INSIDE - The PW Guide To
The London Amateur Radio &
Computer Show

Build -
• The Short Twenty Antenna
• PW Changer HF
  Converter
• Solar Powered
  Charger

Where In The World Are We?
The GPS 45 Personal Satellite Navigator Reviewed By G3XJS
Ultra Compact Handhelds FT-10/40R

Specifications
- Frequency Coverage
  FT-10R
  2m: RX: 140-174 MHz
  TX: 144-146 MHz
  FT-40R
  70cm: RX: 420-470 MHz
  TX: 430-440 MHz
- Choice of 4 keypad options
  (6, 16 or Deluxe and DvRS16 Keypads)
- Auto Range Transpond System™ (ARTS™)
- MIL-STD 810
- High Audio Output
- 12 V DC Direct Input
- Alphanumeric Display
- RX/TX Battery Savers
- Digital Coded Squelch (DCS)
- Digital Voice Recording System (DVRS)
- Digital Voice Recording System (DVRS)
- 2 or 5 W Available
- World's smallest dual band HT!

FT-11/41R
Slim, trim and powerful!
Alphanumeric, Compact Battery
Design. Up/Down Thumb Control,
RX/TX Battery Savers.
2 or 5 W Available.

“FT-11/41R is a totally new HT concept!
Built to rugged, tough military spec,
commercial radio standards inside and out, it's
small, powerful, feature-packed and ready to roll out
in four versions!!
Four different keypads—count 'em, FOUR!
First true user-choice customized HT on the
market, offers a 6 and three 16 keypad selections
plus 25 and 5 W battery choices, too! Easy for
Yaesu, the electronics are in the keypad. Easy for
you, they're already installed. Just pick the one that
suits your HT "style"!
New technology high-efficiency speaker design
provides super-loud audio. No small surprise—after
all it is Yaesu!!
First ever, amateur HT rated MIL-STD 810!
What else could you hope for? This, maybe. Dual
Watch—see two frequencies displayed simultane-
ously in the display. No other single band HT has
this feature. Another Yaesu exclusive, the Auto
Range Transpond System™ (ARTS™) alerts you
visually and audibly when a companion HT is out of
simplex range. Most radio functions are controlled
of the Top Notch™, the neatly placed knob on the
HT. This minimizes complex key sequences. Only
Yaesu has this, Digital Coded Squelch (DCS) for
convenient semi-private operation. Digital Voice
Recording System (DVRS) records voice messages
for playback, and received messages. And, of course
Omni-Directional Display, because you won’t be able
to put this one down!
The FT-10/40R is a military-tough,
commercial-quality force in a small package.
Exactly what you’ve come to expect from Yaesu!!
Better get one now, before the dealer sells out!!
EDITOR'S KEYLINES
Rob Mannion pays tribute to Don Watson G6WJX.

SPOT THE DIFFERENCE
Spot all 12 differences this month and you could win a prize.

RECEIVING YOU
The PW Postbag.

NOVICE NATTER
Eualie Richards G4EFM dips into a selection of newsletters and introduces you to AMSAT UK.

CLUB SPOTLIGHT
Zoë Shortland rounds-up the latest from the Radio Club scene.

REVIEW - THE GARMIN GPS
4S PERSONAL NAVIGATOR
Peter Darville G0XJS has an unusual and different review for PW readers this month.

POWER FROM THE SUN
Ben Neck G4BID shows you how to charge batteries using the sun's power.

ERRORS & UPDATES
Amendments to the 'PW Delta Antenna', and 'Harding's Home Brew'.

THE SHORT TWENTY
Frank Lee G3YCC describes an inductively loaded dipole suitable for DXing on the 14MHz band.

THE BROADCAST ROUND-UP
Peter Shore reports on the international broadcasting scene.

LUCY LUTTEROT
Jan Lutterot G0LUT reflects on the unsung heroism displayed by Second World War merchant seamen.

WOODED WONDER FOR TWO
Maurice Schofield G4WUP 'grows' his own half-over-half collinear antenna.

THE ESSENTIAL GUIDE TO THE LONDON SHOW
Just look at what we've packed into our guide to Picketts Lock 1996!

ONE CHIP - ONE RECEIVER
Steve Ortmayer G4RAW describes a simple receiver that's ideal for the beginner.

THE PW CHANGER
Kevin Walker G4AES makes an h.f. converter using plug-in coils from plastic cash till roll cores!

ANTENNA WORKSHOP
How do you make your attic into a pair of Delta Yagi antennas? - Ray Fautley G3ASG shows you.

WOULD YOU BE ELIGIBLE?
Just what is John GW3C0 fostering skill and enthusiasm for? Read on and find out.

PHIL CADMAN G4JCP describes the first part of a valved amplifier project.

IAN POOLE G3YWX unravels the mysteries behind speech processing.

Mike Richards G4WNC rounds-up the latest computing in radio news.

David Butler G4NSR says now's the time of year to watch for auroral propagation on the v.h.f. bands.

Leighton Smart G6WBI delves into your log books to divulge the latest happenings on the h.f. bands.

Roger Core G5LU takes his bi-monthly look at Packet advances.

Peter Barville G3XJS has an unusual and different review for PW readers this month.

Elaine Richards G4LFM dips into a selection of books.

Look what's coming in Practical Wireless and Short Wave Magazine next month!

84 ADVERTISERS' INDEX
LONDON SHOW SPECIALS

FT-1000  Yaeusu’s HF flagship...............only £2999  save £1000
FT-990   ATU & PSU built in ..............only £1899  save £500
FT-900   Remote mountable HF...............only £1099  save £300
FT-736R  The ‘King’ for the satellites ..only £1499  save £500
TS-790E  VHF/UHF tribander...............only £1659  save £300
TS-50S   Kenwoods HF mobile .............only £899   save £160
TS-690S  HF 100W + 6 metres...............only £1399  save £250
FT-2500M 50W 2m mobile................only £2999  save £100
FT-416G  2m Handi 5 watt................only £239   save £90
FT-10R/A06 New Yaeusu 2m Handi .........only £219   save £50
RL-402  Rexon 70cm Handi................only £149   save £50
RL-102  Rexon 2m Handi...................only £139   save £50
C-188   Standard 2m Handi................only £149   save £130

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2m, 2 watt, single channel & c/w. nicad & charger crystals fitted S22

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* 1 watt output at 7.2v
* 2 channel S20 & S22
* External mic/speaker socket
* Cell case with DC socket
* Hi/low power switch
* Helical & telescopic antennas

only £69

PS120MIIA PSU 3-15V 9/12A ............£66.00
PS140MIIA PSU 3.6V 12/14A ............£72.00

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PK12/100K – 100k Mail Drop Memory Upgrade £49.95 Carr A

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ONLY £319.00 INC Carr C

PK900 – Deluxe multimode data terminal
ONLY £479.00 INC Carr C

PK96 – 9600 Baud packet TNC with 14K of mail drop memory. £219.00 INC Carr B

PAK WIN – Windows based packet software programme ONLY £79.00 INC Carr A

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C1103LN 2.8-525MHz 20/200W ’N’ .......£38.00

CS201 2 Way Switch SO239 1KW .........£17.50
CS201GII 2 Way Switch ’N’ 1KW PEP ....£23.50

LA2808H 2M L/AMP 1.5-5W IN 30-80W OUT £136.00

DLABON 2M/70CM Dual Band Amp 0.5-25W IN 80-60W Out Pre Amps .........£345.00

DX10N 2m/70cm Duplexar UHF/N........£22.50

CPI0Y6 Cigar plug lead for FT530 etc. ....£8.50

Practical Wireless, March 1996
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#### AR-303
Light duty rotator offset mounting.

Only £49.95 inc

AR-200AB matching offset bearing

Only £14.95 inc

#### Comet Antennas Accessories

**RS20**
Mini Gutter Clip
£19.50

**RS21**
Mini Hatchback mount
£19.50

**CX-3MB**
Mini Cable Assembly
£26.50

**WS-VM**
Window Mount & Cable
£39.00

#### Comet Station Accessories

**CBL-30**
HP 1:1 Balun 1kW PEP
£23.50

**CBL-200**
HP 1:1 Balun 2kW PEP
£29.50

**CSW-20N**
Switch 2 WAY "N"
£39.00

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HP Low Pass Filter 1kW PEP
£43.95

**CF-50MR**
6M Low Pass Filter 1kW PEP
£43.95

**CF-30H**
HP Low Pass Filter 2kW PEP
£60.00

**CF-30S**
HP Low Pass Filter 150W PEP
£25.00

**CF-50S**
6M Low Pass Filter 150W PEP
£25.00

**CF-BFP2**
2m Band Pass Filter 150W PEP
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PVR 16-60MHz 28/200/2000
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**CD-270D**
PVR 140-250MHz 15/60/2kW
£89.00

**CMX-2**
PVR 1.8-200MHz 26/50/2000
£119.00

**CA-21HR**
7MHZ Mobile Whip
£49.95

**CA-14HR**
14MHZ Mobile Whip
£49.95

**CA-21HR**
21MHZ Mobile Whip
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2M/70CM Whip BNC
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**CHY60**
370/230CM Whip BNC
£29.95

**HR-50**
6M MOBILE Whip
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**CA2X4K**
2M/70CM Mobile Whip
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**Z4**
2m/70CM M. Whip with locking collar
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**B 10**
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£21.50

**B 22M**
2M/70CM Mobile Whip
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**CHL21J**
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3 x 3 Base Collinear
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£115.00

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6/20/20 Base Collinear
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HVFH Duplexer
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HVFHFUHF Duplexer
£37.00

**CFK-514**
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£54.95

**CF-431**
2M/70CM/23CM Triplexer
£49.00

**CF-520**
2M/60/20CM Base Collinear
£119.00

#### Linear Amplifiers

**TOKYO HY-POWER**

<table>
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<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>HL 100B/80</td>
<td>7MHz 100w out</td>
<td>£20.00</td>
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<tr>
<td>HL 100B/120</td>
<td>14MHz 100w out</td>
<td>£21.00</td>
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<tr>
<td>HL 100B/200</td>
<td>10MHz 100w out</td>
<td>£21.00</td>
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<tr>
<td>HL 66V</td>
<td>50Hz 10w in 60w out</td>
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<tr>
<td>HL 166V</td>
<td>50Hz 2/10 in 150w out</td>
<td>£29.99</td>
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<td>HL 37V5X</td>
<td>2w 5-25w in 35w out</td>
<td>£11.99</td>
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<tr>
<td>HL 62V5X</td>
<td>2w 5-25w in 70w out</td>
<td>£23.55</td>
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<tr>
<td>HL 180V</td>
<td>2w 5-25w in 170w out</td>
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<tr>
<td>HL 36U</td>
<td>70m 5-10w in 30w out</td>
<td>£15.50</td>
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<tr>
<td>HL 63U</td>
<td>70m 10-25w in 50w out</td>
<td>£25.99</td>
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<tr>
<td>HL 130U</td>
<td>70m 3-15w in 120w out</td>
<td>£48.50</td>
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<tr>
<td>HL 2K</td>
<td>HF 2w PEP, 2x3-5002</td>
<td>£175.00</td>
</tr>
<tr>
<td>HL1K/6</td>
<td>6m 10w in 500w out</td>
<td>£99.50</td>
</tr>
</tbody>
</table>

**Carr**

**2 channel Only** £89

#### Other PMR Bargains

307L1 lowband features
F4C-3625 (12.5) UHF 25w 7ch...£89
F4C-4625 (25) RPT UHF 25w 7ch...£99
F4C-740A lowband 40w 12ch...£79
F4C-1625 VHF 25w 7ch...£89

All sets intended for conversion for packet radio use mic's extra.

---

**NEW COMERCIAL MOBILES**

at rock bottom prices, OK for 70cm Packet conversion

**SMC 545LIN/B**
**SMC 1045L2/B**

Single channel Only **£79**

2 channel Only **£89**

Mics available **£10 extra**
The new winter ‘95/96 edition has 280 pages packed with over 4000 products.

- New editions to our computer section further extending our range of PC components and accessories at unbeatable prices
- Free competition with a chance of winning a Hameg 30MHz oscilloscope
- 100’s of new products including; Books, Component Packs, Connectors, Switches, Test Equipment and Tools.
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Practical Wireless, March 1996
Kenwood's TS-870S gives you something called an Intelligent Digital Enhanced Communications System.

Or to put it another way, you can talk to someone halfway round the world and it'll feel like they're in the room with you.

If you've never tried a digital HF transceiver before, you won't believe just how well the TS-870S can find a signal that's almost buried in noise. And because it's made by Kenwood, reliability can be taken for granted, too.

Features? High frequency DSP for post-IF signal processing, high-speed PC control, automatic antenna tuner, a built-in K1 LogiKey for a full range of CW operations features, 100 memory channels...and that's just a taste. Your nearest dealer has the full specification.

Best of all, the TS-870S gives you all this at a price that's amazing value. So you can talk to the world without getting any interference. Even from your bank manager.

For more information on the TS-870S phone 01923 212044.
Introducing the Lowe Electronics VHF Starter Kit

Last month our HF Starter Kit was really popular – but not with Class B licencees! “What about us?” several of you asked. Just as we were getting our thoughts together, news of the ADI AR146 finally becoming available came through and we thought this would make a great basis for our VHF starter kit.

- DTMF Microphone included
- 41 Memories
- Band Scan, Memory Scan, Programme Scan
- 50W power output – selectable 10W and 5W too
- Dual watch operation

And now for all the bits you’ll need to go with it. The first thing is an antenna and for local nets and repeaters a vertical is your best bet. The Chelcom Aerials 2m vertical has been one of our best sellers for the last two years. Solid construction, 6.5dB gain are its main features. An excellent power supply is Manson’s EP815 – 15 Amps at 13.8V is just what you need to power mobile rigs at home. Although the antenna is pre-tuned, it’s still a good idea to have an SWR/PWR meter and the Watson W420 is a great choice. Our starter kit also includes 10m of UR43 and the connectors you need plus our logbook is all you need to get you on the air, nattering on the local net or repeater or perhaps operating packet. Purchased individually the Starter Kit accessories would cost you just over £200. If you buy the ADI AR146 (or any of our other VHF mobile transceivers) you can get this lot for just £149.

Kenwood TM-733E

Their finest dual band mobile to date. Packed full of features, like wideband receive, cross band repeat, duplex operation and of course 9600 baud operation for fast packet radio.

Normally £729 but just £629 from Lowe Electronics.

ADI AT-200

The dynamic duo! Two great handhelds offering great value for money. One for 2m and one for 70cm – choose one or both!

AT-200 – just £164.95
AT-400 – just £189.95

Kenwood TH-79E

Our most popular handheld, full of hidden features but they are all explained in our “Secret World of the TH-79E” booklet. Great radio – great price.

RRP is £479 but pay only £399 from Lowe.

Yaesu FT-51R

The only dual band handheld featuring “Windows” – the manual is built-in so all the commands are at your fingertips. If you want real Windows control, ask about the ADMSI control software and interface available as an option.

FT-51R normally £529 but just £429 from Lowe Electronics.
Can there be such a thing as a professional amateur? We think so. We've sold a number now to respected people in the business of amateur radio - manufacturers, suppliers, respected authors to name but a few. We've also sold the TS-870S to a bunch of ordinary amateurs - but are they ordinary? We don't think so. By and large these are people with several years experience at the sharp edge of DX-ing. They are contest winners, trophy hunters, DXCC chasers and some that just like a good natter with close friends in far away places. They are people who know a good thing when they see it. They know what they want from their set-up and are probably already using some of the best equipment available but to keep ahead, they need every advantage that modern technology can provide. The TS-870S certainly delivers in that respect. Can you afford to buy anything less than the best? If you want to get ahead in this game you've got to do what the very best of them do.

There are two other very good reasons the professionals come to Lowe for top-flight equipment. The first is that they know we NEVER compromise on service and back-up. No one else in this business has four fully-trained, highly experienced engineers who have specialised in Kenwood for nearly all their working lives plus a dedicated spares department to keep the work flowing smoothly. If you don't believe that, come in and see it for yourself. This radio isn't cheap. It is also quite complicated inside. If you are going to spend this much money, it probably represents a considerable investment, you've had to work hard to EARN this radio. You need to know it is going to be looked after - not just shipped out to a third-party service company who don't know you. Secondly, there is value. Our regular customers ALWAYS get the best deals, very often better deals than are offered in anyone's advertising. You just need to call in to take advantage.

FREE!

5 YEAR WARRANTY
A proper warranty from Lowe Electronics - do not confuse with insurance schemes!

FREE!

INTEREST FREE FINANCE
Just £599.00 deposit and 12 payments of £150,000
Total price £2399.00

FREE!

BASE STATION MICROPHONE
Kenwood's MC-85 worth £139.95 at no extra charge!

See the new WINRADiO at Picketts Lock!
That's right, the all-new WINRADiO will be on show for the very first time in the UK on the Lowe stand at Picketts Lock. WINRADiO is a wideband radio that fits into your PC. Amazing Windows software give you full control over the hardware. Covering 500kHz to 1300MHz with a world-wide database of over 300,000 frequencies, WINRADiO looks like it will set new standards for versatility in scanning for PC owners, especially as it looks like being cheaper than a lot of handheld scanners. We expect to sell WINRADiO Multimedia for just £399.

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Practical Wireless, March 1996
Castle Electronics was formed in 1990 by Geoff Wainhouse and John Taylor, when they realised that there was a need for an independent service facility for the Amateur Radio enthusiast. Both are qualified Engineers in Radio Communications and Microprocessor Technology. They are proud to have had Castle Electronics appointed as the authorised service agents and dealers of Kenwood, ICOM and Yaesu equipment. Castle Electronics is the primary sub-contractor for Kenwood service requirements.

The complete SERVICE

SHOWROOM MAIL ORDER SERVICING

Buying, selling a rig or one that’s in need of repair, Castle Electronics has the experience, technical know-how and friendly approach that can help you. As authorised dealers for Kenwood, Yaesu and ICOM we know the rigs inside out. We are the primary sub-contractor for Kenwood’s UK service requirements so we know from the manufacturer the latest service details. Our showroom has large stocks, worth a visit and mail order is welcome.

Equipment sent to us for repair proceeds through an extensive process, including:

- Computer entry of equipment details and history
- Receiver sensitivity tests
- Power output test / ALC and AGC levels
- Spectrum test
- Compliance to manufacture specification
- Fault analysis
- Rectification
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- Service details "print out"
- 3 Month warranty on service undertaken

We can arrange collection and delivery to any part of the UK.

Buying or Selling?

Consider having your equipment tested for performance by Castle Electronics. We can arrange to supply you with certification of its capabilities and performance to your buyer or to you before buying. Contact us today for details.

VISIT OUR SHOWROOM TODAY

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NEW

TS-60S HF TS-60S 6 meter

NEW

TM-733E

YAESU

FT-1000MP

NEW

FT-2500

NEW IC-775DSP

ICOM

NEW IC-706

NEW

IC-Z1E

THE MONTHS SPECIALS

FT-900AT

NEW HF MOBILE with removable front panel & built-in antenna tuner. £1099

FT-900AT

NEW HF MOBILE with removable front panel & built-in antenna tuner. £1250

FT-51R

FT-51RH High power model

New Dual Band HT with Windows

FINEx

IC-706 Includes 6 meters

GEOFF G4AQU - JOHN G6VJC - BOB G0NFO

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PHONE 01384 298616 OR VISIT US TODAY
If I had to name a ‘Mr Practical’ it would have to be Don Watson GW3RJY. ‘Practical’ should have been his middle name! This amazing personality would think nothing of stripping down an old Austin Seven car, totally rebuilding it and making it as good as new! Usually over a couple of weekends.

Don died on Sunday 7 January at the ripe old age of 83. But, ‘old age’ was not a term Don Watson would accept. “No Sir” (to quote his favourite phrase!) ‘You’re only as old as you feel!’ And to judge by his actions, and his never-ending enthusiasm for life and anything he did, he was very much a young man at heart.

Usually, any words such as I’m writing at the moment, are solemnly referred to as ‘Obituaries’. But, in the case of Don GW3RJY, ‘obituary’ is definitely not the correct term. And, like his funeral service in Kerry, near Newtown in the delightful old Welsh county of Montgomeryshire I’m aiming of a wonderful long life’.

Entries to reach us by Friday 22 March 1996.

The beautiful little Anglican church in Kerry was full of his old friends at the funeral. They joined his daughters Sue and Joanne and their families on Saturday 13 January. Paul Essery GW3KFE, RSGB Council Member and friend, read an appreciation of Don’s life (Eulogy is not the correct term here either!) and the lesson was read by Phil Cardwell GW3FX. For once, the rain held off as the congregation wended its way to the nearby cemetery. But it wasn’t too solemn...as I realised if Don had been amongst us that day he would have motorised the bier or at least have had it radio controlled. My seemingly irrelevant remark amused everyone because they knew that’s just what he would have done!

A tiny bag of Arizona desert sand was interred with GW3RJY. It was brought over by his daughter Sue from near her home, and it seemed a fitting tribute to a man who generated international friendship throughout his life.

We’ll miss Don on the annual trip to the Dayton Hamvention and I’ll miss his friendship. However, as he used to say, ‘house-brewing is practised by radio enthusiasts, the GW3RJY spirit will live on in other radio amateurs. It has to, otherwise our hobby would die.

Don Watson GW3RJY
1912 - 1996

Rob Mannion
G5XFD

It seemed to be a good idea to organise an “Editor’s Corner” for the Pickett Lock Show in March. The idea was that Practical Wireless readers could meet Editor Rob Mannion G5XFD at one end of the PW & SWM Stand (Stand T in the Red Hall) and Editor of Short Wave Magazine Dick Ganderton G8VFH at the other end. However, we had forgotten they were both railway enthusiasts! Dick has built another miniature steam locomotive and Rob has borrowed an appropriate uniform to run BR (Bob’s Railway, while readers wait for their books to arrive on platform 1! So, come and join the fun on March 9 and 10, we’ll look forward to seeing you.

There are 12 differences to mark on the right-hand version of the cartoon this month, good luck.
RECEIVING You

Manufacturer's Viewpoint

Dear Sir,

I read with some amusement "Manufacturer's Viewpoint" in the January 1996 PW. David Wilkins GSH Y's long letter about how he manages to "separate" while admitting to control over both simply fails to ring true in a big way. Does he really think that we are all going to go round saying "well, we've had it from the horse's mouth now, so it MUST be genuine". I rather think what we received was from the horse's other end.

About PW's review policy and taking Bill Kitchen's question of "Still Amateur Radio?" (also PW Jan 96) into consideration isn't it time that PW came out of the closet and renamed itself "Wireless Review". This would justify the modern design of the magazine, it's content and it's purpose so much more effectively to its readership.

P. Walton
Manchester

Editor's comment: The PW Editorial team strive to create a 'balance' of articles which appeal to readers. Our reader surveys consistently indicate that equipment reviews are very popular features. Because of this we try to publish varied, accurate and unbiased reports. The reviews include kits and ready-built equipment obtained from manufacturers ranging from 'one man' companies to large international concerns. They aim to reflect all price levels and interests. All reviews are written by authors who are chosen and commissioned specifically by an Editor who guards his professional journalistic independence and high ethical standards (and those of PW!) very closely.

G3XFD.

The 1930s

Dear Sir,

Thank you for the 1000th issue and the Diamond Jubilee issue of Practical Wireless. I have found the articles and pictures relating to the 1930s very interesting. I made up the "Lisfen" w/s kit and remember well tuning into W2XAD Schenectady, New York, it was quite something then. Also, the picture of the 30 line disc television receiver reminded me of the shop window in Guildford in which it was being demonstrated.

F. J. Waller
Cornwall

Editor's comment: Mr. Waller wrote to us after discovering PW on sale in a local newsagent. It appears that he had last experienced radio construction (and PW!) before the Second World War. I sent him copies of our special celebration issues as I'm very pleased that both the magazine and pre-Second World War readers are much in evidence! And in fact, the team would be very interested to hear from readers who have memories of PW from before 1939.

Letter To America

Dear Sir,

Ref: Ed Taylor WT3AU's 'Scene USA', PW January 1996. Thanks Ed for your article (particularly with reference to "The Morse Test"). I have felt for some time that the requirement for a 'One Time' proficiency in Morse does nothing to assist anyone to access the h.f. bands.

I am the first to recognise the value of c.w. as possibly the only method of communications under certain conditions and also the great pleasure that it gives to its adherents. To this end I would like to suggest that a portion of all h.f. bands must be kept for the sole use of c.w. practitioners. If the non-c.w. operators wish to practice Morse then they have access to specific frequencies in the v.h.f. and u.h.f. bands.

As a s.w.l. I have listened to s.s.b. contacts on the h.f. bands well as v.h.f. and u.h.f. And I have to say that in my experience you will hear more courtesy and correct operating procedures on the latter bands! The passing of a Morse Test does not seem to carry with it the wisdom or manners that some people seem to think it merits.

