

Practical Wireless

PW

amateur radio & more!

RADIO BASICS

PRACTICAL PROJECTS FOR YOU TO MAKE



DXPEDITION TO FLAT HOLM ISLAND



YAESU VX-5R REVIEWED

ELECTRONICS-IN-ACTION

February 2000 £2.50



02 >

FIRST In Amateur Radio

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General e-mail: Info@wsplc.demon.co.uk

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SAVE 1.8 - 52MHz 100W Auto ATU 51 Bandwidths IC-756PRO



Real-Time Spectrum Scope RTTY Decoder Built-In

New DX Rig
5" Colour
Screen
32 Bit DSP
51 Bandwidths
RF Processing
Voice Memory
CW memory

The new IC-756PRO has arrived at Icom's top UK dealer. And of course you get best value from Waters & Stanton, whether it be part exchange, pre-sale or after-sale advice and technical assistance. This feature packed radio sets a new standard in HF operation and convenience and for the first time you can send and receive RTTY on the LCD screen. A new mode with no external boxes. Make no mistake, this is a very advanced transceiver, one that needs top dealer support that only comes from W & S. So give us a call and we'll send you the latest information.

KENWOOD TS-570DG
160 - 10m All Mode



19.4% APR Available

£849

or pay 10%
Deposit
and balance in
6 months
Interest FREE

ICOM IC-746
160m - 2m All-mode



SAVE

YAESU FT-840
160 - 10m All Mode



SAVE

The IC-746 offers 100 Watts of RF out on all bands from 160m to 2m. We rate it as one of the best value-for-money packages around.

The FT-840 offers 100 Watts of well engineered RF together with a receiver that can more than hold its own.

FT-90R Can you believe the size?

The tiny dimensions of the FT-90R from Yaesu, are hard to believe. Yet it produces 50W on 2m and 35W on 70cm. Auto repeater shift on UK channels and switched 12.5 / 25kHz deviation, make this a number one choice.



£325

YAESU FT-1000MP
160 - 10m All Mode



19.4% APR Available

Super
Discount
Phone!

It has stood the test of time and used by the worlds top DXers and DXpeditions. Its excellent receiver combined with its superior transmit-

ted signal makes this a natural choice for the HF enthusiasts. AC and DC versions in stock.

SAVE ICOM IC-706IIG 160 - 70cm All Mode

19.4% APR Available

or pay 10% Deposit
and balance in 6 months Interest FREE

£1069 with switch mode power supply



Shown above with PSU

£989

Next Day
Delivery
£7.00

The IC-706IIG is the latest model of this classic transceiver. Great for mobile, portable or base use. Its got a great pedigree and offers 100 Watts on all bands up to 50MHz with 50 Watts on 2m and 20 Watts on 70cm. CTCSS encode and a lovely display with removable front panel.



TUNE CONTROL Plugs into back of your IC-706. Now when you press "tune" you get 10W of RF for tuning up via manual ATU etc. A lovely idea that costs you only £29.95 post £2.00

ICOM IC-Q7E

- * 2m & 70cm Handheld
- * 300mW Output
- * CTCSS Encoder
- * Rx. 30kHz - 1309MHz FM / AM
- * 200 Multifunction Memories
- * LCD Backlight & Timer
- * Runs from 2 x AA Cells

Dual Bander
Airband Receive!
Only 50pcs
Available



£119

W&S Exclusive Deal £169

YAESU FT-847

160 - 70cm All Mode
or pay 10% Deposit
and balance in 6 months Interest FREE
£1379 with switch mode power supply



PRICE MATCH

£1349

Next Day
Delivery
£7.00

The FT-847 has firmly established itself as a true all-band, all-mode transceiver. Loved by the VHF & UHF operators, and superb for satellite operation, it also offers great HF performance. We have sold more than any other dealer, which says a lot about our reputation and our price. Phone for free leaflet today. And remember, our stock is genuine UK, not modified overseas models!!

Price Increase - We have had to increase the "847" price slightly. However, there is a further price increase likely - so now is the time to buy!! BE WARNED

YAESU FT-100

See RadCom Review



£1259

Phone

This rig is the smallest all-band available. We have used it extensively and it is absolutely great. Read RadCom's in-depth review and then come to us for the best deal around.

YAESU				YF-114SN	FT-1000 2.0kHz Fil.	£84.00
FT-840	HF 100W	£589.00		XF-117C	FT-100 500Hz Fil.	£98.00
FM Unit	For FT-840	£56.00		YSK-100	FT-100 Sep. Kit	£56.00
YF-112C	FT-840 500Hz filter	£84.00		FT-3000M	2m Mobile	£295.00
FC-20	Auto ATU	£199.00		VR-500	Scanner	£399.00
YF-114CN	FT-1000 250Hz Fil.	£84.00		FT-920AF	HF 100W	£1149.00

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The Web! **FREE**
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Previously £249.00

£199

Airband Rx

- * 2m & 70cm Handheld
- * 5W Output on 13.8V DC
- * Full CTCSS & 12.5/25kHz Steps
- * 110 Alphanumeric Memories
- * 29 Programmable Functions
- * DTMF Keypad & AM Airband
- * Ni-cads & AC charger

NEW Earpiece / Boom Mic

WEP-501YS

Fits VX-1R, VX-5R, FT-50

This popular, light-weight earpiece and boom microphone makes for easy operation, and keeps the RF away from the head.

£24.95

Clearance Items:

Alinco DR-130E	2m 50W Mobile	£280	£159
Yaesu FT-200	2m 50W Mobile	£330	£169
Yaesu FT-2500	2m 50W Mobile	£280	£169
Optotrakker	Multimode decoder	£200	£229
MFJ-422B	Electronic key + paddle	£445	£95
MFJ-1792	80m - 40m base vertical	£450	£109
Cushcraft AR-X6	6m Vertical	£400	£139
Tonna 209022	21 El. TV antenna	£60	£45

Hoka Decoding Software

We are now the UK distributors. As used by governments, it can decode just about any form of data transmission. Simply connect between PC and Rx audio. Can be loaded on any number of PCs. This is a very advanced programme.



C-150 2m Handy

- * 2m Handheld
- * 5W Output on 13.8V DC
- * 1750Hz Tone Included
- * 25 / 12.5kHz Steps
- * 20 Memory Channels
- * Wideband Receive
- * Uses 6 x AA cells (not inc.)

£99.99



YAESU VX-5R

- * 6m / 2m / 70cm Handheld
- * 5W Output on 13.8V DC
- * CTCSS Encode / Decode
- * 25 / 12.5kHz Steps
- * Auto Repeater Shift
- * AM Airband Receive
- * Lithium Cells & Charger

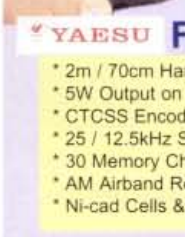
£330



YAESU FT-50R

- * 2m / 70cm Handheld
- * 5W Output on 13.8V DC
- * CTCSS Encode / 1750Hz tone
- * 25 / 12.5kHz Steps
- * 30 Memory Channels
- * AM Airband Receive
- * Ni-cad Cells & Charger

£220



SAVE C-408 70cms Handy

Normally £89.95

£69.95

- CTCSS
- Repeater Shift
- Digital Display
- 12.5 / 25kHz Step
- 20 Memories
- 230mW Output
- Uses 2 x AA

Offer Extended

ICOM IC-T8E

- * 6m / 2m / 70cm Handheld
- * 5W Output on 13.8V DC
- * 25 / 12.5kHz Switchable
- * 123 Multifunction Memories
- * CTCSS & 1750Hz Tone
- * Programmable Features
- * Ni-cads & AC charger

£349



KENWOOD TH-D7E

- * 2m & 70cm Handheld
- * 6W Output on 13.8V DC
- * CTCSS & 1750Hz Tone
- * Built-in Packet Modem
- * 200 Alphanumeric Memories
- * DTMF Keypad & AM Airband
- * Ni-cads & AC charger

£299



ICOM IC-T81E

- * 6m / 2m / 70cm / 23cm Handy
- * 5W Output on 13.8V DC (1w23cm)
- * CTCSS & 1750Hz Tone
- * 12.5 / 25kHz Switched
- * 124 Alphanumeric Memories
- * Wideband Rx. FM WFM & AM
- * Ni-MH Cells & AC charger

£309



ADI AR-147

- AM Airband Receive
- * 2m 50 Watt Mobile Airband Receive
- * Full CTCSS Encode / Decode
- * 81 Memories 25 / 12.5kHz Steps
- * Keypad microphone & Mounting Kit

£199



KENWOOD TM-V7E

- * 2m / 70cm Mobile
- * 50W 2m, 35W 70cm
- * Clear LCD Readout
- * CTCSS & DTMF
- * 8 Frequency Steps & 280 Memories
- * Includes Microphone & Mounting Bracket

£369



MFJ's New MFJ-269

1.8MHz to 70cms
Antenna Analyser
Extra Features



Measures VSWR, Impedance, Reactance, Capacitance, Inductance, Coax losses, Velocity factor, Stub lengths, Even calculates length to fault on coax lines plus more!!

A complete antenna and feeder analyser. Runs from AA cells or external 12V. Solve all antenna problems on-site.

Now with 70cms

£299

ICOM IC-2800H In Full Colour!

- * 2m & 70cm Mobile
- * Colour TV Screen
- * Full CTCSS and 1750Hz Tone
- * 50W 2m 35W 70cm

Includes FREE Remote head cable.

£549



ICOM IC-207H

- * 2m / 70cm
- * 50W / 35W
- * 180 Memories and 7 Tuning Steps
- * Detachable Head Unit / Clear Display
- * Microphone, Mounting Bracket etc.

£309



KENWOOD TM-G707E

- * 2m and 70cm
- * 50W and 35W
- * Full CTCSS
- * 180 Alphanumeric Memories
- * Detachable Head with Amber Display

£279



YAESU FT-8100R

- * 2m and 70cm
- * 50W and 35W
- * Wideband Rx AM & FM 208 Memories
- * 7 Tuning Steps DTMF Remote Front panel
- * Very compact, supplied with all hardware.

Phone



ICOM IC-2100H

- * 2m Mobile 55 Watts Output
- * 50 Alphanumeric Memories
- * Switched 12.5kHz and 25kHz Filters
- * CTCSS and 1750Hz Tone

£209



Number ONE in Amateur Radio Waters & Stanton

Order Details on inside Front Cover

Replacement Batteries

FT-50R	List	Ours
NBP-40Y 6V 650mAh	£43.00	£27.95
FNB-42 9.6V 1100mAh	£46.00	£29.95
IC-T8E		
NBP-200 9.6V 680mAh	£40	£25.95
NBP-199 6V 700mAh	£30	£25.95
TH-D7E		
NBP-39K 9.6V 600mAh	£45.95	£29.95
TH-22		
PB-32 6V 600mAh	£32.00	£21.95

RF Metering

Avair AV-600 1.8 - 525MHz 400W

£59.95
VSWR and power meter. Reads RMS and PEP. The ideal all-band VSWR meter. Reads up to 400W (3 ranges)

Watson VSWR / Power Meters.

£49.95
Measure VSWR and RMS or PEP power. Large easy to read meter. 3 ranges: 5W, 20W and 200W.

W-220	1.8 - 200MHz	£49.95
W-420	118 - 530MHz	£49.95
W-620	1.8 - 525MHz	£89.95

GB Beams from Netherlands

Dual Triple & Quad Bands!

GB-2 Dual band Yagi covering 2m & 70cm. Uses 4 elements of 2m and 5 elements on 70cm. £
GB-3 Tri-band design. 2 el 6m, 4 el 2m, and 5 el 70cm. Ideal as a compact system for VHF/UHF £29.95
GB-4 Quad bander. 2 el 6m, 4 el 2m, 5 el 70cm and 10el 23cms. A complete system on one boom 199.95

Watson Off-Air Frequency Counters

£59.95
High quality units supplied with antennas, ni-cad packs and AC chargers. They are very sensitive and may be used for near-field checking.

Hunter - 10MHz - 3GHz £59.95
FC-130 - 1MHz - 3GHz, switched gates, 16 segments. £79.95
Super Hunter - 10Hz to 3GHz and with signal strength meter. £149.95

Antenna Rotators

AR-300XL Lightweight

£49.95
Ideal for VHF and UHF systems of small to medium size. Includes control box, motor and Brackets. Support mast sizes can be up to 50mm

YS-130 Medium Weight VHF

Made in Japan, this rotator will support medium sized VHF arrays. The diecast motor housing will fit masts up to 40mm diameter. Includes motor, control box and brackets. **£79.95**

New Create RC5-1 Rotator

We are pleased to be able to offer one of the most popular rotators from Japan. The RC5-1 will handle 3-4 element HF beams. It has a torque of 6kg (rotation) and 80kg braking. Uses 7-core cable. **£299.95**

Yaesu Rotators for HF Systems

G-450C	Smaller Tri-band Yagis etc.	£379.00
G-650C	Larger Tri-banders etc.	£499.00
G-1000C	4 element HF Yagis (cw with 25m cable)	£559.00
G-2800SDX	Really large HF Yagis	£1229.00
G-550	Elevation Rotator	£309.00
G-5500	Az/EI Rotator	£569.00

We have extensive stocks of tower mounts, bearings and rotator cables. Phone if you need advice. Leaflets available.

Cushcraft HF Yagis - In Stock

High quality DX Yagis. More Cushcraft Yagis are used in the UK than any other brand. Buy from W&S and be assured of long-term spares back-up.

Carriage £7.00 on all Yagis

A3S	10-15-20m 3 el. 4.27m boom 8.45m el. 2kW	£389.95
A3WS	12m. 17m 3 el. 4.27m boom 7.66m el. 2kW	£299.95
A4S	10-15-20m 4 el. 5.48m boom 9.75m el. 2kW	£469.95
X7	10-15-20m 7 el. 5.49m boom 11.33m el. 2kW	£549.95
X9	10-15-20m 9 el. 8.53m boom 11.12m el. 2kW	£799.95
TEN-3	10m 3 el. 2.44m boom 5.49m el. 2kW	£139.95
XM-510	10m 5 el. 5.8m boom 5.6m el. 2kW	£249.95
XM-515	15m 5 el. 7.3m boom 7.3m el. 2kW	£325.95
XM-520	20m 5 el. 9.75m boom 11m el. 2kW	£529.95
XM240	40m 2 el. 6.7m boom 13.3m el. 2kW	£469.95

80/40/20m Dipole 50ft Long!

G3OJV 80-Plus-2

SpaceSaver

Approx 50ft long (Horizontal) Ideal for the small garden.
400 Watts PEP Linear loading means efficient radiation. Can also be used as horizontal
Balun Matched
ATU not essential
50 Ohms Feed
VSWR Typically 1.5:1 Bandwidth (2.5:1)
20m 350kHz, 40m 100kHz, 80m 100kHz

No soldering, just assemble the elements, check the dimensions and fine tune per instructions. Unlike the G5RV, it self-resonates with low VSWR on all three bands. A unique design that offers LF operation from your back garden.

Garmin GPS-III Plus

With street map up-load feature.

All the familiar features of the old GPS-III plus more. Lower battery drain and the ability to up-load street maps into the memory. Includes serial port data lead. GPS-III Plus £329. UK street CD £69.95

Telescopic Masts

We are now able to supply a range of telescopic tilt-over masts, galvannealised to BS729. Heights available from 7.6m to 12m extended. Models for wall mounting or post mounting are included. The post mounted versions tilt-over and are supplied with a socket for mounting in concrete. Phone or write for information.

VHF/UHF Antennas

Base Station Fibre Glass

WVA-100	2m/70cm 2/4.5dB 1.09m	£29.95
W-30	2m/70cm 3/6dB 1.15m	£39.95
W-50	2m/70cm 4/5/7.2dB 1.8m	£49.95
W-300	2m/70cm 6.5/9dB 3.1m	£59.95
W-2000	6m/2m/70cm 2.5m	£69.95

Mobile Antennas PL-259 bases

W-285	2m 5/8th foldover base	£14.95
W-77LS	2m/70cm 0.39m low profile	£18.95
W-770HB	2m/70cm 1.1m 3/5.5dB	£24.95
W-7900	2m/70cm 5/7.6dB 1.5m	£32.95
W-627	6m/2m/70cm 1.62m	£34.95

Mounts

W-3HM	Hatch / Boot Mount	£14.95
W-3CK	5m low loss cable kit.	£18.95
W-ECH	5m RG-58 standard cable	£12.95
WMM&	Magnetic mount	£10.95
WAM-2	BNC window mount	£12.95

Tonna VHF/UHF

20505	6m 5 el 10dBi 3.45	£82.95
20804	2m 4 el. 8/9dBi 0.93m	£44.95
20809	2m 9 el. 13.1dBi 3.47m	£52.95
20818	2m 9 el.xd. 13.1dBi 3.47m	£10.00
20811	2M 11 EL. 14.1dBi 4.62m	£79.95
20822	2m 11 el.xd 14.1dBi 4.62m	£117.95
20817	2m 17 el. 15.3dBi 6.57m	£89.95
20909	70cm 9 el 13dBi 1.24m	£45.95
20919	70cm 19 el 16.2dBi 2.82m	£61.95
20623	23cm 23 el 17.9dBi 1.75m	£

Carriage £7.00 on any quantity of above Antenna

Double Your Life Nexcell NiMH Cells



AA-Size 1350mAh

Twice the capacity of normal ni-cad cells and no memory effect. Ideal for handhelds and digital cameras. As supplied to the police.

4 x AA cell pack	£9.95
4 x AAA cell pack	£9.95
AC charger (4 x cells)	£9.95
Postage £2.00 any quantity.	

Garmin Street Pilot



Now you can navigate at street level! A must for motorists or anybody travelling in an unknown area. This is the unit everybody has been waiting for. Phone or write for full detail.

Motorola Talkabout 200

PMR-446 New Low Price

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446MHz 500mW Handy
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38 CTCSS Tones
3 Kilometres Range
3 x AA Cells Req'd.
Now you can use a 446MHz handheld without a licence. Ideal for a wide range of uses. The package provides everything you need for personal communications. Just add 3 x AA cells and you are on the air!

£149 pair

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This month Rob Mannion G3XFD describes how you can add a single stage audio earpiece amplifier to the MK484 simple receiver, or a loudspeaker using a previous project. (An update to the January 'Radio Basics' appears on p.62 of this issue).

22 CARRYING ON THE PRACTICAL WAY

This month the Rev. George Dobbs G3RJV says he's describing "Manhattan - Paddy - Matrix and Island" techniques of construction. Intrigued with the ideas? Read the article and find out more.

24 WHAT IS A?

This month Ian Poole G3WYX tells you the answer to the question: 'What Is Gallium Arsenide?' It has many uses in Amateur Radio - so turn to page 24 and discover just what those uses are!

26 THE YAESU VX-5R TRI-BAND TRANSCEIVER

Have you ever been pleasantly surprised? Richard Newton G0RSN was when he tried out the new Yaesu VX-5R! He learnt quite a lot from this little Yaesu - one thing being that first impressions aren't always those you end up with when reviewing a rig!

28 SPURIOUS EMISSIONS

Gordon King G4VIV, PW's regular 'Looking At' author, tells you all about spurious emissions and responses and he has some suggestions as to how you can keep your transmissions as "clean and spurious-free" as possible in order to avoid that visit from the DTI!

32 OPERATING ON 136kHz

Peter Dodd G3LDO gives readers some details of current activity on the 136kHz band as well as telling you how you can use your existing wire antenna for listening and how to know when your receiver system is working properly.

36 SUMMIT MEETING

Sit back and relax as John Worthington GW3COI tells you a story about a time when Rob Mannion G3XFD visited North Wales to meet up with two contributors to PW - John, himself, and Patrick Allely GW3JW.

38 GET READY FOR TEN METRES!

Roger Laphorn G3XBM says that 28MHz is really 'opening up' and it's now time to get ready to join in the action. Don't forget - it's possible to 'work the world' in one day on 'Ten' - so open the magazine at this page and see what 'Ten' has to offer.

40 MAKING SENSE OF TRANSMISSION LINES

In this article, Geoffrey Billington G3EAE explains how you can make sense of transmission lines. He tells you all about pulse generators, the passage of a pulse, reflected waves, standing wave ratios and much more.

Marconi Magic from the Merchant Marine...

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44 DXPEDITION TO FLAT HOLM ISLAND

Clive Tombs GW4MOG tells a tale of a group of Radio Amateurs whose mission it was to set up an Amateur Radio station on Flat Holm Island in 24 hours, operate it around the clock and obtain numerous DX QSOs - all this as well as finding the time to fit in a reconstruction in honour of Marconi!

48 GET GOING ON MICROWAVES - PART 4

David Butler G4ASR brings you the fourth and final part of his mini-series on microwaves. In this last article, he lets you know where you can turn for more information and support if you've developed an interest in microwave operation.

52 ELECTRONICS-IN-ACTION

Tex Swann G1TEX brings you some feedback on the PW Sentinel project, on the ripple current capability of capacitors as well as a few books for electronics fans.

56 ANTENNA WORKSHOP

Charles Reynolds GW3JPT has been down to his local plumbing parts suppliers and on these pages are some traps that he has constructed in the outflow of his antenna!

58 VALVE & VINTAGE

This month Ben Nock G4BXD, PW's 'Military, Marine & Aviation' historical specialist author, is 'on duty' but seems to be in 'civvies' rather than uniform. Perhaps it's because he's got a little 'Marconi Magic' from the Merchant Marine on show this time!

60 MY EARLY DAYS IN THE RADIO INDUSTRY

Ray Fautley G3ASG reminisces over his early days working for a radio valve company back in the 1940s where he discovered that there was quite a lot to designing a low power radio.

72 WIN AN ALINCO DX-70TH!

Collect this month's second corner flash towards your chance to win your very own Alinco DX-70TH courtesy of Nevada. Final corner flash and entry form in the March 2000 PW.

75 BACK ISSUES SALE

There are a limited number of Back Issues available from the PW Book Store. This could be your chance to ensure that your collection of PW's is complete!

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Heading for a Summit Meeting in North Wales... Page 36



76 RadioScene

David Butler G4ASR
 analyses the recent Leonids
 meteor shower.



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Those of you who have been present when I give my *PW* 'Origins, Past, Present and Future' talk to clubs will know how I quote the fact that life often seems to go round in 'circles'. I say this here because after many years of writing this column, my own policies have met me full on and those writing to the *PW* 'Letters' page 'opinion platform' I value so much ... are themselves questioning the freedom offered. Read on and I'll explain!

Opinion & Feedback

When I wrote the first 'Keylines' back in 1989 - and it seems **very recent** to me, especially as it was only 120 *PW*s ago - the 'Keylines' page was introduced to achieve several aims. The first was to provide me with a page where I could air my thoughts, opinions and basic ideas.

Secondly, I also wrote the editorials with the aim of encouraging you all to be involved in the magazine. In particular, I hoped you would respond by writing letters, by telephoning, by chatting with me at shows (and more recently) write in via E-mail (which you certainly do nowadays!).

Thirdly, the 'Keylines' page provided opportunities for myself, as leader of the Editorial 'team' to tell you of new developments, changes, ideas and methods we're adopting from time-to-time. This is because the days when Editors were autocratic and remote - are gone. My team and I have to respond (and we really do try because we care for you and *PW*) to what you need. So, we really are grateful when you take the time to write in.

Publish & Be Damned?

In his interesting letter ('Letters' page 10 this month) **Andy Tillison M5ADK** comments on the opinions of another letter - which was written by **Philip Pimblott G3XVP** ('Letters' November 1999). The original letter from G3XVP made that author's opinions on various matters concerning our hobby very clear indeed - and Andy

politely takes me to task for publishing G3XVP's letter.

In replying to Andy's own letter I must make it clear that myself (as 'team leader'), **Joanna Williams** (News & Production Editor) and **'Tex' Swann G1TEX** (Technical Project Sub-editor/Photographer) all agree that our 'Letters' page **is there to offer an 'open forum' for all our readers. We do not see ourselves as 'Censors' in any form whatsoever.**

In fact, the only intervention at the *PW* end happens whenever someone seems to 'cross the line' of decency and their letter could be seen as becoming very personal (a not uncommon event!). This is when I send the letter back and ask them to reconsider, possibly re-writing their letter to avoid legal pitfalls and other problems while still getting their point across. It usually works well because they've 'let off steam' by then!

Many readers have openly supported our stance on letters and the often controversial topics aired by the writers. I'm always very pleased to hear from our readers that they agree with our policy - **but at the same time I must make it abundantly clear to everyone concerned that just because a letter has been published in *PW* does not mean that we agree with the contents!**

In fact, many letters and opinions appearing in the 'Letters' page leave me feeling just as disturbed as they do readers! However, wherever possible we always try to publish a 'balanced view' of opinions. I also feel that - although some letters are verging on what I would call distasteful ... **it's important to know that such opinions are in existence and, after all, although we might not agree with an individual's opinion - they are entitled to it aren't they?**

Hopefully - and I know this works to some extent because like many others I've written 'strongly worded' letters myself - and regretted it! - when extremely opinionated letter writers see their letters published ... they may think "Did I really write that"? Additionally,

they then may realise just how 'strongly worded' their letter was! **But, again I must say - it is their opinion, they are entitled to it and we live in a democracy.**

So, for the reasons I've outlined - our 'Letters' policy will continue and why shouldn't it? After all, you support *PW* so why shouldn't you have the opportunity to voice your opinion. Long live the debate - and the right to join in, I say!

'Frayed Edges' & Tempers

The letter from **Jack** in Surrey (full name and address supplied) in the 'Letters' page, on page 10, highlights a problem which seems to be getting worse. 'Road Rage' already exists - perhaps now we've also got '80m Rage'? And in the USA the Federal Communications Commission - via their 'Rule Enforcer' **Riley Hollingsworth K4ZDH** are already tackling the problem (see 'Scene USA', January *PW* page 60).

The incident in question started when Jack was involved in the QSO which drew the accusation of 'excessive bandwidth'. But he then quietly withdrew when tempers became frayed (along with the sideband 'edges').

When working late into the night I hear some very questionable QSOs on '80' - with much equally questionable language. No callsigns are used, contrary to licence requirements. But of course ... they don't think anyone is listening! So, for the sake of our hobby and its reputation - please remember **it is a hobby and it's supposed to be enjoyable.** Please make it so for others, whether they're listening to you or trying to complete a QSO either side of your frequency.

Implications For Amateur Radio?

The Department of Trade & Industry (DTI) press release in the 'News' section (page 13), may at first seem unconnected with Amateur Radio. However, when you consider the possibility of many extra

'neighbourhood' microwave distribution systems and necessary antennas - the possibility of problems arising can be realised.

What are the implications - if any - for Amateur Radio? To answer the question I will ensure that our specialist contributor **David Butler G4ASR** will cover it in his 'VHF Report' column. Watch this space - and if you've got any comments yourself ... let's hear from you too!

Amateur Radio Help Alive & Well!

John Noble's 'Thank you' letter, page 10 this issue, referring to his request for help - and the magnificent response from readers - proves beyond doubt (and the doom of doubters!) that the 'helping hand' aspect of the hobby is alive and well. I can say this with confidence because readers have helped me in the past and I know someone will help me again, as I now need your expert advice!

Firstly (for a future *PW* v.h.f. project) does anyone know of an equivalent for the old type **P.346A** and **C.426** transistors. (The latter is equivalent to a 2N1302 I believe). Can you help?

Secondly - Alex my youngest daughter's Sanyo music centre needs an **FT-G8** or **ST-G8** diamond record stylus. (No success with the spares dealers I know). Can you help with this and finding **Sanyo G3002** turntable drive belts?

It seems a shame that otherwise good equipment is idle for the sake of a small component. But I know *PW* readers will be able to help me track down what's needed. Cheerio for now.

Rob G3XFD



ROB MANNION G3XFD DISCUSSES VALUABLE READER FEEDBACK AND THE *PW* 'OPEN FORUM' POLICY



COMPILED BY ROB MANNION



The Star Letter will receive a voucher worth £10 to spend on items from our Book or other services offered by Practical Wireless. All other letters will receive a £5 voucher.

Clandestine Radio

Dear Sir

Although not a regular reader of *PW* I was recently browsing in W. H. Smith and was intrigued to see an article about radio sets used for clandestine purposes in the September issue. I was somewhat surprised to see details of the 121 set which I recall using whilst attached to the Territorial Army (TA) following my National Service with the Royal Signals.

Towards the end of my period of National Service in Vienna I volunteered for 'special duties' and returned to England where I firstly undertook a parachute course and then a period of intensive training in radio operating with much emphasis on reading signals through static and man made interference.

After 'demob' (demobilisation) we were required to undertake a number of training weekends and a summer camp with the TA every year. During the summer camp of 1955 we were told we were privileged to have the opportunity to use this new set that had been specially designed for the use of airborne units. This turned out to be the 121 set.

We subsequently went out to Worcestershire for a four day exercise using the set to maintain contact with base in Buckinghamshire. We were very impressed with the set which was not only lighter and easier to carry than anything we had previously used, but it also provided much better signals. However, we were less than impressed with the portable hand generator as its fixings were not robust enough for use in the field.

Unfortunately, this was the last year that I spent with the TA as my employment made it necessary to give up such commitments. I have subsequently seen a 121 set in the Royal Signals Museum at Blandford Forum where it was described as being used by radio operators attached to the SAS.

J MacKenzie
Hereford

Editor's comment: A fascinating story and I note that Mr MacKenzie lives (appropriately enough) in Hereford, the home of the Special Air Service (SAS)! Have other readers got any more memories like this? - if so we'd like to hear from you!

'Aunt Mary' On 28MHz

Dear Sir

Browsing through the vintage radio at rallies can stir the imagination. A 'dirty' a.m. transmitter, innards exposed, deprived of a little loving voltage, and forgetting the exciting conversations that used to circulate through its arteries. Alas forgotten for the next lady with thinner figure and seductive skirt. Yes that single side band temptress took up less space and the skinny wrench kicked Aunt Mary out of bed. Shame on you!

But all is not lost, if you feel in need of a large hearted lady with two side bands, she can be yours as I found out to my delight! The easiest place to find her at the moment on the Amateur Radio bands is 29-29.100MHz.

Yes, a.m. is alive and thriving in this small home for vintage equipment! I spoke to and got a reply from a Dansette G28 with a healthy 6146 heart via owner and enthusiast **Dan K3XR**, the Big Apple produced a Johnson Viking 1 in 'talk mode' and listening attentively a Collins R390. Caretaker of this wonderful pair? - It was **Paul K2LMO**.

Wow - this is better than any museum, next up a wonderful Heathkit Apache TX1, those two 6146s given speech by a single EL34 and a Collins listening in for the above set up. All driven with loving care by **Edd W8VQL**.

"Beautiful audio" I commented to such rigs as a Hammerlund SP600 (operator, **W9XU**) and a Barker and Williamson 5100 (a partner of **Mo W5KD**). I was having so much fun, four hours passed and it seemed like 20 minutes. You can do this too and it is more fun than a bag of Internet connections slowed down with treacle!

Just heard a heterodyne, what was I using? A TS-930S exciting pair of 3500Zs producing 100W carrier, yes that's 400W p.e.p. of talk power and, no, they don't mind talking to us swanky multi-modes, but be prepared, we are known affectionately as 'rice boxes'. (Hmm?). Oh yes, Aunt Mary says just call me A3E, it's a 'shorty' I know but it just fills the log space.

Having too much fun on 'Ten Metre' a.m. to write more!

Doug Cormack G4VZR
Gloucester

Editor's reply: As Doug's humorously eccentric letter suggests - 28MHz has been 'wide open' lately. I suggest we take advantage of the superb conditions now before it's too late! And I must admit - working all major continents on 28MHz a.m. back in 1968 with my old KW Vanguard and Eddystone 750 and a simple 'long wire' antenna provided me with memories I cherish 31 years later.

Amateur Radio Dead?

Dear Sir

As I approach the age when I slip towards the top of the callsign listings with the inevitable progression of putting a new beam in 'another place', I have cause to reflect on another aspect of something that 's also dying, namely Amateur Radio as it is now known!

Through the lack of foresight by our own National Society and some others in the world that claim to represent the amateur, we have a steady decline in those people that are enticed into a hobby that has failed miserably to modernise with the changes in social and economic conditions and available forms of communication.

On reflection, it seems that over the last 50 years, I have had an interest in Amateur Radio the debate goes on over "Morse or not", should we make it a more practical examination for the entrant to the City & Guilds examination? I have seen the nonsense of the Novice Licences and now the latest foolhardiness, the new h.f. licence that grants access to the bands with a 100W restriction. Of course the ability to send Morse at 5w.p.m. makes all the difference in the skill required to operate on the same!

I make no suggestion on how we might go about reversing the trend, hopefully the next international conference in 2002 or 2003 will at last enable a sensible set of conditions to amateur licences that are fitting for the new millennium. Before it does the following may be of interest: my nine year old grandson has just allowed me on the computer after being in touch by E-mail with a friend in Levin,

New Zealand.

At the moment the 10m band is dead at my QTH and no propagation in those that are open, so having the ability to send Morse would be of no avail! Perhaps there may be a lesson to those that are to direct the Amateur Radio future for the new generation. My Grandson can operate a modern computer much better than I and also appears to be able to time video recordings on my home video with skill! No, he can't read Morse and shows no inclination to do so ... rather like his grandfather!

Colin Burgess G8EWL
Middlesex

Amateur Radio Help - Alive & Well!

Dear Sir

Thank you for putting my little plea for about scanners in the *PW* December issue. I have always known Radio Amateurs as a great bunch. This time they have outdone themselves, Amateur Radio and their help is alive and well! Practically every post brings a letter with helpful suggestions. I am overwhelmed with gratitude.

I think I have replied to everyone thanking them but in case I missed anyone I wonder if you would put a little thank you note somewhere in *PW* for me. I'd be grateful.

John Noble
Kent

Editor's reply: **Our pleasure John! Without exception, everyone who has a request published seems to be overwhelmed with help from throughout the World of Amateur Radio. I find it very reassuring (See 'Keylines' for further comment).**

Technical 'Leanings'?

Dear Sir

Just a few thoughts on the demise of Amateur Radio. In the early 1970s it was recognised that certain people have a greater leaning to the technical side of the hobby. In other words, in the beginning we could experiment with p.m.r. gear, etc., converting it to 144MHz.

Then 'black boxes' started to come to 144MHz and the experimenters found themselves interfering with Class A 'chit-chat'. Did the authorities give us 70MHz to play around on and encourage experimentation? No...not for many a year. Old low-band Vanguards

and Cambridges suitable for the band were then committed to the scrap heap.

On the technical side of things, there is no better transmitter than the old push-pull output from an old p.m.r. equipment (provided the output is loosely coupled and the whole thing is tuned properly). A great number of people have scanners these days and to be able to receive amateur signals on 70MHz would greatly enhance the interest in radio.

At this moment in time, our licence allows us to experiment (provided we keep on good and level terms with our neighbours). How long is this privilege going to last?

Sandy Pimlott G8IDE
Devon

'Airing' The Washing Line

Dear Sir

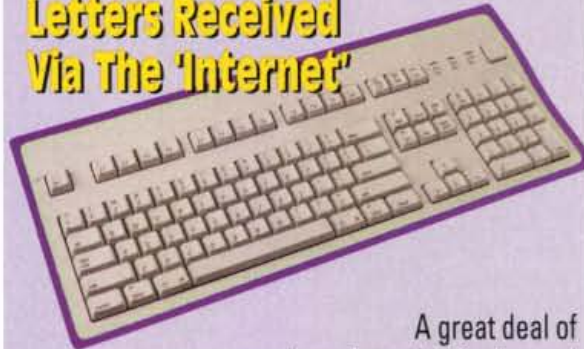
My Wife's rotary washing (the 'Whirlygig' type) line had seen better days. So we changed the plastic coated wire for a nice new green one, for the reasonable sum of £1.50 for the standard 30m replacement. All went well until now, yes the line was fine, but the part of the rotary line that goes into the ground, loaded with washing and licked by a 'strongish' wind decided to bend - to the point of the washing skimming the lawn! What has this tale of woe to do with Amateur Radio I hear you ask? Please read on to find out something to your advantage!

A brand new rotary line was bought and placed in position, fully operational and turning with ease. Result - one happy Wife again.

The old rotary line lay forlorn in the garden until I had an idea. Turning the rotary 'element' upside down with the part that should go into the ground pointing skyward, revealed the perfect groundplane!

So, out came the hacksaw to leave a stub of about two feet long. The old half-wave CB Radio 'Silver Rod' vertical antenna was located

Letters Received Via The 'Internet'



A great deal of correspondence intended for 'letters' now arrives via the 'Internet'. And although there's no problem in general with E-Mail, 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 don't forget to include your full postal address and callsign along with your E-Mail hieroglyphics! All letters intended for publication on this page must be clearly marked 'For Publication' (on the letter itself). **Editor**

and stripped down, out came the base loading coil, and two new connections were made from the bottom male PL259 and one to the radiator from the centre the other from the earth side to the bracket. It was then waterproofed with silicon rubber and re-assembled.

The antenna being some four feet shorter than it was when new, was bolted to the rotary stub, and the v.s.w.r. was carefully adjusted for the 50MHz band. And 'Hey Presto' low it works! (Just sat in the corner of the garden!).

Now remember the £1.50 plastic coated wire? (you know the nice green replacement type I'd bought) a quick check revealed no breaks in the wire, so I inserted a brass self-tapping screw into one end, cleaned up and tinned with solder. Next, the centre of a piece of RG58 coaxial cable was soldered onto the brass screw and the braid attached to a copper rod in the garden. In this way 'The 'Washing Line SWL Antenna' was born!

I hooked it up to my receiver - it works satisfactorily, although not as good as a G5RV of course, but for £1.50, the neighbours only see a washing line. Not such a bad 'wash day' was it?

Mel Gardiner
Suffolk

Editor's reply: **Innovation 'lives' in Suffolk, eh Mel? I'm now tempted to unravel the plastic**



Frayed Edges & Tempers on 3.5MHz

Dear Sir

Strange how I had this silly idea that radio, especially h.f., was a hobby to be enjoyed, but then I woke up and realised that I was on 3.5MHz and heard all the arguments, excessive bandwidth and some of the language would be more suitable on certain TV channels.

Now, I know that there is no rule laid down with regard to bandwidth but I have always believed that 3kHz either side is very acceptable for good operating practices so when people are spreading approximately 4-4.5kHz either side I think this is not very friendly behaviour but I am afraid the individuals behaving in this manner honestly feel that the attitude to others is "too bad" when it is pointed out to them. So, gentleman, let me go back to sleep and next time I wake up....perhaps I might hear people enjoying the radio bands again.

**Jack (Full name & Callsign supplied)
Surrey**

Editor's comment: Jack originally telephoned me on this matter - which disturbed him very much indeed - as it does myself and others. He then wrote in with the letter as published, providing his full name and address. Please see 'Keylines' for further comment on this matter.

rope on the 'Whirlygig' line in my garden and replace it with insulated wire. Perhaps in conjunction with a suitable antenna tuning unit it would work on the higher h.f. bands! However, knowing *PW* readers as I do ... I'm sure someone will have already tried the idea out.

"Fallen Out" With Democracy?

Dear Sir

The tale of woe by **Dennis Bowden G3PNF** in the October 1999 issue about his Amateur Radio club's lack of democracy strikes a chord. Seemingly, the problem is not unique in our hobby, as I once imagined,

though presumably his club rules were open for view before he joined so he "knew the score".

I was a member of a special interest radio group which had the trappings of democracy, supposedly elected officers and committee, a written constitution and an annual general meeting. Only, despite the trappings, I found it wasn't at all democratic. Suffice it to say that a number of members, in compliance with the constitution requested that an EGM be called. The committee, in clear defiance of the club rules, refused to hold the meeting, no doubt influenced by the fact that its proposed agenda included items critical of the committee and the way an election was conducted.

After much thought and deliberation, a few people decided the only practical way forward was to form a new group. It was hard work but very rewarding, so if G3PNF feels strongly about the issue and he has support of others with similar views, speaking from experience I can recommend starting from scratch. It does concentrate minds.

I fear that democracy these days is something many people pay lip service to when it suits them, like when they want votes or new members' subscriptions, but just try challenging the authority of the "big fish" or their policies! The trouble is this nauseating approach can permeate down from the top maybe even from national level and others happily follow the lead given, I dare

say it, by their "betters". As per the editorial comment by G3XFD following G3PNF's letter - I too say no more!

**Howard Aspinall G3RXH
North Yorkshire**

Reading PW In Australia

Dear Sir

Just thought I would let you know that on Tuesday 30th November I received December's *PW* magazine (November is not on the stands yet) and, as usual, it's a very good read. I noted with interest **Chris Edmonson VK3CE's** ('Aussi Oracle') contribution regarding his re-location and his venture into the fringes of the OutBack. He certainly has moved to a good location, the clean air should help him.

