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* General coverage Receiver
* Spectrum Scope
* 102 Memories
* Alphanumeric Display
* Digital Peak Metering
* Tx Compression
* CTCSS & 1750Hz Tone

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- 144 - 146MHz FM
- Two independent VFOs
- 151 channels or 75 Alphanumeric
- 7 channel steps
- 4 power levels
- SW & 9.8V DC
- Alphanumeric
- FM
- CTCSS (optional)
- Automatic batt. saver
- 12V DC
- 57 x 102 x 22.5
- 200g (approx)
- Nicad and charger

Price Smash

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FT-50R 2m70cms Handy
- Wideband Rx (AM/SSB)
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- CTCSS X 1750Hz
- 151 Alphanumeric Memories
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This is a very solid rig that is proving one of the most popular dual band hamradio

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- FM SSB (LSB/USB), CW
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- 1750Hz Toneburst

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- 430 - 440MHz FM
- Two independent VFOs
- 151 channels or 75 Alphanumeric
- 7 channel steps
- 4 power levels
- SW & 9.6V DC
- Alphanumeric
- FM
- CTCSS (optional)
- Automatic batt. saver
- 12V DC
- 57 x 102 x 22.5
- 200g (approx)
- Nicad and charger

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- Size 260 x 86 x 270mm
- Weight 7kg

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- Free FM board & AM Filters
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- SSB CW FM AM
- 100W HF 10W 50MHz
- CTCSS Tone unit

**Alinco DX-70 HF Base / Mobile**

- Phone for Crazy Price!
- If you are looking for a good reliable 100W transceiver, then this is just the job. Supplied with FREE Base Mic.

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- £1599
- 1.8MHz to 432MHz
- Free PSU
- £1595

**Icom IC-T8E Dual Band handy**

- 6m 2m 70cms
- £319
- In stock now!
- Note: you must use the special charger supplied with Starter Kit.

**Icom IC-2100 2M Mobile**

- £269
- With switched 12.5kHz & 25kHz filters

**Icom IC-207H 2m170cm Mobile**

- £339
- 2m & 70cm
- 50W, 30W
- Detachable head

**Icom IC-706 Mk II 1.8 - 146MHz**

- £999
- 18 30MHz 100W
- CW - FM - AM
- Rx 100kHz 30MHz
- Message memory
- Dual in-band n "ESDSP filter" RF processor
- RF pre-amp
- Electronic keyer
- IF shift
- Collins filters
- Comprehensive menu system
- RS-232 interface
- And more
- Send for details

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- In stock now!
- Note: you must use the special charger supplied with Starter Kit.

**Alinco DX-70 HF Base / Mobile**

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- 1.8 - 54MHz
- SSB CW FM AM
- 100W HF 10W 50MHz
- CTCSS Tone unit

**Alinco IC-706 Mk II Dual Bander 2m70cm**

- £249
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MFJ-1026

* Phases out noise at the antenna socket
* Kills local QRM - lets signals through
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* Decodes CW, RTTY, ASCII, AMTOR FEC
* LCD 2 x 16 characters
* 8000 character RAM
* Key input for CW practice
* Epson compatible printer port
* Requires 12V at 300mA DC

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Hear those weak signals - Get rid of the QRM - works better than any internal rig DSP - 16 memories - totally programmable

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£54.95

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30 CARRYING ON THE PRACTICAL WAY
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THE TEN-TO REVIEW
Scheduled for this month has had to be held over until next month, my apologies. Editor.

Practical Wireless, December 1998
DX-70TH

100 Watt HF Transceiver
plus 100 Watts on 6 mtrs

- TX - all HF + 6mtr
- RX - general coverage
- 150kHz - 50MHz
- 50MHz - 54MHz
- SSB, CW, AM, FM and digital modes
- 100 memories
- Detachable faceplate and remote mounting kit available
- Speech processor standard
- Narrow filters fitted as standard
- 100W output on HF & 6mtrs
- Selectable 4 stage RF gain
- Superb TX audio and RX
- Excellent RX sensitivity
- Full break in on CW
- All mode squelch
- Scan facilities
- CTCSS encoder
- Noise blanker
- Quick offset for DX pile-ups
- IF shift control
- Separate HF & 6M antenna sockets

The DX70 TH packs a hefty 100W punch on all Ham bands 1.8 - 50MHz. It is backed by a superb receiver with narrow filters fitted as standard. Make no mistake - this is a real DX operators transceiver ideal for use at home, in the car, or for that portable DXpedition. General coverage receive is included and wideband transmit facilities for export customers. The detachable front panel allows remote mounting and additional security.

