set of audio tones. Most software enables you to select from a range of standards. These appear to have rather improbable names, but most DX stations seem to use Scottie 1 or 2, whilst European stations seem to favour Martin 1 or 2 (don't ask me where these names came from – I haven't a clue!).

It goes without saying, that it's essential that transmitting and receiving stations are using the same system. If you hear a SSTV station, tune it in the way I have described and then click in turn on each of the standards supported by your software until a picture starts to appear. Start with Martin 1, that will be correct for most strong SSTV signals you are likely to hear at this stage of the sunspot cycle.

So far I have said nothing about the software required to perform the complex task of converting a picture to an audio signal. There are many programs available, some free and others sold on a commercial basis. The one I would recommend you to start with is *MMSSTV*, a free program by **Makoto Mori JE3HHT**, which is simple to use and produces very good images. You can download it from Mako's website **http://mmhamsoft.ham-radio.ch/mmsstv/**

The description of how to use the software in the accompanying Help File is very basic, but most of the controls are intuitive and, at least when receiving, you can't do any harm by clicking on each of the buttons to see what happens. However, **Andrew VE8AE** has written a comprehensive Help File, which can be viewed on-line at **http://ca.geocities.com/antennas/**

I've shown in **Fig. 2** a picture I took on 14MHz using *MMSSTV* and is typical of the quality you can expect from a S7 signal. The horizontal noise lines near the bottom of the picture were due to QRM from a nearby s.s.b. station.

When sending, you can type text over your cached pictures before sending them, and thus have a rudimentary QSO with the other station. Most people send pictures of themselves, family, QTH, rig and so on, but there are sometimes 'girlie' pictures which can verge on soft porn. Just be prepared to switch off if you don't like what you see.

Finally, there is a very good introductory site by W0LMD called The SSTV Handbook, which gives a lot of basic information and history about the mode. Some of the later sections of the handbook seem to be 'work in progress', but there is still a lot of valuable reading matter on this site, see **http://www.ultimatecharger.com/SSTV.html** Give it a try and let me know how you get on.

MORSE DECODING PROGRAM

I have described several software Morse decoding programs in the past, and although they all work pretty well at deciphering perfect machine generated Morse, they make errors when confronted with less than perfect sending with, for example, exaggerated or inconsistent dot to dash ratios. I was therefore very interested to discover a free program called *CW Decoder XP*, which claims to learn the characteristics of an individual operator's 'fist' and after a short while make adjustments to enable it to produce a better proportion of correct text from flawed sending. It is by **Grant WD6CNF** and can be downloaded from his website **http://www.hotamateurprograms.com**.

Of course, no decoding software is perfect and there is as yet nothing to compete with the human brain for pulling a signal out of the noise or correcting for a minor sending error by putting the mis-sent character into context from the rest of the sentence. But *CW Decoder XP* makes a pretty good shot at decoding as demonstrated in **Fig. 3**. The station making the CQ call was not very strong, and from time-to-time almost disappeared into the noise, but very few characters were missed.

One feature I liked was the ability to select whether the sender was using short, medium or long gaps between words. Even so, I found that words were often run together without a gap on the screen, so there is still a certain amount of interpretation needed to make sense of what is being printed.

Other user adjustable features of *CW Decoder XP* include a threshold setting to help you cope with noisy band conditions and not print garbage during gaps between characters, and control of the aggressiveness of the a.f.c. function which keeps you locked on to a given station. Useful when there is another QSO very close to your frequency.

Although I haven't used the feature, *CW Decoder XP* can also send Morse. You need the same soundcard/interface set-up as for the other digital modes (yes, Morse **is** a digital mode, probably the first!) and it generates audio tones for the dots and dashes, which will modulate your s.s.b. signal. You can select your own sending speed or, a very neat touch, click a button to make it send at the same speed as the text you are receiving.

This is as good a piece of decoding software as I have seen, and well worth downloading. Some of its features are a step ahead of its competitors, and I hope it will give you some fun.

Well that's all for this time, so please keep your letters or E-mails coming, so that I know the sort of things you would like to read about next time.

73. Robin GW3ZCF

TUNE-IN

JACK WEBER
C/O PW EDITORIAL OFFICES
ARROWSMITH COURT
BROADSTONE
DORSET
BH18 8PW
E-MAIL: tunein@pwpublishing.ltd.uk

Jack Weber - A Potted History

Jack first became interested in radio when he was ten, back in the 1960s using an army surplus PCR receiver and then a National HRO. Although his interest lapsed a little he continued to listen to international broadcasters especially when travelling. Jack worked for 30 years in broadcasting - initially in the BBC World Service then moving over to TV - mostly as a programme producer, before taking early retirement a couple of years ago.

About ten years ago Jack started collecting vintage valve radios, both domestic sets and communications receivers, which has revived a more general interest in radio and he now uses a WiNRADiO G313i software defined receiver and an AOR AR7030+ as well as some of the vintage receivers.

THE *PW* TEAM WELCOME JACK WEBER AS HE PRESENTS HIS FIRST COLUMN, UPDATING US ON THE LATEST EVENTS ON THE BROADCAST BANDS

Welcome back to Tune-In. This column, which was run so ably by the late **Tom Walters**, is all about what you can hear on the h.f. broadcast bands and about international broadcasting in general. I hope that you'll enjoy reading Tune-In again and that it will encourage you to explore the wealth of programmes that's available from around the world.

It's a year since Tom wrote his last column and a lot has happened in that time, so I thought I'd begin by catching up on some of 2004's main events. Inevitably there have been cut-backs and closures, with more planned for the coming months, but there are also new stations to listen out for and welcome signs of expansion in some long-established ones.

Among the high points was the announcement last summer that **Radio New Zealand International** (RNZI) was to get extra operating funds, as well as money for a new digital transmitter. This will be used primarily as a feeder service for re-broadcasters in the Pacific. Many of these remote Island Nations have cultural and economic links to New Zealand so serving them is one of RNZI's main aims.

New Zealand no longer has any transmissions directed specifically at Europe, but some of their daily Pacific programmes are scheduled so as to be accessible here in addition to their primary target area. During our winter these are at 0400-0759UTC on 15.340MHz and at 1851-2050 on 15.265MHz. Picking up RNZI is generally not difficult, though reception can vary from day-to-day.

There's good news too for **Radio Slovakia International**. They were due to shut down all their foreign broadcasts in spring 2004, but received a last minute reprieve from the Slovak Government and are still flourishing. Deservedly so - for a small station with limited resources, they make an effort to produce varied programmes that don't simply sound like government press releases. Their English service is on the air to Europe at 1730-1800UTC on 5.915 and 6.055MHz and at 1930-2000 on 5.915 and 7.345MHz

COUNTRY CHASING

If you're interested in chasing countries, you'll welcome the return of two that have long been absent from the h.f. bands. Denmark ceased direct short wave transmissions over a decade ago, after which **Radio Denmark** could only be heard via Norwegian transmitters until the whole operation closed down in 2003. Now, World Music Radio has started up s.w. transmissions from Karup, Denmark and can be heard testing on 5.85MHz playing international pop. The days and times have varied, but weekends are usually worth trying and increasingly they are on during the week as well. By the time you read this they may be transmitting full time.