At the moment I'm in the process of checking my portable gear in preparation for the BushFire season. Like a lot of amateurs out here I belong to the local emergency services and provide the usual range of communications when needed. My age keeps me out of the front line these days but there's still a lot to be done as a Base Station.

This could be another very bad year for us, as the bush is bone dry and heavily overgrown, already we have had over 100 outbreaks of fires brought on by four days with the temperature going over 35°C here in Victoria. At the moment there is a cool change with some light rain but the heat will be back at the weekend. Oh well, such is life!

**Bruce VK3BIW
Australia**

Editor's comment: Nice to hear from you Bruce! We're getting an increased amount of 'feedback' from our Australian (and New Zealand too!) readers nowadays - and along with enjoying Chris VK3CE's column, we're delighted to have your support. So, best wishes from the Northern Hemisphere, particularly the *PW* Editorial office.

Publish & Be Damned?

Dear Sir

I am surprised to see you publish the thoughts of one Philip Pimblott whose letter you published in your November issue. You allowed him in his letter to describe CB operators, indeed all 27MHz operators as "IQ sub zeros" and later on to suggest that the "ridiculous" new A/B licence was for those who were "half interested" and half qualified.

As a new A/B licensee, I need not state the obvious defence of the licence, but would point out that such a letter was not ideally timed at a point when new operators will be trying your magazine for the first time. Indeed, your

magazine does not title itself as a purely Amateur Radio magazine, but simply calls itself *Practical Wireless*. Mr Pimblott may be horrified to know that I bought it for years as a serious CB operator and that my IQ, while not perhaps as high as his, qualifies me to be a College Lecturer.

May I say that Mr Pimblott's remarks were grossly offensive, over-opinionated and manifestly nonsense. I only hope that this person is NOT a radio 'Ham', (he included no callsign) and that if he is, that his operating protocol is more polite and in accordance with normal operation than this irate outpouring.

I might venture to suggest also, that

the Editor of this page might be a little more selective with the quality of material submitted, realising perhaps that such ramblings will not attract anyone into the hobby for fear of such unpleasant ridicule.

**Andy Tillison M5ADK
Burley in Wharfedale**

Editor's comment: I look forward to working you on h.f. Andy and I feel privileged to work ANY Radio Amateur on the bands! However, I take your point ... and as the Editor 'of this page' I'll ask you to join me on the 'Keylines' page where my stance on the matters mentioned will be explained.



COMPILED BY JOANNA WILLIAMS

Headline News



Headline news comes from **Kenwood** this month with the exciting news of their brand new **TM-D700E Data Communicator**. With first production scheduled for January 2000, Kenwood state that they hope to be able to ship off the new TM-D700Es to customers in the middle to late February 2000.

Kenwood tell PW: "We call it an APRS transceiver built for tomorrow's communication needs with advanced features available today". This mobile transceiver makes the most of SSTV, GPS and APRS and has a built-in TNC. Kenwood also say that the TM-D700E "offers a wide range of data communications options,

including simple Packet operation using the AX.25 protocol".

The new data communicator has a detachable front panel with an extension cable and panel holder supplied. This detachable panel consists of a 188x54 pixels backlit l.c.d. and multifunction key display, the press release says.

The TM-D700E is a full dual-band mobile and comes with many features: 9600bps PC-based Packet communications for chat - with simplified Packet monitoring; GPS input terminal; SSTV functions with Fast f.m. for transmission of images in just 14 seconds, according to the press release, as well as dual receive for voice & image transmissions.

Where memory's concerned, this new Kenwood mobile has 200 memory channels and up to ten programmable memory scan banks. Kenwood say that menu system is easy-to-use and similar to the TH-D7E (which, you might remember, PW reviewed in the May 1999 issue). List price of the TM-D700E is **£519.95**.

Once again, PW are hoping to get their hands on a review model of the TM-D700E Data Communicator, so look forward to a review of this new Kenwood mobile in the **very** near future! In the meantime, if you would like some more information on this new data communicator from Kenwood then please contact them direct:

**Kenwood,
Kenwood House,
Dwight Road, Watford,
Herts WD1 8EB.
Tel: (01923) 816444.**

Licence Free Icom

Icom (UK) Ltd are the latest to join other manufacturers in bringing out a Licence Free PMR-446 radio. The **IC-F4SR(446) u.h.f. transceiver** is "designed to meet the demands of the new licence free PMR-446 service" and is "aimed specifically at the commercial user or those who require a more robust product, such as outdoor activity enthusiasts".

Icom state that the IC-F4SR(446) combines the features of 'consumer' orientated product with "the robust build quality found in Icom's commercial equipment" and offers flexibility and instant communication "in and around buildings and over short distances".

They suggest that this new PMR-446 radio can be used in a number of ways: on building sites; catering; events management; neighbourhood watch; factories; farms as well as orienteering; walking or rambling. The 'F4SR(446)' covers all eight of the new u.h.f. channels, has an l.c.d. display which indicates the operating status "at a glance" so you know which channel is being used, how much battery life is left as well as other information.

Channel searching with the IC-F4SR is done automatically - it has an auto-channel selection function to find a free channel. The radio also has a group call function allowing exclusive groups to use the equipment without interference from each other - a "ringer function" gains the user's attention which, Icom Say, "adds a spot of familiarity for first-time users".



Each radio comes supplied with a wall charger, belt clip, handbook, quick-reference guide and rechargeable battery and it comes with a three-year warranty! Icom tell PW that they have set a guide price for the IC-F4SR(446) at **£169**. For more information please contact **Icom (UK) Ltd. Tel: (01227) 741741. FAX: (01227) 741742, Sea Street, Herne Bay, Kent CT6 8LD. Or you can E-mail: info@icomuk.co.uk or visit their Web site: www.icomuk.co.uk/**

Radio Controlled Aggression?



Low power radio modules are being put to interesting uses in these days of diverse hobbies. **Wood & Douglas Ltd.** of Hampshire have sent PW this very interesting photograph of **Roger Plant** of Plant Engineering in Somerset with his new robot - '**The Big Cheese**' - which, they tell us will be competing in the next BBC Two 'Robot Wars' series.

The remote link for controlling the hydraulic drive system and weapons of 'The Big Cheese' robot (sponsored by the dairy company, **St Ivel**) is provided by a **Wood & Douglas ST500 transmitter** and **SR500 receiver** which were both selected for "their small size, low power requirements and cost". Roger Plant says: "We chose Wood & Douglas because of their reputation, the suitability of the equipment and the price".

The ST500 and SR500 are available to cover the



COMPILED BY JOANNA WILLIAMS

400-500MHz with 8MHz bandwidth, Wood & Douglas say and both have multichannel capability. Ideal for short and medium range applications, the receiver modules and matching 100W transmitter "provide increased range over lower powered wide-band devices, yet have low current consumption and excellent large signal handling properties", the press release states.

For further information please contact **Chris Young, Wood & Douglas Ltd.** Tel: 0118-981 1444, FAX: 0118-981 1567 or E-mail: info@woodanddouglas.co.uk Alternatively, you can visit their Web site: <http://www.woodanddouglas.co.uk>

PC-Controlled Radio With WINRADIO!

A new advertiser in *Practical Wireless* in the form of **WINRADIO** could be of interest to readers. Based in Chelmsford, Essex, WINRADIO deal in PC-controlled receivers - both internal and external.

The WINRADIO **WR1000** and **WR1500** series are computer-based communications receivers "Designed for a wide range of professional and amateur applications" so the promotional material says. Whereas the

WR3100 series is "Designed for government, military, security, surveillance and industrial applications".

You only have to take a look at their Web site to understand a little bit about WINRADIO. There are quite a few products mentioned on the site at: <http://www.broadercasting.com> including the WR1000, WR1500 & WR3100 series mentioned above and much more besides.

According to WINRADIO's advert in the January 2000 *PW*, they also have a "digital suite" which comes with WEFAX/ HF Fax, Packet radio for the h.f. and v.h.f. bands, Aircraft Addressing and Reporting System (ACARS), audio oscilloscope, spectrum analyser with calibration cursors, squelch controlled AF recorder, DTMF, CTCSS decode and analyser (requires SoundBlaster 16 compatible sound card).

For more information on WINRADIO's products - including their new trunking software, please



contact them direct on: Tel: 0800-074 6263 or (01245) 348000. FAX: (01245) 287057. **Broadercasting Communication Systems, Unit B, Chelford Court, Robjohns Rd, Chelmsford, Essex CM1 3AG.** E-mail: info@broadercasting.com or visit their Web site at: <http://www.broadercasting.com>



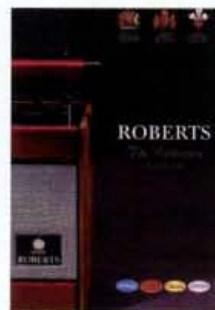
Roberts' Catalogue

As is usual for this time of year, new catalogues from manufacturers and dealers are now being released. One such catalogue is the new **Roberts' Radio Catalogue** called 'Roberts - The Collection' Volume One.

Roberts Radio say that this new brochure includes all the latest introductions for the year 2000 including a new range of clock radios called 'Range Magnesium' and a new range of portable radios in a 'Lifestyle' range. For those of you who aren't familiar with Roberts Radios, the inside front cover of the catalogue tells you a little bit about the company.

According to the catalogue, "Constant development has resulted in the current collection of four distinct ranges that combine traditional materials and skills with leading-edge technology". These four ranges are called: REVIVAL; CLASSIC; LIFESTYLE and WORLD radios.

For more information on the catalogue or any of Roberts' radios please contact them directly on Tel: (01709) 571722. FAX: (01709) 571255. PO Box 130, Mexborough, South Yorkshire S64 8YT.



Trek To Support MAG

Gordon Smith G7UHP has been in contact with *Practical Wireless* to tell us all about a trek which he is taking part in to raise money for **MAG - Mines Advisory Group**. This charity, MAG, is "dedicated to reducing the loss of life and limb caused by land mines and unexploded ordnance (UXO)".

The ten day trek across Namibia's desert will be taking place around the middle of next year and is supported by Trevor Bayliss, Amanda Redman and Paul Burrell (former butler to Diana, Princess of Wales). Gordon is looking for people, businesses, etc., who will be able to offer him any financial or technical help.

If you can help then please contact Gordon directly at 256 Jockey Rd, Sutton Coldfield, West Midlands B73 5XP.

including a purpose-built, fully equipped shack. For all enquiries or queries please contact the **Club Secretary Russell Bradley** on (01773) 783384.

The Welsh Amateur Radio Exhibition

The **Barry Amateur Radio Rally** has been renamed and is now to be known as 'The Welsh Amateur Radio Exhibition'. The next one will be taking place on Sunday 26th March 2000 and John Cooper says that it will be the "best yet".

This year they say that they will be featuring, "centre stage", their "Multimedia Shack" presentation with "live demonstrations of computer aided station management, computer rig control and many digital modes".

The Welsh Amateur Radio

Change Of Venue

The **South Normanton & District ARC** have asked if *PW* would publish the following notice: "As from Monday 10th January 2000, South Normanton & District ARC will be meeting at their new headquarters, based at the Village Hall, Market Place, South Normanton, near Alfreton, Derbyshire. The new venue offers superior facilities to the old meeting place,

New Book In Store

Ladder Crystal Filters, a book published by **MFJ Enterprises**, is designed for "Engineers, technicians, amateur radio operators and students" and will be of use if you require an "in-depth understanding of Ladder Crystal Filters" and anyone interested in the development and construction of them would



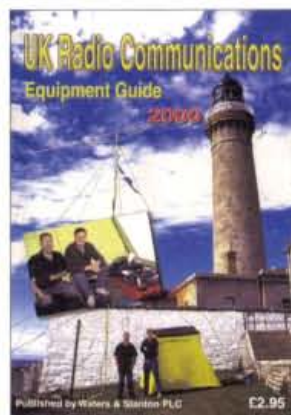
Exhibition will be held at the original venue - the newly refurbished **Memorial Hall, Barry, South Glamorgan**. With ample parking, licensed bar and catering. It opens at 1000 for disabled visitors, 1030 to the general public.

For further information please contact: **Brian Brown on Tel: (01222) 832253**.

All Colour Communications Catalogue!

Waters & Stanton PLC (W&S) have sent *PW* a copy of their new "all colour 274 page catalogue and equipment guide" - new for the year 2000. Most of you would have seen the catalogue before and this year's offering contains 32 pages more than the 1999 catalogue which, **Peter Waters G3OJV** says, is down to their "ever widening range of products".

As with other years, the catalogue contains some vouchers for customer's use, this time offering free delivery on some orders (conditions apply). So, if you're interested in taking a



find this a "handy reference guide", the book states.

With this book, the amateur or the professional would be able to "design and construct very high quality crystal filters for use in shortwave radio, amateur and commercial equipment". The author of this book, **John Pivnichny N2DCH** has "added generous references including essentially every published paper on the subject to date" so you should have all the help you need if

look at what **Waters & Stanton** have to offer then why not order yourself a copy of their very latest catalogue? The 'UK Radio Communications Equipment Guide' costs **£2.95** plus **£1.25 P&P**. Please contact **W&S on Tel: (01702) 206835, FAX: (01702) 205843, Spa House, 22 Main Rd, Hockley, Essex SS5 4QS**. Or E-mail: **info@wsplc.demon.co.uk** You will find their Web site at: **www.waters-and-stanton.co.uk**

Picketts Lock 2000!

RadioSport have been in touch with *Practical Wireless* to tell us the dates for the **London Amateur Radio & Computer Show 2000**. The next show will be taking place at the same venue - **Picketts Lock** - on **Saturday 11th and Sunday 12th March 2000**.

There will be the usual "mix of exhibitors", **RadioSport** tell *PW* as well as: stands by Japanese Amateur Radio manufacturers; electronic component vendors; computer component, upgrade and systems traders; computer software providers; special interest groups; a large Bring & Buy stand; national societies and bodies and local clubs.

Free parking is available and there will be other family attractions such as sport, cinema, swimming, golf, etc. There will be a bar and restaurants, lectures, on-demand Morse tests, disabled facilities and a Talk-in. **For more details please contact RadioSport on (01923) 893929**.

you would like to know more about the design and construction of these filters.

You can get your hands on this book by telephoning the **PW Book Store on Tel: (01202) 659930**, or you can use the **Order Form on p.90** of this issue. Alternatively you can write to the Book Store at **PW Publishing Ltd., Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW**. *Ladder Crystal Filters* costs **£14.95** and is in stock now.

Electromail CDROM Catalogue

Electromail - sister company to **RS Components** - have released their CDROM catalogue for the November 1999 - February 2000 period. You might have seen the **Electromail** advert in recent issues of *PW*.

The **Electromail** CDROM "contains over 107 000 technical products, as well as an extensive library of datasheets and access to specialised technical helplines". You should find almost anything you need for even the most complicated project - "from capacitors, resistors, semi-conductors, switches and voltage converters to tools, health & safety and test & measurement equipment".

Electromail tell *PW* that orders are taken 24 hours a day, 365 days of the year and "every product is guaranteed to be despatched within 48 hours". These orders can be posted by cheque, or processed quickly by telephone or FAX. The CDROM catalogue costs **£3.99**

and is available by phoning **(01536) 204555** or by FAX:

(01536) 405555 with credit card details or you can write to **Electromail, PO Box 33, Corby, Northants NN17 9EL** with a cheque made payable to **Electromail**.



Telecom Links To Homes & Business By Radio

In early December 1999, the *Practical Wireless* news desk received a Department of Trade & Industry Press release dated 22nd November entitled "Consultation On Telecommunication Links By Radio" which will obviously be of great interest to *PW* readers. In the press release **Patricia Hewitt**, Minister of State for Small Business & E-Commerce, announced plans to licence wireless telecommunications services to homes and business.

Elaborating on the announcement Ms Hewitt said "Fixed wireless access offers an alternative method of connection to provide telecommunications service - which could include Internet - to homes and businesses using radio rather than fixed copper wire. This can reduce costs for consumers and operators as it removes the need to 'fly' wire across country or dig up roads to provide fixed telecommunications links".

Ms Hewitt then launched a consultation

into radio frequencies at 3.4GHz, known as 'Fixed Wireless Access'. These frequencies were previously licensed to **Ionica PLC*** (see note below) but were returned to the Government as a result of the company going into receivership.

The purpose of the consultation is to determine: Whether the frequencies should be used solely to provide voice services or to provide voice plus additional service; and whether operators should be licensed to provide services on a national, regional or sub-regional basis.

(Closing date for consultation was 20th December 1999).

* The Cambridge-based company **Ionica PLC** was originally awarded a licence to operate a Fixed Wireless Access service using 3.4GHz frequencies in 1993. Subsequently a second licence using 10GHz frequencies was awarded in 1996. (The company went into administration in October 1998).

Editorial comment: The news contained in this press release obviously has much of interest to **Radio Amateurs** - and many possible implications. So, I ask you to please join me on the 'Keylines' page for further comment. **Rob Mannion G3XFD**.

FOR A FREE MENTION ON THESE PAGES SEND YOUR NEWS & PRODUCT INFORMATION TO THE NEWSDESK TODAY!

RADIO DIARY

2000

January 16: Oldham ARC will be holding their rally at the Queen Elizabeth Hall, Civic Centre, West Street, Oldham, Lancashire. Doors open 1100, 1030 for disabled visitors. Event features the usual traders and a Bring & Buy stall, Morse tests available on demand. Talk-in on S22 via GB4ORC, commencing 0730. Refreshments and free parking will be available. Further details on (01706) 367454. E-mail: m1c1v@netcomuk.co.uk

January 23: The Lancastrian Rally will be taking place at Lancaster University. Routes from south - leave M6 at J33, routes from north - leave M6 at J34. Doors open at 1100, 1030 for disabled visitors. Entrance fee is £1.50. There will be a Bring & Buy, Morse tests on demand - two passport photos required. Licensed Café on site. For booking details contact (01772) 621954.

February 6: The 15th South Essex Amateur Radio Society are holding their Radio & Computer Rally at the Paddocks, (situated at the end of the A130), Long Road, Canvey Island, Essex. Doors open from 1030 and features include Amateur Radio, Computer & Electronic components exhibitors, Bring & Buy, RSGB Morse testing on demand (two passport photos required). There will also be home-made refreshments, free car parking with space outside main doors for disabled visitors. Admission is just £1. More information from **Brian G7HIO** on (01268) 756331 before 2100 please.

February 6: Harwell Amateur Radio Society will be holding a Radio & Computing Rally at the Harwell Science & Engineering Centre located just off the A34 between Oxford & Newbury. Doors open 1030-1530. Signposted from A34. Talk-in on 145.550MHz. Further details from **Ann G8NVI** on (01235) 816379 or on <http://www.hamradio.harwell.com>

February 13: The Northern Cross Rally is to be held at Thornes Park Athletics Stadium, Wakefield, in one large hall, just out of town on the Horbury Road, easy access from M1 J39 & J40 - well signposted and with talk-in on 2m and 70cm. Doors open 1100 (1030 for disabled visitors and Bring & Buy). Details from **Roy G0TBY** on (01924) 893321 (combined telephone and FAX number), E-mail: rally@sandalmagna.demon.co.uk or check their Web site at: <http://www.sandalmagna.demon.co.uk/rally/>

February 13: Cambridge & District ARC are holding their annual club Rally and Car Boot Sale in the Ambulance station at Addenbrookes Hospital, Cambridge. Opens at 1000 for disabled visitors, 1030 to the general public. There will be a Bring & Buy, WC, Bar, Talk-in on S22, car park, adults £1.50, children free. For further information contact **John Bonner G0GKP**, 40 Lyles Rd, Cottenham, Cambridge CB4 4QR or Tel: (01954) 200072.

March 11/12: The London Amateur Radio & Computer Show. There will be the usual mix of exhibitors at this two-day event, including: computer software providers, special interest groups, a large Bring & Buy, local clubs, large and small Amateur Radio equipment dealers, electronic component vendors and lots more. In addition there will be free parking, family attractions (sport, cinema, swimming, golf, etc.), bar and restaurants, lectures, on-demand Morse tests, disabled facilities and a talk-in. Further information is available from **RadioSport** on (01923) 893929.

March 12: The Wythall Radio Club are holding their 15th Annual Radio & Computer Rally at Wythall Park, Silver Street, Wythall, near Birmingham. Doors open 1000 till 1600 and admission is only £1.50. Plenty of traders in three halls and a large marquee with bar and refreshment facilities on site plus a big Bring & Buy stand. Talk-in on S22. There will also be a unique free

park and ride for easy and comfortable parking. Contact **Chris G0EYO** on 0121-246 7267 evenings, weekends for details, FAX: 0121-246 7268 or E-mail chris@g0eyo.freemove.co.uk

March 18: The 7th West Wales Amateur Radio & Computer Rally will be held at Penparcau School, Aberystwyth. Doors open 1000 till 1530 and admission is just £1. Good parking facilities with easy access for disabled and traders for all stalls. Demonstrations of h.f., v.h.f., packet on the air. Amateur Radio and Computer Traders, Bring & Buy, clubs and special interest groups. Catering facilities also. Talk-in on S22. **Ray GW7AGG** on (01686) 628778 or home QTH.

March 19: The Norbreck Amateur Radio, Electronics and Computing Exhibition, organised by the Northern Amateur Radio Societies Association (NARSA), is to be held at the Norbreck Castle Exhibition Centre, Blackpool. Don't miss the largest single day exhibition in the country. **Peter Denton G6CGF** on 0151-630 5790.

March 19: Bournemouth Radio Society's 13th annual sale is to be held at Kinson Community Centre, Pelhams Park, Millhams Rd, Kinson, Bournemouth. Doors open 1030 and close at 1630. Talk-in from G1BRS on 2m/S22. Amateur Radio and computer traders, clubs and specialised groups, excellent refreshments, admission £1. Details from **Olive or Frank Goodger**, 66 Selkirk Close, Merley, Wimborne, Dorset BH21 1TP or Tel: (01202) 887721.

April 16: The 16th Yeovil QRP Convention is to be held at Digby Hall, Sherborne, Dorset. Doors open at 1000, talk-in on S22. There will be traders, construction challenge contest judging, three talks, QRP forum, in-hall catering, free parking, invalid facilities. Further details on (01935) 813054.

April 16: Swansea ARS will be holding their annual show in the Swansea Leisure Centre on the A4067

Swansea-Mumbles coast road. Doors open 1030-1700 and attractions include: trade stands, Bring & Buy, local interest groups and full catering & licensed bar. Admission is only £1, children just 50p. Further details from **Roger Williams GW4HSH**, Show Secretary, on (01792) 404422.

May 7: The Drayton Manor Radio & Computer Rally will be taking place at Drayton Manor Park, Fazeley, Tamworth, Staffs on A4091. Main traders in four marquees, large outside traders flea market, Bring & Buy stall, local clubs and special interest stands. Opens 1000 onwards. Trade information from **Norman 0121-422 9787**, other information from **Peter G6DRN 0121-443 1189**, evenings please.

May 21: The Three Counties Radio & Computer Rally is to be held at Perdiswell Leisure Centre, Bilford Road, Worcester. There will be trade stands, radio and computer dealers, parts and accessories, refreshments, licenced bar and free car parking. Trade stands available, contact **Eddie Cotton** on (01905) 773181.

June 18: The Newbury & DARS will be holding their 14th annual Amateur Radio Car Boot Sale at Cold Ash playing field near Newbury, Berkshire. Sellers/traders should arrive at 0800 and the sale will be open from 0900-1500. Sellers/traders don't need to pre-book and the charge is £9 per normal size pitch. Any telephone enquiries should be made to **George Cook** on Tel: (01488) 682814.

July 9: The 11th York Radio Rally will be held in the Knavesmire Building, York Racecourse, York. Doors will open at 1030 and admission is £2 - children accompanied by an adult will be admitted free. Ample free parking, Amateur Radio, electronics and computers, Morse tests and repeater groups, refreshments and licensed bar. Talk-in on S22. Further details from **Pat Trask G0DRF** on (01904) 628036.

November 12: The Midland Amateur Radio Society are holding their 12th Radio & Computer Rally at Stockland Green Leisure Centre, Slade Road, Erdington, Birmingham. Doors open at 1000. There will be a large, free car park, special interest exhibits, local clubs, etc. More trader information from **Norman G8BHE** on 0121-422 9787 or general information from **Peter G6DRN** on 0121-443 1189.

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.

The Editorial Staff of PW cannot be held responsible for information on Rallies, as this is supplied by the organisers and is published in good faith as a service to readers. If you have any queries about a particular event, please contact the organisers direct. - Editor

TROUBLE FINDING PW EACH MONTH?

We need to know if any of you are having problems obtaining *Practical Wireless*. If you can't find a regular outlet, then let us know. Please contact **Distribution Complaints** by telephone (01202) 659910, FAX: (01202) 659950, E-mail: dist-comp@pwpublishing.ltd.uk or by letter to: **Distribution Complaints, PW Publishing Ltd., Arrowsmith Court Station Approach, Broadstone, Dorset BH18 8PW.**

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73 from Dave G4KQH, Technical Manager.

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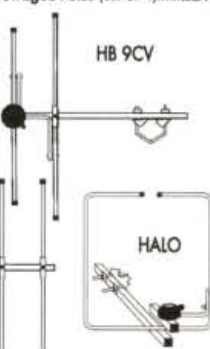
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RADIO BASICS

This month Rob Mannion G3XFD describes how you can add a single stage audio earpiece amplifier to the MK484 simple receiver, or a loudspeaker using a previous project. There's even a chance to add long and medium wave switching.

As promised last month, this time I'm going to describe an extremely simple one transistor amplifier stage so that you can get a little more volume out of the ZN414 replacement 't.r.f. radio chip' - the MK484 project described last month. Fortunately, these remarkably efficient, easy-to-use and rugged little devices are once again available - at the bargain price of £1!

However, before I get 'stuck in' to this month's project I have an apology to make to anyone who built the MK484 because I forgot to mention a requirement in the circuit last month that could effect the success of receivers using 'metal chassis' tuning capacitors.

I wrongly assumed that most of the readers following the series would use the polyvaricon type of variable capacitors. Instead, quite a few decided to use 'air spaced' open frame type of capacitors (my own preference).

Despite the omission on my part (for which I apologise of course) the receiver circuit will work very well with 'open frame' variable capacitors

- and polyvaricons too - but could suffer 'hand capacitance' or hand-induced instability. (In other words, whenever your hand goes near the tuning control the receiver could whistle, drift off frequency or become difficult to tune).

The cure is simple - all you have to do is to ensure that the 'chassis' connection of the (Metal framed* 'air dielectric') variable capacitor is connected to the junction of the ferrite rod coil, 100kΩ resistor and the 10nF capacitor. (The other end of the coil and the other terminal of the variable capacitor are connected to the input of the MK484).

**The 'chassis' connection on the polyvaricon type capacitor is usually the centre solder tag. (They too are 'double ganged' units, with the centre tag forming the 'common' connection, and the two outer tags are for connections to the two separate tuning sections).*

The Circuit

The main circuit we're using this month is shown in Fig. 1. Here, as you'll realise is the MK484 project I described last month (remember that the MK484 'pin out' differs slightly from that of the original ZN414), together with an extremely simple one transistor amplifier stage using the BC184 (the 'pin-out' for the BC184 is shown as an inset in Fig. 1).

The BC184 is the radio constructor's 'dream' as it only costs around 10 pence! It's also rugged and in this configuration offers enough audio signal gain to provide enough power to drive a telephone type earpiece. The audio input 'take off' point was chosen carefully so that I could almost guarantee trouble free operation for constructors.

So, remember that every circuit I present here has been extensively 'tried and tested' and, although more experienced constructors will sometimes see (from the circuits presented) that slightly better

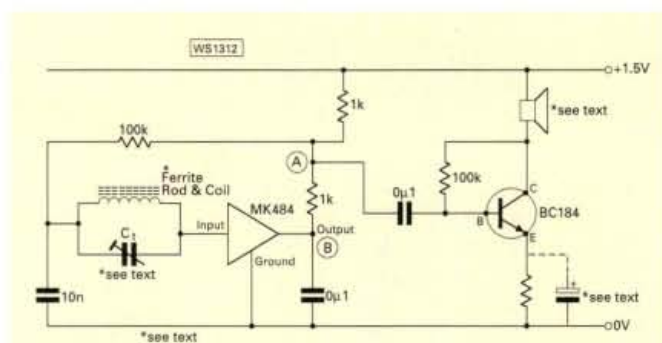


Fig. 1: Circuit of the MK484 receiver with added BC184 single transistor audio amplifier stage, with the pin-out diagram of the transistor shown as an inset (right). The resistor shown in the Emitter (E) circuit of the BC184 is an optional 270Ω (see text). The electrolytic capacitor (shown with a 'hatched' line) in the emitter circuit is of a value between 1 and 50μF and can improve audio quality if the 270Ω resistor is used.

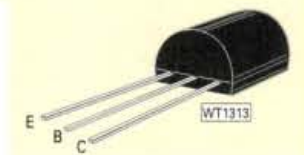


Fig. 2: A selection of the various types of telephone earpiece inserts available as 'surplus'. Offering a relatively low impedance these units are remarkable sensitive and robust and are very useful for use in radio projects (see text).

results can sometimes be achieved, I've often chosen to reduce performance slightly to maintain trouble free operation. Well, that's the idea anyway ... and the part quotation 'best laid plans of mice and men' seems appropriate in this instance!

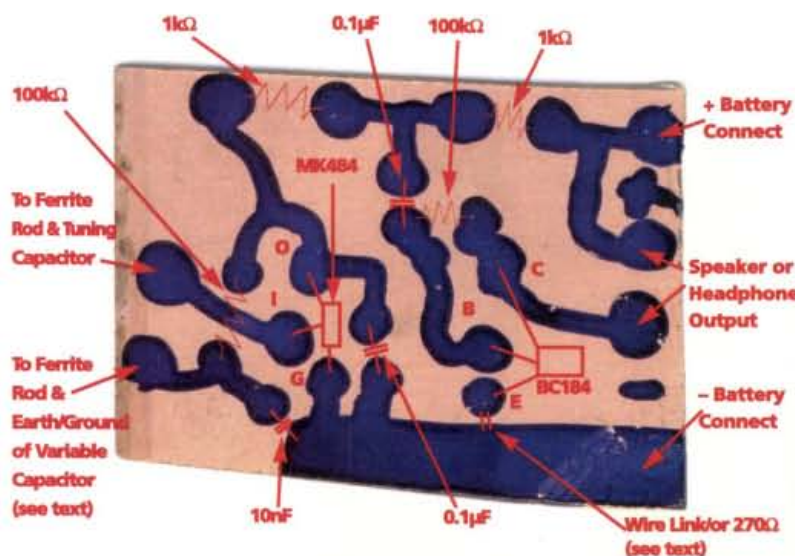
Telephone Earpiece

Several readers have asked me about suitable telephone earpieces which might be suitable for the MK484 circuit. So, to help, the photograph in Fig. 2 shows some of the more common older surplus types found in the United Kingdom and associated Islands and the Irish Republic.

Additionally, in Fig. 2, I've included another common type (also found throughout Europe) - the Ericsson insert (right) from Scandinavia. They're all very sensitive and some are of the balanced armature type which offer

good quality and sensitivity. Surprisingly perhaps, the telephone earpiece inserts offer a good 'load' to the MK484 or the BC184 and you'll

Fig. 3: Annotated photograph showing the etch-resist p.c.b. design for MK484 and one transistor amplifier before etching in Ferric Chloride solution. The board size is 40 × 50mm approximately.



get a very good audio output from them in the circuits I've shown.

With the amplifier circuit shown, there's enough gain to operate a small speaker - from around 40mm diameter up to a diameter of around 65mm. However, take note that the volume you can expect from driving 'loudspeakers' of this sensitivity will equate to 'loud headphone level' only.

Although the single transistor amplifier won't 'fill the room' with sound from even a small speaker - the quality is very reasonable and the speakers are (nowadays) somewhat easier to buy than the telephone type earpiece inserts - which are only available spasmodically on the surplus market. Whereas the loudspeakers are available very easily and cheaply (from about 75p).

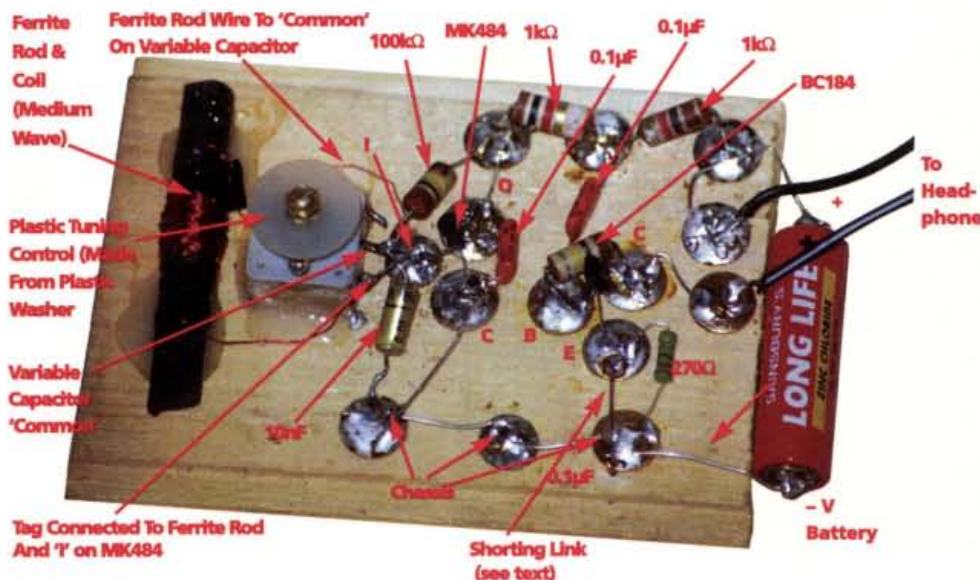
Note: The one transistor amplifier will provide adequate 'headphone' volume levels when used with portable cassette headphones. These headphones are often available at around £1.50 a pair and although not that sensitive - will be adequate for this purpose.

Printed Circuit Design

As usual I've provided a design for the technique I've used many years in teaching 'Radio Basics' ... my favourite 'components on the same side of the track' type p.c.b. technique. The design I've marked out onto a small piece of p.c.b. material, **Fig. 3**, can easily be accommodated on an off-cut or scrap of board. In fact, this is what I've done, hence the slightly odd shape of the board.

The design is drawn out with an etch-resist applicator pen onto the board, which I suggest can measure approximately 50 by 40mm. The board in **Fig. 3** is ready for etching and the annotated photographs show the component placements.

Fig. 4: The completed p.c.b. with tinned wires (left) ready to connect to the ferrite rod/variable capacitor combination (see text).



In the photograph reproduced in **Fig. 4**, I've provided a completed (and tested 'on air') receiver using the track lay-out in **Fig. 3**. Please note that the layout in this design omits the (optional) 270Ω resistor in the emitter of the BC184 amplifier transistor.

In the completed project the emitter of the BC184 is shown connected direct to '0V' or 'chassis'. However, in the marked up board (**Fig. 3**) ready for etching, you'll see that the BC184 'Emitter' p.c.b. 'pad' is not connected to the '0V' or 'chassis' - allowing the 270Ω resistor to be used in areas or high signal strength.

In strong signal areas (big cities where transmitters are likely to be relatively 'local') the 270Ω resistor will reduce the output level somewhat - making headphone volume level more comfortable. (To insert the resistor, connect one end to the '0V' or 'chassis' end and the other to the emitter 'pad' of the BC184).

Bread Board Version

Again, for those of you who prefer to 'bread board' the projects - I've also provided a tried and tested

Fig. 5: The drawing pin and board lay-out for the MK484 radio. In this design the optional 270Ω resistor is shown in place by 'short circuited' with connecting wire (see text).

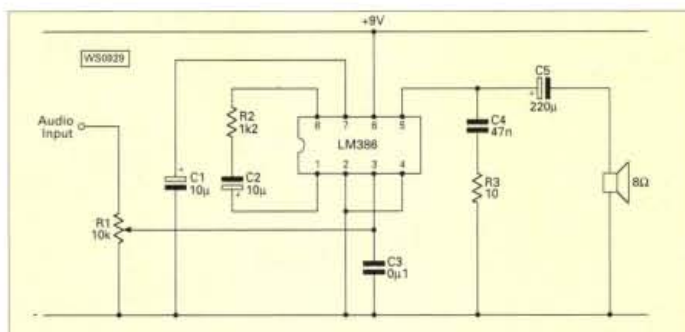


Fig. 6: Suitable amplifier circuit for full loudspeaker operation of the MK484 receiver. When used with the MK484 receiver, the 100nF capacitor (which was previously connected to the base of the BC184 transistor) is connected directly to 'audio input' on the amplifier (see text). This amplifier will drive a large - up to 100mm diameter - loudspeaker with adequate volume.

'drawing pin and board' version of the MK484 radio and amplifier in **Fig. 5**. Incidentally, all my prototypes are (unashamedly) built in this fashion. I find it's an ideal prototype method for simple long medium, and h.f. radio receivers.

Note: You'll see from the photograph of the drawing pin and board version of the project that the 270Ω resistor is actually shown in place in the emitter circuit of the BC184. However, although it's in place, the resistor is shorted out by tinned wire. I suggest that you try the resistor in place first and then taking it out (or shorting it) to see how much difference it makes in your area.

Using The Basi-Tracer

For those of you who built the 'Basi-Tracer' AF & RF probe - you'll be able to use it to advantage with this project and you'll get a very good idea of the volume - and

the sensitivity of the receiver at the same time. And to help - I've marked the audio test points as 'A' and 'B' on **Fig. 1**.

When you apply the AF probe of the 'Basi-Tracer' to either of the test points (don't forget to connect the 'crocodile' clip chassis connection of the audio probe to the 'chassis' (negative or 'ground') of the receiver project). I've no doubt that you'll be surprised at the volume level and how sensitive the receiver is. The audio quality won't exactly be 'hi-fi' due to the small loudspeaker - but even so it's surprisingly good!

Once you've decided which test point provides the best results, you may like to build (or use the amplifier you built originally) the 'Radio Basics' amplifier from page 16 in the June 1998 PW and reproduced here as **Fig. 6**. (And of course, the 'Basi-Tracer' uses the same amplifier circuit).

Make sure that the 'chassis' (ground) of the receiver and amplifier are connected together by soldering a link wire between

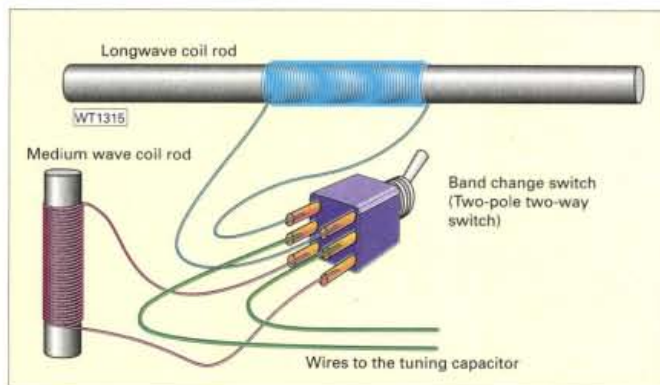


Fig. 7: The ideal technique (if you have the space available) for providing long and medium wave coverage with an MK484 receiver. Note that in practice both the long and medium wave coils are 'bunch' or 'pile' wound (see text and December 1999 for winding details).

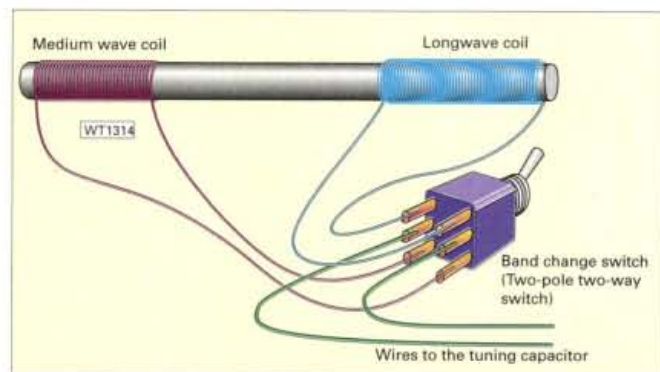


Fig. 8: A compromise (although it still works well) dual-band coverage long and medium wave ferrite rod assembly. Note that in practice both coils are 'bunch' or 'pile' wound at either end of the rod - leaving 10% of the rod uncovered at either end after winding (see text).

them. However, it's best to keep the receiver 1.5V supply and the amplifier 9V supply separate for the time being to avoid damaging the MK484 although if you can arrange a 'tapped voltage' supply (from six 1.5V 'pen cell' (AA) batteries for example, taking the MK484 supply from the first 1.5V in the 'series' supply) you'll be quite safe! (For full constructional details refer to June 1998 or the 'Basi-Tracer' project).