DX-77(E)

- Covers all HF Amateur Bands
- General coverage receive (150kHz - 30MHz)
- 100 memories
- 100W, SSB, CW & FM, 40W AM
- Built in speech compressor
- Computer control with optional ERW-4
- Full QSK in CW modes
- QRM/QRN reduction with IF shift, RF attenuator and optional CW filter
- Two VFOs + memory operation mode
- Basic model upgradeable to (T) model with EJ33U Electronic keyer
- EJ34U CTCSS
- EJ35U CW filter

EDX-1 HF Antenna Tuner

The EDX-1 is coaxial tuner with built in Power and SWR meters. The ATU is rated at 120W and covers 160-10 meters including WARC bands.

EDX-2 Automatic Random Wire Antenna Tuner

Quickly matches random wire antennas, mobile whips, verticals, inverted Ls. Wired for DX70 - but can be used with most HF Transceivers.

EDX-2

- Covers 3.5 - 30MHz
- 200W PEP

HFMT-1 HF stainless steel mobile antenna complete with spring base.
- Covers: 3.5 - 30MHz (when used with EDX-2 auto ATU)
- Length: 2.7 metres

EM-49 Speaker Mic

Miniature speaker mic with lapel clip for use with DJ-C1 and DJ-C4.

DJ-491 70cm handheld transceiver

A slim line 70 cm transceiver that’s easy to use and has an enormous clear display. A unique feature is the ability to display either frequency readout or just a channel number.
- Up to 5W output (with 9.6V NiCad pack)
- 90 memories channels
- RX expandable to 430 - 450MHz
- Programmable steps 5-50kHz
- Auto power off with alert
- Multi function memory channel
- Storing capable
- CTCSS encoder
- DTMF fitted as standard
- Battery save facility
- Multi function memory channel
- 5.55, Time out timer

DJ-C5E Micro sized handheld

- 144 - 146MHz transmit
- 430 - 440MHz transmit
- Extendable receive 116 - 174MHz including AM air band
- Extendable receive 420 - 450MHz

DJ-S41C Slimline 70cm handheld

- Widerange Coverage
- TX: 340 - 440MHz
- RX: 420 - 450MHz
- 500mW Output
- Both CTCSS and Encode
- Repeater Offset

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DJ-G5EY
Dual Band Handheld
A brilliant twin band handheld that does everything including spectrum display of adjacent channels. The RX has a superb front end that does not suffer with breakthrough like some other handhelds. It has CTCSS/DTMF built in as standard.

NEW LOWER PRICE
£269.00

DJ-191E
2 Metre Handheld
A new slim line 2 meter handheld that’s easy to use and has an enormous clear display.
• Up to 5W output (with 9.6V NiCad pack)
• 40 memories channels
• Cloning capable
• CTCSS encoder
• DTMF fitted
• Battery save facility
• Scan functions
• Time out timer

£169.95

DJ-190E
Low Cost 2mtr Handheld
A powerful super slim 2mtr handheld that has a huge easy to read display.
• Up to 5W RF output (with opt. EBP-36N battery pack)
• 40 memory channels
• Includes NiCads and charger
• CTCSS tone encoder fitted
• Battery save function
• Scan function
• Time out timer setting

£149.95

DR-140E
2 Metre Mobile/Base
The DR-140 is simple to operate, easy to program and dependable in use. The clean design, large controls and display show that Alinco are listening to what operators are saying. The DR140 combines solid construction and easy maintenance with popular features and advanced functions.

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DR-150 2 Metre Mobile
A full featured 50W 144MHz FM mobile radio that’s crammed full of extras. The DR-150 takes mobile radios into the 21st century!
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• Channel Scope
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DR-610E Twin Band Mobile
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DR-M06TH
6mtr FM Mobile 50 - 54MHz
V configuration allows both repeater and DX operation. 50 - 54MHz 300 Watts.

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VC6
6mtr V Dipole

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DR-605E Dual Band Mobile
Easy to use dual band mobile TX that delivers both high power and performance with user friendly features.

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DR-605E
Low Cost Dual Band Mobile
A powerful dual band handheld that does everything including spectrum display of adjacent channels. The RX has a superb front end that does not suffer with breakthrough like some other handhelds. It has CTCSS/DTMF built in as standard.