Another country that's reportedly back on s.w. after many years absence is Kiribati (pronounced Kiribas) in the Pacific. Their frequency is 9.825MHz, but with a listed power of just 1kW it would be an extremely difficult catch in Europe. A welcome return all the same.

An announcement in October indicated that **Radio For Peace International** (RFPI) may also return to short wave next year. Based in Costa Rica, RFPI went off the air in November 2003 when it was shut down by officials of the University for Peace, on whose land the station was located. Since then, they've only been available on the Internet. Now, Pacifica Radio in the USA has agreed a grant to help get the station back on air from a new site, possibly in the US.

On a less positive note, several long established international broadcasters are cutting back on short wave or even closing down altogether. October saw the final closure of Swiss Radio International. In its heyday this was one of the best-loved international broadcasters, but had been sadly reduced in recent times. Their English programmes ended in April and their final short wave transmission was on 30 October.

Another station that abandoned short wave in October was German domestic broadcaster **SWR** (Sudwestrundfunk). For many years they had relayed two of their networks on 6.030 and 7.265MHz. Being targeted to Germany itself, I suspect that they had few listeners who couldn't hear them more easily on m.w., v.h.f. or the Internet so it's not really a surprising closure.

At one time there were quite a few German domestic stations on short wave. The only ones left now are **Deutschlandradio Berlin** on 6.005MHz, **Bayerischer Rundfunk** on 6.085MHz and **Deutschlandfunk** on 6.190MHz. All are still transmitting, but who knows for how much longer?

One station that won't be around for very long is the foreign language service of Belgium's Flemish broadcaster, **Radio Vlaanderen Internationaal**. They announced in late October that from 28 March 2005 they will cut back to just a few transmissions in Dutch aimed at Flemings abroad. The English, French and German services will disappear. Their winter schedule shows English to Europe at 0800-0825UTC on 5.965 & 1.512MHz, 1830-1855 on 5.910, 7.490 & 15.12MHz and 2030-2055 on 7.490 and 15.12MHz. Catch them while you can!

NEW STATIONS

While some big broadcasters are shutting down, other smaller stations are starting up. One frequency that's been quite active with new stations is 9.290MHz. The 100kW transmitter at Ulbroka in Latvia has been used intermittently by various small broadcasters such as Euronet Radio, Radio Joystick, Kiss Radio, European Music Radio and others, all playing various flavours of pop to western Europe. The schedules aren't regular and most are only on for an hour or so, but try this frequency at weekends and you may hear one or other of these. It's the only way to pick-up broadcasts from Latvia now since the state broadcaster, Radio Latvia, abandoned short wave in 1999.

That's all for this time, Tune In will be back next month. In the meantime, please get in touch if you have any questions about broadcast listening, suggestions for what you'd like me to cover here or any tips that you'd like to share. Good listening!

Jack

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HF+6m 100w ATU. 32 Bit DSP.

AH-4 100W ATU £359.95
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SP-20 Ext Spkr £164.99
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CT-17 CI-V Conv £99.95
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Inc. SP-21 & SM20

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HF 6m 2m 70cm 100W DSP Mobile.

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MB-62 Bracket M £17.99
MB-63 Bracket F £9.99
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OPC-581 Sep Cab .. £32.99
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2 YEAR WARRANTY **£749.00**

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HF+6m Portable. 10W. DSP. ATU.

BP-228 Batt Pack £71.76
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MB-63 Bracket F £9.99
MB-72 Handle £9.95
OPC-581 Sep Cab .. £32.99
LC-156 Carry case .. £62.06

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HF 100W TX. Dual VFO. Auto Notch.

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Watson Antennas

Watson W2000

Bands 6m/2m/70cm
Gain 2.15/6.2/8.4dB
Power 200W (50W 6m)
Type 1/2, 2x5/8, 4x5/8
Length 2.5m

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WBV-70 4m 1/2 Wave Base	£39.95

Bencher Antennas

Butternut HF-6V

Bands: 80/40/30/20/15/10
Height (Adj): 26 ft (7.9 m)
Weight: 12 lbs (5.4 kg)
Impedance: Nom 50 ohms
VSWR: 1.5:1 or less

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Butternut HF-2V 40/80m	£229.95
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5 Bands - 80-10m
Height 7.64m - Weight 7.7kg
SWR 1.15:1 - Power 1kW

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X510 Base 2/70	£124.95
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A4S - 20/15/10 Yagi	£569.95
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SG-7900 2&70 Mobile	£31.95
CR-627 6&2&70 Mobile	£33.95
X-200 2&70 Base	£58.95
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X-510 2&70 Base	£98.95
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1KW Auto ATU - 1.8-54MHz - 1-8 secs Tune - Approx SWR Rating of 10:1

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LDG Z-100

100w Auto ATU - 1.8-54MHz - 0.5 - 6 secs

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100w Auto ATU - Covers 1.8-54MHz
1-5 secs Tune - Cross needle meters

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100w Auto ATU - 1.8-54MHz
1-5 seconds Tune - 2 Pos Ant switch

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1:1 or 4:1 Balun - Covers 1.8 - 30Mhz
Power rating 200w

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LDG AT-897

100w Auto ATU for FT-897 - 1.8-54MHz

£199.95

Accessories:

K-OTT Kenwood Interface	£49.95
Y-OTT Yaesu Interface	£54.95
Icom-IC1 Icom Interface	£29.95
Alinco-IC1 Alinco Interface	£29.95
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W4RT Electronics

One-Plug-Power

One-Plug Power is the internal FT-817 battery solution you have been waiting for until now.

OPP-817
£54.95
NEW! 2300 mAh Large Capacity FT-817 Internal Battery Soluion. Still use Internal 817 Charger

OPP-897
£99.95
One Plug Power for the FT-897 4500 mAh; Fully Compatible with the FT-897 and Yaesu Charger.

NEW!

One-Plug Power is the internal FT-817 battery solution you have been waiting for until now. One-Plug Power comprises a 1800 mAh NiMH battery pack, both over-termperature and over-current protection, connection to the FT-817 Molex connector, and a modified Yaesu battery cover door featuring a power jack that allows connection of a battery charger such as the Maha MH-C777 or MH-C888.