Long & Medium Waves

I've no doubt that for many uses - particularly if the receivers are being built as simple project gifts, or are being built as 'first projects' that they will start off as single band receivers - mainly on the medium wave band (which - this makes me very cross! - many sources now quote as being the 'AM' band. I suppose they don't realise that amplitude modulation is transmitted on other frequencies?). Despite this, it's not at all difficult to make the receivers work well on long and medium waves - with a little bit of 'switchery'!

The original Ferranti ZN414 application data booklet

and the Second Edition of August 1974 both suggest that a single-pole band-changing arrangement can be used. However, in practice I've found that this technique results in sensitivity being lost on both l.w. and m.w. and after much experimenting and research I found other ways of achieving better results and with simple switching.

The illustration in **Fig. 7** shows the **absolute ideal** way of providing Long and Medium wave coverage for

the MK484 receiver - using two separate ferrite rod antennas, one for long waves and one for medium waves. A simple double-pole changeover (DPCO) switch selects either waveband, with the 'switched out' rod and tuning coil causing the least ill-effect to the coil in use. (In practice, the m.w. rod and coil can be shorter and smaller than the l.w., leaving room for the antenna rods to be mounted at right angles, thus lessening interaction as much as possible).

If you don't have enough room to have two separate ferrite rod antennas and coils, the compromise arrangement in **Fig. 8** will work adequately well. In practice it's best to wind the tuning coils as far apart on the ferrite rod as possible and to keep the separate connecting leads as far apart as possible - except where this can't be avoided (at the switch for example).

Note: Although Tex Swann G1TEX our technical draughtsman/illustrator has drawn the coil winding wound 'side by side' for clarity, in practice I've found it's best to 'pile wind' the tuning coils for best results. (All my conclusions have come from practical 'on air' tests). The photograph, **Fig. 9**, a fixed tuned MK484 (with BC184 a.f. amplifier) 198kHz BBC Radio 4 integral earpiece 'personal pillow receiver' (built for Carol, my wife) shows the pile-wound ferrite rod

sealed in wax as a protection against being accidentally dropped.

The second example, **Fig. 10**, is a long and medium wave MK484 only receiver, tuned by a Jackson solid-dielectric 500pF variable capacitor. This receiver (it uses a separate earphone) has the band-changing switch mounted on the top right. Once completed the ferrite rod (note 'bunch wound' coils) was wrapped at either end in soft plastic tape and sealed in wax. The band-changing switch is kept well clear of the ferrite rod end by the plastic tape. Almost waterproof, this type of construction makes a very rugged receiver for 'hill walking' - not that I do much of that nowadays!



Fig. 10: A two band MK484 receiver (no extra amplifier) employing a Jackson solid dielectric 500pF tuning capacitor and 'shock mounted' ferrite rod assembly (see text). This receiver uses a separate earpiece and was built by G3XFD for his own use.

Have Fun!

I hope you have fun building the MK484 receivers. I hope to use this useful little device on a 'fun

project' for v.h.f. later on this year (How you may ask?). Well, you'll have to wait and see - but it should get you on v.h.f. anyway!

Next month I'll be looking at simple methods for checking the values of fixed and variable capacitors. Until then cheerio for now, keep busy during these dark nights and never let your soldering iron get too cold!

PW

Fig. 9: A single band (long wave) fixed tuned 198kHz BBC Radio 4 receiver built by G3XFD using the MK484 and BC184 combination and an integrally-mounted earpiece. Note the pile-wound ferrite rod antenna - sealed in wax (at the bottom of picture) the 'postage stamp' tuning trimmer and that the sealed (using epoxy resin adhesive) in earpiece and battery, both of which are as far from the antenna as possible for good reception.



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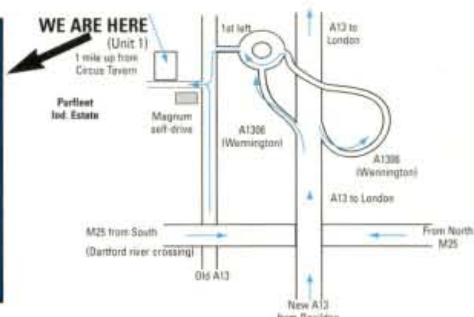
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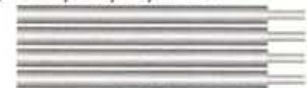
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Carrying on the Practical Way



'Lifting the lid' on some of the methods employed with 'Ugly' construction and using printed circuit board material for non-printed circuit design.

"...she well knew the great architectural secret of decorating her constructions, and never descended to constructing a decoration."

(from *Barchester Towers* - by Anthony Trollope 1815 - 1882)

This month the Rev. George Dobbs G3RJV says he's describing "Manhattan - Paddy - Matrix and Island" techniques of construction. Intrigued with the ideas? Read on and discover the mysteries, after you've read this month's quotation!

The secret of the character Mrs. Stanhope from Trollope's *Barchester Towers* is a fine adage for the amateur electronic constructor. We might want to make our projects look attractive but the real object of the exercise is to make them function! A specially etched printed circuit board (p.c.b.) does make a small radio project look good, but for many purposes it's simply 'overkill'. So, my general advice is make it anyway that works and if you want it to look attractive, put it in a nice case. It's all about appropriate technology.

None of the projects featured in this column use printed circuit boards. That's partly because my turn-round on articles is so quick that the *PW* editorial team would not have time to generate any p.c.b., but also because most of them do not merit etching a board for a modest 'one-off' project.

The most frequent method of construction I use is the 'Ugly' technique. This is the oft-used method of direct wiring over a blank piece of p.c.b. 'blank', used copper side upwards. The copper forms a groundplane to which all the grounded leads are soldered.

The free leads provide anchor points for the other component connections. To see what I mean ... look at almost any photograph of a project from previous editions of this column to see how it works.

Other Simple Methods

This month I want to describe two other simple methods of wiring a circuit board. To do this I have taken a simple, but useful, small circuit to show the methods of construction.

The circuit I'm using for demonstration purposes is the basic Twin-Tee Audio Oscillator that I've used several times in the past to obtain a pleasing audio note for side-tone or Morse monitoring applications. The actual circuit of the oscillator is shown in Fig. 1.

A transistor works as an

oscillator if the signal from the output circuit is fed back in phase to the input. As a common emitter transistor amplifier already has a 180° phase shift between the input and output, it's only necessary to add a filter network to give another 180° shift.

The twin-tee network shown in Fig. 1, is connected between the collector and the emitter. The in-phase feedback only occurs at one frequency and this action depends upon the values of the resistors and capacitors in the network.

A small table shows values, which produce outputs at about 500Hz and 1kHz. If the constructor wants a more definitive frequency, the value of R_B may be trimmed over a limited range.

Using off-the-shelf values quoted in Table 1, my two examples of the circuit produced outputs at 997Hz and 403Hz. The output can be taken off at the collector (the bottom of the 4.7k Ω resistor) or at the emitter (the top of the 22 Ω resistor) via a capacitor of 100nF or greater.

The transistor I used was the 2N2222A because I have lots of them but any similar npn transistor would do the same job. So, that's the circuit ... now it's on to two different methods to build the project.

Matrix Board

An easy-to-achieve method of building a small circuit board is to use a matrix of small squares that act as solder pads. The usual method I adopt to produce such a board is to draw a hacksaw blade across the copper side of the board to cut small grooves in the copper.

A useful size for the matrix squares is about 5mm. The aim is to fill the board with 5mm copper squares.

Cutting the matrix boards can be tricky to do with a hacksaw. If the lines are not parallel the distance between the lines is small enough to cause real problems in making useful square pads.

My favoured method is to use a sharp blade and a mitre block. The edge of the mitre

Table 1

Freq.	R_A	C_A	R_B	C_B
1kHz	22k	2n	3k3	10n
500Hz	22k	47n	3k3	2n

Table 1: George G3RJV suggests these values for your Twin-Tee Oscillator depending on the tone you prefer.

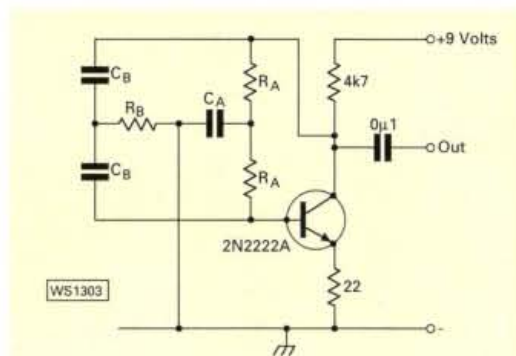


Fig. 1: The circuit G3RJY is using for demonstration purposes this month is the basic Twin-Tee Audio Oscillator, mentioned several times in previous 'COTPW' columns, as a useful circuit to obtain a pleasing audio note for side-tone or Morse monitoring applications.

block holds the board square and using the 90° cutting slot produces parallel strips that are easy to convert into small squares.

The square pads need to be tinned and this is best done before any parts are mounted. Pads may be joined with link wires to give the effect of tracks between components and the components are surface mounted on the appropriate pads.

The photograph, Fig. 2, shows my 1kHz version of the oscillator built on a matrix board. In fact this board is a section from trial product from **Kanga Products** called 'Kanga-Lands'.

In effect, 'Kanga-Lands' is a ready prepared 5mm matrix board, which is supplied already tinned. The spaces between the square pads are milled rather than etched. (This means the board easily breaks along the milled lines and can be broken off to any required size - rather like a block of chocolate).

The 'Kanga-Lands' boards also lend themselves to the second method of construction. So, let's take a look!

Manhattan Construction?

Recently in QRP circles in the USA there has been much discussion about, and use of, 'Manhattan' construction. This followed the fine design and construction work of **Jim Kortge K8IQY**, who uses the method to produce impressive projects.

But there's little 'new under the Sun' and in the 1970s I was describing projects using what I called the 'Island' technique, Fig. 3. That avid constructor **Drew Diamond VK3XU**, attributes the same method, calling it 'Paddy Board' construction, to VK3AOH. But whatever it's called, it certainly is a very useful method of construction, and can be used for complex projects.

Incidentally, the 'Manhattan' is said to have come from the pads mounted on the board looking like a miniature high-rise city! (The majority of what we know of as 'New York' is on Manhattan Island).

In effect, the Island method is another surface mounting technique using pads and strips of p.c.b. material stuck on to a copper clad ground plane. Pads and strips of p.c.b. material can be prepared to suit the required tracks and anchor points for the components.

One simple method is to lay the components on the ground-plane board and mark with a pencil the

pattern of required pads. These pads can then be custom cut from another piece of blank printed circuit board and attached in the appropriate pencil marked place.

The usual method of attaching the pads is to use (Cyanoacrylate) 'Super Glue' type of adhesive and a pair of needle pliers to place the pad in the correct place. For those who have doubts about

Cyanoacrylate adhesives there are other alternatives and I've used double-sided adhesive tape with surprisingly good results.

Another, perhaps more reliable, method is to make the pads from double-sided printed circuit board material. First, you should apply a small line of solder to one edge of the pad.

Next, put the pad, soldered side down, on the ground plane, hold it in place with the point of some needle pliers and apply the soldering iron tip so it makes good contact with the pre-soldered edge and the ground plane. This usually produces a firmly attached pad. (If a strip is being mounted, it will probably require solder at each end).

Drew VK3XU suggests another method for holding the pads in place prior to fixing. His method is to solder a resistor to the pad and use it as a handle to hold the pad into place. When the pad is fixed the resistor can be de-soldered and removed.

When the all pads are mounted the board and the pads and the ground plane can be cleaned with a fine emery block or (my favourite method) using a suede brush. The components are then soldered to the surfaces of the pads to produce a rather neat method of construction.

The photograph in Fig. 3 shows my island board holding the 500Hz version of the oscillator. I used the individual pads snapped off from a Kanga-Lands board. If strips are required, adjacent pads may be linked with wire bridges.

The diagram, Fig. 4, shows an additional circuit suggestion. Here a second *npn* transistor is directly coupled to the oscillator as an emitter follower stage.

With the suggested addition, any reasonable load placed on the output will not change the frequency of the oscillator. This gives a low impedance output, which is more useful for many applications and can even drive a small loudspeaker at a low level.

So, there you have it. Here's a chance to explore 'Manhattan' and Islands - without even leaving your shack. You can even think of our friends in 'VK Land' (Australia) with the 'Kanga-Lands' idea too! And with those awful jokes I'll 'hop off' to next month. Cheerio for now!

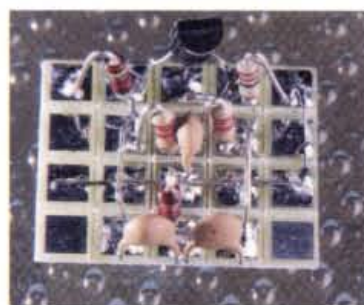


Fig. 2: The demonstration circuit built on to a 'Kanga-Land' pre-prepared matrix board (see text).

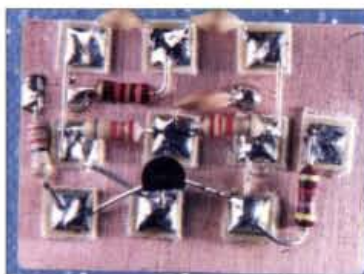


Fig. 3: Close-up photograph of a 'home-brewed Island matrix' board from G3RJY's workshop. (See text).

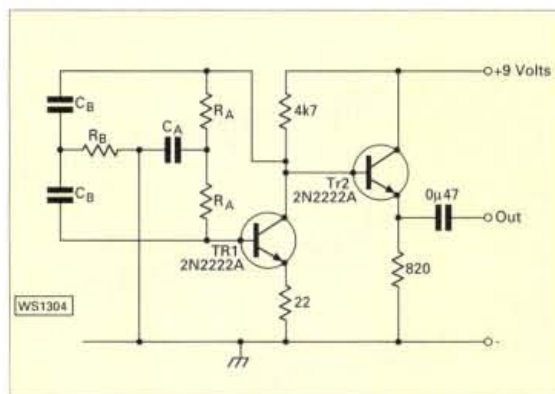


Fig. 4: Alternative circuit of a buffered audio oscillator (see text).



Gallium Arsenide?

This month Ian Poole G3WYX tells you the answer to the question: 'What Is Gallium Arsenide'? It has many uses in Amateur Radio Ian says - so read on and discover just what those uses are!

Gallium Arsenide is widely used in Amateur Radio, particularly in gallium arsenide f.e.t.s (GaAsf.e.t.s) for low noise preamplifiers or front ends for the v.h.f. and u.h.f. bands. Using these devices, noise figures of less than 1dB are found in the specifications, showing that they give a significant improvement over their nearest rivals.

So, what actually is Gallium Arsenide? It's a semiconductor and it shares many similarities with silicon and Germanium - the two most widely used semiconductors, exhibiting the same basic properties. However, unlike the other two materials which are elements, Gallium Arsenide is a compound.

Chemistry scholars know that silicon and germanium are both group

IV elements whereas Gallium Arsenide is made up from elements from group III and group V. Only when combined together do they exhibit any semiconducting properties.

The main advantage of Gallium Arsenide is its high electron mobility, or the ease with which electrons can flow through the structure. This mobility is just over twice the figure for germanium and about seven times the figure for Silicon. With increases of this magnitude, it's hardly surprising that improvements can be seen in performance.

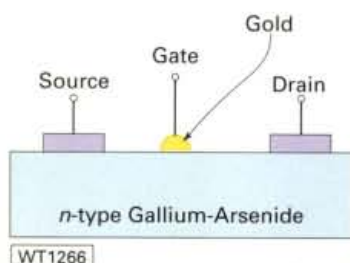
Increased Mobility

The increased mobility leads to much a lower 'on' resistance in f.e.t.s. However, the radio frequency designer is more interested in the fact that it leads to shorter transit times, i.e. the time taken for a pulse to move across the channel.

This, in turn, enables much higher frequencies to be used. Many devices are able to operate at frequencies well into the microwave region and at frequencies which are higher than most comparable silicon devices.

To capitalise on these advantages, most Gallium Arsenide transistors are in the form of f.e.t.s. Apart from the improvement in frequency response, GaAsf.e.t.s also give a marked improvement in noise figure performance.

Fig. 1: The basic construction of a GaAsf.e.t.



In addition to this, the GaAsf.e.t.s are also found to give a higher gain and a more linear characteristic than their silicon

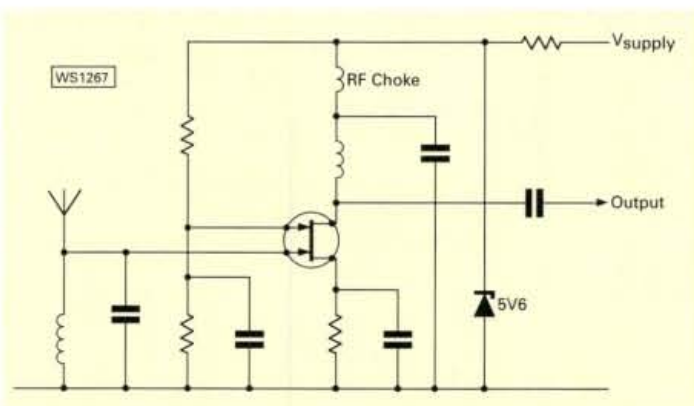


Fig. 2: A typical GaAs f.e.t. circuit.

counterparts. All of these advantages make the GaAsf.e.t. an ideal choice for a receiver front end.

The GaAsf.e.t. follows the basic principles of operation of all f.e.t.s - the flow of electrons through a channel is controlled by the potential applied to a gate. Their structure has many similarities to a junction f.e.t. (j.f.e.t.). In fact, the gate is made from a reverse biased schottky diode. The gate is fabricated using gold bonded directly to the surface of the channel region.

One of the keys to the high frequency operation of the GaAsf.e.t. is the size of the diode - it may only be a fraction of a micron across. This means that it must be reverse biased all the time and it can't withstand any current passing through it. If a positive voltage is applied to the gate, current will flow and destroy the diode, rendering the whole device useless.

The spacing between the drain and source is also very small, being typically around five microns. This means that the transit time for any current carriers is very low, giving it a very good high frequency response.

To prevent the gate junction passing any current, the biasing arrangements for any circuit using

a GaAsf.e.t. needs to be carefully designed. It's particularly important to take into account the conditions when the circuit is being turned on or off. At this time, capacitors charge or discharge and this may lead to transient conditions that can damage the device.

Static is another problem and today many devices are considered to be static sensitive. The GaAsf.e.t. is one of the most sensitive and their gates are particularly prone to damage. Even static charges as low as 30V

can destroy the gate. This is very small when compared to the voltages of 5kV that can easily be generated by walking across a carpet. Accordingly, great care must be taken when they are being handled or soldered into place.

Widely Used

Gallium Arsenide is widely used in a number of other applications. Its high electron mobility leads to low on resistances when used in f.e.t.s. This means that it's ideal for use in high power applications and a number of high power r.f. devices use Gallium Arsenide.

One of the other properties of Gallium Arsenide is that, when it is used in a diode, light can be emitted. It's in this application that most Gallium Arsenide is used. Although research is being undertaken into the use of other materials in l.e.d.s, Gallium Arsenide is still the most widely used.

All of the uses I've mentioned means that Gallium Arsenide is an integral part of the Amateur Radio scene and looks likely to remain so for the foreseeable future. More details of semiconductor fabrication terminology can be found on my Web site at:

http://website.lineone.net/~ian_poole

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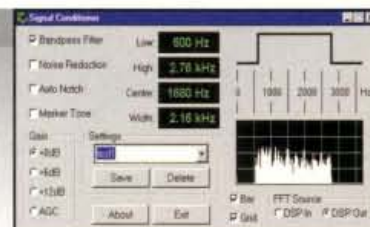
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WRTH 1999 Review

"Five stars for its mechanical design"
WRTH 1999 Review

"Most Innovative Receiver"
WRTH 1998 Awards



Model Name/Number

Construction of internals

Construction of externals

Frequency range

Modes

Tuning step size

IF bandwidths

Receiver type

Scanning speed

Audio output on card

Max on one motherboard

Dynamic range

IF shift (passband tuning)

DSP in hardware

IRQ required

Spectrum Scope

Visitone

Published software API

Internal ISA cards

External units

WR-1000

WR-1500

WR-3100

WR-1000i/WR-1500i-3100iDSP - Internal full length ISA cards

WR-1000e/WR-1500e - 3100e - external RS232/PCMCIA (optional)

0.5-1300 MHz

AM,SSB,CW,FM-N,FM-W

100 Hz (5 Hz BFO)

6 kHz (AM/SSB),

17 kHz (FM-N), 230 kHz (W)

PLL-based triple-conv. superhet

10 ch/sec (AM), 50 ch/sec (FM)

200mW

8 cards

65 dB

no

no - use optional DS software

no

yes

yes

yes

£299 inc vat

£359 inc vat

0.15-1500 MHz

AM,LSB,USB,CW,FM-N,FM-W

100 Hz (1 Hz for SSB and CW)

2.5 kHz(SSB/CW), 9 kHz (AM)

17 kHz (FM-N), 230 kHz (W)

200mW

8 cards

65 dB

±2 kHz

YES (ISA card ONLY)

no

yes

yes

yes

£369 inc vat

£429 inc vat

0.15-1500 MHz

AM,LSB,USB,CW,FM-N,FM-W

100 Hz (1 Hz for SSB and CW)

2.5 kHz(SSB/CW), 9 kHz (AM)

17 kHz (FM-N), 230 kHz (W)

200mW

3-8 cards (pse ask)

85dB

±2 kHz

yes (for ISA card)

yes

yes

yes (also DSP)

£1169.13 inc

£1169.13 inc (hardware DSP only internal)

PCMCIA Adapter (external): £69.00 inc when bought with 'e' series unit (otherwise: £99 inc)

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Fig. 3:



Taught A Lesson By The Yaesu VX-5R Tri-Band Transceiver

Have you ever been pleasantly surprised?

Richard Newton

GORSN was when he

tried out the new

Yaesu VX-5R! He

learnt quite a lot from

this little Yaesu - one

thing being that first

impressions aren't

always those you end

up with when

reviewing a rig!

A lesson I think that most of us are taught at some time in our life is that often things aren't what they at first seem. "Don't judge a book by its cover" my Dad used to tell me and I know that looks can be (and often are) deceiving. Well, in truth, I think that these words of wisdom, uttered by so many people down the years are quite right. Living testimony to this in the Yaesu VX-5R.

When I first saw the small VX-5R, I have to confess that I wasn't as impressed as I thought I would be - when I looked at the Yaesu's diminutive body with its long helical antenna, I thought how unwieldy it looked. But beauty is in the eye of the beholder and I happen to know that various members of the PW Editorial team were impressed by its appearance straight away - the News & Production Editor for one!

However, I've fallen victim to my personal judgements on the appearances of certain rigs before and when I unpacked the VX-5R which I'd been given to review, I was just about to discover just how wrong first impressions can be!

Tri-Band Hand-Held

This new rig from Yaesu is a Tri-Band hand-held f.m. transceiver and it transmits on the 144, 433 and 50MHz amateur bands. But it doesn't stop there, oh no!

The radio itself is **very smartly finished** in a die cast aluminium case, it has **well labelled controls** and a **large display**, which is very well back lit with a **superb orange light** that also illuminates the DTMF keypad and most of the major controls.

As you've probably realised, I was already beginning to regret my initial reaction to the radio's physical appearance. I completely blew myself out of the water when I held it in the palm of my hand.

The VX-5R is just so snug! The radio is small - just a bit bigger than its baby brother, the VX-1R and so I had come full circle - I'd now decided that the VX-5R was a **very good looking radio indeed**, it also has a reassuring weight to it.

The next pleasant surprise came when I eagerly looked for the output power. Such a small radio must

"The radio itself is very smartly finished in a die cast aluminium case, it has well labelled controls and a large display, which is very well back lit with a superb orange light that also illuminates the DTMF keypad and most of the major controls".

surely have a limit, my VX-1R will only manage 1W on external power and even less on the battery but the VX-5R let me know who was boss again.

The radio is supplied with a 7.2Vd.c. 1100mAh Lithium-ion battery pack (see Fig. 1) that gives the operator a full 5W of r.f. output on 144 and 50MHz and about 4.5W on 433MHz. One thing to be aware of with



The new Yaesu VX-5R. As you can see, Richard GORSN wasn't the only one to grow attached to this wonderfully small but very effective tri-band hand-held!

the VX-5R is that the speaker/microphone connector is a single four-way jack. Adapters are available to convert this style to the more normal 3.5mm and 2.5mm jack connections.

I couldn't wait to see what else the VX-5R had to offer and to be honest it would be quicker for me to talk about what it didn't offer! It has an **extended receive range** that surpasses even my much-loved VX-1, it covers the f.m. and a.m. broadcast radio as well as v.h.f. and u.h.f. TV bands and the v.h.f. airband.

Besides encompassing a wide range of other public mobile radio frequencies it also receives in the Marine band and offers h.f. short wave band a.m. reception from 1.8 to 15.995MHz. This is designed for commercial radio reception in a.m. and the lowest frequency step possible is 5kHz. However, if you're an ardent listener to the a.m. amateur activity on and around 1.960MHz this will do you just fine.

Packed With Goodies

The VX-5R is a complex little radio packed with all sorts of goodies and as well as that, it's so easy to use. This hand-held has an automatic repeater shift on 144 and 433MHz and the controls are so well labelled and colour coded that I found navigating around the radio's main and auxiliary functions quite simple.

I wish I had the space to talk about everything on the VX-5R, but unfortunately I haven't, so instead I'll have to make do with the aspects of the radio that best caught my eye. The first thing was the display which is an l.c.d. dot display and is very informative.

You can set the display to have two lines of small data displayed, such as the working frequency and the frequency in the second v.f.o. - yes second v.f.o.! (More

about that later) Or perhaps the current temperature - you can actually ask the VX-5R to tell you what the temperature is inside its case!

If you find the small display hard to see then, at the touch of a button, you can increase the size of the working frequency to twice the size. This means that you lose the second line of read-out, but the main display is then huge and must be an invaluable for those whose eye sight is perhaps not what it used to be.

The display even has the ability to set up a little icon that will show a pictorial representation of the band that you're on. For example, if this function is on and you're tuned to a frequency on airband, a little aeroplane appears in the left-hand side of the display.

Although this is a 'one band at a time radio', the VX-5R offers the added bonus of having two v.f.o.s (as I mentioned briefly earlier). You can't monitor both at the same time but you can swap between 'VFO A' and 'VFO B' with ease.

It doesn't stop there though! You can also configure the rig to do split v.f.o. transmit and receive. In other words, you can monitor one frequency, say on 145.200MHz and transmit on a different band, for example, 433.450MHz. This is very simple to activate and de-activate via the VX-5R user set up menu.

This little tri-band hand-held comes complete with CTCSS and DCS coded tone squelch facilities. Both of these facilities are used to allow only certain transmissions with matching tones to open the squelch on your radio.

Used in conjunction with the audible alarm the CTCSS and DCS can be used effectively on a local chat or club frequency. I know some groups of friends who have even used it as a simple paging facility.

If you're not sure what tone is being used, the VX-5R also offers a CTCSS/DCS tone scan feature and the radio will scan an incoming signal until it identifies the tone being used and the squelch will open. The scan speed on this feature is quite slow which isn't unusual.

Ease Of Operation

As I've already said, ease of operation is a big plus point for this new little Yaesu rig and one of the things I particularly like is the fact that the transmit power level is accessed by a single button press, as is the reverse frequency monitor, band change and v.f.o. select function.

The VX-5R offers an impressive 220 standard memories, which can be complemented by a 'Home' channel for each band and ten sets of band-edge scan limits. Memory storage couldn't be easier and the memories can be grouped in anything up to five groups of 24 channels (in each group) if you wish. Each memory can also be given an alphanumeric name tag.

Using an optional extra (the SU-1 Barometric Adapter), the rig can also be configured to measure (and show) both 'Altitude' and 'Barometric Pressure'. I found the Barometric Adapter interesting and think it would be quite useful on a hill-top site or if you should take the VX-5R hill walking or hiking. (See Fig. 2).

Yaesu do point out that the measurements of altitude and barometric pressure aren't to be used in the course of any activity where the information is depended on for safety reasons. This optional extra, when added to the VX-5R gives a good estimation but shouldn't be used to replace accurate and calibrated equipment used for navigation or personal safety.

Scanning Options

The VX-5R comes with a veritable array of scanning options - you're able to scan bands or part of bands and all the memories, banks of memories and selected memories. This sturdy radio is just so versatile, I would be very surprised if you couldn't configure it to do just what suits you.

The lithium-ion battery deserves a mention of its own. It's very well designed to fit into the main body of

the radio and seems to go on forever (although, unfortunately, it doesn't!) and adds another dimension to the use of the hand-held.

Unlike the NiCad batteries of the past, this battery doesn't suffer from a memory effect, so if you're going out and the battery is (perhaps) half depleted, then you can just pop it on charge and top it up. The radio is kind enough to show you on its display whether it is charging or whether the charging cycle has been completed. I operated the radio for some considerable time on the 5W setting and was amazed at just how efficient the whole set-up was.

Having been somewhat impressed with what I had seen I couldn't wait to try the VX-5R out on air. The radio is supplied with a two-in-one helical antenna with an SMA fitting and a small extension is screwed to the top of the antenna for 144 and 433MHz operation and a larger extension to add 50MHz. (See Fig. 3). I found that the antenna with the long extension worked just as well on all bands of operation and didn't need to use the small extension at all.

I successfully got into the two local repeaters in Bournemouth on 144 and 433MHz - both with signals that were as good (if not better) than I have ever had before on hand-held radios from my home location. I then accessed the Weymouth and Blandford repeaters on low power on 433MHz - quite impressive from just a hand-held with its own helical I thought.

Informative Contacts

One of the most interesting and informative contacts I had was on the way to a club meeting. Colin G3XAS was driving and I was front seat passenger, I had the VX-5R with its helical antenna in place. I thought that I would try my luck and call the club station while we were about 12-16km away.

I had the antenna pressed up against the inside roof of the car and gave a call on 145MHz. To my utter amazement Terry 2E1EJC replied from the club site and gave me a good report. He told me that the audio was "really excellent" - praise from Terry is praise indeed!

Then, even more surprising was that Bob G6DZM, who was mobile and about the same distance away, came up and gave me a similar report. The received audio was really good. At the subsequent club meeting the VX-5R met with the complete approval of all those gathered.

Second To None

I used the VX-5R to listen to both v.h.f. and a.m. broadcast band radio stations and the performance was second to none! The audio quality - even on a.m. stations such as Classic Gold on 828kHz - was excellent and I was listening to BBC Radio 2 on the VX-5R on 88.5MHz as I typed this review! The sound quality is fantastic considering the size and primary function of the radio.

I was a bit concerned as I neared the end of my time with the VX-5R because I hadn't been able to make a contact on 50MHz. I have to say that this had nothing to do with the VX-5R itself, but more to do with the all too short time I had with the rig and the fact that the band is rather quiet where I live. However, I was able to get a report by proxy.

Just as I was typing the review, I received a call from Keith G7HIC in Ivy Bridge. He'd seen the advert in PW telling of the impending VX-5R review and had taken the time to contact the team to share his thoughts.

Keith is a proud owner of his very own VX-5R and was very keen to sing its praises. He told me that he'd found the flexibility of the Lithium-ion battery wonderful.



Fig. 1: The Yaesu VX-5R comes complete with a 7.2Vd.c. 1100mAh Lithium-ion battery pack which you can see at the top of this picture.



Fig. 2: The SU-1 Barometric Adapter comes as a tiny p.c.b. (compare with Lego man!) which then allows the VX-5R to measure (and show) both 'Altitude' and 'Barometric Pressure'. Yaesu do say, though, that these measurements aren't to be used in the course of any activity where the information is depended on for safety reasons.

Continued on
page 62...

RICHARD NEWTON GORSN WAS TAUGHT A VALUABLE LESSON WHEN HE WAS ASKED TO REVIEW THE NEW YAESU VX-5R

How to clean up your Spurious Emissions

Gordon King
G4VFFV, PW's
regular 'Looking
At' author, tells
you all about
spurious
emissions and
responses. He has
some suggestions
as to how you can
keep as "clean
and spurious-
free" as possible
in order to avoid
that visit from the
DTI!

It's our responsibility to make sure that the r.f. output from our transmitters are as clean and spurious-free as is reasonably possible to achieve in the current state of art. If we disregard this, Radio Amateurs risk being closed down by the DTI.

A requirement of the Amateur Radio licence is for the station to be as free from unwanted emissions as the state of technical development for Amateur Radio apparatus reasonably permits. The station must not cause any undue interference to any wireless telegraphy.

The requirement means that the licensee must suppress unwanted emissions or reduce the station's field strength to the degree satisfactory to the Secretary of State in the event of undue interference. But what is 'undue' interference?

There can be no overall definitive answer to the 'undue interference' question! As to whether any particular case of interference is - or is not - undue, the Amateur Radio licence booklet intimates that all the known circumstances should be investigated and that the interference shall not be regarded as undue if such a ruling would unreasonably cause hardship to the person using or desiring to use the apparatus.

Let's face it, a case of undue interference would be proved by severe patterning on a TV screen due to an amateur station radiating excessive harmonic content or other spurious emissions! This really couldn't be tolerated and, as a last resort, the DTI would step in and possibly close the station down.

Even so, there could be the possibility of the amateur station's emissions being perfectly 'clean', while the TV set itself is capable of working correctly in the relatively high signal field of a neighbouring amateur station. (Please see 'Invisible Power', an article also by Gordon King G4VFFV on page 30 of the August 1996 PW. **Editor**).

Signal Responses

The term 'signal responses' describes the unhappy event of the receiver producing its own spurious responses owing to its signal circuits being severely overloaded by the abnormally high signal field, even though the receiver is tuned to an entirely different frequency. The effect manifests as pattern disturbances on TV, whistles or buzzes or even voice breakthrough on sound.

Receiving equipment of recent design would appear to possess a greater tolerance to high signal field r.f. than earlier designs. This, in part, is resulting from the practical application of some of the latest European electromagnetic compatibility (EMC) rules which designers are now heeding. However, there will always be cases where the

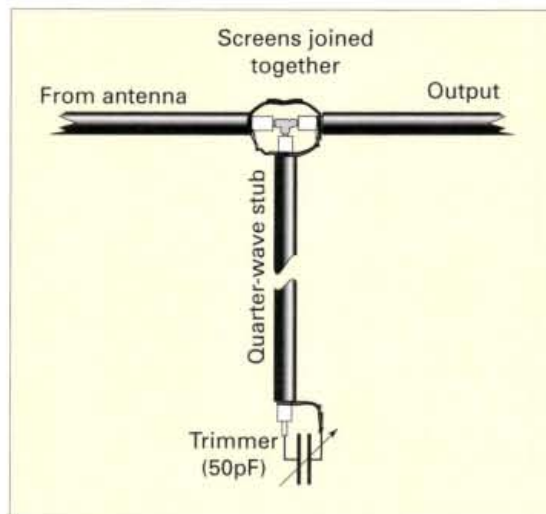


Fig. 1: Quarter-wave coaxial stub filter. Length of stub in millimetres relates to the product of 74980 and the velocity factor of the coaxial divided by the frequency in megahertz. To notch out a signal at say, 145.350MHz, 0.65 velocity factor coaxial would have a length of 335mm.

signal field is in advance of even the most immune to out-of-band r.f. receivers.

Sadly, close neighbours and high signal fields are not good 'bed partners'! It is often overlooked that our signals can be re-radiated at remarkably high levels by wire fences, electric wiring - both inside and outside the house - by metal clothes-line supports, telephone wiring and so forth.

Even though the transmitting antenna may be some way from a neighbouring house, the signal field in proximity to an affected receiver or its antenna could be significantly higher than at first realised. It must not be overlooked, though, that some receivers have a notoriously adverse immunity to virtually any level of r.f. which is removed in frequency from that actually tuned.

Majority Slice

Take the case of an enthusiastic listener whose receiver might embrace a majority slice of the radio spectrum from, say 30kHz-30MHz and perhaps even higher up the spectrum into the v.h.f., u.h.f. or s.h.f. realms. If the owner of this kind of receiver or scanner happens to be a near neighbour of a licensed Amateur Radio station then this could cause problems!

Apart from being able to monitor that station's output on the legal amateur frequencies, the receiver will almost certainly respond to the second and possibly higher harmonics of the station. Even though the amateur's operating perfectly legally.

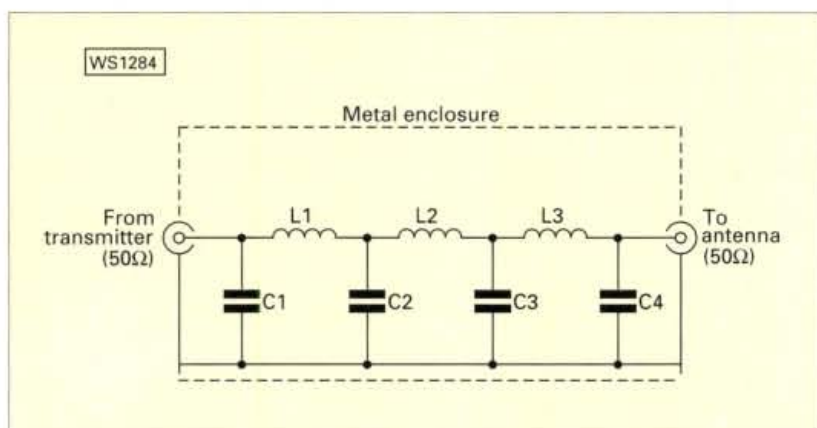


Fig. 2: Seven element Chebyshev low-pass filter. For f_{co} around 33MHz C1 and C4 would be 91pF, C2 and C3 - 180pF, L1 and L3 - 0.34μH and L2 - 0.387μH. For f_{co} of 151MHz, C1 and C4 would be 13pF, C2 and C3 - 33pF, L1 and L3 - 0.669μH and L2 - 0.0827μH. (These values are for 50Ω input and output impedance).

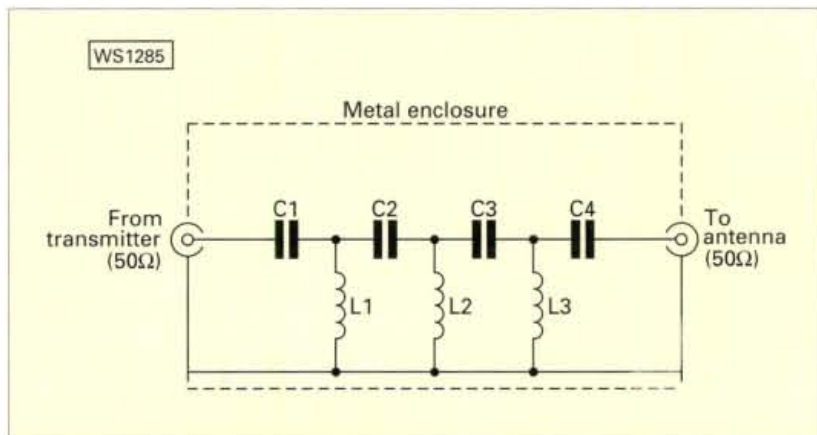
As a demonstrative case, consider that a 144MHz Amateur Radio station, sited some 60m away from the receiver, is producing an effective radiated power (e.r.p.) of 42dBm (16W) in the direction of the receiving site. The receiver would thus lie in a direct-ray field of some 113dBμV/m (0.47V/m).

Now, if the spurious emissions from the transmitter are 60dB down (a not uncommon value), then the second harmonic could well be yielding a signal field around 53dBμV/m (447μV/m). If the receiver were connected to a properly terminated dipole and correctly polarised to the signal, then the potential difference across the receiver's antenna input could be close to 43dBμV (142μV).

An antenna signal of this strength could be expected to take the receiver into full quieting so if the amateur were working on, say 145.350MHz (S14), then that same transmission would be heard on the receiver at 290.7MHz, at least! This would **not** be a transmission fault.

The signal voltage at the fundamental frequency would be 60dB above this (again assuming a correctly matched and polarised cell) so at 145.350MHz the receiver would be getting around 103dBμV (142mV) p.d. This represents a remarkably strong signal which might well cause the r.f. circuits of the receiver to overload.

Fig. 3: Seven element Chebyshev high-pass filter, with 50Ω input and output impedance. For f_{co} of 139MHz C1 and C4 would be 39pF, C2 and C3 15pF, L1 and L3 0.0463μH and L2 0.0371μH.