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South Midlands Comm
### Bits 'n' Bob's

**Bob Coleman's pick of the month**

I HAVE FOUND A NEW - FT-208R - £95

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<thead>
<tr>
<th>USED EQUIPMENT</th>
<th>NEW ALINCO</th>
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<tbody>
<tr>
<td>1 x TS-820</td>
<td>DG-180</td>
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<tr>
<td>1 x TS-520 from</td>
<td>DJG-5</td>
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<tr>
<td>1 x FT-1000 mint condition</td>
<td>DJS-41C</td>
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<td>1 x TS-140</td>
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<td>EX DEMO</td>
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<td>1 x IC-707 EX DEMO</td>
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**EX DEMO**

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<thead>
<tr>
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<tr>
<td>2 x TS-5700S from</td>
<td>£750</td>
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<tr>
<td>2 x TS-50S from</td>
<td>£525</td>
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<tr>
<td>1 x IC-R8500 mint from</td>
<td>£1195</td>
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<tr>
<td>1 x IC-970 with Ext Rcv</td>
<td>£1150</td>
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<tr>
<td>2 x TS-690 with ATU fitted</td>
<td>£925</td>
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<tr>
<td>3 x TS-830 from</td>
<td>£395</td>
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<td>Selection of FT101Z / ZD's - make me an offer</td>
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<td>Loads of 2m Handies from</td>
<td>£75</td>
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### Rodney's Raves

**Rodney Perry's pick of the month**

**NEW EQUIPMENT**

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<td>£2295</td>
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It's the event with something of interest to every radio and computer enthusiast!
As those of you who have been to PICKETTS LOCK before know, there's something about the events which take place here that just feel good.

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Tel: 01923 893929 Fax: 01923 678770
The first 'Leicester' show to be held at the Castle Donington Exhibition Centre near the East Midlands Airport took place amidst much interest and incident. And although the event was marred by a failure of the electricity supply around lunchtime on Friday 25th of September - the new venue is undoubtedly a great success.

The building is clean, with excellent access and the necessary public facilities are also clean - helping us to forget the dreadful state of the old Granby Halls. It was also good to see so many familiar and friendly faces - particularly so the helpful staff working at the ticket desks.

Getting to the show is also much easier - although the last mile or so could do with some 'Leicester Show' road signs. This comment comes from experience - because even though I had been to the site before - I found myself driving through the campsite before getting to the car parking area proper! So, a few signs could certainly help.

Several readers thanked me for the Information provided in the October PW on the approach from the north - and it was quite justified because I too discovered that there's no south-bound exit at the Tonge junction on the A42 for those people because I too discovered that there's no south-bound exit at the Tonge junction on the A42. A victim of my own published directions I had to drive to the Ashby-de-la-Zouch junction and then head back to my Hotel near the M1. Lesson learned readers...sorry about the misinformation!

Light In The Darkness

Despite the valiant efforts of the power supply company the lights stayed off for the rest of the afternoon on the Friday, although large stand-by generators were in operation on the Saturday. But, every dark cloud has a silver lining and as a direct result of the problem - another was temporarily solved.

As the exhibition centre building is of the very large 'warehouse' type with windowless industrial roofing - ventilation is obviously a problem. During the Friday morning it became very hot and stuffy - as is common at such events and it got worse after the power cut.

However, the show organisers quickly arranged to have the roller-shutter type doors at each end of the building opened to provide extra light. And although the affect on the light was minimal - the improvement in ventilation was immediate and refreshing.

I mentioned the improved ventilation to the organisers. Hopefully next year, bearing in mind the very large amount of electrical equipment and people attending (all producing heat) that they try to arrange that the end doors are kept open to the benefit of everyone - especially as there isn't a 'No Smoking' rule in place.

Finally, there's an odd little incident that took place at the show which can't pass by un-reported. It involved Bernie and Brenda Godfrey of Radiosport Ltd (organisers of the London Amateur Radio Show at Pickets Lock) who were 'asked to leave' the building by the organisers.

Bernie and entourage did as the organisers asked - but shortly after they departed the lights went out! When I spoke to Bernie about the incident - jokingly suggesting there was some 'connection' between his sudden departure and the power failure - he in return enjoyed the joke but added that "As Moses was able to part the waters of the Red Sea to help my ancestors escape from Egypt back to Israel...surely he could arrange an electrical fault to brighten my day"?

Our cartoonist John Worthington GW3C01 thought we'd better produce an illustration showing that the incident was a pure coincidence. (or divine intervention?).

So, with a smile on my face (and yours too I hope) I'm looking forward to the next Leicester Show as I'm sure it will continue to be a truly excellent event. See you there!

