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Icom HF Transceivers

ICOM IC-756 PRO III

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Icom' Flagship HF 200W transceiver. 200W max. The ultimate receiver - the ultimate design! AC psu built in.

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It's unbeatable. 160m - 70cm (up to 100W HF) yet so small with detachable head. The ultimate mobile..

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This is a budget class radio HF 160 - 10m at a price that belies its performance. Beautiful display.

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Take an IC-706, reduce power to 10W max and get rid of VHF/UHF. 160 - 6m of pure QRP joy!!

Going HF Mobile?

Then check out the great 80m - 6m SIDEKICK magnetic mount whip from USA. No hassel and great performance. £249.95 C

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KENWOOD TS-2000

Top-of-the-range Kenwood transceiver. The Station in a box. 160m-70cm with every feature imaginable inc. DX Cluster. Kenwood fans dream rig. HF/VHF/UHF or up to 23cm with the optional module. Built-in auto ATU, DSP and its unique TNC.
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TS-2000X *Lower Price* £1789 C
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Buy a TS-480SAT & get Free Of Charge a Heil Microphone Package. To claim send a copy of invoice to Kenwood

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YAESU FT-1000 MKV

200W HF transceiver, EDSP, Collins filter, auto ATU, 220V AC PSU. Acknowledged as one of the finest DX rigs on the market. Superb tailored audio and the ability to select Class A bias for dramatic signal purity. £2099 C

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The HF choice for DXers. With this rigs reputation on DXpeditions what more persuasion do you need?

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6m 200W module for the FT-1000 range. Probably the ultimate for 6m DXing.

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160m - 70cm self-contained portable. 100W and up to 20W from optional internal batts.

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Complete station in a box! 160m - 70cm - up to 100W (50W 2m/70cm). Great for satellite work.

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Is there any other radio that comes close to this price? One of our all-time best sellers. 100W 160m - 10m

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The ultimate QRP self-contained radio. Up to 5W output 160m - 70cm. New low price. UK warranty.

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ICOM IC-E208 *LIMITED OFFER*

VHF/UHF FM Dual Band Mobile Transceiver
**Freq range 144-146MHz, 430-440MHz Tx*
**55/50W (3 pwr steps each band)*
**Wideband Rx 118-173, 230-549 & 810-999MHz*
£215 C

IC-910H *Lower Price* **£1087 C**
2m / 70cm 100W Base station all - modes with option for 23cm module (**UX-910 £359**)

IC-910HX *Lower Price* **£1235 C**
As above but with 23cm module ready fitted and a big saving as well.

IC-2725E **£269 C**
Icom's new dual band 2m / 70cm radio. Very easy to operate and install and a lovely detachable head.

Kenwood
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KENWOOD TMD-700E

2m/70cm dual band mobile transceiver with APRS. Doesn't need extra high cost boards to function. Only extra if required is a compatible GPS receiver.
Lower Price **£418 C**

TM-G707E **£265 C**
Dual Band 2m & 70cm with detachable front

TM-V7E **£359 C**
Dual Band 2m & 70cm with 50/35W output

TM-271E **£187 C**
Single Band 2m FM 60W mobile transceiver

Yaesu
VHF/UHF Mobile/Base

YAESU FT-7800E *SPECIAL OFFER*

**2m/70cms Dual Band Mobile *High power 50W 2m /40W 70cms *Wide receive inc. civil & military airband *CTCSS & DCS with direct keypad mic. *Detachable front panel *1000 memories plus five one-touch*
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*2m, 70cm, 6m & 10m Quadband FM Mobile transceiver * Independent dial for each band

Watson
On-Glass Antenna

WGM-270

Dual Band 2m/70cm mobile whip. 2.5dB gain and 1.5:1 VSWR. 0.8m long. Complete system including 3.5m cable. No drilling involved. Antenna sticks on glass and interface assembly sticks on inside. Simple and very effective.
£29.95 B

Icom
VHF/UHF Handhelds

IC-V82 *NEW* **£159 B**
2m FM Digital Handheld 7W

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70cm FM Digital Handheld 5W

IC-E90 *Limited Offer* **£199 C**
6m / 2m / 70cm handheld transceiver

IC-T3H **£129 C**
2m FM handheld 5.5W c/w BC-01 & BC-146

IC-E7 *DUE IN 2006*
New 2m / 70cm handy wide RX

Kenwood
VHF/UHF Handhelds

KENWOOD TH-F7E

• 144-146MHz Tx/Rx: FM
• 430-440MHz Tx/Rx: FM
Up to 6W out with Li-ion battery and **"scanner" style coverage from 100kHz to 1300MHz** including SSB on receive! This is a great radio to have at all times when you are on your travels.
£237 B

TH-D7E **£299 C**
2m/70cm dualband FM handheld transceiver with data communications

TH-G71E **£179 C**
2m/70cm dualband FM handheld transceiver

TH-K2E **£139 C**
2m FM 5W portable transceiver c/w Ni-MH battery/charger

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Yaesu
VHF/UHF Handhelds

YAESU VX-7R *LIMITED SPECIAL OFFER*

Totally waterproof, wide frequency coverage 500kHz-900MHz AM/FM. 132x64 dot matrix display providing easy-to-read frequencies and information plus pictorial graphics.
£209 C

***NEW* VX-6E** *Offer* **£189 B**
2m /70cm Submersible 5W

FT-60E 2m/70cm 5W **£169 C**
VX-2E 2m/70cms min **£119 C**
VX-110 2mhandheld **£94 C**

Alinco
VHF/UHF Handhelds

DJ-C6E *NEW* **£114 C**
2m/70cm FM 300mW handheld transceiver

DJ-V5E **£159 C**
2m/70cm FM 5W dualband handheld transceiver

DJ-193E **£91 C**
2m FM transceiver no keypad, Ni-Cds & charger

DJ-195E **£99 C**
2m FM transceiver with keypad Ni-Cds & charger

DJ-C7E **£124 C**
2m/70cm credit size FM handheld

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HF Linear Amplifiers

RANGER 811H

**1.8 - 29.7MHz*
**800W CW or SSB, 400W RTTY*
**Uses 4 x811A vertically mounted*
**Drive 10 - 100W*
**Toroidial AC Power Transformer*
**6:1 Reduction Drive on Tuning Controls *"Near Silent" Papst Cooling fan *Front-panel ALC Adjust Control *Built-in AC 230V @ 8A Supply*
£945 B

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HF linear amplifier 10-160m WARC 100W in 1.5kW out

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NEW Mini Buddipole

Portable 40 - 2m Ant
Just 14" long packed!

£189
Order as W3-MBP

Comes in a case **just 14" long** yet extends to a **highly efficient 4.6m long rigid rotatable dipole.** Great for camping and back-packing. Handles 200W and band changing is just a coil tap away. Supplied with 25' of coax and balun. Centre has standard 1/2" plumbers pipe thread. Optional telescopic mast and tripod available.

SGC
HF Linear Amplifiers

SG-500 **£1399.95 C**
"Power Cube" 1.6-30MHz 500W solid state

Yaesu
HF Linear Amplifiers

VL-1000 QUADRA **£3795 C**
HF + 6m linear amp. 1kW comes with PSU

Super Antennas
40 - 2m Screwdriver

A very efficient portable vetical 185cm long when fully extetended approx 40cm packed down. Coil is continuously hand adjusted for resonance. Covers 80 - 10m plus 6/2/70 with just whip. Supplied with universal base table clamp and SO-239 plus radials. 100W Max. "Superb performer" says G3OJV
Order MP1-SA **£139.95 B**
Mini tripod support **£29.95 A**

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YAESU VX-120 & VX-170 *NEW*

< VX-120
A 2m 5W handheld with an 8-key pad, Ni-MH batt & charger
VX-170 >
A 2m 5W handheld with a 16-key pad, Ni-MH batt & charger

£99.95 B **£109.95 B**

YAESU FT-DX9000D *NEW*

Top-of-the-range 200W HF + 6m Deluxe Base Station. Auto ATU, 220V AC PSU, Class 'A' operation for AM & SSB, large TFT data management unit and dual analogue meters, Main/Sub receivers, 32-bit IF DSP. Return of the FT-DX series represents the very best in high power DX-ready base stations.
£7299 D

bhi
DSP Equipment

bhi NES10-2 MkII

NES10-2 Combined speaker and programmable DSP unit. Offers dramatic noise reduction and reduces annoying hetrodynes. 8 filter settings, 12V DC.
£99.95 B

SPECIAL OFFER! Buy a NES10-2MkII for £99.95, send your receipt to bhi and get a *FREE* Banner Badge (£19.95)

NES-5 **£79.95 B**
DSP Speaker Basic Plug & Go model

NEIM-1031 **£129.95 B**
Noise Eliminating In-Line Module with DSP

ANEM *NEW* **£119.95 B**
"NOISE AWAY" Amplified LS DSP module

NEHM *NEW* **£99.95 B**
"NOISE AWAY" Headphone DSP module

1042 **£19.95 A**
Switch box allowing up to 6 items to connect to one bhi speaker/module.

NEDSP-1061 **£89.95 B**
Small DSP PCB module for retrofitting into rigs

NEDSP-1062-PCB **£79.95 B**
Amplified DSP module to insert in speaker path

NEDSP-1062-KBD **£99.95 B**
As NEDSP-1062 but with small keyboard

NCH **£34.95 B**
ANR Noise Cancelling headphones

ANTENNAS

W-2LE	1/4 wave 2m 0.48m 200W	£9.95 B
W-285	5/8th 2m 1.33m long 200W	£14.95 B
W-77LS	2m/70cm 0.42m 50W	£14.95 B
W-770HB	2m/70cm 1.1m 200W	£24.95 B
W-7900	2m/70cm 2m/70cm 1.58m	£32.95 B
WSM-270	Dual band mini magnetic	£19.95 B

BASES

WM-08	8cm diam magnetic	£9.95 A
WM-14B	14cm diam magnetic	£12.95 A
W-3HM	Hatch mount	£14.95 A
ECH	Cable kit	£10.95 B

NOTE: All antennas have PL-259 ends. Mag mounts have cable attached. Hatch mount needs ECH cable.

Watson
Mobile Antennas

Carriage Charges: A=£3, B=£6, C=£10

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FUJIKON NOISE CANCELLING HEADPHONES

NEW

These Active Noise Cancelling Headphones, from Fujikon, blockout annoying ambient background noise. Powered by an AAA battery noise cancelling is controlled by an on/off switch. NC-4 has a folding design for easy storage.

FUJIKON NC-2 £18.95 B

FUJIKON NC-4 £19.95 B

POCKET MORSE READER

MFJ-461

Reads CW Just hold near receiver speaker

£69.95 B

That's right - just hold this self-contained decoder near your speaker and see the text scroll across the screen. Absolutely amazing

MFJ-936B Loop Tuner

The most amazing antenna we have seen in years. For optimum results take a wire around 1/5th wave long, bend into square loop (14ft on 20m = 3.5ft square) and attach to MFJ-936B. Result: Ultra low indoor noise and VK, ZL & W all on SSB! That's what we achieved in one day's operation! 20m loop works on 15m as well. Now In Stock. Great for QRP and portable as well.

£229.95 B

Antenna Accessories

Dipole Bits			
Kevlar	Strong 400lb strain line 200ft	£22.95	A
FW-PVC-50	50m clear PVC 2mm wire	£39.95	A
Flexweave	50m multi-strand 2mm wire	£29.95	A
HDCW	50m hard drawn 16g copper	£14.95	A
Insul-8	Black ribbed insulator	£0.99	A
WDC-50	SO-239 dipole centre insulator	£6.49	A
Egg-m	Medium ceramic egg insulator	£2.15	A
Egg-s	Small ceramic egg insulator	£1.75	A
WS-2580	25pcs 3" ladder line spacers	£9.95	A
Diamond 50 Ohm Baluns			
BU-50	1:1 1.7MHz 40MHz 1.2kW	£26.95	A
BU-55	1:1 3.5MHz - 75MHz 500W	£34.95	A
Antenna Traps (pairs)			
TR-200-14	200W bands 10m - 20m	£44.95	B
TR-200-10	200W 10MHz	£47.95	B
TR-200-7	200W 7MHz	£49.95	B
TR-200-3.6	200W 3.6MHz	£53.95	B
TR-1000-14	1kW bands 10m - 20m	£59.95	B
TR-1000-10	1kW 30m	£61.95	B
TR-1000-7	1kW 40m	£64.95	B
TR-1000-3.6	1kW 80m	£73.95	B
German Made High Quality Baluns			
HB-1-200	1:1 3.5 - 30MHz 200W	£25.95	B
HB-4-200	4:1 3.5 - 30MHz 200W	£25.95	B
HB-6-200	6:1 3.5 - 30MHz 200W	£25.95	B
HB-1-1	1:1 3.5 - 30MHz 1kW	£34.95	B
HB-4-1	4:1 3.5 - 30MHz 1kW	£41.95	B
HB-6-1	6:1 3.5 - 30MHz 1kW	£41.95	B
Remote 4:11.5kW Balun			
REM-BAL	For coax to ladder line match	£45.95	B
Patch Leads			
WPL-70	V low loss 75cm PL-259	£6.95	A
WPL-50	Standard 50cm PL-259	£2.99	A
WPL-50BNC	BNC version of above	£2.99	A
HQ-66	66cm RG-213 PL-259	£4.99	A
HQ-10m	10m long PL-259	£14.99	A

SGC External Auto ATU's

SGC SG-231

1 - 60MHz. 3 - 100W pep (50W CW). Min wire length, 7m. 50 Ohm feed. Needs 12V at approx 900mA.

£349.95 C

SG-239 £189.95 C
Mini auto ATU 1.8 - 30MHz 1.5 - 200W PEP primarily for long wires - non waterproof. 12V DC

SG-231 £349.95 C
1.8 - 60MHz 100W PEP. A great random wire tuner that you can use outdoors. 12V DC

SG-237 £299.95 C
1.8 - 60MHz 100W PEP. Great for mounting outdoors and feeding long wire. Waterproof. 12V DC

SG-230 £339.95 C
1.8 - 30MHz 200W PEP. The original design that handles end fed or coax unbalanced. Waterproof. 12V

SG-235 £749.95 C
3.5 - 54MHz. A hunky 500W PEP tuner that handles long wires. Great outdoor design. Waterproof.

Icom External Auto ATU's

AH-3 £479.99 C
1.8 - 28MHz. A hunky 120W PEP tuner that handles whips or wire longer than 2.5m. Waterproof.

Alinco External Auto ATU's

EDX-2 £289.95 C
1.8 - 30MHz 150W long wire tuner designed for use with DX-70 transceiver. Waterproof.

MFJ Internal Auto ATU's

MFJ-993

**Auto ATU with digital data display *1.8-30MHz *Long wire, coax & balanced line *300W SSB, 150W CW *Cross needle metering*

£209.95 C

MFJ-991 £179.95 C
1.8 - 30MHz auto ATU. Similar to MFJ-993 but no digital display. Works with any HF transceiver. 150W PEP

MFJ-994 £299.95 C
1.8 - 30MHz high power auto ATU. 600W PEP / 300W CW. Tunes wire, coax and balanced feed.

SGC Internal Auto ATU's

MAC-200 £259.95 C
1.8 - 60MHz 200W PEP. Wire, coax and balanced feeder. Features auto antenna switching.

SG-237PCB £279.95 C
1.8 - 60MHz 100W PEP. Same as SG-237 but without housing for building into your own housing.

SG-211 £189.95 C
1.8 - 60MHz works off internal dry cells. Zero drain wait state. 60W PEP. Ideal for portable (Min 1W).

Yaesu Internal Auto ATU's

FC-20 £249.95 C
1.8 - 60MHz 100W matched for FT-100/Ft-847. Desk top unit to match transceivers. Coax systems only.

FC-30 £249.95 C
1.8 - 60MHz 100W. Designed for use with FT-857/FT897. Coaxial input / output.

FC-40 £239.00 C
1.8 - 60MHz 100W. New waterproof ATU designed for use with FT-897 / FT-857 and mobile operation.

Icom Internal Auto ATU's

AT-180 £349.95 C
1.8 - 54 MHZ ATU designed for IC-706. Plugs directly into transceiver for seamless operation. Coax only.

Kenwood Internal Auto ATU's

AT-50 £319.95 C
1.8 - 30 MHZ 100W ATU specifically designed for use with TS-50 transceiver. Coaxial only.

Cushcraft HF Antennas

MA5V £239.95 C
Vertical 5-band 20m - 10m. No separate radials needed. 250W. Self-supporting. 4.48m tall.

A3-S £469.95 D
The classic 20, 15, 10m 3-el beam. 2kW 8dB gain. 8.45 el. Turn radius 4.72m. F/B ratio 25dB.

A3-WS £379.95 D
Dual Band 3 el. beam for 17m & 12m. 2kW. El length 7.66m. Turn radius 4.4m. Gain 8dB. F/B ratio 25dB.

A4-S £569.95 D
Tri-band 4 element Yagi. for 20m - 10m. DXers delight. 2kW . 8.9dB gain F/B 25dB. Turn radius 5.49m

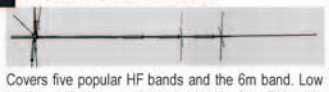
R-8 £469.95 C
8-band vertical 40m - 6m. No separate radials needed. 1.5kW. Height 8.7m

R-6000 £329.95 C
6-band vertical 20m - 6m. No separate radials needed. 1.5kW. Height 5.8m. Great small garden ant.

MA5B £369.95 C
5-band 2 El mini beam. 20m - 10m 2kW. Elements 5.2m Turn radius 2.7m. (Dipole on 17/12m) 5dB gain

Diamond HF Antennas

DIAMOND CP6



Covers five popular HF bands and the 6m band. Low angle radiation makes it ideal for DX work. Outperforms dipoles for long distance contacts and compares favourably with beams located 10m+ above ground.

**Bands: 3.5 -50MHz *Power: 200W *VSWR: Better than 1.5:1 *Socket: SO-239 *Height: 4.6m *Radials: 1.8m rigid adjustable*

£239.95 C

Radio Works HF Antennas

CW-160 £129.95 C
8-band 160m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 265ft long.

CWS-160 £119.95 C
Compact 8-band 160m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 133ft long.

CW-80 £99.95 C
7-band 80m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 133ft long.

CWS-80 £109.95 C
Compact 7-band 80m - 10m dipole with 22ft vertical radiating feeder. 1.5kW. Balun fed. 133ft long.

G5RV Plus £59.95 C

Rugged 2kW balun matched G5RV with 102ft element and 31ft ladder line. Requires ATU. Made in USA

Hustler Base Antennas

6-BTV £229.95 C
80 - 6m 6-band vertical. 7.3m tall 1kW. Can be used at ground level with earth stake. Ideal small gardens

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HF-2V £229.95 C
80 / 40m high performance vertical. 1kW PEP 9.75m tall. Self supporting for ground mount use.

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HF-9V £349.95 C
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Peter Waters says: *I think these products are great. Superbly engineered and very efficient.* Options include adaptor for dipole to decorators pole £6.95, Field tripod £89.95, 2.45m telescopic mast £49.95, mini tripod for Buddistick.

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Screwdriver style adjustable HF QRP whip 40m - 70cm. 150W PEP. Max extended 185cm approx

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Electrically tuned version of the above. Requires around 9V - switch control box not included.

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Add on 80m coil to extend the LF coverage of the MP1 and MP2.

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january 2006
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Cover subject

This first issue of *PW* for 2006 is packed with interesting features including, as our cover shows, the Kilve receiver project designed by **Tim Walford G3PCJ** and a look at Amateur Radio abroad in **Henryk Kotowski SM0JHF**'s Indian adventure. So, settle down, put your feet up and enjoy your monthly dose of radio reading.

Design: Steve Hunt
Main photograph: Henryk Kotowski SM0JHF
Inset photograph: Tex Swann G1TEX

features

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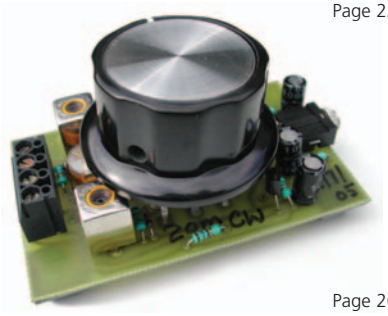

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Scanning Scene: Bill Robertson dips into the latest Tetra news on the Fire and Rescue services with plenty of frequencies to try.

In-depth Reviews: The Elad FDM-77 is an all-mode HF software defined radio. Chris Lorek takes a close look at what this piece of kit can do.

Airband Basics: Godfrey Manning goes Sky High and explains all you need to know to enjoy airband listening.

Scanning in Action: As the Lake District is one of the UK's most popular locations for mountain activities, we look at the work of the Mountain Rescue Teams.

Broadcast Matters: Chris Brand will delve into the **Long, Medium and Short Wave bands** looking for the most interesting broadcast signals.

Neighbourhood Wardens: Using GPS and two-way radio, Knowsley have made a real difference to the local community. We reveal how the system works.

Off the Record: with Oscar the Engineer for a regular look at 'non-licensed' and underground radio broadcasts.

New Products: All the latest and most interesting radios and accessories to interest the scanning, airband and broadcast listener.

Comms from Europe: Simon Parker, based in Bulgaria, looks at CB and some of the record-breaking PMR 446 activities from Europe.

Software Spot: All the latest and very best listening software compiled exclusively for the radiouser reader.

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rob mannion's keylines

Looking at Amateur Radio used in crisis, insurance for portable operating and forthcoming club visits

The appalling tragedies of the Mississippi Delta flooding in and around New Orleans in the USA, and the terrible devastation caused by the earthquakes in the Kashmir area straddling both the Islamic Republic of Pakistan and the giant Indian Democracy - have made the unequally balanced situations painfully obvious.

The unequal situations have become obvious due to the positive use of Amateur Radio in helping to provide emergency communications in the USA. On the other hand the unique emergency communications our hobby can provide when distress strikes - is seeminlgy minimised in the Indian Sub-Continent. To say I was dismayed at the lack of obvious, high profile Amateur Radio service assitance with communications on the India/Pakistan frontier - would be an understatement!

Although the people I come across from those huge, disparate nations of Pakistan, Bangladesh and India are friendly people, there are cultures clashes. It's particularly noticeable with Pakistan and Bangladesh, and most probably our hobby is viewed with suspicion, because of its open nature, as it's of Western in origin and seen as a threat to Islam (it's not of course!). However, I think India's problem comes down to money and currency exchange difficulties, rather than an attitude problem.

Personally, I grieve when I see the children and desperately poor parents eking an existence out on roads, railways stations and anywhere there's shelter. I'm not impressed that - despite this poverty - both the Islamic Republic of Pakistan and India both have nuclear weapon capabilities!

Readers may wonder what my opinions have to do with Amateur Radio? In answering I've got to be honest and say that the Military style regime in Pakistan seemingly has the needs of its people in the background, and doesn't seem to encourage Amateur Radio. However, by not encouraging Amateurs they miss out on a remarkable effective - literally free- emergency communications service that would be backed up by Amateurs all over the world.

Bearing in mind how useful a service Amateur Radio can be - without being a threat to national security in an emergency - I hope that pressure will be put of the Islamic state of Pakistan to prepare for the next disaster. They should greatly encourage Amateur Radio and introduce the freedom that comes with the hobby. In return Pakistan and the other impoverished (despite the nuclear capabilities) countries providing the teeming mass of humanity in the Indian Sub-Continent - they will benefit from a much improved very low cost emergency communications system from a dedicated group of people.

Although not a natural sympathiser with any of the politics of the countries on the Sub-Continent, I would do my very best to help expand the hobby there and I'm sure the other Amateurs the world over would open their hearts and wallets to do the same. Let's hope for a distinct change in attitudes.

Event Insurance Problems?

Have you had problems finding insurance for an Amateur Radio Event/Field Day or outing? If you have - I'd be most interested to hear from you. I'm planning to cover this subject soon- thanks to an enquiry from *PW* reader **John Sims G0LJ**S who has alerted me to the problem (particularly the cost) of insurance for equipment/operations away from home.

If you have concerns, information and advice - please contact me at *PW*. Thank you.

Post Codes Please!

Several readers have suggested it would help if rally organisers included the post codes of their venues publicised in *PW*. On reflection I think it's a good idea. Not everyone has satellite navigation yet - but many of us look up maps and locations provided by Websites such as **Streetmap UK**, etc., requiring a post code

When preparing for a *PW* visit, I always ask clubs to provide postcodes. This is so I can find them much more easily with a spot map on a website.

So as from this issue, I ask rally/event organisers to provide postcodes to help wherever possible. However, those of you in the (generally post/district code free) Irish Republic need not worry - finding a rally in your country never seems to be a problem!

Cockenzie & Port Seton

I'm delighted to confirm that after a very long wait (for the club!) - I've been able to finalise an invitation to visit the **Cockenzie & Port Seton Club** on the outskirts of Edinburgh on **Friday 24 March 2006**. Flying to Scotland for club visits is now easier as book-ahead flights are cheaper - very much cheaper!

My flight to Edinburgh is costing 34p each way - with £41 worth of taxes on top! Odd accounting eh? - but I'll not criticise a system that's allowing me to visit *PW* friends North of the Border. Hope to see you there - it'll be a great 34p's worth to meet everyone - despite the taxes!

Rob G3XFD

practical wireless services

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

Subscriptions

Subscriptions are available at £33 per annum to UK addresses, £41 Europe Airmail and £50 RoW Airmail.

Components For *PW* Projects

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

Photocopies & Back Issues

We have a selection of back issues, covering the past three years of *PW*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. See page 59 for details.

Placing An Order

Orders for back numbers, binders and items from our Book Store should be sent to: **PW Publishing Ltd., Post Sales Department, Arrowsmith Court, Station Approach, Broadstone Dorset BH18 8PW**, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone **0870 224 7830**. An answering machine will accept your order out of office hours and during busy
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Technical Help

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

amateur radio waves

Lead Free Solder

● **Dear Rob**
Having just received my copy of the December 2005 magazine, I totally agree with you regarding the excellent quality of the 'New Standard' paper and printing. (The content is excellent also!).

As a professional engineer, I subscribe to certain other magazines, the quality of which have sadly gone down over recent months. Not so with *PW*; even after receiving every issue since 1958, it still holds my interest. Long may it continue and prosper.

I notice with interest the continuing 'Pb-free' (Lead free) saga. There seems to be much mis-information spread on this subject, but the EEC directive is fairly clear, that in certain areas, the use of lead - based solder will still be permitted.

Exemptions have already been granted for Military and Medical use. However, for repairs to equipment marketed prior to the commencement of the 'Ban', the Directive states: "This directive does not apply to spares for the repair or the re-use of electrical and electronic equipment put on the market before July 2006".

In addition it should be noted, that certain high - melting point lead based solders, as used for instance in solder pots, (for tinning leads, etc.) are also exempt. Therefore it cannot be totally illegal to sell solder containing lead, after July 2006, where it is to be used for the above purposes.

In essence then, repair to older equipment, can, and will need to be carried out using traditional lead-based solder. This will be necessary, as the two varieties do not happily mix, due to their different melting points.

However, this does not let us completely off the hook, as construction of new equipment, and repairs or modifications to equipment manufactured after July 2006, will require us to use the new lead - free solders. We shall have to get used to the joints looking as if they were made by a beginner! I personally have two solder stations in use, for each of the two solder types, this saves confusion. Regards to everyone at *PW*.
Dave Stone G8NGF
Westbury
Shropshire

Editor's comment: Nice to hear from you again Dave! I've passed on your comments to Steve Hunt (Art Editor) and the rest of the staff. It's very interesting to hear - from a professional - regarding the lead free saga. We are planning a major article on the topic in 2006, and it will provide the most up-to-date information, advice and news of techniques from an Author working in the industry. However, as Dave suggests - we mustn't panic! Don't throw that old iron away and don't worry about solder supplies!

What's Wrong With AM?

● **Dear Sir**
(Sorry Rob, 'Sir' is traditional, and I hate breaking with tradition!). I feel I must pass comment on **Ray Howes G4OWY's** letter in the December issue of *PW*. So what's wrong with publishing designs for a.m. equipment? It's simple to build and get going, and a.m. is easy to receive on the simplest of receivers. Although f.m. is rather more in vogue, mainly, I suppose, because of its freedom from interference, but the receiving side is rather more tricky to build and set up.