My suggestion would be that the current Morse Test remains in place for those who wish to have access to the c.w. frequencies on the h.f. bands. I also think that access to the non-c.w. part of the h.f. bands be made only to 'Class B' operators after a period of at least two years operations on the v.h.f. and u.h.f. bands.

Hopefully this would give time for newcomers to the hobby to learn the niceties of behaviour on bands, which in general, are confined to working contacts within the UK.

When such experience has been obtained, an operator should be able to operate in a considerate manner and to give a good account of themselves when making international contacts on the h.f. bands.

I realise that many c.w. operators will not be happy with my suggestion, but how many 'would-be' h.f. operators practice c.w. after they have successfully passed the Morse Test? I suggest that it is not a very large proportion. Perhaps you and/or other radio amateurs have ideas on the subject. I would be interested to hear them!

Keith White G7HQR
Dorset

Attracted into Radio

Dear Sir,

I would like to suggest that if more young people are to be attracted into the hobby of amateur radio, it might be a good idea if you reprinted some of the construction articles from previous years, 1960-1990 perhaps. I have in mind some of the circuits, such as the Direct Conversion Morse Test

Dear Sir,

There is a lot of controversy about Morse at the moment in the radio amateur community. I have just passed my Morse test and would like to say that whilst studying some of it was less than helpful.

I have a full time job and there were times when I had to force myself not to sit in a chair in front of the TV, but to turn the computer on and spend an hour or so doing Morse. It was I suppose a great advantage that I am not married or it could have ended in divorce on the grounds of unreasonable behaviour!

In the area that I live there are no Morse classes and although a friend of mine had offered to send me some Morse for a few weeks before the test, illness stopped this. So I had nothing but my computer and the very excellent Morse program from D. Brandon G4UDX. This program not only gives random Morse, but also has QSO style Morse tests and a facility to connect a key and practice sending. I cannot overstate my gratitude to Mr Brandon.

May I say that the feeling of elation I got on opening the letter containing the RSGB's pass slip has more than made up for the struggle of learning Morse. Despite being as nervous as a kitten on the big day, the examiners did all in their power to put me at ease.

So for me, h.f. will not just be another band, but will be something I have earned a right to use and will respect all the more for having done so. I hope that this letter is of some help to others learning or thinking of learning Morse at a time when so many voices are saying why bother, it will be worth it in the end, not only for access to h.f., but also for the feeling of self-respect.

G. Fowler G7MHT soon to be GO??

Derby

P.W.'s Postbag. If your letter is published you'll win a prize.

Practical Wireless, March 1996
The RAIE, QSL Cards & G4BXD

Dear Sir

This is a "double-barrelled" letter to PW in reply to "Bill's Keytimes" on the RAIE and other club matters.

Through our club we have a commercial agreement with the Bilston Community College for Adult Further Education. (Our Club Secretary is the RAIE lecturer). There is a condition though, to take advantage off the agreement you must be a Student Club Member and put in an agreed number of hours at club meetings. But the bonus is that students get their RAIE tuition free and only pay for their exam.

The areas we cover are Willenhall, Wednesfield, Walsall, Wolverhampton, Essington and many other places. Next, I must mention our club card and logo. We decided because the club QSL card which we use for special event stations is sponsored by the Lock Union!

Finally, I must mention Ben Nock G4BXD. I have seen Ben in action and was very impressed indeed by his talk on "Valve & Vintage" at our club. Ben makes light of his disability and he has my admiration.

J. H. Clifton GOUIU
Willenhall & District Amateur Radio Society

Editor's reply: An interesting letter Mr Clifton. The arrangement your club has made with the College of Further Education seems to me to be one which could be copied in other locations. The 'sponsored' QSL card is a good idea too. (Well, a certain electricity generating concern 'sponsors' the weather forecast on ITV don't they? So why not QSL cards?). And I feel sure Ben G4BXD will be pleased to hear you enjoyed his talk on 'V & V'.

Specifications Explained

Dear Sir

I have followed Ian Poole G3YWX's series 'Specifications...The Mysteries Explained' with great interest. Ian's writing skill and the 'short, sharp and concise' style of his monthly column has been a great help to me (and no doubt to others).

As a student hoping to take Electrical/Electronic Engineering as a subject when I go on to University from Sixth Form College, I feel that Ian's series would make an interesting book. Perhaps PW might consider my idea?

Steve Andrews
Newark
Nottinghamshire

Editor's comment: Ian's excellent series comes to an end soon. Perhaps readers would let us know what they think of your suggestion Steve. And we wish you the best of luck with your studies.

Crysta1 Attraction

Dear Sir

Bill Kitchen G4GHB (January PW) has hit the nail on the head; how can we expect anyone to become interested in amateur radio at all, when all they see at special event stations is equipment costing hundreds, if not thousands of pounds?

As a former Scout Leader, amongst the several bits of equipment I used to take along to Scout JOTA stations was a home-made crystal set. This was built using 'breadboard' construction to look deliberately 'Heath Robinson'.

On most occasions I offered a prize to anyone who could tell me how it worked. Every conceivable explanation was given, solar power and wind power being the favourite!

Of all the bits of equipment used, or on display, my old crystal set was often the centre of attraction.

Personally I feel it sad that today many amateurs can no longer build even simple equipment such as power supplies, aerials (too intricate which are found on insects), simple a.m.s, etc. I take more pride in showing visitors home-made equipment than any of my commercial gear.

Judi by your practical projects articles, you are attempting to highlight the practicalities of the hobby. You might consider it worth repeating articles from several years ago, such as the 'Marchwood' power supply for example and re-starting the 'Morse' column for new-comers to PW and amateur radio who have not had the opportunity to read these items.

Be assured, once you start making your own equipment, the bug bites and adds an extra dimension to the hobby.

Colin Topping GM6HGW

THIS MONTH'S STAR LETTER

Dear Sir

I have followed Ian Poole G3YWX's series 'Specifications...The Mysteries Explained' with great interest. Ian's writing skill and the 'short, sharp and concise' style of his monthly column has been a great help to me (and no doubt to others).

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Steve Andrews
Newark
Nottinghamshire

Editor's comment: Ian's excellent series comes to an end soon. Perhaps readers would let us know what they think of your suggestion Steve. And we wish you the best of luck with your studies.

Due respect to Bill, that the high cost of h.f. rigs may become the only bulwark against severe deterioration of the presently good standard of operation and courtesy found on the h.f. bands.

I would never agree to privilege based upon ability to pay but strongly support the suggestion already put forward that Licence Grauling based upon willingness to prove an increasing level of technical knowledge would protect the already crowded h.f. bands from ruination by overcrowding while at the same time reintroduce the (largely) lost ability for home-brew, thereby partially surmounting the problem of the high cost of commercially built radio equipment and the elitism which goes with it.

The Morse Code test is dead. Long live home-brew and licence grading by proven technical knowledge.

Robert Percival G4DFA

Cumbria

Send your letters to the PW Offices, marking it clearly for 'Receiving You.'

Practical Wireless, March 1996
As I’m writing this column during the Festive break there aren’t many letters around.
And as I’ve got lots of different newsletters and leaflets that have been sat on my desk for a month or two, so I thought I’d pull some information from these for a change.

**Metroplex**

Metroplex is the second largest amateur radio repeater club in the USA and their reference guide has been passed on by Phil G3YPQ. What an organised group!

Part of the Metroplex reference guide is their Operating Practice for their repeaters. It made very interesting reading and many of the 42 points travel well across the Atlantic.

Many of the ‘rules’ are really just good manners – like not barging into conversations uninvited, using unnecessary jargon and not hogging the repeater. But there was one point that made me stop and think: ‘Thieves Are Listening’.

If you are taking your family on holiday for a week, do not tell the world. You many return to find a house that was broken into by thieves.

The thieves knew they had plenty of time and that you live in a white house with green trim on the corner. They knew exactly how to get to your house because you gave out directions over the repeater last week.

Thieves listen on radios and scanners. Wait till you get back home before you start boasting about your vacation.

What do you say if someone on a repeater innocently asks “Where is Harry W2QAQ?”. Please, please do not say he has taken his family to Hawaii for two weeks!

What good advice! If you are new on the air, sit and think about some of the things that get said over repeaters (or on 144MHz, etc.). Are you or others being careless about what you say?

Please be careful about what you are saying, not only for your sake, but for others too. The bit about saying someone else has gone off on holiday could catch any of us out.

**Morse Net**

Morse is in the amateur news a lot at the moment with the business of the no-code license. Details have reached me (a bit late I’m afraid) about Alex 2E0AJ from Cheddar who is trying to get a Novice and Newcomers license. Details have reached me (a bit late I’m afraid) about Alex 2E0AJ from Cheddar who is trying to get a Novice and Newcomers license. Details have reached me (a bit late I’m afraid) about Alex 2E0AJ from Cheddar who is trying to get a Novice and Newcomers license. Details have reached me (a bit late I’m afraid) about Alex 2E0AJ from Cheddar who is trying to get a Novice and Newcomers license. Details have reached me (a bit late I’m afraid) about Alex 2E0AJ from Cheddar who is trying to get a Novice and Newcomers license. Details have reached me (a bit late I’m afraid) about Alex 2E0AJ from Cheddar who is trying to get a Novice and Newcomers license.
Scottish News
I was reading the Winter 95 edition of FM News, the publication of the Central Scotland FM Group and found a good anecdote. Abdaillair GM3AXX writes a column in FM News and mentioned the following story: Bob GM36FT, at aged 87, caused consternation in a recent YU contest. It happened thus - instead of giving a signal report plus serial number e.g. 5901 for the first contact, in this contest you give a signal report plus the year you were licensed. 'In among the 5900s and 5980s, Bobs report of 5925 caused many pregnant silences. He has since received letters and cards with congratulations and requests for a QSL card!' Good for you Bob.

Just for the record, I found plenty of other things of interest in the FM newsletter, those of you who belong to that repeater group and therefore receive the newsletter are fortunate indeed.

The article 'Getting in the Picture' by Simon Lewis GM4PLM about amateur television and 'Observations from a Failed DXer' by Wallace Shackleton GM0GNT were both informative and entertaining. Great reading!

First Steps

AMSAT-UK

I 'started out' on the subject of AMSAT-UK this month after reading that the RSGB had presented a cheque for £25,000 to Ron Broadbent G3AAJ for the AMSAT Phase 3D satellite project. So I thought that perhaps it was time to chat about the group. Mind you, I had to do some searching for the answer too. Fortunately, AMSAT (the parent organisation) have sites on Internet (it does have its uses), so does AMSAT-UK. Anyway, this is what I learned.

The AMSAT organisation is a worldwide group of amateur radio operators who share an active interest in building, launching and then communicating with each other through non-commercial amateur radio satellites. But you don't need to be budding satellite designers to join. Anyone who is prepared to support the group financially to further the satellite causes is welcome.

The first satellite, OSCAR 1, was launched at the end of 1961, followed six months later by OSCAR 2. These satellites were built in people's garages and basements. They contained relatively simple beacon transmitters that used non-rechargeable batteries that meant they were only useful for a few weeks.

The early AMSAT satellites were principally launched on missions carrying weather satellites into orbit. Since that time they have shared launch vehicles with a whole host of other commercial, scientific and navigational satellites from a number of countries.

The organisation AMSAT-UK was set up in the early 1970s with just an occasional newsletter, but as time went on it got larger and demanded more time from the volunteers involved. Then in 1978, Ron Broadbent G3AAJ became the Honorary Secretary and started to organise the group on a more formal basis. Ron built up the organisation in his spare time whilst he was working with Trinity House attending to the UKs lighthouses and lightships.

Then when he retired in 1985 he worked full-time for AMSAT, although how you can call the effort Ron puts into the organisation full-time I'm not sure - it ought be called a life's work! Ron's hard work was rewarded at the beginning of 1995 when he was awarded an MBE.

A very unfavouring description of an amateur satellite is that it's a 'flying repeater'. By that I mean you talk to it on one frequency and listen on another frequency. The specialist bit of satellite operation centres around your antenna systems. Not only do the antennas need to have high gain, but it's preferable to have elevation as well as the usual horizontal (azimuth) control. The high gain is necessary both to project your signal to the satellite and also to make the most of the low power return signal.

Rather than recommend specific antennas here, I would recommend you read-up on the specialist literature to pick the system that will best suit your location and budget. As to antenna control, there are now many rotation and elevation systems available both new and on the second-hand market.

Of course the key is only part of the problem as you need to know where to find the satellite. This is one area where computing and amateur radio technology match together extremely well.

There are a wide selection of low cost and free programs available that will calculate the azimuth and elevation settings for all the current satellite systems. The only time that things get a bit complicated is when you want to work the fast moving Low Earth Orbiting (LEO) satellites.

Tracking LEO satellites requires computerised control of the positioning system. However, the later Phase 3 satellites move much more slowly and can be worked with manual antenna positioning.

If you are even remotely considering working through a satellite, I would send an s.a.e. (and 2 x 1st class stamps) to AMSAT-UK asking for their information package and application forms. Or you could send £2.50 for a recent copy of their OSCAR News, the AMSAT-UK magazine to AMSAT-UK, 94 Herongate Road, London E12 9E0.

I hope you've found this month's 'Novice Matter' interesting and don't forget I'm always pleased to receive your news and 'natterings'. Send queries, questions and suggestions to the address at the top of the column. Cheers for now.

Send your letters to Elaine Richards G4LFM, PO Box 1863, Ringwood, Hants BH24 3XD.
**HF TRANSCIEVERS**

- **Yaesu FT-1000 MP DC**

- **ICOM IC-775**
  - We offer the best part-ex deals. Don’t hesitate, give us a call today and upgrade to this superb new transceiver. RRP £3699. **Our Price £3169.95**

- **Kenwood TS-870S**
  - The very latest HF transceiver from Kenwood. RRP £28439. **Picketts Lock Special £1999.95**

- **ICOM IC-706**
  - HF transceiver with 6+2m. RRP £3195. **Our Price £2499.95**

- **Kenwood TH-79E**
  - UK’s best selling dual band handheld. RRP £249. **Our Price £199.95**

- **Yaesu FT-51R**
  - Dual band handheld. **Our Price £429.95**

- **Alinco DJ-G5**
  - Dual band handheld. Picketts Lock Special. **Our Price £379.95**

- **Yaesu FT-290RII**
  - 2m all mode transceiver. **Our Price £449.95**

- **Alinco DR-610**
  - Amazing value dual band transceiver. **Our Price £599.95**

- **Yaesu FT-2500M**
  - Rugged 2m mobile with 50w output and extended Rx from 140-174MHz. RRP £399. **Our Price £309.95**

**VHF/UHF HANDHELDs**

- **Yaesu**
  - **FT-51R**
    - Dual band handheld. **RRP £525. Our Price £429.95**
  - **FT-690R**
    - 6m all mode transceiver. **RRP £645. Our Price £499.95**
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    - Dual band handheld. **RRP £255. Our Price £229.95**

**VHF/UHF MOBILES**

- **Vectronics VC-300L**
  - UK’s best selling ATU with dummy load + VSWR meter. **RRP £129.95**

- **Vectronics VC-300M**
  - 300W mobile antenna tuner. Dual meter, power + SWR. **RRP £89.95**

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  - 25-30A power supply with variable volts (3-15). Dual meters (VS + amps) and over voltage protected. **RRP £89.95**

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  - DSP-599 (new) **RRP £239 Our Price £219.95**
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  - Invisible Microphone. Microphone is hidden in earphone, just put CT-221 on your ear. It is easy for sending out or receiving signals. **(Please specify brand of radio when ordering)** **£24.95**

- **Nissei EP-300T**
  - Over the ear earpiece with lapel mic & PTT. Fits Kenwood, Yaesu or Icom (Please specify brand of radio when ordering) **£19.95**

**SWR METERS**

- **Nissei RS-402**
  - 125-525 MHz (200W) FWD/REV/APE/PEP PWR + Full SWR Indicator and Meter Illumination. **RRP £69.95**

- **Nissei RS-102**
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- **TSA-6601**
  - 144-44MHz (60W) pocket PWR/SWR meter **£34.95**

- **TSA-6602**
  - VHF/UHF Antenna Matcher **£34.95**

**Microphones & Ear Pieces**

- **Nissei EP-300**
  - Deluxe over the ear earpiece. Fits all handheld radios. **£9.99**

**Deliveries (UK Mainland)** 24HR **£10**
### Accessories

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### Accessories

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### Personal Note

For even greater savings see you at Picketts Lock, Blue Hall Stand Z
Canadian Update

Remember reading in last month's Club Spotlight about the Canadian Amateurs? Well, Club Spotlight has recently received a FAX from Jim Hatch G3DFF regarding the proposed Net, and Jim says that a frequency for 3.5MHz has been found.

The Net will meet on 3.632.4 every Thursday afternoon at 1500Z. Further frequencies and meeting times will be forthcoming in the future.

All Change At Stockport

At the Stockport Radio Society's AGM held on December 13, the following changes occurred. The new Hon. Sec is (once again) Jim France G3KAF, whose address is 34 Ladythorn Road, Bramhall SK7 2ER and the new Chairman is Bernard Naylor G3SHF, and his address is 47 Chester Road, Poynton SK12 1HA.

Southampton Amateur Radio Club

The Southampton Amateur Radio Club meet every Monday evening either at Cantell School, Violet Road, Southampton or at the QTH of Malcolm G1UWL. Full details can be obtained from Harold McIntyre, 42 Dunvegan Drive, Loderswood, Southampton SO16 8DD or telephone on (01703) 737715. New members are always welcome.

The Club hopes to run a special event station on Saturday June 29 1996 to celebrate 135 years of Lockerley Primary School. The callsign GB2LPS has been applied for (further details nearer the time).

All Time High For Trowbridge

The year 1995 has seen club membership of the Trowbridge & District Amateur Radio Club rise to an all time high of 44. The club has also been involved with several special event stations including GB125BRS. The club also provided the talk-in station GB4LR for the 38th Longleat Mobile Rally. Club membership has been bolstered by candidates from last year's RAE course held at the club venue and more recently by the weekly c.w. tuition class.

Throughout the year, the club has enjoyed several interesting and informative talks and social nights have been well supported.

The diary for 1996 is well in hand and topics covered will include QRP, home-brew equipment and quad antennas. It is also hoped that an RAE class will run from next September.

The current c.w. class is due to run until early February. Visitors are very welcome to attend on main meeting nights, however, there is a small charge.

The Trowbridge Club is a small and friendly group providing a focal point for the hobby, in and around the West Wiltshire area. Meetings are held at the Southwick Village Hall, Southwick, Nr. Trowbridge, Wiltshire. All meetings, unless otherwise stated, start at 8pm.

The Club also meets on the 3rd Wednesday of each month for an
Visit From Waters & Stanton

Waters & Stanton will be visiting the Hoddesdon Radio Club on Thursday 29 February for the third time and all visitors will most welcome. This is always an enjoyable evening when new products and rigs are on display.

All local clubs will be notified as usual. Further details on the club including a map and magazine can be obtained from Don G3JNJ on 0181-245 3678.

Informal natter/social night (except in October when it will be on the 1st Wednesday). Visitors are always welcome (fee of 50p). Access is satisfactory for disabled visitors from the adjoining car park.

For further details, contact the Club Secretary Ian Carter G0GRI on (01225) 864698 (evenings and weekends).

Hernia Cup Competition 1996

Having won the aptly named Hernia Cup at Farnborough last year, the Echelford Amateur Radio Society are now arranging and hosting the competition in 1996. To those who don’t know, or who have forgotten, the competition takes place annually between radio clubs in the local area and consists of a Question and Answer session between radio clubs in the local area and weekends).

The invitation is being sent to the following radio clubs: Bracknell, Farnborough, Guildford, Racial and Reading. If it arrives at the QTH of someone no longer an official, the society are asking for members to pass it on to the current secretary.

To find out more, contact Pete Townshend G6PMT, Hon. Sec. on (01344) 843472 or write to 48 Cabrera Avenue, Virginia Water, Surrey GU25 4HA.

Club Reminders

The Wimbledon & District Amateur Radio Society meet on the second and last Friday of each month at 7.30pm at St. Andrews Church Hall, Herbert Road, Wimbledon SW19. The first meeting of the month is a general natter night, combined with Morse practice and tuition and some h.f. phone operation using the club callsign G3W1M.

On February 9 there is an evening of Morse practice and h.f. operating using the club callsign and on the 23rd there is a surplus equipment sale. On March 5, again this is an evening of Morse practice and h.f. operating using the club callsign.

For further information contact the club secretary Charles G7OYX on 0181-679 1387 or E-mail charis@cix.compulink.co.uk.

Meetings are held at 7.30pm for the Newquay & District Amateur Radio Society at Treviglas School, Newquay, Cornwall. Membership is about 15 and the age group ranges from 12 to some retired gentlemen and include Novices as well as Class A and B members.

There is no pre-arranged programme, but there are various evenings which include talks, demos, equipment building activities, quite a bit of nattering (an important part of any radio club!) and always coffee and biscuits! The members are also keen on contest work and participate in several contests throughout the year.

The club callsign is G4AVY and the club say they welcome any stations who hear their call. Anyone with an interest in amateur radio can visit or join the club. More information and details can be obtained from Maggie Reed G6KEM, Secretary, on (01726) 882752 or via Packet BBS GB7NEQ.

The Guildford & District Radio Society meet on the 2nd and 4th Friday evening each month at 7.30 for 8pm in the Guildford Model Engineers Society Clubhouse, Stoke Park, Guildford, Surrey. Throughout the year, the Society try to arrange a series of interesting speakers on club nights as well as some construction and equipment making evenings.

The Society is active in contests such as h.f. and v.h.f. Field Days, organises d.f. hunts and has the occasional club BBQ. Visitors and new members are always welcome at the club nights and further details can be obtained from the Honorary Secretary Michael Marshall G0RXX on (01932) 344351.

The Sutton & District Amateur Radio Society meet on the 3rd Thursday of the month at the ‘Skywave’ premises, 47 Trevian Road, Sutton, Surrey. Natter nights are the 1st Thursday of each month at 8.30pm (approx) in the bar.

On February 9 there is an evening of Morse practice and h.f. operating using the club callsign and on the 23rd there is a surplus equipment sale. On March 8, there is a talk from a representative of the local police on procedures and laws of the air.

For talk-in call on RB4, GB3KL. For more information, contact the club’s Secretary, Reg G4TRV on (01726) 72951.

The Wigan) Douglas Valley Amateur Radio Society, at Marie Place Further Education Centre. Leylands Road, Burgess Hill, West Sussex. The meetings are held on the 1st and 3rd Saturday of each month at the Wigan Sea Cadet HQ Training Ship Seeprie, Brookhouse Terrace, off Warrington Lane, Wigan. Contact D. Snape G4GWG on (01942) 211397 for more details.

Meetings are held on the 1st and 3rd Fridays of each month for the Mid Sussex Amateur Radio Society, at Marie Place Further Education Centre. Leylands Road, Burgess Hill, which opens at 7.30 for a 7.45pm start. The Clubroom is open on all other Friday evenings for informal gatherings and matters.

Contact Paul Everett G7SRV (Secretary) on (01444) 698372 for more details about the Society.

On March 14, the Kings Lynn Amateur Radio Club have a talk on the Nuclear Industry by a member of the Speakers Panel Service, British Nuclear Fuels, Sealfield, starting at 8pm. All are welcome. Refreshments will be available. The location for this talk is at the Scout HQ, Chequers Lane, North Runcton, Nr. Kings Lynn, Norfolk. For talk-in call on RB4, GBJKX. For more information, contact Ian Cooper G0BMS, Honorary Secretary, at (01553) 765614 or @ G87OPC Packet BBS.

Send your club information to Zoe Shortland at the PW Office.
An unusual and different review for me this time! So, before describing the operation of the GPS 45 Personal Navigator, it will probably be useful to offer an explanation of the satellite Global Positioning System (GPS).

As a result of difficulties experienced in the Vietnam conflict, the US military decided to develop an accurate navigational system for use by its forces. Early experiments involved a localised LORAN system, but these were not very successful.

The USA then turned to a system employing four satellites in high orbit above the earth. Although offering advantages over earth based radio systems, the satellite system still tended to be inaccurate, as positional fixes could only be obtained every two hours.

**Nav-Star System**

The Nav-Star system was the next to be developed, and was operational (in a limited way) from 1986. But the small number of orbiting satellites meant that there was only three to four hours coverage per day.

Plans to increase the number of satellites were severely delayed by the Challenger Space Shuttle disaster of 1988, as the shuttle was the main launch vehicle for the satellites.

However, the present GPS system became partially operational when hostilities in the Gulf commenced in 1990. By this time a useable constellation of 21 satellites were in position. and the US Defence Department offered the system to civilian use little later. It is this same system which we are able to use today.

There are now 24 GPS satellites. They orbit the earth twice a day, 11,000 miles above the earth, transmitting information about their precise position and elevation.

A GPS receiver (such as the GPS 45) acquires the signals from each available satellite. Next, it measures the interval between transmission and receipt of the signal, and then determines the distance between it and the satellite.