One-Big Punch

One BIG Punch (OBP) is a custom add-on accessory for the Yaesu MH-31 microphone commonly used with many Yaesu amateur radios

OBP
£49.95
Speech Compressor for the Yaesu MH-31 mic and FT817, FT857, FT897. Improve the TALK POWER.

Hand Mike
£57.95
W4RT Electronics Microphone with One BIG Punch Speech Compressor included.

The One BIG Punch is an AF-based speech compressor specifically configured to provide remarkable increase in talk power while maintaining good audio quality. The OBP is NOT a clipper, but a compressor providing great voice compression, high-level limiting, and noise gating. The unit can be mounted inside the MH-31, requires no additional electrical power, and can be turned on or off by using the MH-31's TONE switch.

One-Board-Filter

The One-Board Filter (OBF) affords you the opportunity to have both the Collins CW and SSB mechanical filters available in your FT-817 together!

OBF
£229.95
Replace two filters in the space of one. OBF includes the two optional filters and fitting.

Collins Mechanical Filters
for the Yaesu FT-817, 857 & 897.

500 Hz CW - £94.95 ***2.3kHz SSB - £94.95***

This is the option that many, many FT-817 owners have requested. The OBF utilizes Collins Mechanical Filters that are the same as used in the optional Yaesu filters for the FT-817. The bandwidth of the 7-pole CW filter is 500 Hz and the 10-pole SSB filter is 2.3 kHz. The One-Board Filter is NOT available for installation by FT-817 owners. This is not a "do-it-yourself" option. The One-Board Filter must be installed by RADIOWORLD, or a competent engineer . If in doubt please call for details.

One-Touch-Tune

At the touch of a button, you have the carrier needed for tuning. One-Touch Tune (OTT) is totally transparent to the FT-817 and to any external equipment that you have attached to the rig.

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£54.95
It requires no external power and works with both manual and automatic tuners.

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Simply snaps into position. Adjust for desired height. Complete with non slip feet and allen wrench.

Professional-Grade FT-817 Stand

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For arm chiar or DX audio tailored to *your* own specifications.

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ATX Walkabout

ATX Walk--about PL-259

£47.95

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ATX Walkabout PL259	£47.95
ATX Walkabout Universal	£54.95

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RX - 0.6 to 460 Mhz
TX - 40,30,20,17,15,12, 10, 6, 2m & 70cm

Power Limits 25W PEP 10W Cont.

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* The Miracle Whip will transmit on almost any frequency you are licensed to use including WARC, MARS/CAP, Alaska Emergency, Citizens Band, Marine, and most commercial HF SSB and VHF/UHF channels

** The Miracle Whip is optimized for for best receive rather than lowest swr on 80 and 160, as no short antenna will present good transmitting opportunities at these frequencies

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Siro MAG 145 PL	£22.95
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Tokyo HL-50B HF / 50MHz Power Amplifier

£269.95

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Power: 13.8V 10A max

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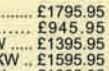

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YAESU

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G-550C Rotator	£309.00
G-650C Rotator	£499.00
G-1000DXC Rotator	£599.00
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Military Spec High grade
50 Ohm coaxial Cable
£69.95 A 100m Drum

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8 core	£1.09 per Metre

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10A DC Cable	£0.75 per Metre
20A DC Cable	£1.00 per Metre
25A DC Cable	£1.10 per Metre

Second Hand List

Second Hand Antennas

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Cushcraft MA5B 10-20m	£250.00
Cushcraft R-6000 Vertical	£200.00
Cushcraft A3S 10/15/20 3ele	£299.00
Butternut HF6V Vertical	£175.00

PLUS MUCH MORE... CALL FOR DETAILS

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Kenwood YK88CN	£40.00
Kenwood YK88SN	£40.00
Yaesu XF114SN	£60.00
Yaesu XF112C	£40.00
Icom FL-53	£100.00
Icom FL-101	£40.00
Kenwood DRU-3	£70.00