Certainly, digital is at the cutting edge of technology, but is as **Tony Nailer G4CFY** points out in Topical Talk, totally beyond the home constructor, and as a highly experienced professional, he should know! I do get rather annoyed with people who bang on about keeping up with the state of the art as we are supposed to be enjoying a very absorbing hobby, not trying to run a high-tech military communications system!

I fear that a single-minded obsession with advanced technology is one of the reasons the RSGB has lost a lot of members. The average Radio Amateur just wants to be free to "do their own thing", and we need lots of simple designs to encourage people to do just that.

How would an impecunious 10-year old schoolboy feel after mastering the art of soldering, and getting to grips with Ohm's Law, and longing to build something for himself, only to be told that he has either to master surface-mount and digital techniques or spend thousands of pounds on the latest all-singing all-dancing Oriental box-of-tricks? As a constructor with over half a century's experience I can assure anyone planning to build their own gear, no matter how simple, that the satisfaction and knowledge to be gained is far in excess of that of merely using a 'plug-in' appliance.

I would point out too, that our magazine is *Practical Wireless* and our hobby is 'Amateur Radio', not Commercial Wireless and Amateur Communications. 'Practical' means doing something for oneself, not leaving an army of robots in a Tokyo back street to do all the work, and 'Radio' implies the equipment itself, not just the operating of it.

Just because a.m. (and s.s.b. too, as Mr. Howes seems to imply) is an 'old' system, there is no need to consign it to the scrap heap. I wonder what Mr. Howes feels about enthusiasts of other persuasions?

Would he have all the lovingly restored old motor-cars one admires at shows towed away and crushed, just because they are not the latest boring, all-look-the-same offerings? Chippendale furniture chopped up for firewood just because it's old? God forbid! What a bland and boring world this would become. We Radio Amateurs are very fortunate to be accorded the privilege of being allowed to design and build our own gear, unlike most other branches of radio, where type-approval is mandatory, and also of being allowed to use a whole range of transmission systems. So long live a.m., f.m., s.s.b., c.w., s.s.t..v. , pulse, etc. There's room enough for all!

Incidentally, the reason the Federal Communications Commission (FCC), then the British General Post Office (GPO) and other licensing authorities had to ban 'spark' transmission is that it is inherently a very wide-band system, and serious interference was impossible to avoid. This does not apply to other systems, provided they are correctly set up. Many thanks for a great magazine!
Chris Atkins G8AFA.
Yetminster
Dorset

Cross In Kidderminster!

● **Dear Editor**
What a load of rubbish **Ray Howes G4OWY** spouts in his letter about a.m. in last month's letters page. He refers to it being the digital age and that a.m. should be banned just as Spark was. By his reckoning then we should also ban c.w., f.m. and s.s.b. We can all simply plug microphones into our computer and talk to the world via the digital comms link, the web and the green friendly *echo-link*. He believes we should just build s.s.b. sets. Does he not realise that many newcomers to the hobby have so little technical training and ability they cannot even build a c.w. transmitter, the simplest form of transmitter there is - let alone a sideband rig?

Indeed, in the simple ratings the cw transmitter is obviously the simplest. Then comes the a.m. set, where audio can be squirted onto any point of the power amplifier stage and a.m. produced; control grid modulation, cathode modulation, screen grid modulation or plate modulation.

In receiver terms the a.m. detector is the simplest to build, one diode, and Hey presto! It even beats c.w. reception as another oscillator in the form of b.f.o. is needed for that mode. Even f.m. needs a fancy discriminator to receive it.

As for s.s.b. well, lattice crystal filters, balanced modulators, product detectors are required. On the simple scale this mode fails miserably. To suggest building a digital transmitter, well, that's just ludicrous!

If newcomers are to be encouraged into the hobby - in anything other than a simple CB radio operator role - then

construction of a.m. receivers and transmitters are an easy entry point and is one that should be promoted. If you wish to be a computer 'geek' then maybe the hobby of Amateur Radio is not for you. Buy a mobile 'phone! (*and pay for the calls!* Ed.)

Ben Nock G4BXD
Kidderminster
Worcestershire

Winter Radio Projects

● **Dear Editor**

Each winter I aim to build at least one radio related project. This winter I've elected to build a three valve a.m. 1.8MHz 'Top Band' transmitter. However, having just read the comments of **Ray Howes G4OWY**, I feel obliged to defend my interest in valves and amplitude modulation.

Before doing so, I agree with one point that Ray made; this is the digital age. And I confess to being an early user of packet radio and computer logging, as well as building a number of solid state projects.

However, I think it's important to keep alive older modes and construction techniques, if for no other reason than it is of interest to some. Furthermore, it's far easier to design, construct and diagnose faults in a.m. equipment.

If Ray's views were transposed to other hobbies, such as classic and vintage vehicles, am I to assume that I will be banned from using my Triumph, Norton and Velocete motorcycles on the road just because they're old technology?

Similarly, on the occasions I've been involved with special event stations, it's the older radios I have on display that draw onlookers, especially children (More so when they get to twiddle the knobs). There's something magical that draws people to older radios, perhaps the warm welcoming red glow from the heaters, not the clinical clean lines of some digi-box.

If we take digital modes to the extreme, then we would all be using *Skpye, E-QSO* or similar on our computers. Hardly as exciting as pulling out a weak DX station on equipment you have built yourself.

Amateur Radio is many things to many people. I get rather tired when certain groups and individuals try to force their preferred mode or views on us all, or even suggest that modes they consider to be out dated be banned.

Incidentally, noting your item about the field telephones ('Fun With Fones' in the December issue of *PW*), I've built many such sets over the years since first coming across the same design in a *PW* publication several years ago. Four pairs are now in regular use on Tristan da Cunha. **Andy ZD9BV** and his wife have a pair between their house and Andy's mother-in-law as she is now into her eighties. So, *PW* projects find a use in the remotest of Islands where they're much appreciated!

Colin Topping GM6HGW
Newport on Tay
Scotland

The Future Is Digital

● **Dear Editor**

I have to take issue with the statement in Topical Talk by Tony Nailer G4CFY that "digital communications... does not lend itself to home construction".

I can't agree - for really simple digital projects just look at the SoftRock40 kit. This is a receiver that's incredibly simple to construct yet when hooked up to the standard household PC can receive everything from a.m. and c.w. through to advanced digital modes such as digital radio mondiale (DRM). The PSK-31 kits for 14MHz are another example of easy to assemble digital communications projects.

I am glad to see that *PW* is going to be producing some s.s.b. projects. By it's very nature s.s.b. is ideal for use in digital comms. Just hook up an s.s.b. transceiver project to a PC and you can immediately use Digital SSTV, PSK-31 and Digital Voice using free software such as *WinDRM* **http://n1su.us/windrm/**

By the way *WinDRM* is far better for use on Top Band than narrow band f.m. (n.b.f.m.). Let's face it a.m. broadcast stations will be shutting down in five-ten years time to be replaced by DRM. The future is digital, but digital is also simple, well within the scope of the home constructor, there's nothing to be afraid of!

Trevor M5AKA
Chelmsford
Essex

Letters Received Via E-mail

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

Editor

amateur radio rallies

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

2006

February 5
21 South Essex ARS Rally
Website: www.southessex.ars.btinternet.co.uk
The 21th South Essex Amateur Radio Society, Radio & Computer Rally will be held at the Paddocks Community Centre, Long Road, Canvey Island, Essex. (The Paddocks is situated at the end of the A130). Doors Open 1030.

February 26
Swansea ARS Amateurr & Radio Computer Show
Contact: Roger GW4HSH
Tel: (01792) 404422
The Swansea ARS rally is being held today at Afan Lido, Aberavon Seafront, Poert Talbot, One mile from J41 off the M4. Opening at 1030 the rally will offer plenty for visitors including trade stands, Bring & Buy, Special Interest Groups, Repeater Groups, Catering and Talk-in on 145.550MHz.

March 11
Junction 28 QRP Rally
Contact: Russell Bradley G0OKD
Tel: (01773) 783394
E-mail: russel.bradley@ntlworld.com
The 6th Junction 28 QRP Rally hosted by the The South Normanton Alfreton And District Amateur Radio Club (SNADARC) in Association with the G-QRP Club takes place at the Village Hall Community Centre, Market Street, South Normanton, Nr Alfreton, Derbyshire.The event will be fully signed, just five minutes from the M1 Junction 28 and the A38. Open to the public from 1000. There will be Amateur Radio, electronics and related items, Bring & Buy and special interest group stalls, outdoor flea market (weather permitting), refreshments.

March 12
Aberystwyth Rally
Contact Ray GW7AGG
Tel: (01970) 611432
E-mail: ray@clocktower.go-plus.net
The Aberystwyth Rally Hobbies Fair with Amateur Radio, computers, model railways, model aircraft and doll's houses takes place at Penweddig School, Aberystwyth from 1000 until 1630. There will be h.f. and v.h.f. on the air, hobbies demonstrations, trade stands and special interest groups, refreshments and Talk-in on S22.

March 12
Wythall Radio Club 21st Annual Radio & Computer Rally
Contact: Chris G0EYO
Tel: (07710) 412819
E-mail: g0eyo@blueyonder.co.uk
Website: www.wrcrally.co.uk
The Wythall Radio Club 21st Annual Radio & Computer Rally takes place at the Woodrush Sports Centre, Shawhurst Lane, Hollywood, Nr Wythall, Birmingham B47. There will be plenty of radio and computer traders, massive Bring & Buy, refreshments, good on-site, parking. Only two miles from J3 M42. The rally will be open from 1000-1500 and will be under cover in the sports halls. Admission: £1.50. Talk-in on S22 and the location will be well sign posted. Bookings are now being taken and traders are advised to book early.

May 1
22nd Dartmoor Radio Rally
Contact: Rob 2E0ONO
Tel: (01752) 773711
The Dartmoor Radio Rally is taking place at the Tavistock College, Tavistock, Devon, this is the same locaton as last year with plenty of space for traders. There will be disabled access and plenty of parking on the college site. Featuring trade stands, Bring & Buy, refreshments and Talk-in on S22. Doors open 1030 (1015 for disabled visitors).

Note to Rally Organisers: Please include the postcode of your rally venue (see Keylines).

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

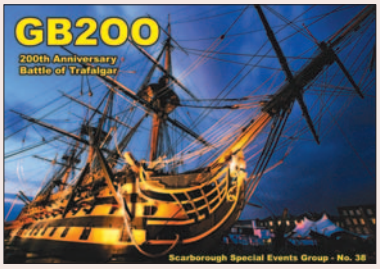
amateur radio news & products

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

Scarborough Special Events

The **Scarborough Special Events Group** have ended their 2005 series of special event stations with GB2OO to commemorate the 200th Anniversary of the Battle of Trafalgar. The QSL card for the event shows Nelson's flagship HMS *Victory* at dusk.

Members of the Scarborough Special Events Group are looking forward to taking part in more events during 2006. Keep an eye on their website **www.sseg.co.uk** for news as the events are announced.



Winter Schedules

Many International shortwave broadcasters started their winter frequency schedules on 30 October 2005. **The World DX Club** has published a 12-page pamphlet listing the times and frequencies of their English broadcasts in country order. Over 100 broadcasters are listed and the pamphlet is constantly updated so that the information is as up to date as possible when you order. To order a copy send 50p or two International Reply Coupons to:

Arthur Ward
17 Motspur Drive
Northampton NN2 6LY

In The Public Eye

Over the last few months members of **Norfolk Amateur Radio Club** (NARC) have been busy demonstrating amateur radio at public events across Norfolk.

In July NARC took to the air with **GB6NAS** from **Seething Observatory** as part of **Norwich Astronomical Society**'s (NAS) 60th anniversary celebrations. Over the course of one weekend 332 QSOs were made with amateurs around the world, with one of the notable contacts being with **GM4DLG**, the Chairman of the **Ayrshire Astronomical Society**, who exchanged greetings messages with the Norwich Astronomical Society Chairman.

In August 20 NARC members braved some of the best wintery summer winds the Norfolk coast could muster as they ran their second special event station of the year, activating Happisburgh Lighthouse for International Lighthouses Weekend. Three stations took to the air from the distinctive red and white lighthouses making over 350 contacts on all bands using voice, c.w.and datamodes.

By September NARC were out and about once again, this time at Norfolk Police's Gala day. This annual event attracts over 20,000 visitors and this year coincided with SSB field day, so not only did club members provide an extensive display of amateur radio past and present, but also participated in SSB field day enabling the clubs newer licensees to experience contest operating for the first time.

After a busy 2005 NARC are already preparing for 2006 when they hope to activate a number of special event stations at public events around Norfolk. Norfolk Amateur Radio Club is a thriving organisation with over 80 members and anyone interested in radio, communications or electronics is welcome to join. The club meets weekly on Wednesday evenings from 1900 at the Norwich Aviation Centre, Norwich Airport.

For more information about Norfolk Amateur Radio Club E-mail: **pr@norfolkamateurradio.org**

Contacting the ISS

On Wednesday 9 November 2005 at 1747hrs, Students from **Furtherwick Park School**, Canvey Island, Essex chatted with astronauts orbiting the earth in the *International Space Station*, thanks to **South Essex Amateur Radio Society (SEARS)**, **Carlos Eavis G0AKI** of the RSGB and **Howard Long G6LVB** of ARISS/Amsat UK.. The pupils used the callsign, **GB2FPS** and various Amateur Radio equipment to ask Commander **Bill McArthur KC5ACR** questions as the *ISS* passed 250 miles above the earth travelling at 28,000kph.

Dave Speechley G4UVJ Chairman of SEARS said the students of Furtherwick Park School really enjoyed it, the School hall was packed, and was covered by all the local Media and BBC Essex Radio a great day was had by all. Afterall it's not everyday you get a chance to speak to someone orbiting the earth!

From left to right: Howard Long G6LVB, Dave Speechley G4UVJ, Carlos Eavis G0AKI and the Students of Furtherwick Park School.

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

Equipment Guide

The 2006 edition of the Waters & Stanton *UK Radio Communications Equipment Guide* 15th Edition is available now! Comprising of 386 pages W & S say this is the largest catalogue they have produced to date. Containing a vast range of the products they stock this catalogue contains everthing from accessories, antennas, cables, tools, CB radios through to receivers and transceivers. There's also a section containing articles on product reviews, featuires and other areas of interest.

Copies of the *UK Radio Communications Equipment Guide* 15th Edition are available direct from W&S stores in Hockley, Matlock or Glenrothes for £3.95 or can be obtained by mail order for an additional £1.75. There are also some vouchers offering free delivery, which will help offset the purchase price. Order your copy today!

Waters & Stanton, Spa House, 22 Main Road, Hockley, Essex SS5 4QS.
Tel: (01702) 206835 Web: www.wsplc.com E-mail: info@wsplc.com

Icom UK Founder Joins Ramsgate Fire Brigade Celebration

Icom UK founder **Dave Stockley G4ELP** was recently invited to join in celebrating the 100th birthday of the Ramsgate Fire Brigade. The station's birthday was on the 17 October and was celebrated by past and present staff. Dave, always a keen Amateur Radio enthusiast worked for the Ramsgate Fire Brigade before opening the radio retail shop, Thanet Electronics, in Beltinge during 1974. Following the success of the shop, Dave approached Icom Inc. and was granted sole distribution rights in the UK and Republic of Ireland, and the rest as they say is history.

When asked about the celebrations Dave commented, "Its amazing how time flies, I can't believe it's been well over 30 years since I worked here, yet some things never change. Its been great to catch up with old friends; I only wish more of them were still around. Still it was a long time ago but out of the remaining few of my lot I'm pleased to say I've got the most hair!"

Talking about Icom, Dave said. "I know how lucky I've been. How many people can say that they've turned what was once just a hobby into not only my job but also a successful business that has been in existence for over 30 years. Both of my sons work with me here and I am very proud that it is a real family business".

Nevada Catalogue

Nevada are pleased to announce that their new 2006 *Amateur Radio Catalogue* is now available. Showcasing the main products that Nevada import and distribute in the UK such as Alinco, Palstar and Comet, it contains up-to-the-minute details and full pricing information.

The new 2006 catalogue is available free on request! A downloadable version is also planned for the Nevada website, **www.nevada.co.uk** allowing potential customers to read its content on-screen and print out as required.

Nevada
Unit 1 Fitzherbert Spur
Farlington
Portsmouth
Hampshire PO6 1TT
Tel: 023-9231 3090
E-mail: sales@nevada.co.uk
Wesbite: www.nevada.co.uk

Kenwood Ready For Lead Free Solder Directive

Dave Wilkins G5HY of **Kenwood UK** read the recent comments in *PW* on lead free solder and contacted the Editor with some interesting news.

Rob G3XFD writes: Dave Wilkins G5HY is not only one of the leading lights in professional commercial Amateur Radio - he's a dead keen Amateur himself. On reading the various articles, and letters in *PW* on the lead free soldering saga he contacted me to provide an up-date on what Kenwood UK are doing towards meeting the EU directive.

Interestingly, the document (originally sent in December 2004 to their agents in the UK for servicing purposes) brought to my notice that the enforcement (at the moment in the EU only - but it's expected to adopted worldwide following the EU directive) also covers other hazardous materials. These included lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyl's (PBB) and polybrominated diphenylethers (PBDEs) will not be able to be used/sold within the EU.

Lead Free Solder?

The lead free servicing guideline issues by Kenwood as far back as December 2004 answers the obvious question - what is lead free solder? - by providing a list of typical lead-free versions: Sn-Ag-Cu (Tin, Silver, Copper), together with Sn-Ag-Bi (Tin, Silver, Bismuth). Others are Sn-Zn (Tin-Zinc), and Sn-Cu-Ni (Tin-Copper-Nickel). Kenwood announce in their Lead Free Service guideline that Sn-Ag-Cu (Tin-Silver-Copper) must be used for Kenwood product repair. Kenwood actually recommend Sn-3.0Ag-0.5Cu as the solder for service repairs.

Soldering Equipment

Of interest to the Amateur Radio fraternity is that Kenwood suggest soldering equipment for use in servicing. Of particular interest to UK based Amateurs is the well known Weller WSD80 soldering station. The Weller units - and others available commercially, are capable of providing the 217°C temperature (melting point of the SN-3Ag-0.5Cu solder) efficiently and only consumes around 70 to 80W when in use.

I found the information from Kenwood to be most useful - particularly the descriptions of the various types of lead free solder. Especially helpful was the information on the soldering station - I just happen to have a Weller WSD80 in my shack. Now it's times to practice using the Lead Free Solder! (Thanks for the information Dave!).

Rob G3XFD

Jamboree On The Air Report

By Mike Richards G4WNC

If you've not been involved in Scouting you could be forgiven for not knowing about JOTA or **Jamboree On The Air** to give it its full title. The JOTA Amateur Radio day is a world-wide event that's organised by the Scouting Movement to promote international communications between Scouts. The event has a very long history and this year's event was the 48th JOTA. All JOTA events rely heavily on volunteers from the Amateur radio and electronics enthusiast communities to bring the event to life. In essence, the Scouts use Amateur Radio to communicate to other Scouts across the World. Although, unless licensed they are not allowed to operate the rigs directly, they are allowed to use the microphone and speak on-air to pass greeting messages and exchange ideas about scouting experiences.

The JOTA event takes place on the third weekend in October every year and this year was held over 15/16th October, JOTA lasts two full days from 0000h on Saturday through to 2359 on Sunday evening. Few stations actually operate for the entire period and most of the activity is concentrated on the daylight hours of Saturday and Sunday. In addition to passing messages to other Scouts, JOTA is an ideal occasion for some badge work and most Scout Groups will combine JOTA with electronic project work.

Our Station

This year was my first attempt at a JOTA station as I've only recently joined the Scouting Movement. Our local Scout group, **3rd Ringwood**, like so many, was struggling for help and I volunteered to join in. This has proved to be very enjoyable and the JOTA station was the first major event I had attempted to pull together.

Fortunately, I was able to use my trade contacts to help pull a station together very quickly. The team at Yaesu UK were brilliant and came up with a Yaesu FT-897 transceiver complete with automatic a.t.u. and full coverage of all the h.f. bands plus 50, 144 and 432MHz! **Graham** from **bhi** also helped-out with the last minute supply of a data lead for the FT-897 and I'm also grateful to the **Shortwave Shop** in Christchurch for helping out with cable and connectors.

As I intended to operate using data modes, as well as s.s.b., I needed some suitable software that I could load on my daughter's laptop. After checking around the usual online sources I settled on an old favourite, *WinWarbler*. In addition to the transmitting station, I thought it would be useful to set up a listening post, so arranged to use my HF-350 along with the excellent and very compact AOR loop antenna.

Other than making sure we had some Scouts available, I needed to get a special event callsign, **GB0RWS**, from the RSGB and pull together a suitably impressive QSL card.

Organising the Day

As the Scout hall was only going to be available for the Sunday we decided we would run the station from 1100 to 1830hours. The late afternoon finish was to make sure we were around to try and catch some grey-line DX at the end of the day.

As well as running the JOTA station, I wanted to start the Scouts working towards their Radio Communicator Badge. A number of the main activities for that badge linked well with JOTA, in that they had to log 25 Amateur Radio stations, show they could tune a simple communications receiver plus recognise callsigns from the UK and near continent.

On The Day

Our day started at 1000 on the Sunday with a hectic set-up. We had hoped to be able to prepare on the Friday, but that didn't go to plan, so all the work had to be done on the Sunday. Fortunately, we had lots of help and the station was set-up and ready to go by about 1100 as planned.

However, I paid the price for poor preparation almost immediately when I attempted to tune-up the rig and antenna. I had used the wrong combination of antenna and a.t.u! The automatic a.t.u. that was supplied with the FT-897 was brilliant and extremely convenient, but it's not designed for use with a tuned feeder as per my G5RV. If I'd tested it properly on the Friday I would have spotted this in time to change over to a trapped dipole or similar. The Scout motto 'Be Prepared' was starting to sound like a slogan I was going to have to take to heart very quickly!

The Scouts all arrived as expected and we had a really good turn-out. When things got going, I spotted my second mistake. Trying to run two stations in a largely empty hall with hard floors and lots of echo was not such a good idea. Although the Lowe receiver and Yaesu rig were at opposite ends of the hall, the sound was echoing around making it very difficult to resolve much at all.

The other point I hadn't fully appreciated was just how difficult it is to understand s.s.b. if you're not used to it. Because I've been listening for years, it all sounded fine to me, but I could see from the look on the Scouts' faces that the combination of 'donald duck' s.s.b. voices and extensive use of the phonetic alphabet was very difficult to cope with!

Another point that made life difficult was the amateur contests that seemed to dominate most bands. There was an RTTY contest all over the lower end of the band and a German s.s.b. contest all over the s.s.b. section. The RTTY contest was handy for checking the station, as it was relatively easy to answer "CQ" calls and get a quick response. However, this was of little interest to the Scouts, as all the contest station wanted was to get a callsign and serial number and disappear off to the next contact!

Learning

As this was my first JOTA it was intended as an experiment, so I was expecting to learn lots! The first rule for next year is Be Prepared! Not only do I need to make sure I have the right kit and check that it all works together okay, but there are lots of other aspects to consider.

It would be good to have more skilled help available and I will have a word with one of the local radio clubs to get a few willing volunteers along next time. I'd also avoid setting-up two stations in the Scout Hall - much better to have smaller units located in side rooms.

Finally, I will be on air for a few weeks prior to JOTA setting-up a few Skeds with JOTA stations or other willing amateurs to make sure we can find someone for the Scouts to exchange greetings with. Despite the problems with our first JOTA, it was great fun and I will certainly be having another go next year. So listen out for us next year!

Another Lynch First!

Yaesu UK delivered their new Flagship h.f. and 50MHz transceiver, the FT-DX9000, to a UK customer via Martin Lynch & Sons Ltd in November. **Arthur Perry** of Twickenham Middlesex had placed a deposit for the new Yaesu back in April of 2005.

On receiving his FT-DX9000 Arthur commented to **Dean Croome, General Manager** of Yaesu UK: "I'm delighted to finally take delivery of such a beautifully engineered piece of engineering from Yaesu". Dean commented that by Yaesu adding the new FT-DX9000 to their excellent h.f. range it further confirms the Japanese manufacturer's investment to world class products for radio operators.

Dean Croome Yaesu UK's General Manager shakes hands with Arthur Perry proud owner of a flagship FTDX-9000.

Arthur Perry seen sitting at his new 'pride & joy', the FTDX-9000.

Lottery Grant for Amateur Radio in Scotland

Amateur Radio in East Lothian recently gained a huge boost from the 'Awards for All Scotland' Lottery Grant when the **Cockenzie & Port Seton ARC** received funding for its education programme. The Cockenzie & Port Seton Amateur Radio Club (CPSARC) needed help to fund new equipment for its popular and successful education programme where they provide an invaluable introduction to Amateur Radio for people of all ages and abilities. The club has been running the courses necessary for the Amateur Radio Foundation and Intermediate Licences for some time but recently the Chief Instructor **Bob Glasgow GM4UYZ** realised that they needed new tools and test equipment for the training events and a computer and projector of their own to present the courses more effectively.

Reading about the 'Awards for All Scotland' Lottery grants, Bob realised that the Club met the criteria and sent in an application. A few weeks later he was delighted to hear that the application had been successful and that they had been granted £4772.

With the grant Bob was able to order the much needed equipment, which is now in place and the the latest set of pupils have been able to benefit from good quality, safe tools and equipment and the latest in presentation technology.

For more information on the Cockenzie & Port Seton Amateur Radio Club, visit their website at **www.cpsarc.com/** For more information on the Amateur Radio Courses run by the club contact Bob Glasgow on **(01875) 811723** or send an E-mail to **gm4uyz@cpsarc.com**

Braintree Club News

The **Braintree & District** recent club meeting featured a talk by **Tony G4YTG** entitled 'Aerials are not magic'. All the members agreed it was a fascinating evening, holding the attention of everyone from newly licensed M3s to seasoned G3s. Although some of what was covered may have already been known to some, everyone learnt something. Tony's presentation made sure that everyone understood, and that is what made the evening so different.

Despite the club's overhead projector giving up during the talk Tony carried on making drawings to present his points. Using his vast experience of antenna systems both, commercial and amateur, plus using plenty of anecdotes, this was one meeting that was sure to over run and it did by a fair margin! Thanks to Tony for the talk.

"Who needs a projector?" Tony G4YTG

If you fancy joining in with the activities of the Braintree Club take a look at **www.badars.org.uk** or call **John M5AJB** on **(01787) 460947**.

amateur radio clubs

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

ESSEX

Clacton Radio Club
Contact: G4AQZ
Tel: (01255) 429117

The Clacton Radio Club have moved their meeting venue to The Kingscliff Hotel 55 Kings Parade, Holland-on-Sea. Meetings take place on the first Wednesday of the month at 1930 for a 2000 hours start. The Committee would like to remind members that the AGM takes place on January 18th 2006 from 2000. The club welcomes anyone interested in Amateur Radio, past, present or new members.

KENT

Swanley & Hextable ARC
Contact: Ken
Tel: 020-8306 3544
E-mail: M1cza.ken@ntlworld.com

The Morse Radio Club have changed the club name to a title that represents the location of the club hall, and hopefully encouraging new members from the surrounding area. The club has been renamed The Swanley & Hextable Amateur Radio Club and members meet at the Five Wents Memorial Hall on the Swanley to Hextable Road, Swanley, Kent.. Meetings are held on the first three Thursdays every month. All visitors are welcome.

NORTHERN IRELAND

Glengormley Electronics Amateur Radio Society
Contact: James Hoey GI0BJH
Tel: (07836) 790041
E-mail: gi0bjh@ntlworld.com
Website www.gn0xyz.com

The Glengormley Electronics Amateur Radio Society meet every Monday at the Knockagh Lodge, 236 Upper Road, Greenisland, County Antrim, Northern Ireland. Meetings commence at 20.00 Hours until 2200. New members & visitors are most welcome.