Once the receiver has calculated the data for (at least) three satellites, its location on the earth’s surface can be determined. Almanac data is general information on the location (and health) of each satellite in the constellation, and can be received from any of the satellites.

A GPS receiver with a current almanac in its memory knows where in the sky to look for satellites, given its last known position, and the time of day.

**Almanac Information**

When the GPS 45 is switched on for the first time, it will have no almanac information in its memory. So, it will need to discover which satellites are available, and their positions.

Signals from the satellites do not travel well through obstructions (buildings, trees, etc.). So, in order to let the GPS 45 carry out this operation, the manufacturers recommend finding a large open area with a clear view of the sky from horizon to horizon.

The manual suggests the initial acquisition period will be between seven and a half and 15 minutes, although the review model took around 20 minutes. Once this operation is completed, however, the GPS 45 (when it is next switched on) will already have a "last known position" in its memory, and the satellite acquisition time drops to around two minutes.

The GPS 45 is not dissimilar in size, and weight, to the average mobile phone or amateur hand-held rig. The attractive black and white case is well constructed, and should be able to withstand the rigours of outdoor life.

A carrying case is provided (with belt attachment strap) for additional protection, although it's not possible to operate the receiver whilst in the case. The unit fits easily into the hand, and the liquid crystal display (which takes up nearly half of the front panel) is easy to read. A backlight is provided for night time conditions.

"There are now 24 GPS satellites. They orbit the earth twice a day, 11,000 miles above the earth."
My next experiment was to take the receiver with me in the car. And in order to give it the best possible view of the sky, I put it above the dashboard, just inside the windscreen.

I expected the screening effect of the car body to prevent the GPS 45 from working too well, but to my surprise it seemed able to plot our position as I drove along. Once again, I felt that a 'system pause' would have been very useful because, as soon as I removed it from inside the windscreen to look at its display, the receiver began losing the satellite signals.

However, it's possible to remove the small antenna from its BNC socket on the receiver and install it outside the car, fed via a length of coaxial cable. In fact, a remote antenna mount (with a small suction pad) is available at an additional cost of £41.

I've no doubt that the external antenna will provide much better results for in-car use, and (except in built-up areas) provide superb navigational information.

Moving Map

It's possible to zoom and pan around the Moving Map display. With 12 different map scales to choose from, the whole route can be viewed, or just a small part of it.

It was quite remarkable to see my route around the village being displayed on the receiver's screen. However, because the unit is continually plotting its position, I found it prone to short term inaccuracies, due to temporary loss of signal from one or more of the satellites.

The problem was caused by proximity to buildings, trees, or even the screening effect of my own body. More reliable results were obtained by holding the GPS 45 away from my body, but this wasn't comfortable for long periods.

Because of the screening problems, I felt the need for a facility to be able to 'freeze' (or pause) the system. This would enable the user to study the displayed information without running the risk of screening the receiver from its satellites, and thereby producing 'false' positional data.

In The Car

The default setting for the positional information is latitude and longitude (degrees and minutes). You can also select degrees, minutes and seconds; degrees only; UTM co-ordinates; or British, Irish or Swiss Grid formats.

When the British Grid format is selected, the GPS 45 will show which 'Worked All Britain' (WAB) square you are in. This is ideal for mobile and portable WAB operators.

Many is the time I have been asked when mobile (even on the h.f. bands) which WAB square I was in at the time, and have had to admit that I didn't know. The GPS 45 will solve this problem.

Latitude And Longitude

The default setting for the positional information is latitude and longitude (degrees and minutes). You can also select degrees, minutes and seconds; degrees only; UTM co-ordinates; or British, Irish or Swiss Grid formats.

When the British Grid format is selected, the GPS 45 will show which 'Worked All Britain' (WAB) square you are in. This is ideal for mobile and portable WAB operators.

Many is the time I have been asked when mobile (even on the h.f. bands) which WAB square I was in at the time, and have had to admit that I didn't know. The GPS 45 will solve this problem.

Manufacturers Specifications

<table>
<thead>
<tr>
<th>Physical</th>
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<tbody>
<tr>
<td>Case</td>
<td>Waterproof, dry nitrogen-filled.</td>
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<tr>
<td>Size</td>
<td>150.5 x 50.1 x 10.23mm</td>
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<tr>
<td>Weight</td>
<td>284g with batteries</td>
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<tr>
<td>Temperature Range</td>
<td>-15 to 70°C</td>
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</table>

<table>
<thead>
<tr>
<th>Performance</th>
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<tr>
<td>Receiver</td>
<td>Differential-ready MultiTrac8</td>
</tr>
<tr>
<td>Acquisition time</td>
<td>Approx 20 seconds (warm)</td>
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<tr>
<td></td>
<td>Approx 2 minutes (cold)</td>
</tr>
<tr>
<td></td>
<td>Approx 7.5 minutes (AutoLocate)</td>
</tr>
<tr>
<td>Update Rate</td>
<td>1/second, continuous</td>
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<tr>
<td>Position Accuracy</td>
<td>15 metres RMS (*)</td>
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<tr>
<td></td>
<td>5-10 metres with DGPS corrections (**)</td>
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<tr>
<td>Velocity Accuracy</td>
<td>0.1 knot RMS steady state</td>
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<tr>
<td>Dynamics</td>
<td>Performs to specification to 3G</td>
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</table>

<table>
<thead>
<tr>
<th>Power supply</th>
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</thead>
<tbody>
<tr>
<td>Input</td>
<td>4 AA batteries or 5-40V d.c.</td>
</tr>
<tr>
<td>Battery Life</td>
<td>10 hours (normal mode)</td>
</tr>
<tr>
<td></td>
<td>Up to 20 hours (battery saver mode)</td>
</tr>
</tbody>
</table>

* Subject to accuracy degradation to 100m 2DRMS under the US DOD-imposed Selective Availability Program.
** With optional GARMIN GBR 21 Beacon Receiver Input.
ICOM IC-736. SAVE £300! Now that the six meter "season" is with us, only not treat yourself to a new 100w HF Transceiver, 100w 6M transceiver, PSU & with ATU!
RRP: £1999. ML Price: £179. DEPOSIT FROM ONLY £279!

ICOM IC-706. SAVE £150! If you not lucky enough to win yours shared to the RSS, then the next best thing is to buy one cheap cheap.
RRP: £1199. ML Price: £99. DEPOSIT FROM ONLY £99!

ICOM IC-775DSP. SAVE £600! The only new 200 watt design from the top three Jap manufacturers in the last twelve months. Add DSP and you'll have themes well as they hear you!
RRP: £2359. ML Price: £2099. DEPOSIT FROM ONLY £399!

ICOM IC-2350H. SAVE £120! One of the best selling dual band mobiles during 1995. Fifty watts on 2M and thirty five on 70cm, you can't afford to miss this bargain!
RRP: £599. ML Price: £259. DEPOSIT FROM ONLY £599!

KENWOOD AT-850. SAVE £30! An internal auto tuner for the TS-850. If you purchased your rig without the ATU because of the price, then our bargain offer is a must!
RRP: £149.95. ML Price: £119. THATS LESS THAN TRADE!

YAESU FT-900AT. Save £500. A full size HF base station performer in a small compact package! 100 watts with the facility of 70cm as standard.
RRP: £1499. ML Price: £119. DEPOSIT FROM ONLY £199!

YAESU FT-290RMK2. SAVE £100! The only 2.5 watt 2M multimode transportable available. Special offer for those who want it with or without the matching 25 Watt linear amp!
RRP: £599. ML Price: £499. DEPOSIT FROM ONLY £499!

YAESU FT-736R. SAVE £500! A nearly £2000 kit, sales have slowed down. Not at the Lynchy stable however. We've still got old priced stock at loadsa money off list!
RRP: £1999. ML Price: £149. Add a six metre card for only £199 (Whilst stocks last).

THE YAESU FT-840 "STATION". SAVE £200! Getting back into the hobby, or wanting to clear out your old gear and trade up for new? Have a look at this little package.
YAESU FT-840 (RRP £699)
Waterco 20 PSU (RRP £99)
1/2 size 5DRV (RRP £22)
VCI 300M ATU (RRP £119)
Coax. plugs. (RRP £15)

YAESU FT-23R. SAVE £59! Engineered like a nr other 2m, the facility of 70cm as standard. The FT-23R will form the basis of a sturdy "commercial grade" transceiver for many years of operation.

YAESU FT-51R. SAVE £100! Complete with nicads and charger, offered with CTSS included, this dualband handle is a real find.
RRP: £159. ML price: £129. DEPOSIT FROM ONLY £49.

YAESU FT-1000. SAVE £1010! Down to the last few at a massive 80% off the RRP 200 watts and the only transceiver available with two fully independent receivers. (When fitted with the OPC-1)
RRP: £2999. ML price: £799. BRAND NEW & BOXED.

YAESU FT-1000MP. SAVE £420! The latest offering from the YAESU camp. "EDSP", built in PSU & the advantage of Collins Filters.
RRP: £2499. ML Price: £1499. DEPOSIT FROM ONLY £499!

YAESU FT-990AC. SAVE £668! Place an order for this 190 watt HF Base Station complete with Auto ATU, Internal PSU and Digital filtering and YAESU will throw in two optional filters, FREE of Charge! But hurry - offer ends mid March!
RRP: £2557. ML Price: £1899. DEPOSIT FROM £399 WITH FREE FILTERS!

SPECIAL INTRO PRICE: £479.95

YAESU FT-990. SAVE £600! The only new 200 watt design from the top three Jap manufacturers in the last twelve months. Add DSP and you'll have themes well as they hear you!
RRP: £2359. ML Price: £2099. DEPOSIT FROM ONLY £399!

YAESU FT-990MP. SAVE £368! Place an order for this 190 watt HF Base Station complete with Auto ATU, Internal PSU and Digital filtering and YAESU will throw in two optional filters, FREE of Charge! But hurry - offer ends mid March!
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RRP: £2557. ML Price: £1899. DEPOSIT FROM £399 WITH FREE FILTERS!
In addition to the small selection shown here, we have at least 400 other used items available. Call FAXBAK on 0181 - 566 0 007.
Garmin GPS 45 Personal Navigator

Continued from page 19

for you, but do NOT try to watch its display whilst driving. If you have a passenger with you, I suggest they do the navigating!

The receiver is (normally) powered by 4 AA alkaline batteries, and the Status page gives a very good (bar graph) indication of their state. Although NiCads may be used, the bar graph calibration is only correct for alkaline batteries. The optional Power/Data Cable allows connection to an external supply of between 5 and 40V.

**Extremely Sophisticated**

The facilities offered by this extremely sophisticated receiver are too numerous to describe here. Many of them are perhaps of more relevance to marine applications than to amateur radio.

However, it's worth mentioning a few of the facilities, because I'm quite sure the GPS 45 will find its way onto many an amateur's list of essential equipment.

For example, Waypoints (up to 250 can be stored and used) may be entered by taking an instant electronic fix. They can be manually set by entering their co-ordinates, or even by entering the range and bearing from an existing Waypoint. The GOTO function guides you to any of them, and gives a 'roadway' graphic display as you go.

In fact, the roadway display is quite fun to use, and not unlike playing a computer game. A slow 180° turn results in the roadway rotating within the receiver's display (almost makes you feel seasick!), but there is no confusion as to which way to travel as there is always an arrow clearly indicating the correct direction.

Additionally, you're also given the distance from destination and the given correct heading, plus your current heading and speed. As you approach the destination, a 'finish line' appears in the roadway, and you are given an audible and visual alert as you approach even closer.

You can plot a route from one place to another using a set of predefined Waypoints, and see your actual position in relation to each of them as you travel. A computer interface is available, which (with the optional PC kit) allows you to save details of routes, Waypoints etc to and from a PC.

The GPS 45 will let you optimise its display to your own requirements, and is a very user-friendly piece of equipment. There's no doubt that its navigational versatility is quite astounding, and the technology has clearly derived enormous benefit from the receiver's military origins.

In order to ensure optimum performance, it's necessary to give the receiver an uncluttered view of the sky. This may mean using the detachable antenna mounted (for example) on the roof of a car, or boat. The GPS 45 may not function well within a built-up area. But then I don't suppose you would need a satellite Global Positioning System to find your way around town!

**Precise Location**

I imagine the ability to be able to determine your position with pinpoint accuracy, or follow a course to a pre-determined and precise location will be regarded as an invaluable asset by those setting up DXpeditions to the more remote spots. Indeed, perhaps such navigational aids should be an essential piece of safety equipment.

Keen WAB operators, needing to know quickly and easily which square they are in, will certainly find the GPS 45 helpful. And the altitude indication will be useful to v.h.f. and u.h.f. operators considering portable locations.

The price of this advanced technology has fallen dramatically in recent years. So, if you need to know where you are, or where you're going - the GPS 45 price of under £300 must represent good value for money.

All I need to do now is to find my way to the PW office to return the GPS 45. It's a pity, but I can't claim I lost my way and couldn't return this fascinating piece of equipment!

My thanks go to Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (01629) 580080, FAX: (01629) 580020 for the loan of the review GPS 45. It's available from them at £289 plus £10 P&P next day delivery.

Richard McLachlan of Lowe Electronics sent us the following comments:

Thanks for letting me add a couple of comments to the very comprehensive review by Peter Barville G3XJS.

We have been selling the GPS 45 for around five months now, and we have found that one of the most popular Amateur Radio applications that customers have asked about is using their GPS together with a packet TNC for automatic position reporting over a v.h.f. radio link. The GPS 45 provides position data in NMEA format from its serial port that can be connected to any GPS compatible TNC, such as the latest version of the Kantronics KPC3.

If this is hooked up to a portable transceiver, it will beacon its location every 30 seconds back to a control point, where position can be displayed on a PC using the Automatic Position Reporting Software (APRS), which is freely available on the Internet. The end effect is very like the aircraft plotting tables seen in wartime films, with a number of annotated targets moving in real time on a map display. This feature has obvious applications for RAYNET use, where, for example, ambulance and rescue vehicle positions can be displayed automatically.

You can also upload and download lists of waypoints and track information etc, via the data port on the GPS 45 to an external computer. This is done using the optional Garmin PC interface cable and software control package.
By Ben Nock G4BXD

Ben Nock G4BXD is banking on another sunny summer over in Kidderminster this year! Ever on the look out for a bargain, he’s developed a sun-powered battery charging unit using a budget-priced solar panel.

Heading Photograph: The solar panel and associated regulator unit connected to an IC1 144MHz hand-held transceiver.

Given the falling price of solar panels these days a thought crossed my mind that one might be worthwhile as a simple charger. After all, at the moment the sunlight seems to be the only free thing left!

With free power in mind I’m going to describe a simple solar-powered charger. The project, shown in the heading photograph, is suitable for charging hand-held transceiver batteries, flashguns, just about anything that needs 12V or less at several hundred milliamps.

The solar panel I bought measures approximately 305 by 305mm, and cost about £12. The panel is not very thick but rigid enough to be free standing.

The current regulator used in conjunction with the panel is fitted in a small box. I used a meter as an indicator to set the current but a switched resistor or a suitable scale around the potentiometer would have done.

My solar panel provided over 20V d.c. (no load) in full, bright sunlight. On load, with full sunlight the panel would supply 12V at 250mA, more than enough for most NiCad batteries.

As a four panel unit, only 610 x 610mm square, would supply 1A, I had a brainstorm. How about fitting the entire roof with them? It was only the intervention of ‘she’ who must be obeyed that stopped the idea!

Current Settings

A simple constant current regulator is used in the project because I’ve assumed that most of the devices to be charged will contain NiCad cells. The regulator built using the L200 regulator i.e., available for under £2 from most suppliers.

A constant voltage circuit could also be used but seemed less useful. The circuit diagram is shown in Fig. 1, and the L200 pin-out configuration in Fig. 2.

Construction is straightforward enough and can be housed in either a metal or plastic box. If you decide to use a meter, then the regulating components can be hung off the meter terminals. The regulator i.e., itself can be bolted to the box if it’s a metal type metal, otherwise a small heatsink can be fitted.

I used 4mm sockets for the panel connections and 4mm terminal posts for the regulated output. The choice of plugs and sockets is very much up to the constructor.

In use, I placed the solar panel in the sloping window of my attic workshop. As luck would have it the window faced just west of south, so it received sunlight for most of the day.

I did have some thoughts about using small motors to step the panel around so as to follow the sun. This idea is still being worked on and might form the basis of a future article.

During normal daylight alone, the charger would happily sit there all day and charge one or two AA NiCad cells in series. This is handy for maintaining a battery backup for equipment.

In bright sunlight I used the...
charger on my big press flashgun. Its 6V battery will quite happily take 150 to 200mA while charging. And even in the winter the local watery Worcestershire sunlight proved the unit will charge a couple of AA cells in series.

**Handy On Holiday**

I would imagine that the panel and charger would be handy if you’re going away on holiday to sunny climes. Leave the panel on the balcony and radio batteries, flashguns, hand-holds, etc., could all be charged during the sun-filled day while you’re on the beach.

You could come back to fully charged batteries. They would be ready for that night’s party pictures or evening QSOs.

I suggest that you obtain a small stout carrying case, something that would not get bent easily (a briefcase perhaps). This could be used to transport the panel, the regulator simply sitting in the case.

I hope you find the unit useful, I have had mine charging away for quite a while now and am fully convinced it has paid for itself already. It’s not often you can get something for nothing!

---

**PW**

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**PW Helta An Experimental Loop Antenna, pages 39 - 41 PW February 1996**

Further to the PW Helta Loop Antenna in the February issue of *PW*, Richard Marris G2BZQ asked us to emphasise that the wire used to wind coils L1 to L5 should be at least a 6A type. Any wire thinner than this will probably result in a dismal failure.

On the prototype Richard used a 26/0.2mm 6A rated pvc covered wire with an overall diameter of 2.05mm. This is available from most large suppliers. He also mentioned that he used only two metres of RG58 cable to connect to his transceiver.

One value, left off both the diagram and the shopping list, is that for capacitor C2. This item should be a 1000pF (1nF) silver mica type.

*My apologies for these errors.* Editor

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**Harding’s Home-Brew, pages 36 - 38 PW December 1995**

In the circuit diagram of the ‘two rail’ power supply shown in *Fig. 1* on page 36 of the December issue of *PW* an unfortunate error crept in. The two diodes D2 and D4 were both shown with the wrong orientation.

Refer to the corrected new circuit diagram shown here. The cathodes of D3 and D4 should point towards Output 2. The other two diodes, D1 and D2, should have their anodes pointing towards the 0V rail.

*My apologies for these errors.* Editor

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**Errors & Updates**

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**Fig. 2: Pin-out configuration of ICI.**
IT'S PICKETTS LOCK TIME AGAIN!

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AMATEUR RADIO &
COMPUTER SHOW

And this
year there's
an added
attraction!

7th Great Year!

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The antenna I'm describing is an inductively loaded dipole for the 14MHz band. It may be found to be useful for amateurs with limited space and for taking on holiday!

The first time I came upon the idea for this antenna was in an article in Amateur Radio Techniques, by Pat Hawker G3VA, published by the RSGB. (It's in Edition 5).

To build the antenna I used readily available aluminium tubing. It only needed a handful of extra hardware.

The original article used coils of 63.5mm diameter. This makes construction difficult, so I modified the idea by using a much smaller diameter pvc tube (or dowelling), which also joins the two halves of each element. The dimensions for the 'Short Twenty' dipole are in Fig. 1 and construction methods are illustrated in the photographs.

Aluminium Tube

I bought six pieces of aluminium tube to build my prototype. Four were 1067mm long sections of 25mm outside diameter and two 610mm lengths of 22mm outside diameter. (These were the only two available from my local supplier that are a sliding fit).

Two 305mm long off-cuts of 22mm pvc pipe were available, which is a reasonable fit in the larger tube. This is strengthened by inserting pieces of hard wood dowels and they're used to join the two halves of the larger tubing as illustrated. (They also act as a former for the two small loading coils).

To ensure a good fit, the pvc tubing is wrapped with a couple of layers of adhesive tape. The free ends of the larger tubes have three saw cuts in them and a hose clip is used to secure the sliding inner tube when tuning the antenna.

Centre Piece

The centre piece of the dipole in my prototype was made from a defunct nylon chopping board, which was approximately 255mm square and 6mm or so thick. (Any strong insulated material could be employed here, possibly marine quality plywood treated with polyurethane yacht varnish).

The dipole elements are secure to the centre plate by suitable car exhaust clamps. Another piece of 22mm pvc tubing strengthened as above with dowel (approximately 152mm long) is inserted into the elements at the centre to help with rigidity.

Again, to ensure a good fit, a couple of layers of adhesive tape is applied. I used self-tapping screws to secure the aluminium tubing to the pvc joining sections at the centre and at the location of the loading coils.

Loading Coils

The loading coils were wound using 18 turns of plastic coated single strand wire. I secured the ends under the self-tapping screws with suitable washers.

I then used pvc tape to cover the coils to prevent the turns moving. (When the antenna is finished, the coils and their associated fastening screws I suggest you cover them with heat-shrink tubing).

Coaxial Cable

The coaxial cable connection is achieved by using crimp-on connectors, which are available from the local motorist's accessory shop. They're fixed under suitable washers and screws at the centre of the dipole as can be seen from the photographs.

I treated the end of the coaxial cable with a coat of 'Waxoyl' to prevent the entry of water. The various screws and fasteners were similarly treated.

The method I've used has proved to be an effective way to waterproof antennas and coaxial cable joints. The ends of the thinner tubing can be sealed with an insert of dowelling, dipped in polyurethane varnish.

Finally, the dipole is fastened to the mast support using suitable sized U-bolts to suit the mast diameter. The two U-bolts pass through the nylon centre as illustrated in the diagram.

Tuning The Antenna

Tuning the antenna is simple. However, it should be done with the dipole in the clear, preferably in its final position.

In my case, the tuning-up was done with the help of an MFJ Antenna Analyser. But it can be done satisfactorily using rig on low power and s.w.r. bridge, adjusting the end tubes a little at a time for minimum reflected power.

If the dipole is initially tuned near the ground, it will need to be readjusted when raised to its final position. This will be to compensate for effect of the ground.
With my prototype antenna, initial tuning was done at a height of approximately 2m and resonance was easily obtained. At this point though, I decided to wait until the next day before finally attaching the dipole to the crank-up mast (it was getting dark!).

**Rig Connected**

However, my MFJ-9420 QRP rig was connected up to the antenna in the shack and signals were being received quite well. But surely it would be no use trying to transmit with anything like this? But surely it had to work! The station came through from S59DBC in Slovenia, twenty at the top of the mast, 11m above ground...it should be useful at 10m, at the top of a mast!

The next day, with the ‘Short Twenty’ at the top of the mast, I worked several stations at good strength with the QRP rig. The only one of note was VLF, a special event station on Cape Breton Island (IOTA NA10) who I managed to work with the 10W through a pile-up with a KST of 599. A good test for my antenna.

I also worked many European stations with good results. And after the successful results my initial impressions are that this loaded dipole will be a useful antenna, especially where space is at a premium.

---

**Shopping List**

- You need some 22mm outside diameter (OD) 18 gauge seamless welded aluminium tube (two lengths, 610mm long. You also require some 25mm OD 18 gauge seamless welded aluminium tube: four lengths 1067mm long, 22mm PVC plumber’s tubing.

---

**February 11:** The Northern Cross Rally is to be held at a new and better venue, the Thomas Park, Athlone Stadium, Wakefield. Just out of town on the Horbury Road. Easy access from M1 junct. 39 & 40 - well signposted and with a talk-on at 1544 and 330MHz. Doors open at 11am (10.30am for disabled visitors and Bring & Buy). Details from Dave Gyll, Lx on 0113-238 3622.

**February 17:** Computer Fair’s (Northern) computer rally fair and games fair is to be held at the G. H. Carnal Leisure Centre, Lassoeck Road, Daws Heath, Manchester, imminently at 14 off the M63 motorway, doors open at 11am to 3pm. The show is open to traders of both computer and radio backgrounds alike. There is easy access for disabled visitors and a massive free car park, cafe and bar. Admission is £1.50 for adults, free for OAPs and children up to 14 years old. More information can be obtained from Brian Brown GW8WUP on (01222) 832253.

**February 24:** The Rainham Radio Rally is to be held at the new and better venue, the Thornes Park Athletics Stadium, 627-2502. Doors open at 10am (10am for disabled visitors and a massive free car park, cafe and bar). Admission is £1.50 for adults, first 400 + free £2.25 nag or CD. 0161-287 2502.

**March 10:** Wythall Radio Club will be holding their annual rally at Wythall Park, Silver Street, Wythall (near the M42). Doors open 10.30am until 4.30pm. Talk-in from GI. BRS on 2m S22. Admission £2, OAPs £1 and under 14s free. More information obtained from Peter Denison G0CJG on 0121-630 5790.