The effect is often to produce spurious signals within the r.f. stages. Additionally, because the receiver would also simultaneously be receiving other signals at different strengths and various frequencies coming in at the antenna, the signals can heterodyne between themselves or with the local oscillator signal (or both).

The net result of the 'entanglement' of signals is that the amateur's 145.350MHz transmission might well be tuneable on the overloaded receiver - at frequencies other than those corresponding to the fundamental and to the direct harmonics of the transmitter. Again, this would **not** be a transmission fault, even though the transmission may be tuneable right up to 500 or 600MHz, or higher!

Many and diverse

Many and diverse are the ways in which spurious responses can be evoked. This includes cross-modulation, odd-order and other intermodulation, image responses, heterodynes with harmonics of the receiver's local oscillator and so forth.

Similar effects, of course, can arise when a receiver is operated in a strong signal field of a commercial or professional station. This I can vouch for - as I live pretty close to maritime navigation and coastal stations in the fishing port of Brixham!

The e.r.p. could quite legally be significantly higher than the 42dBm previously exemplified. With an antenna gain of 15dB and the full legal r.f. power of 56dBm fed to this, the e.r.p. in the direction of maximum response would thus be around 717dBm, which is close to 12.6kW! At a distance of 60m in the direction of maximum antenna response the direct ray field would now be some 142dBμV/m (about 13V).

There are few receivers, especially of the scanning variety, which could handle such a strong signal field without producing some spurious responses, since based on a tuned and matched dipole, the antenna input would correspond to around 132dBμV (around 4V) p.d.! The level of the transmitter harmonics and any spurious signal would also be up from the previous example by a corresponding amount (29dB).

A major problem these days with receivers which tune over remarkably wide frequency ranges (without band switching), especially of the scanning variety, is the almost total lack of r.f. selectivity. The front end might well be open to signals from d.c. to light, little wonder then, that our signals find their way in easily enough and evoke the spurious responses.

In the old valve days each band was switched, the front-end r.f./mixer stages had, at least, one stage of tuned selectivity, often with bandpass

"Similar effects, of course, can arise when a receiver is operated in a strong signal field of a commercial or professional station."

Continued on Page 30...

Continued from
Page 29

tuning, while communications receivers had several stages of tuning. Moreover, valves didn't overload as easily as solid-state devices!

Responsibility Of Owner

It is the responsibility of the owner of an interfered with receiver to ensure that the requirement of a 'reasonable standard of immunity' is met.

Also that the equipment is properly installed and partnered with the correct type of antenna for the band - or bands - tuned - the odd bit of wire dangling along a wall is unlikely to inspire much authoritative sympathy in the case of the Radio Amateur or, indeed, other source of interference.

Nowadays, the DTI would likely take heed of the harmonised immunity standards on EMC (Council Directive 89/336/EEC) when considering a case of radio receiver interference and this may well require an improvement to the immunity of the affected receiving installation.

A receiver troubled by a strong signal can easily be tamed and its self-generated spurious responses diminished or eliminated by means of a suitable filter at the receiver's antenna input circuit. The best place for this is in the coaxial antenna feeder, which is why the receiver must have a properly installed and matched antenna system in the first place.

An effective arrangement is shown in **Fig. 1** (p.28) This uses a quarter-wave coaxial stub cut to a length corresponding to the strong offending signal. This is an ideal scheme for use with a sensitive receiver or scanner which is being affected by a strong v.h.f. or u.h.f. signal from a nearby Amateur Radio station. The small trimmer at the bottom of the stub facilitates a small degree of tuning once the calculated length has been established. It also avoids the stub responding to harmonics.

Virtually any kind of tuned rejecter circuit could be employed to notch out an unwanted signal at the receiver and several are given in my book, *The Practical Aerial Handbook* (old now, but still available at some public libraries!) which could be of interest. It's also possible to purchase a commercial version and, in this respect, the Waters & Stanton rejector unit one (WAF-125) could be worth investigating.

Although spurious outputs from the transceivers on the Amateur Radio market are not commonly less than 60dB below the full fundamental delivery, it may still be necessary to improve upon this. (Especially when a linear amplifier is used and interference is being experienced in the neighbourhood).

For example, if the full legal power of 56dBm is being applied to an antenna of, say, 10dB gain, the e.r.p. in the direction of maximum gain would be 66dB, while the e.r.p. of the spurious signals would be around 6dBm (4mW), which could represent an interface problem, depending on band, frequency and the strength of the TV and broadcast signals in the vicinity.

Low Pass Filters

It has always been my practice to employ a low-

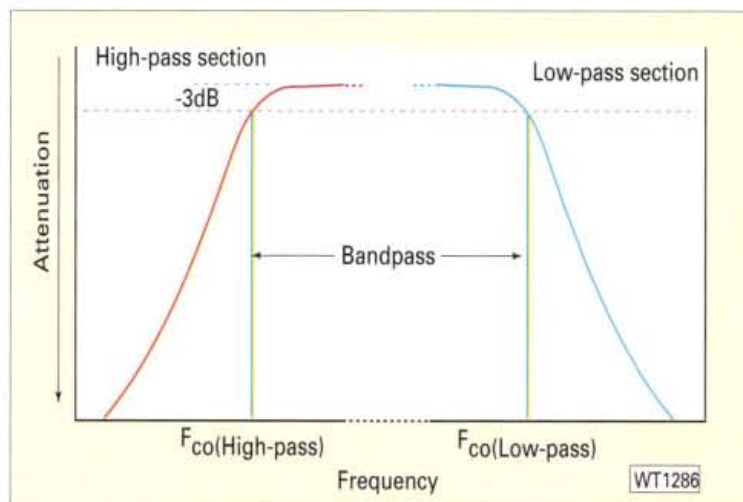


Fig. 4: High-pass and low-pass filter responses, showing the formation of a band-pass filter. The rate of attenuation after the first octave from f_{co} is around 42dB per octave for the seven element filters. On receive, such filters can also help to prevent overloading and the production of spurious responses by attenuating strong, unwanted out-of-band signals.

pass filter at the final output of my h.f. transceiver. This has a cut-off between 30 and 40MHz and yields an ultimate rate of attenuation exceeding 45dB per octave. The filter is connected after the station's power/v.s.w.r. meter to ensure that any higher-order harmonics or spurious signal generated by any non-linearity in this area are not fed to the antenna or radiated to any significant degree.

It must be admitted that some of the older kind of power/v.s.w.r. meters have tended to introduce non-linearity into the antenna circuit and thus encourage the production and transmission of harmonics. Happily, more recent matters are less prone to this shortcoming, but if your neighbourhood is suffering interference and you are operating with an in-line v.s.w.r. meter, try working the station without it! There are some well designed and substantial low-pass filters on the amateur market and you would be well advised to shop around to find the best.

High Pass Filters

It's sometimes necessary to quell spurious emissions below the operating frequency. This calls for the use of a high-pass filter. A band pass characteristic (where only a specific band of frequencies is allowed out of the transmitter and any spurious emissions above or below are significantly attenuated) is often desirable for 144MHz working, especially when a linear partners a transceiver.

Again, the amateur market caters for such a device, the DCI-145 by Waters & Stanton being but one example. In their adverts, W&S state that, if the filter doesn't cure the problem, then you will get your money back! (In my station I use the Comet CF-BPF2 which is marketed by Reg Ward and Co. There are also models for other bands).

Of course, it's possible to make your own filters. The circuit in **Fig. 2** (p.29) shows a useful low-pass filter and **Fig. 3** (p.29), it's high-pass counterpart. These should be solidly built and contained in metal housings. Their responses are shown in **Fig. 4**, while detailed design data are given in the captions. So, that's spurious emissions for you - I hope that you stay clean and 'DTI' free!

PW

"The odd bit of wire dangling along a wall is unlikely to inspire much authoritative sympathy in the case of the Radio Amateur or, indeed, other source of interference".

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Getting The 'Low Down' On LF Operating On 136kHz

Peter Dodd
G3LDO is a keen operator on the new 136kHz low frequency Amateur Radio allocation and he invites you to 'come down' and join in. And to help - Peter explains some of the very special techniques needed for operation on 'Long Waves'

On the 30th January 1998 a new frequency band 135.7kHz to 137.8kHz was made available to all UK amateurs. If you haven't tried listening on this band yet ... I'm hoping this article will encourage you to give it a try.

To help you, I'll be giving you some details of current activity on the band. I'll also tell you how you can use your existing wire antenna for listening and how to know when your receiver system is working properly. I will also explain a little bit about low signal detection methods.

You might be interested to know that there's a fair amount of activity on the 136kHz band these days. The following is a report from ON7YD of stations heard and worked during the weekend 20th and 12st of November 1999:
GD3YXM/P (589), GD3XTZ (589), GD0MRF/P (589), DL3FDO (569), DK8KW (559), DL1SAN (329), OH1TN (569), SM6PXJ (569), OH5UFO (549), HB9ASB (559), DJ5BV (579), G6RO (539), G3AQC (549), G3LDO (569), G3XDV (549), G4GVC (559), PA0SE (589), PA0BWL (589), GW4ALG (549), SM4DHN (539), MM0ALM (589), I5MXX (539), G3LNP (559), G3BDQ



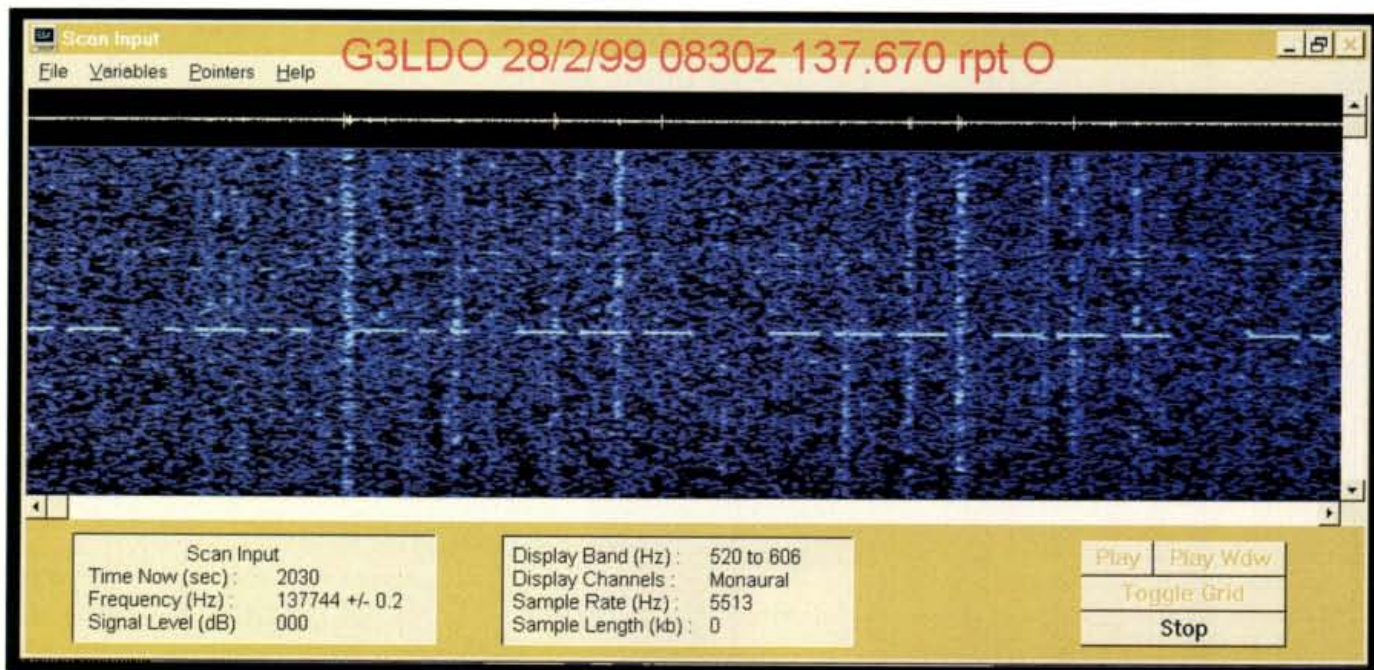
The 136kHz station operated by G3LDO - note that the computer (right) can play a major part in the low power DX QSOs on this band as the signals can often appear to be 'buried' under the noise.

(549), G3KEV (569), GB2CPM (579), PA2NJN (529), GD0MRF/P(559), GB2CPM(579), GD3YXM/P(599)

Narrow 'Band'

Now, as I've already said, the narrow frequency allocation is from 135.7kHz to 137.8kHz, which means that the 'band' is only 2.1kHz wide - not wide

Fig. 1: A c.w. signal (from Peter G3LDO) resolved with the help of computer software at IK1ODO's station in Italy (see text).



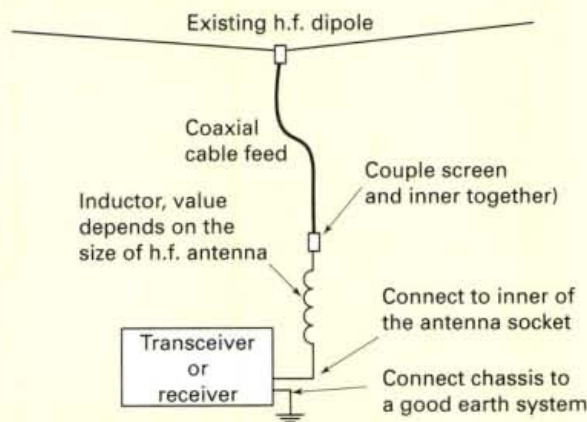


Fig 2: A listening station antenna may be quickly made using an h.f. dipole as an electrically lengthened monopole antenna. (See text).

enough for a single s.s.b. channel. This means that all QSOs are made using c.w., (generally very much slower than on the h.f. bands).

But don't let the c.w. aspect put you off '136' if you're a Class 'B' licence! I say this because there are other interesting modes evolving - this **really is** an experimenter's band.

Maximum Power

The maximum power output allowed on 136kHz is 1W effective radiated power (e.r.p.). Most of the stations I've already mentioned have worked each other with considerably less power than this!

Because of the power level restraints, signal strengths (particularly for DX), are often very low. The most common method of overcoming the low signal problem is to send the transmission very slowly - and I mean **really slowly**! For example, the Morse 'dots' last two or three seconds and are sent under computer control.

The signals are 'assembled' and can be read as 'dots' and 'dashes' (see Fig. 1). You don't need any special 'black boxes', as a sound card and computer with Windows 95 or 98 and readily available (free) software does the trick.

Receiving Signals

There are several solutions to receiving signals on 136kHz:

1. Use an old military or commercial receiver that covers this band. They're likely to have plenty of sensitivity and selectivity. However, although relatively cheap, they can be rather big and heavy.
2. Use a commercial or home-brew 'up-converter' with a standard Amateur Radio receiver or transceiver. The Datong up-converter Fig 2 uses the low end of the 28MHz band as the tuneable i.f. frequency range. (I used to use Datong converter with an old Drake R4C receiver as the second i.f.). The advantage of my Drake receiver is that it's fitted with a very good 250Hz crystal filter and this arrangement has enabled me to hear amateur stations at distances of over 100km when used with a tuned antenna. The downside of this receiver is that the frequency read-out resolution is poor. **Note:** If you're using a transceiver as a tuneable i.f. remember to disable the transmitter by removing the key and microphone.

3. Use a modern transceiver or receiver that covers the band. The IC-737, for example, covers the band but the sensitivity is very poor - 50dB down on signals on all the other Amateur Radio bands. (The reason for this lack of sensitivity is that manufacturers often fit attenuators to prevent undesirable effects of very strong local broadcast stations in the m.w. band). You could use a 136kHz pre-amplifier to overcome this characteristic, or if you're really bold, short out the attenuator.

John More G4GVC, who has been very successful receiving low frequency signals from the days of 73kHz experiments, found that his Kenwood TS-850S relies on good engineering practice and screening to get good performance. This rig performs very well on this band.

John has also added all the useful options for l.f. work to his set-up, i.e. the 0.5p.p.m. master TCXO and three c.w. filters: 500Hz bandwidth 8.83MHz, 270Hz bandwidth 8.83MHz and 500Hz bandwidth (crystal) 455kHz. Most of G4GVC's successful receiving work has been done using a resonated horizontal 60m long wire antenna only 8m high. (In fact the TS-850S has now become the standard for serious l.f. work.).

Detect Weak Signals

A receiver for 136kHz must be able to detect very weak amateur signals in the presence of very strong adjacent commercial stations. This means that a receiver for this band must have a high performance, i.e. good sensitivity, selectivity and dynamic range.

If your receiver and antenna system is performing well you shouldn't be able to hear the strong adjacent signals when the receiver is tuned to say, 137kHz. All that should be audible are 'pulses' of static constantly hitting the S3 mark on the S-meter with occasional loud static 'bangs' hitting S7.

The level of static varies considerably. When it's bad, the S-meter can be up at the S9+ level. The static on 136kHz has a sharper sound, rather different from the long 'crashes' heard on the 1.8 or 3.5MHz bands.

Narrow Filter Essential

As you can imagine, a narrow c.w. filter is essential to be able to hear anything between the commercial signals active on l.f. However, the standard 500Hz filter will work quite well especially if your receiver or transceiver is fitted with a PBT (Passband Tuning Control).

You can use the PBT control, set to 'Low Cut', in conjunction with the c.w. filter, to get very good selectivity. This technique also removes some of the noise caused by the filter ringing when hit by large static 'crashes'.

Most modern receivers don't use any selectivity ahead of the first mixer. The Datong converter is designed to cover 10-600kHz and has a low-pass filter to cut out the broadcast signals on the m.w. band. (This means that, when this converter is used with a modern receiver, the very strong commercial signals near the 136kHz band will be present in the receiver circuits in front of the selectivity determining filters in the i.f.s.).

If any of the circuits in front of the filter are unable to handle these large signals (poor dynamic range), then cross-modulation will occur. In practice this results in noise and 'birdies' on top of the signals you are trying to receive.

The problem can be overcome with some front-end selectivity and some means of controlling the gain to prevent any of the stages of the receiver overloading. An r.f. gain control is more useful than the 'step attenuators' commonly used for this purpose. Ideally,

**Continued
on page 34 ...**

Operating On 136kHz

... continued
from page 33

the gain distribution in all stages of the receiver should be controlled.

If your receiver doesn't have an a.g.c. switch and you're not able to switch off the a.g.c., then set the r.f. gain or attenuator so that the background static is just below the a.g.c. threshold - this often gives the best S/N for weak signals.

Tuned Antennas

Tuned antennas are far more effective than just connecting few tens of metres of wire into the back of the receiver or converter. A tuned antenna at 136kHz can operate as a very selective filter ... the first line of defence for reducing cross-modulation effects already described!

Remember that the gain of an antenna has to be taken into consideration when assessing the gain distribution of the total receiver system. I've tried the following antennas:

1. A tuned loop antenna 1.4m in diameter. This has a calculated gain of around -65dBd so an attenuator is unnecessary. Smaller loops would have even less gain but this can be compensated for by fitting a pre-amplifier.
2. My transmitting antenna, which comprises 100m wire antenna with 4mH loading coil, matched with another 4mH coil and vacuum capacitor against earth. With an antenna this size the gain is around -28dBd and a variable attenuator is a must to reduce the strength of

the adjacent commercial signals and the static if used on receive.

3. A modified broadcast long-wave ferrite rod antenna with added parallel capacitance. This type of antenna is very inefficient but is useful for portable work. A pre-amplifier is necessary.

What Frequency?

It is important to know exactly what frequency you're listening on, because the band is so narrow. There's a very useful time and frequency signal from HBG on 75kHz. (Most of the time this signal is about 5/9+5dB with me at my home in West Sussex).

My Datong converter was about 300Hz off frequency when I checked it with HBG and I was unable to adjust it exactly on frequency with the capacitor in the oscillator circuit of the converter. I settled for 500Hz high; it's easy to calculate the exact frequency from this offset.

Static and other noise is at its lowest early in the morning and for this reason most amateur activity is between 0800 and 1000 local time on a Saturday and Sunday. If you're one of the lucky ones to have access to the Internet, then you can check out the November list at: <http://www.pagnell.demon.co.uk/novlist.html>

Datong Electronics Ltd will have ceased production of their Model VLF converter by the time you read this. However, these converters are still available from **Waters & Stanton, Spa House, 22 Main Road, Hockley, Essex SS5 4QS. Tel: (01702) 206835/204965.**

PW

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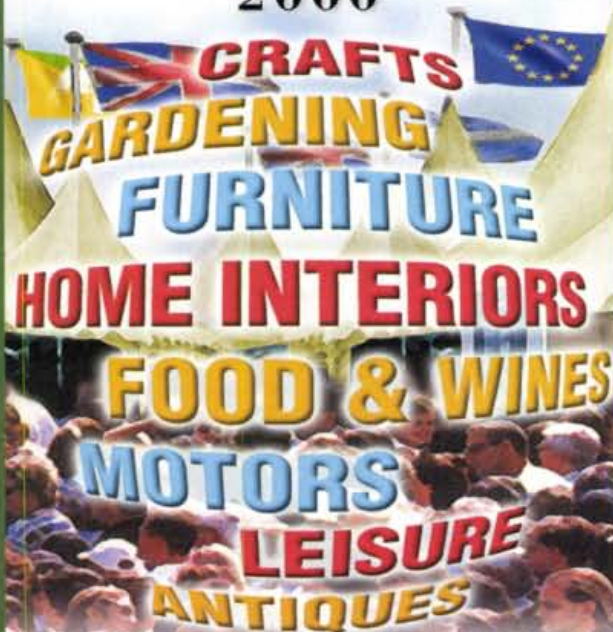
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A Story About A Visit To A North Wales Summit Meeting

Sit back and relax as John Worthington GW3COI tells you a story about a time when Rob Mannion G3XFD visited North Wales to meet up with two contributors to PW - John, himself, and Patrick Allely GW3KJW.

"On one of his many journeys ... with faithful four-legged friend, 'Mandy'!"

Well, it wasn't exactly 'summit', more a 'summat' (abbreviation for 'something') and, in spite of the 'flu, it came to pass successfully. The Editor, **Rob Mannion G3XFD**, said he would like to meet two of his North 'Waleian' contributors while on one of his many journeys to various parts of the globe to provide club talks. **Pat GW3KJW** was one and I was the other so, in order to save him the business of searching for my QTH and that of Pat, I suggested we should meet at some landmark.

Now, most places have a clock in the square or a statue of somebody, but Abersoch is only a village with no real landmarks at all and as the telephone bill climbed, Rob suggested the entrance sign of 'Abersoch' on the main road. "Good idea, we'll do that" I said, not knowing that the sign was just on a bend and enveloped by a double yellow line for a mile each way!

Pat said he would be there as it would also save him searching the wild hinterland for my QTH. At this point, the XYL said "why don't you get Pat to lead Rob and save you a trip to the spot which is bound to be at the same time of one of your sudden appointments in the bathroom?"

Well, I mulled on this point for many hours and when the R2/3 mobile telephone call came from Rob some way along the coast, my mind was made up that Pat should stay with the original arrangement. So I 'phoned him and he told me he was in the middle of assembling a camera but would get on his way (his QTH is on top of a mountain some 10km further away from me).

Bump Start

I threw on my motoring coat, jumped into the ancient Nissan and released the brake for my usual bump start. (It's nice when you live on a slope saves the battery). Arriving in the village, I took the opportunity of getting

some bread and sped in a north-easterly direction looking for the Abersoch road sign.

I still hadn't found the sign and I was now in the outskirts of the next village, Llanbedrog. If only I had a 144MHz handheld, but I later discovered neither Rob or Pat had one either. (What a sorry admission for three old 'Hams' - well, my excuse is I'm a 3.5MHz fossil).

I turned and went back, saw the sign 'Abersoch' (which didn't welcome careful drivers) and parked a good 200m from it. Now to spot G3XFD who I thought I should recognise from his regular photos in the magazine.

There weren't many cars about as it was 'Flag day', but suddenly a red estate hove into view with an artificial arm gesticulating from the driver's window. It was he. I used my electric starter and was soon in pursuit. I caught up to find him pulled off the road by the lifeboat drive.

Breathlessly, I reminded Rob that Pat was to have met us by the sign so he told me to go back and wait. Now, I had never met Pat and furthermore, didn't know what car he'd be in. (I am a poor organiser and would have invaded Bognor if I had been in command on June 6 1944 - 'D-Day').

I sat scanning the traffic for a face and a car that I didn't know. After 40 minutes I gave up and went back to where Rob was resting from his 560km (350 mile) trip from Dorset. We agreed that Pat must have been held up and would have to find us on his own. When we arrived at my QTH, Pat appeared suddenly, as if he'd been waiting at the gate!

Well, after all that, the meeting went fine and you're probably thinking - if you're still with me - what is all this about? I know you will say why on earth didn't I let Pat and Rob find their own way? But you must understand that I live in the mysterious country where roads are narrow and illogical in their direction. It isn't the case of asking the way because when you try to do that, there isn't anyone about and if there is he probably speaks Welsh only.

Many's the time I have had folk telephone me to say that they've had to give up and go back using astro-navigation - I couldn't let our Editor, fatigued with his marathon drive, suffer such indignities and then have to go another 100 or so kilometres to deliver his lecture to the Colwyn Bay club.


Mind you, as an ex-Coastguard I know how much the rescue lads appreciate turning out but Rob wasn't in any sort of boat. As he gazed over the sea outside my QTH, he remarked on the clarity of the distant Pembroke peninsular, I hadn't the heart to tell him it was actually Butlins!

As I sit in my lonely shack and think about the day Mannion became a minnion, I realise how different it would have been had we all been on 'Top Band' with giant whips on our vehicles.

No, a better idea would have been for me to put out an intermittent carrier which Pat and Rob would have then 'D/F'ed with their home-brew loop receivers. Not only would this have then saved me the bother of firing up the Nissan, but would have spared them the fun of a fox hunt with a fox who really wanted to be found. Neither of them asked me for a QSL - rather strange that!

PW





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Prepare For Action And... Get Ready For Ten Metres!

Roger Lapthorn
G3XBM says
that 28MHz is
really 'opening
up' and it's now
time to get ready
to join in the
action. Don't
forget - it's
possible to
'work the
world' in one
day on 'Ten'!

The 28MHz band has been in the 'Doldrums' with the sunspot count having remained very low now for some years. This is now changing dramatically as conditions started to improve again during 1999. Now is the time to dust off the gear and get ready for action! 'Ten' is unique: at times it behaves very much like a v.h.f. band with only local stations to be heard. At other times it can be an excellent DX (long distance) band on which all parts of the world can be worked with ease, even with simple home-made QRP equipment. It's this rich mixture which gives the band its special character.

With low sunspot activity, the maximum frequency for reliable F-layer h.f. DX has been well below 28MHz for most of the time. But even during the quiet years, the band is far from uninteresting.

Using FM On Ten

Using narrow band frequency modulation (n.b.f.m.) - usually just referred to as 'f.m.' - from a 4W converted CB rig and a small vertical whip it's possible to maintain reliable local communications over very useful distances making it an ideal band for club nets. But greater things are possible!

With a CB half wave vertical or vertical dipole it's possible to work mobiles and other fixed stations up to about 30km with good reliability - and frequently even further. Most n.b.f.m. operation centres on 29.6MHz, although well mannered operators move off this frequency once a QSO has been started.

Keeping an f.m. rig tuned to this frequency often brings unexpected surprises! One of the joys of

28MHz f.m. is that, from time to time, stations 'pop up' from much greater distances ... often completely 'out of the blue'.

Right Weather Conditions

Tropospheric propagation (often referred to as 'Tropo'), especially in the right weather conditions, allows stations from hundreds of kilometres away to be worked. Very early morning is often a good time to catch this type of opening on 10m.

Sporadic-E (Sp-E), which is most common in the summer months, brings in stations strongly from all over Europe. Occasionally stations from even further afield such as the Middle East, or North America can be worked by way of multi-hop propagation.

The best months for Sp-E tend to be from May to September with a smaller peak around December and January. That having been said Sp-E, as its name suggests, can appear at any time and has been known to occur on 28MHz in every month of the year.

Monitoring & Beacons

An advantage of 'Ten' f.m. operation is that people monitor the 29.6MHz calling channel, so openings are easily spotted. However, the band is well endowed with a range of beacons which can be monitored for signs of life on the band.

The beacons are mainly between 28.2 and 28.25MHz and are located all over the world. The 'International Beacon Project' (IBP) consists of a number of beacons on 28.200MHz (*see note below) which time-share, switching between different beacons at different times (on 14.100, 18.110, 21.150, 24.930 and 28.200MHz) in rotation. In this way one can monitor the individual frequency/frequencies and judge how extensively the band (or bands) are open, if at all.

To help, the 28MHz callsigns for the IBP beacons are provided in **Table 1**. For further information on the 'timing slot' sequences (these will help you to identify each beacon by its time sequence - very useful as the c.w. identification is sent at 22w.p.m.) are included in **Table 2**. For further in-depth information please refer to either the *Practical Wireless* Callsign Directory CDROM, or the January 1999 *PW* (*see note below).

Slot	Country	Call	Location	Latitude	Longitude
1	United Nations	4U1UN	New York City	40° 45' N	73° 58' W
2	Canada	VE8AT	Alert	82° 31' N	62° 18' W
3	United States	W6WX	Mt. Umunhum	37° 09' N	121° 54' W
4	Hawaii	KH6WO	Honolulu	21° 17' N	157° 48' W
5	New Zealand	ZL6B	Masterson	41° 03' S	175° 36' E
6	Australia	VK6RBP	Rolystone	32° 06' S	116° 03' E
7	Japan	JA2IGY	Mt. Asama	36° 16' N	138° 18' E
8	Russia				
9	China				
10	Sri Lanka	4S7B	Colombo	6° 54' N	79° 52' E
11	South Africa	ZS6DN	Pretoria	25° 54' S	28° 16' E
12	Kenya	5Z4B	Kilifi	3° 37' S	39° 50' E
13	Israel	4X6TU	Tel Aviv	32° 06' N	34° 48' E
14	Finland	OH2B	Espoo	60° 11' N	24° 50' E
15	Madeira	CS3B	Madeira	32° 43' N	16° 48' W
16	Argentina	LU4AA	Buenos Aires	34° 37' S	58° 21' W
17	Peru	OA4B	Lima	12° 04' S	76° 57' W
18	Venezuela	YV5B	Caracas	10° 25' N	66° 51' W
Other beacons on 28.200MHz but not on the IBP cycle					
	Quincy Illinois	KB9FOF			
	Hollywood Florida	K8UNP	EL96UA		

Table 1: The 28MHz callsigns for the IBP beacons (see text and Table 2.).

*** Editorial note:** For further reading on this fascinating aspect of the Amateur Radio hobby, readers should refer to the article "The International Beacon Project" written by **Professor Martin Harrison G3USF** and published in the January 1999 issue of *PW* - also, as stated - it's on the 'magazine' section of the *PW* Callsign Directory CDROM. Martin G3USF is the RSGB beacon co-ordinator for the International Amateur Radio Union (IARU). Sub-titled as a 'Shining Example of International Co-operation', this article provides much valuable information on aspect of the hobby which is on the whole not given as much publicity or the praise it deserves. **G3XFD**.

Best Modes

I think that the best results are to be had on the s.s.b., c.w. and digital modes. Even in the sun-spot minimum years, ranges of up to 160km can be spanned on these modes between modestly equipped stations using the same polarisation (e.g. both stations with horizontal antennas or both with vertical antennas) with reasonable reliability.

Signals may suffer fading and at times will fade below the noise level. But contacts can be reliably made even with just 10W.

When the band is open as a result of Sp-E it's possible to work anywhere in Europe using less than 1W on s.s.b. On c.w. the same distances can be achieved even with less than 100mW.

Additionally - good results can be achieved with truly simple antennas. A simple wire dipole no more than 5m up in the air is capable of achieving solid contacts!

As the band is now returning to life with F-layer propagation the fun is really starting! I know of no other band on which such spectacular results can be achieved with so little.

The F-layer DX on 10m tends to be best in daylight hours with signals starting to appear from the east. It gradually moves westwards and normally (eventually) fades as darkness falls with paths way to the west.

Band Open?

In periods of lower sunspot activity the band may be open only on north-south paths such as to Africa or South America and then for brief periods only on the very best days. Conversely, at the peak of the sunspot cycle it can be open simultaneously to all parts of the world with signals being received with echoes having been around the Earth several times!

At its peak, the band can remain open right through the night. Despite this, some operators often miss openings, assuming the band dies out after sunset*.

***Editorial update:** As this issue of PW goes to press (in mid-December 1999) there are reports of 28MHz being 'open' for DX as late as 2200UTC. Additionally, over the weekend of 11-12th December - 28MHz was 'open' from mid-morning until late in the evenings with West Coast American stations, New Zealand and Australians signals being reported at excellent signal strengths.

Some keen QRP operators have even spanned the Atlantic with 10mW (yes ... one hundredth of a watt!) when conditions are good proving that power is far from important on this band. However, I have to admit that if you are trying to work a juicy piece of DX on a rare Pacific Island a bit more power will come in handy!

Amplitude Modulation?

You can still hear amplitude modulation (a.m.) on 28MHz! "What - a.m. - on this band ... really?" I can imagine you asking. Well, answering I can say this is one band where there's enough space even for this mode.

You often hear a.m. if you listen between 29 and 29.1MHz when the band is open to the USA in the better years of the sunspot cycle. Here you can enter a 'time warp' with stations using beautifully modulated a.m. transmitters often dating from the 1950s and 1960s being workable (see letter entitled 'Aunt Mary' on 28MHz, page 10 of this issue).

To prove the point I had many enjoyable QSOs using just 10W of a.m. with Canadian and US stations in the last sunspot peak. Why not join in yourself?

Satellite Operation

Another joy of 10m operation for some is satellite operation using the lower orbit satellites such as the Russian RS series. These have input frequencies on 144MHz (or 21MHz) with outputs around 29.3-29.4MHz.

The unsuspecting newcomer may believe 10m is wide open hearing these signals not realising they are the downlink of a satellite! (Usually there is little s.s.b. or c.w. activity above 29MHz except for satellite operation).

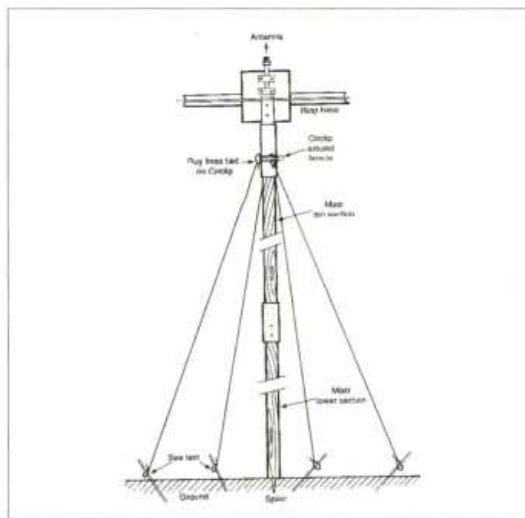


Fig. 2: A diagram reproduced from the original August 1990 RB10 28MHz antenna project showing how the system could be used for 'portable' use. (The July and August 1990 issues are no longer available, but photocopies of the two part article are available from the PW Book Service).



Fig. 1: A suitable 28MHz 'Ring Base' antenna was designed by the late Fred Judd G2BCX and published as the 'RB10' antenna in the July and August 1990 issues of PW. The prototype antenna is shown being set-up by (a very young 'slim-line') Tex Swann G1TEX, not far from the old PW offices in Poole.

Slot	Call	14.100	18.110	21.150	24.930	28.200	Operator	Status
1	4U1UN	00:00	00:10	00:20	00:30	00:40	UNRC	OK
2	VEBAT	00:10	00:20	00:30	00:40	00:50	RAC	Off air: moving
3	W6WVX	00:20	00:30	00:40	00:50	01:00	NCDXF	No o/p on 18 or 24MHz
4	KH6WO	00:30	00:40	00:50	01:00	01:10	UHRC	No o/p on 18 or 24MHz
5	ZL6B	00:40	00:50	01:00	01:10	01:20	NZART	OK
6	VK6RBP	00:50	01:00	01:10	01:20	01:30	WIA	OK
7	JA2IGY	01:00	01:10	01:20	01:30	01:40	JARL	OK
8	UA...	01:10	01:20	01:30	01:40	01:50	SRR	Does not exist
9	BY...	01:20	01:30	01:40	01:50	02:00	CRSA	Does not exist
10	457B	01:30	01:40	01:50	02:00	02:10	RSSL	OK
11	ZS6DN	01:40	01:50	02:00	02:10	02:20	ZS6DN	OK
12	5Z4B	01:50	02:00	02:10	02:20	02:30	RSK	OK
13	4X6TU	02:00	02:10	02:20	02:30	02:40	U.Tel Aviv	OK
14	CH2B	02:10	02:20	02:30	02:40	02:50	U.Helsinki	OK
15	CS3B	02:20	02:30	02:40	02:50	00:00	ARRM	OK
16	LU4AA	02:30	02:40	02:50	00:00	00:10	RCA	OK
17	OA4B	02:40	02:50	00:00	00:10	00:20	RCP	OK
18	YV5B	02:50	00:00	00:10	00:20	00:30	RCV	pw doesn't reduce below 60W

Table 2: The 'timing slot' sequences for the IBP beacons on 28MHz. These will help you to identify each beacon by its time sequence as the c.w. identification is sent at 22w.p.m. (For further in-depth information please refer to either the Practical Wireless Callsign Directory CDROM, or the January 1999 PW. New beacons (Slot 8 + 9) are now, or are about to come on air.

Appetite Whetted?

I hope you have read enough to have your appetite 'whetted'! Get those converted n.b.f.m. CB rigs down from the attic, string up a wire dipole from the gutter down the garden or buy a cheap CB vertical - or build the PW RB10 antenna.

Alternatively get that simple QRP transmitter built for 10m which you always meant to build but never did! Or just fire up your main station. Join the fun which is really getting under way now! And I hope to see you on 29.6MHz n.b.f.m. or 28.060MHz QRP c.w. Good DX hunting!

PW

Making Sense of ... Transmission Lines

In this article, Geoffrey Billington G3EAE explains how you can make sense of transmission lines. He tells you all about pulse generators, the passage of a pulse, reflected waves, standing wave ratios and much more which should help you to enjoy and understand your hobby even more.

It's usually assumed that when an electric current is switched on, it starts instantaneously everywhere in the circuit. In fact, it takes time for any disturbance of the electrons to travel along a wire.

The speed of propagation is almost equal to the speed of light and, in most cases, time lags are undetectably small. However, things are different at radio frequencies, where a transmitter voltage may change significantly before distant parts of the circuit have had a chance to respond.

Pulse Generator

The drawing in **Fig. 1** shows a pulse generator connected to one end of a transmission line consisting of a long pair of wires. The generator is 'off', in this drawing, but it is capable of producing a single pulse of extremely short duration. The wires will normally be electrically neutral: this means that (everywhere) there are just sufficient (negative) electrons to neutralise the positive charges which are fixed within the atoms of metal and unable to move.

Now imagine that the generator produces a short pulse by rapidly pumping some electrons from the upper wire to the lower. This produces a small, positively charged region at the left hand end of the upper wire and a similar negatively charged region on the lower wire.

The two charged regions travel out, side by side, at nearly the speed of light. The propagation of these regions can only be properly explained in terms of the electromagnetic field around the wires, but the following simplified picture may be helpful:

Imagine the two wires to be represented by two long corridors, both packed with people. Suddenly a small group are dragged out from the left hand end of the upper corridor and forced into the left hand end of the lower. A compression pulse passes down the lower corridor as people push against their neighbours whilst in the upper corridor, people tend to fall into the less densely packed 'hole' which moves as a result.

The main point is that nobody moves very far as the regions of high or low density travel along the

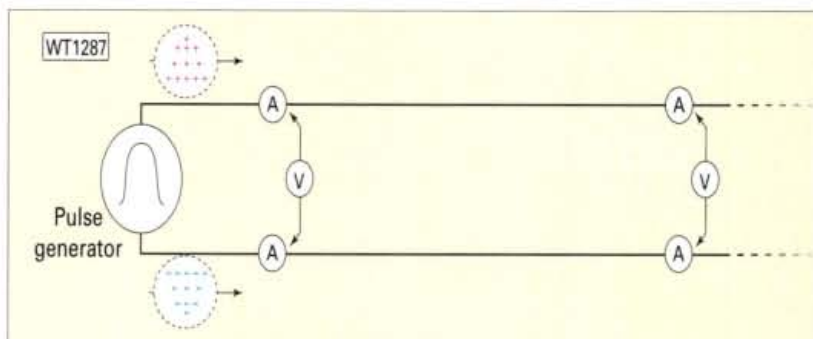


Fig. 1: Diagram of a pulse generator connected to one end of a transmission line consisting of a long pair of wires.