NORTH WEST

Macclesfield Wireless Society
Contact: Ron G0WUZ
Tel: (01625) 430433
E-mail: gx4mws@gx4mws.com
Website: www.gx4mws.com

The Macclesfield Wireless Society meets every Monday at 2000 hours, at the Pack Horse Sports & Social Club, Abbey Road, Macclesfield. The weekly club net operates each Wednesday from 2000 on 145.550MHz +/- QRM. Forthcoming meetings and events include: **Dec 12**: Antenna construction activity; 19th: On-air activity evening and **Jan 9:** On-air activity evening. Please note there will be no meetings on 26 December and 2 January.

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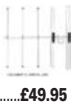

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(All other leads and lengths available, ie. BNC to N-type, etc. Please phone for details)

ALL PICTURES ARE FOR REFERENCE ONLY

doing it by design

This month Tony Nailer G4CFY is looking at Transmit Matching Networks following requests from regular readers. And as usual he's aiming to take the mystery out of the design process!

The subject of matching networks has been requested from some readers and I'll attempt to consider some of its aspects in this month's article. Unfortunately, and unusually for this series, this will not lead to a project or a printed circuit board (p.c.b.). Despite this, it's an important subject and I hope it will enable design enthusiasts to use the equations for their own projects.

Signals Generated

So, let's start at the beginning, where we generate the signals. Signals generated in the transmitter are usually processed at low power levels initially. Then, only when converted to the final frequency are they handled by a series of power amplifiers.

During early processing the signals are usually handled by voltage amplifiers, where there's no requirement to power match between stages. It is usual practice here to make the input resistance of the following stage at least ten times the resistance of the stage feeding it. In this way the following stage only damps the signal initially by 10%.

Once the signal has been converted to the final frequency it will be necessary to pass it from stage to stage whilst transferring with minimum power losses. Due, mainly to non linearity of power amplifiers - particularly when using bipolar transistors - there's also a need to incorporate low-pass or bandpass filtering as part of the matching function.

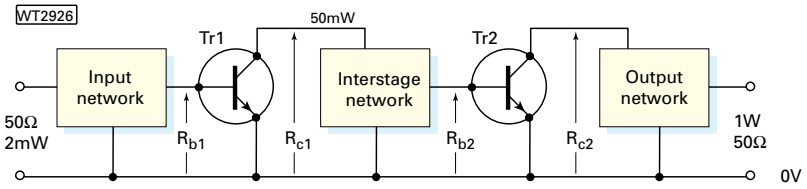


Fig. 1: The design used for discussion and design purposes this month. The two-stage amplifier is designed to produce 1W output on 21MHz (see text).

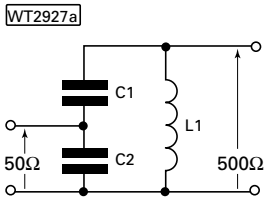


Fig. 2: A tuned circuit comprising an inductor L with two capacitors in series across it, the ratio of the values of the capacitors determines the transformation (see text).

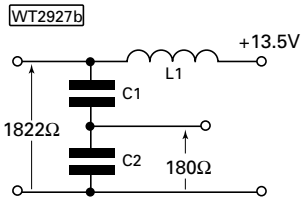


Fig: 3: This is still a parallel tuned circuit with capacitive tap, provided the supply rail is properly decoupled with a low reactance capacitor at the operating frequency, the 13.5V point supply being grounded to a.c. (see text).

Collector Load Resistance

Let's now look at collector load resistance and it's often here that power amplifiers operate on just 50 or 60% of a complete cycle of the r.f. signal. This is a good compromise between efficiency and harmonic generation.

Now we'll consider a single device running from a 13.5V supply (V_{cc}) and working on just half a cycle of an r.f. wave. If the half cycle has a peak level equal to the supply rail, it will have an RMS (root mean square) value of 0.707*13.5V, which is the same as 13.5/1.414.

Power can be calculated from $P = V^2/R$, where V is the RMS value. Changing the formula round gives $R = V^2/P$,. Substituting $V_{cc}/1.414$ into this formula will result in a value of the equivalent collector resistance for the transistor stage $R_c = V_{cc}{}^2/(2*P)$.

In a low power stage designed to produce 100mW of radio frequency (r.f.) on a 13.5V supply, the collector resistance will be $R = 13.5^2/(2*0.1) = 910\Omega$. Now, often the collector load will be a tuned circuit and to help reduce harmonic generation, and this requires a *Q* of between 5 and 10. This means the reactance of the L and C combination should be chosen to be around 91Ω.

Base Input Resistance

Time to look at base input resistance now and it's something that I've never found in the text books or data books except for high power devices. However, without knowing the resistance into which a network is driving - it's not possible to accurately design a network!

So, when creating a new transmit strip I generally assume the input

impedance of the following stage is somewhere between a quarter and a sixteenth of the preceding stage.

Amplifier For 21MHz

We'll now look at a specific amplifier design for 21MHz and use the diagram of **Fig. 1** to represent a two stage amplifier to produce 1W output on 21MHz. Let the first transistor have 50mW output and the second transistor 1W output and the supply rail 13.5V. The input and output resistance are both 50Ω.

Note: An important rule of cascaded amplifiers is that subsequent networks should be lower in *Q* than their predecessors. So, in this case let the input network *Q* be 10, the interstage network *Q* = 7, and the output network *Q* = 5.

Applying the formula $R_c = V_{cc}^2/(2*P)$ to each transistor in turn:

$R_{c1} = 13.5^2/(2*50*10^{-3}) = 1822.5\Omega$.

$R_{c2} = 13.5^2/(2*1) = 91\Omega$.

Input Network

On to input networks now, although I really cannot say what the input resistance of a low power stage is with an input of around 2mW! I will assume 500Ω. So the input network needs to translate 50 to 500Ω.

A good first choice would be a tuned circuit comprising an inductor L with two capacitors in series across it, see **Fig. 2**. The ratio of the values of the capacitors would determine the transformation.

As $Q = R/X_L$, the inductive reactance X_L is $R/Q = 500/10 = 50\Omega$.

Now $\omega = 2*\omega*f = 2*\omega*21*10^6 = 132*10^6$.

$L1 = X_L/\omega = 50/(132*10^6) = 0.38\mu H$.

The equivalent parallel reactance X_c will also be 50Ω, so $C = 1/(\omega*X_c)$.

$C = 1/(132*10^6*50) = 151.5pF$.

Now the total resistance R_L divided by the source resistance Rs is equivalent to the square of the (total capacitance divided by C1), that is $R_L/R_s = (C1+C2)/C1^2$.

Then $R_L/R_s = (1+C2/C1)^{2.}$ So, $SqRt(R_L/R_s)-1 = C2/C1$

Applying this SqRt(500/50)-1 = C2/C1 = 2.16. This means C2 = (2.16*C1).

In a series arrangement of capacitors $C_t = (C1*C2)/(C1+C2)$.

Substituting 2.16*C1 for C2 in this equation gives;

$C_t = (C1*2.16*C1) / (C1+2.16*C1)$

$C_t = (2.16*C1*C1) / (3.16*C1) = 0.68*C1$.

If $C_t = 151.5pF$ then C1 = (151.5/0.68)pF = 222pF

Now C2 = 2.16*C1. C2 = 2.16*222 = 480pF.

In practice I suggest using 220pF for C1 and 470pF for C2. For L1 a TOKO coil type 2036 with its internal capacitor removed.

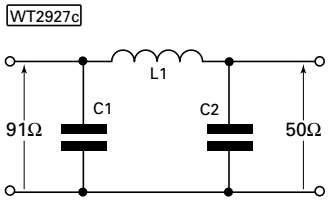


Fig. 4: The symmetrical Pi matching networks can work with a range of transformations, including equal input and output impedances. So I would choose this circuit, as it only uses one inductor (see text).

Interstage network

Next we go on to the interstage network. The input to this is 1822Ω and assume the output is a tenth of this, at 180Ω.

Again I will use a parallel tuned circuit with capacitive tap, see **Fig. 3**. Provided the supply rail is properly decoupled with a low reactance capacitor at the operating frequency, the top of the coil is then grounded to a.c.

Let the *Q* be 8, so $X_L = 1822/8 = 228\Omega$.

$L2 = X_L/\omega$, where ω, $= 132*10^6$.

$L = 228/132*10^6 = 1.7\mu H$.

To resonate, it will require a capacitive reactance of 228Ω.

$C = 1/(\omega*Xc) = 1/(132*10^6*228) = 33pF$.

Exactly the same equation can be used to determine the individual capacitors as $C_t = 0.68*C1$, so C1 = (0.68*33pF = 48.5)pF, and C2 = 2.16*C1 = (2.16*48.5)pF = 104.8pF.

Use C1 = 47pF, C2 = 100pF, L2 = TOKO coil 4612.

Note: Despite the above calculations, I often find that a stage running that sort of power often runs with greater stability if the collector circuit is damped with a 1kΩ resistor and the matching values recalculated accordingly.

Output Network

The output network has an input value of $R_{c2} = 91\Omega$ and $R_{out} = 50\Omega$. Most matching networks require the transformation to be greater than 2:1.

The symmetrical Pi or T matching networks can work with a range of transformations. These include equal in and out, so I will choose the Pi as it only uses one inductor, see **Fig. 4**.

Let $R_s = 91\Omega$, and $R_L = 50\Omega$. Let $Q = 6$.

$\omega = 132*10^6$.

$N = SqRt(R_s/R_L) = SqRt(91/50) = 1.35$.

$X_{c2} = R_L(1+N)/Q$

$X_{c2} = 50(1+1.35)/6 = 19.6\Omega$.

$C2 = 1/(\omega* X_{c2})$

$C2 = 1/(132*10^6*19.6) = 386pF$.

$X_{c1} = X_{c2}*N$

$X_{c1} = 19.6*1.35 = 26.5\Omega$.

$C1 = 1 / (\omega *X_{c1})$

$C1 = 1 /(132*10^6*26.5) = 286pF$.

$L2 = (X_{c1} + X_{c2})/\omega$

$L2 = (19.6+26.5)/(132*10^6) = 0.35\mu H$.

Use 390pF for C2, 270pF for C1 and use a TOKO 100107 coil for L2.

A High Power Amplifier

Consider now the same situation as Fig.1 for a two stage amplifier on say 29MHz with the first stage running 2.5W and the second stage running 25W, **Fig. 5**. The supply rail is 13.5V as before. $\omega = 2*\omega*f = 2*\omega*29*10^6 = 182*10^6$.

The network used in all three

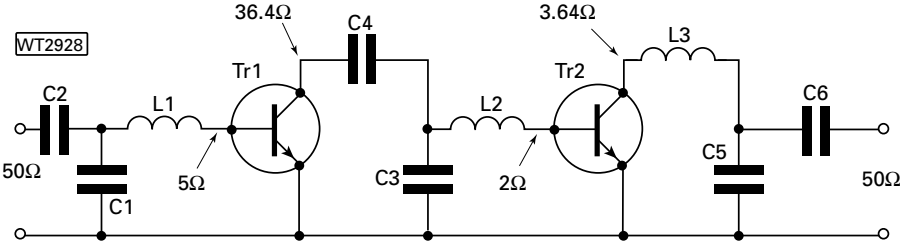


Fig. 5: The simplified signal path circuit of the two-stage amplifier, showing the matching components (see text).

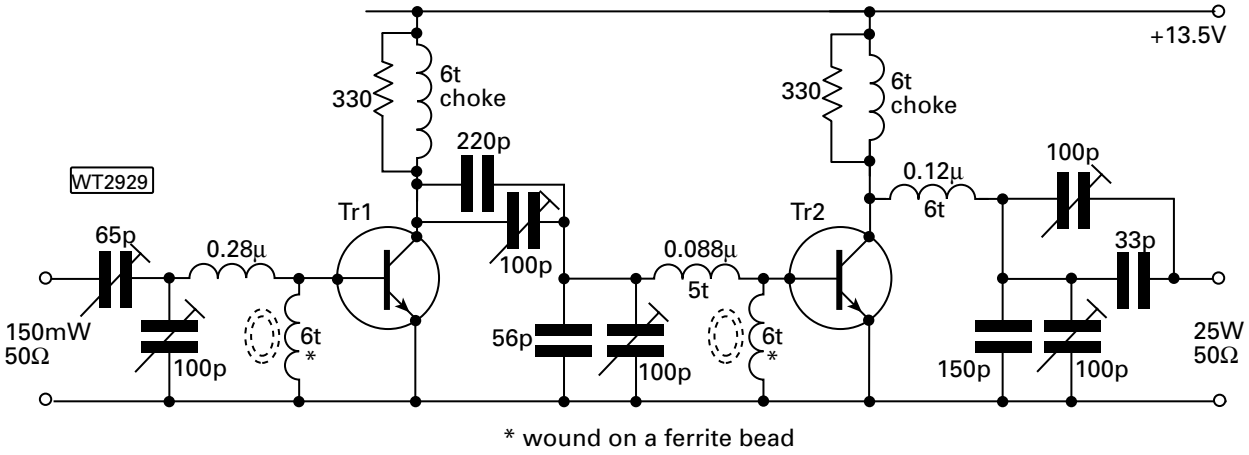


Fig. 6: The final physical design of the prototype amplifier (see text).

positions is the asymmetrical T with equations as follows;-

As R2 must always be higher than R1 the network is reversed in some situations.

As before, $R_{c1} = V_{cc}^2/(2*P) = 182/5 = 36.4\Omega$. $R_{c2} = 182/50 = 3.64\Omega$.

Assume R_{b1} is 5Ω and R_{b2} is 2.5Ω, (based on experience!).

Network equations

$X_L = Q*R1$

$B = R1(1+Q2)$

$A = SqRt((B/R2) - 1)$

$X_{C2} = A*R2$

$X_{C1} = B/(Q-A)$

Input network

Let $Q = 10$: $R1 = R_{b1} = 5$: $R2 = 50$.

$X_L = 10*5 = 50\Omega$.

$B = 5(1+100) = 505\Omega$.

$A = SqRt((505/50)-1) = 3$

$X_{C2} = 3*50 = 150\Omega$.

$X_{C1} = 505/(10-3) = 72.1\Omega$.

$L1 = X_L/\omega = (50/182*10^6) = 0.275\mu H$.

$C2 = 1/(\omega*X_{C2}) = 1/(182*10^6*150) = 36.6pF$.

$C1 = 1/(\omega*X_{C1}) = 1/(182*10^6*72.1) = 76.2pF$.

Use trimmer capacitors for C1 and C2 and a small dust iron toroid for L1.

Interstage Network

Let $Q = 8$, $R1 = R_{b2} = 2$, $R2 = R_{c1} = 36.4$

$X_L = Q*R1 = 8*2 = 16\Omega$.

$B = R1(1+Q^2) = 2(1+64) = 130$

$A = SqRt((B/R2)-1) = SqRt((130/36.4)-1) = 1.6$

$X_{C4} = A*R2 = 1.6*36.4 = 51.8\Omega$.

$X_{C3} = B/(Q-A) = 130/(8-1.6) = 20.3\Omega$.

$L2 = X_L/\omega = 16/(182*10^6) = 0.088\mu H$.

$C4 = 1/\omega *X_{C4} = 1/(182*10^6*51.8) = 106pF$

$C3 = 1/\omega *X_{C3} = 1/(182*10^6*20.3) = 270pF$.

Use a 100pF trimmer capacitors in parallel with 56pF for C4 and 100pF trimmer capacitor in parallel with 220pF for C3. L2 would be best as an airspaced coil about five spaced turns using 19s.w.g. with a 6mm inside diameter.

Output Network

Let $Q = 6$: $R1 = 3.64\Omega$: $R2 = 50\Omega$.

$XL = Q*R1 = 6*3.64 = 21.8\Omega$.

$B = R1(1+Q^2) = 3.64*(1+36) = 135\Omega$.

$A = SqRt((B/R2)-1) = SqRt((135/50)-1) = 1.3$

$X_{C6} = A*R2 = 1.3*50 = 65\Omega$.

$X_{C5} = B/(Q-A) = 135/(6-1.3) = 28.7\Omega$.

$L3 = X_L/\omega = 21.8/(182*10^6) = 0.12\mu H$.

$C6 = 1/\omega *X_{C6} = 1/(182*10^6*65) = 84.5pF$

$C5 = 1/\omega *X_{C5} = 1/(182*10^6*28.7) = 191pF$.

C6 should be 33pF + 100pF trimmer capacitor, C5 should be 150pF + 100pF trimmer capacitor. The inductor, L3 should be air wound six spaced turns of 19s.w.g. with 6mm inside diameter.

Experimental Amplifier

In an experimental amplifier using the discussed initial values, the supplies to the collectors would be via chokes of six turns of 20s.w.g. enamelled close wound, 6mm diameter, with 330Ω 500mW resistors across them. Decoupling at the tops of these chokes will be necessary together with a further choke consisting of two beads on a piece of 18s.w.g. wire.

The transistor base supply should be from either a bias supply for linear use or from the ground for class C use should be via a choke of six turns 28s.w.g. enamelled wire on a 4mm dia, 5mm long ferrite bead. The prototype circuit is shown in **Fig. 6**. This design has made many assumptions but is provided as a good first attempt at the creation of a two stage amplifier for 29MHz. Readers wishing to develop such a unit should follow the methods by doing the first stage with network for 50Ω in and out.

A 3dB resistive pad should be used in front of the first stage to aid stability. Only after the first stage has been successfully built and developed should you complete the two stage unit. **Note:** But remember, I cannot accept responsibility for the cost of any devices blown during the development of such an amplifier!

Two Stage Filter

Due to non linearities in transistor amplifiers it will be necessary for an amplifier unit to be followed by a two stage harmonic half-wave filter. Better still would be to use a 7-element Chebychev low-pass filter.

If you wish to correspond regarding this article or previous ones subscribe to the E-mail list **pw-g4cfy-on@pwpublishing.ltd.uk** by sending a blank E-mail with the word subscribe in the subject box. When you receive confirmation from the server you can send an E-mail to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will be answered by myself or the *PW* team.

PW

Radio Basics

This month Rob Mannion G3XFD continues the antenna theme in an effort to encourage readers to enjoy the radio hobby - even though they may have antenna problems. Rob demonstrates just how useful relatively simple antennas can be!

Despite my comments last month that the best approach for h.f. antennas is "As much wire as you can, as high as you can"- those Radio Basics (RB) readers without the requisite space need not despair! I can say this with confidence gained over many years in the Amateur Radio hobby - after all our hobby is one of technical comprises. Let's face it just how many Amateurs in the UK can afford the best equipment, the best location or find room for full size antennas for 1.8 or 3.5MHz? (If you can - let me know and we can share your good fortune!). In fact we all have to comprise and get the best out of our personal situation.

During the almost 40 years that I've been licensed as G3XFD, I have been active from many different locations. Locations that have ranged from a small flat to a large country garden and from many different /P sites in different areas of this widespread group of Islands. And of course, when it comes to small size antennas - the mobile h.f. types have got to be small haven't they? So, let's now take a look at using h.f. mobile antennas to advantage, in either a portable or semi-permanent situation.

Versatile Antenna

The good quality h.f. mobile antennas available today are extremely useful. For my own /P work (I don't operate truly mobile much nowadays on h.f. for safety reasons) I've got a selection of the ProAM h.f. antennas from the USA. Although they're no longer made - various similar antennas are available. Fortunately, I've got a complete set to cover the 3.5 to 28MHz bands.

Fig. 1: The ProAM h.f. mobile antennas used by G3XFD (see text).

The long, thin ProAM antenna, **Fig. 1**, is easy to use and has provided some excellent local and DX work for G3XFD/P. Obviously, I've used it mostly when mounted on a car, usually employing the three unit mag-mount. However, I've also used the antenna system away from the car - in conjunction with cheap roof rack!

The usual h.f. mobile antenna is designed to match into the impedance resulting from the feeder and antenna (and the load presented by the antenna itself) positioning on a car roof/combined with the metalwork, and physical positioning on the vehicle itself. Another important consideration is that the car roof metals helps to provide a ground-plane effect - although this isn't very efficient at h.f.

The diagram, **Fig. 2**, shows a cheap car roof rack (available from Halfords, and other motor accessory outlets) made from galvanised steel. This unit, with a bracket for the h.f. mobile antenna mounted in the centre, (or a flat plate of steel to allow the mounting of a mag-mount base) will provide a very suitable portable antenna system base. It's very versatile - you can even use the rack on the roof of the car to carry things when it's not in use for radio!

Joking apart, the simple roof rack assembly is versatile. I've used it on the patio of a flat and in front of a seaside beach hut. It's also useful in places where it's not possible to knock a temporary mast base post into the ground.

If you don't fancy the practical d.i.y. approach of 'make do and mend' you can always get a frame made up to suit your own special needs. Advertisers such as **Waters & Stanton PLC** (see advert this issue) have several ready made units available suitable for the job, from different sources. They use ground spikes, enabling the assembly to be mounted on a lawn to provide a mast base.

Additionally, I mustn't forget just how useful the **Tennamast** Tenna-Tourer mast base is! (see the Tennamast advert in this issue for more details). Originally made to provide a drive-on mast base - using the weight of a vehicle to keep it in place - several readers have told me that they've bolted their Tourer units to concrete bases. I've also tried the Tenna-Tourer on a concrete base - using the weight of a concrete block to keep it stable. In this fashion I've found that even in medium to strong winds the mast base will support a 10 metre high fibreglass fishing rod acting as an antennas (see last month's article).

Resonance & Tuning

Anyone who has used an h.f. mobile antenna will know how sharp the resonance and tuning is for a particular frequency. Obviously, this isn't too much of a problem in a mobile operations mode because it's not convenient to stop to adjust the antenna. Instead, most mobile operators try to stick to one frequency - where they've tuned and adjusted the system for maximum output.

Incidentally, I use a mains neon indicator bulb mounted at the base of the whip (above the loading coil) to indcate 'the most smoke up the chimney so to speak'. It's very re-assuring to see it glow when maximum radiation is taking place. (One half of the neon bulb is painted black to help you see it in bright daylight).

Despite the natural narrow band tuning of most h.f. mobile antennas, there's a very

simple trick we can use to spread the coverage and that's by using a mobile antenna tuning unit (a.t.u.). I use an MFJ mobile a.t.u. - it's ideal for low power work (less than 100W) and enables me to erect the antenna on the car roof and then adjust the tuning over the band from inside the car. It's extremely effective, **Fig. 3**, and removes the problem of getting in and out of the car to adjust the antenna with each change of frequency.

The same method can be used when an h.f. mobile antenna is operated in conjunction with the car roof rack idea I made earlier. The a.t.u. effectively helps you reduce the standing wave ratio (s.w.r.) to be as low as possible (I recommend an a.t.u. fitted with a suitable s.w.r. meter).

If you are considering a semi-permanent antenna system along the lines I've suggested, there's one a.t.u. system that I've found to be very useful - it's not cheap - but is extremely helpful in tuning up odd lengths or wire! The 'roller coaster' rotary inductor is a superbly simple system of achieving as correct match as possible for a comprise antenna. The reason why I like it so much is it's directly under my control!

You really can get the finest adjustment with this type of a.t.u. Again, there are a number of manufacturers and both **Nevada** (in Portsmouth) and **MFJ** (UK agents Waters & Stanton) will be pleased to sell you a suitable a.t.u.

Again, if you have the money to spare there's yet another alternative! In my case I use the SGC auto a.t.u., but prefer to use it to resonate a length of wire (see last month) wrapped around the fibreglass fishing pole mast. Despite the advantages in ease of operation, I prefer to use this system on a long term basis. There's nothing to beat simplicity and my little MFJ a.t.u. and ProAM antenna system is extremely convenient for /P operating. I urge any reader who has problems regarding space for antennas to try the ideas out - it's amazing what you can achieve, especially on lower power operating whether it's on c.w. or s.s.b.

Another Suggestion

I've already mentioned the SGC auto a.t.u. (a.a.t.u) - a unit that's proved itself over a number of years during /P work, and when I had a very small patio for a back garden. Here the a.a.t.u. worked with one of my favourite 10 metre long fishing poles (purchased from **Sycom**).

But what if you have no garden at all? Not even a balcony? This scenario might discourage the keenest radio enthusias - even to the extent that they might regard an otherwise pleasant flat/apartment as being a prison - stopping them getting on the air. However, if you're in that situation, why not consider a roof top antenna tuned by an auto a.t.u.?

Several readers who live in flats, or have other space problems, have taken up the idea of a remotely tuned antenna. The SGC unit- and others - are suitable for this type of antenna and I've seen it many times in Holland where they have particular trouble in having gardens for the canal side houses in Amsterdam! Instead, the antenna is mounted high on the roof and is often controlled remotely

There's no need to have a huge whip antenna - and no need to mount it vertically either. It could easily be arranged for a horizontal length of wire (perhaps around 10 metres long) to be supported on the outside of plastic guttering, or carried on short cantilever supports to keep it away from the gutters during heavy rain.

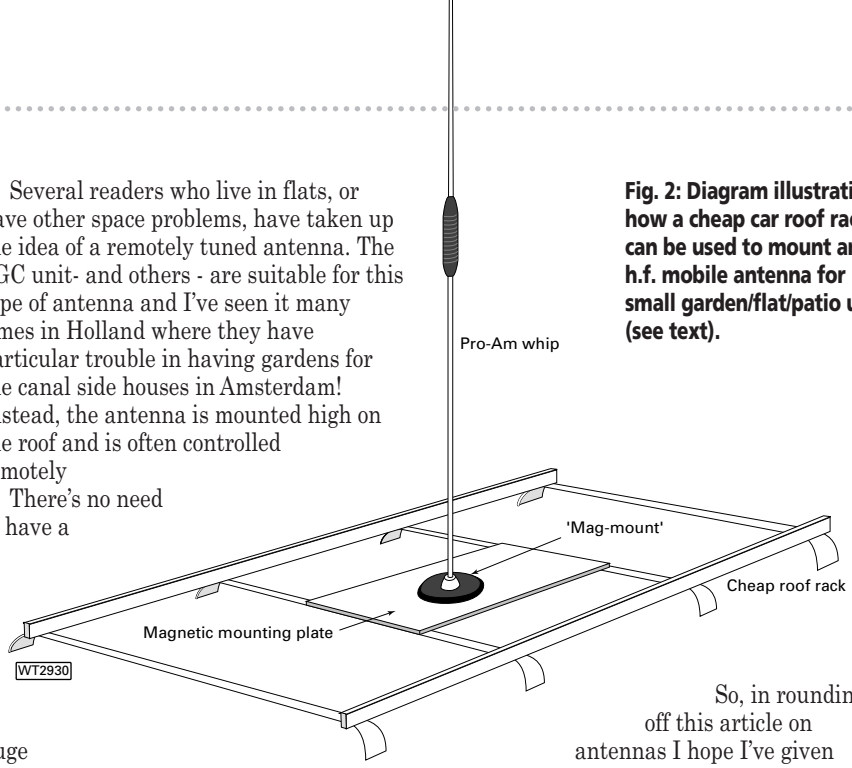


Fig. 2: Diagram illustrating how a cheap car roof rack can be used to mount an h.f. mobile antenna for small garden/flat/patio use (see text).

So, in rounding off this article on antennas I hope I've given those of you with space/planning problems- some ideas. Whatever happens, you must not be deterred from enjoying our hobby. If a block of terraced houses in Holland can sprout a 4-element h.f. beam for 14, 18, 21, 24 and 28MHz (right out of the roof ridge!) - you can surely have a simpler array. Good luck! **PW**

Fig. 3: The MFJ mobile antenna tuner favoured by G3XFD to enable a mobile antenna to be remotely tuned and matched from inside the vehicle (see text).

Radio Basics Oscilloscope Project

I've got some good news for those readers who have been patiently waiting for a suitable high tension (h.t.) unit for the RB 'scope project! The news is that the long awaited tried-and-tested inverter unit to provide the necessary h.t. for the 1CP1 one inch cathode ray tube (c.r.t.). The project is to be published in the February issue of *PW* and should remove a problem for constructors (the lack of suitable transformers).