**March 24:** Bournemouth Radio Society’s 9th Annual Sale will be held at Kirton Community Centre, Peiham, Salisbury. Daws Heath, Daws Heath, Salisbury. Doors open at 10.30am until 4.30pm. Talk-in from G1BRS on 2m S22. Admission £2 OAPS £1 and under 14s free. Information obtained from Peter Denison G0CJG on 0121-630 5790.

**March 31:** Thames Valley Electronics Rally is to be held at Kempton Park Racecourse, Staines Road East, Sunbury-on-Thames, Middlesex. Doors open at 10.00am until 3.00pm. Talk-in from G1BRS on 2m S22. Admission £2 OAPs £1 and under 14s free. Information obtained from Peter Denison G0CJG on 0121-630 5790.
Here are just a few of our mouthwatering offers!

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156 to 162.9MHz marine band active antenna system. "Pull in" those distant signals! MB156 Kit: £18.90 Assembled PCB Modules: £25.60

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By popular demand All the features of the CTU8 (500kHz to 3MHz, T-Match, 50239 sockets etc.) plus additional built-in balloon, bypass switching and extra screw terminals for connecting balanced feeders, single wires, and a separate earth connection. A fully featured ATU that should suit almost every listeners needs. Real value, kit or ready built!

REVIEW

CTU8 Factory Built: £49.90
CTU8 Kit: £29.90

CTU9 Factory Built: £69.90
CTU9 Kit: £39.90

WIDE-BAND PRE-AMP, 4 - 1300MHz.
Boost those signals with the HOWES SPA4! Low noise IC amp with 10dB switched attenuator. Over 15dB gain. Good dynamic range, IP3 +15dBm. 50 Ohm. Coax powered for shack or mobile use. Just the job for use with discotvs etc. in weak signal areas! SPA4 Kit: £15.90 Assembled PCBs: £22.90

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The DXR20 covers 20, 40 to 80m bands with optional extra band modules for 160m, 30m, 15m or 10m amateurs or 3.5/4.3MHz HF air. Many high performance features in this excellent direct conversion design.
DXR20 Kit: £39.90, DC52 "S meter" Kit: £10.90, HA20R hardware pack: £28.90

Please add £4.00 P&P, or £1.50 P&P for electronics kits without hardware.

HOWES KITS contain good quality printed circuit boards with screen printed parts locations, full, clear instructions and all board mounted components. Sales, constructional and technical advice are available by phone during office hours. Please send an SAE for our free catalogue and specific product data sheets. Delivery is normally within seven days.

73 from Dave G4KOH, Technical Manager.
By Jan Lutterot G0LUT

Former Marine Radio Officer Jan Lutterot G0LUT (ex PA0LUT) modestly reflects on the unsung heroism displayed by merchant seamen who served on oil tankers during the Second World War. We owe much to this modest man and his compatriots, many of who did not survive.

I had always thought that I had used up my quota of luck during the Second World War, when, as a deepsea 'sparks', I had several narrow escapes.

I think the nearest I came to death was on the ocean going tanker on which I served as Chief Radio Officer (CRO). It received a direct hit on the bridge and radio room instantly killing everyone, but me.

As luck would have it, I had just come off watch and was having a chat with the second Officer, who had just started his midnight to four o'clock stretch. I was sitting on the bridge railing when we heard a 'plane approach.

Prepare For Action

The second Officer told the guncrew to prepare for action, but one of the gunners replied: "One of ours, Sir"! Those were his last words, as at that moment the bomb hit us and the blast of the explosion blew me backwards from my perch and I landed in the midship's lifeboat, not knowing what had happened, but still alive and well.

However, the young 18 year-old third Radio Officer, who had been on board less than week, and was making his first trip, was not so lucky.

Radio Holland

And looking back to December 1939, I must have been very lucky when Radio Holland called me back from leave to sign-on as Second Radio Officer. It was to be on a passenger liner, bound for the Dutch East Indies.

However, my train was late and when I arrived at the Radio Holland offices in Amsterdam, I was told that an old classmate had 'pipped me to the post'. Instead I was sent to a small freighter going to the West Indies.

To be quite honest, I did not feel so lucky then. But I later heard that as soon as he arrived in Batavia, my friend was 'collared' by the military. He was later captured and spent the rest of the war in a Japanese prison camp near Nagasaki.

West Indies

I spent some time in the West Indies on board the freighter until May 1940, when in Curacao, I signed on as Chief Radio Officer on a small passenger liner. It was busily trading between the Dutch West Indies, South and Central America and the USA.

The previous CRO had been interned in Curacao as he belonged to the Dutch Nazi party. And we were now officially at war, although on board our ship, you would not have noticed. We were still painted in the normal peacetime colours and at night we showed every light possible!

The full illumination was done for our US and South American passengers, whose countries were still neutral and expected 'cruising standards'. And so, while all around us 'blacked-out' ships were being torpedoed, we sailed through it all unscathed. The ship survived the war! After a year of cruising, I left the ship in Curacao and was sent to a large ocean-going tanker. I spent the rest of the war and indeed the rest of my life at sea on aviation fuel tankers.

Radio Holland

As soon as we were back home that evening, I started working my way through the 200 pages of the manual, which proved to be quite a job. But at last, the long awaited time arrived that I was ready to 'have a go' on the air.

"I must honestly say that first of all I did not fancy living on top of a volcano. But my luck held out and I lived to tell the tale, while very few of my friends from 'The class of 1938' survived".

Entered Every Contest

After retiring from the sea in the mid-1950s, I entered every radio related contest imaginable, but always without success. So, when I received a letter from the Editor of PW telling me that I had won first prize in the October to December Special Competition in 1993 to win an SG-2000 transceiver, I just could not believe my eyes. I thought that some friends were playing a trick on me!

But the day came that my wife Gabby and I were invited to the PW Editorial Offices to meet the staff, have lunch and receive my prize.

Well, I can honestly say that PW did us proud and it was an unforgettable, interesting day.

Continued on page 33
When I thought of designing this antenna, I approached the job with cheapness combined with functionality in mind. So, not only is this a cheap antenna, but the experience in making and getting it to work is very valid.

The antenna support consists of two pieces of dowelling available most d.i.y. stores. It consists of one base section 420mm long section of 22mm diameter. The top section is a piece of dowel 12mm diameter some 820mm long.

The wire used for the windings can be enamelled copper wire, or it may be recovered from old household wiring. A length of high current cable stripped will provide suitable wire of at least 1mm diameter. But wherever you get the wire from, it must be approx 4.3m long.

Have a look at the drawing in Fig. 1. The lower helical section is wound up to the phasing coil using about two metres of wire. The phasing coil is wound with six turns close wound. The upper section is wound on the 12mm diameter dowel, and also uses approximately two metres of wire.

**Ground Plane**

The ground plane shown in drawings Fig. 2 and 3, which I made from odd bits of aluminium plate. Whatever you use it should be at least 2mm thick. The ‘earth’ plane consists of two rods.

The drawings Fig. 2 and 3, show how to make the earth-plane. Each rod is twisted through 90° so as to allow the extended ground plane to stick out 90° to the antenna.

To match reasonable well into a 50Ω coaxial cable, a small base loading coil and capacitor assembly is needed. The matching coil is made up of six turns on a 8mm drill

**Shopping List**

- One 420mm length of 22mm dowelling.
- One 820mm length of 12mm dowelling.
- Two 300mm lengths of 4 or 6mm aluminium rod (or tube).
- Two pieces of 2mm thick aluminium plate (see Figs 2 and 3).
- One 5pF (4.7pF) silver mica or high voltage ceramic capacitor.
- One SO239 coaxial socket (or other socket to suit).
**Practical Wireless, March 1996**

**Lucky Lutterot**

**Continued from page 31**

**On The Air**

For a start on the air I chose the 18MHz band, because my trusty FT-101 MkI does not cover the WARC allocations. I’ve always had a soft spot for this band, as 45 years ago, this was the band to ‘get in touch with the Dutch’ (PCH) wherever you were in the world.

So, I switched on and gave a tentative CQ call. Straightaway a DL7 from Berlin came back and gave me a 56/79 report. “Well, I thought that was not too bad, considering I was using a makeshift vertical antenna, about 2m above ground”!

But then to my surprise, I was called by PT7WX who gave me S99 and as soon as that QSO was finished JR3SRB appeared on the frequency (579 both ways). All this happened within 20 minutes.

**Practical Wireless, March 1996**

My success left me thinking of the long hours I spent after the war, trying to get through to PCH to get rid of a couple of telegrams. My ship was only equipped with a ‘straight’ Telefunken receiver and a 200W short wave transmitter that was built like the proverbial battleship!

Then, when at long last contact was established, more often than not you received ‘QRV’ followed by a number (QRV = your turn is...). And very often there were two or three passenger liners ahead, carrying ex-prisoners of the Japanese or repatriated troops, each ship having some 25-40 telegrams on hand.

**International Vocabulary**

During those times, my international vocabulary of swearwords came in real handy! But I guess that many amateurs will know the feeling when they are trying to work some rare DX station during a pile-up!

But I see things have progressed tremendously when I look at the SGC SG-2000. Only the remote control-head stands before me on the desk, while the rest of the transceiver (which is only slightly larger than a shoe box) is hidden from view. All I have to do is key the required QRG and I am ready to transmit.

The set tunes itself to each chosen frequency. The old slogan “The world at your fingertips” comes to mind and I think that for one, the advertising boys were right when they thought of it.

**PW**
An ad from Waters & Stanton featuring various products for sale, such as a Dual Band Antenna, Magnetic Mount, and accessories for Ham Radio. The ad includes specifications and prices for different models, along with information on ordering and payment options. The ad is from the 1996 edition of their catalogue.
In this 16-page special section you'll find a show floor plan, to help you find your way round the ever-expanding event, an interesting 'potted history' of the show itself from one of the organisers and a little corner from G3XFD. So, even if you can't make it to London on March 9 and 10, you should find something of interest.

Also included is a comprehensive news section (Donna G7TZB our News Editor has been really busy!), information on the newly-introduced Picketts Lock 'Vintage Fair', and an invitation for you to join us on the annual PW Dayton Hamvention Holiday to the USA in May.

And you can help us to help you! By filling out the Questionnaire form inside this section, you can help us plan an even better PW for you in the future.

Finally, regular readers don't have to spoil their precious magazine! Copies of this 16-page section will be available free on the PW & SWM stand at the show. So, you can still have your guide to Picketts Lock, fill out your Questionnaire and keep your copy in good condition!

Enjoy the show!
Three dual receive configurations: VHF/UHF or VHF/UHF with main band frequency on either left or right side. Flexible programming allows transistion on main or sub band.

An 8 character alpha-numeric user help menu scrolls operation instructions in the bottom of the large backlit display.

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See the FT-51R with "windows" at your Yaesu dealer today!

"I can see two frequencies and alpha-numeric all at the same time."
"Scrolling instructions tell me what to do next!"
"I use the Spectrascope to find new contacts faster."
"Yaesu did it again!"

Specifications
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- TX/RX Battery Savers Built-in
- Handy Cloning Feature
- 5 Selectable Power Output Levels
- Message system w/CW ID
- Selectable RX Smart Mute™
- Cross-Band & One-Way Repeat Functions
- DTMF Paging/Coded Squelch Builtin

Accessories
Consult your local dealer.

Yaesu
Performance without compromise™
Steve White G3ZVW of RadioSport Ltd., provides a little background history of the popular London Amateur Radio & Computer Show. His story explains how a successful partnership between a club and commerce has provided the South with a very popular event.

Head photograph: Picketts Lock, site of the London Amateur Radio & Computer Show. The first Picketts Lock Show in 1990. The PW & SWM stand is on the far right of the photograph.

Our story begins in 1980, ten years before the first London Amateur Radio Show. This was the year in which Alexandra Palace was destroyed by fire, which resulted in the RSGB moving their annual exhibition to the NEC in Birmingham, leaving London without an Amateur Radio event.

During the years of the 'Ally Pally Rally' members of the Southgate ARC had manned the talk -in station. So, it wasn't long before thoughts turned to the club running its own event.

Several proposals were made. But they were rejected on the grounds that more money than the club had ever possessed would be needed to hire the hall, let alone advertise an event.

However, the idea was not forgotten about. This was because eventually a meeting was convened between a small group of club members with a view to financing such an event privately.

Members' Money

The log jam was broken when three members of the Southgate ARC offered to put up their own money and protect the club from any potential losses. They were Steve Blayer G4UKK, Ron Lindsay G3KTZ and Steve White G3ZVW.

The initial idea was to stage a one day rally and to hold it in only one hall of Lee Valley Leisure Centre in Edmonton, North London. A small group of Amateur Radio retailers from the London area were shown the venue. But after seeing it, they insisted that such an event should not only be staged over two days, but should also take place in two halls. So, it was over the course of just one evening that the proposed event literally quadrupled in size.

Brenda And Bernie

It was at this point that Brenda and Bernie Godfrey of the Amateur Radio Exchange entered the scene. They were invited to become partners in a co-operative, because they knew most of the likely exhibitors.

Paperwork was produced and the new London event was launched in April 1989. The expectations were that it would be quite difficult to fill the space, but by September of the same year, over 90% of the stands were filled. And by the time the first London Amateur Radio Show took place at Picketts Lock in March 1990, all the stands were filled.

The working arrangement was that the five organisers dealt with sales, advertising and ticketing. The radio club members provided the on-the-day manpower to staff the event, Southgate ARC being the sole beneficiaries of the Bring & Buy stand and the raffle. It is an arrangement which continues to this day.

RadioSport Registered

It was almost immediately apparent that a more formal arrangement was required to run the event. So, by 1991, RadioSport was registered as a company.

Other than the company registration formalities, little has changed other than the days of the event (altered from Friday and Saturday to Saturday and Sunday). This, coupled with the fact that news had got round that the London Show was really worth visiting, resulted in a dramatic rise in attendance.

With the increasing adoption of computers in the shack, by 1992 the official title of the show had become the London Amateur Radio & Computer Show. The event also increased in size, to occupy all three halls at the Lee Valley Leisure Centre.

These days, the show attracts many thousands of radio and computer enthusiasts. They come from not only from around Britain, but also extensively from Continental Europe and beyond.

However, RadioSport is not one to rest on its laurels. So, this year the company has introduced a new attraction, the Vintage Sound & Vision Fair, which visitors to the Radio Show will also be able to visit.
Rob Mannion G3XFD explains why he's looking forward to meeting readers at the London Show. He also explains how you can get a chance to talk to him if you can't get to Picketts Lock in March.

In my job as Editor of Practical Wireless I consider the opportunities, provided by shows and rallies, to meet and talk to readers to be of prime importance. That's why I'm looking forward to meeting as many readers as possible at the London Show on March 9 and 10.

This year we're arranging the PW Publishing stand (Stand T1 in the Red Hall) so that I have my own 'small corner' at one end. But, I don't think it will be anything like Worthington (our cartoonist) has drawn it in his 'Spot The Difference' picture this month as unfortunately Dick is unable to attend the show as he will be away 'playing' with his trains!

However, Short Wave Magazine, the only monthly magazine devoted to the listener will be well represented. Short Wave columnists Graham Tanner (SSB Utility Listening) and Elaine Richards G4LFM ('Junior Listener') will in attendance and on-hand to answer all your questions.

I must stress that I'm not at the London Show to sell you anything (apart from the fact that I want you to share PW). I'm there (or you. So, don't hesitate to come and talk to me. Your suggestions, ideas, complaints and opinions are very valuable. We need your input to help provide a good readable magazine with as good an editorial 'balance' as possible.

To help us prepare PW in the way you want, you'll find a Questionnaire included in the magazine. Please spare a little time to fill it out. By doing this, it will guide us to provide you with an even better magazine and give you the chance to win a prize.

Other Events

If you're not fortunate enough to be attending the London Show, there are other events coming up throughout 1996 when I will be delighted to meet you. So, if there's something particular you want to say, suggest (or complain about) why not look out for me (I'm quite easy to spot!).

This year I'm planning to be at the Dayton Hamvention (USA), the Woburn Rally, the Winborne Hamfest, the Rochdale QRP Convention and The Leicester Show. Additionally, I've got Club talks planned in Bangor (Northern Ireland), Cornwall, the South Manchester club and North Ferryhill in Humberside.

Meeting readers (and non-readers) provides me with many opportunities. Very often readers provide ideas and valuable feedback. And the best example I can think of in this respect is Ian Poole's series 'Specifications...The Mysteries Explained'. This series came about directly because of suggestions and ideas from talks I gave to clubs.

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Data Sheets

I'm pleased that we've been able to introduce our 'Data Sheets' to help readers get even more benefit from the hobby. We've got more ideas planned for further Data Sheets, but have you got any suggestions?

Did you like the first issue of the new information charts contained in the sheet offered free with the January PW? So, as I've already mentioned, your comments and ideas are welcome.

One of the first comments I've had from readers recently, concerned the 'Wall Planner' we published in the January issue of the magazine. The readers who contacted me were asking several things running from

"Can you publish in December?" to "Could you please make it larger?"

Of course, the PW team want the charts/wall planners to be as useful as possible for readers. So, please let us know what you'd like. We'll do the rest (and our best) at the same time!

To round off my 'Editor's Corner' I'd particular like to hear from you regarding practical projects in the magazine. Do you prefer smaller projects? Or would you like larger ideas to build...but concentrating on items not easily available commercially?

Practical Wireless values its readers. So, this is your chance to help us to help you. I wish you good reading and much enjoyment of our absorbing hobby.

Rob G3XFD

Practical Wireless, March 1996
Icom UK Ltd.

Icom’s design teams in Japan have been busy and the result is that two new models are on their way as we go to press. First on the scene is the Icom IC-T7E which the manufacturers stress is NOT a single band hand-held...although it may look like one!

In fact Icom state that IC-T7E is smaller than many single-band transceivers although it is a full feature dual-band transceiver, covering 144 and 430MHz. Icom's design approach has incorporated a single p.a. power stage for both bands. The transceiver also employs single circuits for the receiver, i.f., and transmitter drivers, bringing additional miniaturisation benefits. The IC-T7E provides up to 4W output on v.h.f. and 3W on u.h.f., has 70 memory channels, has tone squelch as standard. There are many innovations for ease-of-use (including a single volume control). And Icom say all this technology fits comfortably in the palm of your hand!

A new mobile transceiver from Icom, the IC-2710H will also be launched for the London Show. The dual-band f.m. transceiver comes complete with a multi-function remote control microphone as standard, but Icom report they are also to provide an optional infra-red wireless remote control microphone.

The IC-2710H features optional front panel separation (kit required) and also has independent dials for each band. The new mobile transceiver provides up to 50W output on v.h.f. and up to 35W on u.h.f.

Designed around a double-conversion receiver package, the IC-2710H also features seven types of ultra high speed scans, 220 channel capacity memory, r.f. attenuator (linked to squelch control) and built-in duplexer. The transceiver is fitted with independent tuning controls, volume control, squelch and functions control for simpler operating.

More details on the IC-2710H priced at £675 and IC-T7E priced at £329 will be ‘launched’ from Icom UK on Stand S in the Red Hall at Picketts Lock or by calling (01227) 741741.

Yaesu UK Ltd.

Although Yaesu UK won’t actually be launching any new products at the London Show this year they will be emphasising their recently launched FT-1000MP. The FT-1000MP all-mode h.f. transceiver is still fairly new to the UK market and will therefore form the centre piece of the Yaesu stand.

Also on view will be the new ADMS-1B Windows PC programming software for the FT-10R/40R/11R/41R/51R series of hand-helds as well as the ADMS-2 for the FT-8500. This new ADMS software allows the user to quickly program the transceiver from a PC, all the information such as frequencies, repeater offsets, power output levels etc can be stored in the PC.

And that won’t be all! The full Yaesu range will of course be featured and we’re sure the Yaesu team will be pleased to demonstrate any of their radios to you. You’ll find them on Stand Q in the Red Hall or alternatively call 0181-814 2001.

Sandpiper Communications

The Welsh based antenna technology and design company of Unit 5, Sandpiper Communications will be on Stand M in the Red Hall where they will be exhibiting a large new range of h.f. vertical antennas.

The ‘V’ range includes the MK2 which measure approx. 19ft high and covers 1.8 to 28MHz and the Mini V, approx. 10ft high. Both antennas can be bought as single banders and then upgraded to all bands as required.

Alternatively you can buy the antennas with any number of bands as required. There is also a 35ft versions suitable for the DX enthusiast. Chris from Sandpiper states that the mini V range is ideal for portable work or for use in caravans as it is telescopic and shortens to approx. 1 metre.

Trio-Kenwood UK Ltd.

Trio-Kenwood UK won’t actually be launching anything new for the London Show but the emphasis will be put on their latest model, the TS-870s h.f. transceiver. Dave Wilkins G5HY will be on-hand on Stand N in the Red Hall to demonstrate the TS-870s together with the recently issued Windows software designed for use with this already popular h.f. rig.

You will of course be able to see, pick-up literature and discuss the complete Kenwood range from hand-helds through mobiles to base station radios. If you can’t wait until March 9 & 10 call (01923) 816444 now for information.

continued on page 40

Practical Wireless, March 1996
Mike Haydon pictured second from left with Phil Hutnall and Oliver D’Allessandri at the 1995 Leicester Amateur Radio Show (GITZB, far left on loan for photographic purposes).

**Haydon’s Expanding!**

Mike Haydon who has been trading for the past four years from his shop at 132 High Street, Edgware, Middlesex HA8 7EL Tel: 0181-951 5781/2 is expanding his business by opening a new showroom in the West-Midlands towards the latter part of February. Mike has told the ‘Newsdesk’ that his new shop will be stocked with all the usual ‘goodies’ together with plenty of other items of interest.

The West-Midlands branch of Haydon Communications will boast an on-site radio amateur who will be on-hand to demonstrate equipment and offer advice. The exact date of opening and location are yet to be confirmed so, watch this space!

Mike’s mail order will continue to be run from the Edgware shop so all enquires of that nature should be directed there.

The PW team would like to wish Mike Haydon and his team all the best and every success in the future and hope that he will continue to uphold the reputation as being one of the UK’s largest dealers for scanners, shortwave and amateur radio equipment. Look out for Haydon Communications on Stand Z in the Blue Hall.

**Hooker Hangs-Up**

One of the best known ‘characters’ in the Amateur Radio Retailing Industry, Alan Hooker G4OEM has decided to ‘hang-up his headphones’ and retire. Alan, although based at his shop in Doncaster, Yorkshire, was a very familiar and friendly figure seen at many of the major rallies in the UK.

Alan, now 55 years old, has been advised to “sit back and relax a little” from the busy commitment of running a radio business. “Since my heart by-pass operation some 10 years ago, I’ve been feeling much better, but my doctor says I’ll do much better and last longer if I sit back a bit!” Alan told PW in his usual straightforward manner!

This friendly and forthright Yorkshireman has many funny stories on hand and delights in telling one against himself which happened in the days when he was selling ex-GPO teleprinters.

“It was in the days when we were just doing rallies, and I was offering teleprinters at bargain prices of around £35” Alan told PW. “This chap came up to me and said he wanted a printer for his young son. He asked me how much I wanted paying and I told him.......in money”!

Alan said that his somewhat sarcastic reply brought unexpected results! “Five minutes later the chap arrived back at the stand and paid me the £35 in pennies! It was the contents of his son’s money box. Oh well, I couldn’t complain.......I’d said I wanted paying in money”!

There are many stories like this to come from Alan Hooker. And although he closed for business as from Friday 12 January, his many friends in the amateur radio world are sure to see him at rallies in the future. “Although I’ve rented out the shop, We’re staying on in the flat above it” said Alan “I’m not disappearing yet and look forward to seeing old friends again during the rally season”!

Everyone on PW wishes Alan, his wife Val and son Jason well for the future. We hope that by ‘taking it easy’ he’ll have more time to dish out the welcome doses of ‘Hooker Humour’ to cheer us all up on rainy days. And we’re wondering if the rumour about Alan buying up all the photographs of himself (“Fetch a better price if they’re rare” he said!) is true!

**Waters & Stanton Electronics**

Hockley based Waters & Stanton have been trading for the past four years from their shop at 132 High Street, Edgware, Middlesex HA8 7EL Tel: 0181-951 5781/2 is expanding his business by opening a new showroom in the West-Midlands towards the latter part of
Your Guide to the London Amateur Radio & Computer Show

March 9+10

**Blue Hall Exhibitors**

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<th>Exhibitor</th>
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<tr>
<td>AA Computers</td>
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<td>AJP Communications</td>
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<td>AKD</td>
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<td>ARE Communications</td>
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<td>BD Media</td>
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<td>Bring &amp; Buy</td>
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<td>Computer Junk Shop</td>
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<td>Deecon</td>
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<td>Electrocomp</td>
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<td>Haydon Communications</td>
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<td>Hoves Communications</td>
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<td>Kent RA Ltd.</td>
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<td>Keytronics</td>
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<td>LCE Len Cooke Enterprises</td>
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<td>Loutronics</td>
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- Maitech
- Micro Direct
- Mirage Designs
- No Nut
- Proops
- QRCP Component Company
- RAIBC
- RAYNET North London
- RSARS
- RSGB
- Satellite Surplus
- Sinkin Electronics
- Squire V Ltd.
- Sirkalite
- Swindon Electronics
- Telecom Services (SW) Ltd.
- Telford Electronics
- Tennantast Scotland
- Thornton P
- Vector Computing
- Waters & Stanton
- Woodstra Ltd.