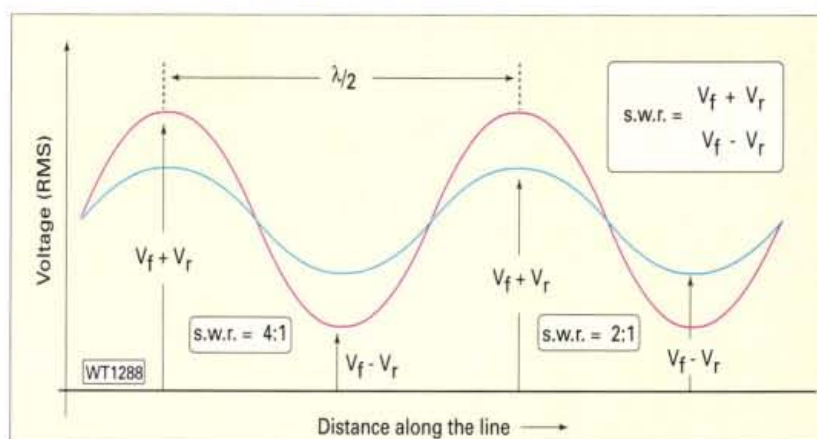


Fig. 2: Charting the variation of the effective voltage of the combining forward and reverse travelling pulses as various points along the transmission lines. The ratio of the actual voltage readings, at points of highest and lowest voltages, we term the voltage standing wave ratio (v.s.w.r.). Two examples are shown here.

corridors. Similarly, the charged regions can move along a wire without any electron moving very far.

Passage of a Pulse

Now, how can we monitor the passage of a pulse? Imagine that the generation of a pulse could take place in slow motion. Now imagine that this could be monitored from instant to instant using a centre zero ammeter in each line and a similar voltmeter connected across them at a point close to the ammeters. (Two such groups of meters are shown in **Fig. 1**).

First we must think about the voltmeters. The left hand meter responds first, swinging over to one side and then returning to zero as the pulse passes and the right hand meter plays 'follow my leader' a short time later. If the line is loss free then the meters will give identical readings apart from the time lag.

Now look at the left hand pair of ammeters - the upper and lower meters will give equal readings, but they will deflect in opposite directions. Although the upper and lower charged regions are moving in the same direction, the upper ammeter denotes the direction in which the positively charged region is moving. The lower ammeter gives an opposite deflection because it's monitoring the motion of a negatively charged region. After a short time lag, the right hand pair play follow my leader with the left hand pair.

If an alternating sequence of positively and negatively charged regions passed along the line, there should be a continuous wave and each group of meters would swing back and forth from one side to the other. As before, the right hand meters will lag on the left hand meters. If this lag was one complete cycle, the two groups of meters would swing in phase and the distance between the groups would be one wavelength (the 'repetition distance').

Let's suppose that the pulse generator had been connected to the **right** hand end of the line and had produced similar charged regions which now moved in the opposite direction, i.e. from right to left. If the pulse was monitored as before, it's obvious that the left hand meters would lag on the right hand meters.

What may not be so obvious without further thought is that, although the voltmeters will deflect to the same side as previously, the ammeter readings will be reversed. If two (oppositely) moving pulses have voltages of the same sign, their associated currents have opposite signs - and vice versa. This will become very significant later when dealing with standing waves.

If the voltage and current on a loss free line could be monitored from instant to instant, as in Fig. 1, it would be found that the ratio (volts/amps) remained constant during the passage of a wave or pulse. This ratio is represented by the symbol ' Z_0 ' and is termed 'the characteristic impedance of the line'. It depends upon the diameters and spacing of the wires and on the 'dielectric', i.e. the substance between them.

Also, when a transmitter is switched on the line presents a resistance of $Z_0\Omega$ to the transmitter. No matter what terminates the far end of the line the transmitter continues to 'see' a resistance of $Z_0\Omega$, unless and until a reflected wave arrives back, when the line's input impedance suddenly changes.

The impedance which terminates a line will impose restrictions on the values of voltage across and the current through it. If the terminating impedance is a resistance of $Z_0\Omega$, then the voltage and current delivered by any pulse or wave will always be in the required ratio. There are no complications and the energy of the pulse is completely absorbed. The line is said to be 'matched'.

If the line is terminated in any other impedance then the oncoming wave can't satisfy the imposed conditions. Thus reflection occurs in such a way that the oncoming and reflected waves together produce acceptable resultant values of voltage and current at the load.

Reflected Waves

What happens to a reflected wave? If we're dealing with a generator which produces a single pulse then the answer is fairly clear. As a general rule the pulse would be re-reflected at the quiescent generator and it would shuttle up and down the line rapidly decaying as it lost energy at each reflection.

Things aren't so obvious if the generator is producing a continuous train of pulses (a wave) and is still running when the reflected wave returns. Without going into immense detail, it can be said that there's usually a short 'settling down' period which quickly results in the build up of steady continuous forward and reflected waves.

Once this 'steady state' has been attained, the energy stored on the line remains constant and the energy fed into the line in each second by the transmitter must be equal to the energy leaking out per second into the antenna.

Let's look at the matter this way: when the steady state has been attained, an energetic wave arrives continuously at the antenna end and a less energetic reflected wave continuously leaves it. The difference in energy goes to the antenna.

At the transmitter end, the reverse process takes place with the energetic wave continually leaving whilst the less energetic reflected wave is continually arriving. The difference in energies must be supplied by the transmitter, the reflected wave's energy helps to maintain the forward wave.

For instance, some transmission line watt meters can display either 'forward power' or 'reflected power' - or sometimes both at the same time. These two readings do **not** refer to 'useful power' and 'wasted power'.

The power supplied to the transmission line is given by the formula - **Power Supplied to the line = Forward Power - Reflected Power**. Hopefully, the power **delivered to the antenna** will be the same as the power **supplied to the line**, which would be true for a loss free line.

Standing Wave

The resultant distribution of current and voltage produced by the combined effect of the forward and reflected waves is termed a 'standing wave'. The diagram, **Fig. 2**, shows the sort of waveform which would be obtained if the r.m.s. voltage due to a standing wave was measured at different points using a normal r.f. voltmeter and the results plotted on a graph.

The root mean square (r.m.s.) voltage is the 'equivalent d.c. value' and is equal to 0.71 times the peak value and is displayed by the meter as a steady reading. The peaks and troughs of the standing wave remain fixed in position on the line, hence the name.

The peaks and troughs of the standing wave are formed because of the phase difference between forward and reflected waves. These vary along the line due to the time taken by the wave to travel from any given point to the reflector and back again.

Suppose that the r.m.s. voltage of the forward wave was V_f and that of the reflected wave was V_r . At some points on the line these two voltages will be in phase and the resultant voltage is obtained by adding them giving $[V_f + V_r]$. Half way between these points the component voltages V_f and V_r will be in antiphase and the resultant voltage is $(V_f - V_r)$.

At other points things become more complicated and the V_f and V_r need to be combined using a vector (phasor) diagram but the resultant always lies between these extreme values. If the load is only a slight mismatch, V_r will be small compared with V_f so there will only be a small variation of voltage along the line. With a perfectly reflecting termination (i.e. an open circuit, short circuit, or a pure reactance), V_f and V_r would be equal and complete cancellation would occur at the minima.

A word of warning should be added at this point.

"The existence of a standing wave on an ideal line involves no wastage of energy. Any real line will have intrinsic losses due to the resistance of the conductors and inefficiencies of the dielectric between them and losses tend to increase with increasing s.w.r., but there's no direct one-to-one relationship between s.w.r. and efficiency."

Although Fig. 2 may give the impression that the distance between neighbouring peaks is one wavelength, this distance is in fact only half a wavelength. The reason for this 'doubling-up' of voltage peaks is due to inadequacies of r.f. measuring equipment, which is unable to 'see' the phase of the maximum voltages. One peak being due to 'positive going peaks', the other 'negative going peaks', both being shown only as peak readings.

The distance between **alternate** maxima (or alternate minima) is the 'repetition distance', i.e. the true wavelength. The minima are half way between the maxima so the distance between a maximum and neighbouring minimum is one quarter of a wavelength.

If the distribution of r.m.s. current is plotted then the graph obtained is similar to the voltage graph but it is shifted so that the current maxima occur at the same points as the voltage minima (and vice-versa). The reason for this stems from what was briefly mentioned earlier, i.e. where you see V_f and V_r add, I_f and I_r subtract and vice versa.

Here, I_f and I_r are the r.m.s. values of the forward and reflected waves. At a voltage maximum the resultant voltage is $(V_f + V_r)$ and resultant current is $(I_f - I_r)$. At a voltage minimum the resultant voltage is $(V_f - V_r)$ and resultant current is $(I_f + I_r)$.

Note: The idea that the current in a wire can vary from place to place may seem strange until you realise that the alternating current in any part of the wire consists of the electrons surging backwards and forwards, and the strength and the phase of these surges varies from one place to another. In most cases this motion is too complicated to visualise.

Standing Wave Ratio

The standing wave ratio (s.w.r.) is equal to: **(Maximum Voltage)/(Minimum Voltage) = $(V_f + V_r)/(V_f - V_r)$** and gives a useful indication of mismatch. In Fig. 2 the s.w.r. is 4.

The s.w.r. can have any value between 1.0 for a perfect match up to infinity for a load which absorbs no energy whatever, e.g. a short circuit, an open circuit, or a pure reactance.

Note that the s.w.r. can alternatively be calculated using maximum and minimum currents. The value of the s.w.r. is determined by reflection from the load **and is completely independent of anything which happens at the transmitter end.**

No Wastage

The existence of a standing wave on an **ideal** line involves no wastage of energy. Any real line will have intrinsic losses due to the resistance of the conductors and inefficiencies of the dielectric between them and losses tend to increase with increasing s.w.r., but there's no direct one-to-one relationship between s.w.r. and efficiency.

In practice, an s.w.r. of less than 2.0 usually involves negligible extra loss. As a general rule, higher s.w.r.s can be tolerated on open wire feeders than on coaxial cable as the former usually has lower intrinsic losses.

Pure Resistance

When the load is a pure resistance, 'R', (e.g. a resonant antenna), there are some simple rules which apply: If

R is greater than Z_0 there will be a voltage maximum at R and the s.w.r. will be R/Z_0 . If R is less than Z_0 , there will be a voltage minimum at R and the s.w.r. will be Z_0/R .

For example, an s.w.r. of 2 on 50Ω line would be given by a resistive load of 100Ω, but this s.w.r. could equally well be due to a resistive load of 25Ω. To complicate matters further there's a whole range of complex impedances lying between 25 and 100Ω which will give rise to an s.w.r. of 2. Although only resistive loads will give a maximum or minimum at the termination.

Mismatched Length

A mismatched length of line can sometimes be used to produce a transmission line transformer, although the use of such transformers is limited as their operation is usually restricted to a single frequency. A simple example is the quarter wave transformer.

Suppose a resistive load of 100Ω is connected to a transmitter by one quarter wavelength of 50 ohm line. A standing wave will be set up with a voltage maximum at the 100Ω load and the s.w.r. will be 2.

As the line is one quarter wavelength long, there will be a voltage minimum at the transmitter end. The formulae relating R to the s.w.r. can be applied equally well to the transmitter end of the line where R will represent the resistance presented to the transmitter.

For example: $50/R = \text{s.w.r.}$ The s.w.r. has been fixed at 2 by the load so $50/R = 2$. Hence $R = 25$ - a pure resistance of 25Ω is presented to the transmitter.

If the load had been a resistance of 25Ω, a similar treatment would show that a resistance of 100Ω would be presented to the transmitter. In fact, the whole arrangement can be summed up by the formula: $P \times Q = Z_0^2$ - where P and Q represent the two resistances.

This simple formula can only be applied when the load is a pure resistance with no reactive component (e.g. a resonant antenna). If the line had been one half wavelength long it would have acted as a 1:1 transformer and this would be equally true whether or not the load was a pure resistance.

The reason is fairly obvious when you remember that both currents and voltages repeat every half wavelength. Admittedly the phases of both reverse but this has no effect on impedances.

Any whole number of half wavelengths of line act as a 1:1 transformer, whilst any odd number of quarter wavelengths will transform resistive loads according to the formula $P \times Q = Z_0^2$. The impedance transformations due to other lengths of feeder are much more complex but can be found using a Smith chart.

Measuring Wavelengths

The wavelength on a transmission line is less than the free space wavelength and may be calculated using the formula: **Wavelength in metres = $(300 \times \text{Velocity factor of line}) / (\text{Frequency in MHz})$** . The velocity factor is always less than unity.

For coaxial cable with a solid dielectric it is usually 0.66, when the dielectric contains air cells it is likely to lie between 0.75 and 0.80. For open wire lines the velocity factor is almost 1.0 and can usually be ignored.

Anyway, that's transmission lines for you. I hope that my article has helped shed a little light on some of those nagging questions - happy calculating! **PW**

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The GB100FI Experience ...

A DXpedition To Flat Holm Island

Clive Tombs GW4MOG tells a tale of a group of Radio Amateurs whose mission it was to set up an Amateur Radio station on Flat Holm Island in 24 hours. Then they had to operate it around the clock and obtain numerous DX QSOs - all this as well as finding the time to fit in a reconstruction in honour of Marconi! Read on and find out just how they managed the marathon.

Fig. 2: The Marconi monument (representing the "Spark of Marconi's idea" translated into a "Sparkgap transmitter") erected on Flat Holm Island by the Barry ARS. Sculpted by Alf Cornick MW1AML and unveiled on the 13th May 1997 by the Italian Vice Console Mr. D. Casetta. (Photograph courtesy of Glynn Jones GW0ANA).



In the summer of 1997, myself and a group of fellow Radio Amateurs set off on a mission to a little island situated half way between Penarth & Weston-Super-Mare in the Bristol Channel. Flat Holm island is a wonderfully green isle, populated by thousands of Herring and Lesser Black Back Gulls. (Who were, incidentally, in the middle of their nesting season - which meant eggs everywhere and the added hazard of dive-bombing by agitated Gulls!)

The spearhead party, consisting of Alf MW1AML, Brian GW3WBU, myself - Clive GW4MOG and Ronnie DL1RCB, a special guest from the Passau Radio Club in Bavaria arrived on the island on a Monday morning with a boat full of antennas and radios. Our mission: to establish an operational station in 24 hours.

Standing on the Barry Dock quayside staring out beyond the breakwater, the sea was looking a little 'lively'. But in the event, when we were past the rough eddies in the entrance to the harbour, our boots only got wet a dozen or so times!

Upon landing on Flat Holm island, it was as if it knew we had arrived - as soon as we set foot on the island, the heavens opened. We had no choice but to lift all the equipment by hand up the steps in the cliff with a resigned smile on our faces and the thought of a hot cup of something later in our minds.

Having been drenched through to beyond our skins, it was with the aid of modern telecommunications equipment that Brian ordered a replacement pair of trousers from the mainland. This was the source of much amusement among the intrepid explorers.

However, the skies cleared partially and for the rest of the day, working in the showers between the cloudbursts, the antennas were assembled. Just as the light was about to be lost, a calm descended on the island and it was thought safe to hoist the previously built (but



The GB100FI Flat Holm Island crew: Back row (left to right): Marcus DL9RCF; Keith GW3TKH; Bob GW4UZW; Brian GW4LFV; Ronnie DL1RCB; Hansi DL9RDZ; Andy GW0KZG (the head) and Glynn GW0ANA. Front Row: Alf MW1AML; Brian GW3WBU; Clive GW4MOG and Alois DL8RBL. (Photograph courtesy of Andy GW0KZG).



Fig. 1: The 3-element Tri-band antenna at 30ft (9m) sitting on top of a copper ground mat installed years ago by Trinity House as there was a radio beacon at this point once (which is now gone but the mat remains). The beam is only 100m from the cliff face and 100 feet (30m) a.s.l. (Photograph courtesy of Glynn Jones GW0ANA).

most of the spearhead crew retired for the night.

The first night was spent in a house adjoining the operating position which was done to protect us all from the ten or so sixth form girls staying at the farmhouse! Contact was made with them during breakfast but both parties emerged unscathed. They departed the island after breakfast on the boat that was to bring the full compliment of eight more members of the Barry ARS members, plus assorted press and dignitaries to commemorate Marconi's first

prostrate) Cushcraft Tri-band antenna and mast. Someone must be watching over us!

Equipment Used

In terms of the equipment used, we were lucky enough to have the aid of a number of UK manufacturers and dealers. Yaesu (UK) Ltd. were kind enough to loan the Barry Amateur Radio Society two top of the range FT-1000MP DSP transceivers and Linear Amp UK likewise loaned the society their brilliant Explorer 1.2kW linear amplifier.

The antennas we used included: a half wave dipole for 1.8MHz which was situated on the top of the lighthouse, over the roof of our station to a 25 foot (7m) pump-up mast which was supported by a Second World War brick shelter some distance beyond (see Fig. 1); a Cushcraft C3 Beam for 14, 21 and 28MHz and a Butternut vertical for 3.5 and 7MHz.

Welcome Meal

After a simple but extremely welcome meal of beef pie followed by apple crumble, the four of us - having achieved our main goal - had to put our station to the test. At this point the skies were as black as pitch and I swear I heard Thor walking around. I wasn't too surprised to be able to draw a half inch arc from the wire when disconnecting the 1.8MHz dipole. After all this excitement and with some reservations about the 6-element quad for 144MHz,

ever radio transmission across water.

When it arrived, the boat was fully loaded down with personal belongings of the operational unit of members and some more radio equipment - as well as Brian's new pair of trousers. All this was somewhat dwarfed, however, by the paraphernalia carried by the cameramen, soundmen and assistants with attendant dignitaries, that can only be described as a media circus.

Monument To Marconi

The presence of the media on the island was brought about by the imminent unveiling of a very fitting monument to Marconi and the spirit of world-wide friendship through Amateur Radio (see Fig. 2). The heavy Stainless Steel sculpture, created by Alf, had been set in a cairn of local stone - a project that had been some six months in construction - and was about to be unveiled by the **Italian Vice Console, Mr. D. Casetta**.

One last polish with special grade sand paper not an hour before its appearance in the media spotlight and the

uncomfortable it was, wasn't a factor! The same applied to the bunk beds in the dormitory. In some cases the spring and wire assembly had been removed and replaced with a '6 be 3' sheet of five ply.

Around The Clock

The radio operation was carried out around the clock except for an hour or so each evening to "rest the generator". (See Fig. 4). However, this was an apparently necessary operation according to the warden and - after all - it was convenient, during this time, to take dinner.

Dinner was cooked each evening by the Society's chairman & station manager, **Glyn GW0ANA**. One speciality conjured up of a Wednesday evening was "**Marconi Bolognese**" - "a rich meat sauce with red beans served on a bed of fresh pasta" (so the menu would have read) - a fitting repast. Other fine feasts included roast chicken with roast potatoes and sweet corn. Meals were all washed down with a polybin of "Buckley's Best" (beer), especially imported for the occasion.

During the trip to Flat Holm Island, dinner was a period in which to relax, be ourselves and, where Alf was concerned, to practice his German language on the guests. This consisted in part of "Yah Yah Bebe" repeated often and loudly and various other phrases picked up from dubious sources and best not repeated in polite company. But it is a well known fact that foreigners like us to practice their language on them, and our German friends were no exception. Their sides nearly split with laughter.

Technical Breakdowns

The DXpedition suffered from its fair share of technical breakdowns, of course. The first major problem was the failure of Alf's rig that was working on 3.5MHz, was switched to 7MHz, then back again but with no transmit and very little heard on receive.

A replacement for Alf's rig was shipped out from the mainland and this worked fine for a day or so, but then also succumbed to the vigorous over-use and became possibly intermittent. At 0500 on Thursday morning a "twang", followed by a screech of a wounded Seagull and the gentle 'tinkle' of wire against tiles alerted the sleepy operating staff that all was not well with the dipole.

The unfortunate avian culprit was no where to be seen but the dipole, however, had suffered a breakage on its centre support. Luckily, this was repaired and hoisted aloft before the dayshift returned none the wiser.

With three h.f. stations, a v.h.f. station plus a link to the Packet DX cluster, as well as the 144MHz link to GB100LP, the DX soon started to pile up. After about 40 hours the DXCC was ours and by Friday morning the total QSO count was around 4700.

It was at breakfast on the final day that we were told to have our bags at the jetty for midday. This was some four hours before our scheduled departure. The boat would now have to make two trips because of a party unexpectedly on board the boat. The first trip to take a large quantity of our gear to enable everybody to return to the mainland without overloading.

The target of 5000 QSOs was to be fought for and at 1030, the countdown reached the point at which celebrations could be legitimately started. The bottle of specially imported Mott & Preece wine was uncorked and distributed to the entire assembled gang of weary but jubilant masters of the microphone.

The freshly swilled tea mugs might not have been the first choice for the toast to be served in, but my, it tasted good! We had made over 5000 QSOs and had achieved 124 DXCC countries in four days. The whole team sipped their wine and glowed with pride, yes Mr. Marconi, we remembered you in fine style.

PW



Fig. 4: The author himself, Clive GW4MOG (standing), looking 'bushed' having just changed operators after a long night DXing on 7MHz. Keith GW3TKH is on the microphone ready to QRX into the pile-up! (Photograph courtesy of Glyn Jones GW0ANA).



Fig. 3: Dr. Marcus DL9RCF working a pile-up - the dawn's breaking and the early morning sun is creeping into the shack, but Marcus is lost in the pile-up - he wants his DXCC in four days! (Photograph courtesy of Glyn Jones GW0ANA).

metallic 'spark' representation was looking magnificent. To prepare it finally for the dignatorial presence it was draped with the Italian and Welsh flags.

Following the unveiling ceremony, the 'Fleet Street' contingent marched up to the operating point to see what 100 years of development had done to the first spark that Marconi had sent. At a previously appointed time a reconstruction of that first transmission was sent to Lavernock Point. The plan was to use 'Top Band' with a kite antenna. However, problems with the weather balloon meant that 144MHz was a much favourable choice for the event.

So, at the appointed time **Andy Adams GW0KZG** sent the exact message in c.w. to Lavernock Point as Marconi had done 100 years ago. After this historic re-enactment, the personnel of the broadcasting organisations scurried back to the boat to catch the tide. Now the operating could start in earnest!

With the last h.f. vertical antenna erected, a quick change to the v.h.f. beam and the tea urn up to temperature, the task ahead was started. Four days of operating, sleeping and eating: not in any particular order.

The various members had different operating styles of course and for sheer QSO rate the prize must, I feel, go to **Marcus DL9RCF**. He seemed to be unable to stop! For the whole of the night he was completing probably 80-100 QSOs each hour - and he could still talk at the end! (See Fig. 3).

Sleeping was no problem for most, despite the hard chairs in the shack. We were usually so tired that if we were in a position to be falling to the 'land of nod' then how

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Part Four Of Our Introduction To Microwaves Series...

Get Going On Microwaves!



David Butler G4ASR brings you the fourth and final part of his mini-series on microwaves. In this final article, he lets you know where you can turn for more information and support if you've discovered an interest in microwave operation.

From letters and E-mails recently received, I'm pleased to note that a number of you are now becoming very interested in communications at super high frequencies, especially with local Amateur TV (ATV) and the more distant DX modes.

Last time around I took a look at the various options that can get you going on the microwave bands. In particular, I mentioned transceivers and transverters for narrow band communication and the modification of surplus satellite receivers for ATV and high-speed data links.

I also described how an inexpensive Gunn diode module, taken from a security alarm, can form the basis of a wide band telephony, data or TV transmitter/receiver. However, just looking at the hardware aspects won't necessarily give you all the information you require. You also need to keep up to date with recent trends and developments and also find out where you can get help when you require it.

So, for the final part of the series I'm providing details of books, newsletters, magazines, microwave organisations and their relevant Internet Web sites. The latter will also provide you with details of where to obtain components, kits and surplus microwave equipment.

Sources Of Information

Books are an ideal source of information if you want to learn about established microwave technology and associated techniques. Two books which I would personally recommend are the **RSGB Microwave Handbook** - Volumes 1, 2 & 3 (See Fig. 1) and the **ARRL UHF/Microwave Experimenters Manual**. (See Fig. 2). By their very nature, though, books are often unable to keep up with the very latest microwave developments and normally don't provide operational details of what other experimenters are currently building or using.

To find out what's really happening you need to subscribe to specialist newsletters and magazines. However, because of the wide diversity of interests in microwave communications you'll need to carefully select which one is right for you.

Here are my personal choices:

If you're interested in **any** aspect of microwave DXing then, in my opinion, you should subscribe to the **Microwave Newsletter**. It's edited by **Peter Day G3PHO** and **Barry Chambers G8AGN** and published by the RSGB approximately once a month (ten times a year).

The **Microwave Newsletter** is usually 12 to 16 sides in an A5-size booklet and has information covering all microwave bands with an emphasis on the 10, 24 and 47GHz bands and DX operation. It also contains operational news, station activity, technical articles, equipment information and much more.

There's also a very useful 'Sale and Wanted' column where recent items for sale have included transverters for the 1.3, 2.3, 10 and 24GHz bands, amplifiers - both solid-state and valve (t.w.t.), components, waveguide and specialist test equipment. I reckon the newsletter is worth it just for finding out where all the surplus equipment is located! Contact the RSGB (you don't need to be a member) if you wish to subscribe to the **Microwave Newsletter** or to obtain a free sample copy.

German Publication

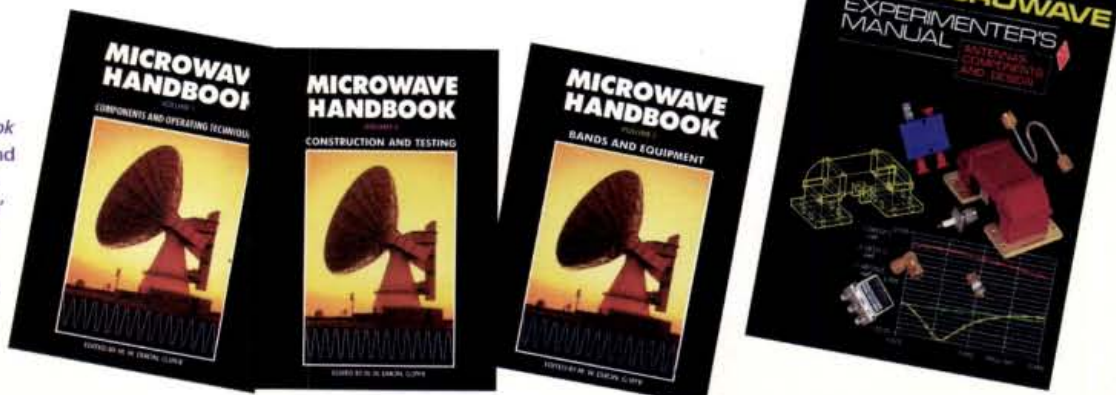
A superb technical magazine entirely devoted to v.h.f., u.h.f. and microwaves is the German publication **Dubus**. It is, without a doubt, the **leading European** magazine for microwave Amateur Radio, covering weak-signal operation for all bands from 50MHz through to 241GHz.

Dubus is published quarterly and normally runs to 100 A5-size pages, written in English and German. It has advanced technical projects covering receivers, transmitters, transverters, antennas, cables and waveguides, filters, propagation, theory, microwave components and equipment reviews.

There is also operating information with beacon lists, meteor scatter (m.s.) and earth-moon-earth (e.m.e.)

Fig. 2: The ARRL UHF/Microwave Experimenters' Manual is also available from the **PW Book Store** and costs £15.50. To order, please use the Order Form on p.90 of this issue or telephone the Credit Card Hotline on (01202) 659930.

Fig. 1: The **Microwave Handbook** Volumes One - 'Components and Operating Techniques', Volume Two - 'Construction and Testing' and Volume Three - 'Bands and Equipment'. All three volumes are available from the **PW Book Store**. Volume One costs £10.50 and Volume Two and Three cost £15.75 each.



address lists, contest dates, contest results, expeditions, news and comments. *Dubus* also features regular columns with activity reports covering 50MHz, e.m.e., aurora, field-aligned irregularities (f.a.i.), m.s., Sporadic-E (Sp-E), tropo and microwave openings. In fact, it's the magazine that every DXer should have on their bookshelf. Indeed, it's often said that if you haven't heard of *Dubus* then you're not a DXer at all!

A spin-off from the magazine is *Dubus Technik* - a soft-back book of 400 pages containing a selection of technical articles and reports from *Dubus* magazines in the previous three years. Edited by **Rainer Bertelsmeier DJ9BV** (famous for his antenna design work), the latest volume, *Technik V*, has chapters on antennas, measuring equipment, oscillators, pre-amplifiers and receivers, transmitters and transverters, power amplifiers, software and computers, construction techniques, parts and kits.

So, if you want the design for a Yagi with a gain of 20dBd on the 1.3GHz band, a 40W GaAs f.e.t. amplifier on the 2.3GHz band, a 'no-tune' transverter for the 5.7GHz band, a pre-amplifier with a noise figure of 1.5dB for the 24GHz band or an active doubler for the 47GHz band (and much more), then this will be the book for you.

(Don't forget it also covers all bands from 50MHz and up, so you'll also find constructional details for a 13m long Yagi for the 50MHz band and amplifier designs producing 1.5kW output on the 144, 430MHz and 1.3GHz bands). Both *Dubus* and *Dubus Technik* can be obtained from the UK agent, **Roger Blackwell G4PMK**.

Excellent Quarterly Publication

Another excellent quarterly publication covering v.h.f., u.h.f. and microwave technology is **VHF Communications** which is the international edition of the German publication *UKW-Berichte*, edited by **Michael Wooding G6IQM** and published under licence in the UK by **KM Publications**. However, due to Mike's early retirement, the last issue he edited was Issue 4, 1999.

The good news though is that **Andy Barter G8ATD** will be picking up the reigns from 2000 to ensure *VHF Communications*' continuity. This is very welcome news as the publication features many state-of-the-art microwave constructional articles. The magazine also supplies the kits, p.c.b.s and components associated with the technical articles. Unlike *Dubus* with its pages of station reports, *VHF Communications* concentrates entirely on technical projects and the occasional theoretical article on propagation.

The foremost association for anyone interested in ATV is the **British Amateur Television Club (BATC)**. The club magazine *CQ-TV* (issued four times a year), covers not only the intricacies of TV technology but often features transmitter/receivers for many of the microwave bands. Indeed, even if you aren't interested in ATV, I would still recommend that you join the club just for the microwave constructional articles featured in the magazine.

Internet Home Pages

There is an enormous wealth of information to be found on the Internet regarding Amateur Radio microwave operation. I've mentioned a number of sites in the table on this page, but the home pages of **Peter Day G3PHO**, **Simon Lewis GM4PLM**, **Al Katz K2UYH** and the BATC are particularly worthy of note.

Together, the sites will provide you with everything you need to know about microwave construction, kits, components, operational news and links to other microwave sites. The BATC site even contains back

copies of *CQ-TV* magazine and ATV handbooks - thoroughly recommended!

If you want to receive technical information via E-mail you should note that **Glen Ross G8MWR** runs two discussion groups, 'radio-tech' and 'waveguide', the latter specifically for microwave operators. Send an E-mail to: **ross@zetnet.co.uk** to join either list.

Conventions

If you're interested in any aspect of microwave construction and need guidance or help you will benefit from attending a microwave 'Round Table' event. These are organised by like-minded enthusiasts and are held at various venues around the country.

During 1999, the 'Round Tables' were held in Berkshire, Dorset, Gloucestershire, Suffolk and West Sussex. The one-day event normally consists of a Bring & Buy stand, equipment display, alignment service with specialised test equipment, a number of short talks and the opportunity to meet other microwave operators.

Another venue worthy of attending is the **RSGB VHF convention**, normally held at Sandown Park, Surrey during the first quarter of the year. The RSGB Microwave Committee have a display stand where face-to-face advice can be provided. They also arrange the microwave lectures held during the afternoon.

New Microwave Society

The inaugural meeting of the **UK Microwave Group** was recently held at the Martlesham round table event in November. It has been formed by **Sam Jewell G4DDK** and **Lehane Kellett G8KMH** to provide an officially recognised UK-based organisation along the lines of existing DX clubs, ATV and satellite organisations.

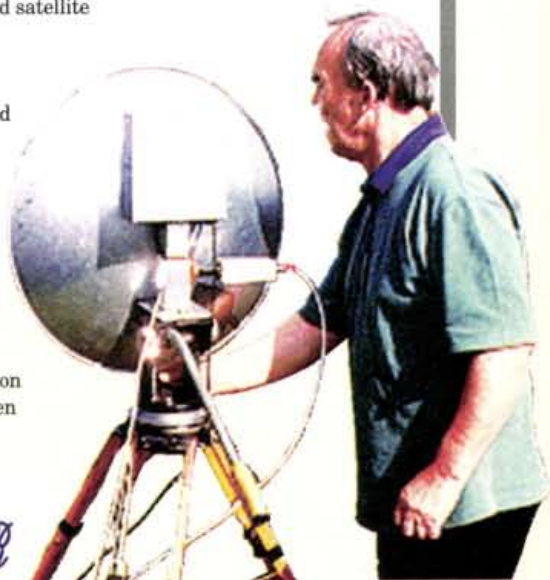
One of the aims is to make membership attractive to narrow band, beginners, satellite, data and ATV operators. It is proposed to publish a bi-monthly newsletter and an annual technical collection. Send an E-mail to: **jewell@btinternet.com** or **lehane@mm-wave.demon.co.uk** for more details.

That's it for this series. If you have any questions regarding microwave construction or operation please contact me. Details are given in my 'VHF Report' column at the back end of the magazine.

Internet Web Sites

Amsat-UK:
<http://goshawk.pharmweb.net/Radio/AMSAT/>
BATC: www.batc.org.uk
Severnside ATV Group:
<http://wkweb4.cableinet.co.uk/severnsideTV/Severnside.htm>
RSGB Microwave Committee:
www.rsgb.org/society/mc.htm
G3PHO Peter Day (Microwave Newsletter):
www.g3pho.freeonline.co.uk/microwaves/
G3WDG Charlie Suckling:
www.g3wdg.free-online.co.uk/
(Components and Kits)
G4DDK Sam Jewell (Technical Information):
www.btinternet.com/~jewell/
G4KNZ Steve Davies (24/47GHz):
www.geocities.com/siliconvalley/vista/8063
G4PMK Roger Blackwell (Dubus):
www.marsport.demon.co.uk/dubus.htm
GM4PLM Simon Lewis:
www.pacsat.demon.co.uk/
(European Microwave News)
G6IQM Michael Wooding:
www.clearlight.com/~vhfcomm/
(VHF Communication)
G8KMH Lehane Kellett (24/47/76GHz):
www.mm-wave.demon.co.uk/radio.htm
K2UYH Al Katz (EME Newsletter):
www.nitehawk.com/rasmit/em70cm.html

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73 David G4APR

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KENWOOD TH-G707	2M/70CM MOBILE TX - 3 ONLY - NEW BOXED	349.95	299.00	OPTO 3005A	10KHZ 30HZ FREQUENCY COUNTER - EX DEMO	299.00	149.00
KENWOOD TH-G7E	2M/70CM HANDI + ROT TNC - 2 ONLY - NEW BOXED	319.99	259.00	OPTO CB AR	SERIAL V/F ADAPTOR FOR SCOUT BEFORE V3111 - CHEAP	39.95	20.00
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CUSHCRAFT 13B2N	13 EL 2M BOOMER, 15.8 DBD GAIN, IDEAL FOR DX	129.95	115.00	PRO AM RH12	24MHZ MOBILE WHIP, WORKS THIS GREAT BAND FOR	19.00	10.00
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CUSHCRAFT 7318B	70CM OSCAR 38 EL 14.3FT BOOM INC POLARITY SWITCHER	209.95	175.00	REVEK FM50	HEADSET/SPEAKER MIC WILL FIT MOST RIGS	49.00	29.00
CUSHCRAFT A14820T	10+10 ELE 2M CROSSED YAGI - 11 DBD ON 11FT BOOM	105.95	99.00	REVEK FM80	MOBILE BOOM MIC, WE'LL WIRE FOR YOUR RIG - (FITTING EXTRA)	25.00	
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DRAE SW2	QUALITY COMMUNICATIONS RX - EX DEMO	489.00	399.00	STARTER ATH30	1MHZ - 2.8KHZ COUNTER - NEW - BOXED	299.00	149.00
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KENWOOD BT11	BATTERY CASE FOR GT1E - LAST ONE	12.95	9.95	WISE WP272H	2/70CMS DOCKING BOOSTER FOR TH95, 2W IN 10W OUT	169.00	99.00
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KENWOOD MB430	MOUNTING BRACKET FOR TS430/140/680/450/690 ETC	30.00	13.00	YAESU MC30	DUAL SLOT RAPID CHARGER - FT10/40/50/51 ETC	91.00	59.95

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KENWOOD TH6707	2M/70CM MOBILE TX	259.00	SANGEAN ATS-803A	SHORTWAVE RECEIVER	99.00	PALSTAR WM150	300/30W PWR/SWR METER	49.00
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YAESU FT290 MK2	2MTR MULTIMODE TX	275.00	COMET CM400N	MINI 70CM SWR METER	15.00			
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50/3 3 E 50MHz Beam	£81.95
Beam - 1.75m, Gain - 9.1 dB, F/B - 25	£12 P&P
50/5 5 E 50MHz Beam	£81.95
Beam - 4.35m, Gain - 12.1 dB, F/B - 28	£12 P&P
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ELECTRONICS IN ACTION

Hello and welcome to the action-packed (tightly-squeezed!) February Electronics-in-Action column (E-i-A), in which you'll find some feedback on the *PW* Sentinel, on the ripple current capability (or otherwise) of capacitors. And lastly a few books for your consideration.



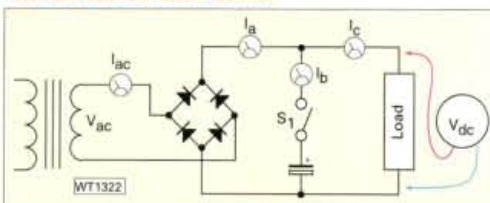
Let me begin this Electronic-in-Action (E-i-A) by turning to the *PW* Sentinel, a project created by **Jim Brightman G0JXN**. Firstly, by the number of you that requested the additional sheets, you seem to think it's a splendid project and I must agree with you all on that point. The project that Jim produced was an excellent power and s.w.r. meter suitable for both h.f. and v.h.f. with the appropriate sensing heads.

I've had a letter from **Lawrence Woolf G3RAX**, about the *PW* sentinel saying that he had seen a similar approach of using a pair of toroidal cores to make the sensing heads, that was patented by **Carl Sontheimer** and **Raymond Frederick** under a US patent issued in 1969. However, the patented version produced by Carl and Raymond didn't use tapped windings on the toroidal cores.

Direct Path

Lawrence says that as both versions provide a direct path through the winding to chassis

Fig. 2: A skeleton unregulated power supply. See the text for more details.



for the signals from the coaxial cable they may both have problems on the lower bands of 1.8MHz. In one version that Lawrence built to counteract this inadequacy at 1.8MHz, he says that, although it indicated a good match itself, it seemed to cause a greater mismatch at the transceiver. (Ah well it goes to prove that nothing in life is free, or without its problems!)

But Lawrence then goes on to write, "My main concern with this article is the application of the term 'RMS' to power. This seems to imply that the author does not fully understand either the mathematics or the physics of power. It should be obvious that while 'RMS' is both valid and necessary when considering a.c. voltages and currents, it cannot be applied to power in any meaningful way.

"The calculation can be performed but gives a different numerical value to the average power which the author seems to mistakenly assume is identical. I believe that this shows that there can be no valid physical meaning to the application of 'RMS' to power". Lawrence then goes on to say that he wrote an article on this subject that was published in another magazine about a year ago and he enclosed a copy of it for, "light reading" as he said. Lawrence then made other comments about the *PW* Sentinel in his letter, but I won't go into them here, I'll expand on them another time.

Ticklish Subject

I'll admit Lawrence, that you've raised a rather ticklish subject, as we often use words and phrases rather loosely. Words and phrases that were defined, often mathematically, to simplify or standardise the way we describe

cyclically varying voltages or currents. For instance, the 'normal' definition of an alternating voltage (or current), where the instantaneous voltage (or current) follows a sinusoidal curve is defined using the term 'Root Mean Square' (r.m.s.). Where the r.m.s. value has an exact and constant numerical relationship to the maximum peak voltage.

No don't turn the page! It's not that difficult. Let me explain it with reference to our mains power system that we say is 230V (a.c.), though in reality the voltage

varies between 0 to around 325V over one part of the cycle, then it travels back down towards 0V again, where it reverses polarity and once again follows the same voltage levels, before beginning the full cycle again as it

returns to 0V. The waveform is shown in **Fig. 1**. So, how can we possibly measure the voltage if it is varying all the time?