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Adonis AM-805G Desk Microphone, £70.00
AEA PK-232 MBX TNC £125.00
AEA PK-900 TNC £200.00
AEA PK-96 TNC £90.00
AKD 6001 6m FM Transceiver £135.00
Alan HQ-2000 2kW 26 - 30MHz SWR / Watt Meter £25.00
Alinco DJ-G5EY Dual Band Handheld £199.00
Alinco DJ-X2000 Scanner 0.1kHz-2.1GHz £299.00
Alinco DJ-X10 Wide Band Receiver £200.00
Alinco DR-150 2m Transceiver with Air-and Receive £150.00
Alinco DR-605 2m/70cms £175.00
Alinco DR-M10 10 Metre Transceiver £99.00
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Alinco DX-70TH HF & 6m Transceiver (100W Output) £475.00
Alinco DX-77 HF Base £399.00
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AOR AR-3030 HF Receiver, Including PSU £350.00
AOR AR5000+A AR5000+A £1,599.00
AOR AR-7030 Top Receiver £550.00
AOR AR-8200 MkIII AR-8200 MkIII Receiver £299.00
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AOR SDU-5000 Spectrum Display Unit £399.00
AOR SDU-5500 Scope £450.00
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Bearcat UBC-780XLT RX Trunktrack £220.00
BHI BHI Noise Eliminating Module £89.00
Bnos 20AMP PSU 20A PSU £89.00
Bnos 432-25-100M 70cms 100W £199.00
Bnos CLP430/25/100 70cms 100w Amp £199.00
Bnos LP50-3-50 6M Amp Solid State £89.00
Bnos LPM144/10/100 2m 100w Amp £119.00
Comet CD-270D SWR Power Meter £49.00
Commtel Comm-225 Receiver £150.00
Daiwa CN-103L 2/70cms Cross needle Meter £40.00
Daiwa CN-801H 1.8-200 MHz SWR+PWR Meter £80.00
Daiwa CS-201 2 way Switch £10.00
Daiwa PS120 10A PSU £40.00
Daiwa PS-30 XM II 30A PSU £99.00
Datong ASP Auto Speech proc 817 etc £70.00
Datong FL2 Multimode Filter £69.00
Diamond SX-100 SWR & Power Meter - 1.6 - 60MHz £65.00
Diamond SX200 SX200 £69.00
DL-600 DL-600 Dummy Load £60.00
Drake Base Mic Mase Mic £50.00
Drake R8 Receiver £450.00
Drake R8A Receiver+Converter £499.00
Fairhaven RD-500 Communications Receiver £500.00
Fairhaven RD-500VX Communications Rx £550.00
FDK Multi-750 2m Multimode Transceiver £129.00
Fujion F-2000A Radio Direct Finder £99.00
Grundig SAT800 Base Station HF RX - Air Band £350.00
Hal DXP38 TNC £140.00
Hanson FS7 2/70cm Meter £30.00
Heil BM-10-5 Headset £50.00
Heil HMM-K Hand Mic £30.00
Heil Traveller Traveller £65.00
High Sierra Sidekick Sidekick PRO antenna £289.00
High Sierra Sidelick Sidekick antenna £160.00
Hygain Rotator Rotator £250.00
Icom 451E 70cms Multimode Transceiver £250.00
Icom AT160 ATU and Built In Artificial Ground £175.00
Icom IC-271E 2m multimode trx £275.00
Icom IC-207H IC207H £199.00
Icom IC-2100H 2m FM Mobile Transceiver £150.00
Icom IC-2710H Dual Band Mobile £225.00
Icom IC-271E 2m multimode £299.00
Icom IC-471E 70cms Multimode Transceiver £299.00
Icom IC-490E 70cms Mobile Transceiver £250.00
Icom IC-703 HF/6M £450.00
Icom IC-718 HF Mobile/Base £389.00
Icom IC-726 Mobile/Base £400.00
Icom IC-740 HF £299.00
Icom IC-7400 HF/6/2 Band / All mode Tranciever £949.00
Icom IC-746 HF / 6m / 2m Built In ATU £875.00
Icom IC-901 2m/70cms £175.00
Icom IC-775 DSP 200w Base £1,599.00
Icom IC-R10 Handheld Scanner £229.00
Icom IC-R5 Handheld Scanner £125.00
Icom IC-R70 HF Receiver £299.00
Icom IC-R7000 MINT CONDITION!!! Receiver £550.00
Icom IC-R7100 25mhz - 2Ghz Receiver £450.00
Icom IC-R71E Receiver £325.00
Icom IC-R72 Receiver £350.00
Icom IC-R75 HF/6M Receiver £450.00
Icom IC-R8500 Receiver £999.00
Icom IC-W31E Dual Bander £160.00
Icom PS125 25A PSU £225.00
Icom RC-7000 Remote Control £40.00
Icom SM-20 Desk Microphone £90.00
Icom SM-6 Icom microphone £75.00
Icom IC-756PRO2 HF/6 DSP Base £1,599.00
ICS AMT-2 All Mode Terminal Unit £40.00
Jil Jil SWR Meter SWR Meter £15.00
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JPS NIR-12 DSP Filter £129.00
Junker Pump Key Pump Key £75.00
Kamtronics KAM Multimode TNC £140.00
Kent RA Morse Paddle Key £40.00
Kenwood AT120 ATU matches TS120 £89.00
Kenwood AT250 Auto ATU £199.00
Kenwood AT250 Auto ATU £199.00
Kenwood AT300 Tuner £275.00
Kenwood IF232 IF-232 £50.00
Kenwood LP Filter LP Filter £30.00
Kenwood MB-201 MB-201 £20.00
Kenwood PS-30 PSU £89.00
Kenwood R-2000 Receiver Inc Converter £275.00
Kenwood R-5000 Receiver £499.00
Kenwood R-5000 Receiver inc VHF Converter £600.00
Kenwood SP-430 Kenwood Speaker £45.00
Kenwood TH-79E Dualbander Handie £170.00
Kenwood TH-G71E Dualband Handie £129.00
Kenwood TH-G71E Dualband Handie £129.00
Kenwood TH-K2E 2m Handie £99.00
Kenwood TM-D700E Dualbander TNC £299.00
Kenwood TM-V7E 2m/70cms £250.00
Kenwood TR-751E 2m Multimode Transceiver £250.00
Kenwood TR-9000 2m Multimode £220.00
Kenwood TS-2000 All Band / All mode Tranciever £1,299.00
Kenwood TS-271E TS271E £165.00
Kenwood TS-480HX HF 200w Mobile £850.00
Kenwood TS-570DGE HF 100w £675.00
Kenwood TS-570S HF + 6m Trx (VERY RARE!!) £825.00
Kenwood TS850S HF £550.00 & TS850SAT inc Tuner £699.00
Kenwood TS-870 HF DSP Base £899.00
Kenwood TS-940 HF Base £450.00
Kenwood TS-950SD HF150W DSP Base Station £1,200.00
Kenwood TS-950SDX HF150W DSP Base Station £1,599.00
Kenwood TMG707 2m 70cm mobile £199.00
Linear Amp UK Challenger II 2KW HF Amp £1,395.00
Lowe HF-150 HF Reciever £150.00
Lowe HF-225 HF Receiver £175.00
Lowe HF-350 HF Receiver £295.00
Lowe Keypad Lowe Keypad £30.00
MFJ 9406X 9406X 6m TRX £99.00
MFJ MFJ-1112 DC Outlet £25.00
MFJ MFJ-1272B TNC / Mic Switch £20.00
MFJ MFJ-1278 TNC All Mode £175.00
MFJ MFJ-202B Noise bridge £49.00
MFJ MFJ-442 Elec + memory keyer £89.00
MFJ MFJ-704 Low pass filter £30.00
MFJ MFJ-722 CW / SSB Filter with 5 Watts Amp £59.00
MFJ MFJ-784 DSP Filter £149.00
MFJ MFJ-9015 15m cw TRX £99.00
MFJ MFJ-921 VHF 200 Watt ATU £50.00
MFJ MFJ-949D ATU £99.00
MFJ MFJ-956 Rx ATU £25.00
MFJ MFJ-962B MFJ962B £99.00
MFJ MFJ-986 1.5Kw Tuner £250.00
MFJ MFJ-949E ATU £109.00
Microset PT135 PSU £120.00
Microset RU-432 70cms Amp 100w £150.00
Microwave Mod 432-50 70cms Amp 50w £99.00
Microwave Mod MML/432/50 70CMS AMP £129.00
Nissei DC300GL 30A PSU £80.00
Palstar PS-15 15 Amp Power Supply £49.00
Palstar PS-30N PSU £79.00
Palstar PS-50 50A PSU £139.00
Realistic PRO2004 Base Scaner £89.00
Realistic PRO2005 25-13000 Scanner £119.00
SGC SG-231 Smart Tuner £275.00
Sommerkamp FT-290R 2m Multimode Transceiver £150.00
Sony ICF-SW7600GR World band Receiver £99.00
Standard C-156E 2m Handheld Transceiver £125.00
Starmaster Memory Keyer Electronic memory keyer £59.00
Target HF3 HF3 RX £99.00
Tentec Paragon HF BaseInc. Speaker £700.00
TenTec RX-350 HF Receiver £999.00
Timewave DSP9+ External DSP Unit £99.00
Timewave PK-12 Packet £99.00
Trio PS-430 Kenwood PSU 22A £100.00
Trio R-1000 HF Reciever £170.00
Trio TR-9130 2m multimode £220.00
Trio TS-530SP TS530SP £299.00
Trio TS-711E 2m Base £350.00
Uniden UBC-780XLT Scanner/Trunk Tracker £249.00
Yaesu DSV2 Voice recorder £139.00
Yaesu FC-20 ATU for FT847 £175.00
Yaesu FC-700 ATU £99.00
Yaesu FL-2025 Amplifier £90.00
Yaesu FP-700 Power Supply £100.00
Yaesu FP-707 PSU £110.00
Yaesu FP-757GX 757 PSU £99.00
Yaesu FR-101 HF, 2m, 6m Base Transceiver £399.00
Yaesu FRG-100 HF Receiver £299.00
Yaesu FRG-8800 RX £199.00 or inc Converter £299.00
Yaesu FRG-9600 RX VHF/UHF £199.00
Yaesu FRT-7700 FRT-7700 £70.00
Yaesu FRV-7700 Converter for FRG-7700 £60.00
Yaesu FT-100 HF/6m/2m/70cms Mobile Transceiver £499.00
Yaesu FT-1000MP AC HF Base £1,199.00
Yaesu FT-1000MP Field HF DSP Base £1,599.00
Yaesu FT-1000MP MkV DSP HF Base £1,799.00
Yaesu FT-200 FT200 £175.00
Yaesu FT-2600M Mobile VHF / FM Transceiver £120.00
Yaesu FT-290R Mk II 2m multimode £250.00
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-690R 6m Multimode Mobile Transceiver £199.00
Yaesu FT-7100M 2m / 70cms Mobile Transceiver £220.00
Yaesu FT-736R 2/70 Base £550.00 or 6/2/70 £750.00
Yaesu FT-767GX HF/6/2/70 Base £799.00
Yaesu FT-76R 70 cms Handheld Transceiver £99.00
Yaesu FT-77 HF inc FM £275.00
Yaesu FT-7800 2/70 mobile £199.00
Yaesu FT-8100R 2m / 70cms Mobile Transceiver £220.00
Yaesu FT-817 Mobile HF, VHF, UHF Transceiver £450.00
Yaesu FT-840 HF 100w Mobile £399.00
Yaesu FT-847 HF/6/2/70 BASE £899.00
Yaesu FT-897 Portable £699.00
Yaesu FT-920AF HF / 6M Base Transceiver £899.00
Yaesu FT-980 FT980 £399.00
Yaesu FTV-1000 200 W Transverter £475.00
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Yaesu VX-1R VX1R £99.00
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Yupiteru MVT-9000 II MVT9000II £269.00