**Red Hall Exhibitors**

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<th>Exhibitor</th>
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<tr>
<td>Agile Tools</td>
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<td>AOR (UK) Ltd.</td>
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<td>Bill Macdonald Ltd.</td>
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<td>Boxed Ltd.</td>
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<td>Cheshunt &amp; District ARC</td>
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<td>Dolsier J Ltd.</td>
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<td>Eastern Communications</td>
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<td>Garex Electronics</td>
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<td>Ham Radio Products</td>
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<td>Icon UK Ltd.</td>
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<td>Linear Amp UK</td>
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<td>Lowe Electronics</td>
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<td>Martin Lynch &amp; Son</td>
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<td>Nevada</td>
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- Oasis Computer Systems
- PW Publishing Ltd.
- Radio Research
- Rich Electronics
- Sandipper
- Semi-Conductor Archives
- SEM
- SGS
- Shacklog
- SMC
- SW Shareware
- Sweet Box
- Syon Trading
- Time Srp Electronics
- Trio Kenwood UK Ltd.
- UBM
- Venus Electronics
- Westlake W H Ltd.
- Yuesa UK Ltd.

**Green Hall Exhibitors**

<table>
<thead>
<tr>
<th>Exhibitor</th>
<th>Stand</th>
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<tbody>
<tr>
<td>J &amp; J Classic Juke Boxes</td>
<td>J112</td>
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<tr>
<td>Jim Cookson</td>
<td>B34</td>
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<tr>
<td>Lee Thompson</td>
<td>B33</td>
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<tr>
<td>Old Time Supplies</td>
<td>A1</td>
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<td>RAB Surplus</td>
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<td>Radio Bygones</td>
<td>K125</td>
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<td>Radio Fix</td>
<td>F80</td>
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<td>Southern Aerial Services</td>
<td>L128</td>
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<td>Sunrise Press</td>
<td>J114</td>
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<tr>
<td>Supertronics</td>
<td>B35</td>
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**Special Interest Groups**

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<th>Exhibitor</th>
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<tr>
<td>Air Training Corps</td>
<td>10-11</td>
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<td>AMSAT-UK</td>
<td>15-17</td>
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<td>BARTG</td>
<td>5-6</td>
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<td>British ATV Club</td>
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<td>British DX Club</td>
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<td>Grafton A R Society</td>
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<td>Guide Dogs For The Blind</td>
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<td>Hocklesdon Radio Club</td>
<td>8</td>
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<tr>
<td>RAOTA</td>
<td>24</td>
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<td>Remote Imaging Group</td>
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<td>RNARS</td>
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<td>TARTS SSTV &amp; Data Group</td>
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<td>Worked All Britain</td>
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* Stand number unconfirmed at time of going to press.

Details correct at time of going to press in January.
1 ARE YOU INTERESTED IN AMATEUR RADIO?
YES ☐ 'YES', Continue.
NO ☐ If 'NO', Do not continue.
Thank you for your help.

2 ARE YOU?
MALE ☐ FEMALE ☐

3 PLEASE COULD YOU SPECIFY YOUR AGE BAND?
☐ Under 15 ☐ 15-25 ☐ 26-35 ☐ 36-45 ☐ Over 65

4 HAVE YOU EVER BOUGHT HOBBY RELATED BOOKS FROM THE FOLLOWING SOURCES?
PW Publishing Book Service ☐
Adverts in "Practical Wireless" ☐
Adverts in "Short Wave Magazine" ☐
RSGB ☐
Radio Dealer ☐
NO ☐ If yes, state name of dealer.
Other (Please specify) ☐

5 HOW INTERESTED ARE YOU IN THE FOLLOWING?

<table>
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<tr>
<th>Computing in Radio</th>
<th>Interested</th>
<th>Not Interested</th>
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<tr>
<td>Morse</td>
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<td>Antennas</td>
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<td>Other (Please specify)</td>
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6 IF YOU WERE READING ABOUT A SPECIFIC TOPIC SUCH AS ANTENNAS WOULD YOU PREFER:
A whole issue devoted to antennas including the regular features ☐
A separate supplement devoted to antennas attached to the magazine ☐

7 HOW MANY ISSUES OF PW DO YOU BUY A YEAR?
Under 5 ☐ Go to BLUE 'Occasional' section.
6 - 9 ☐ Go to 8.
10-12 ☐ Go to 8.
Stopped Buying ☐ Go to GREEN 'Lapsed' section.
Never Buy ☐ Go to TURQUOISE 'Never Buy' Section.

8 HOW COULD WE IMPROVE PW?
Reduced cover price but to detriment of quality ☐
c. g. fewer pages
Make it easier to locate in shops ☐
Special novice section ☐
More competitions ☐
More special offers and give-away offers ☐
Change in topics covered ☐
More colour ☐
Increased technical content ☐
Reduced technical content ☐
More practical construction projects ☐
Other (Please specify) ☐

9 DO YOU SUBSCRIBE TO PW
YES ☐ If 'YES' Go to 13.
NO ☐ If 'NO' continue.

10 IS THERE A SPECIFIC REASON WHY YOU HAVE NOT TAKEN OUT A SUBSCRIPTION?
Too expensive ☐
Lack of special offers and incentives ☐
Prefer browsing and buying off the shelf ☐
Not consistently interested ☐
Lack of student/junior rates ☐
Member of the RSGB ☐
Other (Please specify) ☐

11 HAVE YOU EXPERIENCED ANY PROBLEMS OBTAINING YOUR COPY OF 'PW'?
YES ☐ If 'YES' continue.
NO ☐ Go to 13.

12 PLEASE INDICATE WHICH OF THE FOLLOWING DESCRIBES YOUR PROBLEM OBTAINING 'PW':
Local newsagent/shop doesn't stock ☐
Cannot order from local newsagent/shop ☐
Not available in surrounding area ☐
Other (Please specify) ☐

13 PLEASE STATE YOUR NEAREST TOWN:
NAME: ____________________________ CALLSIGN: ____________________________
ADDRESS: ____________________________

Thank you for your time, all details will be treated in the strictest confidence and privacy.

OCCASIONAL

O1 DO YOU HOLD AN AMATEUR RADIO TRANSMITTING LICENCE?
YES (Class A) ☐ (Novice A) ☐ NO ☐
(Novice B) ☐ (Class B) ☐

O2 IS THERE A SPECIFIC REASON WHY YOU DON'T BUY "PW" ON A MONTHLY BASIS?
(Tick a maximum of 3 boxes)
Too expensive ☐
Prefer to buy varied selection ☐
Dislike format ☐
Unattractive cover ☐
Technical content too complex ☐
Technical content too basic ☐
Lost interest in hobby ☐
Dislike content of features ☐
(Please specify) ☐

Rather buy a rival publication ☐
(Write name) ☐
Other (Please specify) ☐

Practical Wireless, March 1996
Q3 HAVE YOU EXPERIENCED ANY PROBLEMS OBTAINING YOUR COPY OF PW?
YES ☐ NO ☐

Q4 PLEASE INDICATE WHICH OF THE FOLLOWING DESCRIBES YOUR PROBLEM OBTAINING PW
Local newsagent/shop doesn’t stock ☐
Cannot order from local newsagent/shop ☐
Not available in surrounding area ☐
Other (Please specify) ☐

Q5 PLEASE STATE YOUR NEAREST TOWN

Q6 IS THERE ANYTHING IN THE FOLLOWING LIST WHICH WOULD ENCOURAGE YOU TO BUY PW ON A MONTHLY BASIS? (Tick a maximum of 3 boxes)
Reduced cover price but to detriment of quality eg fewer pages ☐
Change in format ☐
Change in topics covered ☐
Cover re-designed ☐
Special novice section ☐
Technical content less complex ☐
Technical content more complex ☐
Other (Please specify) ☐

Q7 WHAT MOTIVATED YOU TO BUY PW WHEN YOU DID?
(Tick a maximum of 2 boxes)
Eye-catching cover ☐
Special offer/incentive/free gift ☐
Recommendation ☐
Special interest in a particular article/theme ☐
Seasonal interest (Write season in) ☐
Other (Please specify) ☐

Q8 PLEASE INDICATE YOUR LEVEL OF SATISFACTION WITH THE FOLLOWING FEATURES? (Tick one box per line)

Advertisements ☐ ☐ ☐ ☐
Antennas ☐ ☐ ☐ ☐
Broadcasting ☐ ☐ ☐ ☐
Book service ☐ ☐ ☐ ☐
Constructional ☐ ☐ ☐ ☐
Competitions ☐ ☐ ☐ ☐
News Pages ☐ ☐ ☐ ☐
Reviews ☐ ☐ ☐ ☐
Special Offers ☐ ☐ ☐ ☐
Regular Features ☐ ☐ ☐ ☐
ANY EXTRA COMMENTS ☐ ☐ ☐ ☐

Q9 IS THERE A SPECIFIC REASON WHY YOU HAVE NOT TAKEN OUT A SUBSCRIPTION? (Tick one box only)
Too expensive ☐
Lack of special offers and incentives ☐
Prefer browsing and buying off the shelf ☐
Not consistently interested ☐
Other (Please specify) ☐

Thank you for your time, all details will be treated in the strictest confidence and privacy.
L7 IF THOSE CHANGES WERE MADE, DO YOU THINK YOU MIGHT START TO BUY PW AGAIN?
NO □ YES □

L8 PLEASE SPECIFY WHY YOU WOULD NOT START TO BUY PW AGAIN
Please specify

Thank you for your time, all details will be treated in the strictest confidence and privacy.

NEVER BUY

If you have picked up this questionnaire at a rally, and have never seen a copy of Practical Wireless please ensure you have looked through an issue on our stand before completing this part of the form.

N1 DO YOU HOLD AN AMATEUR RADIO TRANSMITTING LICENCE?
YES (Class A) □ YES (Class B) □
YES (Novice A) □ YES (Novice B) □
NO □

N2 HAVE YOU EVER READ A COPY OF PW?
NO □ YES □

N3 IS THERE A SPECIFIC REASON WHY YOU DO NOT BUY PW ON A REGULAR BASIS? (Tick a maximum of 3 boxes.)
Dislike the appearance of the cover □
Dislike format □
Too expensive □
Lack of incentives/gifts/offers □
Technical content too simple □
Technical content too complex □
Prefer another publication □
State name □
Difficult to find in local shops □
Name area □
Lack of interesting features (Please specify) □
Other (Please specify) □

N4 WHICH OF THE FOLLOWING CHANGES WOULD ENCOURAGE YOU TO BUY PRACTICAL WIRELESS?
(Tick a maximum of 3 boxes)
Cheaper price □
Technical content more complex □
Technical content less complex □
Modified format □
Appearance of the cover □
Topics covered □
Easier to locate in local shops □
More incentives and special offers □
Other (Please specify) □

N5 HOW WOULD YOU RATE THE LOOK OF THE COVERS OF PRACTICAL WIRELESS?
Poor □ Fair □ Good □ Excellent □
Other (Please specify) □

N6 HOW WOULD YOU RATE THE LOOK OF THE COVERS OF PRACTICAL WIRELESS?
NO □ YES □

Thank you for your time, all details will be treated in the strictest confidence and privacy.

REMEMBER BEFORE SENDING YOUR COMPLETED QUESTIONNAIRE IN MAKE SURE YOU’VE FILLED IN YOUR NAME AND ADDRESS ON PAGE 42.

COMPETITION
Win a Rexon RL-102 144MHz f.m. hand-held transceiver worth £199 from The Short Wave Shop!

Fill out the questionnaire, help us to plan the Practical Wireless you want to read - and you could win the Star prize of a Rexon RL-102 144MHz f.m. hand-held transceiver, kindly donated by Bob Burrows G6DUN, of the Short Wave Shop in Christchurch, Dorset. The two runners-up will each receive one year subscriptions to PW.

To enter the free competition all completed questionnaires must be sent to the Practical Wireless, Editorial Offices, Freepost, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW by 11 April 1996. Alternatively you can drop your completed questionnaire into the ‘Bin’ on the PW Publishing stand at the London Show.

The first questionnaire drawn out by the Editor will win the sender a Rexon transceiver. The two runners-up will each win a one year subscriptions. The Editor's decision is final and no correspondence will be entered into.

Unfortunately, the Freepost facility is only available to readers within the United Kingdom, Northern Ireland, Channel Islands and Isle of Man. Despite this, although readers living abroad will have to pay the postage to return their questionnaire they will still have free entry to the competition. And with the closing date of 11 April 1996 we have allowed plenty of time for entries to arrive from around the world.

Editor.

Practical Wireless, March 1996
The Affordable Duo

Now Cost Even Less!

DX-70
160m - 10m plus 6 metres
100W (10W 6m) SSB CW FM AM
Narrow Filters for SSB & CW
Receive: 150kHz - 30MHz
Fast & Slow AGC; Noise Blanker
3 Stage Attenuator; IF Shift
Full break-in; Linear Switching
100 Memories; CW Carrier Shift

Accessories: Mic, DC lead, handbook

DJ-G5E
2m & 70cm Dual Band Handheld
2W on ni-cads - 5W on 12V DC
CTCSS & DTMF included
11 Channel Spectrum Scope
100 Memories; Illuminated Display
Electronic Volume & Squelch
Receive: AM/FM 108 - 173.9MHz
Receive: FM 400-511.9/800-9MHz
Cross Channel Repeater Mode

Accessories: Ni-cad pack, AC charger, aerial, belt clip, carry strap, handbook.

From All Good Dealers
Or Direct from UK Importers
Waters & Stanton
22, Main Road, Hockley, SS5 4QS
Tel: (01702) 206835 Fax: 205843

£995
£439
The Waters & Stanton sales team comprising of (l-r) Andy Tietjen G7NZH, Elaine Ingram, Tanny Millard, Mark Francis G6GBY Technical Support Manager, Jeff Stanton G6XYU and Steve Hoy G7JPU.

will, for the seventh year, be attending the London Show at Picketts Lock. The sales team will be manning Stand W in the Blue Hall where they will be displaying a vast array of stock, including the full Alinco range. Included in the Alinco display will be the recently introduced DJ-190 priced at £199 and the DJ-191 priced at £249. Other products on show will be the new ADI AR-146 144MHz 50W f.m. mobile transceiver costing £269 (look out for the review April's PW), as well as the latest versions of the MFJ-784 d.s.p. filter and MFJ-259 antenna analyser.

Jeff Stanton G6XYU has also told PW of a new miniature brass Morse key, the GMP. It measures just 108 x 72mm, is manufactured under the Watson name, sells for £39.95 and will also be on show.

Jeff G6XYU, Peter G30JV and the rest of the sales team will be eagerly awaiting your visit to their stand so, why not drop by on either March 9 or 10th? If you can't wait until then to view the full Waters & Stanton range you'll have to go to 22 Main Road, Hockley, Essex. Tel: (01702) 206835.

C. M. Howes Communications

Three new products will be debuting on the C. M. Howes stand at the 1996 London show in the shape of the CTU9, ASU8 and the RA30. These will all be available in the kit form, with the CTU9 and ASU8 also available ready built.

The ASU8 is an antenna selector, the CTU9 an antenna tuning unit and the RA30 receiver attenuator. The RA30 consists of a rotary switch and a small p.c.b. that fits on the rear of the switch and the resistors to make the attenuator network.

In addition to the newly introduced items you will also be able to find the full range of Howes kits which includes the PW Daventry 7MHz receiver as featured in the October and November 1995 issues of PW.

You'll be able to find Dave Howes on Stand L in the Blue Hall. However, if you want to find out more before the London show you can contact him on (01327) 260178 or at Eydon, Daventry, Northants NN11 3PT.

Lowe Electronics Limited

Lowe Electronics Ltd. of Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (01629) 588800 will be showing for the first time ever in the UK a new receiver concept at the London Show. This new concept, WinRadio Multimedia consists of a receiver card, which plugs into the option slot of a PC and Windows base software to give a user front-end and control panel.

The receiver covers 500KHz to 1.3GHz continuously so that it can be used for h.f., v.h.f. and u.h.f. listening. Built-in functions include scanning and memories together with a database of over 300,000 frequencies sourced from all over the world. It's also possible for the user to create their own database of local frequencies.

The Windows user interface gives control of all receiver parameters that are normally presented in a normal radio front panel. This means that all the control functions are immediately obvious.

WinRadio Multimedia will be launched with a price tag of around £399 inc. VAT, which will put it in the same range as many hand-held scanners. A professional version featuring d.s.p., spectrum analyser, real time signal oscilloscope and data decoding of WinRadio will also be available soon.

To find out more about this exciting new concept stop off at Lowe Electronics, Stand F in the Red Hall where the staff will be more than happy to answer your questions.

AKD

The AKD team from Herts will have their range of newly styled transceivers on display on Stand T in the Blue Hall at the London Amateur Radio & Computer Show over the weekend of March 9 & 10.

As well as being restyled, the transceivers have been given a new colour and the front panels have been remodelled to achieve a more aesthetically pleasing shape. However, they still retain their no-nonsense functions. All the internal workings have undergone a change so that they meet the new CE requirements.

The TVI filters which AKD produce have also seen changes in that the once familiar tube shape has been replaced by a purpose made moulding designed to give a 'new lease of life'. All filters can be bought individually or as a kit.

In addition to this when you're talking to AKD why not ask them about their new h.f. transceiver which they are currently developing.

If you can't attend the London Show and want to find out more contact AKD on (01438) 351710.

South Midlands Communications

In addition to the usual range of radio products on display on the SMC Stand M in the Red Hall, Graham Taylor and his team will be selling a new World Time Clock, and an Electronic Barometer, a lightweight Rainou and budget priced transceivers.

The World Time Clock is of a see through design and features world and home time for 24 major cities, 100 year calendar from 1990 to 2089, selectable temperature display in °C or Practical Wireless, March 1996
**Nevada Communications**

The new Trident VIII multiband h.f. vertical will be on display on the Nevada Communications Stand H in the Red Hall for the first time at Picketts Lock. The Trident VIII has been manufactured here in the UK under the DRAE name and is designed to withstand the British weather as it’s made from high quality materials with stainless steel fittings. Nevada tells us that it’s also ideal for the amateur who has limited space and wishes to work DX. The selling price for the Trident will be £239.

Another item to look out for is the recently introduced Timewave DSP-599ZX d.s.p. filter. This offers a unique alphanumeric display, quick select push buttons and optical encoders. Continuous filtering is also featured designed to cope with wider bandwidth modes. The retail price of the DSP-599ZX is £349.

**Mike Devereux** G3SED and the Nevada team will be eagerly awaiting your visit to their stand and in the meantime if you can’t wait to find out more about the Nevada Communications range of products why not contact them on (01705) 662145?

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**Eastern Communications**

Eastern Communications, who have been a major amateur radio dealer since 1980 will be occupying Stand J in the Red Hall. Tim Thirst of Eastern will be there to discuss any of his product range with you.

The range includes Mosley h.f. beam antennas, Sigma wire antennas, Vibroplex Morse keys, the Autek RF1 antenna analyser covering 1.2 - 35MHz and their newest range of accessories the DELTA two and four way coaxial switches.

Many of the products on offer from Eastern Communications are exclusive to them and therefore if you’ve been looking for any of the items mentioned above you really should speak to Eastern. If you want to know more now give Tim a ring on (01692) 650077.

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**MicroHenry & Mode Warrior At Martin Lynch**

There’s an added attraction on the Martin Lynch stand at the Picketts Lock Show this year...in the shape of young ‘MicroHenry Lynch’. If you catch him ‘on duty’ Martin and Jennifer Lynch’s young son (who’ll be almost five months old and is the only item on the stand not for sale) can distract your partner while you look at what’s on offer on the ‘Martin Lynch & Son’ stand!

Also on display at the ‘Lynch Mob’ stand will be the ‘Mode Warrior’. It’s the latest DSP data controller from AEA in the USA and from the details supplied to PW it looks most impressive.

The new state-of-the-art multimode controller is designed around a high speed digital signal processor which, the manufacturers claim, provides the “ultimate” in digital signal filtering. Featuring 9600 and 1200bps packet, all standard h.f. and v.h.f. modes, and Mailbox expandable to 240. There’s also full mailDrop facility for packet radio, AMTOR, PACTOR, two switchable radio ports, SIAM, Memory ARQ and many other facilities. Available from Martin Lynch for £499.95. For further details on the AEA DSP-232, contact Martin on Stand R in the Red Hall.

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**PW Publishing Ltd.**

The staff of Practical Wireless and Short Wave Magazine will be pleased to see you in the Red Hall on Stand T, where they will be able to answer your questions and queries and welcome you to the world of amateur radio and short wave listening.

Not only will you be able to buy copies of your favourite magazines and take out subscriptions but you will be able to browse through the comprehensive selection of radio related publications. Don’t forget that this will be your last chance to subscribe to the old rates to both PW and SWM as all rates will increase with effect from the April issues - so make sure you subscribe before then!

Among the books on sale will be PW Publishing’s very own More Out of Thin Air, a collection of antenna theory, design and construction articles. This book is well worth a look, as it has been completely re-written and complemented the original Out of Thin Air making it a must for any antenna enthusiast.

Make sure you don’t leave the Red Hall without having stopped by the Practical Wireless and Short Wave Magazine stand.
Jonathan at Picketts Lock where he'll be on Stands J14/J15 in the Green Hall selling a range of his own books on vintage radio and audio including his latest publication Audio! Audio! Jonathan will also be publicising the next (very successful) National Vintage Communications Fair which is to be held at the Birmingham NEC on Sunday May 5.

So, if you're interested in early technology such as vintage radio, 405-line TV, gramophones, early telephones, classic audiophi-fi I suggest you call in and see Jonathan at Picketts Lock. And if you're keen on any old equipment nowadays this includes transistor sets too! you'll find something to interest you at Picketts Lock in March and at the NEC in May.

The Radiophile

We're privileged in PW to have Charles Miller, Editor of The Radiophile, writing for us on a regular basis. At the moment in his 'Valve & Vintage slot, Charles is presenting a fascinating history of the radio valve (it's surprising how devious the early pioneers were sometimes!).

The Radiophile magazine, Edited and produced by Charles is a subscription-only publication. It's well known for the strikingly nostalgic front covers. Just looking at them transports you back to the 1920s and 1930s!

Although I can't tell you the number of the stand where you'll find Charles...you can't miss him as he'll be dressed in his straw boater and an Edwardian-style Eton pinstripe blazer. Just look out for The Radiophile placard above his stand and you'll be transported back to the days of summer picnics, 78rpm record players and (only available in black)

The name of Jonathan Hill is synonymous with today's vintage radio collecting scene. He is Founder member of the British Vintage Wireless Society (BVWS), Director of a radio and communications museum in Devon and an established author. Jonathan's book Radical Radios has become the collector's bible. And the author says "I am still in my early 40s, but many people assume that because I know so much about the subject I must be well past retirement age!"

You can meet

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This year for the first time, the Picketts Lock show will incorporate a section for the vintage equipment enthusiasts. It's an ever popular aspect of radio and electrical engineering and one which I find totally absorbing.

I'm always fascinated while looking at vintage equipment. As a mainly 'post War' product myself, I've a particular fascination for radio, electronic and mechanical items produced in the 1940s and 1950s.

A few years back, the Radio Society of Great Britain (RSGB) held its last National Show at the Birmingham NEC that coincided with the very successful National Vintage Communications Fair (NVCF). Taking time off from the RSGB show, Tex Swann G1TEX and I attended the NVCF. We both thoroughly enjoyed our visit.

Organised by Jonathan Hill, the NVCF is a treasure trove of everything remotely radio and electrical. I even saw a Polyphon (a gigantic mechanical precursor to the 'Juke Box')!

We saw many old copies of PW on sale and hundreds of very collectable radios. We thirsted for more!

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The PW Dayton HamVention holidays have established themselves on the amateur radio travel calendar. In 1996 you can join us on a two-centre trip and have the option to extend the holiday and 'Flexi-Fly' wherever you wish in the USA. And like the passengers who travel aboard the Cunard Line's Queen Elizabeth II, you too can enjoy the sights of New York!

Following many years of Ohio's late April variable weather, the organisers have moved the Dayton HamVention date to mid-May when it should be warmer and drier. Unfortunately, the change brings the return airline flights into the summer season, with the inevitable increase in cost. To get over the increased flight and accommodation costs our professional tour organisers - Gallivers Groups & Incentives Ltd. - have come up with an interesting two-centre package based on New York and Dayton.

London to New York

The 1996 PW HamVention Holiday departs from London (Gatwick) on May 13, when we'll fly direct to New York with Continental Airlines. On arrival, the party will be transferred by bus to the Edison Hotel in Manhattan for a three-night stay.