The 'trick' that was employed was to use the value of a d.c. voltage that gave the equivalent heating power of a sinusoidal waveform with a constant peak voltage. This value simplified the mathematics, involved so allowing calculations to be carried out using mental arithmetic only. You probably know the relationship ($0.7071 \times V_{\text{peak}}$) but may not have understood where it came from originally.

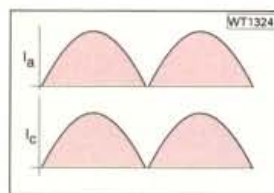


Fig. 3: With no smoothing capacitor, currents I_a and I_c (from Fig. 2) are equal at all times.

However, this numerical relationship of $0.7071 \times V_{\text{peak}}$, exists only for pure sinusoidal voltages. Not for 'square-waves' or 'triangular' (or 'sawtooth') waves, which both have other relationships. In fact when you use a modern digital multimeter (d.m.m.) to measure an a.c. voltage it assumes that the measured voltage is following a sinusoidal curve. The meter actually measures the peak value then, does a quick mathematical evaluation on it, showing a level of 0.7071 of the peak voltage measured. In reality this is a very simplified explanation and the exact maths depend on the type of meter used.

I've had a letter from **John Gomer G8UNZ**, in which he mentions a discussion he had with a local amateur about power supplies. John says in his letter "The concept of ripple rating of capacitors is not taught apparently. Manufacturers, to economise, use ten little audio 'things' in parallel in a p.s.u. that can only give a clean 10A maximum load whatever the panel meter indicated". He then mentioned a 'budget' power supply claiming a '40A' load capability that, after one minute on test, was too hot to touch when loaded to 30A.

John delved inside and found that the input voltage to the series pass regulator was 26V on load. I

presume that this was where John found the "ten little audio things" and I have to admit that I've had similar dealing with power supplies. Mind you, in the case of the power supply that John had it was producing 366 watts of heat in the series regulator - no wonder it was getting hot.

Innermost Workings

As we are talking about it, let's have a closer look at the innermost working of power supplies and at ripple current rating as well. Leaving aside the series regulator part for the time being, I've shown a skeleton transformer, rectifier and input capacitor circuit in **Fig. 2** along with some measuring points. Of course in a real p.s.u. the switch shown in line with the capacitor wouldn't be there, it's

merely as an explanation tool.

To start with imagine that the switch in **Fig. 2** is open, the various current waveforms found in the circuit are as shown in **Fig. 3**, where you can see only currents I_a and I_c . Apart from the very small period when the waveform is near zero, the two currents are identical and almost continuous. Of course

the waveform across the load follows the same shape as I_c . Now imagine the load reduced to nothing and the switch closed to connect the capacitor into circuit.

When there is no other load, the capacitor rapidly charges up to the peak voltage of the waveform often with large current flowing for

a very short time. But eventually all current flow ceases (in theory only). The voltage across the capacitor becomes steady at a value of the peak value of the applied waveform less the very small volt drop across two diodes, which, when no current is flowing is very small so that we can ignore it.

Light Load

Now let's connect a light load to this simple unregulated p.s.u. Now look at the illustration of **Fig. 4**, in which I've tried to show several things, the 'reference' curve, in black, is the successive half wave voltage

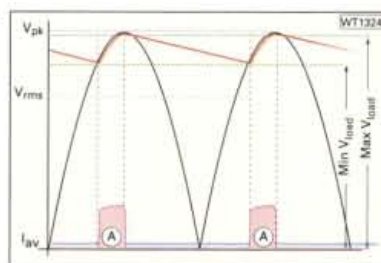


Fig. 4: Putting the smoothing capacitor into the circuit and with a light load, gives various waveforms as shown here. See text for more detail.

cycles hinted at in **Fig. 3**. The line in red represents the voltage across the load (and by inference the smoothing capacitor). As you will see it follows a rise and fall pattern being highest at the point of peak voltage.

As the input voltage falls the diodes of the bridge are reverse biased and stop

conducting so we can say that the current pulse I_a (marked 'A' in **Fig. 4**) ceases at this timepoint. The smoothing capacitor now becomes the reservoir and has to supply the load current, I_c , until it can be charged again by another pulse of current I_a from the rectifier. Note that during this time period the voltage across the load falls.

The currents in the circuit I've represented in the diagram of **Fig. 5**, which shows at the top the current pulses of I_a . The

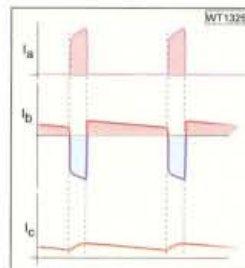


Fig. 5: The cyclic representation of the current pulses of I_a , I_b and I_c of **Fig. 2. Please note that positive and negative curves representing I_b are on different scales. See text for more detail.**

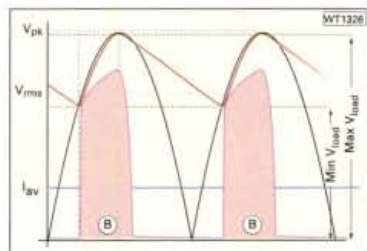


Fig. 6: With the smoothing capacitor in circuit but with an heavier load than that of Fig. 4, gives the waveforms shown here. See text for more detail.

lower curve show the current flowing in the load, I_L , which follows the same sort of curve as the voltage across the load (as you would expect). The curve that might be the strangest is the middle curve of the current flowing in the capacitor, I_C . You may find it rather surprising to see that the current flows two ways.

During the period when the output of the bridge rectifier is higher than voltage across the load, current flows into the capacitor (and $I_A = I_B + I_C$). This current into the capacitor, I've shown in blue to make the rest of the explanation easier to follow. The amount of energy (charge \times time) put into the capacitor in this period has to be the same as the energy taken out in the rest of the cycle (coloured in pale red), i.e. the two areas are mathematically the same. This means that the peak charging current is many times the load current I_L .

A similar explanation occurs for the conditions of a higher loading, shown in Figs 6 and 7. The important part of this explanation is that that the current that flows in the capacitor, I_C , is of a true alternating form swinging both 'positive' and 'negative' in turn. But what has this to do with ripple current you may ask? Well that answer is that the ripple current must be taken into account when designing power supplies as all of the load current flows both into and out of the smoothing capacitor. But this current isn't the nice clean sinusoidal curve that you might expect. It is peaky and bidirectional. In fact in high current supplies where the transformer has a very low resistance, the peak charging current for the capacitor may be as high as ten times the load current. Perhaps now you can appreciate why John G8UNZ places such a high requirement on smoothing capacitors.

Commercial Regulated Supplies

To show you the sort of item I've found in commercial medium to high current regulated supplies have a look at Fig. 8, a regulator board from a commercial 7A supply.



Fig. 8: These two tiny capacitors were supposed to be adequate smoothing for a 7A supply. (See the text for views on their suitability!).

The two miserably small blue items you can see are two 4700 μ F 36V capacitors, that frankly, I would just about use on a small 5W amplifier. Bear in mind that, the current is shared between both capacitors giving at least 3.5A ripple current flowing in each capacitor.

From the size of the capacitors, I'd estimate that the maximum ripple current is around 1-1.5A each. No wonder that capacitors in this type of unit get very hot. I find that the type of capacitors used, shows the standard of a p.s.u. To test the 'quality' of the smoothing capacitors in your p.s.u., just touch a finger to a capacitor after operation at a significant current level for some time. If it's more than just warm, it may fail early, giving more mains hum on the output.

Remember - continual overheating of electrolytic capacitors, for whatever reason, causes very premature failure.

In the photograph, Fig. 9, compare the two 'teeny' capacitors with the type that I would recommend for a 7-10A (or more) regulated p.s.u. The 'can' is a 25 000 μ F unit with a ripple current rating of around 20A. Note the large heavy screw terminals, shown in more detail in Fig. 10. This unit is more than adequate for the job even though it does take up far more space.

I've included a picture of my '12V' power supply, Fig. 11, that I use continuously in the shack. It supplies rigs, experiments and high powered quartz-halogen lighting, used when taking photographs. So I know that the continuous loading can be, and indeed is around 10A for long periods with the occasional surge of up to 15A.

The p.s.u. shown in Fig. 11, started life as a 6V 30A supply from some computers system or other. There are six 2N3055 power transistors in the series regulator, all on two separate heat sinks. A large heavy bridge rectifier occupies the other heatsink. I bought it very cheaply because it wasn't a 12V one. Rewired and with a new regulator board, it has been doing sterling service for ten years, and looks set to go on for a further ten years.

And Finally

Finally this month, I've been down raiding our book department again to see what I could find in the way of interesting books to tell you about. The first two are really a pair intended, according to the titles to be aimed at beginners or

Novices. But don't let that put you off them, as they are both very good and informative books.

Anyone who has taken the Novice course will know the name of John Case GW4HRW as he was one of the instigators of the scheme, originally to bring youngsters into the hobby, but a scheme that found favour with many others looking for a simpler entry to the hobby. Published by the RSCB, *Practical Transmitters For Novices*, contains over 120 pages of circuits for test gear and transmitters for 'Top Band' to 10GHz.

The ten chapter headings are: Methods of construction, How to make an RF probe and absorption wavemeter, Simple oscillators (including the design of a useful h.f. signal generator. Ed.), Amplifiers and filters, An 80m CW transmitter, Modulation and modulators, A double-sideband transmitter for Top Band, A frequency modulated transmitter for 50MHz, A frequency modulated transmitter for 1.3GHz and Transmitters and test equipment for the 10GHz band.

There are two appendixes over the final eight pages covering tools and their use, and some suggestions for suppliers of components. All in all, *Practical Transmitters For Novices* is a book that I find a useful source of ideas when I'm 'doodling' with circuits. Although aimed at beginners, it's quite possible that real beginners would need some help from more experienced constructors, which after all was the idea of the Novice Course in the first place!

Companion Book

Logically a companion book to *Practical Transmitters For Novices* would be a book on receivers, and that is what *Practical Receivers For Beginners* is. Again under the guidance of John Case GW4HRW, this book is a little thicker than its companion, being some 160+ pages. Likewise the book is broken down in to frequency 'areas' and so we find chapters with descriptions of receivers for the 3.5, 7, 50MHz and some microwave projects.

The contents of *Practical Transmitters For Novices* also cover such topics as: basic receiver requirements, types of receivers, simple 'fun' projects (a crystal set, audio



Fig. 10: A close up view of the very heavyweight terminals of the good smoothing capacitor with an 8-pin i.c. for size comparison. The rubber seal near the i.c. is a 'gassing' indicator, showing if the capacitor has been subject to some over-voltage or over-current abuse and may be damaged.



Fig. 11: My own '12V' p.s.u., now many years since I rewired it, but still going strong supplying 10A continuous and up to 15A peak without problems. Note all components are conservatively rated and so, run quite cool, even at maximum loading.

method of presenting the equipment that's reviewed on *The ARRL VHF/UHF Radio Buyer's Sourcebook*. In this large paper backed book there are 18 main reviews in which a total of almost 90 rigs, from single-band 50MHz s.s.b rigs from the MFJ stable to top of the range multi-band, multi-mode base station rigs are compared and evaluated. Whatever band, 50-1300MHz you will find at least one rig in here if there is a handy, base station or mobile available for that band.

There are two reviews of antennas and amplifiers, but this book is mainly rigs. Although some models have differing specifications in America to the European model with the same name (number), the specification is broadly the same. Compiled from articles that have appeared previously in *QST* from the ARRL, this book would be an ideal addition to any club's bookshelf. An excellent reference book for those looking for details in a compact easily readable form.

Well, once again space (even though we packed it in) and time have defeated me! I'll see you next time in the column.

Tex





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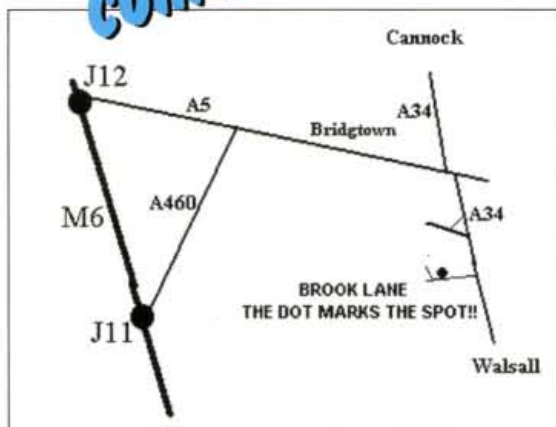
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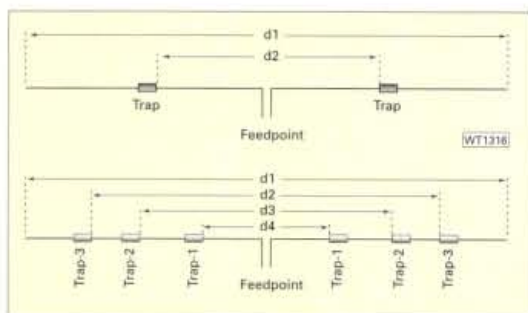
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Antenna Workshop

Plumbing For Traps

Charles Reynolds GW3JPT has been down to his local plumbing parts suppliers and here are some traps that he has constructed in the outflow of his antenna!

Fig. 1: The general layout of a dipole antenna. With only one pair of traps, d2 represents the $\lambda/2$ value of the frequency to which the traps are tuned. With the multiple trapped dipoles the presence of one or more traps within each resonant length changes the overall length somewhat, but the same principle holds.



Having produced antenna traps for many years, I have been urged to share the technique by friends and members of my local radio club. Although I have been making traps for a long time, I have not seen a great deal of information about how to create them for particular bands. So, I'd like to present my method that I've developed over the years.

Finding a design for an antenna creates many questions: Will it fit the site? Where do I get the materials? Will it work effectively? These are but a few of the ideas that spring to mind. In most cases the physical layout of the site sets the limits on the type of antenna that you can use. Which, in many cases, will be a dipole of some sort or perhaps a long wire if enough garden length is available to erect one.

Although it's possible to put traps in a long wire to create resonant sections for several bands on one length of wire, I'm going to concern myself with a dipole antenna with a similar set of traps in each leg as shown in Fig. 1. The top antenna configuration is shown with just one trap in each leg, and has two main bands of operation.

Antenna Trap

If we consider that there is no trap in the antenna then the main ($\lambda/2$) resonant frequency has a wavelength of d1,

which as the length is maximum, will have the lowest resonant frequency. Now let's move upwards in frequency. What happens when we reach the resonant frequency of the trap?

The trap itself now acts effectively as an insulator removing the outer wire lengths. If we arrange that the antenna length, d2, is resonant at the same frequency as the trap is,

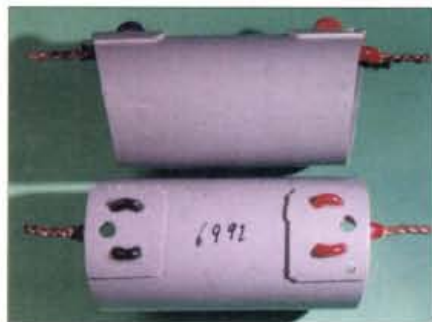


Fig. 2: A pair of completed traps for 7MHz in 'side' and 'top' view. The design is so repeatable that the resonant frequencies of the two traps are only separated by 6kHz (the hidden value being '6998').

F _t (MHz)	L (mm)	F _t (MHz)	L (mm)
3.750	2980	18.110	730
7.000	1640	21.200	640
10.075	1200	24.900	530
14.175	900	28.850	500

Table 1: Lengths of RG58 coaxial cable needed to make traps for different bands. You may need to modify these dimensions by a few millimetres depending on the exact coil dimensions involved.

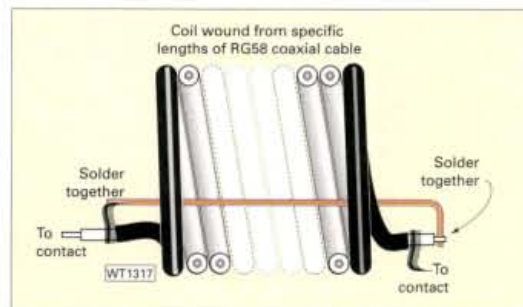


Fig. 3: Choose the length of coaxial cable from Table 1 and wind and connect it in the form shown here. (See text for more detail).

then we effectively have a ($\lambda/2$) resonant antenna on this higher frequency as well.

So, the antenna can be resonant on **two totally non harmonically related** frequencies. And of course we can extend this idea by putting more traps, resonant at different frequencies, in each antenna element, to create a 'single' dipole that can be resonant and effective on any combination of the traditional and the WARC bands (at h.f.).

Traps marked 'Trap-3' are resonant at the lowest frequency and those marked 'Trap-1' are designed for the highest frequency. But how are the traps made to be resonant at one design frequency? How can we ensure that the design is repeatable?

My first attempts at making traps, were of the same form that I suspect many others have tried, they were made using heavy gauge copper wire and very high voltage capacitors. However, I found them not particularly repeatable and were also quite expensive to make. I needed to find an option that was both cheap to make and was repeatable without needing professional style methods. I have overcome both drawbacks with my traps presented here. So, you may ask what is 'my secret'?

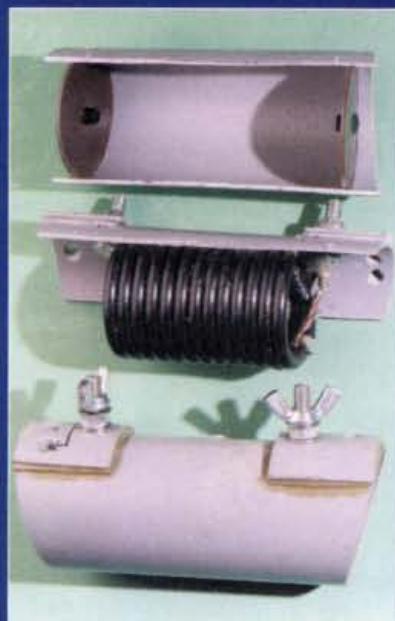
The answer is that my secret is to create the traps using known length of RG58 coaxial cable wrapped around and placed inside lengths of the plastic piping, now available in all good DIY outlets. As the piping is of known size, my designs are repeatable. The piping is easily worked, needing few tools and, of course it's

waterproof for use in all weathers as shown in the example of Fig. 2!

How Is It Done?

So how is it done? How can you use length of coaxial cable as small effective antenna traps? Well, the answer lies in coiling them up on (or inside) the plastic piping. Let me describe how to make the trap for 7MHz as an example. As shown in the listing of Table 1 you will need a 1.64m (plus 'ends') length of clean fresh RG58 coaxial cable.

I use a section of (two inch) 50mm diameter tubing as the outer for the trap and a section of (one and a half inch) 36mm diameter as the former for winding the trap on. The former that I use for winding the traps, is just a short length of the 36mm diameter



A trap split to show the 'insides', compare this to the drawing of Fig. 5.



Detail of the end where the coaxial braid is connected to the element. Note the piece of outer insulation used to cover the join of the inner conductor to the short length of heavy copper wire, and the strain relief holes in the 'top' lip.



Two variation of 7MHz tuned traps, one internally coiled and one still on the original former. With these versions extra care is needed to ensure that they are fully sealed from the weather.



Showing the strain relief holes in operation with the wire forming the elements.

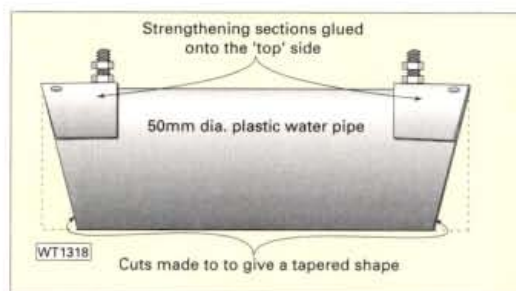


Fig. 4: Side view of a completed trap using screw terminal. The holes in the fortified areas act as strain relief points.

plastic pipe. Cut a lengthwise slot in one end about six to eight millimetres wide and about 25-30mm long.

The slot forms the 'clamp' to hold one end of the coil whilst it is being wound. To wind the actual coils for each trap, choose the length of RG58 coaxial cable (Table 1), prepare as shown and insert one end of the coaxial cable in the slot cut in the pipe former.

Wind the coaxial cable around the pipe, keeping the cable and turns quite tight together. But it's important to note, that if you over tighten the turns, they become difficult to remove later. Whilst still holding the free end on the coil securely, overwind the whole coil with a wide insulating tape (if possible wound with the opposite twist, this helps to lock the coil turns together).

Firm Grip

Take a firm grip on the coil and remove it from the former, if the winding operation is successful, the coil will remain in shape. Now take a length of heavy single gauge copper wire, place it inside the coil and solder one end to the coaxial cable's braid at one end of the coil. Slide an length of insulating material along the wire to cover up the area around the soldered joint (I use a length of the outer insulation cut from a length of RG58 cable).

The other end of the short length of copper wire should be soldered to the inner connector of the coaxial cable at the other end of the coil. The resonant frequency of the trap can now be checked, using either a dip oscillator, or my preferred option, using one of the MFJ Antenna Analysers with a single turn coupling coil around the trap.

A degree of tuning may be done by positioning the

copper wire within the coil. The final result of winding the coil should be of the form shown in Fig. 3. If the coil tuning point is far away from the design frequency, then a new coil should be created with fewer turns (if the resonant frequency is low) or more turns (if the resonant frequency is too high).

Minor changes of frequency (upwards) may also be achieved by unwinding slightly more of the braid back at one end of the coil. This reduces the overall capacitance and so moves the frequency upwards slightly. When you're happy with the resonant frequency of the trap, it may be placed inside the new outer casing made in the shape and form shown in Fig. 4.

Before sealing the tube all parts should be given a good coat of a sealant especially around the places where holes go from the outside through to the chamber of the trap. When the sealant has dried then carry out a final check on its resonant frequency, retuning if needed and seal the end of the chamber with a round 'plug' made from a piece of flat plastic.

If you have problems getting hold of flat plastic, try splitting a section of large diameter tubing lengthways, putting it in almost boiling water to soften it then quickly clamping it between two large flat pieces of wood until such time as it has cooled down. The heating and clamping may be carried out again if the piece isn't quite flat afterwards. I've found that a suitably sized hole cutter make a quick and easy endplate that may be sealed with hot-melt glue after being glued into position.

Word Of Caution

A word of caution, hot water and plastic can both cause severe injuries. Always use tongs and thick gloves when handling hot pieces of plastic.

The various other photographs with this article show stages of the manufacture of my traps. Go on have a go - trap your antenna to make it more effective on all bands. **PW**

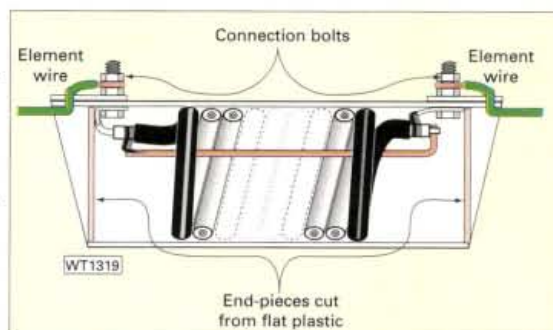


Fig. 5: Cross section through the completed trap of Fig. 4.



This month Ben Nock G4BXD, PW's 'Military, Marine & Aviation' historical specialist author, is 'on duty' in the wireless shop but seems to be in 'civvies' rather than uniform. Perhaps it's because he's got a little 'Marconi Magic' from the Merchant Marine on show this time?

First of all, a very happy and prosperous New Year and millennium to you all. I hope you had a good Christmas and excellent New Year's celebrations. As we are now in the 21st Century it seems odd to be talking of valves and vintage equipment. Maybe we should give it all up, after all, nostalgia is a thing of the past!

However, the fact remains, the old 'kit' still holds many an interest. Remember ... it's easy to repair and quite probably will still be going well into this millennium when the 'plastic and sand' technology sets of today have returned to the beaches. Be that as it may, let's press on with this month's selections.

Marconi Magic

First off, I'll start with a recent acquisition, **Fig. 1**, which is an item of 'Marconi Magic'. It's a marine set made by Marconi Marine and is called (confusingly) the Atalanta (rather than Atlanta) and this 13 valve double-superhet proved to be a superb receiver indeed.

The Atalanta is **Big!** In fact it's bigger than an AR-88, but I have to say that I think its performance is better. The receiver officially tunes from 15kHz to 28MHz (with a bit of run-off though) in a total of ten bands and basically operates as a single conversion set with an 85kHz i.f. up to 800KHz, above this the receiver operates as a double conversion set with a 700kHz first intermediate frequency.

Having installed the Atalanta receiver on the bench it was hurriedly switched on. The usual question asked when purchased, "is it working?" ... had received a "Yes"

answer. So, I waited and waited but nothing.

"Ah-hah!" I thought (a dud!) ... but I was wrong. It turned out when I read the manual (last resort) that came with the set, that although there's a cloth speaker grill top right of the casing, it's standard that no speaker is fitted! So, plugging in a speaker to the headphones socket brought forth (welcome) noise.

And what noise! Even on a short whip antenna the signals being received were terrific. Even on the lowest frequency signals were present (and strong). Just what are all those 'gurglings and squeaks' between 10 and 150kHz? I even heard Morse on 136kHz, on nothing more than a 3m long whip antenna.

The tuning on the receiver is really smooth and the bands not too cramped at the high end, although there is the facility to switch in a bandspread function. This is a mechanical function selected by pushing in the **BS control** knob (just to the right of the main tuning control).

The bandspread tuning window has scales marked for the marine bands, 4.1 to 4.4MHz, 6.1 to 6.7MHz, etc., but if the operator sets the pointer at a suitable point on the scale nearest the Amateur Radio band required, then the facility can still be used.

For example: let's say you want to tune the '80m' - 3.5 to 3.8 MHz band. If you set the BS pointer to 4.1MHz when the main tuning is at 3.5 MHz, then the swing of the bandspread tuning is near enough to be useful. Likewise, set BS at 6.1 for 7MHz and so on.

The Atalanta set is designed to run off 110V d.c. and the valve filaments are all wired in series and the same voltage used for the ht. For 'on-shore' (or 'in shack') use an internal mains power supply is fitted. In marine service the set could be operated with the 'Globespan' or 'Oceanspan' transmitters and would have made an excellent station.

No Cheap Rigs?

An E-mail which I received late last year moaned about how there were no cheap rigs about. If the sender was implying there were no cheap 'all singing, all dancing', ten v.f.o., 'all-mode up to satellite with bells and whistles' then he was right. However, if my correspondent meant a rig you could use to have QSOs on then he was wrong!

For instance, at last year's Castle Donington rally in September I spotted a small home-brewed transmitter, **Fig. 2**. 'Home-brewed' yes - but it was evident from the front panel that the constructor had taken the time and trouble to make a good job. Sure enough, when powered up the little set was very good. Crystal controlled, it covers 3.5 to 28MHz and with a 5763 valve in the p.a. stage it runs at about 10W a.m. or c.w.

Several contacts on 3.5MHz proved that the transmitter was sound and the first try on 14MHz provided a QSO into Moscow with a 579 report. At a whopping £7.50 for the set I think it was a real bargain.

Of course, to get the full benefit from the bargain rig you need to know c.w., although this factor of course might be the reason our E-mailer had problems in finding a cheap rig. The lack of interest in certain modes and the desire to only have s.s.b. QSOs at 59+ into VK (Australia) would limit the appeal of such sets. But cheap sets **are around**, that is if you're really interested in 'Amateur' Radio.

Fig.1 : The Marconi 'Atalanta' receiver, with the main tuning dial along the top of the front panel. The bandspread tuning ranges are in the lower (larger) 'window'.



Chinese Arrival

Having made mention of the Type 892 Chinese set for **Dave G4BXH** in the May 1999 issue another Chinese set actually arrived here in Kidderminster ... but the one I've got, **Fig. 3**, is a Type 889. Although it's obvious from their similar appearance, that both sets are from the same stable, the one I've got is the 'v.h.f.' version.

The Type 889 covers from 20MHz at the higher end of h.f. to 49.975MHz on v.h.f. in 25kHz steps. The rig operates on f.m. only with 3 or 20W of r.f. output.

However, although working, there's a receiver fault which will be very hard to fix as the internal construction of the set is modular with no chance of circuit or wiring tracing. So, if anyone has any internal information on the Type 889 set, I'd welcome a copy. (Despite the fault, it still makes a nice, and exotic, addition to the collection!).

From Japan

Continuing with the Far Eastern 'theme', another recent acquisition of mine came from Japan a long time ago. These Second World War military sets, **Fig. 4**, have circumnavigated the globe. They've gone from the Japanese mainland to some far flung outpost of their Empire on one of the Pacific Islands, been 'liberated' by an American Marine and taken back to the USA, eventually finding their way into my collection here in Worcestershire!

Designated a 94 Mark 5, the Japanese set comprises a Mark 32 receiver and transmitter. Both sets are dated the 15th year of Reign of the Emperor. (As this started at 1925 then that dates the sets as 1940).

The receiver is a three valve type, with a regenerative detector and the transmitter uses a single valve, a twin triode, as a 'self oscillating' power amplifier (p.a.) stage. Frequency coverage is from around 900kHz to 5MHz, with 1.5W in the c.w. mode or 750mW using amplitude modulation.

In service, the receiver ran from batteries held in a compartment beneath the set and the transmitter was powered from a hand cranked generator supplying 6V for heaters and 150V for the high tension (h.t.) supplies. On c.w. the two triodes are in parallel and on a.m., one triode acts as the modulator with a carbon microphone.

The construction of the Japanese sets is quite plain but substantial. And although each component is numbered (much like in the German military sets), servicing must have been difficult.

Additionally, considering the 'theatre' of war these sets were supposed to operate in (tropical temperatures, rain forests and jungles), it's surprising there was no attempt at tropicalisation. (British sets used under the same conditions were 'tropicalised').

Pleasantly Surprised

At the time of writing this month's column I've quickly tried the Japanese transmitter on a supply and was pleasantly surprised to hear a quite decent note on c.w. No doubt by the time you're reading this a few of you around the country will have worked me on the air with it.

Hopefully I can bring you further information on these Far Eastern sets and others. I've collected a total of seven Japanese Second World War sets now and I plan to write a more detailed article in the near future.

So that's all for now. As always, I can be contacted at: **62 Cobden Street, Kidderminster, Worcestershire DY11 6RP**. Or via E-mail on: **G4BXD@compuserve.com**. You're also welcome to visit my Web pages at **http://ourworld.compuserve.com/homepages/G4BXD/**

PW



Fig. 2: The little 'home-brewed' transmitter found by G4BXD at the Castle Donington show. Using a crystal-controlled oscillator it provides a good 10W output from 3.5 to 28MHz (see text).



Fig. 3: The Chinese Type 889 transceiver, the operating frequency is selected by the four knobs along the top. A meter (top left) measures all the set's various voltages (using the selector knob directly below the meter).



Fig. 4: The Japanese h.f. transmitter (left) and receiver (right). The various multiple pin sockets are for power and signal connections between units. The two-pin socket (bottom left on the transmitter unit) is the 'jack' for the telegraphy key.



My Early Days In the Radio Industry

Ray Fautley
G3ASG
reminisces
over his early
days working
for a radio
valve company
back in the
1940s where
he discovered
that there was
quite a lot to
designing a
low power
radio.

It was in the first part of 1940 that I, as a lad of 18, was working at the Mitcham Works factory of the Mullard Radio Valve Co., part of the Philips organisation. The department I was employed in was called the 'Reception Laboratory' and was, in fact, in the middle of the River Wandle at Mitcham in Surrey - to reach it one had to cross a bridge to 'The Island' - very romantic!

As a junior with only a First Class Diploma with Distinction in maths and physics (from the Wimbledon Junior Technical School), it wasn't much of a qualification for working in a real radio laboratory! However, being very keen to learn helped a lot!

I managed to move from the laboratory model shop into the very laboratory itself. Here I was put with a very understanding and helpful senior engineer to discover what radio design and development was all about.

At that time, with the Second World War only a few months old, it was apparently considered that communications would prove to be vital if such an unthought-of thing as an invasion of Britain from the continent actually happened. Anyway, for whatever real reason, my senior engineer and I were given the job of trying to design and produce a prototype low power radio transmitter capable of producing some 10W of r.f. over the whole spectrum of 1.5 to 30Mc/s. (Sorry, I meant MHz).

There was only one catch to this interesting (for me at least!) project. It had to be made using only standard Mullard and Philips receiver components that were still available in the factory. This posed quite a lot of difficulties for the engineer in charge, my boss.

Simple Tasks

Some of the more simple tasks were passed to me. The one most remembered was "Find out which type of wire would be most suitable for making the highest 'Q' coils for the

different wavebands to be used". Three questions popped into my head: first, so there were different kinds of wire were there? Then: what the heck was 'Q'? Finally, why was this 'Q' so important anyway? This was supposed to be the

simple part of the project - not to me it wasn't!

I'd heard of thick wire and thin wire, but that was about the limit of my knowledge of wire at that time. Not very much. Well, I was soon to learn! My boss took me over to a large rack filled with reels of all sorts of wire, bare copper, tinned copper, enamelled copper, silk-covered, cotton-covered and what did that label say - 'LITZ WIRE'? What on earth was Litz wire? Was I going to find out? Yes, I was!

Litz wire, I discovered, consisted of many separate, very thin insulated wires that had been twisted together to form

a single wire. What was so special about this complicated wire? That answer came a bit later!

Given a value of inductance, minimum and maximum values of tuning capacitance and a frequency range for each of the coils, it was to be my job to find out which sort of wire would give the highest value of 'Q' for each of the windings. How should I start?

I knew that a certain value of inductance was needed for a coil to be able to make it tune with a condenser (capacitor) to a specified frequency. That at least was a start! But what about this 'Q' thing?

It was explained to me that the term 'Q' was a sort of 'goodness' factor for a coil and that the higher its value, the better the selectivity provided by it when it was tuned to resonance by the correct value of capacitance. Also, when used in a transmitter, the higher the 'Q' of the coil, the less losses there would be in the tuned circuit to provide unwanted heat and worst still loss of transmitter power.

Where Did I Start?

So, where did I start? The first thing to learn was how to use a Q-Meter. After quite a lot of instruction, I learnt how to set up the Q-Meter and adjust the controls to measure the 'Q' of coils at different frequencies. Here I was, doing my first real radio engineering work!

At first I thought I'd try the lowest frequency range coil - this was to be used down to about 1.5MHz and up to about 4.5MHz. It took a long time winding away, testing, rewinding and retesting over and over again until I found that either fairly thin wire or Litz with a few strands produced the highest 'Q' for the size of coil former that was to be used.

When using Litz wire it was essential that all of the insulated strands should be soldered together at each end of the coil. How could you remove the insulation of each separate strand without breaking the hair-like thin wires? My boss to the rescue!

Simply put the whole of the ends of the Litz wire into a small flame, such as a meths burner and heat it until it glows red. Then immediately plunge the red-hot wire ends into a small container full of methylated spirits. Hey-presto, each strand could be seen as bright copper!

The last thing to do was to insert the cleaned wire ends into a hot solder pot. All the strands were soldered together without damaging them. Very simple now, nearly 60 years later, but at that time - magic!

Having found that thin wire or Litz could be used for the lowest frequencies, it seemed logical that thick wire would produce the highest 'Q' for the highest frequencies - as anyone knows now, that is what I discovered all those years ago. A very important lesson had been learned, never to be forgotten.

Yes, I made all the coils for that transmitter - and helped with finding suitable receiver components. This was done by worrying people all over the factory until we had enough mains transformers, rectifying valves (no silicon diodes available then), small valves for oscillators and audio output valves for the power amplifier stages.

When completed, the engineer (with a bit of help from his junior trainee) had produced a couple of prototype transmitters that met the required specifications. I wonder what happened to them? Perhaps you know? **PW**



"The department I was employed in ... was, in fact, in the middle of the River Wandle at Mitcham in Surrey - to reach it one had to cross a bridge to 'The Island' - very romantic!"

RAY FAUTLEY G3ASG REMINISCES OVER HIS 'EARLY DAYS IN THE RADIO INDUSTRY'

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These antennas are great for portable or permanent use, are easy to install, and can be used without radials. They are available in 1, 2, 3, 4 and 5 trap versions. The standard 1 trap designs will have a low VSWR on 2 bands, and will operate with a higher VSWR on up to another (depending on model) 3 bands. Versions with 2, 3, 4 and 5 traps will have a low VSWR on more bands. These antennas are commercial quality, and are built to last. Heavy duty stranded copper-coated steel wire is used with low loss end insulators, and a Bottom Connector which accepts a standard PL259 connector. Antenna tuners are usually never required. It is advisable to use Copper based Anti Corrosion Compound No. 1 on all connections.

These vertical slopers are fed at ground level with the 'cold' side of the bottom connector connected to a ground stake.

Layout of 4 trap sloper

Coax Feed

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SVS-32	20/15/10m	2 Trap	13ft	£87.45
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SVS-42	40/20/15/10m	2 Trap	24ft	£89.45
SVS-51	80/40/20/15/10m	1 Trap	53ft	£67.45
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Continued from page 13...

NEWS

extra

COMPILED BY JOANNA WILLIAMS

Radio Basics - January 2000 Update

Rob Mannion G3XFD writes:

In truth the headline on this 'up-date' on the January 2000 'Radio Basics' column should read 'An Update from a confused G3XFD!'. Additionally, if I am to be quite honest - I owe our 'Antenna Workshop' author **John Heys G3BDQ** a 'thank you' for pointing the confusing errors out to me, for despite having worked on the projects, written the article and having

read it at least half-a-dozen times ... I didn't notice the problems. So, if I've caused confusion to the readers following this popular series - I ask them to forgive me!

John G3BDQ's letter points out that I 'reversed' the ferrite rod tuning coil winding instructions in the last paragraph of the left hand column on page 13. The correct advice should have read: "If, on testing the receiver you find the 198kHz signal can only be received by tightly 'screwing

down' the trimmer - **add** a dozen or so of the coil turns and try again. Conversely, if the Radio 4 transmissions can only be received with the trimmer fully 'unscrewed' - just **remove** some turns until it's comfortably in the middle of the range".

There was also some confusion between 'decimal' points in the text (although the circuit diagram information is **correct**. John reminded me that "10nF is 0.01µF and not as stated in the text.

Bearing in mind that the column is really aimed at less experienced constructors - I'm very grateful for the kind and helpful letter from John G3BDQ. I'm also very sorry for any confusion caused to readers who I know otherwise enjoy joining in with me each month in the column. It is hard work - especially as it's 'on top' of my other Editorial and journalistic duties - **but it is very enjoyable work**, particularly

as I know so many of you enjoy the series.

Recently, on my very last 'club visit' of 1999 I enjoyed a truly wonderful evening at the Christchurch (Dorset) Amateur Radio Society. It was there that I was told of one of their members who had **successfully built and used every one of 'Radio Basics' projects**. And I can tell you - that one little bit of 'feedback' makes it all very worthwhile!

Finally, I'm sorry that I wasn't able to get the 'Update' onto this month's 'Radio Basics' pages - this was due to the very much shorter 'Christmas' publishing and printing schedules effecting this issue, meaning that 'Radio Basics' had 'gone to press' before G3BDQ's letter arrived. So I hope you read the information on the 'News' pages instead - as these are amongst the last to be 'run to film' before printing. **Rob Mannion G3XFD.**

The Yaesu VX-5R Tri-Band Transceiver

Continued from page 27...

"I couldn't wait to see what else the VX-5R had to offer and to be honest it would be quicker for me to talk about what it doesn't offer!"

Excellent Front End!

Keith G7HIC told me that he thought the radio was easy to use and had an "excellent front end" - I would certainly agree there! Keith went on to say that he owned a VX-1 and then progressed onto the VX-5R and describes the VX-5R as "the icing on the cake". He has used his VX-5R to listen to the BBC World service on h.f. and has also had a contact on 50MHz while walking on a hill near to his home.

All I can say is that the VX-5R was **my constant companion** in the time I had it. The large antenna was, at times, an encumbrance but the sheer versatile nature and excellent performance of this delightful little radio far outweighed that slight inconvenience for me.

Whether you're walking, biking, camping, caravanning or

just out and about, I'm certain that Yaesu's new VX-5R will give you hours of operating pleasure. When you (or your better half) get tired of operating just switch across to the easy listening broadcast band radio station you have programmed in on 'VFO B', sit back and enjoy!

My thanks go to Yaesu (UK) Ltd. for the loan of the VX-5R and the SU-1 Barometric Adapter. The VX-5R costs £359 (RRP) including VAT and the optional SU-1 Barometric Adapter costs £32. Please contact Yaesu direct on Tel: (01962) 866667, FAX: (01962) 856801. Unit 12 Sun Valley Business Park, Winnall Trading Estate, Winchester, Hampshire SO23 0LB.