Readers will already know how embarrassed I was to find out just how difficult it is to get a 300-350 secondary transformer nowadays! The problem was highlighted for me at the 2005 Leicester Amateur Radio Show when I had just removed my head from inside a large junk box on the **Radio Amateurs' Invalid & Blind Club's** (RAIBC) stand. A friendly voice said; "You won't find any suitable transformers for 1CP1 tubes in there Rob - I've already looked! All I could do was to apologise (I was looking for a special valve base actually!). But, in honour of his patience I dedicate the note to that dear, very patient reader along with the many others who've been waiting! **G3XFD**

India Revisited

Henryk Kotowski SM0JHF recounts his travels to India where he got to meet some great characters and experienced Amateur Radio being used in a crisis situation.

My first encounter with India took place in December 2002 and I described the radio related facet of my trip in *PW*. I knew I would go there again, so I applied for a licence in India.

Two years later, in the middle of December 2004, it was time to ring up the curtain of India Revisited. I did not expect the second trip to be dramatic or turbulent, as I was going to tranquil and peaceful South India. However, the first idea of my future predicament popped up at 0500 hours when the airport coach broke down in the middle of nowhere, although I did get to the airport in time!

The following morning I was in Chennai, one of the larger cities of India and the capital of Tamil Nadu state. Holding a valid Amateur Wireless Telegraph Station Licence, I'd brought with me my Icom IC-706 transceiver with accessories – a lightweight power supply, an automatic antenna tuner AH-4 and a Morse paddle.

Chennai is a very noisy and crowded city so I quickly moved out of town to one of the beach resorts on the coast of Bay of Bengal. I could then watch the rising sun, monitor the Amateur Radio bands and walk the beach with only fishermen present.

Making Contacts

I contacted a few Amateur Radio operators in Chennai and after a couple of days of adjustment, I went to see **Gopal VU2GMN** in a residential neighbourhood. Chennai is better known as Madras, even the airport abbreviation is still MAA, officially the name was changed about 10 years ago, yet the local main radio club is notwithstanding and is called the **Madras Amateur Radio Society**.

Gopal VU2GMN is a member of the board of the national society called **Amateur Radio Society of India** representing India in the **International Amateur Radio Union**. As the country comprises 28 states and seven union territories, with 15 official languages and more than one billion people, it is only natural to have several Amateur Radio societies and one hundred radio clubs.

Another major organisation on the Amateur Radio scene in India is **The National Institute of Amateur Radio** (NIAR) located in Hyderebad. It is a commercial enterprise committed to spreading the use and knowledge of Amateur Radio through a network of local clubs. The NIAR managed to arrange all permits required for a four week activity from the Andaman Islands.

An aerial view of Chennai.

Charles K4VUD from Florida, in front of the Science Center in Port Blair and the temporarily set up antenna.

The Andaman and Nicobar islands lie between Myanmar (Burma) and Sumatra in the Bay of Bengal. The islands are actually the visible crest of a submersed mountain range with at least one active volcano, called Barren Island. The Andaman and Nicobar Territory is totally supervised by the navy and air force commands and until 1994 it was closed to tourists. Today there are daily, comfortable flights from Chennai to Port Blair in the South Andaman Island.

During my trip I landed at Port Blair on the 20 December and was granted a five day authorisation to visit parts of this Union Territory. The next day I met all the members of the Andaman road show staged by the NIAR. The leader, **Mr Suri VU2MY** had a mission to break ground for at least one Amateur Radio club. **Bharathi VU2RBI** intended to conduct more two-way radio exchanges (QSOs) than ever before, using the **VU4RBI** callsign. The multi-operator team of **VU4NRO** was to demonstrate Amateur Radio to potential new operators in the islands and to the already existing global community on the air. Not really a member of the team, but an

old friend, **Charles, K4VUD** and also **VU3CHE, HS0ZCW** etc., was the official photographer of the DXpedition.

Bharathi VU2RBI, a 46 year old mother of two and an experienced Amateur Radio operator, was spending whole days on the air from her hotel room on the top floor of Sinclair's Hotel outside of Port Blair, sleeping for only a few hours when the bands were dead. A multi-band Yagi and a few wire antennas were overlooking the waters of the bay from the hotel roof.

A temporary station was also set up in the Science Center near Port Blair and I witnessed a practical demonstration of radio contacts in conjunction with a lecture by Mr Suri VU2MY. I think it's a brilliant idea to preach Amateur Radio, particularly in virgin territories, while undertaking any DXpedition (well, maybe with the exception of places like Peter I Island).

My appeal to anyone travelling to a DX land is: leave some permanent footprints of your visit, get some local guy, or girl, at least interested in Amateur Radio, and if there is someone already interested, give some help, show how to improve the reception or transmission, how to make better use of what is already available.

Visiting VU4NRO

A day before my departure from Port Blair I took a cab to The Polytechnic College in the outskirt of Port Blair, where the VU4NRO station was installed. It was easy to find. However, none of the four or five operators who were supposed to take care of the station were present. I waited one hour and left a message that I would try to drop in next morning *en route* to the airport. But I failed, due to security procedures in the airport terminal - once I'd checked in my luggage I was not allowed to leave the terminal even though I could almost see the College from there.

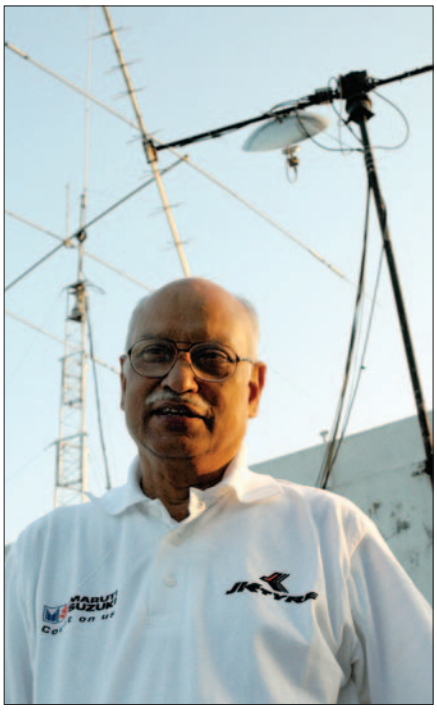
I left Port Blair for Chennai on December 25 2004. The next morning I woke up when the red rising sun was still touching the surface of the sea and the whole hotel was markedly shaking. I felt the earthquake minutes after Bharathi VU4RBI shouted into the microphone "Tremors" in Port Blair.

I don't know how fast seismic waves travel but the tidal wave arrived at the coast of India in about three hours. I could see the Marina Beach in Chennai from my hotel window. The previous evening I'd strolled the beach where thousands of families with children were having fun. By the Sunday morning the huge and long beach was almost empty when the tsunami wave swept over it. The city was spared but southern parts of Tamil Nadu state were severely damaged.

Tens of Indian Amateur Radio operators were monitoring the frequencies used by Bharathi VU4RBI in Port Blair. A few teams of Tamil Nadu operators went off to areas hit by the disaster. Part of the VU4NRO team were transfered to Car Nicobar island, which was totally damaged, and they set up an h.f. station. For a while

The Yagi antenna used by Bharathi VU4RBI from Sinclair's Hotel, Port Blair Andaman Islands.

Taken in Chennai, India at the table clockwise in blue shirt – Devadas VU2DH, VU3ASB, VU3USI, VU3VTK, VU2AKW, VU3RLR, VU2PTR, VU2VAU, VU2KV, VU2ZNS, VU3VRN, VU2KLS and VU3MOA (partly visible).



Gopal VU2GMN, a retired mechanical engineer with some of his antennas in the background in Chennai.

this was the only working means of communication in this remote place. The Amateur Radio activity in the region of Gulf of Bengal was febrile on h.f., v.h.f. and *EchoLink*.

I revisited **Gopal VU2GMN** who was quite exhausted after sleepless nights and hours spent in the attic, in his well equipped radio room. A few days later I met Devadas VU2DH who was also assisting in emergency traffic. On Saturday, almost one week after the catastrophe, I was asked to join an improptu meeting of several Chennai amateurs. Emergency preparedness was the subject of the heated and fruitful discussion.

My scheduled itinerary of South India had to be changed. The news indicated that as much as 2000km of Indian coastline were affected by the tidal wave. Even in some areas of Kerala state, facing The Arab Sea, the impact was severe but fortunately with few casualties.

I spent the rest of my trip in Kerala. This part of India is calm and mellow. I did not meet any Kerala radio operators, instead I did some on the air activity of my own. The propagation in this part of the world is disappointing. The neighbouring countries have little or no Amateur Radio so most of the time our bands seem to be unused. I could however hear hundreds of VU stations, both on c.w. and s.s.b. in the preferred 7MHz band as it offers good skip for short and medium distance contacts and the antennas can be quite simple.

Contacts Difficult

As India is fairly difficult to have a QSO with from Europe and is a rarity from such places as the USA, with several thousands of licencees of whom hundreds are really active, where is the mystery? An average Radio Amateur in India has limited means for the hobby. Imported equipment is quite expensive, amplifiers are almost non-existent, the living space is not ample so setting up efficient antennas in most cases is impossible, the operating skills are not up-to-date due to lack of competition, excercise and qualified teachers.

The Amateur Radio tradition in India might be as old as anywhere else but it was only 20 years ago that this pastime started to become popular. There is a lot of enthusiasm, curiosity and aptness but without influence from outside there is no progress. The most obvious example is the Indian version of English language – the teachers can teach only what they know themselves, whether or not it is correct or true. The result is that most foreigners who speak English, including myself, do not understand most Indians speaking their version.

Over 100 years ago, Indian physicist **Jagdish Chandra Bose** successfully experimented with microwaves. I don't know why his inventions and works are unknown to the general public world-wide.

I know however, that a joint, international DXpedition to 'rare' DXCC entities in India would make a better impact and would leave good impression on everybody, the participants could learn from each other, the thousands of hungry DX chasers would easier get their bit. There is a lot of progress in India, much of the red tape is being removed from Amateur Radio so this is my sincere hope that my third visit to India will be much more gratifying radio wise. **PW**

Some operators of VU4NRO at the Science Center checking the temporary demonstration set up. At the microphone Babu VU3RSB while Jose VU2JOS (in dark red shirt) and two other members of the team look on.

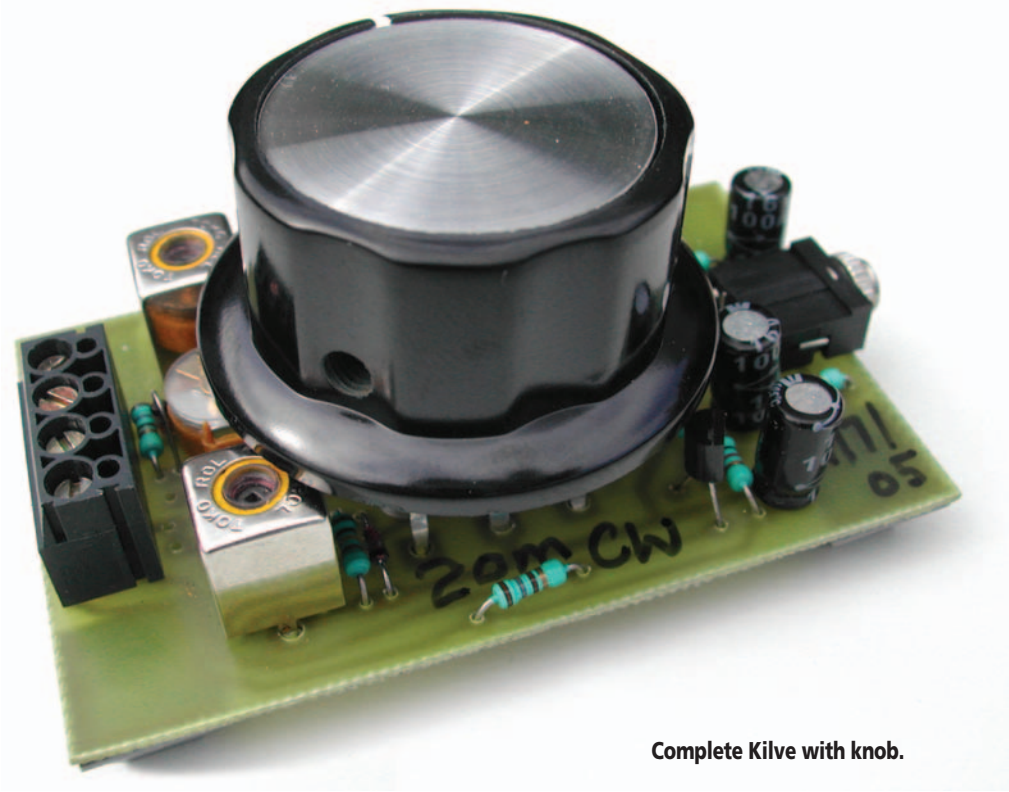
The antenna of VU4NRO station at the Polytechnic College.

Bharathi VU4RBI demonstrating Amateur Radio to naval cadets in Science Center in Port Blair, Andaman Islands. Cadet M.H.Collince speaks to a station on the mainland.

Devadas VU2DH at his home in Chennai monitors 7050kHz and talks with VU2JHM using VoIP Echolink on Internet discussing emergency communication matters after the disaster.

K is for Kilve! - The Receiver

Tim Walford G3PCJ has been busy at his designer's desk again. This time he's come up with a useful little receiver and - as usual - it's named after a Somerset village. Kilve, is on the coast near Hinckley Point on the Bristol Channel.



Complete Kilve with knob.

The Morse letter K normally signifies 'over to you' but in this case it's the starting letter of a new family of small kits, where its 'over to you' to get building! The objective is simple radio projects that can actually be used on air, and which will give you that special thrill from making contacts with something you've built.

The kits are all suitable projects for students needing practical projects to support any of the current radio exams. The minimalist mechanical style leads to excellent performance for their cost, and they perform much better than 'single transistor does everything indifferently' circuits!

The Kilve is a simple direct conversion single-band receiver - to be described in this article. It came about Because both the Editor **Rob G3XFD** and I were surprised by the interest in the earlier Sutton-Montis double sideband (d.s.b.) 'phone transmitter *(PW* July 2005).

The second article will be on the Kilmot* d.s.b. phone transmitter The Kilton is an alternative c.w. transmitter. All three projects can be used on their own, for any single band 3.5 to 14MHz. Each is built on a 50 x 80mm p.c.b. They are available as kits – see the side panel for further details.

***Editorial note:** Tim asks readers not to try to identify Kilmot on the map. It doesn't exist - as it's a combination of projects for PW - resulting in Kilmot*!

The Receiver Concept

For serious low cost receivers, I think it's hard to beat the direct conversion (DC) approach. They are relative simple and produce very clean sounding reception for phone or c.w. purposes. They have a continuously running local oscillator (l.o.) that drives a product detector, followed by audio amplification.

For 'phone reception of either single or double sideband (d.s.b.), the local oscillator frequency should be exactly the same as that of the transmitting station. For c.w. work, the l.o. frequency is slightly different so that an audio beat note whose pitch is the difference in their frequencies is produced.

Usually the r.f. filtering is preset with little amplification, with tuning applied only to the local oscillator. After detection of the incoming signal in the product detector, a typical DC receiver has lots of audio gain. The Kilve receiver has this classic format as shown by the block diagram **Fig. 1**. Although there are several blocks, it only has six transistors – all f.e.t.s.

The RF Circuits

The weak antenna signals are assumed to come from a low impedance source – see later. Thus the first block is a simple bandpass filter made up of L1, CT1 and combinations of C1/2. This provides some voltage amplification and moderate rejection of unwanted out of band signals, such as from broadcast stations. It then feeds the high impedance gate of the first transistor Tr1 as ahown in the diagram.of **Fig. 2**.

The transistor Tr1 is a 2N3819 junction f.e.t. working as the product detector. The other input of this detector is the l.o. signal - applied at its source at point D from the buffer transistor Tr2 – another 2N3819. This stage isolates the

mixer from the local oscillator transistor Tr3, the third 2N3819 in a Hartley circuit.

The l.o. buffer stage assists greatly with stability and minimises pulling of the frequency when adjusting the r.f. filter, especially on the higher bands. All three stages are fed from a regulated 6V supply to improve stability and provide reversed supply protection!

The resonant circuits of the r.f. filter and the oscillator are tuned to the same frequency and need the same component values for the chosen operating band. To cater for any band in the range 3.5 to 14MHz with a single set of parts, one type of inductor (ready made TOKO type 3334) is used but the capacitors are altered to suit the band.

The table, **Table 1**, shows the combinations of fixed capacitors C1/2 (r.f.) and C7/8 (l.o.) required for each band; the p.c.b. has provision for fitting these as either a single capacitor, or two wired in series or in parallel. The photograph, **Fig 3**, shows the capacitor options fitted for 7MHz, and c.w. – see later. The trimmers permit other capacitance values that cannot be obtained by the different connection choices of just two fixed value capacitors.

The actual oscillator frequency, and hence tuning, is adjusted by altering the capacitance on the tapping point of the l.o. inductor L2; tapping down the inductor allows a bigger standard value variable capacitor to be used instead of a special small one across the whole inductor. Even so, it is necessary to reduce the tuning capacitance on the higher bands, by using just one section of the PolyVaricon tuning condenser, and the optional addition of a small series

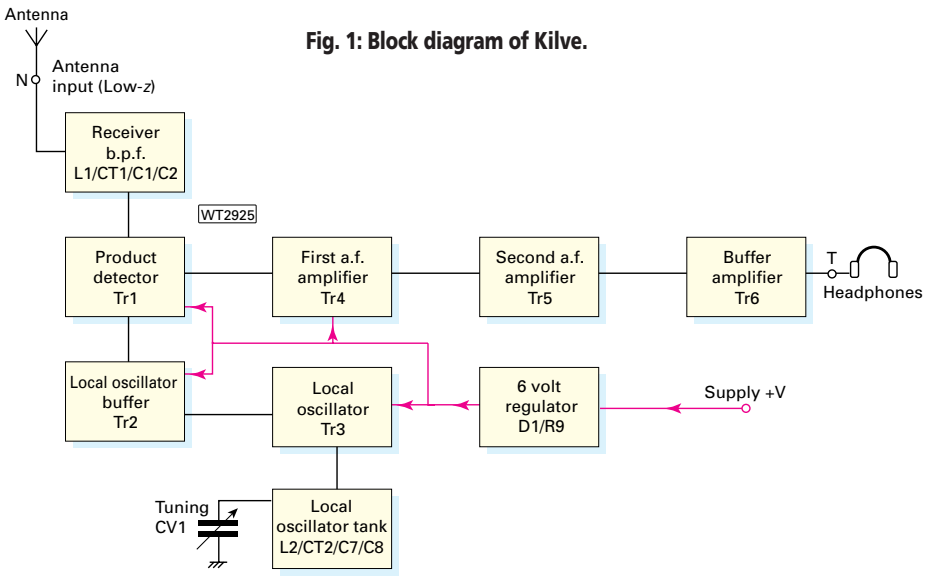


Fig. 1: Block diagram of Kilve.

Band (m)	Freq (MHz)	L1 & L2 (µH)	Total C (pF)	Trimmer (pF)	Fixed (pF)	Method	C1/2-C7/8 (pF)
80m	3.6	5.5	355	55	300	Parallel	2x150
60m	5.x	5.5	183	33	150	Single	150
40m	7.0	5.5	93	18	75	Series	2x150
30m	10.1	5.5	46	46	-	-	-
20m	14.0	5.5	23	23	-	-	-

Table 1.

capacitor. With such a simple scheme, there is a compromise between tuning rate/ease of use and the tuning range; this is an excellent topic for further experiment!

Audio Circuits

Because the Kilve is a direct conversion receiver, the selectivity is determined by the audio bandwidth; for 'phone operation, 3kHz is normal, while about 750Hz is typical for c.w. work.

The 1kΩ load R2 of the detector stage Tr1 has provision for decoupling by two 100nF capacitors C3/4 which can be connected in series or in parallel to give a choice of bandwidths. (They can be omitted if a really wide bandwidth is

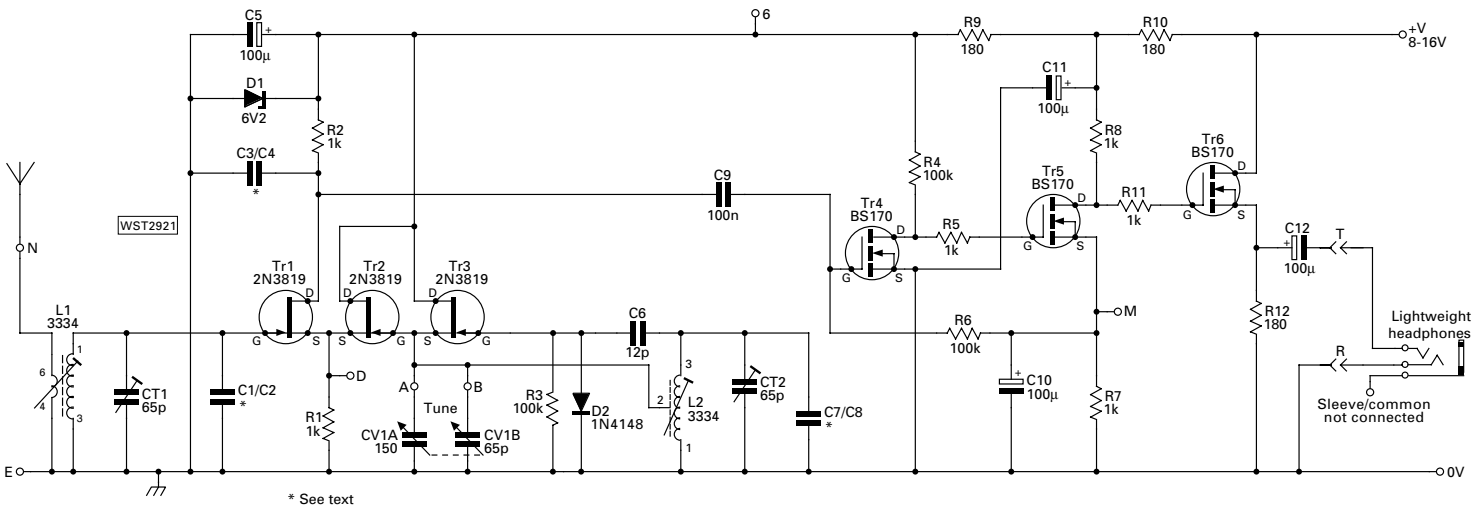


Fig. 2: Circuit of Kilve.

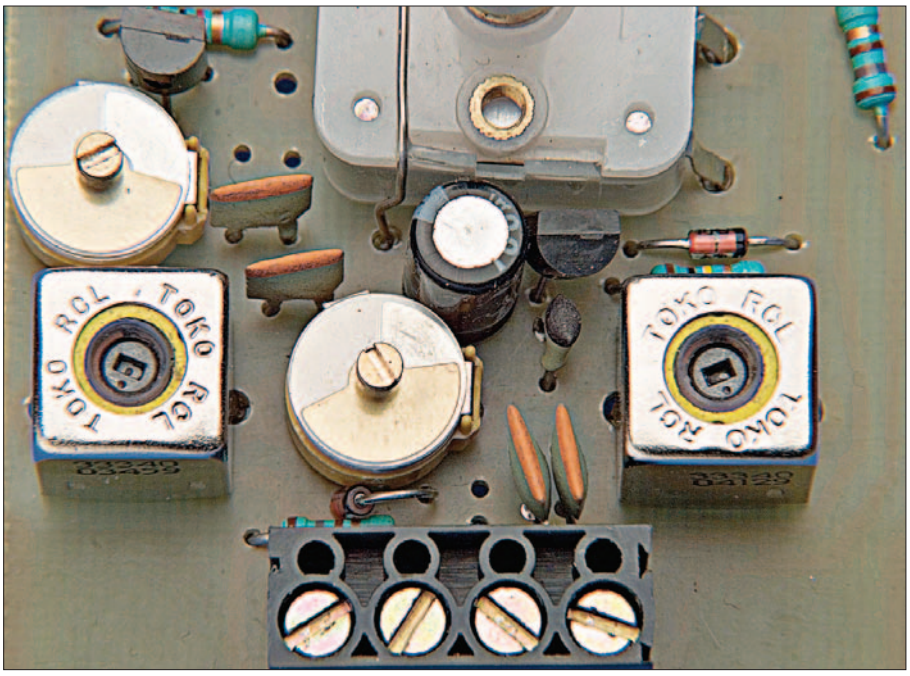


Fig. 3: Close up of capacitor options for the 3.5MHz band.

required for a simple monitoring receiver). This filter is very simple, with limited attenuation above the nominal bandwidth, so voice signals can often be understood even when the filter is built for c.w.

There are three stages of audio amplification, each using a BS170 m.o.s.f.e.t. The first two transistors are in the common source configuration, with most of the amplification in the first stage. The third is a low output impedance buffer stage for driving the 64Ω impedance of series connected portable cassette type headphones, or other external devices such as an a.f. gain pot and loudspeaker amplifier.

The first two transistors are arranged in a self biasing d.c. feedback pair so that point M is about 2V positive - just sufficient to turn on Tr4. This makes the drain voltage of Tr5 also 2V less than the junction of R9/10, which is midway between the supply and the stabilised 6V; this leads to the source of Tr6 being 2V lower still – giving a minimum of 3V at the source of Tr6, which is suitable for the likely signal levels.

The resistors R5 and 11 are gate stoppers to prevent unwanted v.h.f. oscillation, and the combinations of R9/C5 with R10/C11 provide the necessary supply filtering.

Building the Kilve

The recommended approach is to build in stages and test each before proceeding to the next. This should provide satisfaction as you progress and hugely increase the chances of eventual success!

The lack of powerful transmitter type circuits allows a single sided board to be used, provided it has many interlinked ground tracks. The p.c.b. is designed to sit on four rubber feet on your bench, but can easily be installed in a case by drilling holes for mounting bolts in the four corners.

The tuning capacitor is held in place by its tags with a wire strap over its body. The knob is mounted on a shaft extension to clear the parts underneath.

The tuning capacitor, the TOKO inductors and trimmers are fitted first, followed by the supply circuits, which are then checked for the desired 6V. The first two audio stages TR4/5 are then fitted and easily tested by measuring the d.c. voltage on point M. Next the output buffer stage is added and tested by the 'screwdriver hum test'. Apply your finger to the shaft of a metallic screwdriver gingerly applied to either side of C9 - you should be able to hear some sort of rough sounding hum noises in the phones as your body picks up the 50Hz mains! (The phones must be switched to stereo.)

Testing RF Circuits

Testing the r.f. circuits is a little harder and will depend on what 'instruments' are available. One approach is to build the resonant circuits of the r.f. filter and l.o. but not install their transistors – remembering to fit the capacitors C1/2 and C7/8 as required for your chosen band, set the tuning capacitor options, and to centre its rotation. Their resonant frequency can then be measured/adjusted with a dip meter (see *PW* March 2004) using the techniques explained in *PW* Aug 2004 of a small temporary link coil connected to pins 4 and 6 of the TOKO coils. Then after fitting the three f.e.t.s, it should spring to life!

Another approach is to listen for the l.o. on a general coverage receiver after the resonant circuits and transistors have been added. The antenna of the other receiver is draped over the Kilve so as to hear the strong carrier from the Kilve l.o. when their tuning coincides.

If the general coverage receiver is set for the appropriate band, then swing CT2 till the l.o. signal is found. If you then connect an aerial to the Kilve, you are likely to be able to hear strong signals (especially at night), which will enable you to then peak up the r.f. tuning using CT1.

Another approach is to measure and set the l.o. frequency with a counter connected to point D; however this must be connected by a scope type 'divide by ten probe' on the counter input, to avoid excessive capacitive loading by a plain screened counter input cable.

Yet another approach is to listen for harmonics of the l.o. on a domestic Band II v.h.f. receiver. Then the difference in frequency between adjacent harmonics will be the l.o. frequency. If none of these are possible, then with a little patience, if you can find any off-air signal as the tuning is altered, you can then peak up the r.f. filter with CT1. Then gingerly alter the tuning with CT2 to find some more signals and re-peak CT1, repeating this process up and/or down in frequency until Amateur signals are heard.