Following the opportunities to explore and enjoy the sights of New York, the party will fly to Dayton on Thursday where we'll be staying in the Englewood Holiday Inn for four nights. The Holiday Inn has a good sized indoor heated swimming pool, a bar and restaurant, and there are a good selection of reasonably priced 'diners' nearby, together with the excellent 24-hour opening Meijer's department store only a short walk away.

The HamVention opens Friday lunchtime ('Flexi' market open from 6am) and runs until Sunday afternoon and there's plenty of good shopping in the nearby shopping malls (public transport is frequent and is good value in Dayton). The HamVention bus service departs from the Hotel car park and although a small charge was made in 1995, we understand that the service will be free this year (subject to confirmation).

The party then departs from Dayton on the Monday lunchtime May 20. We then fly on to New York to join our connecting flight, arriving in London (Gatwick) on Tuesday morning May 21.

You can join the 1996 HamVention Holiday for £785* per person. The £785* cost is based on two people sharing a twin-bedded room but single rooms are available for a supplement.

To receive your information pack and obtain other details, telephone Donna Vincent G7TZB at the Practical Wireless Editorial offices on (01202) 659910. Alternatively, write to Donna, marking your letter: 'Dayton HamVention '96' providing your name, address (and if possible) a daytime telephone number.

Hurry! Places on the HamVention Holiday are limited. Also send for your information pack today. Don't miss the flight to the holiday of the year with PW!
TS-850Sat
An excellent HF transceiver with an auto ATU fitted. Beautifully built with an investment value envied by its competitors.
A few left at a very advantageous price of only £1495. (saving almost £500). Also available on interest free finance. Deposit £495 & 12 payments of £83.33. These are brand new and are not "ex-demo" only while stocks last.

TS-870S
Our best selling HF "DIGITAL" Transceiver, the introduction of this model has taken the communications market by storm. As featured on the BBC World Service programme, "WaveGuide" at the Martin Lynch Open Day last November, it was pronounced the most advanced piece of HF Engineering of the decade.
Available on our 50% purchase plan. Deposit £495, balance of £1200 at £100 per month, with FIVE YEARS Warranty included. Zero APR.

TS-450S
An excellent "compact" HF Transceiver. Offering features found only on Base Station models. A full 100 watts, offered with a built in auto ATU.
The recommended retail is £1649. Martin Lynch has several left at £1195. Also available on "free finance". Deposit £196, with twelve payments of only £83.25.

TM-733E
Kenwood have put together a functional dual band mobile transceiver that is "preferred" by Raynet operators in use during emergencies, not only because of its crossband repeater facility, but also for its build quality, reliability and quick release remote head.
RRP £729. For the month of "Pickets Lock" London show, only £659 including wideband and auto repeat modifications.

TH-79E
The ideal personal companion, the TH-79E is a superbly engineered dual band handie slim enough to slip into the pocket. Its advanced features allow the user to "alpha tag" against each stored memory. RRP £473. For the month of "Pickets Lock" London show, only £415 including wideband receive.

140-142 NORTHFIELD AVENUE
EALING, LONDON W13 9SB
0181 - 566 1120
Before the days of transistors and i.c.s the radio constructor faced a big step after making a crystal set if they were to advance in the hobby. In fact, it was not really a step at all, but a giant leap!

Valves involved great expense and potentially dangerous high voltages. Fortunately nowadays the next step, now after a crystal set is quite small, thanks to the ZN414 i.e. Developed by the famous Ferranti company, the original ZN414 (there are now several versions) looks like a black plastic TO92 transistor. But appearances can be misleading, because in fact it's a complete 10 transistor t.r.f. radio in one package.

The ZN414 only needs few extra components to make it work. It's also available with an audio amplifier built onto the same 'chip' which is designated the ZN415E.

### Drawing Pins

The circuit, shown in Fig. 1, is laid out on a wooden base using drawing pins. And the board lay-out (it's a favourite method of mine...as many readers will remember) is shown in Fig. 2.

Circuitry for the ZN414 receiver as you can see from Fig. 1, is simple. However, it's sensitive enough to use a ferrite rod antenna.

To prepare the antenna coil, carefully wind 80 turns of 0.32mm (30s.w.g.) enamelled copper wire onto the ferrite rod. Once wound, fix it with plastic tape.

Important: The earth tag (moving vanes) of C2 should go to R1 and C1. The capacitor, C3 should be close to the i.c. Although the ZN414 is not expensive (approximately £1) there's no point in ruining it. Use a 'croc' clip to act as a heat sink when soldering the i.c. to protect it from heat damage (especially if you're not used to a soldering iron yet).

Because switches are expensive, I didn't bother with one. Instead I just slipped a bit of stiff card in the battery box between the box contact and the battery's positive terminal.

### Headphones

When complete, check the wiring and connect high impedance headphones or a crystal earpiece. Next, switch on (pull out the card!) and you should be able to hear stations.

If you have one of the sensitive dynamic telephone earpiece inserts, the ZN414 output will drive one of these to considerable volume with a local station. To use this type of earpiece, connect the earpiece directly in line with the resistor R2.

### Shopping List

<table>
<thead>
<tr>
<th>Category</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistors</td>
<td>Carbon film 5% 0.4W (any type will probably work)</td>
</tr>
<tr>
<td></td>
<td>1kΩ</td>
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<tr>
<td></td>
<td>100kΩ</td>
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<tr>
<td>Capacitors</td>
<td>Miniature disc ceramic</td>
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<tr>
<td></td>
<td>10μF</td>
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<tr>
<td></td>
<td>100μF</td>
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<td></td>
<td>Metalized Polyester film</td>
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<td></td>
<td>220nF</td>
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<td></td>
<td>Miniature variable</td>
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<tr>
<td></td>
<td>500pF</td>
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<tr>
<td>Semiconductors</td>
<td>ZN414</td>
</tr>
<tr>
<td></td>
<td>IC1 (Maplin Ref. QL41 U)</td>
</tr>
<tr>
<td>Inductors</td>
<td>L1 see text</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>You will also need a socket (SK1) suitable for the earphone you use, a section of wood or 'chipboard' about 60 x 40mm along with six to eight drawing pins, a small piece of aluminium sheet or p.c.b. material to make the front panel and a 1.5V battery.</td>
</tr>
</tbody>
</table>
Clive Hardy G4SLU decided to try out the ZN414 project on some novice constructors. He had some interesting results! Once again Steve has thought of another design using drawing pins. And he’s chosen a useful device.

The ZN414 is a wonderful component. The performance of the device, which needs so few external components to make it into a useful radio, is superb.

Additionally, the chip also seems to be very tolerant of abuse. So, because of its qualities, I think that Steve’s drawing pin design using the ZN414 is an ideal first project.

And he’s chosen a useful device. Another design using drawing pins. Once again Steve has thought of the design on four boys who belong to the ZN414. They are an evangelical uniformed youth organisation, at my local church. And they had great success.

Building the radios was part of their first working radios. Their first working radios. Michael showing off his picture shows Steve, Lewis, Gary and Michael proudly showing their completed and working ZN414 receivers.

Young ‘Campaigners’ Steve, Lewis, Gary and Michael proudly showing their completed and working ZN414 receivers.

Free earpieces! Do you want to build the ZN414 receiver? If you’re aged 15 or under, the Editor has 20 sensitive dynamic earpieces to give away. The first 20 young readers to write in will receive an earphone each. Send to Editor’s Earpiece Offer, Practical Wireless, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW.

All we ask is that you send us a photograph and a few words about you and your radio.

Clive Hardy G4SLU
New products for 1996

AR7030: New high dynamic range short wave receiver 0 - 32MHz

The AR7030 is the result of a combined project between AOR and internationally acclaimed UK designer John Thorpe. The AR7030 represents the very latest and best ever "JT" design concentrating on exceptional strong signal handling and bristling with enhanced features and facilities. The AR7030 is being manufactured by AOR MANUFACTURING LTD based at the new Belper locale in Derbyshire UK. Price includes mains power supply, infra-red remote control, all mode reception including synchronous AM and FM.

£799 inc VAT

AR5000: New all mode wide band base receiver 10kHz - 2600MHz

The AR5000 is housed in a newly designed solid metal cabinet and provides a very wide receive frequency coverage from 10kHz to 2600MHz in 1Hz steps, all mode reception, excellent strong signal characteristics and MANY microprocessor facilities aimed toward professional monitoring and the dedicated listener. Price includes mains power supply.

£1749 in VAT

AOR (UK) LTD
4E EAST MILL, BRIDGEFOOT Belper, DERBYS DE56 2UA.
TEL: 01773 880788
FAX: 01773 880780
E&OE

Adapt-A-Mast

- Lifts to 25ft • Wall mounting
- Complete with all brackets, cable and winch
- Accepts 2in stub mast • Adaptable to tilt-over
- Available bare steel or hot dip galvanised BS729
- Simple four bolt installation

Call (01505) 503824
or write to
TENNAMAST SCOTLAND
81 MAINS ROAD BEITH, AYRSHIRE KA15 2HT

AOR \ TM
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£799 inc VAT

AR5000: New all mode wide band base receiver 10kHz - 2600MHz

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Kevin Walker G4AES is a keen homebrewer with a eye to saving money. So much so that he’s used plastic cash till roll cores to provide the basis for some neat plug-in coils! It’s an ideal starter project for novice s.w.l.s.

Newcomers to amateur radio and short wave listening nowadays have a problem that wasn’t encountered by ‘Old Timers’ like myself! How do you start off as an s.w.l. without having to spend a considerable amount of money on an all-band receiver?

Many years ago, when I began, surplus military equipment was commonly used by beginners. This option is no longer available, the sets which were cheap and plentiful, have become highly prized items for collectors.

A direct conversion receiver is now a very popular and cheap starter radio. However, from my own experience, they don’t compare favourably with a superhet set. Resolving an a.m. broadcast is difficult, due to annoying heterodyne whistles.

My first receiver was a one valve tuned radio frequency (t.r.f.) with plug-in coil for each band. This set covered from medium wave up to about 21MHz. I was later loaned a ‘Minimiter’ converter, which I fed into a portable broadcast receiver. For this project I shall be using the same conversion method.

**All-Band Converter**

A big problem with building an all-band converter is the large number of coils and associated switching that’s often necessary. This can be even more of a problem with a complete receiver.

However, if the plug-in coil technique is used, no band switching is required. You are free to choose which area, and how much of the h.f. spectrum you are interested in.

The PW Changer converter I’ve built covers 1.7 to 30MHz in four ranges. The design uses eight coils in total, two for each range. The four r.f. and four oscillator coil winding details are shown in Table 1. Please note that the r.f. coil for Range 4 is wound differently to the coils for the other ranges.

**Overlap Tuning**

I’ve incorporated a reasonable amount of tuning overlap on the various ranges. This is to avoid using the very low capacity end of the tuning where tuning compression takes over. With this compression, a small tweak on the tuning capacitor changes the oscillator frequency rapidly.

The coil manufacturer Denco (sadly no longer in existence) manufactured a range of plug-in coils. The coils were constructed to fit into a B9A valve holder. Occasionally you still see these coils in the ‘junk-box’ section at rallies.

Sadly most of the Denco coils have been rewound for other uses. So, what is needed is an accessible replacement for the Denco range of coils.

My idea stemmed from a suggestion by regular PW author...
Steve Ortmayer G4RAW. Steve must have been an avid viewer of BBC's Blue Peter TV programme, and recycled many loo roll tubes! I've used a similar idea with the plastic tube centres from cash till rolls. These roll centres also just happen to be manufactured locally to me, and so I naturally used them for the coil formers.

The internal diameter of the till roll tube is just right to accommodate the plastic/pin section from a DIN plug. This is very convenient! The DIN plug section may be fixed in place with a fast setting epoxy glue, to complete the coil former.

When it comes to the coil winding, the obvious choice was to use an field effect transistor (f.e.t.) oscillator and a dual gate metal oxide field effect transistor (m.o.s.f.e.t.) mixer. But bearing in mind this project is meant for the beginner and being an advocate of the 'Keep It Simple...Stupid!' (KISS) principle, I wondered if the m.o.s.f.e.t. could be used as a self-oscillating mixer.

I've not seen this circuit idea mentioned published, so I found some experimentation was necessary. I also found that the Hartley oscillator (here the coil is tapped a little way up from the 'earthly' end) was the obvious choice for a plug-in coil system.

Initial tests showed me that conventional forward biasing for the m.o.s.f.e.t. was not suitable. I found that a simple potential divider was the answer, and the resulting oscillator has proved to be fairly stable. The total current consumption of the oscillator is only about 1.5mA, so it's not worth fitting an i.e.d. or other convertor is only about 1.5mA so, it's not worth fitting an i.e.d. or other

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paddi ng capacitor (C1) to correct the tracking of both tuned circuits.
To finish off the coils, after the converter has been set-up and calibrated, they should be given two or three coats of clear polyurethane varnish.

With only one r.f. coil, there can be a problem removing the 3.2MHz image frequency. To minimise this happening I have kept the antenna coupling very low. This low loading helps to keep up the r.f. coil Q, which increases the off-frequency rejection. Where broadcast stations appear in this area, using an a.t.u. is essential.

Setting-Up
To start setting-up the converter, a little help and a signal generator is required. Or better still (if you're not already a member) join your local radio club!

For the following steps put the bandspread control R3 in about the middle of its travel. First, tune the receiver to 1.6MHz. Then inject a modulated 1.6MHz signal (through a blocking capacitor (about 10-100pF) onto the junction of R1 and R2. Adjust the core of T2 for maximum audio on the receiver.

Plug the Range 1 coil into the socket. Inject a 1.7MHz signal into the antenna connection of the transverter. Tune in the signal using the dual capacitor C2/C5 and adjust C3 (r.f. trim) for maximum audio output.

The two dial positions of tune and trim can then be marked on their scales. Now repeat the process for other frequencies in the band and repeat those steps for each of the other coils.

That was the method I originally used for calibration, but it is easier to use a frequency counter to measure the oscillator frequency at Pin 2 of L1. You must be careful that the frequency counter doesn't 'pull' the oscillator too much, otherwise when you remove it the calibration is not accurate.

To resolve s.s.b. signals, a b.f.o. is needed at some point in the chain. Ideally you should have one fitted to the receiver itself. But if one is not available you can improvise using another receiver placed close to the first.

Plug the second receiver to

Table 1: The frequency bands covered and coil winding details. Note that Range 4 coil uses a different pin-out to the other three.

<table>
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<th>Osc. Coil (t)</th>
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<td>3.3 - 6.6</td>
<td>39</td>
<td>41</td>
</tr>
<tr>
<td>2</td>
<td>4.7 - 10.0</td>
<td>6.3 - 11.6</td>
<td>15</td>
<td>16</td>
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<tr>
<td>3</td>
<td>9.2 - 18.0</td>
<td>10.8 - 19.6</td>
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<td>70CMS</td>
<td>0.9-1.8GHz</td>
<td>£189</td>
</tr>
<tr>
<td>2MTHS</td>
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<td>WA1</td>
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<tr>
<td>WA2</td>
<td>500MHz-210MHz</td>
<td>£29.96</td>
</tr>
<tr>
<td>WA3</td>
<td>1.8MHz-92MHz</td>
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**COASTAL COMMUNICATIONS**

Practical Wireless, March 1996
It's wire and tape measure at the ready this month as Ray Fautley G3ASG, shows you how to make your attic space into a pair of delta Yogis.

Have you noticed that the attic roof space in most houses is triangular? I looked at the attic space at home and thought: what about using that shape for a triangular, or delta, loop antenna? This type of antenna ‘grew’ from the antenna I described in the September 1995 issue of PW.

Observation showed that the angle at the peak of the roof of my bungalow was rather more than a right angle. Look at the cross sectional drawing of Fig. 1. The angle between the two sloping sides I estimated the angle to be about 120°, after squinting through a protractor at the roof ridge. The actual angle is twice angle B shown in the cross section (so angle B is about 60°).

After groping about in the attic with a long tape measure, the floor of the attic was found to be 9.9m between walls (dimension 0 - Q). Using a little trigonometry, rather than acrobatically trying to measure the lengths of the roof sloping sides (P - Q and P - O) with the tape, I calculated them to be each 5.72m long.

If you’re faced with the same measuring problems, use the little bit of maths shown below. On Fig. 1, the width of the attic floor is shown as (b+b) or 9.9m. The dimensions to be calculated are for the two sloping sides of the roof. As both sides are obviously the same (well, they should be!), only one side needs to be calculated. The maths uses the Sine rule (not that it really matters!) and the bit to use is:

\[ \frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)} \]

The required sloping length is c in Fig. 1.

Using the same Sine rule, the height of the roof space is found to be 2.86m (not that that matters much either!). So, the total length of one triangular loop will be:

\[ \text{Length} = b + b + c = 2b + 2c = 2 \times (4.95) + 2 \times (5.72) = 9.9 + 11.44 = 21.34m \]

The calculated length of 21.34m is very close to one wavelength of a signal at 14MHz. The feed point could be at the centre of the 9.9m section (on the floor of the roof space), which is easier to get at than anywhere else!

Not Recommended

Coaxial cable is not recommended as the feeder of choice. I always use 300Ω twin feeder for any form of balanced antenna. I shall assume that you will also use the same feeder in this article.

Any length of twin feeder may be used, provided (and here it comes again!) the 300Ω twin feeder is connected to the balanced output terminals of the antenna tuning unit. This ensures that the whole antenna system is tuned and matched to the 50Ω required by most modern transceivers.

An indication of forward and reverse power is necessary so that the a.t.u. controls can be adjusted to give zero (or very low) reverse power. These adjustments should be made with low transmitter power, so as to minimise interference to other operators.

But let’s return to the antenna itself. Practically any type of copper wire is suitable for the loop, except perhaps cables with pvc insulation. Mainly, I use bare single strand tinned copper wire for my indoor antennas.

Furniture Stapler

To secure the wire to the attic timbers. I use a furniture stapler to staple the wire directly to the woodwork. I’ve used this system of holding wires in place for a long time in my various attempts to find antennas that operate in the roof space, without apparent problems.

A few measurements to provide about 0.1 wavelength spacing (about 2m on 14MHz) between the elements will fix their positions, shown relative in Fig. 2. The total length of the common ‘reflector’ element can be increased to about 105% of the ‘driven’ elements and the two ‘director’ elements reduced to be about 95% of the overall length.

Fig. 3: A three dimensional view of the antenna system without the various bits of woodwork getting in the way.
If, due to difficulties you cannot secure varying sizes of element to the woodwork, then I have a trick to help you out. Cut the total length of the reflector and directors all to be about 0.5m shorter than the calculations indicates.

Next, in the middle of the bottom run, stubs (bare wires about one metre long and spaced about 20mm apart) can be soldered to elements 1, 3 and 5 as shown in Fig. 3. These stubs will be adjusted by a shorting link slid along the length of the stub. (Adjustment of these stubs will enable both maximum forward gain and back-to-front ratio to be achieved).

Measurement (of the r.f. fields) during adjustment can be done in two ways:

A) by using a Field Strength Indicator (f.s.i.) near the antenna site as detailed in the separate panel or

B) by using a couple of local amateurs to check your signal strength. That is if you can find fellow amateurs in just the right directions! (ie. in the directions of the f.s.i. positions FSI-1 and FSI-2 in Fig. 2).

Second Method

Let’s now go on to the second method I mentioned. That was using the two amateurs (if you’re lucky enough to find them in the right places!). Just repeat the above steps using their signal reports each time instead of f.s.i. readings.

It’s possible that better results can be obtained by using the antenna described above, not as delta loops, but as inverted-V elements. This may be possible only at frequencies higher than 14MHz where the element lengths (only c+c) will be nearer a half wavelength at the 24 and 28MHz bands.

To create an inverted-V beam, just omit the horizontal part of the antenna (the wires on the floor of the attic). Then split the wires at the apex of the roof space to connect the feeder. Again, this makes two 3-element fixed beams antennas.

Stubs are then fitted into the centres of elements 1, 3 and 5 as before. Feeders are connected to the top of elements 2 and 4. The set-up procedure is as for the loops.

With indoor antennas the achievements can’t be expected to equal what can be done ‘out in the open’ but when it’s a question of indoors or nothing at all - the answer’s obvious! Best of luck, see you next time.

More Antenna Workshop next month

Fig. 3.

Steps Carried Out

Let’s now look at the steps to be carried out when using a field strength indicator.

1) Connect the shack end of the feeder from element 2 to the balanced antenna terminals of the a.t.u.

2) Set the f.s.i. several wavelengths (50 to 60m) away from the house in the required direction of maximum radiation, ie. in the direction FSI-1.

3) Connect all the shorting links about half way down the stubs. (I use a short length of tinned copper wire, about 25mm, with a clip on each end until their final positions are established).

4) Apply low power at the operating frequency (about 14.15MHz for the antenna dimensions given) to element 2.

5) Tune and match using the a.t.u. until the reflected power is zero (or very nearly zero).

6) Note the f.s.i. indication.

7) Switch off the transmitter.

8) Change the position of the shorting wire on the stub on element 1 by about 20mm to lengthen (or shorten) the element.

9) Apply low power at the operating frequency again.

10) Tune and match using the a.t.u. controls for zero reflected power.

11) Note the f.s.i. reading again.

12) Switch off the transmitter.

13) Continue to change the position of the shorting wire in the same direction as step 8 (remembering to switch the transmitter off each time) until the maximum indication on the f.s.i. is obtained. If the stub length is required to be greater than the 1m suggested, just length it! If, however, it needs to be shorter, then cut some 150mm off each of the open ends of the element and move each of the two bottom corners of the element 150mm inwards. Reconnect the stub and restart from step 3 again.

Rather a lot of detail perhaps! But it can be very frustrating if the reader, particularly a beginner, isn’t told what to do if things don’t work out first time!

14) Switch off the transmitter.

15) Reposition the f.s.i. several wavelengths away in the opposite direction, ie. in FSI-2 in Fig. 3.

16) Switch on the transmitter.

17) Tune and match using the a.t.u. controls for zero reflected power.

18) Note the f.s.i. reading.

19) Switch off the transmitter.

20) Change the position of the shorting wire on the stub on element 3 by about 20mm, either to lengthen or shorten it.

21) Switch on transmitter

22) Tune and match with the a.t.u. controls again if necessary.

23) Note the f.s.i. reading.

24) Switch off the transmitter.

25) Continue to change the position of the shorting wire on the stub on element 3 until the minimum f.s.i. reading is obtained.

26) Switch off the transmitter.

27) Disconnect the element 2 feeder from the a.t.u. and replace it by the 300Ω feeder from element 4.

28) Without moving the f.s.i., adjust the position of the stub on element 5 for maximum indication on the f.s.i. (remember to switch off the transmitter each time before you touch the stub!).

After carrying out the above steps, a re-check of the whole procedure, to ensure the best performance may be worthwhile. When you’re satisfied, replace the crocodile clip shorting leads by about 80mm of tinned copper wire (approximately the length of the clips plus the wire) and solder them in exactly the same positions on all three stubs.
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60  Practical Wireless, March 1996
Would You Be Eligible?

Written by John Worthington GW3COI

It struck me again recently the remarkable number of c.w. clubs there are, to name a few, the First Class Operators, FISTS, RNARS, RAFAR, Tops and the BTKB. Yet, as far as I know, there is no recognised club for 'phone users.

And, of course, the latter far outnumber the users of c.w., so I would have expected a club for them would have germinated many years ago.

One of the main 'planks' of all the c.w. clubs is to foster enthusiasm and skill for their chosen mode. And there is little doubt that the practice of repeating the initials of the club when calling 'CQ' or 'DX' can often lead to a QSO, which would leave non-members little hope of DX success.

So, isn't it strange that no one has come forward to propose the formation of a club for 'phone? I have no wish to put myself forward as a founder member, because I think it is probably vitally important that senior members should have a superior speaking voice for obvious reasons.

Being a chap who worked in Birmingham for many years and who was born within a short distance of the Black Country, I still have more than a trace of that area's dialect in my everyday speech, which would not be conducive to the recruitment policy.

Don't for a moment think I am ashamed of my origins, as I often amuse many foreign tourists with my recitals. However, I know from experience that used on 'phone, my accents often inspire requests from other parts of the UK for repeats of what I have just said!

President's Voice

I visualise the president of a 'phone club should be someone with a voice akin to Sir John Gielgud. There are such amateurs about and the encouragement and development of the perfect speaking voice is something the club would foster.

A government grant might be in line due course as soon as the 'powers that be' realise the tourist attraction angle. The Americans love the John Snagge voice (to name an old favourite), but are often baffled when they hear me! There could be a quarterly magazine for members carrying microphone adverts and other relevant products like throat spray and elocution tapes.

Short articles on operating seating arrangement, dental problems and diet would be written by members or commissioned from experts. Of course, there would be an annual convention, possibly held in the 1930s airship hangar at Cardington. The lofty roof there would be very challenging to the entrants of the annual loudest voice contest (first prize, the enormous Alderman Bellow Silver Trophy, which depicts a pair of gleaming tonsils, free swinging).