PW

Fig. 4: Top of the VX-5R. You attach the helical antenna on the right. The control in the middle is the volume (VOL) and on the far left is the 'DIAL' control.



General

Frequency Ranges (Receive):

0.5-1.8MHz (BC band)
1.8-16MHz (SW band)
48-59MHz (50MHz amateur band)
59-108MHz (f.m.)
108-137MHz (airband)
137-174MHz (144MHz amateur band)
174-222MHz (v.h.f.-TV)
222-420MHz (ACT1: Action Band 1)
420-470MHz (430MHz amateur band)
470-729MHz (u.h.f.-TV)
800-999MHz (ACT2: Action Band 2)

Channel Steps:

5/9/10/12.5/15/20/25/50/100kHz
(9kHz: a.m. BC)

Frequency Stability:

±5ppm (-10°C to +60°C)

Repeater Shift (default):

±600kHz (144MHz)
±1.6/5.0/7.6MHz (430MHz)

Emission Type: F2, F3

Antenna Impedance: 50Ω

Supply Voltage:

Nominal:
7.2V d.c., negative ground

Operating:

10-16V d.c., negative ground
(EXT d.c. jack)

Current Consumption:

15mA (Receive)
55mA (Standby, Saver Off)
25mA (Standby, Saver On)
700µA (Auto Power Off)
1.6A (5W TX, 50MHz)
1.7A (5W TX, 144MHz)
1.9A (4.5W TX, 430MHz)

Operating Temperature:

-20°C to +60°C

Case Size:

58(w) × 88(h) × 27(d)mm (without knob & antenna)

Weight: 255g

Transmitter

RF Power Output:

5W (@ 13.8V EXT d.c. input)
5W (@ 7.2V, 50/144MHz)
4.5W (@ 7.2V 430MHz)

Modulation Type:

Variable Reactance

Maximum Deviation: ±5kHz

Spurious Emission: At least 60dB below

Microphone Impedance: 2kΩ

Receiver

Circuit Type:

Double-Conversion Superhet.

Intermediate Frequencies:

1st: 47.25MHz (n.f.m.)
45.8MHz (w.f.m.)
2nd: 450kHz (n.f.m.)
10.7MHz (w.f.m.)

Sensitivity:

0.5µV for 10dB S/N (0.5-16MHz, a.m.)
0.9µV for 12dB SINAD (76-108/174-222 w.f.m.)
3µV for 12dB SINAD (470-540MHz/630-729MHz, w.f.m.)
0.16µV for 12dB SINAD (50-54/144-148MHz)
0.18µV for 12dB SINAD (430-450MHz, n.f.m.)

Selectivity (-6dB/-60dB n.f.m.):

15kHz/35kHz

AF Output:

400mW @ 8Ω for 10% THD (@ 7.2V d.c.)

**Yaesu VX-5R
Specifications**

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THE PW PERSONAL ORDER FORM

Roger Hall G4TNT – PW's Advertising Manager – describes how we're launching the PW Personal Order Form service to help readers buy with extra confidence from advertisements in this magazine.

Many readers will have noticed how the battle for their custom has become more intense as the popularity of the hobby has declined. Fewer amateurs buying less equipment means there are now some great deals to be had but it also means that some dealers may try to cut corners when it comes to honouring their commitments. Also, as the real cost of Amateur Radio equipment has fallen and the competition for your custom has increased, some of the smaller shops have either gone out of business or been swallowed up by the bigger companies. In some areas, it's almost impossible to find a local shop and now the trend is towards mail order purchasing.

This, in itself, is not a bad thing but it does mean you'll probably be buying from a shop you've never visited and from a salesperson you've never met. So, how do you know who to trust with your money? You could go on air and ask about the dealer you're thinking about buying from, but the risk is that there may be one or two vociferous individuals who will be happy to tell the world about their grievances while the majority of satisfied customers just keep quiet. The same is true of the Internet. The various radio related newsgroups are a good place to ask but, again, you may not get a representative (or honest) selection of answers.

The truth is, there is no real way of telling beforehand how your transaction will be handled, how well the equipment will perform or whether it will go wrong. All you can do is to take reasonable precautions before you buy and know what to do if the worst happens. This is where we aim to help. First of all, take a look at the Top

Ten Tips in the Buyer's Guide box. If you follow those guidelines before you buy, you'll have minimised the chance of something unforeseen cropping up and you'll be prepared should the worst happen and you have to return the goods.

Secondly, whenever you order goods from an advertisement in *PW*, make sure you use the Personal Order Form that will be printed in every issue from now on. Call around your list of potential suppliers first and then post or FAX them this form when you place the order. It has been carefully laid out to help you make sure you've not forgotten anything and it will act as written confirmation of the deal. If you post it, don't forget to keep a copy! If you have placed the order over the telephone, still send them the form with ORDER CONFIRMATION written across it.

The vast majority of transactions are trouble free but, if you are one of the unlucky ones who does have a problem, here's what you should do. Write to the supplier enclosing a copy of the order form and the advertisement (you did keep them, didn't you?) and outline your complaint. The letter should be accurate and brief but should also contain the details of any

telephone conversations you've had with the company. It's always a good idea to make a note of the date, time and the name of the person you're speaking to whenever you call a company.

If the supplier fails to resolve the matter to your satisfaction, contact us and we will be happy to take up the case on your behalf. Just write (no 'phone calls please) to **Roger Hall, Advertisement Complaints Dept., PW Publishing Ltd., Arrowsmith Court, Station Approach, Dorset BH18 8PW** enclosing copies of all relevant paperwork and we'll take it up with the supplier. We have helped many readers in the past and almost always succeeded in putting matters right but this has been on an *ad hoc* informal basis. Now that we have formalised this process, we can only accept complaints if the original order was placed on the *PW* Personal Order Form to show you bought from an advertisement in *PW* and not from one in another magazine. Also, the order must have been for goods that were advertised in this magazine (but not in Classified or Bargain Basement advertisements) and not for goods that did not appear in the advertisement. Not only will we help you to pursue your claim, we will also publish in the magazine a selection of the complaints we receive and the responses from the advertisers. This will help other readers when it comes to deciding where to buy from and who they prefer to deal with.

We also intend to publish rulings from the Advertising Standards Authority. When we get complaints about the content of advertisements, some of which come from readers and some from other dealers, we refer them to the ASA whose job it is to decide whether the advertisement is legal, honest, decent and truthful. They then make an impartial ruling in favour of either the complainant or the advertiser. Up until now, we've just asked those concerned to comply with the ruling but now we're going to publish those rulings in the magazine so that readers can see for themselves how advertisements are judged.

We hope our Personal Order Form, along with our offer to take up complaints on your behalf and the publishing of complaints and ASA rulings will make it easier for you to make an informed choice when it comes to parting with your money. You should also look out for buying advice in future issues of *PW* where we will be bringing you features on your rights when buying and returning goods, the pros and cons of buying 'grey' imports and many other topics that will allow you to buy with extra confidence from advertisements in *PW*.

Buyers Guide Top 10 Tips

- 1: Telephone first to confirm the price and details are as in the advertisement. Dealers often have to send in copy up to 8 weeks before the magazine is published and prices and availability can change in that time.
- 2: Ask if it's a parallel/grey import or if it came from the authorised UK importer.
- 3: Ask if it is the full UK specification and if it has CE approval.
- 4: Ask about extra charges (delivery, VAT etc.) and find out the final, all-inclusive price.
- 5: Ask about their return/refund/repair policy for faulty goods and if they have a restocking fee for the return of non-faulty items.
- 6: Ask for a written quotation if it's a large order.
- 7: Make a note of all calls and who you spoke to and keep copies of all paperwork.
- 8: Pay by personal credit card whenever possible as the card company has insurance to cover all transactions above £100 and you will almost certainly get your money back from them should something go wrong.
- 9: Check everything as soon as it arrives. Open all the boxes and check that you have been sent everything exactly as ordered. If there is a problem, contact the supplier immediately.
- 10: If a problem develops later, write the supplier a concise and accurate letter outlining the problem and asking them how they intend to rectify it. If that fails, write to us with copies of all relevant paperwork and we'll take it from there.

Use this form when ordering by mail, FAX or for telephone order confirmation

Company
Sales contact
Address
Postcode
Date & time of telephone order
Order reference number (if quoted)
Despatch reference number

Name	
Address	
Postcode	
Daytime telephone number	
FAX number	

Delivery address

Postcode

Agreed delivery date

Terms of warranty/money back/returns policy

☒ Tick method of payment

☐ Credit card

☐ Cheque

☐ Debit card

☐ Postal Order

Credit card company
Card number
Start date
Expiry date
Signed
Date

[illegible]

PAGE NO.

TOTAL

Don't forget to keep a photocopy

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SP-21 speaker £55
AH-4 Auto ATU £265



IC-2800H
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IC-706 MkII G



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FT-920AF
OUR PRICE: £1125 **SRP: £1499**
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YAESU



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OR NO DEPOSIT AND 36 MONTHS @
£32.50, APR 19.5%



VX-5R
£255



FT-1000MP
OUR PRICE: £1999 **SRP: £2599**
OR NO DEPOSIT AND 36 MONTHS @
£72.26, APR 19.5%



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FT-8100 **£339**

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ALINCO



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DR-150
£199



DJ-V5
£195



DR-605
£269



TS-5700G
OUR PRICE: £775 **SRP: £995**



TM-G707E
OUR PRICE: £259 **SRP: £399**

KENWOOD



TH-D7E
OUR PRICE: £250



TH-G71E
OUR PRICE: £225 **SRP: £299**



TS-370E
OUR PRICE: £1175 **SRP: £1995**



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FINANCE EXAMPLE, APR 19.5%				
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MFJ-949
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ATU
£89



MFJ-948
300W HF
ATU
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300W HF
ATU
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MFJ-260	30W DUMMY LOAD	£18.00
MFJ-264	1.5KW DUMMY LOAD	£29.00
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MFJ-812	VHF SWR POWER METER	£20.00
MFJ-816	HF SWR POWER METER	£18.00
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MFJ-862	VHF-UHF SWR POWER METER	£25.00
MFJ-864	HF-VHF-UHF SWR POWER METER	£39.00
MFJ-910	MOBILE ANTENNA MATCHER	£12.00
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MFJ-934	ARTIFICIAL GROUND + ATU	£85.00



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This month the Editorial team here at Practical Wireless are bringing you some 'Book Profiles' on a couple of subjects which are featured in this very issue - radio frequency interference (RFI) and electromagnetic compatibility (EMC). Three of the books in this section cover this subject and will be of special interest to all Radio Amateurs and if you haven't got a book on RFI in your bookshelf then perhaps you ought to invest in one of the following. The last three books in these profiles cover radio projects so if you are a keen constructor then you could find what you're looking for on these very pages.

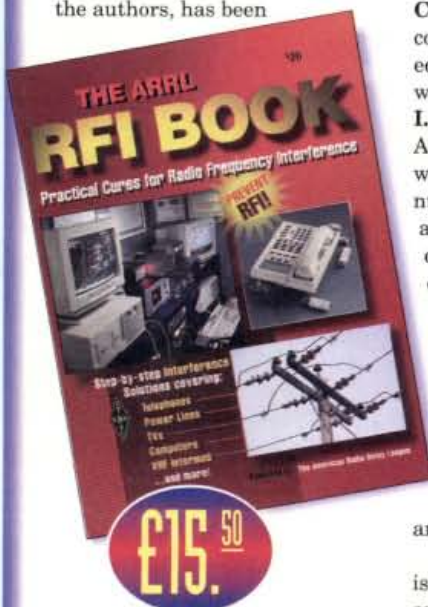
TELEPHONE, FAX, E-MAIL OR USE THE ORDER FORM ON PAGE 90

Book PROFILES

The ARRL RFI Book - Practical Cures For Radio Frequency Interference **Various Authors**

On the front cover of *The ARRL RFI Book* (as you will be able to see from the picture of it here), it claims to have 'Step-by-step interference solutions covering: Telephones; Power lines; TVs; Computers; VHF Intermod ... and more'. Compiled by **Ed Hare W1RFI** (ARRL Lab Supervisor) and a team of RFI experts, they have put together "the best advice available on every type of interference ..."

A follow up to *Radio Frequency Interference, How To Find It and Fix It*, this American book includes some new material and, according to the authors, has been



extensively re-written to bring you the most up-to-date and proven techniques for curing

all kinds of interference problems". Some of the chapters include: 'First Steps'; 'Radio Direction Finding'; 'Cable Television Interference'; 'Telephone RFI'; 'Automobiles' and much more.

The ARRL books are popular with a lot of Radio Amateurs and this book comes **Recommended**.

Interference Handbook **William Orr W6SAI & William R. Nelson WA6FQG**

Published by the **Radio Amateur Callbook** company and edited by the very well known **William I. Orr W6SAI**, this American book deals with interference in a number of ways and from a number of angles. The back cover of the book carries a quotation from **Gordon West WB6NOA**, President of Gordon West's Radio School which says: "Every ham and CB operator can benefit from the valuable data in this practical handbook. Covers every imaginable RFI problem and its solution".

The handbook looks at issues such as "How to locate and cure Radio Frequency Interference"; "How to work with the public, safety precautions ..."; "Amateur Radio, CB radio, power line

RFI problems analysed and solved"; "TV and stereo owners: the causes and cures of annoying interference"; "Home, business and industrial sources of RFI" as well as "Case histories of difficult RFI problems and their solutions".

A little bit smaller than the ARRL book, it nevertheless includes some interesting information with diagrams and pictures to illustrate chapters. **Recommended**.

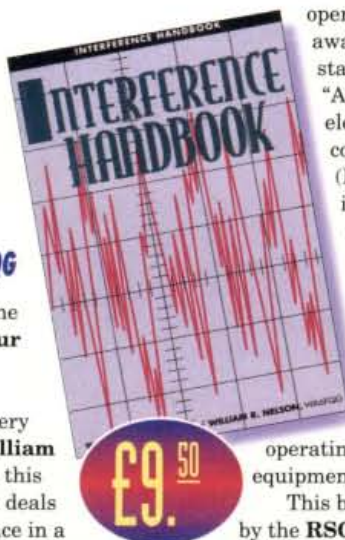
RSGB Guide To EMC **Robin Page-Jones G3JWI**

Electromagnetic Compatibility (EMC) is another aspect of Amateur

Radio that the operator has to be aware of. The book states that "Achieving electromagnetic compatibility (EMC) with the increasing number of electronic devices in surrounding buildings can be a major problem for anyone

operating radio equipment".

This book, published by the **RSGB**, seeks to address EMC problems by "practising good radio housekeeping" as well as assisting you "in the diagnosis



and cure of any [EMC problems] which do occur". The book also claims to deal with the "social dimension" with a whole chapter "devoted to dealing with neighbours".

This book also states that "Considerable revisions of the text have been made for this edition, including coverage of the important new EU EMC regulations which came into effect in 1996". If you want a reference book on EMC then this RSGB book could be the one for you. It's 204 pages are well illustrated with diagrams and pictures and comes **Recommended**.

Radio Receiver Projects You Can Build Homer L. Davidson

If your main interest in Amateur Radio lies in construction and electronics then this American book is worth taking a look at. *Radio Receiver Projects You Can Build* focuses on how you can "Build your own radio receivers and tune in to broadcasts from near and far"!

Chapter One of this book takes a broad look at "Building simple radios" and includes aspects such as radio circuits, pictorial diagrams, tools, obtaining parts, winding your own coils, "PC boards or perfboards", antenna requirements and a lot more. So, as the back of the book claims, if you want to build any of the projects in this book, then "no experience [is] necessary".

The book concentrates on the following projects: 'Crystal radio projects' and 'AM radio projects'. In the chapter on crystal radios, the book looks at a "simple" crystal radio, the "spider-web special" radio, the "deluxe TRF" radio and much

more. In the a.m. radio section the books concentrates on the "linear IC AM" radio, the "breadboard AM" radio, the "solar IC AM" radio and more.

If you want an easy going approach to radio projects then this book comes **Recommended**.

Projects For Radio Amateurs And SWLs R. A. Penfold

This little **Babani** book concentrates on short wave radio projects, so if you're main interests in Amateur Radio is in short wave listening projects then this would be an interesting little book to own. The book claims that it "... describes a number of electronic circuits, most of which are quite simple, which can be used to enhance the performance of most short wave radio systems".

Some of the circuits covered include an antenna tuning unit (a.t.u.), a "simple" active antenna, an add-on b.f.o. for portable sets, a wavetrap to combat signals on spurious responses, c.w. and s.s.b. audio filters and much more.

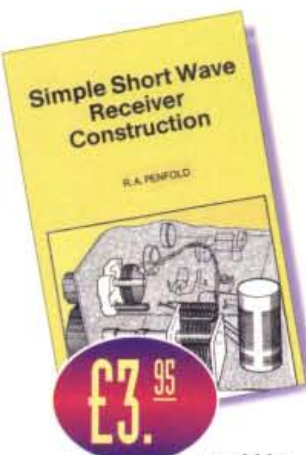


So, if you would like to enhance any of your s.w. equipment then this would be of interest to you.

The little **Babani** books make interesting reading and are good value for money at only £3.95. **Recommended**.

Simple Short Wave Receiver Construction R. A. Penfold

If you've wanted to have a go at short wave listening but thought that it



would be too expensive an hobby to get in to, then this book claims to be what you are looking for. Another little book courtesy of **Babani** books, *Simple Short Wave Receiver Construction* is written by the same gentleman who wrote the other book mentioned here on *Projects For Radio Amateurs And SWLs*. It claims to look at inexpensive projects for short wave listeners, putting paid to the belief that s.w. listening can be an expensive hobby.

If you are "prepared to undertake a bit of DIY" then this could be the book that you need to get you going on s.w. listening. "All the sets are easy to construct, full wiring diagrams, etc., are provided and they are suitable for complete beginners" the book claims.

Some of the aspects of short wave receiver construction covered in this **Babani** book include: "the

broadcast bands and their characteristics"; "The amateur bands and their characteristics"; "The propagation of radio signals" as well as "simple" antennas, "Making an earth connection". "Short wave crystal set" and much more.

Claiming to have "everything you need to know in order to get started in this absorbing hobby", this book is also **Recommended**.

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ICOM PCR-1000
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MVT-7100
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MULTIMODE
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ICOM IC-751
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BOXED
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USED EQUIPMENT

USED EQUIPMENT WANTED

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KENWOOD TS-450SAT GREAT CONDITION	£499
KENWOOD TS-450SAT GREAT CONDITION	£499
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Alinco DX-70TH 02 2000

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PW

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Yaesu FT-8500 2m,70cm FM 50W,35W,Remote Head, Full Duplex	£345

VHF/UHF HAND HELD TRANSCIVER

ADI AT-600 2m,70cm FM H/Hand Wide RX, Full Duplex	£175
Alinco DJ-580 2m/70cm FM H/Hand	£175
Alinco DJ-45 2m/70cm FM with wide RX	£169
Alinco DJ-541C 70cm FM Palm Transceiver with 400-500MHz RX	£69
Icom IC-Q7E 2m/70cm FM micro with 30-1300MHz RX	£119
Icom IC-W2E 2m/70cm FM H/Hand (with sp. mic)	£179
Icom IC-W21E x2 2m/70cm FM H/Hand	£199
Icom IC-W21ET 2m/70cm FM H/Hand	£199
Icom IC-W32E 2m/70cm FM H/Hand with Full Duplex	£229
Kenwood TH-42E x2 70cm FM H/Hand	£189
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Kenwood TH-77E 2m/70cm FM H/Hand with Sp.mic Full Duplex	£225
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Yaesu FT-811 70cm FM H/Hand with DC adapter	£189
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SHORTWAVE RECEIVERS

Drake R-8E 150kHz-30MHz All Mode Receiver Mains	£625
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Icom IC-R71 100kHz-30MHz All Mode with Remote controller	£399
Icom IC-R72 DC 100kHz-30MHz AM,CW,SSB 12V with PSU	£449
Low HF-225 x2 30kHz-30MHz All Mode Receiver 12V	£299
Low HF-250 x3 30kHz-30MHz Receiver 12V PC Compatible	£399
JRC NRD-345G x2 100kHz-30MHz AM,SSB,CW,FAX 100Ch. 12V	£449
Realistic DX-394 150kHz-30MHz AM,CW,SSB 100Ch. Mains/12V	£115
Roberts R-617 Portable 150kHz-30MHz AM/FM stereo	£99
Roberts R-817 Portable Receiver with FM stereo and SSB	£79
Roberts R-861 Portable 150kHz-30MHz SSB, FM stereo RDS	£149
Sony ICF-2001D Portable SSB,AM/FM with VHF Airband 32Ch.	£149
Sony ICF-SW55 Portable Receiver with FM stereo and SSB	£189
Sony ICF-SW100E Pocket Receiver with FM stereo and SSB	£149
Sony ICF-SW7600 Portable Receiver with FM stereo and SSB	£119
Sony ICF-SW7600G x3 Portable Receiver with FM stereo and SSB	£135
Yaesu FRG-7700 150kHz-30MHz All Mode + FRT-7700.FRV-7700	£299

SCANNERS MOBILE/BASE

AOR AR-2001 25-550MHz AM/FM,WFM 20Ch. 12V	£145
AOR AR-2002 25-550MHz AM/FM,WFM 20Ch. 12V	£199
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Icom IC-R10 0.5-1300MHz All Mode + RS-232 1000Ch.	£199
Realistic Pro-26 25-1300MHz AM/FM,WFM 200Ch.	£149
RadioShack Pro-60 30-512.760-999MHz AM/FM,WFM 200Ch.	£125
Realistic Pro-62 66-960MHz (with gaps) AM/FM 200Ch. Hypercan	£139
Wels WS-2000 x2 100kHz-1300MHz AM/FM,WFM 300Ch.	£185
Yupiteru MVT-3300 66-1000MHz (with gaps) AM/FM 200Ch.	£99
Yupiteru MVT-7100 100kHz-1650MHz All Mode 1000Ch.	£169

STATION ACCESSORIES

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JPS NIR-10 x2 Noise / Interference Reduction Unit	£199
Kenwood VC-H1 Visual Communicator, Colour LCD, SSTV	£225
Low AA-150 0.3-30MHz Active Antenna for Mobile/Base	£105
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Ramsey W9CR x2 DSP Audio Filter	£165
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MISCELLANEOUS

Academy WT-2C Pair of 2Ch. FM CB Hand Held Transceivers	£45
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Maycom EM-27 80ch 4w UK/CEPT CB Mobile	£79

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VHF REPORT

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THIS MONTH DAVID BUTLER
G4ASR ANALYSES THE RECENT
LEONIDS METEOR SHOWER
AND TAKES A LOOK AT YOUR
ACTIVITY REPORTS.

Recently I reported in this column that maximum activity during the Leonids meteor shower would occur between midnight on November 16 through to midday on November 17. I based this on the accepted practice that, as the earth intercepts the shower orbit every 365.25 days, you simply add six hours to the date and time of the previous year's radio peak. For leap years, you must also subtract one day for all shower dates after February 29 (including the January Quadrantids shower in the following calendar year).

In 1998, the maximum activity of the Leonids shower occurred during the night between 2300UTC on February 16 through to 1200UTC on November 17. As 1999 was not a leap year, I therefore added the requisite number of days to give a theoretical peak for this year's shower of around 0800UTC on November 17.

However, as you may be aware, the actual peak in 1999 occurred between 0200-0300UTC on November 18 with the consequence that many readers of this column (myself included) lost valuable sleep on the preceding night.

So, how could the UK's premier v.h.f. columnist have made such a mistake! That was the question I posed on the 'v.h.f.

dx-discuss' Internet mailing list and to which I've had a few replies.

Steve Harrison K0XP

commented that this year's peak was based upon historical observations of when the earth crosses the dust trail that generated the maximum activity some 33 years ago. He mentioned that, based upon observations made last year, it's now known that the Leonids are caused by several filaments of cometary debris. The Earth crossed one of those filaments last year and will cross another this year.

Mark Turner G4PCS

provided additional information reporting that according to the **British Astronomical Association (BAA)** there were two observed peaks last year. The first was overnight on November 16/17 and was driven by filamentary material outside of the main core. This peak was reasonably broad lasting many hours and contained a large number of fireballs. These meteors caused intense ionised trails as those lucky enough to be on the air observed.

The second peak during the 1998 shower occurred on the following evening of November 17/18. Observations indicated that there were considerably less meteors, no fireballs and it only lasted for a very short period.

Mark surmises that, compared to the intense activity of the previous night, the second peak wouldn't have been noticed by many v.h.f. operators. Indeed, he thinks that in western Europe this peak would have occurred when the shower radiant was below the horizon and therefore not actually been observed at all.

Mark reports that at a recent talk given by a meteor expert from the BAA, the Leonid storm period in 1999 was predicted to be very brief lasting only a few hours. His final comment was that since the core-driven peak in 1999 is not likely to contain many fireballs, it may well have a different 'feel' from a radio perspective to that experienced during the early session in 1998.

Finally, **Mike Tubby G8TIC** mentions watching a recent 'The Sky At Night' programme on **BBC Television**, devoted to the Leonids meteor shower. It

explained in great detail why showers have large activity one year and then nothing for a number of years.

Basically, it's due to the fact that the trail from the comet is not a single cone full of a uniform cross-section of debris that can generate meteors. It actually comprises of a number of filaments of different ages and densities laid down over hundreds of years.

The Earth passes through different streams (or even between them altogether) in different years. Mike reckons that this can explain why the Perseids shower was good in 1994, average in 1995, 1996 and 1997, poor in 1998 and dreadful in 1999.

So, there you have it. The mega-opening that occurred on November 16/17 1998 was a fortuitous event caused by the Earth passing through filamentary material, rich in fireballs, outside of the main shower core.

The main shower activity on November 17/18 wasn't observed in Europe as the optimum geometry had probably occurred when the shower radiant was below the horizon. That is why my method of adding 365.25 days was incorrect in these circumstances. I rest my case!

UNCERTAIN PREDICTIONS

Much of the uncertainty in predicting Leonid storms in the past has been due to the fact that astronomers have traditionally relied on the comet's nodal longitude and distance to predict activity. It had been assumed that the cometary dust was more or less constant in density, varying from the most dense near the comet and becoming less and less dense farther away from its orbit and the comet's position in orbit.

However, the assumption didn't take into account the possibility of stable dust trails in a similar orbit, trails that could (after several revolutions) become quite narrow and dense. Perhaps these are similar to the 'filaments' that some have talked about, for both Radio Amateurs and some visual observers have long said that the major showers seemed to have considerable

structure in their density.

The larger pebble-sized particles tend to remain for a longer time near the comet itself as they are not pushed away by the sun's radiation pressure. Over the next three years, the Earth should closely encounter individual dust trails at various distances. Thus, between 2000 and 2002, there appears to be an excellent chance of one or more meteor storms. In fact, each year may have several peaks, separated by several hours.

One of the peaks may produce a storm. However, there's no reason to expect any further great display of fireballs as the Earth will be well past this area in the following years.

Just what conditions will be like at 0300UTC on November 18 2000 will be anybody's guess, but being a Saturday morning I reckon there will be tremendous activity. I stake my reputation on it!

DIFFERENT 'FEEL'

Now I'm picking up on the comment by the BAA meteor expert who suggested that the recent shower may well have a different 'feel' to it compared to the event in 1998. **Graham Daubney G8MBI (JN04)** reckoned that there was a noticeable difference between observations he made at 49MHz (Band I) and those at 144MHz.

Graham mentions that, based on many years of simultaneously listening to both frequency ranges, he's developed a distinct feeling for the ratio, length and strength of any particular shower. Although Band I will always produce many more reflections the recent Leonids shower possessed, in his opinion, a low frequency bias.

Masses of long reflections, even continuous activity, at 49MHz was failing to produce even a single ping on the 144MHz band. (During the main meteor activity period, 0200-0300UTC, this was not observable as both bands were simply swamped with continuous activity).

Graham also observed that there were a disproportionate number of long duration reflections from stations located far away. An example of this was **LA0BY/P (JO59)** who was the only station audible for some time with little reflections from stations located closer in.

The observation leads me on to a brief comparison of meteor scatter (m.s.) propagation on the 50MHz and 144MHz bands. Text books often mention that meteor reflections are more prevalent at lower frequencies. Mention is made of longer burst lengths and stronger signals. But

is this borne out in practice?

Shelby Ellis W8WN reports making his first high speed c.w. contacts during the Leonids and his surprise at how weak the reflections were on the 50MHz band. He mentions having no trouble making contacts, only that he expected much stronger signals.

Shelby heard one or two strong pings but not many that would even rate a 26 (duration up to five seconds, strength up to S3) report. Shelby knows that his 4-element Yagi on the 50MHz band doesn't compare with the 144MHz array but wonders if that is the main reason or if there is something else he might have missed.

Palle Preben-Hansen OZ1RH reports that there is indeed something that has been overlooked and that is the background noise level and the characteristics of the antenna. At 50MHz the atmospheric noise level is much higher than on 144MHz.

From a quiet rural location, the background noise temperature on the 50MHz band is somewhere around 4000K (degrees Kelvin), approximately equivalent to a noise figure of 12dB. On the 144MHz band a typical noise temperature might be 200K, approximately equivalent to a 2dB noise figure.

In a town, man-made noise on the 50MHz band is considerably higher and can reach 300 000K. This means you can't really take advantage of a pre-amplifier at 50MHz with a noise figure of lower than say 10dB unless you have considerable feeder loss. Thus, comparing like-for-like, your QSO-partner should provide some 6-10dB more power on 50MHz band than on the 144MHz band to provide you with the same signal to noise ratio.

Turning now to the characteristics of the antenna and Palle mentions that antenna gains of 12-15dBd are quite realistic on the 144MHz band but at 50MHz a 13dBd gain antenna will be huge. Meteor scatter operation on the 50MHz band therefore takes place with antennas possessing 5-6dB less gain. The beamwidth of the antenna at 50MHz will also be much broader and may not be entirely suitable for meteor scatter communication.

Indeed, a 50MHz beam on top of an 18m high tower is only three wavelengths above the ground and this will lead to a much higher angle of radiation than an equivalent beam on the 144MHz band. Of course the power limits in some countries are also much less than ours in the UK and this will not allow

full exploitation of scatter modes.

Taking all these factors into account it can be seen that meteor scatter signals on the 50MHz band will be weaker than those experienced on the 144MHz band.

ACTIVITY REPORTS

Now it's time to turn to some of your activity reports. "What an interesting evening on the 50MHz band" exclaimed **Andy Durrant G7OEC** (JO01). He got home at 2230UTC on November 17 and went straight into the shack.

Swinging the beam to the north, Andy heard the Lerwick beacon GB3LER peaking 559. Normally this beacon is unheard from his QTH. All was then very quiet until the stroke of midnight when - just like magic - several Italian stations popped up out of the noise. They were all 59 but after a few minutes all was quiet again.

Then, gradually - every 15 minutes or so - the 50MHz band

IZ2AAJ and S51UF. His best DX on the 144MHz band was HA1BC who he contacted at 0218UTC.

Paul G7GUC was using an Icom IC-746 transceiver and Command Technology 3CX800-A7 amplifiers for both the 50MHz and 144MHz bands. His antennas, both made by M2, consisted of a widespaced 4-element Yagi on 50MHz and a 9-element Yagi on the 144MHz band.

Paul was really pleased to work the Hungarian station as it was a new country. Hementions that even if the Leonids shower wasn't quite what everyone else had hoped for, it has opened up another method of working v.h.f. DX for himself. He's now hooked!

I was active on the 144MHz band from my QTH (IO81) between 0130-0430UTC on November 18. Although I made s.s.b. contacts throughout this period, the best activity for me occurred between 0150-0225UTC. Signals were reasonably strong but nothing

Patrick TK5EP comments that, as he only made two contacts in 1998, he made a special effort this time to be active some hours before and after the predicted activity period. He experienced very strong winds (130km/hour) from his mountain top QTH and could only use a small 9-element Yagi on the 144MHz band. However, he managed to make 31 contacts which included the UK stations of G0FDH, G0KPW, G0RUZ, G4ASR, G4HWA, G4IVH/P and G4ZTR.

Giuliano Artico I3LGP reports that at his QTH (IN55), the conditions before 0100UTC were rather poor and that he observed the best conditions to be around 0200-0230UTC. After 0300UTC the reflections were reduced in number and duration and by 0340UTC he had enough and went to bed!

Giuliano confirms that the conditions in 1998 were infinitely better. Running a Kenwood TS-711E transceiver, 300W and a 17-element F9FT Yagi he made a total of ten contacts on the 144MHz band. These included EI4DQ, G0RUZ, G4ASR, GW7SMV, G7RAU and stations in DL, EW, F, ON and SP.

From Scandinavia comes a report from **Jari OH1XT** (KP01). He was active on the 144MHz band running 300W into a pair of 15-element Yagis. Between 0039-0444UTC he made 48 s.s.b. contacts including the stations of G0KPW, G1HWY, G1WPF, G4LOH, G4SSO, G4XBF/P, G7RAU and GM4OGI. His furthest contact was with F1DUZ (IN97) at 2115km.

Over in Austria the station of **OE6IWG** reported making contact with G0PES and hearing G0KPW, G1WPF and GW7SMV. He also worked into EW, F, HA, I, LA, OH, PA, RX and YU. Spare a thought for **Dave Dibley G4RKG** (IO91). He spent most of the night listening on the 430MHz band but unlike 1998, he heard no reflections at all. He uses an array of eight 27-element Yagis and a K2RIW amplifier.

Now a report from **David Dodds GM4WLL** regarding the RSGB c.w. contest held on November 7. He entered the six hour section (concurrent with the 24-hour IARU event) and, despite some keyer problems, found activity to be quite good. In all he managed 38 contest contacts including the stations of DL0KM (JO31) at 786km, F5JLQ/P, ON7RY and OT9M. These were all worked via tropospheric propagation.

Conditions then took a turn for the better during the last 30 minutes of the contest when an auroral opening occurred. He



Fig. 1: Antennas at the QTH of ISOAGY on Sardinia.

slowly opened up, progressively longer and to a wider area. By 0115UTC on November 18 most of eastern Europe and Scandinavia could be heard. Stations from Cornwall (IO70) through to Scotland (IO87), Norway, Denmark, Sweden, Germany, Poland, Croatia, Slovenia and Italy were all very strong.

The frequency of 50.150MHz was like a huge 'cooking pot' full of signals, all rising and falling in strength with the vagaries of the ionised trails. Paul was running a Yaesu FT-650 transceiver, 400W and a Cushcraft 6-element Yagi and managed to contact 10 s.s.b. stations located in seven countries.

However, Paul heard little from the south or west. No EH (Spain) EI, GI or GW stations and nothing outside of Europe. He found it interesting to work a number of new squares at distances not normally heard via other propagation modes.

Another Paul, **Paul Bradbeer G7GUC** (IO93), reports that this was the first time he had ever tried meteor scatter communication. On the 50MHz band he made s.s.b. contacts with the stations of IW2MEX,

like that experienced in 1998.

My contacts included the stations of EA3TI, EA7AJ, HA5BDJ, OK1DIG, OK2BVE, OK2PIN, I3LGP, SM4VQP, S51AT, S53J, S57FB, YU1IO and YU7DP. The best bit of DX (but not the farthest), was TK5EP located on Corsica, who I worked at 0308UTC. I also heard the stations of IK0BZY, I4XCC, OE3MWS, OM3RM, OZ1FTU, SM0EPR, SM5BSZ, SP4MPB, YU7KB and 9A2PT. I was using a single 18-element DL6WU Yagi, 400W and a Kenwood TS-790E transceiver.

Conrad Farlow G0RUZ mentions that his equipment was much better this time around with a GS35B amplifier and an array of four large DJ9BV Yagis. However he still made a similar number of contacts, 32 in total, as he did in 1998 when he was using a significantly smaller station.

Conrad also reports that operating around 144.200MHz was quite good with many stations moving away from the calling frequency. The most outstanding signals at his QTH (IO93) were F/G8MBI, I4XCC and PA2PT. The longest bursts he heard were about one minute in duration.

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was then able to work the stations of SK7MW (JO65) at 1000km, DJ4SO (JO44) at 828km and DL8EB/P (JO30) at 827km.

Just after the contest ended at 1400UTC the auroral propagation faded out but David decided to wait at his portable QTH (IO85) in case it returned. Fortunately it did and at 1440UTC he was hearing strong tone-A signals from the LA4VHF (JP20) and SK4MPI (JP70) beacons.

In the following hour he then went on to make further c.w. contacts with the stations of LA0BY (JO59), LA8AJA (JP50), OZ2TF (JO46), SM4IVE (JO79) for his best DX at 1165km, SM6CEN (JO57) and SM6OPX (JO58). Although he checked the s.s.b. section there was no activity apart from the station of MM1CXE, who had no takers on 144MHz but did have some success on the 50MHz band.

DEADLINES

That's it again for this month. Next time around I'll be reporting about the good propagation that has been occurring on the 50MHz band. This band should now be open to all continents and this will continue through to the end of March.

PLEASE FORWARD ANY NEWS, VIEWS, COMMENTS OR PHOTOGRAPHS TO THE ADDRESS AND BY THE DATE GIVEN AT THE TOP OF THE COLUMN. GOOD LUCK WITH THE VHF DX

73 David G4ASR.

HF FAR & WIDE

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LEIGHTON SMART GW0LBI
HAS MORE NEWS ON THE HF

**BANDS FROM REPORTERS
FROM ALL AROUND THE UK.
HE SAYS THAT ALL REPORTERS
HAVE NOTICED AN INCREASE
IN HF PROPAGATION.**

Pheh! What a difference a few weeks makes! All our reporters this month indicate a very noticeable increase in h.f. propagation conditions (at long last!) with even 28MHz staying open (sometimes) very late into the night. About time too I hear you all say! Well we can only keep our fingers crossed that, as the year 2000 progresses, then so do conditions!

Certainly, the DX worked on the higher frequency bands this month has increased, both in terms of distance and signal strength. As a result, it looks as though our reporters have naturally been attracted towards those bands.

If 28MHz is 'up', however, then conditions also improve on the bands below too, so it's also very worthwhile checking out the 18 and 24MHz bands when conditions are good. These bands, particularly 24MHz, are very often overlooked by many amateurs in favour of the wider allocations and, as a result, they tend to suffer to a lesser degree from QRM - leaving the field open for you and me!

CATCHING UP WITH Y2K

No, this is not a report of a lost tribe of Amazonian Indians suddenly discovering Amateur Radio, it's just that yours truly has finally got himself an E-mail address. Just as the 20th century

comes to an end, then GW0LBI - always a bit slow to take advantage of new technology - finally catches up with it!

It's not that I'm a Luddite by any means, it's just that things are changing more rapidly than I can manage! My two young sons, however, are both way ahead of me and have now taught me how to use it, so reports for the column are now welcome by both the good old Post Office and also via trelewis@skynow.net

YOUR REPORTS

On to your reports now, starting with the 14MHz band where **Sean Gilbert G4UCJ** of Milton Keynes reckons the h.f. bands are 'alive with exotica'! Well, he's certainly had good results on 14MHz c.w. using 30W of output power to work (amongst others) R1AND (Antarctica - the seventh continent as Sean says!) at 1836UTC, FY/DJ6SI (French Guiana) at 0022UTC, ZL6QH (New Zealand) at 1753UTC, BD5WW (China) at 1730UTC, as well as VK7GK (Australia) with 3W QRP.

A switch to s.s.b. at 30W p.e.p. brought in ZX0F (Fernando De Nohorona Island) at 2241UTC and 5W0GD (Samoa) at 0859UTC, while just 3W s.s.b. gave him a contact with 7M4BEN (Japan) at 2033UTC. Not bad for the power used and loft-mounted antenna!

On the Isle of Sheppey in Kent we find **Ted Trowell G2HKU** who, this month, lists two 14MHz c.w. contacts with VR2GY (Hong Kong) at 1500UTC, plus V51AS (Namibia) at 2100UTC, while **Carl Mason GW0VSW** of Skewen in West Glamorgan used 3W c.w. to hook up with CU2/DL9VSB (Azores Islands) at 1105UTC and 3W of s.s.b. to work CN8WW (Morocco) at 1342UTC.

THE 18MHz BAND

The 18MHz band was the place to be for **Eric Masters G0KRT** of

Milton Keynes this month, after working ZM4DJ (New Zealand) three times on the band. Eric says that ZM4DJ is active most mornings on 18MHz s.s.b. after 0815UTC UK time. His other contact on the band was RN3DD (Russia) at 1240UTC.

Using a Doublet antenna and 100W was **Robin Trebilcock GW3ZCF** of Swansea, who hooked up with JA4FKX (Japan) at 1939UTC with c.w., while s.s.b. brought him contacts with VU2GTE (India) at 1542UTC and VK1TX (Australia) at 1348UTC.