The final step is to adjust CT2 so that the tuning range covers your chosen part of the band. If the tuning range is too wide, disconnect CV1B and perhaps add a small capacitor in series with CV1A. Prior to fitting the knob, it should look like the photograph in **Fig. 4**.

Using The Kilve

Using the Kilve is simplicity itself - with only one control, all you need to do is tune is for best intelligibility of the wanted signal! For 'phone, there will only be one optimum position, but for c.w. reception a suitable beat note can be obtained either just above or just below the frequency of the transmitting station – use whichever has least interference.

Because it's a simple receiver, a good antenna and earth system is highly desirable. This means generally getting plenty of wire up high, ideally in a balanced arrangement with equal arm lengths.

The receiver input impedance is low so an antenna matching unit (a.m.u.) is desirable - but not essential. If a transmitter is also going to be used then generally an a.m.u. will be required.

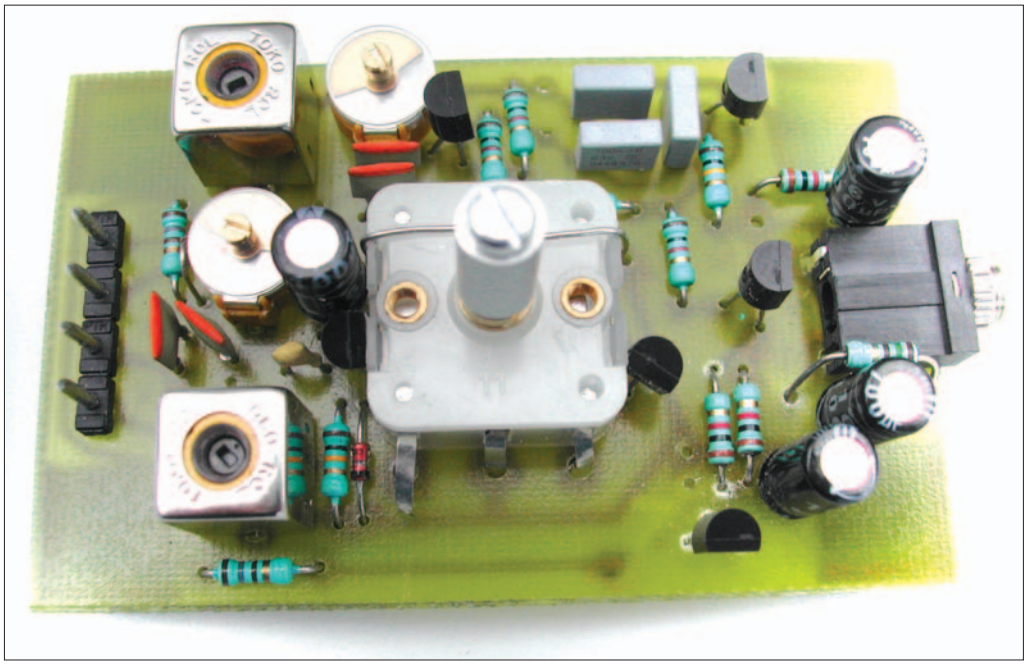


Fig. 4: Another complete Kilve but this time without the knob.

The a.m.u. will help to filter out unwanted strong out of band signals from broadcast stations that can plague simple receivers – especially at night. This form of interference is known as broadcast interference (BCI) and is easily recognised as un-tuneable mushy sounding audio.

Often a small amount of attenuation will get rid of BCI but hardly reduce the level of the desired signal. In practice this can be done with a low value pot in the receiver antenna lead or by detuning the r.f. filter away (in a frequency sense) from the cause of the BCI.

Transmitter Options

Both the d.s.b. 'phone Kilmot and the c.w. Kilton produce nominally 1.5W on any band 3.5 to 14MHz. They both have their own r.f. oscillators (using an 3.5MHz ceramic resonator or a crystal for the higher bands) to overcome chirp or 'FMing' problems.

Suitable 80m resonators are included as standard (in the kits) and give a useful tuning range with their trimmers, so that the receiver and transmitter can be tuned separately. Both can also be driven from an external l.o. source; perhaps based on the Kilve v.f.o. near 5MHz mixed with a suitable crystal, so giving transceiver operation, but gets a bit complex for such simple rigs! Both transmitters have circuitry to drive an external TR relay. So - K de G3PCJ!

PW

Kits & Bits

Kits for the Kilve family are available from Walford Electronics. They include all the parts, to build them 'open' style as in the accompanying photographs. Prices are:- Kilve DC receiver - any band 3.5 to 14MHz £19. Kilmot d.s.b. 'phone 1.5W transmitter inc 3.5MHz ceramic resonator, £24, Kilton c.w. 1.5W transmitter inc 3.5MHz ceramic resonator, £19. Optional 20m crystals for transmitter – 14.060MHz (c.w.) or 14.318MHz (phone), £2. Optional 40m crystal for c.w. transmitter 7.030MHz, £2
(7MHz crystals for phone – specials being investigated – please ask!).
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Please send your orders with a cheque direct to **Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ**.
Further information is available at **www.users.globalnet.co.uk/~walfor**

Oops! Errors & Updates

Carrying On The Practical Way, *PW* December 2005

Whoops, we managed to miss out a table from Carrying On The Practical Way by George Dobbs G3RJV, on pages 36 and 37 of the December 2005 issue of *PW*. When creating the regenerative receiver, described by George, you should use the table of winding details shown here.

My apologies to all for leaving the table out. **Editor**

Frequency range	L1 (turns)	L2 (turns)	L3 (turns)	Wire (mm/s.w.g.)
4 – 14MHz	4	15	8	0.38/28
10 – 30 MHz	2	6	4	0.71/22

The three coils are wound on a 10mm diameter ferrite rod with a length of about 50 to 100mm. See pages 36/37 of the December 2005 *Practical Wireless* for more details.

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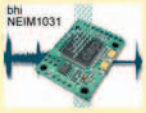

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Bencher Antennas

Butternut HF-6V
Bands: 80/40/30/20/15/10
Height (Adj): 26 ft (7.9 m)
Weight: 12 lbs (5.4 kg)
Impedance: Nom 50 ohms
VSWR: 1.5:1 or less
£299.95

Butternut HF-2V 40/80m	£229.95
Butternut HF-6V 80-10m	£299.95
Butternut HF-9V 80-6m	£349.95
Butternut HF-5B 20-10m	£319.95
30-MRK 30m ad for HF2V	£89.95
A-17-12 17&12 ad for HF6V	£49.95
A-6 6m ad for HF6V-X	£14.95
TBR-160S 160m HF2/6/9V	£114.95

Hustler Antennas

Hustler 5-BTV
5 Bands - 80-10m
Height 7.64m - Weight 7.7kg
SWR 1.15:1 - Power 1kW
£189.95

Hustler 4-BTV 4 Band Vert	£159.95
Hustler 6-BTV 6 Band Vert	£209.95

West Mountain Radio

RIGblaster Pro	£209.95
RIGblaster Plus	£119.95
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RIGblaster M4	£89.95
RIGblaster RJ	£89.95
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Nomic 4P	£59.95
Nomic RJ	£59.95

Tonna Antennas

Tonna - 20655
23cms (1296 Mhz) 55 element 21.5 dbi gain "N" 4.64m long

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Tonna 20809 2m 9el	£54.95
Tonna 20811 2m 11el	£79.95
Tonna 20817 2m 17el	£99.95
Tonna 20909 70cm 9el	£45.95
Tonna 20919 70cm 19el	£59.95
Tonna 20921 70cm 21el	£74.95
Tonna 20635 23cm 35el	£64.95
Tonna 20655 23cm 55el	£89.95
Tonna 20745 13cm 25el	£69.95

Diamond Antennas

HF10FX 10m Mobile	£39.95
HF15FX 15m Mobile	£39.95
HF20FX 20m Mobile	£39.95
HF40FX 40m Mobile	£39.95
HF80FX 80m Mobile	£42.95
CR8900 10/6/2/70	£72.95
CP6 Base 6m-80m	£239.95
X50 Base 2/70	£54.95
X200 Base 2/70	£84.95
X300 Base 2/70	£99.95
X510 Base 2/70	£124.95
X700 Base 2/70	£249.95

Cushcraft Antennas

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A3S - 20/15/10 3el Yagi	£499.95
A4S - 20/15/10 Yagi	£569.95
A3WS - 12/17 3el Yagi	£379.95
ASL-2010 13-32MHz Log	£749.95
MA5B - Mini Beam	£369.95
D3 - 20/15/10 Dipole	£249.95
D3W - 30/17/12 Dipole	£249.95
D4 - 40m Rotary Dipole	£349.95

TGM Antennas Mini Beams

** Call for prices on TGM upgrade kits.*

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MQ-34SR 6-20m 3el	£449.95
MQ-3 6-20m 3el	£379.95
MQ-26 6-20m 2el	£389.95
MQ-26SR 6-20m 2el + EH	£419.95
MQ-36SR 6-20m + Dir	£559.95

Radioworks Wire Ants

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CWS-160 160-10m (133ft)	£114.95
CW-80 80-10m (133ft)	£89.95
CWS-80 80-10m (66ft)	£109.95
CW-40 40-10m (66ft)	£84.95
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AT-1000

1KW Auto ATU - 1.8-54MHz - 1-8 secs Tune - Approx SWR Rating of 10:1

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£115.00 BEST SELLER*

LDG TW-1 TALKING WATTMETER *New*

Speaks Fwd - Rev power in Watts & SWR
Continuous tone for amplifier adjustments
Power range: 0 – 2000 watts PEP

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

£169.95 *New*

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

£29.95

LDG AT-897

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

£199.95

Accessories:

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

One-Plug-Power

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

OPP-817 £54.95

NEW! 2300 mAh Large Capacity FT-817 Internal Battery Solution Still use Internal 817 Charger

OPP-897 £89.95

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One-Big Punch

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

OBP £49.95

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

MAX PUNCH £165.95

You can also enjoy the "MAX PUNCH" option that features the HC-4 with the OBP and the HC-5 (w/o OBP). The TONE switch is used to select which element is operational.

HAND MIKE £57.95

W4RT Electronics Microphone with One BIG Punch Speech Compressor included.

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

One-Board-Filter

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

OBF £229.95

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

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

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

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

One-Touch-Tune

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

OTT-817 £54.95

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

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ATX Walk--about PL-259

£47.95

The ATX Walkabout covers all bands (including WARC bands) from 80-6m, 5W guaranteed, 25W max. When fully telescoped it is about 65 inches long. This makes it ideal for the FT-817 or any other portable HF radio.

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ATX Walkabout PL259	£47.95
ATX Walkabout Universal	£54.95

The Miracle Whip

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

Power Limits 25W PEP 10W Cont.

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Carrying On The Practical Way

This month - along with sizzling sounds - the Rev. George Dobbs G3RJV announces he's playing with single chips! But they don't need cooking - only a little effort to provide pleasure after you've read the appropriate quotation.

"A man with a watch knows what time it is. A man with two watches is never quite sure". **Segal's Law**

I must admit that a lot of my Amateur Radio construction is coloured by the requirements of writing this column. Preparing a little practical project each month for *PW* is a source of pleasure to say nothing of being a motivation in keeping my soldering iron hot - especially when there are so many other calls on my time.

Although I keep a file of potential ideas for the column, sometimes it is difficult to keep the projects flowing. At other times I'm inspired by what other people have been building and think, "I'd like to try a version of that idea" or "that bit of the circuit might be worth trying for *PW*".

Hans Summers

Recently, I was inspired by a project by **Hans Summers G0UPL**, based upon an idea from the late **Geoff King G3MY**, which appeared in the winter 1987 edition of *Sprat* (the journal of the G QRP Club). The original idea was the 'Unichip'; a transceiver for 3.5MHz built around a single CA3086 (or CA3046) transistor array integrated circuit (i.c.).

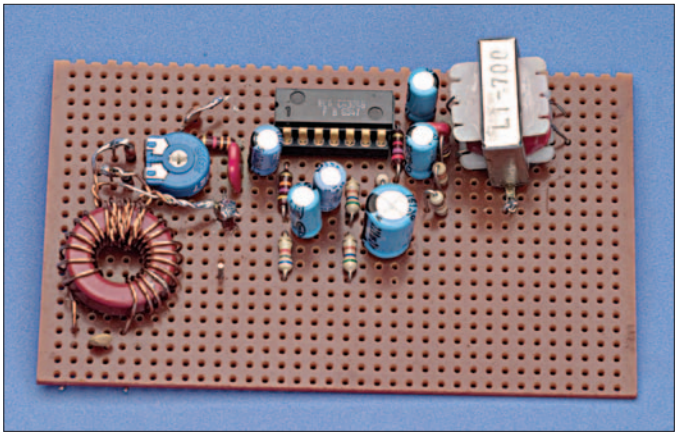
The project uses the five transistors in the array; one for a crystal oscillator, one as a transmit pre-amplifier and three for the receiver audio stages. To this combination Hans added a single IRF510 m.o.s.f.e.t. power amplifier. And having had some successful contacts with the transceiver in the UK, Hans decided to take it on a business trip to the eastern United States.

In his hotel room Hans used a makeshift antenna made by stripping out four lengths of wire from a culled network cable and joining them to form a single wire of about 32 metres long. One end was secured to a mineral water bottle and the other was thrown into a tree outside his second story window!

The wire was tuned with a home-made antenna matching unit against the mains supply earth - accessed through a dissected power lead. Over two evenings his little 2W, crystal controlled, transceiver provide Hans several solid contacts and a lot of fun.

I was especially interested in Hans' escapades because I had built my own version of the Unichip shortly after it first appeared in *Sprat*. I looked around to see if I could find it in my collection of junk but it had disappeared; probably stripped for parts sometime since it was last used.

However, I did find several CA3046 chips in my collection and decided to play with the circuit again. Incidentally, the CA3046 and the CA3086 are identical in connections so either can be used and both are cheap to buy. Hans praised the receiver results for so small a component count, so I decided to have a try at the receiver portions of the Unichip.



This month's project offer a lot from one chip - in the form of a single i.c. receiver!

Five Transistors

The CA3046 (or CA3086) consists of five general purpose silicon *npn* transistors on a common monolithic substrate, **Fig. 1**. Two of the transistors are internally connected to form a differentially connected pair.

In the case of our amplifier, this will be Tr1 and 2. The transistors of the CA3046 are well suited to a wide variety of applications in low power circuits from d.c. applications to the v.h.f. range. They may be used as discrete transistors in conventional circuits - as in our case.

The original Unichip receiver circuit operated on the 3.5MHz band, but I decided to try it on the 7MHz band. The circuit diagram for the receiver is shown in **Fig. 2**. It's a simple direct conversion receiver using a pair of diodes as the mixer.

The receiver input is tuned by C1 and L1. The inductor L1 has a tapping in the coil to match the antenna input to the usual 50Ω impedance used by most Amateur Radio antenna inputs.

The inductor L2 is a bifilar wound link winding to couple the signal into the diodes (D1 and D2) 180° out of phase. Almost any common silicon diode can be used for D1 and D2 and I used 1N914 devices. A purist may want to use a pair of matched diodes, although a balancing potentiometer, P1, has been included in the output from D1 and D2.

An 'even purer' purist might like to replace the silicon diodes with a pair of germanium or even Schottky diodes. All are noble options but the common silicon diodes worked fine in the circuit!

Direct Conversion

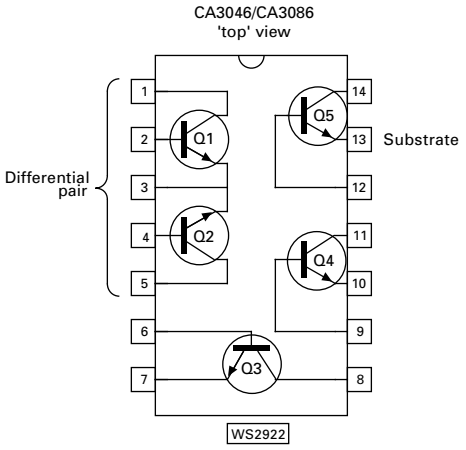
As this is a direct conversion receiver, a local oscillator signal is required at the desired frequency of the receiver. This mixes with the incoming signal from the antenna and produces upper and lower audio frequency sidebands which will be amplified to hear the desired c.w. (Morse) or s.s.b. (Single Side-Band) signal.

The local oscillator signal is injected into the receiver circuit on the balancing resistor, R1, side of the series resistor, R2. **Note:** A diode mixer does require quite a lot of local oscillator signal injection; in the order of a volt or more. Germanium or Schottky diodes will require a little less signal injection for the desired results.

The audio amplifier uses three transistors on the CA3046 chip. This follows the original **G3MY** circuit. It's a high gain three stage directly couple circuit with adequate decoupling and some feedback to prevent instability.

The first two stages use the differentially connected pair of transistors and so have commonly connected emitters to ground. The audio output is taken from the final stage via C8 to a matching transformer, T1.

Note: If the constructor wishes to use high impedance headphones, they can be connected directly to C8 without the need for the transformer. The LT700 transformer is a typical transformer of the type used to match a loudspeaker to a two transistor push-pull output stage commonly used in older transistor radios. The centre tap wire on the primary is not used in this circuit and an alternative would be to use an output transformer culled from an old transistor radio.



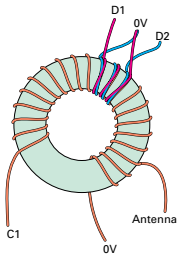


Fig. 1: The CA3046 (or CA3086) consists of five general purpose silicon *npn* transistors on a common monolithic substrate (see text).

Fig. 1a.

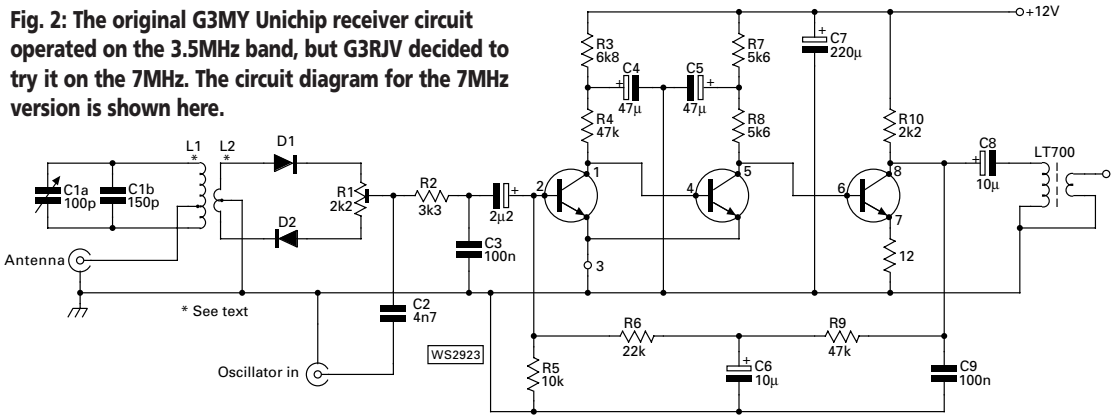


Fig. 2: The original G3MY Unichip receiver circuit operated on the 3.5MHz band, but G3RJV decided to try it on the 7MHz. The circuit diagram for the 7MHz version is shown here.

Likely Problem

The only likely problematic section of the circuit is the winding of the inductors L1 and L2. Some constructors do shy away from bifilar wound coils, in spite of the fact they are really quite simple! And this is simple because I have chosen a large core and a thick gauge of wire.

Begin by making 21 turns of 0.56mm (24s.w.g.) enamelled wire on the core. Space it out to occupy about three-quarters of the radius. Remember that each time the wire passed through the core counts as one turn. The tap can be added by scraping away enamel from the third turn, tinning the exposed portion with solder and adding a wire for the antenna connection.

To make L2, take about 200mm of the same wire and bend it in half to form two 100mm parallel wires. Twist the wire together until there are about four twists per centimetre and treat this as one wire and wind three turns around the centre of L1.

Next, open the twists at either end of the winding, scrape off the enamel and tin the bare copper. Use a multimeter to sort out the beginning and ending of each winding. The beginning of one winding is connected to D1. The end of this winding is connected to the beginning of the second winding. The end of the second winding is connected to D2. That's all there is to it! The insert drawing **(Fig. 1a)** shows the connections and the dots show the beginning of each winding.

The input tuned circuit can be used without adjustment and the circuit is as I've modified my own project. The pre-set capacitor in the tuned circuit allows some adjustment. The values shown should work but this may depend upon individually wound examples. (Some experimentation with values may be required).

Local Oscillator VXO

In the original Unichip project the local oscillator was a variable crystal oscillator (VXO) using an internal transistor in the CA3046 (pins 9, 10 and 11). Conveniently I already had a VXO for 7MHz (used in a project described in this column for October 2005) and the circuit is shown in

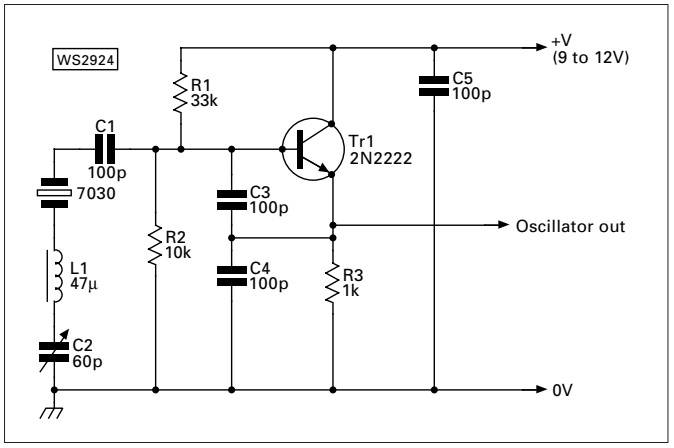


Fig. 3: Using a variable crystal oscillator (VXO). See text.

Fig. 3. This example uses a 2N2222 device but the reader could use a remaining internal transistor in the CA3046. (The layout will be tight but *PW* readers are ingenious people!).

So, here's something else to try on dark winter evenings! The amplifier is surprisingly good, although care has to be taken with layout to ensure stability.

It is a simple receiver; it even lacks a gain control but it's surprisingly effective. If a reader really wants to add a gain control, a basic input attenuator can be added. A 1kΩ linear potentiometer added at the antenna input will do the job. A lot of 'stuff' from one chip and I hope you enjoy using it. **PW**

The Secret Antenna

Bob Harry G3NRT proves that not all April Fool's articles are a joke. Sometimes they can be made to work!

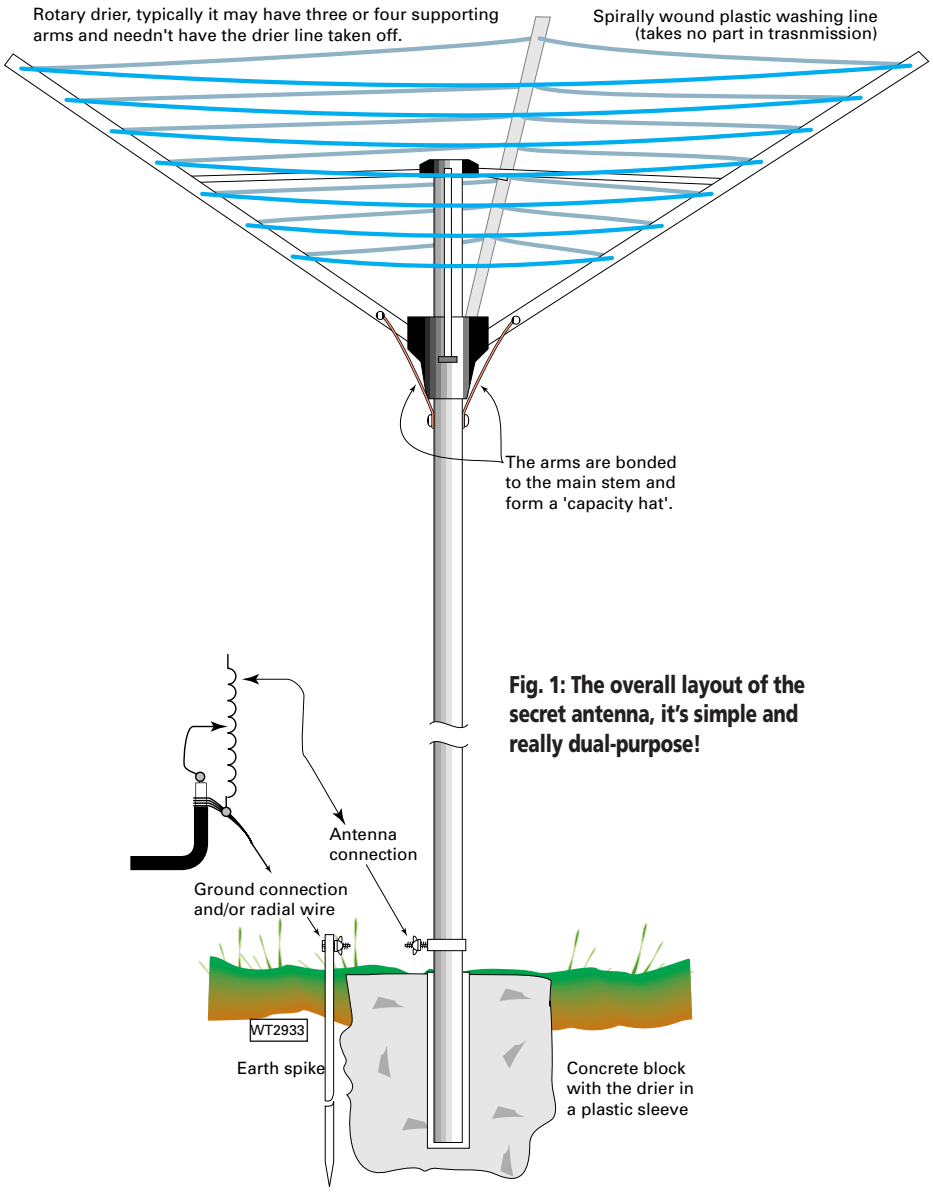


Fig. 1: The overall layout of the secret antenna, it's simple and really dual-purpose!

Some years ago in a radio magazine (though not *PW*) there appeared an April Fool article describing a rotary clothes line as an antenna. I didn't find it amusing, for at first sight the rotary washing line is only a short vertical with a capacity 'top hat'. In fact it's not too dissimilar to the sort of antenna used on 1.8MHz operation by mobile operators.

So to prove a point, I took my TS-520SE into the garden, connected the output to the base of our own rotary washing line, threw out a length of wire as a counterpoise and worked a Hungarian station on voice using s.s.b. The contact was so good, I received a 55 report. So, satisfied I returned indoors and to Amateur operation using less exotic antennas.

The years passed, and I thought no more about the idea, until one day my wife said it was time to replace the rotary line. The memory of that single contact energised me to see whether 'improvements' could be made to effect a better radiator before the clothes line was replaced. As it was to be replaced, I was effectively free to do whatever I liked to it.

Vertical Metal

The type of rotary washing line I refer to, has a vertical metal tube, some 35mm in diameter. Some go into a ground-piecing spike, but ours was resting in a plastic tube embedded in a chunk of concrete surrounded by grass. Each of the four metal arms, was 1440mm long, and spread outwards and upwards at an angle to support the line. The plastic washing line is wound in a spiral form around the frame, giving a great deal of 'space' while taking up little real-estate.

The plastic tube insulates the rest of the metal line from the earth. My first move was to drill two holes in the vertical portion and the each of the spreaders and link them electrically with short lengths of copper braid. I now had a short vertical with - depending on how you viewed it - a short vertical antenna with a capacity top - or a slightly longer one with several bent top parts.

I connected the inner connection of some coaxial cable, via a car exhaust clamp, to the bottom of the support pole. I then connected a simple counterpoise about 5m long, connected to the screen of the cable and laid it out on the grass. The other end of the cable was connected through an s.w.r. meter to my trusty TS-520SE - 25 years old and still going strong!