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Trader's Table

The equipment for sale on this page is secondhand or ex-demonstration

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ICOM IC275 VHF ALL MODE BASE TCVR £295
ICOM IC745 HF TRANSCEIVER £295
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ICOM IC706 MK1 HF/VHF TRANSCEIVER £475
YAESU FT690 MK2 6MTR TRANSCEIVER £179
YAESU FT290 MK1 VHF TRANSCEIVER £95
YAESU FT690/MK1 6MTR TRANSCEIVER £125
YEASU FT100D HF/6/2/70 TCVR £575
YEASU FT815ND HF/6/2/70 QRP TCVR £375
KENWOOD TS850SAT HF TCVR £525
KENWOOD TS850S HF TCVR £495
KENWOOD TS2000X HF to 23cm TCVR £1299
KDK 2030 VHF MOBILE TRANSCEIVER £65
KENWOOD 9130 VHF MULTIMODE £195
KENWOOD TM251E VHF MOBILE £99
PALATAR KH-6 50Mhz HANDHE D TCVR £65
ALINCO DR 150 VHF MOBILE TCVR £95
AZDEN PCS4000 VHF TRANSCEIVER £65

RECEIVERS

ICOM ICR-70 HF RECEVER £295
ICOM IC-R75 HF+50MHZ RECEIVER £475
ICOM IC R71E HF RECEVER £395
JRC NRD 535 HF RECEIVER £525
JRC NRD 515 HF RECEIVER £495
PRO 2042 VHF UHF BASE RECEIVER £155
DRAKE R8E HF RECEIVER £425
LOWE HF 125 HF RECEIVER £135
LOWE HF 225 HF RECEIVER £245
AOR 7030+ HF RECEIVER £575
AOR AR8600 WIDE BAND RECEIVER £495
AOR AR8000 HANDHELD RECEIVER £245
YUP TERU MVT7300 H/H RCVR £185
YUP TERU MVT7100 H/H RECEIVER £145
YAESU RG100 H RECEIVER inc K/PAD £295
YAESU 9600 WIDE BAND RECEVER £185
YAESU RG 7700 HF RECEIVER £125
HITACHI WS1 WORLDSPACE RECEIVER £95
REALISTIC DX394 HF RECEIVER £85
BEARCAT 9000XLT BASE SCANNER £185
BEARCAT UBC120XLT. H/H SCANNER £95

ACCESSORIES

KENWOOD BC15A CHARGER/TH28/78 ..... £39
BNOS LPM144/10/100 LINEAR AMP £95
BNOS LP50/10/50 6Mtr LINEAR AMP £95
DATONG FL3 AUDIO FILTER £85
MUTEK TVHF230c 144-HF TEANSVERTER £125
LGD857 AUTO ATU FOR YEASU FT857 ..... £145
SGC 211 AUTO ATU FOR YEASU FT817 ..... £95
SGC 237 SMART TUNER (EX DEMO) £195
MFJ 9593 ACTIVE ANTENNA UNIT £85
JPS ANC-4 ANTENNA NOISE REDUCER £85
JPS NTR-1 DSP NOISE REDUCER £85
HF MODULE FOR FT726R 21/24/28Mhz £125
TIMEWAVE DSP9+ DSP UNIT £85
GLOBAL AT2000 SWL ATU £59
HEIL HMM-K HAND MIC FOR KENWOOD £45
GARMIN STREET PILOT COLOURMAP £295
SGC 230 SMART TUNER £235

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VHF/UHF TRANSCEIVERS

Alinco DJC5 Microsize 2m/70cms Handy Transceiver £129
Alinco DR605 Twinband FM Mobile Transceiver ..... £ 90
Alinco DR6 0 D al Band Mobile Transceiver ..... £ 99
Kenwood TR7730 2m FM 25w Transceiver 89
MFJ 9402X 7w SSB 2m Transceiver ..... £ 49
Trio TR9500 0cms Mobile/Base Transceiver c/w PSU & BO9 ..... £ 99
Trio TS700s 0w All mode 2m Base Tx with Ext VFO £299
Yaesu FT290II 2m A I Mode Transceiver with 25w Amp & Case etc., ... £249
Yaesu FT726R 2M/70CM All Mode 0W Base Transceiver £499
Yaesu FT726R 2M/70CM All Mode Base Transceiver £399
Yaesu FT726R 2M/6M All Mode 0W Base Transceiver £395
Yaesu FT736R VHF/UHF All Mode Transceiver £699
Yaesu VX2E Twinband Compact Handie with Wide Receive £139 95
Yaesu VX-7R Triband Handy Transceiver with speaker mic (black) £239