Tempting Offer

As a tempting offer to all interested, I would think a full page advert in *Practical Wireless* would be the thing plus a specially low first year's sub of £3. This very low figure would bring the member a quarterly broadsheet, a smart lapel badge and forage cap with sides that let down (ideal for field day operations 'al fresco').

A name for the club would have to be modern, incisive and to the point. I have been mulling over one or two and think I have perhaps the ideal. What about 'World Institute of Mainly 'Phone Club' or 'Phone Radio's Are Tops'!

'World Association of Likely Lads In Every Sense'. Of course, on the badges we would use only the initials of the above!

Small booklets would be published from time to time on techniques of 'phone operation. Voice projection and production are very important, although sadly neglected subjects in the hobby press.

Of course, any members wishing to contact others in the club would add the latter's initials in his CQ and it is fair to say that it would become so popular that some sort of sharing arrangement would have to be negotiated with the WAB Club, as far as frequencies go.

Annual Contests

There would naturally be annual contests in which members would exchange perhaps beautiful quality sound bites limited to five words per contact or something of the sort. The Trophy, a replica of which would be awarded yearly, would be a solid gold D104 mounted on a Greco Roman solid marble plinth about four feet high to discourage theft or vandalism.

This Trophy would be presented to the winner at the club's convention by a celebrity of some sort, GW3COI has already let it be known that he is not available, so the field is open to offers. Enquiries should be addressed to me, wrapped in one of the new tenners QTHR.
It's Phil Cadman G4JCP's turn to look after the PW 'wireless shop'. This time Phil describes the first part of an interesting valve amplifier project. So, get that soldering iron out and ready!

Disaster! A blown cylinder head gasket prevented me from attending the National Vintage Communications Fair Christmas Special that was held at Birmingham's NEC in December (Life's Like That...!). But my spies tell me I missed a good show but I'd still like to know what other people thought.

Now, on to choicer things. I see, from reading your letters, that some of you are keen to start a constructional project. Well, Ladies and Gentlemen, it's time to stand by your soldering irons.

High Voltages

Before diving into valve projects using normal high h.t. voltages (250V or more) I thought it might be safer for all you neophytes if I began with something less potentially dangerous. A simple receiver using miniature battery valves seemed an ideal starter.

On reflection however, I thought of several disadvantages regarding the use of battery valves. For instance, they are quite delicate and their filaments are all too easy to burn out accidentally. Battery valves don't ease power supply requirements either. Whilst a battery can supply the 1.4V needed for the filaments a mains supply is the only sensible way to provide the h.t. rail.

A far more robust alternative to battery valves are those made for television receivers. These valves were designed to operate with a relatively low h.t. - around 170V - and so are not too unhappy with a 100V h.t.

Working with a low h.t. is considerably safer than working with an h.t. of 250V. That's not to say you shouldn't take care. Treat the design as if it did have a 250V h.t. At least if you do accidentally come into contact with the h.t. rail then this won't end up being your last valve project.

Remember, 100V can still 'bite'!

Long Wave Radio

Let's face it, no-one builds valve equipment in order to out-do commercial gear. We build valve stuff for fun. If we can make something useful in the process then that's a bonus.

You have, I've no doubt, noticed that there are many transistor radios that lack long-wave coverage. So, I thought, why not build a valve radio specifically for long waves?

I've kept the design simple. It utilises components that are easily obtainable and the design is particularly suitable for anyone new to valve radio construction. Because of space limitations I've broken the design into three parts - the p.s.u., the a.f. amplifier and the r.f/detector section. This month's column covers the p.s.u. and a.f. sections.

The diagram, Fig. 1, shows the h.t. power supply. The transformer (T3) can be any type providing it has a total secondary voltage of between 30 and 40V and a rating of 6VA or more. (Note: 6VA equates to a minimum secondary current of 75mA.)

Looking at Fig. 1, you'll see that the transformer is shown with both a split primary and a split secondary. Despite this, transformers with single primary and/or secondary windings are just as suitable. If your transformer has an electrostatic shield then connect it to mains earth.

There is only one important point to bear in mind (and this doesn't just apply to this design). You should keep the total secondary current should be 1.5A or more (10VA). However, there is no reason why you can't use companies who advertise in PW and other electronics magazines who sometimes have these transformers for sale at knock-down prices!

Heater Supply

The components shown in Fig. 1, are not critical. Diodes D1 and D2, should ideally be type IN4003 rectifiers but any diode with similar or better characteristics will do. Capacitors C9 and C10 need to be rated at 63V working if your transformer has a 40V secondary or 100V if it has a 40V secondary. Larger values of capacitance can be used but don't go above 220µF.

As for R15 and 16, these are simply 'bleed' resistors which discharge C9 and C10 when the power supply has no load. Again, their value is not critical and anything from half to double the quoted resistance will be satisfactory.

By now, clever types will have recognised Fig. 1, as a voltage doubler circuit. Using this type of circuit allows us to use transformers intended for transistor power supplies to generate the necessary h.t. Even better, there are companies who advertise in PW and other electronics magazines who times have these transformers for sale at knock-down prices!

The diagram in Fig. 2, shows the heater supply for the radio. Again, the same comment about substituting single winding transformers applies here too.

The total secondary current should be 1.5A or more (10VA). However, there is no reason why you can't use two lower-rated transformers. Indeed, for the prototype I used two transformers, each providing 6V at 1A. One feeds the audio section, the other the r.f/detector section.

By Phil Cadman G4JCP
the heater voltage as measured at the valve pins as close as practicable to 6.3V. This is because small transformers, particularly if they are lightly loaded, may give a much higher voltage than they're supposed to.

If the heater voltage measures higher than 6.5V you should add some series resistance (at point A in Fig. 2) until you get 6.3V. (Very low value resistors are a bit thin on the ground so I make them up by winding lengths of 0.56mm (24swg) tinned copper wire into coils.) Should you find the heater voltage is less than 6V get another transformer!

Audio Amplifier

The audio amplifier is shown in Fig. 3. Although it has been designed for an h.t. of 100V it will work satisfactorily over the range 85 to 120V. But beware, the ECC88 has a maximum anode voltage of just 130V so no load exceeds this figure.

The input stage uses one half of an ECC82 directly coupled to a 'concertina' phase splitter. Anti-phase outputs are fed from the anode and cathode, via C3 and C4, to the grids of the push-pull output stage.

None of the capacitors in the design are critical, look upon the values given as the minimum you should use. But under no circumstances use capacitors with a lower voltage rating.

In contrast, most of the resistors are critical and only the stated values should be used for R4-7, R10 and R11. Resistors R5, 10 and 11 set the bias points for the individual valves.

If the heater voltage measures between 25 and 35V. If it's outside this range then try a slightly higher or lower value resistor for R5.

Output Transformer

Transformer T1, is a small push-pull output transformer and will probably be impossible to obtain. But, it's well known, amongst the make-do-and-mend fraternity, that a small mains transformer will double for an output transformer in a low-fidelity design such as this. The question is how to choose a suitable type!

First, the load VA rating of the transformer should be at least five times the output power of the amplifier. This little amplifier only has an output of around 250mW so even a 3VA transformer will do fine.

Next, the required ratio has to be calculated. The ratio, taken over the whole of the primary to the secondary should equal to the square root of the required anode-to-anode load divided by the loudspeaker's impedance.

In this design the ECC88 should 'see' an anode-to-anode load of around 17kΩ, so for a loudspeaker impedance of 8Ω the ratio required is

\[
\sqrt{7000} = \sqrt{2120} = 46.1
\]

For all practical purposes the ratio is 46:1 ratio. The corresponding ratios for 3 and 16Ω loudspeakers are 75:1 and 32:1 respectively.

Finally, the ratios have to be put in terms of primary and secondary voltages.

We don't have much choice over the primary voltage, that's set to 240V by the mains supply. It's just the secondary voltage we have to work out.

A transformer with a 240V primary and 6V secondary has a ratio of 40:1 (240 ÷ 6 = 40). That's close enough for an 8Ω loudspeaker. A 3V secondary will match a 3Ω loudspeaker (coincidence, that's all) and either a 6V or a 9V secondary will match a 16Ω loudspeaker.

Because this design uses a push-pull output stage a transformer with two 120V primary windings is necessary. (Make sure you wire the two primaries as if for 240V mains operation - h.t. to the centre tap.) Split secondaries can be connected either in series or in parallel to obtain the required voltage.

Separate Sections

Although you can build the whole radio on one chassis, I suggest you (at least) separate the combined p.s.u./a.f. sections from the r.f. section. That way you can use the a.f. section as both a general purpose amplifier and as an audio stage/a.f. for other radio projects.

(By the way, capacity C8 is only necessary if the a.f. and p.s.u. sections are built on separate chassis.)

Layout is not critical with one exception. Both valves have appreciable gain at v.h.f. (the ECC88 in particular). So to prevent any unwanted v.h.f. oscillations the 'grid stoppers' R2, R12 and R13 should be wired as close as possible to their respective valve holder pins. That's to say the wire lead between the body of the resistor and the valve pin needs to be as short as is reasonably possible (the wire from the other side of the resistor body can be as long as you like).

Both valves are readily obtainable. Unfortunately, the ECC88 is beloved by the hi-fi fraternity and branded examples are outrageously expensive.

If the list price makes you wince ask if there is a cheaper, un-branded alternative. Both valves were used in TV sets, so I suggest you ask around for second-hand examples before buying new.

Amplifier Performance

Let's take a look at the amplifier performance. My prototype had an 18V-0-18V transformer for T3, which gave an h.t. of 110V.

The output stage draws about 8mA for each half of V2. (You can work out the anode current of each stage by measuring the voltage drop across the corresponding cathode resistor)

Closing Time

It's closing time already and there's been no room for my component spot. So, until it's my turn 'in the shop' again I'll say cheerio and good luck with the project.

Please keep your letters and E-mails coming. You can send your letters to me either via the PW offices, or direct to me at 21 Scots Green Close, Scots Green, Dudley, West Midlands DY1 2DX. PW
For many years speech processors have been a standard item in most single sideband (s.s.b.) transmitters and transceivers. They perform the vital function of increasing the effective power, giving effective gains of about an "S" point or more. This means that a good processor can give as much gain, and probably a more effective output than a linear amplifier, and at a fraction of the cost.

When compared to the peaks the output than a linear amplifier, and gain, and probably a more effective good processor can give as much increasing the effective power, and the average intensity levels are comparatively small as shown in Fig. 2.

To prevent the amplifiers being overloaded and causing interference the transient peaks must be within the capability of the transmitter. This means that the transmitter will only be able to operate at its maximum output for a short time and the average power level will be comparatively small.

By using a speech processor the transient peaks are removed enabling the average level of the transmission to be increased. This makes the signal sound much stronger and able to be copied at much lower levels.

Clipping

Most communications processors use a process called 'clipping'. Using this any peaks in the signal which are above a certain level are removed as shown in Fig. 2. With the peaks removed it can be seen that the ratio of the peak to average power level is much improved.

Often, a clipping level is quoted. This is simply the ratio of the peak level of the waveform if no clipping was present to the peak level with clipping.

It might be imagined that clipping would distort the signal beyond recognition. Fortunately this is not the case because the ear (mainly) recognises the frequency content of the signal and not the amplitude envelope which would be seen on an oscilloscope. However, clipping does introduce some distortion which can reduce the intelligibility of the signal. The process is non-linear and introduces harmonics and intermodulation distortion.

The harmonics and distortion have to be removed wherever possible so that they do not detract from the intelligibility of the signal. Many of these signals fall outside the normal communication audio bandwidth, Fig. 3a, of 300 to 3kHz, and can be removed by filtering.

Any harmonics of low frequency signals will fall within the wanted bandwidth and cannot be removed. This is why normal audio frequency clipping has to be limited to 12 to 15dB, and can only give an effective gain of around 5dB. Any higher levels of clipping make the signal sound more distorted and reduce the intelligibility.

To overcome the problem a process called r.f. clipping can be used. Here an s.s.b. signal is generated and clipped. Any harmonics which are generated fall at multiples of the radio frequency signal as shown in Fig. 3b. These are well away from the wanted signal and are easily removed by a simple filter.

Often r.f. clipping is contained within an s.s.b. transmitter and can be included as part of the signal generation with the addition of very little extra circuitry. For a stand alone unit the s.s.b. signal is generated and the clipped audio is regenerated before it's applied to the microphone input of a transmitter.

Processors for r.f. are able to operate at much higher levels of clipping, some processors being capable of providing 30dB or more. Whilst the signal sounds different once it has been processed there is no great loss of intelligibility. With the highest levels of clipping up to 8dB of effective gain can be obtained, making r.f. processors the preferable option when compared to their a.f. cousins.

Range Limited

Apart from clipping the audio to ensure the best use of the transmitted power, the audio frequency range can also be limited. This has to be undertaken for two reasons.

The first reason is that hi-fi type transmissions with a wide audio bandwidth occupy too much space on the amateur bands, and with today's crowded conditions this is clearly not acceptable.

Secondly, any frequencies which don't contribute to the intelligibility are wasting valuable power. Most amateur transmitters use an audio bandwidth of about 300Hz to 2.7kHz.

Even within the 300Hz to 2.7kHz bandwidth it's sometimes useful to reduce the level of the lower frequencies as they contribute more to the naturalness of the sound and add little to the intelligibility. Reducing these lower frequencies before clipping also helps a.f. processors.

This is because the harmonics these low frequencies would have produced fall inside the wanted frequency band and reduce the intelligibility.

Finally it's worth noting a couple of points about clipping. Care must be taken when using an a.f. clipper not to use to high a level of clipping as this may reduce the intelligibility of the signal.

Care must also be taken not to let any r.f. signals enter the clipper. The level of clipping is equal to the additional amount of audio gain, and this means that even small amounts of pick-up can give rise to distortion or howl round effects.
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Practical Wireless, March 1996
Mike Richards G4WNC brings you
the latest 'Computing in Radio'
news in his monthly round-up.

Steve Townsley from the
Thompson Partnership has
just sent me their latest CD-
ROM, The Best of British. The
CD contains a host of good quality
shareware programs for DOS,
Windows and even some OS/2
packages.

The two most notable points
about The Best of British CD are its
price, £5 plus VAT and the high
quality presentation. I've seen many
so called jumbo CD-ROM's most of
which are just about unusable as
files with little information.

This new set-up gives
customers direct access to super-
fast v.34 7,880bps modems. For
more information contact Demon at
http://www.demon.co.uk/dispatches
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Popular Prediction
Geoclock 7.0 is the latest version of
the popular grey line prediction
program, which has recently arrived
for review. The program is available
in two versions, one for DOS, and
one for Windows operation.

The main purpose of the
Geoclock program is to give the
operator a graphical view of the
daylight/darkness areas of the Earth.
In its most basic mode it shows a
picture of the Earth with differing
levels of illumination for day and
night times.

From a radio point of view, the
most important area is the period of
dusk/dawn. Within Geoclock this
area is very clearly shown and can
be used to discover those areas of
the Earth that lie in the grey line at
the same time as your own location.
At this time you will generally find
enhanced propagation between
points on this line. Hence the term
grey line DXing.

As well as showing the current
situation you can alter Geoclock's
internal clock to give useful
projections of forthcoming DX
openings. Geoclock can also be
customised for your own location
and features a gazetteer database to
simplify the set-up.

As well as the standard Global
map there are a number of other
maps included for a more
specialised view. For UK operators
the European map is likely to be
used the most.

You can also use Geoclock to
calculate the bearing and distance
(miles & km) between any two points
on the globe. Geoclock is available
from a number of sources including
the Public Domain & Shareware
Library, Wincombe House, Beacon
Road, Crowborough, Sussex. The
program is also available from most
of the popular on-line sites both BBS and
Internet.

Amiga

ScanMate

Michael Strecke of
MSoft in Cologne has
contacted me with
details of his latest
FAX and SSTV
package for Amiga
computers. Although
not cheap at around
Deutsche Mark (DM)
448, ScanMate
includes a lot of
advanced features
and has been
specifically designed
to be easy to use.
Included in the
array of new features
is the integration of
the Viavi video
digitiser which enabes
real time
digitization of video
ing images right through
to transmission. So,
instead of working with
prepared images you
could use a video
camera to capture
events as they
happen.
For those of you
that are always
looking for improved
image quality
ScanMate includes a
high definition SSTV
mode that supports 320 by 512 pixels.
I think FAX users will appreciate the
new slant correction mode that lets
you correct a slant after the picture
has been received.
At the heart of the new
ScanMate is a d.s.p. interface that
has its own processor to handle all
the front-end signal conditioning.
If you're heavily into multi-band
operation this interface can be
supplied with software switchable
inputs for up to three transceivers.
Prices at the time of going to
press were; DM448 for ScanMate
interface with connections for 1
transceiver, DM558 for the 3
transceiver version and DM698 for 3
transceivers plus an a.m. option for
weather satellites.
For more details of UK prices
The spring equinox occurs in March, with the autumnal equinox being encountered in September. This transitional period interests me greatly as it's also the time of year when certain types of radio propagation events are more likely to take place.

I'll cover some of the modes unique to the 50MHz band in two months time but this time I'm concentrating on one of my favourite propagation modes, that of aurora.

Why do I rate aurora among one of my favourites? Foremost I guess it's because I can use it to work DX in areas that other modes rarely reach and secondly because I can wind up my iambic keyer and really let zip! So, maybe it's a bit anti-social for those slow-speed c.w. operators amongst you but I sure do make a lot of DX QSOs when the band is open.

Aurora Glow

The Aurora is a phenomenon usually observed as a glow coming from the upper atmosphere in the northern sky. In the northern hemisphere it's referred to as the 'Northern Lights' or aurora borealis. In the southern hemisphere the effects are known as the 'Southern Lights' or aurora australis.

Up until a few years ago the popular theory was that solar flares caused large magnetic storms that affected high frequency radio propagation and produced aurora on the Earth. However, a paper written in 1992 by J. T. Gosling makes it very clear that solar flares are not a cause of anything very much at all.

Many flares indeed are simply a product of something called a Coronal Mass Ejection or c.m.e. (sorry yet another acronym to remember!) As this mass ejection rises off the sun it draws out magnetically opposed field loops which subsequently reconnect and produce a flare.

However, the flare is a secondary effect which when compared to the coronal mass ejection and the tremendous shock wave it propagates into the solar wind, is of little consequence.

Equally important, the output of the flare covers only a narrow cone angle, whereas the output of a c.m.e. can cover up to half of interplanetary space. This solar material is made up of charged particles (ionised hydrogen, electrons, protons) and is carried towards us via the solar wind before becoming trapped in the earth's magneto-tail.

An increase in this particle flux, by a c.m.e. or to a lesser extent by a coronal hole, stretches the magneto-tail until it snaps and reconnects. When this happens some of the trapped particles are propelled towards the earth by the contracting magnetic field lines leading ultimately to an auroral event.

Number Of Emissions

Charged solar particles are only one of a number of emissions that emanate from the sun. When solar activity takes place two other types of emission occur. These are electromagnetic radiation and cosmic-ray particles.

Electromagnetic radiation travels at the speed of light and reaches the earth in 8.3 minutes in the form of ultra-violet radiation, X-rays, visible light and radio waves. These emissions may increase the ionisation of the D, E, F-layers, causing short-wave fades (Dellinger) and Sudden Ionospheric Disturbances (s.i.d.).

Cosmic-ray particles reach the earth some 15-120 minutes later and contribute to delayed terrestrial effects. Finally, the charged solar particles arrive at the earth having taken 20-40 hours to arrive via the solar wind, those from c.m.e. events arriving a little quicker than those from coronal hole events.

Aurora activity is centred in a doughnut-shaped region surrounding the magnetic poles. These zones are termed the auroral ovals and are normally located around 65-70° of geomagnetic latitude.

For European stations the southern most part of the oval arc will usually be located over Greenland, Iceland and northern Scandinavia. With increasing geomagnetic activity the auroral ovals expand, moving south towards the equator.

During major magnetic storms the auroral ovals may even migrate to 45° latitude. They can then encompass the UK and large parts of Europe.

Typically the aurora is at an altitude of approximately 80 to 150km in that part of the ionosphere called the E-layer. At these altitudes the aurora can be seen for hundreds of kilometres.

Stations located in Scotland and Scandinavia can often 'see' the polar auroral oval above their horizon maybe three nights out of four. Thus stations at these latitudes experience considerably more openings than those in central UK for example.

\Solar Events

As I've mentioned earlier, there are two types of solar events that relate to auroral activity. These are the coronal mass ejection and the coronal hole.

Large c.m.e. events are more prevalent during the years of sun spot maximum, whereas coronal holes reach a maximum in the last few years of the sun spot cycle. This period is between the ending of the spots of the previous cycle and the beginning of a new cycle.

If you've been reading this column regularly you'll know that we are very near solar minimum, predicted to be between June-December 1995.

During sun spot minimum auroras are predominantly of the recurrent form. For example of the 55 events noted at my QTH during 1995, 44 appear to have a connection with a previous 27-day solar rotation.

Spring And Autumn

Aurora can occur at any time of the year. But it tends to peak around the spring and autumn equinox in February-March and October-November. The reason why it peaks at these times is based on the varying position of the auroral oval during the year.

In the northern winter the magnetic pole is on average tilted further from the direction of the sun and therefore the oval moves to lower latitudes. The chart, shown in Fig. 1, shows these peaks quite clearly. It's based on auroras observed at my QTH during the five year period from 1991 to 1995.

Auroral backscatter communications have two well defined daily peaks of activity. The first and largest peak occurs in the late afternoon usually between 1400-1900UTC. (It may be useful to note...}

---

**Fig. 1:** Radio auroras observed at the QTH of David Butler G4ASR (IO81MX) during the five-year period 1991-1995 (see text).
increased international availability band. This is probably because of the often much better on the 144MHz band. However, I find that DX activity is best on the 20m and 70MHz bands.

In theory auroral propagation works in the ex-Russian republics and stations between 1800-2000km away contacts have been made with north and south. The geometry of auroral contacts can only be made up to due north. The geometry of the path signals are generally quite weak. Therefore stations running low power will require a lot more perseverance especially if the event is quite weak. A 10dB increase in power from 10 to 100W will make your signal more readable when it's close to the noise floor. Increases in power above this level will be equally worthwhile bringing with it more consistent results.

Any good Yagi-type antenna can be used for auroral work. Multiple antenna groups, such as a 4 x 17-element array, can be a disadvantage during general operation. Some e.m. operators have reported that it's harder to make many OSOs with a narrow beamwidth system. A simple Yagi will have a much greater beamwidth enabling reception of more stations over a greater geographical spread.

On the other hand a large array will provide stronger signals in specific directions. This is exactly the same common volume mismatch that is experienced with troposcatter and meteor scatter. Basically it means that the wider the beamwidth the more like a 'real' DX is and there is of finding an optimum reflecting point. The ultimate of course is to have two antenna systems, one for general DXing and the other for making distance records!

Not All Good

Large auroral events are not all good news to everyone though! The emissions have completely knocked out long distance h.f. radio communications and caused disruptions to earth satellite communication systems. The low earth orbiting Oscar satellites RS1 and RS8 were possibly the first examples of satellites 'killed off' by cumulative radiation damage. And proton events have permanently damaged the sensitive processor systems in some geostationary satellites even though they use supposedly 'space hardened components'.

Geomagnetic effects have caused lack of compass accuracy and loss of directional abilities in homing pigeons! Induction of heavy currents in pipelines, railway tracks, telecommunication cables and electrical power transmission lines have also caused severe problems. However, it's the detection and logging of these effects that can enable you to predict when an auroral event is likely.

Measuring Instruments

There are a number of measuring instruments you can build yourself to detect disturbances in the earth's magnetic field. One of the simplest magnetometers is a bar magnet suspended in a jar of damping oil. Changes in the magnetic field are detected by the use of Hall-effect devices. A more professional device, although complicated to build, is the fluxgate magnetometer.

Another method is to measure the current in the earth by burying two rods a minimum of 50m apart in a north-south direction. The overhead ionospheric current develops a voltage in the ground which can be amplified and fed to an indicating meter.

Or you could build a radio telescope and detect increases in solar noise. This is simply accomplished by pointing your v.h.f. array towards the sun and making daily measurements. You could even spend all your time listening on the h.f. bands waiting for a short-wave fadeout. Then there is monitoring of Band I television signals and 27-day auroral calendars.

Additionally, there are the WWW propagation announcements, monitoring of Band I television signals and 27-day auroral calendars.

Best Bands

In theory auroral propagation works best on the 20m and 70MHz bands. However, I find that DX activity is often much better on the 144MHz band. This is probably because of the increased international availability and the ease with which much higher transmit effective isotropic radiated power (e.i.r.p.) can be generated. Contacts on the 40m band are fairly scarce. And they're usually limited to the larger auroral events.

To my knowledge no one has claimed a two-way contact on the 1.3GHz band. (Although professional radar observations indicate reflections are possible even at 3GHz.)