The reason for using the old TS-520SE 'war-horse' was because it possessed an adjustable pi-network, matching the transmitter's output to whatever impedance was presented to it. Most modern transmitters are designed to work into a 50Ω load and shut down if the load impedance is too high. As I didn't know what value of feed impedance I would be encountering, I thought that it would be easier to use the older rig.

Suburban Garden

Assessing antennas in a suburban garden is difficult if not near impossible because of size and area constraints. Professionals

usually have acres of land and lots of expensive test equipment, which I did not have. But I did have a multi-band vertical antenna that I normally use. Like my transceiver (and myself) the vertical is venerable, and only covered the 'old' bands of of pre-WARC days (3.5, 7, 14, 21 and 28MHz).

I reasoned that comparing this 'old' vertical antenna with the clothesline was as fair an assessment as any. I even connected a similar length of coaxial cable to both the new antenna and the vertical, so that cable losses would equal (or at least very similar).

My first check was to measure the s.w.r. at the transmitter point to the new 'antenna'. I found just under 2:1 was typical for 14 21, and 28MHz, but a little under 3:1 was evident on 7MHz, with an absolutely awful 4:1 on 3.5MHz.

Listening on the bands and switching between antennas showed the clothesline to be several S-points weaker than my main vertical, but I found it rather difficult to assess accurately. Signals would fade, or stations would stop transmitting just as I was making a comparison. It was difficult to be certain about the efficiency of my clothes line antenna.

Definitive Answer

Not discouraged by my inability to find a definitive answer, I contacted my friend **Rob G6BDV** who, as well as being the owner of a switched attenuator, lives about 500m away. At such a close distance reception would certainly be by ground-wave and therefore free from fading. This, I thought should make definitive readings easy to evaluate.

With Rob's help we carried out a series of signal strength comparisons. Rob placed the attenuator in series with his antenna and made adjustments it to give the same S-meter reading from signals from both my antennas. So, when I switched antennas he readjusted the attenuator to get the same S-meter reading. This way the S-meter merely provided a reference point the difference between the signals was the difference between the two attenuation levels.

The results are shown in **Table 1**. To allow for readers who may not be familiar with decibels (db) I have added a third column, which converts the dB reading into the equivalent power that would be needed to make the clothes line antenna produce the same signal strength as the vertical.

Although poor on 3.5 and 7MHz the clothes line was only 5dB down on 14MHz and was better than the vertical on 21MHz. This improvement reversed on 28MHz, where it was down by 10dB. So, on 3.5MHz, to make up the 25dB difference in signal strength I would need a staggering 316W fed to the clothes line antenna, for every 1W fed to the reference vertical!

"Sorry old man - QSB caused by flapping washing".

Band (MHz)	Gain (dB)	PWR equiv. needed (W)
3.5	-25	316
7	-20	100
14	-5	3
21	+5	0.3
28	-10	10

Table 1: Signal strength comparisons. (See text for more details.)

More Efficient

The figures in Table 1 show that the clothes line antenna becomes more efficient as the frequency goes up, until, on 21MHz it's actually more effective than my vertical antenna. Then on 28MHz I again needed 10W fed to the clothes line for every watt to the vertical. The tests were carried out on an empty line. When damp clothes were hung on the device, it changed the s.w.r. slightly but had no noticeable effect on performance. But enough of numbers, would the secret antenna (as I now thought of it) get QSOs?

Calling CQ on 14MHz - using the (reference) vertical antenna - I contacted a Swedish station and received a 57 report. Switching to the clothes line the report changed to a 53 one. To try to improve performance I tried adding extra ground wires but no improvement followed.

I then realised I was making the mistake of treating the secret antenna as if it was like my vertical - insulated from earth. It obviously was not; the bottom of the vertical metal tube formed a capacitor, with the plastic sleeve as a dielectric, and earth. There was also unknown resistance between the base and earth. Whilst I could do nothing about the resistance, if I put a coil between the feed-point and earth (cable outer braid and counterpoise) the capacitance would then become part of a parallel resonant circuit.

Band conditions were not good at the time of these tests and the best band was 14MHz so, I selected this band for testing. I connected a 7µH coil across the feed-point to the washing line and with a couple of short leads with crocodile clips tapped up and down the coil for best s.w.r., adjusting both the tap to the antenna and the coaxial cable, as shown in **Fig. 1**. Once the best s.w.r. was found the clips were replaced with soldered wire connections. Everything was mounted in a plastic sandwich box to provide weather proofing.

Returning to the shack I tuned to 14MHz and found a s.s.b. contest in progress, and I quickly worked stations in European Russia, Romania, Ukraine and Sicily.

They all gave me 59 reports! Well, of course these were 'contest 59s', but none of the stations spoke those classic words "You're 59 - please repeat my report and serial number."

Improved Performance

Adding the coil improved the performance on 14MHz but it made the antenna effective on one band only. Later, I removed the coil and reconnected a shorter coaxial cable directly to the antenna. I had a contact on 14MHz with a station south of Hamburg who gave me a report of 59 on the vertical and 5/6-7 on the secret antenna. It is a matter of choice whether single band working is worth sacrificing the other bands.

The antenna comparisons and contacts on 14MHz indicate that the secret antenna should give reasonable performance for its size on all the bands from 14-28MHz without the complication of a matching unit.

A well known High Street chain of shops sells 'rotary airers' of various shapes and sizes, the most expensive costing £70. One advertisement in a recent *PW* offered an h.f. vertical for the same range of frequencies at £99.95. You do the maths!

The secret antenna is very good value. If you have a small garden or restrictions on the erection of antenna, you would be a fool not to try the 'secret antenna'! **PW**

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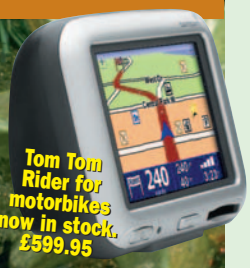

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Ram Raiders

Steve Mahony VK5AIM shares some more stories involving Amateur Radio in Australia. This time the story sounds a bit sheepish with woolly operating procedures - but ends up providing a new use for Amateur Radio direction finding and impressing the Victorian State Police!

Rob and **Alan** are two Amateur Radio operators who live in the mid-North of South Australia, Burra, Hallet, Mount Bryant, Booberowie. Rob is a farmer, Alan is an agriculture machinery mechanic. Their common interest is Amateur Radio and Farming. Like all farming folk, they use u.h.f. CB radio. Out in the country, there are no 'ratbags' abusing it here in VK!

Rob and Alan decided to go to one of the big interstate Hamfests/Field Day. For two country men, it was an eye opener. They saw aspects of Amateur Radio and met people associated with the hobby that they didn't know existed. They enjoyed it and were most impressed.

Foxhunting On 144MHz

An activity that caught their interest was Fox Hunting on 144MHz. Some time later they decided to try fox hunting for themselves. Alan found a 12MHz crystal (x12 = 144MHz) on some old computer boards providing a suitable output channel .

A few transistors, components, a bit of p.c.b. and a box and they had a 2m fox! It pinned the 'S' meter needle on the home receiver and they could copy it on the hand-helds. Taking it a kilometre or so out into the paddock and sitting it on a fence post, they could copy it quite well at the home QTH. They could even d.f. it with the Yagi beam antenna.

The next project was a small portable 3-element Yagi beam antenna. Some aluminium welding rod, a small trimmer capacitor for the Gamma match, along with a piece of broom stick and they had their Yagi beam. The ease and skill of building the antenna showed the skills and versatility of these Australian farmers! It worked okay, with a good 'Null' off the back. But how were they going to try the Fox out? The matter was left for a later date.

Fox & Sheep Trials

A week or so later Rob said to Alan over the radio. "I know how we can try out the Fox transmitter". "Yes, how?" asked Alan. "Why not attach it to a sheep!" - replied Rob. A thoughtful Alan replied; "A good idea, it will wander around to give us a moving target, probably run off as we get close to it"!

Alan made up a box for the batteries, this he attached to a curved aluminium plate, along with the transmitter. "Now, you supply the sheep"! he said to Rob.

Next day, Alan arrived at Rob's complete with transmitter, 3-element beam and hand-held. "Come on, let's find your sheep. I know an old ewe who is used to people, she will be no trouble".

Off they drove in the 4x4. It didn't take them long to locate the required ewe. It was easy catching her, as Rob said, she was used to people. It did not seem to bother sheep as he attached the transmitter to her back, with binder twine. When turned on, it pinned the needle on the hand-held's 'S' meter. When let go, she trotted off to rejoin her mates, as though the transmitter did not exist!

Rob and Alan got back in the 4x4 and drove away from the flock, when the sheep were just a dark patch in the paddock, they stopped. Alan climbed up onto the tray with the sheep dog. He lashed the antenna support pole to the back frame of the 4x4 with binder twine (marvellous handy stuff, you can use it for so many jobs) attached the coaxial, tuned on the hand-held and there it was, quite strong, peaking up off the front with a null at the back.

They drove round the paddock, taking a fix on the sheep. Even when down in a hollow where the sheep were not visible, they got their DF fix. From a height point behind a clump of trees and when the sheep were a dark shape in the distance, it still worked okay.

When they approached the sheep close, the null of the back of the beam worked best. The 'Radio Ewe' was caught and relieved off her transmitter, totally unaware of what had gone on. They both agreed it was fun and interesting - although they didn't ask what she'd thought of it!

Idea Grows!

Rob and Alan must have commented to each other about their fox hunt transmitter over the local repeater. Some of the other Amateurs were quite interested, one asked when were we all going to have a radio controlled sheep hunt? "Okay" commented Alan, "when can we have a sheep hunt on your place Rob"?

The friends arranged to get together one Sunday afternoon. On the appointed Sunday, five Radio Amateurs, complete with various portable antennas and 144MHz hand-held radios arrived at Rob's place. "Well, where's this radio controlled sheep?" they asked.

Alan got out the ox transmitter, he had modified it so that it was only on for about 15 seconds and off for 45 seconds, to help save battery power. "Okay', said Rob, "I'll ride out on the quad bike, attach it, turn it on and inform you all via the local repeater. I will tell you the frequency then. You have to go on foot you know, no cars, or bikes in the paddock with the sheep. I'll join you - just for practice".

Off Rob went. Some 20 minutes later, up came Rob on the repeater. "Okay, it's going. It's on 146MHz, see you in the paddock".

The five Amateur hounds switched on their receivers, dialled up the frequency and waved their antennas around. Yes, there it was, over that way. Rob had left the bike, hopped the fence into the paddock and had come back almost 45° to the direction he had headed. The six set off like a group of school kids. It took quite some time, they had to cross an erosion washaway and of course lost the signal while down in the dip. It got difficult when the flock of sheep ran away from them. The Amateurs who were farmers and could handle sheep did better. They drove them into a fence corner and then located the radio sheep. After much chasing and shouting, although they were not as good at it as the sheep dogs, they had the radio sheep!

A short time later, Rob arrived switched off the transmitter and removed it from the sheep. They all agreed it had been fun. How about asking more Amateurs to join in and finishing up with a picnic barbecue down by the creek! Yes a good idea.

Ram Rustling!

Before they had a chance to Sheep Hunt again my friends had an interesting and rewarding experience. It became known that someone was rustling or stealing sheep. To be more precise, Rams!

The 144MHz Foxhunt transmitter worked well on the sheep's back and the animal seemed unconcerned - the signal was 'end stopping' on the receiver. They were ready for DFing the sheep on the range.

Only a couple of rams were stolen at a time. They were not missed for a couple of days, by that time it was too late. They could be many kilometres away.

A day or two later Alan said to Rob, "I think I have an idea to catch the 'Ram Raiders' - you know how you put the dye markers on the rams so that they mark the ewe, they've serviced.

"Yes" Rob replied - why not replace it with our fox transmitter? We'll know where it is and may be able to track the thief! It's worth a try".

Transmitter Modified

Alan did a bit more work on the fox transmitter. A resonant antenna, better batteries and a light sensitive switch so that the transmitter only came on during the night time, when the ram raiders were active. He borrowed the ram harness and substituted the transmitter for the dye box. (It's a good job that r.f. is not affected by wool!). Following the modifications we felt that we should be able to detect and track the fox-equipped ram a good distance with the shack radio and the Yagi beam.

Alan then remembered that one of the other Amateurs had said he had a tracking d.f. unit. It had been described in an electronics magazine some time ago and then came out as a kit. He'd built it, it appeared to work, but he had never really tried it out.

Alan borrowed the tracker receiver and set it up in Rob's shack. It had a compass 'rose' made up of l.e.d.s. The l.e.d.s lit up indicating the direction of the received signal. Curious, we tested it - the unit worked okay when someone wandered around the property with a hand-held.

A day or two later the friends brought a chosen ram into the stockyard. Alan had everything ready and set-up. Rob's wife came out to see how all this technology was going to foil the ram raiders!

It was when Alan had attached the transmitter to the ram that Glad, Rob's wife, started laughing and had to sit down on an empty drum and wipe her eyes dry. Alan and Rob looked at one another and asked "What are you laughing at"? "You two, you'll shoot, poison, trap or whatever to catch a fox and here you are attaching a fox to a sheep - talk about a fox in sheep's clothing"!

Alan had moved the d.f. receiver along with another f.m. receiver into Rob's kitchen. The special antenna was mounted on a pole outside the kitchen window. The f.m. transceiver with its Yagi antenna, out in the radio shack, could then also be used to track the signal.

Travel Ram Style

With everything checked out and working, Rob loaded the radio into the back of the car. Yes, rams worth four figures don't ride in 4X4s, but travel in style! He headed out to the chosen paddock.

About 20 minutes later, Rob called up on 2m simplex. "Okay, I'm testing the transmitter, can you hear it and see its location on the display?".

"Yes, they replied NNE l.e.d. blinks when the transmitter comes on".

"Good, I'll let him go and we will see what happens" replied Rob. That evening, after it got dark, the l.e.d. on the receiver lit up and Rob could d.f. the signal from the radio shack. Alan reported he could do likewise from his place.

A week or more passed, Rob and Alan had monitored the 'Radio Ram.' The l.e.d. on the d.f. receiver only changed one segment either way, in all that time, indicating that he hadn't wandered far in his paddock.

However, one late Friday night, Saturday morning, to be precise, at about 0100, Rob had need to get up. On his way back to bed, he looked in at the d.f. radio receiver. He looked at the indicator, then looked again. The l.e.d. indicating SSE was blinking and the audio signal was in and out of the noise!

The Radio Ram had moved considerably

from his paddock! He had been Ram Napped! Rob quickly raced to the radio shack, switched on the 144MHz receiver.

There was no signal from the Radio Ram in the normal direction. Rotating the beam to the direction indicated by the d.f. receiver, the signal peaked up. Rob quickly roused his wife, Glad. "I think our Radio Ram has been taken! He's not in the normal direction. Get dressed and be prepared to operate the radio shack and the phone".

Rob then 'phoned Alan, who, after waking up properly, said he would check the ram's direction from his QTH, when confirmed, get dressed. Rob did the same, and together with his wife, studied the district map on the shack wall.

"I reckon that the ram rustler had come in by the Pots Road gate crossed the south east paddock to the ram paddock and gone out the same way". "Yes", said Glad, "gone along Pots Road to Wilsdon Road, which then joins the highway to the Victorian border".

Rob phoned Alan, who was just getting read to go in the 4x4. "Okay, I'll head for the highway from my place, head for the Victorian border, all the while listening for the Ram Radio signal".

Alan replied; "Good, I'll get on the quad bike and see if I can see any sign of the vehicle or catch up with it". "I have the 2m hand-held and mobile 'phone with me".

Glad made them a cuppa and went out to the radio shack while Rob set off on the quad bike. The south paddock gate was still open as Rob went up Pots Road, towards Wilsdon Road. Once he turned up this road and had gone some distance he could just detect slight dust clouds in the headlight beam, indicating that a vehicle was some distance ahead.

Rob hoped he didn't turn into a Kangaroo or Wombat in the dark, if he did - it would mean the end of the chase. As he topped some of the rises, for the road had to cross a range of hills to get to the highway, he caught a glimpse of headlight beams lighting up the trees on the side of the road. He thought he saw a red tail light, but he wasn't sure.

Minutes later, Rob felt his mobile 'phone vibrate in his pocket. He would not have heard it with his safety helmet on and the noise of the bike. He slid to a halt in a cloud of dust and answered it. It was Alan. He had just joined the highway and was 25km down the road and could just hear the Radio Ram's signal as he crested the rises, on the 144MHz radio.

"Good," said Rob. "It will be quite a few minutes before I get to the highway. I don't know how much fuel is in the bike. I had better wait for you there".

Alan replied;"You hide the bike just inside the gate of the property close to the road junction and walk to the junction. Use the 2m radio to call me, when you're there. Call on top of the Ram signal and I'll reply. I'll call again when I'm close". The reply from Rob was a brief "Okay".

Then up came Glad. "I hear you Alan. The Ram's signal d.f. bearing is a bit more east and it is in and out of the noise".

Alan replied;"Okay, monitor the signal and we'll keep you informed".

Junction & Gate

Rob came to the junction of the highway, turned around and went back till he found a gate. Undid it, for all farm gates are the same. He parked the quad bike against a post, closed the gate and walked up to the highway. At the highway, he called Alan on 2m using the hand-held, "Okay, I'm about 15 minutes away, watch for my lights".

Rob couldn't hear the Radio Ram's signal on the hand-held, so he just listened for Alan. Minutes later a pair of headlights appeared. "Is that you?" Seconds later the lights dipped and a voice replied, "I see you". The 4x4 rolled to a stop, the door opened and a voice said, hop in, it's good to see you Rob"!

It was much more comfortable in the car than on the bike. Rob had dressed quickly and not for bike riding. He asked "How far ahead do you think the rustler is"?

Alan replied "It's hard to say, he's probably got a 4x4 with a horse box on the back".

"You wouldn't do 120kph with that lot", said Rob. "Not at this time of night and draw attention to yourself. How far into Victoria do you think he will go before unloading the Radio Ram and hiding it?".

Alan replied - "Got no idea. Here, use the mobile 'phone and call the Police Stock Squad and see what help you can get".

Rob, after being shuffled around, spoke to the local Stock Squad officer. After explaining what was going on, they informed Rob that they were 50km away and wouldn't be able to get there before the rustlers crossed the border. He asked for Rob's mobile 'phone number and said he would call the Victorian Stock Squad, inform them and get them to call Rob.

Rob explained everything to Alan. "We're still about 30km from the Victorian border. The Radio signal was getting stronger and still ahead. Their big 4x4 wasn't loitering! They were travelling at the speed limit, exceeding it on some of the long down hill slopes.

"I don't think there will be too many Laser Speed Guns out here at this time of night!" said Alan. "And besides, we have a good excuse"!

They continued racing along in silence. The mobile 'phone rang. It was the Victorian Stock Squad, they were at a small 'one horse town' some 10 to 12km over the border on the highway. They'd call if they stopped a likely looking vehicle.

The signal was now steady and ahead and as they crossed the border, the 'phone beeped. It was the Stock Guard Officer, "We have your Ram Raider, pull up behind the horse box stopped under the only street light in the town. You'll see the accompanying police car with us". By then the Radio Ram's signal was full scale on the radio.

Red & Blue Lights

As Rob and Alan reached the rise, they could see, in the distance, the single street light and the red and blue flashing lights of the police car. In a few minutes they rolled to a stop with the headlights lighting up the rear of a horse box attached to an old Toyota Land Cruiser.

Police and Stock Squad officers were standing around the lowered ramp. The lights showed one side stacked high with straw bales.

Bales that had been removed from the trailer to the other side of the road. These had revealed the Radio Ram sitting comfortably between more bales. He was looking unconcerned and blinking at the lights, as much as to bleat, "what's all the fuss about"?

Rob and Alan got out of the car and there were introductions all around. "What clever technical tricks have you two been up to? How do you know this is your Ram"? - the police officer enquired.

Rob took his hand-held off his belt, and turned it on. The signal was excessively strong. "I'll show you" he said. He walked up to the ram with the receiver overloading. He reached down to the Ram's Transmitter and switched it off! The hand-held went quiet.

"Okay" said the Stock Squad officer, "come back to the car and we'll write out a report". (The two rustlers were already in custody in the back of their car with another police officer).

While they wrote out the report, Rob 'phoned Glad to say they were okay and had caught the 'Ram Raiders'.

She replied "Yes I saw, and heard it go off, so I guessed you had found it".

He told her "We'll both be home when all this is sorted out. Cheerio"!

The officer turned to the friends and said; "We'll have to take your Radio Ram with the vehicle back to the stock yard as evidence. We'll let you know when you pick up your Radio Ram with his transmitter". This they did a few days later, none the worse for his adventure.

The local Amateurs thought that the whole episode was a big plug for Amateur Radio with the publicity. Some months later, Rob and Alan had to attend the court case in Victoria. The magistrate complemented the pair on their use of technology.

However, as to whether the Amateur Radio group will have any more radio sheep hunts in the future, I don't know! **PW**

Antenna Workshop

The Vårgårda 3-element

David Butler G4ASR tries out his Skandinavian pronunciation as he takes a look at the 3EL6 antenna, a three-element Yagi made by Vårgårda of Sweden.

The 50MHz (or six metre band) is probably the only band that will support just about every form of propagation mode that you can think of. And this is one of many aspects that makes operating at this frequency so interesting! When the band was originally first released to UK Amateurs there was relatively little activity and equipment was either imported from the USA or home-built. Since then the situation has radically changed with almost every country, European and world-wide now having an allocation, however small, in the 50MHz band.

Commercial equipment such as transceivers, transverters, amplifiers and antennas are now readily available from various suppliers. Antennas come in various shapes and sizes and it is very important to recognise that the antenna is the most important component in your station. Both your receive and transmit capability will be improved when using an antenna with gain and this is particularly useful at 50MHz where propagation events can at times be weak and transitory.

The antenna that I was asked to review is the Vårgårda 3EL6 and as the name suggests it is a 3-element Yagi designed for use on the 50MHz band. Manufactured in Sweden by Vårgårda Radio AB, a company that has for over 30 years produced a range of towers, as well as commercial and Amateur Radio antennas for the 50, 70, 144 and 430MHz bands.

Fig. 2: An interesting construction, with twin booms and the element clamped between them. The coaxial cable is part of the matching system.

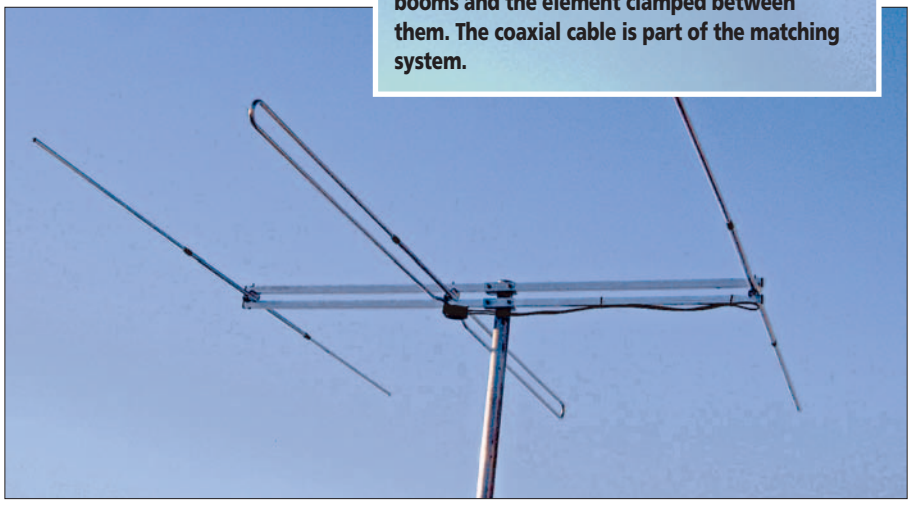


Fig. 1: The fully assembled antenna.

Electrical Specifications

I'll begin with the electrical specifications and the 3EL6 is, as you may be able to guess, a directional Yagi antenna consisting of a director, folded dipole and reflector parasitic elements as shown in **Fig. 1**. The centre of the driven element incorporates a special waterproof connection box into which the coaxial feeder cable is attached. A long length of high-quality coaxial cable comes out of two holes, one on each side of the connection box.

This cable and its connections is the balun, which does the work of matching your unbalanced 50Ω feeder to the high impedance input of the balanced folded dipole. Both the balun and connection box are capable of handling 1kW, which is more than enough for UK power levels. However, if you have a higher-power permit then Vårgårda can provide, on special order, a balun that will handle up to 2kW continuous transmitting power.

The claimed gain for the Vårgårda 3EL6 is 7dBd with a front/back ratio of 18dB making the antenna suitable for DXing and contesting. The antenna's polar pattern is very clean and exhibits an E-plane half-

50MHz Yagi

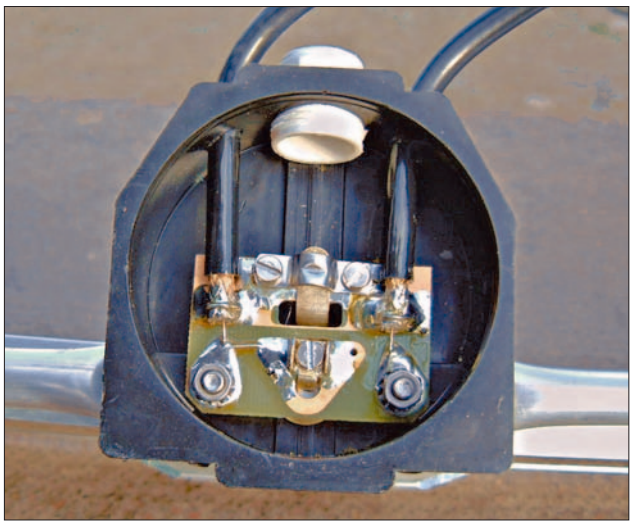


Fig. 3: Inside the feed-point box, showing the two ends of the pre-assembled matching section of coaxial cable.

power (3dB) beamwidth of 64°. In the H-plane, the beamwidth is a little wider at 75°. This antenna is optimised for use in the lower end of the band in the sub-band of 50-51MHz. Over this 1MHz bandwidth range the s.w.r. typically measures less than 1.3:1. Above this frequency range the s.w.r. rises rapidly although the 3EL6 is quite usable up to 52MHz with a peak s.w.r. of around 1.5:1

Mechanical Specifications

On the mechanical side of things, the 3EL6 Yagi has a boom length of only 1.7m and weighs in at 3.3kg. The reflector element is 3m long giving the beam a turning radius of 1.6m. The main boom is unusual in that it is actually made from two lengths of aluminium box section 18 x 24mm square as shown in the photograph, **Fig. 2**. The elements are substantial in size, with the centre sections being made from 16mm aluminium tubing. All the aluminium parts are of the highest quality and resistant against salt water. This heavy-duty approach should enable the antenna to survive harsh environments and gale-force winds.

All the screws, washers and nuts used, as well as the element-to-boom attachments are also made of high quality non-corrosive steel. The supplied clamps are adequate to allow attachment to masts of 38-65mm diameter and are designed so that the antenna is mounted to give horizontal polarisation. The antenna can of course be used for vertical polarisation provided that a horizontally positioned mast tubing is used.

Assembly Details

As with any antenna, that arrived as a self assembly 'kit' the instructions and details are paramount. The 3EL6 beam arrived in a 3 metre long cardboard box containing the pre-assembled antenna, the mast clamps and an instruction/specification sheet. Unfortunately the poorly written leaflet enclosed was for the larger 5EL6 Yagi antenna, but assembly is so simplistic that this was not really as great a drawback as it might have been. It would have been useful to know the antenna specifications though and I had to resort to finding these on the Vårgårda website.

As the folded dipole is already attached to the boom it's only necessary to slightly loosen the clamp and rotate the element into the correct position. The two other elements are colour coded and need placing into their respective clamps and tightening with a spanner. The assembly literally taking only minutes.

Unlike many other Yagis designs no coaxial connectors are used. Connection of the feeder cable is made inside a special waterproof box as shown in **Fig. 3**. This is a simple operation and results in much lower loss than using an in-line connector however, good. All inside connections are resistant against humidity and the connection box has a drain for condensed water.