SCANNERS & SCANNING RECEIVERS

Alinco DJX 0 Wideband Scanning Receiver with Carry Case ..... £ 99
Alinco DJX3 Handheld Scanner c/w accessories & book ..... £ 59
AOR AR8200 Mk II Wideband A I Mode Handheld Scanner £229
Aor AR8200 Mk III Wideband Scanning Receiver £299
B ar at 220XLT Handheld Scanning Receiver 99
Icom R2 Wideband AM/FM/WFM Handheld S anner 95
Icom R3 Wideband Scanning Receiver with TV £249
Icom R5 Wideband Scanning Receiver £129
Yaesu VR5000 Wideband Scanning Receiver ..... £ 49
Yupiteru MVT9000 MK I Wideband S anning Receiver £229

RECEIVERS

Grundig YB500 Receiver 99
Icom 7 00 Wideband Receiver £495
Icom R70 HF Receiver ..... £ 85
Icom R75 Base Receiver £499
Icom R8500 All mode 0-2Ghz Communications Receiver with PSU £850
NRD JRC545DSP Base Receiver £849
Palstar R30 Receiver £325
Roberts 9914 FM/MW/LW/SW Receiver £65
Steepletone 747 Portable Shortwave Receiver £65
Yaesu FRG8800 General Coverage Receiver £299
Yaesu FRG8800V HF Receiver + VHF Converter £325
Yaesu VR5000 A I Model 00KHz 2600MHz Base Receiver £449

DAB

Perstel Bluenote Personal DAB Radio £59
Pure ST1 DAB Extension Sp aker £15

Transceivers

Alinco DX701 00ch. All mode HF 0- 00w Mobile Transceiver £299
Alinco DX70th 00w HF & 6m All Mode Mob le/Base Transceiver £399
Icom 756 Pro 00w HF/6m Base Transceiver £999
Icom 756 Pro II 00w HF & 6m DSP Tx c/w Auto Tuner £1395
Icom C7400 HF/6M/2M 00W Transceiver ..... £ 095
Kenwood R5000 A I Mode Base HF Receiver £425
KENWOOD TS 430S 00W HF TRANSCE VER £349
Kenwood TS570DG 00w HF TX & ATU/DSP £599
Kenwood TS850SAT 00W HF Transceiver with Auto Tuner £695
Kenwood TS870SAT 00w DSP HF Transceiver with Auto Tuner £999
Yaesu FT840FM 00w HF General Coverage Receiver £395

ACCESSORIES

Alinco DX77E Desktop HF Transceiver - 00w £399
Alinco EDX2 120w Automatic ATU for DX70/77 ..... £229
Amdat ADC60 Frequency Standard Clock 99
Aor CT8200 CTCSS Card £55
AOR T 8200 Tone Card £29
Daiwa 403g 0cms Preamplifier £22
Dewsbury S/TUNER Super Tuner £25
Elmic CONTRO S Noise Limitor ..... £ 0
Hitachi KH-YG1 Worldspace Yagi Kit £39
Icom AT 60 Coaxial Auto ATU ..... £ 79
Icom AT 80 Auto Tuner for Icom 706 ..... £239
Icom SM20 Base Microphone 95
Icom SM8 Base Microphone £69
Jim M75 Preamplifier £49
Jim NF96X I Filter £15
Maldol AH212 2M/70/23CM Handi Antenna £15
MFJ 249 Antenna Analyser £1 0
MML144/40 2M 40W Amplifier & PreAmp £69
Morse Key Brass Key £35
NAG 2200 2m Amplifier £299
Sony AN1 Active Antenna £65
Trio T 922 HF Amplifier £895
TSA Duplexer 1 30 / 350-540 Duplexer £14
Twin Paddle Morse Key £45
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Global AT2000 SWL ATU £79
Ga min Street pilot mint european base maps £249
Watson 30-35amp PSU with mete s £89
Datong FL-3 multimode filter £99
MFJ949E 300watt tuner with dummy load £115
Hei HM-10 dual insert studio quality mic £99
Watson WMM-3 multimode data decoder £45

VHF/UHF TRANSCEIVERS

Yaesu FT2600 65watt 2meter mobile £139
Kenwood TM255E 2m 45watt multimode mint £349
Kenwood TR751E 2m 25watt multimode mobile £299
Kenwood TH79E true dualband hand held £199

HF TRANSCEIVERS

Yaesu FT857D HF,6M,2M,70cm DSP £549
Yaesu FT817 portable HF,6,2,70cm charger etc £399
Yaesu FT857 HF to 70cms Demo model £599
Kenwood TS140S 0-35mhz all mode £399
President Lincoln 10m Amateur transceiver new £175
Yaesu FT-900AT 100watt all mode detachable head.. £449
Icom IC746 HF,6m,2m,Auto ATU 100W £899
Icom IC7400 HF,6m,2m, Auto tuner DSP £999
Icom IC706 MK2 DSP,HF,6,2m boxed £499
Icom IC756Pro HF,6m DSP, auto ATU, mint £1299
Kenwood TS870S DSP,Auto ATU £999
Yaesu FT100 boxed mint HF to 70cm DSP £499
Yaesu FT920 HF,6m DSP boxed and mint £899

Shortwave Receivers

Lowe HF250E remote control £339
Lowe HF225 0-30mhz keypad option bowed mint £269
Lowe HF150 0-30mhz all mode £249
Realistic DX349 all mode receiver £129
AOR3000A 0-2036mhz AM,FM,LSB,USB mint £599
Sony SW100E Tiny Shortwave 0-30mhz+VHF £119
Yaesu RG100 0-30mhz PSU and Keypad £399
Icom IC-R75 0-60mhz all mode £499

Scanners Base/Mobiles

Uniden Bearcat 220XLT 66-956mhz £99
AOR5000 0-2600mhz all mode, boxed £999
AOR3000A 0-2036mhz all mode 400 mems,mint £599
Yaesu VR5000 0-2600mhz all mode £499
Bearcat 780XLT 25-1300mhz trunk tracker Demo £239
Alinco DX10E 1000 channels 0-2000mhz handheld £225
Bearcat UBC278cxl base scanner 100mems demo £139
Icom PCR1000 0-1300mhz computer receiver £239
Yupiteru MVT7100 0-1650mhz nicads etc £169
Bearcat 3300XLT 25-1300mhz demo £179
Icom ICR-10 all mode full coverage £199

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Alinco DR-M03SX 0m FM Mob le 28-29 7MHz 0W ..... £ 59
Icom C- 03 HF& 6m All Mode QRP mobile + Gen Cov. 0W £449
Kenwood TS 570DG Base wi h Gen Cov. + ATU & DSP filter 100W 12V £699
Kenwood TS-870S Base wi h Gen. Cov. + ATU & DSP in he IF, 00W 12V £949
Yaesu FT-817 HF, 6m, 2m, 0cm All Mode Portable + Gen Cov RX £579