Ted G2HKU reports just a single c.w. contact on 18MHz this month in the shape of VP2P/G3TXF (British Virgin Islands) at 1000UTC, while Sean G4UCJ reports 30W c.w. contacts with 9M2TO (Malaysia) at 1706UTC and S79BL (Seychelles Islands) at 1858UTC.

THE 21MHz BAND

Up to the 21MHz band now, where Carl GW0VSW, using a 'Sandpiper' vertical antenna, reports a 3W QRP c.w. contact with J7/K3UG (Dominica) at 1142UTC, while 5W of s.s.b. brought in PJ4B (Netherlands Antilles) at 1500UTC. Also using s.s.b. was Eric G0KRT who netted a bagful on 21MHz, including H2T (Cyprus) at 0810UTC, SV1DKL (Greece) at 0754UTC, J6J (St. Lucia Island) at 2113UTC and K8DX (USA) at 2100UTC.

Robin GW3ZCF offers three s.s.b. contacts on 21MHz in the form of LU9AY (Argentina) at 1932UTC, 8R1Z (Guyana) at 1442UTC and N6AR (west coast USA) at 1954UTC, while Sean G4UCJ listed BD5WW (China) at 1354UTC, 3B9FR (Rodriguez Island) at 1404UTC, 8JTRL (Antarctica) at 1738UTC and ZL4WA (New Zealand) at 1250UTC - all using c.w.

A switch to s.s.b. also brought him contacts with TI7DBS (Costa Rica) at 1955UTC, HC8A (Galapagos Islands) at 1320UTC and with 5W s.s.b. he landed 5N0W (Nigeria) at 1300UTC, KL7Y (Alaska) at 1656UTC and J6J (St. Lucia Island) at 2215UTC.

THE 24MHz BAND

The narrow 24MHz allocation provided Ted G2HKU with a few gems this month which included c.w. contacts with JY9NX (Jordan) and A45XR (Oman) at 1000UTC, with 6W/K3IPK (Senegal), V47GU (Federation of St. Kitts & Nevis Islands) and AD6C (west coast USA) coming in between 1500 and 1600UTC.

Using the reliable half-sized G5RV antenna and 4W of c.w., Carl GW0VSW lists two 24MHz contacts this month in the form



Fig. 1: Jon Wheeler G0IUE in Melksham in Wiltshire - a self-confessed "10 metre aficionado"!

of 6W6/K3IPK (Senegal) at 0800UTC and VP5/WA2YVA (Turks & Caicos Islands) came in later at 1308UTC, while Eric GOKRT used 100W of c.w. and a sloping 28MHz dipole to snag PY2YC (Brazil) at 1730UTC, W5WM (Texas) at 1655UTC and V26AK (Antigua & Barbuda Islands) at 1720UTC.

THE 28MHz BANDS

On to the 28MHz band now and low power is the name of the game for **Jayne Richardson 2E0ASR** of Milton Keynes who reckons that, despite the increase in powers to 10W for Novice stations, it's not worth the bother of making internal adjustments to her rig and has remained running just 3W output power!

Nevertheless, Jayne offers 28MHz s.s.b. contacts with HI9/DL4JS (Dominican Republic) at 1638UTC, IH9P (Pantelleria Island) at 1515UTC, 9H0A (Malta) at 1400UTC and a string of US stations including W6XR (west coast USA), W1US and K8AZ (eastern USA) all at around 1600UTC.

Meanwhile, another single band report comes from **Jon Wheeler G0IUE** in Melksham in Wiltshire (See Fig. 1) who says his 28MHz logbook is 'filling up fast'! Jon is a self-confessed "10 metre aficionado" who seems to be having great fun now that the band is opening up.

His log includes contacts with CX6FP (Uruguay) at 1224UTC, EX8MDA (Kyrgyzstan) at 1143UTC, HI9/DL4JS (Dominican Republic) and ER2GF (Republic of Moldova) both at 1200UTC. VE1CSM (Canada) was worked at 1200UTC, as was George KZ1H, who Jon worked while mobile on his way home.

Incidentally, George mentioned that he remembers *Practical Wireless* from way back in the 1930s and sent his best wishes to an old 'on-air' pal of his, our very own Rob G3XFD! Small world, innit?

SIGNING OFF

At last there are signs that conditions on the h.f. bands are on the up and let's hope it's the start of better things to come eh? A happy New Year/century/millennium to all readers! Thanks again to all 'HF Far & Wide' reporters for their most valuable information.

AS USUAL, REPORTS, INFORMATION & PHOTOGRAPHS (I LIKE TO PUT A FACE TO YOUR NAMES!) BY THE 15th OF THE MONTH. DETAILS AT THE TOP OF THE COLUMN.

73 Leighton

FOCAL POINT

REPORTS & INFORMATION TO:

GRAHAM HANKINS G8EMX
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ACOCKS GREEN
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E-MAIL:
graham@ghank.demon.co.uk

PACKET: G8EMX@GB7SOL

THIS MONTH GRAHAM HANKINS G8EMX IS BACK AND HE BRINGS YOU MORE ATV RELATED NEWS, VIEWS AND IDEAS.

I have a dream. It is a Sunday morning, sometime in the 21st century and at 1000, the Amateur Radio news is going out via a network of voluntary 'presenters', through each voice repeater and over the Packet network. The morning's bulletin carries the usual reports and thousands of Radio Amateurs are listening.

But in my dream I'm not among the audience for the voice news, because here in the year 2000 there is now a fourth carrier for the regular bulletin, which now goes out nationally in vision. All the 24cm (1270MHz) Amateur Television (ATV) repeaters have been linked together on 10GHz to carry a half-hour video of the latest for radio and TV amateurs.

My local repeater is showing the coverage area for a new voice repeater mentioned in the radio news, with some shots of the equipment being built and tested. The news bulletin then goes to video footage taken the previous Sunday at a major rally, including extracts from the lectures.

We then see a v.h.f. contest station in action, with graphs of propagation predictions. The ATV bulletin continues with pictures from the recent Open Day at Radio Society of Great Britain (RSGB) headquarters. Finally, latest call signs are given in vision, followed by video of how a typical Morse Test is conducted. Then the alarm goes and I wake up!

The weekly Amateur Radio news on a Sunday may, one day, also be carried on all ATV repeaters. Whether it ever will depends not only on licence conditions and permissions but, of course, voluntary resources within the ATV hobby, which is supported and promoted by the British Amateur TV Club (BATC).

REVIEWING STRATEGIES

After the General Meeting at Shuttleworth last year, the BATC has been actively reviewing its strategy for 2000 and beyond. The club now has all its management committee 'plugged in' to the Internet and E-mail, so opinions on the 'way forward' for the BATC and ATV can be rapidly circulated and discussed.

The main issues discussed are: promoting membership; raising the Club's profile; creating an 'easy way into ATV' for the beginner and the production and distribution of the CQ-TV magazine.

My suggestion for promoting membership and raising awareness of the BATC has always been to attend more of the major rallies - the Club was at the London Show in November and will, hopefully be there again in March. It's certainly makes more 'time and effort' worthwhile to be at the two-day events than the one day rallies and I've personally offered assistance to the BATC here. I have a caravan, so can easily travel and carry exhibits!

Making ATV easy for the beginner is, surprisingly, slightly controversial. There is the view that ATV is very much a 'home-brew' specialism, requiring a moderate commitment from the newcomer to build and experiment. But some other clubs have boosted their membership by offering a complete, simple-to-construct kit at a modest cost which 'opens the door' into their particular theme.

So, a simple kit, or ready-built low-power 24cm ATV transmitter, complete with vision call sign source, paired with a basic receiver and, between them sufficient to work a local ATV repeater, could be just what the BATC needs to make available.

Its quarterly magazine CQ-TV is, perhaps, the BATC's most regular service to its members, but storing and posting nearly 2000 (I'm using that number a lot this month!) A4 magazines every three months is a substantial undertaking and commitment for someone. That 'someone' is BATC secretary **Paul Marshall G8MJW**.

Paul has recently 'done it' for the 24th time, as CQ-TV 188, November 1999 arrived on my doormat. But this was after all 2000 had been delivered to Paul, stored at his home, inserted into envelopes then collected by van. Paul may be storing and posting a 25th time, but the situation is under review.

The centre section of CQ-TV

188 is dominated by a seven-page 'Photo Gallery' of pictures taken at Shuttleworth and the International Broadcasting Convention. Included in the Gallery is a photo accompanied by tantalisingly brief news of a new ATV repeater for West Wales.

WEST WALES

The GB3GW ATV Repeater, located near Criccieth, will cover the West coast of Wales and Cardigan Bay. The band is not stated, but the antenna installation crew comprised **Derek GW3FDZ**, **Endaf MW1BQO**, antenna rigger **Max** (call sign not stated) and **Arfon Repeater Group** chairman **Brian GW4KAZ**. More news of this next time.

Philip Fuller G0PVQ keeps me up to date on the very active ATV scene around Crawley and assures me that "432MHz and 1.3GHz ATV is alive and well in West Sussex". Historically, members of the Crawley, Reigate and Redhill radio clubs had been very active with 70cm (430MHz) ATV and the Crawley 24cm (1270MHz) ATV repeater GB3CT gave good coverage.

"But", says Philip, "as with all things, most beginners into ATV stay with one band before moving on to the next and microwave parts were, at the time, quite expensive". Eventually, the repeater was taken temporarily out of service.

But **Crawley Amateur Radio Club** has a thriving Novice section who are eager to get onto ATV when they receive their call signs. As part of a club project, novices build their own 70cm ATV transceivers or modify p.m.r. radios by adding home-brew vision modulators so there is still substantial vision activity on the 430MHz band.

A past Mayor of Crawley was amongst local dignitaries and business people who visited the club and were treated to a demonstration of colour ATV on 70cm. As for the 24cm Crawley repeater, it may soon be back on air, assures Philip:

"The club has decided to resurrect the 1.3GHz repeater, but we have been experiencing minor problems with the antenna and p.a. driver. But we hope to repair these, check the system out, plot a polar diagram, then send for the repeater licence".

That's all for this month's 'Focal Point', all being well, I hope to see you at Picketts Lock in March 2000!

UNTIL THE NEXT TIME MY COLUMN'S IN PRACTICAL WIRELESS ...

73 Graham

GRAHAM HANKINS G8EMX IS BACK THIS MONTH & HE BRINGS YOU MORE ATV NEWS

RadioScene

DATA SCAPE

NEWS, VIEWS & PICTURES TO:

ROGER COOKE G3LDI

TEL: (01508) 570278

E-MAIL:
rcooke@g3ldi.freemove.co.uk

PACKET: G3LDI@GB7LDI

ROGER COOKE HAS SOME MORE DATA NEWS FOR YOU THIS MONTH. HE TELLS YOU ALL ABOUT SOME NEW MEMORY TECHNOLOGY & INFORMATION ON AMATEUR CRACKERS FOR YOU ALONG WITH SOME WACKY WEB SITES FOR YOU TO SURF.

Memory prices seem to fluctuate from day to day - it's a bit like investing on the Stock Market. You buy today at £5 per Mb and then tomorrow it drops to £1, much to your annoyance! Watching the prices and jumping in at what appears to be the bottom is the trick of course, but not always possible.

Accessible memory is also changing, even the disk drive is under threat. New developments are on the horizon and Hitachi scientists recently announced that they had developed the next generation of semi-conductor memory devices.

The new technology, called **Phase-state Low Electron hole-number Drive Memory (PLEDM)**, will be targeted at the IT and communications industries. (With a mouthful like that, the initials might be easier to remember!) The PLEDM technology will allow large amounts of information to be recorded and accessed on a solid state storage chip, rather than power hungry magnetic disks.

The new chip could be deployed in areas needing magnetic or solid state storage where low power consumption is needed. It should make PCs, laptops, and mobile phones, etc., more economical. It's a viable alternative to magnetic storage, strengthened by compact design and access speeds that are comparable to that of DRAM technology.

Currently, **Dynamic Random**

Access Memory (DRAM) is used as the main memory resource in computers because it offers the best capacity and speed. But DRAM is limited as it requires a high signal-to-noise ratio.

Hitachi's PLEDTR transistor has unique electrical characteristics, allowing the PLEDM cell to work on a standard metal oxide semiconductor field effect transistor (m.o.s.f.e.t.) gate. This integration of one transistor onto the gate of another is a first, and the basis of a breakthrough.

The chips should cost no more than the media in use today, because the production uses standard semi-conductor techniques. Just don't expect it to appear too soon, there are lots of disks spinning out there and replacement will take a long time!

AMATEUR CRACKERS

Criminals are recruiting an army of amateur crackers to attack networks unwittingly, security experts recently warned. The professionals are distributing trick software that lets teenage enthusiasts attack networks and then secretly sends their findings to experienced crackers.

Consultants cited the hacking group New Order's Aggressor network-attack software. Another consultant warned network administrators that young people who collect cracking tools to impress their peers would quickly use them. Cracking attempts rise by a factor of three or four during school holidays.

The news comes shortly after security experts learned that the password authenticator Tepwrapper has been re-written and distributed in a form that sends passwords it finds to an anonymous Hotmail address.

Take a look at the following URL: www.junkbusters.com/cgi-bin/privacy This information comes courtesy of **Paddy G7KZZ** who comes up with a few gems of which this is one. If you value your privacy and don't like personal information being sent over the Internet, or being obtained, then this is for you. The program itself is quite small, only 350k, so takes only about two minutes to download.

Visit the site and have a read and I think you will then be convinced. (Fig. 1 shows the

JUNKBUSTERS Alert on Web Privacy

You can be tracked from your mouse clicks

Most people don't realise the extent to which web sites can track what they look at. We want you to know what companies that visit you when you visit their web sites.

Two browser sessions each page by making "HTTP requests" for the text and graphics parts from one or more web sites. These sites may not have been visited in the last few days but on the same page can come from different computers. Your browser gives all of them a lot of information you might prefer to keep private. Most sites store these details securely.

How they know where you came from

The "HTTP Referrer" tells them what led you to the request. In the case it was not provided:

- If you use a search engine to find a site, the search engine typically forwards the site you then click on.
- If you clicked on a banner advertisement, the URL may contain coded data used to track specific ads as you (directly or indirectly) visit the site.
- If you click on an ad, look at the URL displayed for it. Codes and long addresses suggest that your mouse clicks are being tracked.

At the time of writing, the following sites were found to be using the HTTP Referrer to track visitors:

Fig. 1: The home page of www.junkbusters.com/cgi-bin/privacy



Fig. 2: The home page of <http://google.stanford.edu/>



Fig. 3: The home page of <http://www.almaden.ibm.com/cs/k53/clever.html>

home page. Maintaining as much anonymity on the Internet is advisable to avoid all the unwanted mail).

PK232 SOFTWARE

If you're looking for software for the PK232 you might like to take a look at the following URL: <http://www.web.inter.nl/net/hcc/pa0nc/> This program can be used with the PK232 and the PK900 for PACTOR/AMTOR and RTTY. There are DOS and Windows versions available.

NcW95Pk.zip is a Windows 95 terminal program for the PK232 and PK900; NcW95.zip is a Windows 95 terminal Program for ALL SCS Multimode Controllers; These programs will not run under Windows 3.1, but will be fine for Windows 95;

Installation is very simple - make a separate directory for the program you want and copy the

*.zip to that directory. Unzip the file and several files will be put into that directory.

NcW95Ptc.exe is the program for the PTC controller and NcW95Pk.exe is the program for the PK series. Likewise the NcW95Ptc.ini and NcW95Pk.ini files.

If you want to edit files from the program you also need NcW95Ed.exe in the same directory. The initial comport number for both programs is 4 with 9600 Baud. These values can be changed in the .ini files with a text editor. If you need any further information, contact **Roel PA0NC @ P18DAZ.# TWE.NLD.EU** or E-mail him at: **Pa0nc@net.hcc.nl**

MORE SEARCH ENGINES

As I reported in January, more search engines are coming online. As the Internet expands, exponentially with the impetus of the media and Bill Gates' prediction that every home will



Fig. 4: The home page of <http://www.directhit.com/>

How to repair a PC

Setting your workplace up

- You need adequate clothing
- Prepare all needed tools
- For the PC where it feels comfortable, this means on the floor. Desktop PCs should be put on the side with the keyboard to the left
- Shut out the last tool you have at hand



Fig. 5: The home page of the "wacky" 'Repair PC' site which is found at: www.cpu.lu/~gkes/pcrepair/



Fig. 6: Another "wacky" site here, this time concentrating on 'Astral Projection': www.lava.net/~goodin/astral.html

have an Internet connected PC, the search engine will have to grow more specific. New technologies are being developed to challenge the already well known ones, such as **Yahoo**, **Excite** and **Altavista**.

Better search engines means more visitors and, as a result, companies are trying to improve their search capabilities, turning to projects such as **Google** (one I reported about several months ago), **Clever** and **Direct Hit**. Google is one that I still use the most. Developed by Larry Page and Sergey Brin, over three years' research has resulted in quite a fast result.

The Google search engine currently has more than 25 million indexed pages and hopes to raise that to 100 million. Researchers estimate there are currently more than 300 million publicly indexable pages on the Web.

Google isn't the only start-up developing new ways to

search the Web - **Clever** is being developed at IBM's Almaden Research Centre. Like Google, it ranks pages by calculating links between them and measuring their importance. The system, based on an algorithm developed by Jon Kleinberg, a Cornell University researcher, looks at the links between pages, ranking them in order of importance.

A third contender comes from venture capital backed **Direct Hit**, which has a system that records users behaviour and documents popular results. The company has produced technology that tracks millions of Internet searches and records which pages users visit form a lost of results. The data is then used to determine which pages are popular and they are ranked accordingly.

Direct Hit also

factors in the frequency with which Web sites have been visited by previous Internet searches. By keeping track of the outcome of previous searches, the company plans to create a market for that kind of information.

While all these new projects are aiming for the top spot, it is unlikely that a single search technology is going to serve everybody's needs. Specific subjects are likely to be tackled in the future, so that if you need information on medical matters, you will use one search engine and if you need information on finance you will use another.

The working Google site is at: <http://google.stanford.edu/> (Fig. 2 shows the home page at the site). There is no present working version for **Clever**, but more information can be found at: <http://www.almaden.ibm.com/cs/k53/clever.html> (Fig. 3 is the home page which is found at the **Clever** search engine site). To use the **Direct Hit** search engine or to find information on **Direct Hit** integrated into **HotBot** and **MacOS 8.5** point your browser at: <http://www.directhit.com/> (Fig. 4 is the home page at this site).

DISTURBING FINDINGS

Disturbing findings from a US psychological study indicate that millions of users are hooked on the Internet and are effectively downloading depression. A report, issued at a recent meeting of the American Psychological Association annual meeting, claimed that nearly six per cent of online users are Internet addicts.

Dr. Kimberley Young, a lecturer at the University of Pittsburgh, said psychologists are starting to take serious note of the 'Internet' condition, following a dramatic increase in divorce and family break-ups where Internet addiction is cited as the cause.

Dr. Young's comments adds legitimacy to the concern that Internet addiction is real. This can also pose a problem for the workplace, where much of this

abuse goes on. Consideration is being given to the installation of technology that monitors and controls surfing habits.

Surfing the Internet for long periods of time is known to produce high levels of dopamine in the brain, which gives Web surfers temporary highs before sending them into depression. In a parallel development, the European Union is drafting guidelines that will enable Internet addicts to receive clinical treatment in much the same way as alcoholics and drug addicts.

If the policies become a reality, it will mean that Internet addicts will be treated as having a serious behavioural disorder and could receive treatment on the National Health Service!

WACKY WEB SITES!

During the dark cold days of February, this section might amuse you. I should have put this in the December issue just for Christmas, but better late than never! The following are some of the very best in pointless and weird Web sites that have come to my attention.

Listed with tongue firmly in cheek, I don't expect you to spend too much time here, but it might help with your ISA (no, NOT your Individual Savings Account, but your Internet Surfing Addiction!), providing you a little light-hearted entertainment.

The first wacky Web site will be found at the following URL: www.mudhead.uottawa.ca/~pete/beard.html Next to the anorak, the baseball hat with antenna and the four hand-held rigs strapped across the chest comes the unusual facial hair - beards and computers seem to go hand in hand. But if you are follically challenged in the facial region, then a visit to this site could provide you with a picture of what you could look like with a beard! Personally, I can't stand the things, even hair on my head has to be kept to a grade four these days!

If you've ever been frustrated with a PC and wanted

Web Watch:

Google search engine: <http://google.stanford.edu/>
Clever search engine: <http://www.almaden.ibm.com/cs/k53/clever.html>
Direct Hit search engine: <http://www.directhit.com/>
PK232 software site: <http://www.web.inter.nl.net/hcc/pa0nc/>

Wacky Web sites:

www.mudhead.uottawa.ca/~pete/beard.html
www.cpu.lu/~gkes/pcrepair/
www.ghe.ecn.purdue.edu
www.lava.net/~goodin/astral.html

RadioScene

revenge, then this is your chance. The informative guide is packed full of useful tips for kicking the living daylight out of any PC.

There is a comprehensive guide to hand-held devices, such as axes and power tools, for the advanced repairman. If you find the repairs a bit too complicated, the site also contains links to the critically acclaimed: "The Illustrated Guide to Breaking Your Computer". It takes you, step by step, through all the tools you'll need to inflict maximum damage on your PC and impress your friends:

www.cpu.lu/~gkes/pcrepair/
(See Fig. 5).

If you're looking for a new way to roast the turkey, then this site has some hints and tips on adding some sparkle to your cooking. Our hero, George, demonstrates the finer points of cooking using liquid oxygen - three gallons to be exact! Apparently, just one charcoal briquette soaked in the volatile stuff is equivalent to a stick of dynamite. That should impress them at our annual BBQ in June! This site can be found at:

www.ghe.ecn.purdue.edu

Fancy an extension to that lunch time drink for the rest of the afternoon but worried what the boss will say? You need to learn astral projection. Simply focus your mind and you can send your astral self down to the pub for the rest of the day. Make sure that the pub in question is prepared to serve spirits in the afternoon:

www.lava.net/~goodin/astral.html (See Fig. 6).

Finally, when the going gets tough - reach for the gaffer tape. This site contains 1001 uses for 'gaffer tape', or 'duct tape' as our American friends call it. Top tips include:

1. To prevent theft, seal the doors of your car with half a dozen layers;
2. One piece shaving kit. (Hmmm!);
3. Replacement for your lunch-box - tape all your food together;
4. Tape together all the wife's credit cards.

This Web site can be found at:
www.intranet.ca/~mdeabreu/ducttape.html

THE G3LDI APPEAL

I have an appeal for you now. I'm writing an article entitled 'The First Forty Years', in which

I'm mainly concentrating on RTTY (as that was the first data mode) back in the late fifties and early sixties. If you have any pictures or information - but especially pictures - featuring old Teleprinter set-ups, I would be very grateful to have them and would like to include them, if possible. Please send them via E-mail to my address at the top of this column.

THAT'S ALL FOR THIS MONTH'S 'DATA SCAPES' COLUMN, I HOPE THAT YOU ENJOY THE WACKY WEB SITES! UNTIL NEXT MONTH...

73 Roger

BROADCAST

REPORTS & INFORMATION TO ME PLEASE:

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PETER SHORE HAS SOME MORE BROADCAST NEWS FOR YOU THIS MONTH ALONG WITH A LETTER FROM A READER CONCERNING THE RELUCTANCE OF STATIONS TO REPLY TO REPORTS.

Here's the current (rather massive) English schedule of **Radio Australia** (all times are in UTC):

0000-0100 on 9.660, 12.080, 15.240, 17.580, 17.750 17.795 21.740MHz;
0100-0200 on 9.660, 12.080, 15.240, 15.415, 17.580, 17.750, 17.795, 21.725MHz;
0200-0400 on 9.660, 12.080, 15.240, 15.415, 15.515 17.580, 17.750, 21.725MHz;
0400-0500 on 9.660, 12.080, 15.240, 15.415, 15.515 17.580, 17.750, 21.725MHz;
0500-0600 on 9.660, 12.080, 15.240, 15.515, 17.580, 21.725MHz;
0600-0800 on 9.660, 12.080, 15.240, 15.415, 15.515 17.580, 17.750, 21.725MHz;
0800-0830 on 5.995, 9.710, 12.080, 13.605, 15.515, 21.725MHz;
0830-0900 on 5.995, 9.710, 12.080, 13.605, 15.415, 15.515, 17.750, 21.725MHz;
0900-1000 on 11.880, 13.605, 17.750, 21.820MHz;
1000-1100 on 11.880, 13.605, 17.750, 21.820MHz;
1100-1200 on 5.995, 6.020, 9.580, 12.080, 13.605, 21.820MHz;
1200-1400 on 5.995, 6.020, 9.580, 11.650, 21.820MHz;
1330-1430 on 9.445, 11.660MHz;
1400-1500 on 5.995, 6.180, 9.580, 11.650, 11.660MHz (from 1430);
1500-1700 on 5.995, 6.180, 9.500 (from 1530), 9.580, 11.650, 11.660MHz;
1700-1800 on 5.995, 6.180, 9.500, 9.580, 9.660, 11.880MHz;
1800-2000 on 6.080, 7.240, 9.500, 9.580, 9.660, 11.880MHz;
2000-2100 on 6.080, 7.240, 9.500, 9.580, 9.660, 11.880, 12.080MHz;
2100-2130 on 7.240, 9.500, 9.580, 9.660, 11.880, 12.080, 21.740MHz;
2130-2200 on 7.240, 9.660, 11.880, 12.080, 15.415, 17.580, 21.740MHz;
2200-2300 on 9.660, 12.080, 15.415, 17.580 17.795, 21.740MHz;
2300-2359 on 9.660, 12.080, 15.415, 17.580, 17.795, 21.740MHz.

Let's start this month with a letter from a reader in Malta, **Anthony Privitera**: "Some months ago I bought a communications receiver and took up short wave listening", he writes. "Although I tune in to the amateur frequencies my main interests are the broadcast bands."

"I am a regular reader of *Practical Wireless* [and] my favourite article is your 'Broadcast' with reports and information on broadcast stations world-wide. I wish that you would be given more space, so that you would be able to give us more information helpful for our hobby. I also wish that you include addresses of the stations you report on".

Well, I'm delighted to learn that you enjoy the column, Anthony and I'll certainly try to include addresses whenever I can. However, Anthony does express disappointment over one thing. "Since taking up this hobby, I have sent several reception reports and to my disappointment I have received only one card acknowledging my report. It seems that most stations are reluctant to send back cards".

Anthony's difficulty is a common problem that enthusiasts have been encountering for a good many years. International broadcasters often have very few staff and replying to the hundreds of reports they receive (in some cases) every month, is time consuming and expensive.

So, when the station is faced with the prospect of spending time and money on replying to reports or making programmes, it's inevitable that dispatching QSL cards is going to take a back seat. This can cause disappointment and doesn't help



Fig. 1: QSL card courtesy of Adventist World Radio.

to encourage anyone in tuning to stations around the world.

I can still remember the immense thrill when, at the age of around 12, I received my first QSL card from **Radio Kuwait**! It made me more determined than ever to find more interesting things on the short wave dial. But times have changed and I think that we all have to recognise that the first priority for stations is getting scarce resources put in to programme making.

Anthony goes on to ask if I can help identify two stations he has heard on several occasions, each with a female voice repeatedly calling either "Kilo Papa Alpha 2" (this on 3.94MHz noted at 2019UTC on 28 September) or "Uniform Lima X-Ray" (on 4.88MHz at 2030UTC on 14 November).

Anthony asks if they're calls to secret agents. Could be, is my answer. During the Cold War, there were large numbers of what were reputed to be "numbers" stations, beaming messages that could be deciphered using a "one-time pad".

The calls originated from transmitters in the former East Germany, Magdeburg, and from near Washington DC in the USA. I thought that they had gone away, but maybe there's a resurgence. Has anyone else heard them lately and been able to work out whereabouts the signals are beamed from?



Fig. 2: Sticker from Radio Australia.

The address of Radio Australia is as follows:
GPO Box 428G, Melbourne 3001, Australia.

NO SOUND

As we go to press, there's no sound from **Radio Luxembourg**, whose return was announced back in late October last year. Keep an ear to 208m (that's 1440kHz in new money) to see if the English-language service makes it to the airwaves.

Adventist World Radio (AWR) closed a short wave relay station in Costa Rica in November. Five transmitters, ranging in power from 20 to 50kW, beamed programmes to Cuba and central America. Now AWR is relying almost entirely on satellite to feed programmes to local stations instead of short wave, although it is using a 5kW sender in Guatemala.

Showing the differing approaches needed in different parts of the world, the **Voice of America (VOA)** has inaugurated its new short wave transmitter in Sri Lanka that serves Asia. It is on the air at the following times (all times are in UTC):

1200-1300 on 17.82MHz;
1300-1400 on 21.665MHz;
1400-1500 on 21.84MHz;
1400-1800 on 9.645MHz;
1500-1600 on 15.34MHz;
1600-1700 on 21.635MHz;
1700-1800 on 21.58MHz.

Trans World Radio (TWR) is also relying on short wave in Africa, with a new 100kW short wave transmitter on the air from Swaziland, with programmes made at a new studio complex in Mozambique that's been built in shipping containers.

Radio Budapest in English is heard (all times are in UTC):
0200-0230 and 0330-0400 on 9.835MHz for North America;
2000-2030 on 6.025 and

7.165MHz;
2200-2230 on 6.025MHz;
2230-2300 on 3.975MHz
Radio Budapest's address is as follows: **Brúdy Sandúr u. 5-7, H-1800 Budapest, Hungary.**

Radio Ukraine International is on the air with English - sometimes erratically - at (all times are in UTC):
0100-0200 on 6.020, 9.560, 9.610 and 9.810MHz;
0400-0500 on 6.020, 9.600, 9.810MHz;
1200-1300 on 9.870, 15.520MHz;
2200-2300 on 6.020, 9.810MHz.
You can write to Radio Ukraine International at this address: **vul. Khreschatyk 26, 252001 Kiev.**

Radio Finland is on m.w. (in Europe) and short wave at the following times (all times are in UTC):
0300-0330 on 9.655 and 11.665MHz plus 558kHz;
0730-0800 on 9.840 and 21.670 (to 0750 Saturday) plus 558kHz;
2000-2030 on 6.135 (to 2020 Sunday) plus 558 and 963kHz.
Again, you can write to Radio Finland: **YLE Radio Finland, PO Box 78, 00024 Helsinki.**

THAT'S ABOUT ALL

So, that's about all for another month. If you've been successful in getting QSL cards from international broadcast stations, please let me know - I'll include details in a future column and if you send in your card, we'll pick a selection of the most attractive ones.

UNTIL NEXT TIME - GOOD LISTENING!

73 Peter

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In order to be able to undertake a thorough refurbishment of my shop, I have to shift much of the stock cluttering up the place.

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Whilst prices of goods shown in advertisements are correct at the time of going to press, readers are advised to check both prices and availability of goods with the advertiser before ordering from non-current issues of the magazine.

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TECHNICAL MANUALS. AR88, CR100, R210, HRO. £5 each. Circuits £1.50. Hundreds available. SAE list. Bentley, 27 De Vere Gardens, Ilford, Essex IG1 3EB. Tel: 0181-554 6631.

THE UK'S LARGEST SOURCE for Vintage Service data, circuits and manuals from 1900 to the 1970s. Free brochure from Tudor Gwilliam-Rees, Savoy Hill Publications, 50 Meddon St, Bideford, The Little White Town, North Devon, EX39 2EQ Tel: 01237 424280.

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E-mail: chevet@globalnet.co.uk

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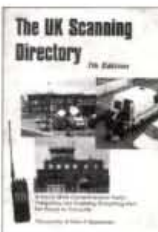
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The Publishers of *Practical Wireless* also wish to point out that it is the responsibility of the buyer to ascertain the suitability of goods offered for purchase.

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Kenwood TS-830S h.f. all bands, £275. Lowe HF-150 h.f. receiver with keypad and PR-150 preselector, £285. Kenwood YM-22E 2m (144MHz) hand-held SMC33 microphone, spare battery, box, car charger, keypad, £135. Tel: Bob Meggs GOWOK (01454) 218787 (near Bristol).

BNOS 12V 40A power supply, twin meters, £80. AEA Isolop Mag antenna and controller, £80. Ten Tec Century 22 h.f. QRP transceiver/receiver, £100. Heath HW8 QRP transceiver/receiver, £100. Tel: Pete on Bristol (01454) 882465.

TS-530S mint, boxed, c.w. filter, £250. Datong FL2 filter, £40. Tel: Dave G4NZY on Birmingham 0121-427 1788.

Yaesu FT-901 all filters, built-in electronic keyer, £250. AVO 8, £25. AVO 8 Mk 6 in case, £50. Wanted: TS-120 or TS-130V, all in new condition. Tel: G3KDP (01752) 700255.

Eddystone 1650 receiver table top model, manual, excellent condition, £750. Inspect/collect or pay postage. Radio swap or cash. Tel: West London 0181-813 9193.

Shack clearance: FRG-7 receiver v.g.c., £70. Trio TS-520 transceiver, v.g.c., £70. HRO receiver, excellent, nine coils, p.s.u., speaker, loads of spares, choice of several, signal generator, r.f., £25. Tel: St. Albans (01727) 839908.

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FRG-8800 g.c. receiver, v.g.c., all modes, £230. Yaesu FRG-7, works OK, £45. No.19 set 2 x AR88, RA17 make an offer for the military sets as a job lot. Tel: Tom GW0EGF on Bangor (01248) 602887.

Yaesu FRG-8800 receiver plus v.h.f. converter, v.g.c., £325. R107 receiver, £40. Plus various odds and ends. Tel: Peter on Harwich (01255) 502195.

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Racal receiver 1772, £245. Racal receiver 1217, £125. All g.w.o. with handbooks. Tel: (01244) 815681.

Yaesu FT-757GXZ, v.g.c., boxed, £350. Yaesu FT-290C MkII linear amplifier charger, etc., £180. Alinco DJ-GC77 microphone, mint, boxed, £170. MFJ-949E, mint, boxed, £70. Realistic DX-394, mint, boxed, £70. All o.n.o. Tel: G1KWO on Telford (01952) 410686. E-mail: g1kwo@aol.com

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Yupiteru MVT-9000 little used, too complicated for me, charger and user guide, £150. Tel: Harry 0181-445 0152.

Eddystone 940, £100. R1154 plus p.s.u., £55. Wayne Kerr universal bridge, £10. AVO 8MK577 cased, new leads, £40. Hand microphone, No.3, £5. 807 valves, new, 5634 valves

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MFJ-969 a.t.u. for sale, Balun Itoi, £20. Power supply 3-5A, 220V input. MFJ-901 a.t.u. cost £65 will sell for £30. Tel: John (01283) 221870.

Icom IC-729 transceiver, £600. AT-150 auto a.t.u., \$75. IC-P515 p.s.u., £75. Daiwa PS304, 12V-20A p.s.u., £75. All v.g.c. Tel: Tony Harwood G4HHZ (01703) 270785. 55 Nichol Rd, Chandlers Ford, Hants SO53 5AX.

Heathkit SB610 monitor scope, two tone oscillator, Yaesu low pass filter Hustler and G-whip mobile antenna, Hi-gain trapped h.f. vertical and Jaybeams requiring attention ex-G30JJ - Silent Key, offers to G3NSI QTHR. Tel: G3NSI 0191-586 5259, Peterlee, Co. Durham or www.vhfband.freeserve.co.uk

AX700 standard base scanner with discone, £200. Target HF3M short wave receiver, £100. Tel: Keith (01942) 745512.

KW107 "Decca" comprises 1kW a.t.u., 1kW s.w.r./p.w.r. meter, 50Ω dummy load, six position antenna switch, £100. Solid state 600W h.f. linear, needs work, £30. Tel: Notts 0115-970 4184, leave message if no answer.

Power supply unit PP2684/RPI for special forces radio GRC-109, working, £50. Second World War WS36 transmitter and power unit, connectors, dummy antenna, handset, £120. May part with matching receiver R208. Tel: Bob Warner (01233) 636185, 45 Eastry Close, Ashford, Kent TN23 5RS.

1930s Ekco type A22 mains receiver, brown Bakelite cabinet with copper trim and circular dial, beautiful working example, £550. Tel: (01668) 282171.

Kenwood TS-950SD, 150W, excellent condition, fully loaded including voice, full range transceiver, carefully used, all original packing, instructions and manual, £1295 - airtest by arrangement, looks like new. Tel: Max G3WMB on Ware, Herts (01920) 463564.

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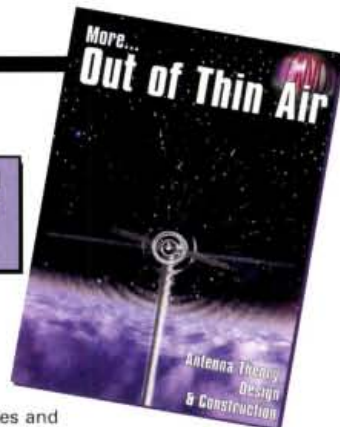
More Out Of Thin Air

Our 'Book Of The Month' this month is one that most of you will be familiar with - **More Out Of Thin Air** comprises of a collection of antenna theory, design and construction articles and is a follow on to *Out Of Thin Air* which was published way back in 1981.

Containing articles on antenna theory and construction for h.f., v.h.f. and u.h.f. antennas, as well as reviews and articles on associated equipment, *More Out Of Thin Air* is an essential addition to any Radio Amateur's book shelf. Although it is a revised and updated version, it still contains some of the old favourites - including some of the now 'famous' **Fred Judd G2BCX** antenna designs.

The usual price of *More Out Of Thin Air* is £6.95 plus £1 P&P. However, our special price this month is a mere **£5 including P&P (UK and Overseas postage)**. Order your copy today!
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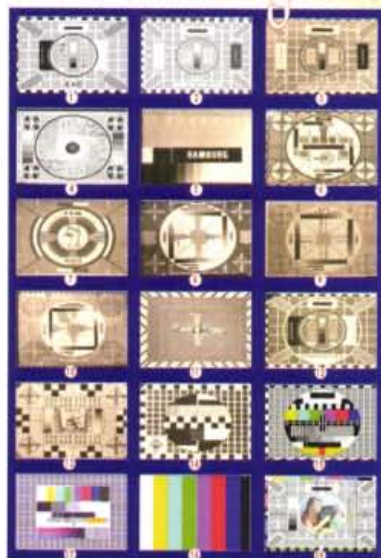
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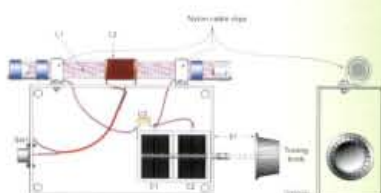
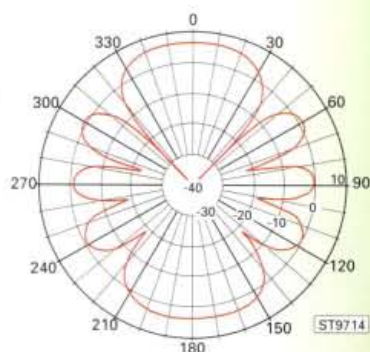


BROADCAST SECTION

- ◆ LM&S
- ◆ Bandscan Europe
- ◆ Off The Record

Also This Month

- ◆ Joe Carr K4IPV guides us through the characteristics of a plain old random length antenna.
- ◆ How low can you go? Richard Q. Marris provides SWM readers with a home build budget alternative for i.f. reception.
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An Alinco DX-70TH in our competition next month.

Have you collected the corner flashes from the January and February 2000 PWs? If so then you can go on to enter the competition with the March issue.

REVIEWED!

David Butler G4ASR

reviews the new Icom

IC-PW1 Linear Amplifier in the March 2000 issue - what did he discover? You'll have to pick up a copy of next month's PW to find out!

ANTENNAS-IN-ACTION

Tex Swann G1TEX has

more antenna-related news, reviews and projects for you next month.

Plus all your regular favourites including:

- Bargain Basement
- Carrying on the Practical Way
- Keylines
- Looking At
- News
- Radio Scene
- Valve & Vintage
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and much, much more!

* Contents subject to change

LONDON SHOW SPECIAL!

Pick up a copy of the March 2000 PW and you'll have your very own guide to the London Amateur Radio & Computer Show taking place at Picketts Lock next March. We hope to bring you news of who'll be there, what they'll have on offer as well as a Floor Plan and Lecture timetable.

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- RTTY tuning indicator and received characters
- Real-time spectrum scope
- Voice memory/CW memory keyer contents

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- Dual VFOs

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- Smart Search™ Automatic Memory Channel Loading System
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