One of the advantages of the 3EL6 antenna is that it's pre-tuned and no adjustments are required. So once you've connected the feeder it really is ready to go. To confirm this I checked the impedance-matching s.w.r. bandwidth. The results were very good. Between 50-51MHz the s.w.r. was very flat and the measurements I made showed less than 1.2:1 across this design range. As no tuning is required it also makes the antenna ideal for stacking.

On-Air Performance

As soon as I had mounted the 3EL6 Yagi onto my tower I used the beacons GB3BAA (50.016MHz) and GB3BUX (50.000MHz) as signal sources to check the antenna polar patterns. Though both beacons are over 150km from my location, they were received with strong 599 signals. I rotated the beam and observed that the radiation pattern was clean with good nulls either side of the main lobe and no significant lobes elsewhere.

During the review period I was fortunate to catch a few auroral and Sporadic-E openings on the 50MHz band and this enabled me to put the 3EL6 through it paces. The antenna's pattern although broad, at around 60° (in the horizontal pattern) enabled me to locate the different scattering points during auroral openings and a number of c.w. contacts were made with stations in England, Scotland and Norway.

During one auroral-E opening, I also heard the OH9SIX beacon peaking 599 over a 2300km path. Contacts were also made via Sporadic-E with stations around 1500km away in Croatia, Italy, Slovenia and Yugoslavia.

From a reception standpoint it must be admitted that the lower forward gain of this small antenna compared to my much larger array was noticeable during some weak openings. On the other hand most people don't have the space to put up a beam such as mine at nearly 10m long! I don't think I missed much though and I had more than my fair share of DX contacts.

Specifications

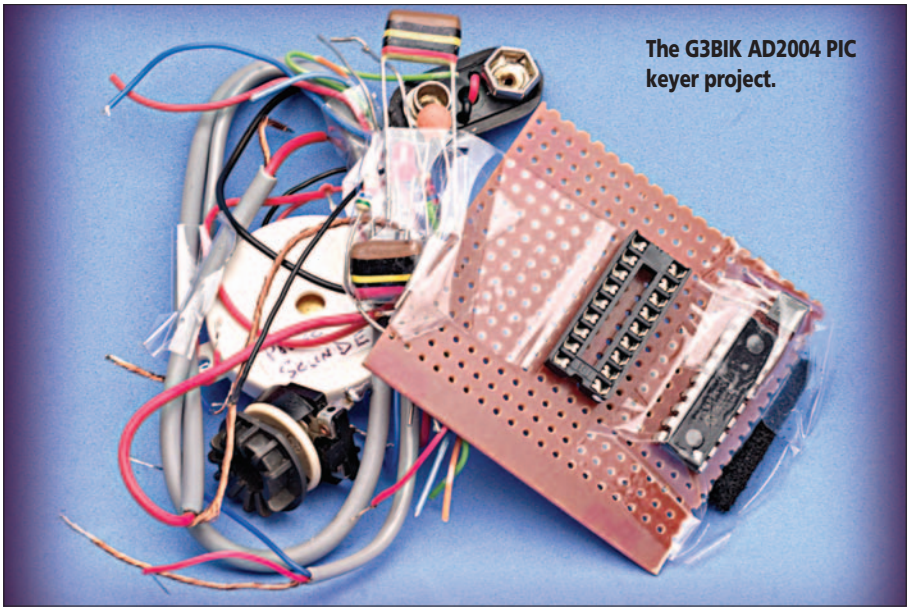
Model name	Vårgårda 3EL6
Type:	3-element Yagi
Frequency:	50 - 51MHz
Bandwidth:	1MHz
s.w.r. (50-51MHz):	<1.3:1 (51-52MHz <1.5:1 typical)
Impedance:	Unbalanced 50Ω
Polarisation:	Horizontal
Gain:	7dBd
Front to Back Ratio:	18dB
Beamwidth:	64°(E-plane) 75° (H-plane)
Power Handling:	1000W
Boom Length:	1.7m
Longest Element:	3m
Turning Radius:	3.6m
Wind Load:	298N (150km/h)
Area:	0.2 square metres
Weight:	3.3kg
Mast Size:	38-65mm

Conclusions

Mechanically the construction of the 3EL6 Yagi is excellent as it is made of top-grade materials. It's very strong and should prove up to surviving extreme environments. Assembly of the supplied antenna is extremely easy, the feeder connection to the driven element is simple, though a little care must be taken. Once connected the antenna is ready to go. Considering its boom-size the Yagi packs quite a punch. It has a clean polar pattern and is well optimised. Two of them stacked will make a compact and very effective DX array. **PW**

The G3BIK AD2005

Ed Chicken MBE, G3BIK presents his programmable integrated circuit (PIC) keyer project. It's simple to make and Ed was invited to publish his project in PW by the Editor G3XFD (see special introduction).



The G3BIK AD2004 PIC keyer project.

Special introduction: In line with our new policy of attracting authors with good, practical ideas for projects I've invited Ed Chicken G3BIK to present his PIC keyer project. The new initiative encourages articles where the author is prepared to offer kits, technical back-up or (as in this case) specialised components in the form of a pre-programmed PIC. I hope readers enjoy the projects and I ask any of your with similar ideas- especially if you are prepared to help constructors with specialised components/fault finding or programming services - to contact the *PW* offices. Ed's project was first seen when he advertised in *PW*'s Bargain Basement section and we hope to find many more ideas from our readers and authors.

Rob G3XFD

Excellent in performance yet simple and cheap to make, this PIC–based electronic keyer with Iambic function can be used either to key a transmitter, or for Morse practice. It's battery-powered and has an automatic switch-off/switch-on ('sleep/wake') facility, even though the current drain in use is only 2 or 3 milliamperes.

Electronic construction has been kept to a minimum as shown in **Figs. 1** and **2**, but the PIC must be pre-programmed using the software listing included within this article.

If you have access to a PIC Programmer and PC, you can simply copy or scan the listing onto the programming screen to automatically program the PIC, which will be then ready for use. **Note:** that not all scanners can decode text for direct use via a PC word-processor. Alternatively, an E-mail to the author could yield a programmed PIC at modest cost (details at end of text).

Twin Paddle Key

As it's an Iambic keyer, the project does of course require a twin-paddle key of your choice. It will then produce dots from one paddle and dashes from the other as is normal with electronic keyers, or to produce Morse in the Iambic mode for the more experienced operator.

The Iambic mode requires both paddles to be pressed and held to produce a train of alternating dots and dashes, or vice-versa according which paddle is pressed first.

Components RV1 and C1 determine the frequency of the PIC's internal clocking oscillator, upon which is based the Morse keying speed. The potentiometer, RV1, acts as the speed control with a range of about 5-30 words per minute (w.p.m.). However, this can be made slower or faster simply by changing the value of capacitor C1. (See Fig. 1).

The *n*-channel f.e.t. connected to the PIC's output port B3 can be used to key any transmitter whose keying line is positive with respect to ground. The keying can be monitored by the audio tone from either an electronic buzzer or a lower-cost piezo-electric sounder. An electronic buzzer will produce an unvarying tone, but the tone-pitch from a piezo-electric sounder will vary in sympathy with the sending speed.

Indicator LED

Keying activity is indicated by the light emitting diode (l.e.d.), which is connected to and driven via the PIC's oscillator output port B2. However, when the PIC switches into the 'sleep' mode - after a few seconds of inactivity - the current drain falls to nominal zero and the l.e.d. extinguishes.

Because of the sleep mode the batteries will therefore last almost indefinitely even without an **On/Off** switch, and like a TV Remote Control, the keyer is always ready for immediate use. Power is restored instantaneously when either key-paddle is pressed, and the l.e.d. indicates once again that the keyer is 'awake' and active.

Screened cable should be used for the wires connecting to the paddle-key and transmitter. I think it would be sensible to enclose the finished keyer in a grounded metal container, perhaps one of the popular die-cast aluminium case.

Program Language

The Program in Assembler Language for the PIC16F84A-04/P is as shown. The Program text and spacings must be copied as shown, column-by-column and line-by-line, starting with LIST P=16F84A finishing with END.

Start on the next page:-

```
LIST P=16F84A
#INCLUDE    <P16F84A.INC>
ERRORLEVEL  -302
__ CONFIG   B'11111111111011'
#DEFINE     PAGE0     BSF       STATUS,5
#DEFINE     PAGE1     BCF       STATUS,5
ORG         0
SETUP:
            CLRF      PORTA
            CLRF      PORTB
            PAGE0
            MOVLW     B'00000000'
            MOVWF     TRISA
            MOVLW     B'01110000'
            MOVWF     TRISB
            BCF       81,7
            BCF       PORTB,6
            PAGE1
            MOVLW     0
            MOVWF     0F
            CLRF      8B
            GOTO      KEYING
DOT:
            MOVLW     55
            MOVWF     15
DOT1:
            BSF       PORTB,1
            MOVLW     0A*2
            MOVWF     0C
            MOVWF     0E
DOT2:
            DECFSZ    0C,1
            GOTO      DOT2
            BCF       PORTB,1
DOT3:
            DECFSZ    0E,1
            GOTO      DOT3
            DECFSZ    15,1
            GOTO      DOT1
            RETURN
SPACES:
            MOVLW     55
            MOVWF     15
SPACE1:
            NOP
            MOVLW     0A*2
            MOVWF     0C
            MOVWF     0E
SPACE2:
            DECFSZ    0C,1
            GOTO      SPACE2
            NOP
SPACE3:
            DECFSZ    0E,1
            GOTO      SPACE3
            DECFSZ    15,1
            GOTO      SPACE1
            RETURN
DASH:
            MOVLW     55*3
            MOVWF     15
DASH1:
            BSF       PORTB,1
            MOVLW     0A*2
            MOVWF     0C
            MOVWF     0E
DASH2:
            DECFSZ    0C,1
            GOTO      DASH2
            BCF       PORTB,1
DASH3:
            DECFSZ    0E,1
            GOTO      DASH3
            DECFSZ    15,1
            GOTO      DASH1
            RETURN
KEYING:
            BTFSS     PORTB,4
            CALL      KEYDOT
            BTFSS     PORTB,5
            CALL      KEYDASH
            CALL      SLEEPYTIME
            GOTO      KEYING
KEYDOT:
            BSF       PORTB,3
            BSF       PORTB,2
            CALL      DOT
            BCF       PORTB,3
            BCF       PORTB,2
            CALL      SPACES
            BCF       0F,4
            BSF       0F,0
            RETURN
KEYDASH:
            BSF       PORTB,3
            BSF       PORTB,2
            CALL      DASH
            BCF       PORTB,3
            BCF       PORTB,2
            CALL      SPACES
            BCF       0F,5
            BCF       0F,0
            RETURN
SLEEPYTIME:
            DECFSZ    11,1
            RETURN
            DECFSZ    10,1
            RETURN
            MOVF      8B,W
            MOVWF     18
            MOVF      PORTB,1
            MOVLW     B'00001000'
            MOVWF     8B
            SLEEP
            CLRF      8B
            MOVF      18,W
            MOVWF     8B
            RETURN
            END
```

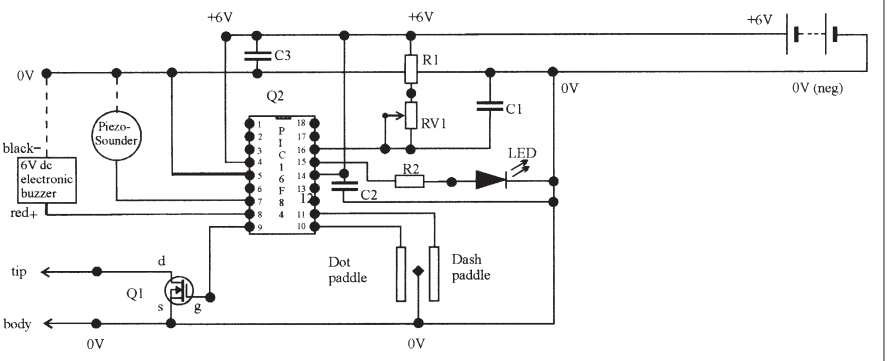


Fig. 1: Circuit of the G3BIK AD2005 PIB based c.w. keyer (see text).

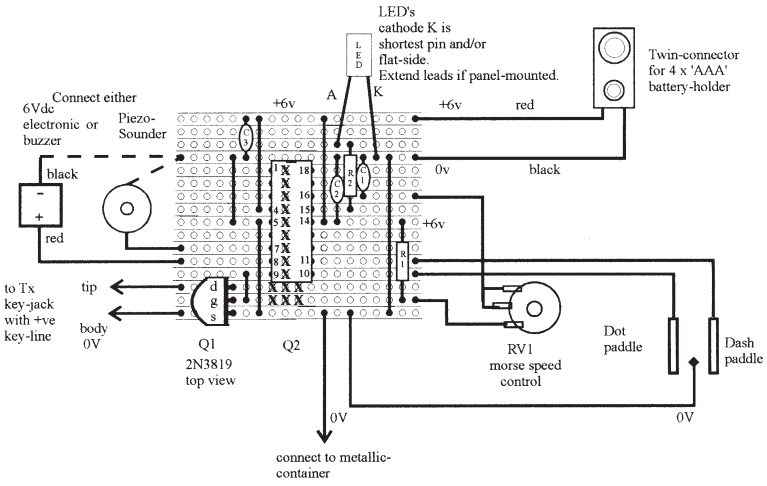


Fig. 2: Layout diagram for the keyer using Veroboard (see text).

Note: Due to production problems this diagram has been reproduced in the author's style. I thank Ed for his permission. **Editor**

Components

Q1	1	BS170 (or similar m.o.s.f.e.t.)
Q2	1	Preprogrammed PIC1684A-04/P PIC
LED	1	Mini 3mm

Resistors

5.6kΩ	2	R1, R2 (Metal oxide)
22kΩ	1	Linear rotary variable with knob

Capacitors

100pF	1	C1 (ceramic)
100nF	2	C2, C3 (ceramic)

Miscellaneous

One 18-way d.i.l. socket. Piezo sounder or 6V electronic buzzer, wire, 6V source, paddle Morse key

Help From Author

The programming of the PIC should be straightforward. But if any readers who think they may have problems- they can contact me for further asisitance. I can be contacted by E-mail at **chick@chickene.freeserve.co.uk**

For those without E-mail I can be contacted by post at: **Ivy Thorn Cottage, Hepscott, Morpeth, Northumberland NE61 6LQ**. The costs of the pre-programmed PIC including post is **£8.50**. Enjoy the project! **PW**

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Global AT-2000 150kHz-30MHz SWL ATU with Q selector....£69
Ameritron ALS-600XCE 10-160m Solid State 600W Amplifier....£849
Icom IC-746 HF,6m,2m All Mode Base Transceiver + DSP, ATU & Gen.Cov. RX 12V....£899
Yaesu VR-120 100kHz-1300MHz AM,FM,WFM Receiver 640Ch....£109
ADI AR-446 70cm FM Mobile 35W + CTCSS....£129
Yaesu FT-290RII 2m All Mode Portable 2.5W....£199
Yaesu FL-2025 2m clip-on 25W Linear (for FT-290R II)....£99
Ameritron AL-80B 10-160m 1kW Linear Amplifier with 3-500 Tube....£799
Icom IC-R8500 100kHz-2GHz All Mode Receiver 1000ch. 12V + PSU....£899
Palstar KH-6 6m FM H/Held with CTCSS....£75
MFJ MFJ-9340K 1watt 40m QRP CW Tranceiver Kit....£139
Yaesu VR-500 100kHz-1300MHz All Mode Receiver 1000Ch.Alpha....£149
Yupiteru MVT-3300 66-1000MHz (with gaps) AM,FM 200Ch....£95
Alinco DJ-X10E 100kHz-2000MHz All Mode H/Held Receiver 1200Ch....£149
Yaesu FT-8100 2m,70cm FM 50W,35W Full Duplex + Remote Head....£229
Yaesu FT-920AF HF,6m All Mode Base Transceiver + Gen.Cov. FM & Filter 100W 12V....£899
MFJ MFJ-1786X 10-30MHz Super-Loop Antenna + Controller....£249
Icom IC-R5 150kHz-1300MHz AM,FM & WFM Hand Held Receiver 1000Ch. + Nicads....£119
Uniden UBC-9000XLT 25-550,760-1300MHz AM,FM,WFM 500Ch. 12V + psu....£189
TGM Communications MQ-34SR Four Band Three Element Hybrid Quad Antenna....£349
AOR AR-7030 0-32MHz All Mode Receiver 12V with PSU....£449
Alinco DJ-446 446MHz PMR H/Held + Nicad & Charger....£89
Icom IC-706 HF, 6m, 2m All Mode Mobile/Base Transceiver with Gen.Cov....£449
Fairhaven RD-500 10kHz-1750MHz All Mode Receiver with PC Control, CD ROM, 13000+ Ch. 12V + PSU....£525
Icom IC-R5 150kHz-1300MHz AM,FM & WFM Hand Held Receiver 1000Ch. + Nicads....£115
Uniden UBC-780XLT 25-1300MHz + Trunk Tracking 500Ch. 12V + psu....£190
Sony ICF-SW55E Portable Shortwave Receiver with FM stereo and SSB....£189
Yaesu FT-790R 70cm All Mode Portable Transceiver 1W Batt....£149
Icom PS-55 12V 20A Matching PSU....£149
Icom IC-756Pro II HF + 6m All Mode Base Transceiver + ATU, DSP & Gen.Cov. 12V....£1,199
Icom IC-R8500 100kHz-2GHz All Mode Receiver 1000ch. 12V + PSU....£899
ERA MicroReader RTTY,Morse Decoder and Tutor....£69

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VHF DXer

REPORTS & INFORMATION BY THE LAST SATURDAY OF EACH MONTH.

DAVID BUTLER G4ASR TAKES A LOOK AT YOUR AUTUMNAL DX CONTACTS

October was a relatively quiet month for v.h.f. and u.h.f. propagation. UK operators reported a number of Sporadic-E (Sp-E) openings on the 50MHz band and periods of extended tropo openings on the 144MHz and higher frequency bands. Regular meteor scatter (m.s.) and Earth-Moon-Earth (e.m.e.) contacts were achieved during October more so because of the Orionids meteor shower and the ARRL e.m.e. contest. No DX activity was reported on the 70MHz band, this frequency being too low for extended tropo propagation and too high (at this time of the year) for ionospheric Sp-E propagation.

QUIET SUN

No Auroral back-scatter openings were reported on the v.h.f. bands during October because the solar activity was extremely low during the month and the level of X-rays from the Sun dimmed to their lowest levels since 1997. This period of solar quiet follows a furious outburst of flares and coronal mass ejections that were reported during September, highlighting the unpredictability of the Sun on a month-to-month basis. However, the 11-year solar cycle seems to be on track and the current spate of quiet is consistent with the approach of solar minimum that is expected sometime in 2006.

Maybe it had something to do with a very quiet Sun but it is quite unusual to report Sporadic-E openings on the 50MHz band so late in the season. Openings were reported on October 1 between 1200-1300UTC to Italy (I) and Portugal (CT) and later between 1700-1800UTC to Spain (EA) and Morocco (CN). Further openings were then reported in a four day period between October 9-12 to stations in Bulgaria (LZ), Ceuta and Melilla (EA9), Italy, Portugal and Spain.

A two hour opening on October 17 between 1000-1200UTC was reported by stations in southern England and Wales to Italy, Morocco, Portugal, Sicily (IT9) and Slovenia (S5). Two further openings were reported between 1330-1430UTC on October 23 and 1245-1530UTC on October 26, on both occasions to Morocco, Portugal and Spain. It is interesting to note that apart from one opening all events occurred around the same time in the early afternoon to similar areas of Europe and North Africa.

If the Sun continues to be quiet with very low geomagnetic activity it may give rise to an increase in Sp-E openings throughout the winter period. Generally the winter openings are quite weak though and the maximum usable frequency (m.u.f.) doesn't rise much above 60MHz or so. However, it's always worthwhile checking out the 70MHz band to see if propagation has reached this frequency. It is unlikely that it will reach the 144MHz band but it can never be totally ruled out.

TROPOSPHERIC ENHANCEMENTS

During the autumn period it is normal to expect periods of enhanced tropospheric propagation on the v.h.f. and u.h.f. bands. Autumnal openings are often caused by temperature inversions that occur under still, clear conditions when the land cools rapidly, therefore cooling the air close to the surface but leaving the higher levels relatively unaffected. These conditions occur most often in anticyclonic weather systems, an anticyclone being an area of high pressure.

Although anticyclones can appear at any time of the year, they're more common in late summer and early autumn, when one or two big tropo openings are very likely. True to form the first of the autumnal openings were reported by UK stations between October 3-7 and later in the month around October 15-16. Although, propagation wasn't particularly stable some stations did report making contacts up to 1400km away on the 144 and 430MHz bands.

At the beginning of the month the tropo paths seemed to swirl around on a daily basis. On October 3 the best propagation was to northern Spain (EA1), on October 4 it was to Denmark (OZ) and northern Germany (DL) and on October 5 it was back again to northern Spain. On the following day October 6 propagation shifted to the east with 144MHz stations making contacts into Denmark, Germany and the Czech Republic (OK).

A strange duct formed between the UK and the Czech Republic during the evening of October 10. Many operators located in southern England reported working the 144MHz station of OK1RI (JO60) but unusually no-one else in that country. A few stations did report making other c.w. and s.s.b. contacts with stations in Germany (JO50, JO71) and Denmark (JO55) around the same time so, it was probably some form of 'leaky' duct situated between the UK and central Europe.

A far more extensive tropo opening occurred during the weekend of October 15-16 with contacts being made on the 144, 430MHz, 1.3GHz and higher frequency bands. Some of the DX worked during this period included the stations of LA2PHA (JO38), LA4YGA (JO48), LB8SE (JP20), OE2CAL (JN67), OE5MPL (JN78), OK1KIM (JO60), OK1KVK/P (JO60), OK1TEH (JO70), OK2AF, SP6MLK (JO60) and German stations in locator squares JN47, JN59, JO41, JO42, JO43, JO50, JO51, JO53, JO60 and JO61.

An opening on the 144MHz band to Denmark, Norway and Sweden was reported by Scottish and east-coast English stations during the afternoon and evening of October 18. Initially, a number of well sited beacon stations including those of LA8VHF (144.480MHz), OZ4VHF (144.466MHz), OZ7IGY (144.471MHz), SK4MPI (144.418MHz), SK6VHF (144.448MHz) and SK7VHF (144.481MHz) were reported but as the opening developed a growing number of fixed stations became audible. Many s.s.b. stations were worked including those of LA1T, LA3FV, OZ0TE, OZ5DL, SK6HD and SM7WT.

In my opinion though the very large-scale tropo openings that many DXers enjoyed 10-20 years ago during the September-October period don't exist nowadays. I can recall always looking forward to Scandinavian openings in October and working stations up to 2000km away but this doesn't happen any more. Maybe it's global warming that has affected the way in which stable high pressure systems form. Incidentally, my records show that tropo openings now occur more often during December to areas directly east of the UK, such as Germany and Poland. There might even be one right now!

METEOR SCATTER

There was one minor meteor shower, the Draconids, which encountered the Earth between October 6-10 and a major shower, the Orionids, that occurred between October 16-26 created an increase in DX activity on both the 50 and 144MHz bands. There was no reported high-speed c.w. or s.s.b. contacts, something that I regret, as these modes work very well during meteor showers. All contacts appear to have been made using the new

digital modulation systems, either JT6M on the 50MHz band or FSK441 on the 144MHz band.

The following contacts gives a flavour of what can be worked with low-power on the 50MHz band; Aland Island (OHOJFB), Austria (OE5MPL), Ceuta and Melilla (EH9IB), Czech Republic (OK1MRS), Denmark (OZ1P), Finland (OH7TE), Italy (IW5DHN), Lithuania (LY2BAW), Luxembourg (LX3DX), Morocco (CN8LI), Norway (LA8NK), Poland (SP9HWY), Romania (YO7VS), Slovenia (S59F), Spain (EH5AGR), Sweden (SM5LE) and Switzerland (HB9QQ). On the 144MHz band FSK441 contacts were made with Austria (OE3DXA), Czech Republic (OK1UGA), Finland (OH6PA), Germany (DG0FE), Hungary (HA5CRX), Italy (IK1PAG), Norway (LA4YGA), Poland (SP2MKO), Russia (RX1AS), Slovakia (OM3WBC), Slovenia (S54T), Sweden (SM2CEW) and Yugoslavia (YU7EW).

EARTH-MOON-EARTH

The first leg of the American Radio Relay League (ARRL) Earth-Moon-Earth (e.m.e.) contest took place over the weekend of October 22-23. In moonbounce terms this generated a large amount of activity on the 144, 430 and 1.3GHz bands. There was universal agreement that conditions on the v.h.f. and u.h.f. bands were far from ideal. The main problem appeared to be Faraday rotation that produced non-reciprocal polarisation to many parts of the world.

Many European stations reported polarisation dispersion and high atmospheric absorption which led to poor conditions. In common with meteor scatter techniques the vast majority of e.m.e. contacts made on the 144MHz band were accomplished using the JT65 digital modulation system although pleasingly there were still many c.w. contacts being made as well.

There was JT activity on the 430MHz band but it was not anywhere near the level now being used on 144MHz. On the 430MHz band the majority of stations still use c.w. and signals are much stronger because you don't need that much space to erect a **real** e.m.e. array. The presence of W6IFE using a commercial 40M parabolic dish on the 1.3GHz band was a big attraction. Even though they were running low power, true 599 signals were received at moderately equipped stations.

Dave Dibley G4RGK spend much time before the contest replacing all feed lines to his 8-Yagi array following damage caused by tree cutting! All seemed to be working OK but soon after the start of the contest he came to the conclusion that something was not right. On inspection he found that the first director on one of the Yagis had partially melted along with its mounting insulators. When it was removed, a half litre of water came out of the boom. He checked the other seven Yagis and they were all full of water as well.

The reflector ends of the booms were capped but the other ends were not and had filled up with water when the array was elevated during a storm. After the water was drained out and the director replaced all was well again and Dave went on to make 19 e.m.e. QSOs on the 430MHz band. His c.w. contacts included the stations of DJ6MB, DL7APV (Germany), K1FO, K2UYH, KL6M, N9AB (USA), OE5EYM (Austria), OH2PO (Finland), OZ4MM, OZ6OL (Denmark), RW3PX (Russia), SM2CEW, SM3AKW (Sweden), SV1BTR (Greece), S52CW (Slovenia), VK3UM (Australia), 7M2PDT (Japan), G3LTF and HB9Q (Switzerland).

Fig: 1: Conrad G0RUZ standing in front of the 15.3M dish at the QTH of HB9Q.

Dan HB9CRQ passes on the news that his contest group had the pleasure of inviting **Conrad Farlow G0RUZ** to be a guest operator during the e.m.e. weekend. The group, using the callsign **HB9Q**, operated on three bands using a large 15.3M dish shown in the photograph **Fig. 1**. On 144MHz the c.w. activity was very low and they spent most of the time using digital JT mode. A total of 79 contacts were made, 6 on c.w. and 73 on JT65B.

Operation on the 430MHz band was a huge disappointment. Conditions were difficult with many hours of polarisation locked at 45° rotation. Their results on this band was 53 c.w. contacts and two digital JT65B contacts. Activity was brilliant on the 1.3GHz band. They only spent about one quarter of their window-time on 1296MHz but worked many new stations and three new DXCC countries for a total of 50 QSOs, 49 on c.w. on 1 on s.s.b.

Peter Blair G3LTF operated on the 430MHz and 1.3GHz bands using a 6M dish with a dual dipole feed. The feed can be rotated through 140° in about three seconds and this enabled Peter to hear echoes under all conditions. It's also used to estimate the Faraday rotation and to align the polarisation for best signal at all times.

Throughout all of his operating period there was very little change in signal with polarisation, much of the time Peter could receive signals over a range of 90° with little obvious change in level. This is unusual as in good conditions there is a sharp peak. This phenomena is well known to e.m.e. operators as spread polarization and this phenomenon results in lower signal levels and difficult conditions, which many stations reported during the weekend. Despite the poor conditions a total of 32 contacts were made by G3LTF on the 430MHz band and 52 QSOs on the 1.3GHz band.