VHF UHF Base/Mobile Transceiver

ADI AR- 47 2m FM Mobile 50W CTCSS 40Ch ..... £ 49
Alinco DR-6 0E 2m, 0cm FM Mob le 50W,35W (Remote Head) £249
Icom C-92 H 2m,70cm All Mode Base 45W, 40W 12V ..... £ 99
Icom C-3230H 2m, 0cm FM Mobile 45W, 35W Ful Duplex £229
Kenwood TM 451E 0cm FM Mobile 35W 2m RX, Ful Duplex £249
MFJ MFJ 946BX 6m SSB QRP Transceiver 10W 12V £129
Yaesu FT-8 00R 2m,70cm FM 50W,35W Full Duplex + Remote Head £249

VHF UHF Hand Held T ansceiver

ADI AT 400 70cm FM Battery box 420 465MHz RX £99
Palstar H 6 6m FM H/Held w h CTCSS £75

Shortwa e Receivers

AOR AR- 030 0 32MHz All Mode Receiver 12V wi h PSU £449
Lowe HF-250 x2 30 Hz-30MHz Recei er 12V PC Compatable £229
Sony CF-SW07 Min Recei er + FM ste eo, SSB & One Touch" tuning £169
Yaesu FRG- 00 x2 90 Hz 30MHz AM,CW,SSB 12V + PSU & Keypad £229

Scanners Mobile Base

AOR AR 3000 00 Hz-2036MHz All Mode Recei er 400Ch. 12V £449

Scanners Hand Held

Alinco DJ-X2000E 00 Hz-2150MHz All Mode + CTCSS, Alpha 2000Ch £299
Opto R-10 30MHz-2GHz FM Inte ceptor £99
Yupite u MVT-7300 x3 521kHz-1320MHz All Mode + 8 33kHz step £229

Station Accessories

AEA PK-232 PakRat Dual Port Multimode Data Cont oller £79
Come CF BP 6 6m Band Pass F lter 50W £49
Datong ANF CW Automatic Notch Filter £69
Diamond SX 600 1 8-525MHz 200W SWR,PWR meter + 2 sensors £99
Diamond SX-2000 x2 1 8-200MHZ Automatic SWR,PWR meter 200W £79
Icom AT-180 HF + 6m Automatic ATU £249
Icom PS-15 13 8V 20A (max) Matching PSU £79
JPS NIR-10 Noise / Interfe ence Reduction Unit ..... £ 99
JPS NTR-1 DSP Noise Reducer £99
Kant onics KAM Plus Multimode Data Cont oller w h Pacto ,Dua Port ..... £ 99
Kant onics KPC 9612 x2 Dual port Dual speed Packet TNC Cont o ler £229
Linear Amp Explorer 1200 0-160m Linear 0-130W in, 00- 300W out (RMS) £995
MFJ MFJ-77 Remote Memory Keypad for MFJ 486 contest keyer £15
MFJ MFJ-201 1 5-250MHz (6 Bands) Dip Meter & Field St eng h £99
MFJ MFJ 422BX Compact Elect onic Paddle Keyer (fit your own key) £49
MFJ MFJ 486 G andmaster II Contest Memory Keyer £169
MFJ MFJ-784B Tunable DSP Audio Filter ..... £ 89
MFJ MFJ-12 4PC Multimode Interface for BM FAX,CW,RTTY,ASCII £119
MFJ MFJ-12 6 HF / HF TNC wi h Precision Tuning + Pactor £129
MFJ MFJ-1278 Multimode 10 mode Data Cont oller £175
MFJ MFJ-1289M BM Multimode Control Softwa e £49
MFJ MFJ-9821 2m Packet T anscei er only £129
Mic oset PT- 05A 12V 5A (max) P otected Stabilized PSU £29
Opto 3000A + 0Hz 3GHz F equency Counter £289
SGC PowerClear DSP Audio F lter wi h 5W Amp,Band Pass F lter ..... £ 99
Watson WMM-1 Multimode Modem £49
Yaesu FRT-7 00 50kHz 30MHz Receive ATU for FRG-7700/8800 ..... £49
Yaesu FRV-7 00 1 8- 50MHz Con erter for FRG-7700/8800 ..... £49

Miscellaneous

Garmin GPS-12 Hand held 12Ch 500 Waypoints wi h BackTrack £79
Garmin GPS-III 12Ch. 500 Waypoints,BackT ack w h MAP ..... £ 99

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Drake R4C, Eddystone Edometer MkII, wooden cased, Eddystone 830 restoration project with black finger plate, R210, Trio R-1000, SG Brown headphones, type F, Datong ANF auto-notch filter, Maplin a.t.u. Tony, Worcester. Tel: (01905) 641759 after 1800 please.

FL-2100Z amp, £350 o.n.o. Trio 9000 multi-mode, £100. FT-221 multi-mode, £100 o.n.o. Brass Kent key, £30. 2 Star Master Keyers, £25 for two. 3-element 10m (28MHz) beam, £30 - good condition. Tel: Bucks (01234) 240979.

HRO with coils, audio oscillator, AVO8 (cased). ±2.5% bridge, crystal calibrator (Marconi), Variac, 1kHz to 150MHz, 40dB wideband amp, counter (H. Packard), 400W h.f. linear (2 x 811A valves), megger, 'phone for shack clearance prices. Ron G3ZSJ, West Sussex. Tel: (01293) 885701.

Icom 703, bought new in October by blind M3 who now finds it unsuitable, £460 inc. P&P or £450 if collected. Also available voice synthesiser for 703, cost £46, sell for £35. John G3EGC, QTHR. Tel: Bolton (01204) 301502.

Icom 706 MkIIG, two years guarantee, new £675. Yaesu VX2E, all new, boxed with case, speaker mic. and car charger/adapter, two years guarantee, £150. Alinco DJX10 scanner, boxed, £160. DX-394 short wave receiver, £100. DTMF microphone MH36D8/triplexer for Yaesu 847, new, £80. Tel: Wiltshire (01373) 301855.

Kenwood R-2000 receiver, with VC10 extended frequencies built-in 0-30MHz and 108-165.000, short waves, amateur, airband, marine, c.w., a.m./f.m., u.s.b., l.s.b., like new, box, manual, only, £260. Tel: (01608) 663745.

Kenwood SW200 s.w.r./power meter, 140-450MHz max power, 100W f.m./a.m., 200W s.s.b., 150W c.w., coupler, £50. Alinco DR?EM 2m (144MHz) transceiver, output 5W/45W, scan/skid key, CTCSS function, no microphone, hence £50. Standard C528 twin-band hand-held transceiver, £75. Tel: Wigan area (01942) 870954.