However, I did mention some seven years ago that the station of G4FUF (J001) made a one-way contact with HZFRD (JN87) over a path length of 1300km. This took place during the huge auroral event on 12/14 March 1989 when G4FUF received a S5A report from the Hungarian station.

Unfortunately the station of HZFRD was only running 2W output and therefore a record breaking two-way contact was not established. It's worth noting that approximately 12kHz of Doppler shift was present on the received signal. Future attempts at a world record on this band will probably require the use of two v.f.o.s if a successful contact is to be made.

Another way to make contacts via the aurora you need to beam at the auroral oval itself. So, regardless of your station location, you should beam north when auroral activity is suspected.

When signals are heard swivelling the beam either side of north to maximise the signals. (Hands up all you that have set your rotator stop at 0°!!) Set it to due south, recalibrating the compass dial if necessary.

Depending on the extent of the opening increment the antenna towards the east. Different beam-headings will give propagation into different areas of Europe. As a generalisation stations in central England should beam 010-030° to contact stations in GM, 030-060° to contact LA, DH, OZ, SM and 050-080° to contact eastern Europe and the ex-Russian republics.

In general the longest distance stations peak the furthest away from due north. The geometry of auroral radio reflections dictates that contacts can only be made up to certain specific distances from your location. The region within which auroral contacts are possible is called the 'boundary fence'. It's approximately oval in shape, about 2000km to the magnetic east and west of your QTH and about 1000km to the magnetic north and south.

For example, from my QTH in western England (JC81) many contacts have been made with stations between 1800-2000km away in the ex-Russian republics and eastern Europe. But none have been achieved with stations in southern France or Spain.

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Badly Distorted

Signals propagated via the auroral plasma will always be badly distorted. This is caused by a random wideband Doppler shift imparted to the signal by the wave-like motion of the aurora.

The shift produces a characteristic 'hissing' sound making voice signals very difficult to copy. Morse on the other hand is far easier to copy (providing you know c.w.), the signals sounding exactly like keyed white noise.

Because auroral working is essentially a weak-signal mode the use of s.s.b. or c.w. is preferred. These transmission modes can be copied right down to the noise floor unlike f.m. that requires a signal strong enough to exceed the demodulator threshold. (That's not to say that f.m. won't work, it just needs a very strong auroral event and probably an increase in the audio deviation for it to be successful.)

My preference is always to use c.w. because that's where all the 'real' DX is. It's also a much quicker and efficient way of making contacts. Try it some time...it even works at Novice speed!

Power Helps

High power is not obligatory for aurora operation but it certainly helps. Because of the non-optimum geometry of the path signals are generally quite weak. Therefore stations running low power will require a lot more perseverance especially if the event is quite weak.

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Additionally, there are the WWW propagation announcements, propagation warnings on h.f. and v.h.f. beacon stations, the DX Cluster, the Internet and even the telephone network. So, now it's over to you and hopefully I'll hear you on the air in the next event!

Deadline Time

It's deadline time again. And as usual please send any news (to reach me by the end of the month) to: Yew Tree Cottage, Lower Maescoed, Herefordshire HR2 0HP.

You can also contact me via packet radio @ GB7MDA, the DX Cluster @ GB7DZC or E-mail via davebu@md1hr1.igw.bt.co.uk Alternatively you can telephone me on (01873) 866679.
Leighton Smart GWOLBI reports on your h.f. log books for the past month and takes a look at the RSGB\'s DX Newsheet.

I'll start this month with a look at the RSGB\'s DX Newsheet, which is widely seen as a 'must' for all serious DX operators and listeners. Amongst some of the information included is news that Ted LZ1WR is hoping to be active from Libya in March from 5A1A, and intends to improve the i.f. antennas while he is there. Maybe we'll hear Ted on 1.8MHz soon.

There's also news that Allen KNG4AHL will be operating from the Marriand islands (KNI4AHL) about mid-March. He will be active for or five days from Tinian Island on both s.s.b. and c.w. on the bands between 7 and 28MHz.

Allen will accept skeds via FAX on: (916) 896-4407. Alternatively you can use Internet to E-mail him as: asherwood@oavax.csuchico.edu

Mike Manafo K3UOC, who operates from Sandy Island in the Lacepede Islands group in May this year. The four islands in the group, Middle, West, Sandy and East, are located in the Indian Ocean and are all part of a nature reserve. Mike already has the right permission, and intends to finalise his plans soon.

Saudi Arabia

I've received some information from Mike Maaske K3UOC, who operates 7Z500 in Saudi Arabia. He's provided some interesting details on the background of the station.

One thing that did surprise me is that amateur radio is technically illegal in Saudi Arabia. In fact, 7Z500 is licensed to a member of the Saudi Arabian Royal family, and apart from a handful of other stations (such as HZ1A13) there is no publicly available amateur service in the country!

Mike's station is located in Riyadh, and consists of an IC-795 transceiver. This is backed up by an Alpha 91B linear amplifier capable of running 1kW output.

Antennas include an R7 vertical, a high power version GS 5VR, and inverted 'V' antennas for 3.5 and 1.8 MHz.

Mike has been operating the station since the 11th of October 1994, and so far has made a staggering 39,332 contacts, 97½ of which are on c.w. (One of which was our own John Heys G3BDQ. John worked him on Friday Jan 5. Edition).

Mike says that the hardest part of setting up a station in Saudi Arabia is the near impossible task of setting up a good earth. However, he sorted that problem out by using the Royal Palace's cold water system, and says that it works adequately.

In his letter, Mike tells me will be active from 7Z500 until July this year, operating generally around 0900-2000UTC on a daily basis, mostly using c.w. At around 0900 he checks the 24MHz band for any openings on that band, otherwise operating on any band which is open.

Band Conditions

Our reporters indicate (in December) that band conditions have been improving of late. The 21MHz band carried an increasing amount of reasonable DX traffic.

It still seems that 14MHz is the main band for most DX operators. But perhaps as conditions continue to improve at the higher end of the i.f. spectrum, we may see a gradual drift to the 21, 24, and 28MHz allocations.

Of course, with the dark evenings of winter, the i.f. bands tend to be at their yearly peak. As a result they in turn attract a great deal of DX activity.

Although a difficult band to work, 1.8MHz (Top Band) has always been a favourite of mine, especially during those long winter evenings in front of the fire, microphone in one hand, glass of wine in the other!

Your Reports

On to your reports now and this month I'm starting with 'early bird' Ted Tremwell G2HKU on the Isle of Sheppey in Kent. Ted uses a Ten-Tec Omega V transceiver at 70W output and a selection of GS 5VR, HP6 (Vertical) and MFJ loop antennas. He reports 1.8MHz c.w. contacts with 9A1A (Croatia), TF3J (Iceland), OY9JD Faroe Islands, 2B2X (Gibraltar) and TK2C (Corsica), all at around 0600.

Next comes John Heys G3BDQ near Hastings, who's been having a whale of a time on 1.8MHz. He uses a Kenwood TS-870 transceiver with a 3/4 wave sloper antenna plus a shielded loop receive antenna in the loft.

John lists some very nice 1.8MHz c.w. DX including KI2M (USA) at 2238, VK3DUX (Australia) at 1647, TA4ZM (Turkey) at 1908, VE3JB (Canada) at 2151, UA9CMO (Asian Russia) at 1905, plus a string of north American contacts in the morning at around 0700UTC.

(Propagation on 1.8MHz is usually at its best during the months January to March inclusive. So this is really the best time of the year to crack a few new countries on this band).

The 3.5MHz Band

Now it's over to Steve Locke GW0SSL in Mountain Ash in South Wales, who has been trying 3.5MHz DX operating for the first time. Steve says that '80' has been producing some excellent DX with good signal strengths in the 'DX window' (around 3.790MHz) at the top of the band.

Steve seems to be quite taken by the 3.5MHz band after operating mostly on the higher frequencies. He has heard all parts of the world recently, and has managed to contact AP2N (Pakistan) at 2256, G5SL via AP2MN/KH8, 88KMU (Kuwait) at 0013, V01WLO (Newfoundland) at 0223, and W9QO (USA) at 2340UTC, all on s.s.b. Steve uses a Kenwood TS-940 transceiver at 100W output, and a trapped dipole up at 15m for this band.

At around 0700, Ted G2HKU again used c.w. to work E8ABP (Spanish Morocco). He also raised RZF/JMM in the North Sea bound for Wales, and W1M4K (Massachusetts, USA) during a brief period on 3.5MHz.

The 7MHz Band

The 7MHz band is the one you either love or hate! And it certainly seems to provide consistent long distance contacts regardless of time of year.

As a consequence 7MHz has its dedicated aficionados. On the other hand, it's a band which is affected by high levels of QRM due to its being such a narrow (100kHz) allocation, and that's enough to put paid to some amateurs' enthusiasm!

I think it's about time the 7MHz band was extended here in Europe. And I don't mean up into the 41MHz 'megawatt' broadcast allocation, but down into the 6.5MHz range - after all, it seems to be one of our most reliable - and well supported - DX bands!

Over now to 7MHz enthusiast Charlie Blake RS-6034 in Milton Keynes, Buckinghamshire. He reports that English-speaking QSOs have become virtually non-existent of late, and as a consequence, he has been spending some of his precious spare time on 14 and 18MHz.

Charlie's report for 7MHz band includes s.s.b. reception of CP60A (Bolivia) at 0646, HC20A (Equador) at 0653, VK2SL (Australia) at 0704, TG5NT (Guatemala City) in contact with DLAXA at 0833. He also logged...
The 14MHz Band

I've received a detailed log (as per usual) from Don Mclean G3NOF in Yoelli, who says that 14MHz has only been open during daylight hours recently. At around 0800 the long path to Australia and New Zealand has been open, also to Asia and South America.

Don lists his s.s.b. contacts with BV6DF (Taiwan) at 1011, CO2WF (Taiwan) at 1011, CF20NV (Japan) at 1012, 1060K (Canada) at 1017, K3NOF (USA) at 1017, 3JE8 (Japan) at 1017, and G3NOF (Canada) at 1017.

Moving west now to Carl Mason GWVSSW in Skewen South Wales, who has been giving the c.w. key a right bashing according to his log! Carl has notched up s.s.b. contacts with C6DK2 (Canada) at 1040, ZL1BSN (New Zealand) at 0830, PT7BZ (Brazil) at 1744, and ZP5K (Philippines) at 1000.

The 18 & 24 MHz Bands

I'll start the 18 and 24MHz reports with the contribution from new reporter Richard Evans GOVCW in Rushden, Northants. Richard apart from sporting a snazzy pair of shorts, Fig. 1, informs me that he is a "QRP nutter" (nice to meet a fellow 'nutter' Richard!).

Richard has now sent in a short log detailing low power contacts on 18MHz with VE1KCN (Canada), and the C47DMZ (position?!) both with 3W of c.w. Richards also worked F5SPL (French Saint Martin), VU2TRI (India), C6AKV (Morocco) and HK40DF (Colombia) all with 8W on 18MHz.

Back over to Don G3NOF now who reports 18MHz s.s.b. reports with KHOTCN (San Andreas Islands) at 1151, HJ1AB (Saudi Arabia) at 1022, ZKCLB (Australia) at 1014, ZL40J (New Zealand) at 0530, and F5PSK (St. Pierre & Miquelon) at 1534. His 24MHz contact was with 7Q7A (Malawi) at 1210UTC, who (says Don), will automatically send a QSL card, but does not require your QSO report.

Lastly, for 18MHz, comes s.w.l. Charlie Blake R58004. He reports s.s.b. reception of 7X2WAK (Algeria) working I3EZE in Italy at 1456, TA1BN (Turkey) working KD5MJ at 1453, PT7BZ (Brazil) working TA1BV in Turkey at 1528, (QSL via bureau), and CN8BE (Morocco) working PA5DA at 1259UTC, (QSL via FE6BC).

John G3BDQ has been busy on 7MHz too. He lists c.w. contacts with ZL1CO (New Zealand) at 0830 and WA1LSH (Ohio, USA) at 0830, and his 24MHz contact was with 8W s.s.b.

The 21MHz Band

To 'wrap things up' this month I'll take a brief look at 21MHz. This is where it seems a lot has been happening. Starting with John G3BDQ who has been using both s.s.b. and c.w. on this band and who reports contacts with ZL1CO (New Zealand) and BY6EY (Montenegro), both s.s.b. using a Ham International Concorde 2 transceiver and a wire dipole antenna.

Leighton Smart GWOLBI operates: Every Sunday at around 1100 on 28.500MHz s.s.b. using a Ham International Concorde 2 transceiver and a wire dipole antenna.

Finally, the report from Ted G2HKU includes 21MHz c.w. 5G50s with 9RE2MRC (Zaire), T4USUH (Dominican Republic), 7Z500 (as mentioned earlier), EASEU (Spanish Morocco), 3D4NX (Swaziland), PY1OF (Fernando de Noronha Island), YS6A (Benelux) and Z6K2 (Ascension Island).}

The variety of information you send makes the column readable and the success it is. Keep up the good work! As usual, reports and information by the 15th of each month to: Leighton Smart GWOLBI, 33 Nant Gwyn, Trelewis, Mid-Glamorgan Wales CF6 4DB. Tel: (01144) 411459.
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PHONE 01707 659015 FAX 01707 645105
International broadcasting is likely to suffer a loss at the end of March. It was announced in mid-December that the Canadian Foreign Affairs Ministry was to withdraw its funding of Radio Canada International (RCI) at the end of the financial year.

Currently, the Foreign Ministry shares the cost of running RCI with the nation's public service broadcaster, the Canadian Broadcasting Corporation (CBC). The timing of the announcement was inauspicious, just a fortnight before Christmas, giving RCI's staff an unwelcome Yuletide gift. And it seems to many practitioners and supporters of international radio a shortsighted move.

Radio Canada International's total operating budget is just over Can$16 million (about $9 million) and reaches a known audience of 12 million people through its services in seven languages. The CBC faces a budget reduction of several hundred million dollars, and decided it could not justify spending the Canadian public's money on maintaining an overseas service.

Celebrated Anniversary

Just 12 months ago, RCI celebrated its 50th anniversary. The station started on February 25, 1945, with the aim of broadcasting to Canadian military forces overseas, and, in the words of Mackenzie King, the then Prime Minister of Canada, 'to bring the country into closer contact with other countries'.

At the time of writing it was unclear whether any short wave broadcasting would continue from RCI. Readers may know that CBC domestic programmes in English and French are carried by RCI, and at the time of writing, no decision had been reached as to whether short wave relays would continue. Nor had a decision been taken over the transmitter exchanges RCI operates with the BBC World Service, ORF Radio Austria, NHK Radio Japan and China Radio International.

The BBC World Service is facing its 80th anniversary. It was announced in mid-December that the Canadian government provides for 'capital' reductions during 1996-97 in the money for 'revenue' spending in 1997-98 (staff costs, travel budgets, power, etc.). That means in theory it may not be able to afford to spend money to hire the Sackville transmitters it currently uses under the exchange agreement. The result could be far worse reception in North and Central America for World Service programmes. It seems there is no easy solution, so my advice is listen while you still can. If there is any change in the grim outlook for the Montreal station, I'll let you know.

Schedule News


Channel Africa is on the air to sub-Saharan Africa in English at 0258-0405 on 9.695 and 9.995; 0459-0555 on 11.90 and 7.595; 1448-1755 on 9.53 and 7.155 and 1558-1655 on 15.24MHz. Readers with Astra satellite equipment can also hear Channel Africa in studio quality via the World Radio Network relay at 1556UTC, and if you are lucky enough to be on holiday in South Africa, you can hear Channel Africa's programmes on the national English language f.m. network, SAFM, between 104 and 107MHz f.m.

Further north in the continent is Radio Omdurman in Sudan. The station operates on a variable 31 metre band frequency (try 9.00 or 9.025MHz) between 1700 and 1900, with French for an hour, followed by English for another 60 minutes.

Radio Pakistan has extensive English language broadcasts beamed to Europe and Africa, Tune in at 0800-0850 and 1100-1115 on 17.895, 15.47; 1600-1630 on 15.595, 13.59, 11.745, 11.57, 9.795 and 9.485 and 1700-1750 on 11.57 and 5.825MHz.

The Voice of Indonesia in Jakarta is on the air to Europe on 9.555MHz between 1730 and 2100UTC, including English for an hour at 2000. Other languages include Spanish, German and French.

Radio Highlights

Highlights of programmes in the English service of Radio Netherlands during late January and February include Greenland on January 31 and February 7.

Greenland is considered by many to be the last frontier on the planet. And that is all for this month. Let me know if you hear anything interesting on the broadcast bands, and I'll pass on the information to other readers. Good listening.
Roger Cooke G3LDI has news of friends, news broadcasts, test successes and technical advancements at GB7LDI this month.

I have many phone and packet radio friends in the Pacific Northwest. One of the latest converts to the digital mode is Dave Snape VE7FM. Dave’s ‘conversion’ is the result of a little ‘bullying’ and a visit to Jack Balfour VE7FMY.

Jack runs a very busy BBS about half a mile up the road from Dave, and we spend an interesting few hours with Jack. He has radios and computers in just about every room of his house, such is his enthusiasm!

Some enthusiasm must have rubbed off onto Dave who is shown together with Jack in Fig 1. The station shown is Jack’s. I wish I could keep my station as tidy as this and I can confirm that it was not tidied just for the picture!

The computer systems and radios Jack has in use for packet operation are extensive. Try sending a message to Dave or Jack, I’m sure they would love to make more UK friends on the packet network.

**Teledata News**

The British Amateur Radio Teledata Group (BARTG) news is still being broadcast in RTTY mode, using the callsign GB2ATG. The schedule of GB2ATG is that transmissions are made during the first full week commencing Monday each month as shown in Table 1.

The news is also posted to the UK packet network and to Packet Clusters. Items to look for are messages to BARTG @ GBR. It’s also available from the files area at GB7BS and GB7MXM (in the Clive sub-directory).

For those on Internet but without RTTY, the news is also available on the Internet BARTG Web site: http://e.c.nott.ac.uk/~ibx/BARTG/

It’s also posted to a number of Internet news areas including: info-hams@ucsd.edu

uk.radio.amateur

The GB2ATG news Editor, Bob Canning G6ARF, takes items of interest for publication to reach him before the 25th of each month. Contact him via packet as: G6ARF @ GB7MAD, or GTHR, or E-mail as: bcing@kc3itd.dircon.co.uk

**EMC Test Success**

Also from BARTG, is the proud announcement that their ‘New Improved Multiterm’ multi-mode data terminal unit has just passed the rigorous EMC testing in compliance with the EEC standard EN50082-1/1993.

Tests were carried out by the York Electronics Centre at the University of York. They tested the unit for radiated immunity, immunity to electrostatic discharge and immunity to electrical fast transient bursts.

The tests involved frequencies up to 1000MHz with a field strength of up to 3V/m. Static discharges of up to 8kV, were applied to the unit under test in both ‘air space’ and ‘full contact’.

The BARTG tell me it’s believed to be the first instance of an amateur radio club having obtained compliance to the EMC tests. The EMC standard EN 50082-1/1993 applies to within the residential environment. Further details can be obtained by contacting: Ken Godwin G0PCA, 11 St Lukes Way, Allhallows, Kent, ME3 9PR. Tel: (01634) 271548.

**Baycom Project**

The Baycom project, a simple and cheap computer based TNC, was published in a BARTG Journal. Sometimes however it’s difficult to obtain information or documentation for Baycom in English.

A supplement, designed to get the newcomer up and running with the simple Baycom 2 or 3 chip board, has been written by Jim G4RGA. Jim is willing to supply it on disk if required as long as the usual mailer and postages are included. The supplement is also in the CLIVE database and can be downloaded from there.

**Easyterm For Windows**

A copy of ‘Easyterm for Windows’ was recently sent to me from Mustafa Topukcu, 1B1AD. Written by John Henley W1EDR. Easyterm for Windows supports most of the major TNCs.

Unregistered users can have 100 free trials by using the serial number 999. After that, registration is necessary. The program has an impressive set of features and is well worth it. If anybody would like a copy of the program, then send me a formatted disk + disk mailer and return postage.

**Satgate at GB7LDI**

At long last, and after a series of catastrophes, the satellite gate (Satgate) is up and running at GB7LDI. Mail for MDLE, OC, AF now goes via UD-22.

My usual e.f. forwarding will still be maintained and also the server between GB7LDI and GB7LAN (in Lancaster). After running for a month or so (fingers crossed) all systems appear to be go!

Support for Satgate should be by either joining AMSAT, or making a donation towards the cost of building and launching the amateur satellites. Files are available giving further information at the Satgate.

There is also a tag-on message automatically added to mail imported from the satellite. Members of AMSAT do not receive this message.

That’s all for this time, 73 de Roger, G3LDI @ GB7LDI #35.GBR.EU. Tel: (01503) 570278.

END
For Sale

AR1000 handheld scanner receiver. 8-600MHz (no gaps). ±1000 memories with i.q. output. £40. Fully rechargeable, in as new condition. £165. Edystone TX-380 (acure set), £185. £19-165MHz, excellent condition. £135. Tel: Yorks (01482) 869652.

Bereavement forces electrical shop stock sale: Resistors, capacitors, transformers, tuners, hundreds of i.c.s, valves, valve characteristic testers, TV pattern generators, 100s of manuals for TVs and radio’s, etc. (Location Grintn), Andrew. Tel: (01472) 603378 or Sean 0181-947 2176.


Cowor CDU150 solid state oscilloscope, dual-channel, d.c. to 25MHz at 50V/cm. 8 x 10cm display, delayed timebase with gated mode, photocopy of handbook. Tel: Southampton (0170) 454558.

Eddystone communications receiver type 4L, 136kHz to 30MHz, a.c. operation. £25. Scorpion 2m (144MHz) transverter. 28MHz U/P 50W o/p, works with FT-101 series, space grade O-s-s-A and 7- element ZL Special, £80. Tim Hague GAGGP, Milton Keynes. Tel: (01908) 563600.

Electrical, test and laboratory equipment, OLP, some collectable. From estate of J. D. Cooper (medical research council, retired). Send s.a.e. to 4 Gillmans Road, Kent BR5 14E.

For Sale

100W h.f. mobile, £275 or n.o. Zenith Trans-Oceanic portable valve m/w/v. 1937 vintage, £150 or n.o. Sire GTPY, London. Tel: (0926) 542402.

Imcron 551D (50MHz), exchange for Imcron R7000 or sale. £550. J. Nurmes. Tel: 351-1-7777860 or FAX. 351-1-777791.

Kenwood TR851E 70cm (430MHz) transceiver, all-mode, 25W or 5W, as new, with box and manual. £450. Tel: Exeter (0392) 764027.

Kenwood TS-830 with matching AT230 and MC30 desk mic., all as new, exchange 430 or mobile h.f. or, £60. o/n.o. Tel: Lowestoft (01502) 730253.

Neton PRO283 base scanner, frequency coverage 68-960 with gaps, four months old, still under guarantee, boxed £15 or n.o. Realistic DX-260 built in wave receiver, 0MHz, £90 o/n.o. Tel: Carlisle (0229) 585218.

Oscilloscope Gould Advance 02552 twin trace 15MHz, good working order, £65. Tel: Exeter (0170) 522099.

Philips. PFP8, two off, v.h.f. PFP706, two off, v.h.f. Base TX/RX inc crystals for 2m (144MHz), 2m (144MHz). £30, all-mode transceiver, as new with warranty or swap Delta 1 or Reflec. £5. A. Morgan, Headu. Tel: Derby (0115) 930 8096.

Practical Wireless, March 1996

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Leaflets. G8SLBICITHR). Tel: 0181 595-0823.

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JWfax/STSTV, HamComm, PktMon. 9FD/25FD Tx/Rx Interface, programs, manuals, pictures. £2850. SASE leaflets. GSSLB (QTHR). Tel: 0181 595-0823.

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R.A.E. PAY AS YOU LEARN COURSE. £3 per lesson includes tuition. Ken Green, c/o G3PMD, QTHR or ring me on 01483 573688 (Guildford).

SALES SELLING BUYING P/F W. G3RCQ. Cash waiting, large collection, in good condition. Marconi TF317 suppressed Zero Voltmeter £35, AVO Model 7 £15, Heathkit R11 Rovr £20, Airtec 314A Electronics Meter £25, DC21 Frequency Meter £25, Marconi TF 1020 Power Meter £56, AVO Minor with shunts £15, KW E-ZEE Match £70, Datascan Audio Wattmeter £5, Advance DC2 Times/Counter £10, Trio TR7000G 2m FM Transceiver plus PSS, PWR SUPP PLUS 10G EXT VFO £200, Power pack 300V 150MA £5, Marconi Sensitive Voltmeter TF2600 £50, Marconi Millivoltmeter TR899 150 mV to 2V with RF probe £20, One dozen assorted moving coil instruments £5. G3PMD, QTHR or ring me on 01483 573688 (Guildford).

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B.F.O. KITS Resolves single side-band on almost any radio, £16.49. H. CORRIGAN, 7 York Street, Ayr KA8 8AR.

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