DEADLINES

That's it again for another month. Thank you for your reports and please keep sending them in to the address and by the date given at the top of the column. Have a Happy Christmas and I'll see you again next year.

73, David G4ASR

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HF Highlights

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

CARL GW0VSW PRESENTS HIS MONTHLY ROUND-UP OF HF BAND ACTIVITY WITH HELP FROM YOUR REPORTS

There's plenty to get through this month so I will start with news of the **XXI Italian Antarctic Scientific Expedition,** which began in October. This is well under way with the first group of Specialists and Logistics personnel leaving home for Terra Nova Bay in Antartica to open the Italian 'Mario Zucchelli Station' (MZS). The Communication Officer at MZS is **Carlo Risani IK5DHM**, Chief of Firemen for the entire period until the end of February 2006. He has received a brand new callsign for this activity **II0AMZS** (Antarctic Mario Zucchelli Station). He will operate from the Italian Base (WAP ITA-01) using this callsign and will also use an alternative call **IK5DHM/ANT**.

During his stay, Carlo will try to activate a couple of remote camps such as 'Mid-Point' and 'Tolos Dome', which will have WAP references after they are activated as the dates have yet to be confirmed. Carlo will also try to operate for a couple of days from Concordia Dome C (WAP MNB-03). You can get more information and regular updates on this Expedition and on the WAP programme at **www.ddxc.net/wap** The QSL Manager is for this operation is **Paolo Ghelardini I5GWO, Via Pordoi 3, 51100 Pistoia Pt, Italy**.

THE DX NEWS

On to this month's DX news now and **Salvatore Bonomolo IZ1BWB** who is Afghanistan and the operator of the Italian Army Alpine Brigade Amateur station 'Taurinense' callsign **YA/IZ1CCK/P** in Kabul. He operates on 14 and 21MHz c.w. but has also been heard using s.s.b. after 1600UTC around 21.25MHz. If you work Salvatore you can QSL via his home call direct or via the bureau to **San Giovanni Bosco, 52, 10144 Torino, Italy**.

In West Malaysia **Richard Smeets PA0RRS** will be active from Penang Island AS-015 from 28 December to the 8 March 2006 using the call **9M2/PA0RRS** but Richard does hope to obtain and official 9M2 callsign while he is there. A trip to Langkawi Island AS-058 may also be possible and QSL will be via the burea or direct to **Schoorveken 100, 5121 NM Rijen, The Netherlands.**

Japanese operator **Naoyuki Kobayashi JK1FNL** will operate as **V63O** from Pohnpei OC-010, Micronesia, which is in the North Pacific Ocean, about three-quarters of the way from Hawaii to Indonesia. Nao will be there between the 28 and 31st December and activity is expected to be on all h.f. bands using both c.w. and s.s.b. with some RTTY. Please QSL via bureau or direct to, **South-Hill 2-703, 11 Noukendai Higashi, Kanazawa-ku, Yokohama-city, Kanagwa , 236-0058, Japan.**

YOUR REPORTS

On to your reports now and first off this month is **Leighton Smart GW0LBI** in Trelewis, Mid-Glamorgan who has enjoyed a second month of QRP operating. Having put up a 58m (190ft) end-fed long wire antenna for 1.8MHz he was keen to see just how well it would perform.

Using just 1W c.w. from his Yaesu FT-100 Leighton worked F5PEZ (France), S50X (Slovenia), PI60HGV (Netherlands), G3TLH also QRP in Bracknell, Berkshire, OK1FM (Czech Republic), DK9NCX (Germany), YL2KO (Latvia) and HB0/DL2OBO (Liechtenstein). This was followed by one s.s.b. contact with GU5XW/P on Guernsey EU-115. Good going with such low power and simple antenna.

THE 3.5 & 7MHz BANDS

Trying out the 3.5MHz band was **Martin Addison M3JUQ** in East Finchley, North London who uses a Yaesu FT-840 running 10W s.s.b. into a folded half-size G5RV. Martin said in his E-mail "I know that the half size G5RV is clearly not supposed to work on this band and it was a struggle to get it to tune up but it was the only way I could participate in the 'Edgware Activity Period'. I did not work outside the UK but I was pleased to work GB2IWM the Imperial War Museum at 0838UTC. A station I have not been able to work on 7MHz. Needless to say I was encouraged by this and must get down to making a proper dipole for this band soon".

All c.w. man **Ted Trowell G2HKU** on the Isle of Sheppy, Kent used his Ten-Tec Omni-V and Butternut HF6 vertical to work OE50VIE (Austria) and HB80IARU (Switzerland) around 2100UTC. A change to 7MHz found ET3TK (Ethiopia) and 5B4/G3VMW (Cyprus) AS-004 around 2000UTC.

Chris Colclough G1VDP in Nuneaton says "Another month goes by and my country total continues to rise all be it slowly! DX-wise I have spent the past week trying to work the **K7C DXpedition** on Kure Island but they only seem to want to work US and Japanese stations. When the propagation is right for Europe they just appear to go 'off air' and this has been noted on the DX Cluster but a large number of operators! Another disaster was my rotator decided to pack up and I wish now I had gone for a more expensive and robust model. That will teach me"!

Chris continues: "It did give me the opportunity to get my half-size G5RV down and add some coils to it. This now tunes nicely on both 3.5 and the 7MHz bands and I can now hear some DX at last". Using his new Yaesu FT-1000 Mark V Field Chris managed one s.s.b. QSO with SO1MZ (Western Sahara) on 7MHz at 2302UTC.

The mobile log of **Mark Taylor G0LGJ** lists two voice contacts made with YY5LKD (Venezuela) at 0100 followed later by TF3XEN (Iceland) EU-021 at 2101UTC using a Kenwood TS-480 at 100W and a DK3 screwdriver antenna.

THE 14MHz BAND

On to 14MHz now and **John Yarnell M1AUN** near Wolverhampton was in his shack working on his computer with 14MHz tuned up on his Kenwood TS-430S in the background. John say's "Out of the band noise around 1300UTC came a call from VK4JSR (Australia) in Carina, Queensland. His signal was about 5/7 on my Diamond CP6 vertical and a small pile up developed as I listened. I decided to try and call him and to my surprise Scott came back to me and gave a 5/5 report. Needless to say I was pleased with that! That same day I also worked TF3FA (Icelandl) and KF4ZZY (USA)

Max in Winston, Georgia at around 1500UTC. Band conditions by this time were first class".

Another s.s.b. operator is **Martyn Medcalf M3VAM** in Chelmsford, Essex who worked SM0PSO (Sweden) 1148, OH3JR (Finland) 1159, EA9LZ (Ceuta & Melilla) 1458, T99A (Bosnia & Herzegovina) 1634, UA3QDX (European Russia) 1737, EA8AOC (Canary Island) AF-004 at 1807, OZ7RJ/P (Denmark) 2017 and EI9E/P (Ireland) at 2024UTC using an Icom IC-746 and long wire antenna with SGC-237 auto tuner.

The 2W s.s.b. QRP of Leighton GW0LBI found HB0/DL2OBO (Liechtenstein) 1436, JW9LMA (Svalbard) EU-026 at 1500, IO1BIA (Italy) 1600 and YT1BB (Yugoslavia) at 1950UTC using his long wire once again.

Ted G2HKU worked c.w. stations TA2DA (Turkey) and OH0P (Aland Island) EU-002 at 1800 followed by 8R1J (Guyana), LU5DY (Argentina), PY4HGM (Brazil) and YV1NX (Venezuela) between 1900 and 2100UTC. On the move again was Mark G0LGJ who had voice contacts with ZS6CCY (South Africa) at 1720 and then HS0/IK4MRH (Thailand) at 1735UTC.

Conditions were good for Chris G1VDP who's s.s.b. log included HS1CKC (Thailand)

Chris Colclough G1VDP in his shack.

A QSL card from a previous DXpedition to Penang Island by Richard Smeets PA0RRS.

1602, 3DA0TM (Swaziland) 1658, 4KR60S (Azerbaijan) 1658, VR2XMT (Hong Kong) AS-006 at 1715, SY8S (Greece) on Skiros Island EU-060 at 1727, VU2TES (India) 1741, R1ANF (South Shetland Island) AN-010 at 1914 and XL3NJ (Canada) 2021 and KG4OX (Guantanamo Bay) NA-015 at 2048UTC.

Using a half size folded G5RV again and 10W Martin M3JUQ logged s.s.b. stations ZB2FX (Gibraltar) 0751, K2QBV (U.S.A.) Joel in New York at 1205, LZ1QI (Bulgaria) 1557, J48HW (Greece) on Thasos Island EU-174 at 1607 and SV8/DL4JWU on Corfu, EU-052 at 1823 and TK/F5CWU (Corsica) EU-014 at 2020UTC.

In Middlesbrough **Keith Winward 2E0JKD** has been spending a good deal of time learning Morse with local Amateur **Bruce Hyde G0MHE** in Darlington but still found a hour or so to fire up his FT-1000MP Mark V Field and dipole antenna to work s.s.b. stations S51CK (Slovenia) at 1016 and IZ2FLA (Italy) at 2200UTC

THE 18 & 21MHz BANDS

Moving on to 18MHz Keith found EU3AR (Belarus) at 1502UTC while Ted worked ST0RM (Sudan) and TA2ZAF (Turkey) at 1600 on the key and Chris G1VDP managed 5N8NDP (Nigeria) on s.s.b. later at 1649UTC. Also on this band were Martyn M3VAM who found conditions in the morning 'fair' and lists s.s.b. stations LZ1QI (Bulgaria) 1123, Ik6HMF (Italy) 1125 and 3V8SM (Tunisia) at 1208UTC while Mark G0LGJ had one QSO with 5Z4DZ (Kenya) at 1508UTC.

Later in the week and on 21MHz Mark heard the band pick up and added 3B8CF (Mauritius) AF-049 at 1416, YI9LZ (Iraq) 1439 and A45WH (Oman) at 1447UTC to his mobile log while Ted G2HKU also operated at a similar time logging A61Q (United Arab Emirates), VE3NE (Canada) in Etobicoke, Ontario and KR5V (USA) Morris in Fairwood, Texas.

THE 28MHz BAND

There was only one contact reported on 28MHz and that was made by Chris G1VDP who found conditions "very poor" but heard and worked 7Q7CE (Malawi) at 1240UTC. Incidentally, Chris has just sent in his application for the IOTA 100 Award and understands that he may be the first G1 to apply for 'any' IOTA award!

SIGNING OFF

Well that's about it for another month and indeed another year. By the time you read this Christmas will not be far away and no doubt the colder nights and poorer weather will be with us. The lower bands are picking up a little now and even if you don't have antennas cut for 1.8 or 3.5MHz it may be worth trying to tune your antennas up on these bands and see just what can be worked.

Using one leg of a half size G5RV I managed 20 countries including Asiatic Russia on 1.8MHz using 5W c.w.and my favourite transceiver the Index QRP Plus. I am not saying it was easy. In fact, it was incredibly hard going at times but I did work some new countries and enjoyed myself and surely that's what Amateur Radio is all about, experimenting! Until you try your antenna you will never know just what is possible and maybe you too will be able to work a few new countries on a new band when you do!

As usual my thanks go to all our reporters this month and to **Tedd Mirgliotta KB8NW** editor of the *OPDX Bulletin* and **Mauro Pregliasco I1JQJ/KB2TJM** editor of the *425 DX Newsletter* for the DX information. Until next time have a good DX filled month and have a very Happy Christmas.

73, Carl GW0VSW

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Data Burst

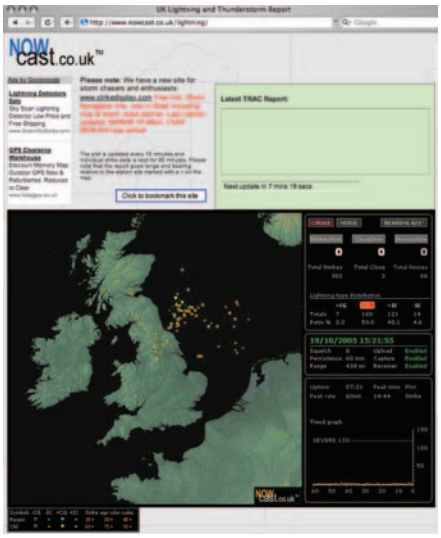

Fig. 1: A small thunderstorm brewing over the North Sea is clearly visible in this live lightning map from the NowCast website. The Lightning receiver is in the Pennines, as shown by the small yellow cross.

JACK WEBER TAKES A LOOK AT THE RELATIONSHIP BETWEEN THE WEATHER AND RADIO

We British are well known for our preoccupation with the weather and the arrival of the Internet has been a great benefit in the pursuit of our obsession. Anyone who needs a regular fix of meteorological information can find countless observations, forecasts and images to weigh up; and even the most esoteric weather data, such as the latest temperature in Yerevan, is instantly available. As radio enthusiasts, we have an added interest in certain specific aspects of the weather and the internet can be a big help here as well.

The relationship between weather and radio is far from straightforward, but weather does affect radio in all sorts of ways. On the v.h.f. bands, of course, there is a well established link between weather conditions and the propagation effects of tropospheric ducting and tropospheric enhancement.

On the h.f. bands there's much less of a direct connection because the ionosphere rides high above the weather. Even so, h.f. conditions aren't immune from the weather because precipitation static can seriously increase noise levels while lying snow can sometimes help reception by improving ground reflections. Meanwhile, thunderstorms bring unwelcome noise interference even when far away and represent a serious threat to outdoor antennas when close by.

RADIO RELATED

Apart from the obvious weather forecasts on websites such as **www.metoffice.com** and **www.bbc.co.uk** there are quite a few sites that you may find useful for more specifically radio-related weather information. One of the most interesting areas that's developed recently has been the appearance of realtime lightning trackers on the web. These display live maps to show the location of lightning discharges, both between cloud and ground and from cloud to cloud.

The maps can provide invaluable information about approaching thunderstorms and also give you a sense of how much lightning QRN is brewing farther afield across the country and throughout Europe. They're also interesting in their own right as examples of how radio can be used in all sorts of unusual ways.

Have a look at **www.isleofwightweather.co.uk/live_storm_data.htm** or **www.net-weather.co.uk/index.cgi?action=charts;type=uklightning** to see the sort of information that's available. Bear in mind, though, that the display may look very empty and boring unless there's actually some lightning around. During the winter months, weeks may go by with no activity, but there were some days in July when you could see multiple storms tracking right across the UK.

The data that drives these maps comes from specialist l.f. radio receivers that attach to a PC or, in many cases, mount inside the computer on a PCI card. They listen for the characteristic crash of a lightning strike, using a small direction-finding antenna to obtain a bearing, and estimating distance from the strength of the signal. The software that does these calculations automatically plots the strike onto a map, which is then updated periodically onto the web page. The frequency of these updates varies - some sites, such as **www.net-weather.co.uk**, update as often as every 60 seconds, while many others run on a ten minute update cycle. Either way, for all practical purposes these maps provide an almost real-time display of lightning activity.

One thing you'll notice fairly quickly if you start comparing the various map sites is that their maps don't always entirely agree. Inevitably signal strength can't be a very precise ranging tool so there'll be limits on how accurately the software can estimate distance. Also, when there are a lot of thunderstorms around, they'll cause mutual interference so that nearer storms may tend to mask more distant ones. It may also be that the d.f. antenna isn't mounted in an ideal position with equal coverage all-round and with no local effects to distort the field.

The only way to find out which, if any, of the maps gives an accurate picture of your region is to perform what the remote-sensing people call a 'ground-truth' survey – though in this case 'sky-truth' may be a better term - in other words look outside and see if what's actually happening where you are corresponds to what the map says is happening there.

Where I live, in Hertfordshire, the website that seems to give the most accurate maps is **www.nowcast.co.uk/lightning/**, which is a lightning tracker located in the Pennines, some 200km away. In other parts of the country it may well be that different sites will give the best results. Having found one that regularly gives an accurate picture for your area, I'm sure you'll find it a valuable resource for spotting electrical storms before they come too close. For a wider-ranging view have a look at **www.wetterzentrale.de/pics/Rsfloc.gif**, which provides data from storms across the whole of Europe.

LIVE LIGHTNING DATA

A useful online source for live lightning data from Europe is The European Co-operation for Lightning Detection (EUCLID). Their website is at **www.euclid.org/**, click on the tiny map in the corner of their homepage to see a larger image. EUCLID attempts to eliminate some of those discrepancies that exist between individual lightning tracker sites by combining all the readings from 75 widely scattered detectors to create a consensus map.

Before the arrival of the Internet, setting up such networks for simultaneous scientific observations would have required permanent radio or land-line links, which would have been prohibitively expensive in some cases. Now, it's not only feasible to do this sort of research affordably, but the results can be made available to all of us almost as fast as they appear.

Thunderstorms often occur when moist air is heated near the earth's surface and rises rapidly in a powerful convective storm cell. Quite the opposite situation – with cool moist air at the earth's surface being overlain by warmer dry air – is known as a temperature inversion and leads to calm settled conditions. These are ideal for refracting v.h.f. signals and

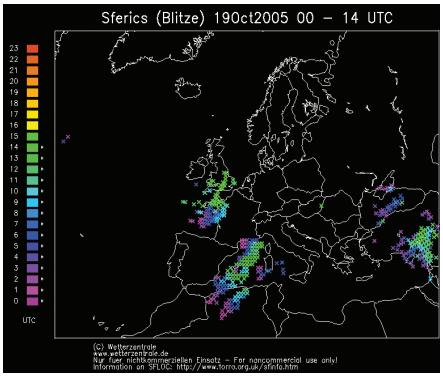

Fig. 2: This German website provides a cumulative map of lightning strikes over Europe each day.

can provide DX openings that go far beyond the horizon. Because the effect happens at relatively low altitudes in the troposphere, rather than in the much higher ionosphere, it's known as tropospheric or tropo propagation.

The Internet provides various websites, forums and chatrooms for keeping up to date with current propagation conditions and rare openings, but it can also help you to plan ahead by predicting tropo conditions. The place to go is the extensive website of Canadian meteorologist **William Hepburn**. Based on weather observations from around the world, he maps the varying probability of tropo conditions expressed as a numerical value that he calls the Hepburn Tropo Index or HTI. If the value of the HTI in your area goes above 4, that represents a good chance of tropo conditions. Anything above 6 is a sign to look out for some serious openings. The results are colour-coded and mapped for up to five days ahead so you can clearly see where and when tropo propagation paths may open up.

You'll find the maps for the UK and north-west Europe at **http://home.cogeco.ca/~dxinfo/tropo_nwe.html**. To check conditions elsewhere in the world look at **http://home.cogeco.ca/~dxinfo/tropo.html**, which links to all the regional maps that Hepburn produces. It's impressive how accurate the predictions often are. Of course, the local topography can have an effect at the shorter wavelengths so the conditions you experience may be better or worse than the prediction would suggest. Local weather pockets may also affect tropo propagation. Even so, Hepburn's maps are remarkably useful.

If only someone could come up with a similar index to William Hepburn's for predicting Sporadic-E (Es) conditions. These highly volatile openings may appear and disappear in a matter of seconds, or swing just as suddenly so that one moment you're getting local-strength signals from Italy and the next moment from Portugal. Detailed prediction of such a fast-changing phenomenon seems impossible, but simply having advance warning that Sporadic-E is likely would be very helpful.

Unfortunately, its not really possible at the moment to predict Sporadic-E condtions, but the prospects are improving all the time. The real problem is that no one fully understands what causes Sporadic-E. The immediate cause is the formation of highly ionised clouds at an altitude of about 90-100km, but what causes these clouds is still a mystery.

All sorts of things have been proposed, ranging from wind shear to meteors. One popular idea that has been around a long time and has been studied by Radio Amateurs and scientists alike is that the ionised clouds are caused by thunderstorms. The problem has always been that no one could adequately explain how lightning might influence the ionosphere, when the two are at such different heights. Also, there's never been a clear enough statistical connection – some thunderstorms do correspond to the sites of Sporadic-E clouds, but many do not.

In recent years, a possible explanation has emerged in the form of a whole menagerie of newly discovered phenomena that seem to provide a previously unsuspected link between thunderstorms and the ionosphere. A small number, possibly as few as 1%, of thunderstorms are associated with very high-altitude discharges known as red sprites and blue jets that move upwards from a thunderstorm all the way to the ionosphere. These events were first recorded in 1989 but not photographed in colour until 1994 when researchers from the University of Alaska at Fairbanks managed to obtain some stunning images.

Other related phenomena that have been discovered more recently include Elves, which appear as a halo around a sprite, and Trans-Ionospheric Pulse Pairs (TIPPS), which produce powerful radio pulses at v.h.f. frequencies. Space-based observations have also spotted gamma-ray bursts moving upwards from some thunderstorms. All-in-all then, it's clear that the

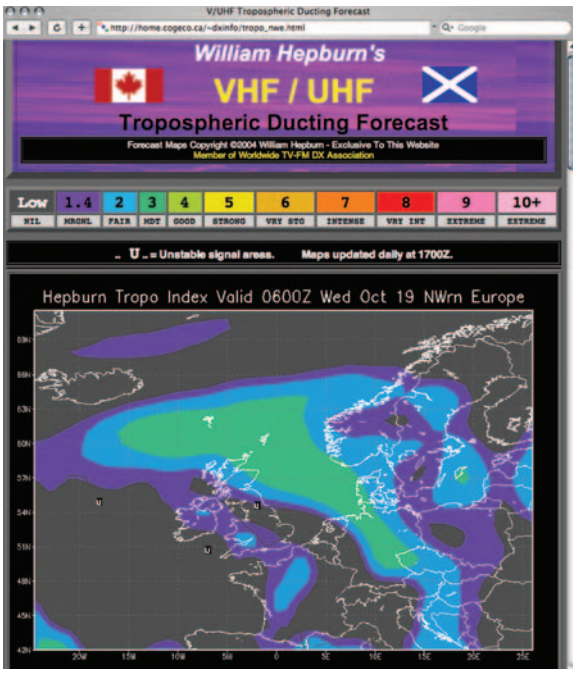

Fig. 3: Poor prospects of tropospheric propagation in this prediction from William Hepburn's website.

ionosphere isn't as far removed from weather events as everyone once thought, and even the missing statistical correlation between lightning and sporadic-E is starting to fall into place. In a recent letter to the science journal Nature, two researchers at the Rutherford Appleton Laboratory in Oxfordshire reported finding a clear correlation between thunderstorms and Sporadic-E, probably as a result of one or more of the newly discovered phenomena.

Observing high-altitude events is extremely difficult so, for the moment, there's nothing online to match the real-time lightning trackers. However, you can find a lot of interesting information at **http://elf.gi.alaska.edu/sprites.html**, which has links to other relevant sites. There's also an impressive colour movie of sprites and jets that you can view online at **http://wwwghcc.msfc.nasa.gov/movies/redsprite.mpg**

Once the actual mechanism for creating Sporadic-E clouds has been pinned down, it could eventually lead to a method for predicting where and when they'll form. When that happens, you can be sure that the Internet will be the place to look for those predictions. In the meantime, keep an eye on the lightning trackers, they may be even more relevant to radio than we thought.

See you next month, Jack

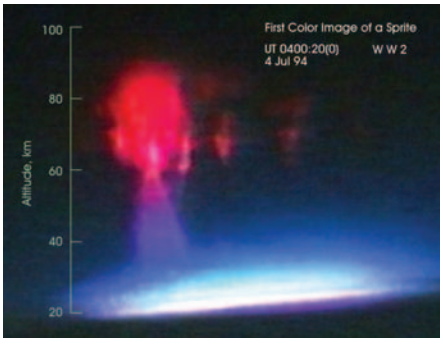

Fig. 4: A red sprite photographed in 1994 from a high-flying research aircraft. The altitude scale is based on triangulation from simultaneous observations by two aircraft about 50 km apart.
(Image courtesy of Geophysical Institute, University of Alaska Fairbanks.)

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B.B. Jan '06

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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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Qtz x-tals: 10.08, 10.7, 11.155, 10.245 and 14.484MHz, £1.50 each. X-tal filters: 2 pole, 45MHz @ 4k/±7.5kHz, 10.7MHz @ 1.5k/±7.5kHz, £3.50 each. Dual mod synthesizer I.C's. MB1504P, £6.95. MC145158-2, £2.49 P&P add £1. Other parts available. Phone 01244 546960. E-mail: ian.heywood@tesco.net

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rob mannion's topical talk

As there's a busy debate going on in the letters pages this month - Rob Mannion G3XFD takes the opportunity to seek out new projects and articles from *PW* readers. So, if you've got an idea for an article - talk to the editorial staff!

Keen *PW* reader and equally keen letter writer **Ray Howes G4OWY** has done himself and other readers, a great favour by voicing his opinion on the subject areas covered by the magazine. With one well timed letter Ray has brought in what we always need in *PW* - feedback! Thanks Ray, and to anyone else who has the courage of their convictions enough to write, starts and keep a debate rolling!

The present debate's main topic, is of course what type of projects we should have in *PW*. So, I've taken this opportunity and intend to strike while the iron is hot (pun intended) - and write earlier than I'd planned to encourage readers to send in their article ideas for future *PW*s.

My published requests early in 2005 for more articles - particularly practical projects - certainly got readers busy. The result was a good supply of articles for use in 2006. In fact, several authors came up with more than one idea - **Stef Niewadomski** is one excellent example. As a result of Stef's writing I'm hoping he'll become a much more regular contributor to *PW*.

However, you too could perhaps write an article for *PW*! Not sure if you can? You'll only find out if you contact us here in Dismal Dorset (it's dull and raining as I type this!). And following my appeal last year I sent out a large number of *PW Author's Guides*. I then had flurries of letters and questions from new authors and readers with ideas. It wasn't a problem and we're here to help you - and if you're not confident - we can provide full support.

What's Needed

What do we need? In answering I do so simply: it's your ideas! We need basic constructional projects, larger ideas for h.f. and v.h.f. Articles and projects featuring simple/and more advanced test equipment, servicing experiences and workshop practice are always welcome.

Also very much needed - the subject is always very popular - are antenna related articles and projects. As I've said before- everyone is looking forward to the matchbox-sized one unit h.f. to u.h.f. and microwave pocket antenna that can work the world with milliwatts! (and cost pence to make). Yes, we're all looking for the golden pot at the end of the rainbow! But even if your project only goes part way towards creating the radio equivalent of the Alchemist's dream - let me know as readers will want to build it!

Readers often tell me they're not keen on the results of their own drawing capabilities. In return I tell them not to worry! The drawing of the ProAM mobile antenna in use with a car roof rack idea (Radio Basics pages 20 to 21) are a good example. My original drawing was poor indeed - and although I got the perspective correct - it was very amateurish. But the results as re-drawn professionally by **Tex Swann G1TEX** and proves my point- it's excellent despite the raw material!

So, whatever ideas you have - contact *PW* as soon as possible. We work as a team with our authors and strive to present your articles in the best way possible. Articles on antennas, mobile operating, antenna. radio accessories, digital projects suitable for home-brewing (more of the same as **Ed Chicken G3BIK's** project published this month) are all needed. We also need features on the hobby in general - along with the (very occasional) holiday articles. With a balance of projects, features and regular articles everyone here can help to produce your *PW* - to your satisfaction.

The forward planning (basic skeleton of the future magazines) is done usually in late summer and early autumn. There's a good chance that your practical project will appear the next year if it's sent in before mid-year, for publication.

Don't forget you can telephone me at the office, use E-mail or come and chat at club visits and the major shows I attend. But above all - don't forget we produce *PW* for you - and your opinions and input help all the time. Ray Howes G4OWY has done his bit - now you can help too!

PW

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This service is also available for copies of *Short Wave Magazine* (£3.25) and *Radio Active* (£2.85). Alternatively, you may like to consider a subscription to ensure you don't miss out, see page 78 of this issue for details.

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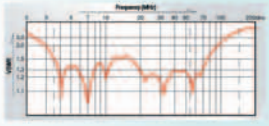

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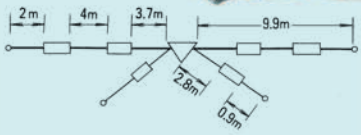

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