MFJ-962D Versatuner III, 1.5kW a.t.u., eight months old, as new, surplus to requirements, boxed with manual, £185 inc. P&P. Mike, Durham. Tel: 0191-389 2822 or (07958) 049026.

Pye service manuals, 80 different items, full manuals to operating install leaflets, rare sales leaflets, all mint condition, all reasonable offers excepted. Telephone or E-mail for lists. Dave Hewitt G8ZRE, QTHR. Tel: (01244) 316673 or E-mail: g8zre@hotmail.com

Quantity of valved radios, Bush 1965 dual standard TV type T125C, sliding doors, Murphy radiogram A172R, 1950, output valves, PEN445 push-pull amp, s.a.e. or E-mail. Colin Balfour, 22 Pitt Lane, Lerwick, Shetland ZE1 0DW, E-mail: colinbalfour @supanet.com

Realistic DX-394 general coverage communications receiver, mint condition, boxed, £100. Superstar 3900 10m (28MHz) transceiver, boxed, plus digital frequency counter, £130. President Lincoln 10m (28MHz) transceiver, £80. Tel: Staines (01784) 885117.

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Yaesu FT-290 transceiver, carry case, microphone, charger, 30W amp, Micro Modules headset with boom mic., earpiece send/receive switch for mobile use, BNOS power supply, 12V/12A, £350 o.n.o. Mike G3TMB, Southport. Tel: (01704) 214012.

Yaesu/Sommerkamp FT-290R all-mode transceiver, good condition, £110 o.n.o. MFJ-1278B multi-mode packet TNC, £40. Prefer buyer collects or plus P&P. Jack G7NOQ, Preston area. Tel: (01772) 631610 or E-mail: jack@howarth61.freeserve.co.uk

Wanted

6:1 balun. Arthur GM4LBE, QTHR. Tel: (01595) 694270.

1155 RX, aluminium chassis preferred, also 1154 TX, quad valve amps and pre-amps also required, can collect or carriage added to cost. Peter G8CKM, Shropshire. E-mail: peterparker2@lineone.net or Tel: (01939) 290118.

Blind M3 seeks Kenwood TS-50, also c.w. filter for same, can anyone help? John G3EGC, QTHR. Tel: Bolton (01204) 301502.

Grundig Yacht Boy radio, must be model 210 from between 1970 and 1972, must be in mint condition, will pay very good money for one in mint condition. Peter Tankard on 0114-231 6321 from 0900 to 2230.

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MFJ-9020 or MFJ-9030 transceivers in g.w.o. Tel: Merseyside 0151-420 1183.

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Ten-Tec 580 delta dynamic microphone, Kenwood MC35, MC40, MC42 microphones. Tel: (01206) 865670.

Exchange

Yupiteru MVT-7100 scanner, covers 530kHz to 1650MHz, v.g.c. Wanted old style communications RX valve type, covering 160-10m (1.8-28MHz) if possible, e.g. Eddystone, HRO, AR88 or similar. Please deliver as disabled. Larry, 94 Wisden Road, Stevenage, Herts SG1 5JA.

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B.B. Jan '05

Practical Wireless BO

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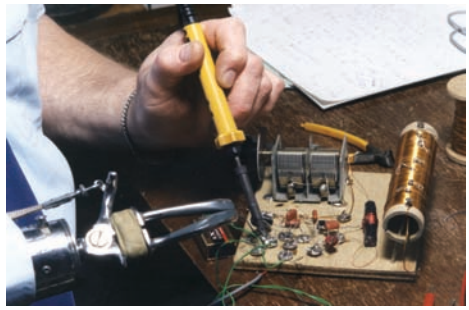
topical talk

A thought provoking letter has been aired in this month's Radio Waves pages by G1HDQ regarding home-brewed v.h.f. projects. Rob G3XFD takes a look at some of the problems - and pleasures of building your own v.h.f. equipment.



● Rob says "Get that soldering iron busy on that prototype"!

The letter from **Kevin Ravenhill G1HDQ** in this month's Radio Waves really set me thinking! And in replying in depth to Kevin's letter I'd also like to re-assure him that he's not the only Amateur who feels somewhat obsessive regarding ancient modulation. Why shouldn't we use this mode on v.h.f. more? My opinion is let's have a go and let's do it soon!

Kevin's letter marked his appreciation of the CQ2 project, which was republished in the November 2004 issue. I was pleased to hear from Kevin and others of their support of this topic because (to be frank) I hesitated in publishing it again.

Hesitate? Yes indeed - I did hesitate, although on reflection I think my temporary indecision was a mistake. This is because, with care a super-regenerative design should cause no problems for other users, especially when a radio frequency stage is used for r.f. isolation and avoiding antenna loading problems.

I chose Kevin's letter as the basis of this month's Topical Talk because he struck home with his comments. As he says, you can have great fun with home-brewed v.h.f. a.m. equipment when hill-topping using relatively simple antennas. Despite the obvious possibilities outlined by Kevin, there's obviously a problem somewhere because home-brewed v.h.f. equipment is rare nowadays.

Rare On VHF?

So, why is home-brewing on v.h.f. so rare nowadays? Answering that question isn't as straightforward as the usual comment; "It's all down to Japanese-made black boxes". In fact, it's my opinion that although v.h.f. equipment made in the Far East is convenient and exceptionally well priced at the moment, this cannot be the reason for the virtual disappearance of home-brewed transceivers, etc.

The black box argument doesn't hold water as far as I'm concerned because there are even more black boxes available for h.f. than there are for v.h.f. Indeed, I think the reasons go far deeper than the arrival of ready made equipment from the Far East.

The h.f. home-brew scene is alive, literally fizzing with activity, as anyone can hear on the bands. And if you're fortunate enough (or determined enough) to learn the Radio Amateur's other language - Morse - you'll hear and see just what I mean. Listening to c.w. QSOs it's always interesting to note just how many Amateurs are running home-brewed c.w. transmitters, mainly because they can be relatively simple to build.

As I see it, the main difference between home-brewing h.f. and v.h.f. equipment is that builders see the generation of a v.h.f. signal to be more complex. Whereas you can literally use a one transistor crystal oscillator just as it is on air on h.f.

However, setting up an oscillator multiplier chain for a simple v.h.f. rig need not be difficult. Additionally, you should remember that QRP on v.h.f. can achieve a great deal - just listen to the annual *PW* 144MHz QRP Contest to see what I mean.

So, watch the Radio Basics space for v.h.f. ideas. I hope that many of you will join Kevin G1HDQ and I using a.m. rigs on 50, 70 and 144MHz. Get those soldering irons ready - home-brew v.h.f. here we come! **PW**

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