Radio 'Scape & Data Diary

As briefly mentioned last month - we've said 'goodbye' to Mike Richards G4WNC our 'Radio 'Scape' columnist. Unfortunately, due to pressure of work Mike has had to shed some load so he can enjoy a little more life with his family again. However, I'm sure that readers will join with us and wish him well in the future and that he may find time to occasionally do some work for us! Good luck Mike!

Readers will remember that 'Data Diary' often 'overlapped' in coverage of the same topics as 'Radio 'Scape' and because of this, some time ago we dropped the 'Data Diary' column. But, now that Mike G4WNC's column has ceased, I'm delighted to say that it can be re-started by Roger Cooke G3LDI, the previous author who is an extremely active Radio Amateur and very busy using computers, data modes and the Internet.

So, thanks again Mike G4WNC and good luck to Roger G3LDI and the relaunched column - 'Data 'Scape'.

Rob Mannion G3XFD
On Target With AKD

Dear Sir

I thought that the Editorial team and the readers of Practical Wireless, might be interested in the following.

Some time ago, I wrote to you that I had bought an AKD Target HF3 receiver and with a wonderful little radio it was for the price. You were kind enough to send me a review on it that had been published in the November 1996 PW (thank you).

It is a good little radio but there were two things lacking. One was lighting behind the digital readout and the second was the lack of memory facilities.

Fear not, salvation was at hand! For a radio to have a two year guarantee must mean that the manufacturers have great faith in it, I thought to myself. So, I wrote to AKD asking them if any such modification to the back lighting and memories was envisaged in the near future. I had a very nice letter back from them with the good news that they would not only fit back lighting facilities into my receiver but also a ten memory bank.

I had a voucher worth £10 to spend on items from our book or other services offered by Practical Wireless. All other letters will receive a £5 voucher.

The price? £20 plus £6 P&P. My receiver was in the post within the hour.

I could have traded my present receiver in for an HF3S plus £70 - but I think the first option the best.

So, for anyone owning an AKD HF3, for a small outlay they can have a receiver guaranteed for two years that can compare favourably with many higher priced receivers on the market.

Also, with reference to 'Radio Basics' in the September issue of PW, I see the old problem has arisen.

Coil winding or rather the formers.

The answer is simple. Go to your nearest supermarket, have a quiet word with the manager and I am sure they will fit you up with a supply of the little plastic formers from inside the till rolls.

There are apparently two sizes. One is approximately 11mm outside measurement and the other is 21mm. These can be easily fitted to the p.c.b. board or chassis by carving a piece of dowel to a tight sliding fit and either glue it or drill it and screw it.

John Noble G20961
Kent

More On Morse

Dear Sir

I have followed the debate on Morse/No Morse and changes in the licensing regulations with interest ever the past few months but I think that many of the subscribers miss the main point which (in my opinion) - what’s going to happen to Amateur Radio in the future?

We read constantly of surveys which document the falling numbers of Radio Amateurs throughout the world. I believe that we must do something to attract new members to our hobby and that if it is necessary to relax the entry conditions, then we have to take the appropriate steps now.

We often read of ‘frequency auctions’ in the USA and if our numbers decline at the rate they appear to do I would not be surprised if parts of our frequency allocations are up for sale in the future.

One reader was quite worried about what the rest of the world would think if the Morse speed was reduced. I can assure you sir, nothing. Last year here in Denmark we simplified the license categories, upped the maximum power to 1kW and dropped the Morse speed for a full license to five w.p.m. I have not noticed any deterioration in operations by Danish amateurs.

So, come on you good people out there, support your national organisation’s attempts to brighten the future and avoid the situation that “the last 25 c.w. operators on 80m will hold their last net on Friday before that portion of the band is sold”.

Tony Woodcock OZ2ZZZ
Copenhagen
Denmark

....And The Future?

Dear Sir

My reason for putting fingers to keyboard are two-fold. Firstly, let me begin by congratulating you on such a brilliant magazine. I have been reading PW fairly regularly since 1984 and possess issues dating back to about 1975. The progress in presentation over the years has been remarkable, culminating in what has become a second-to-none specialist publication which everyone interested in radio can enjoy.

My second point is with regards to the many letters published in your letters column for and against keeping the Morse test as a compulsory prerequisite for access to the h.f. bands.

Callsign Number Plates

Dear Sir

I think everyone is missing the point about callsign number plates! Of course you can save money by having your callsign made up as a sticker for your windscreen, or printed on your actual plate where dealers sometimes have their name displayed. Anyone can do this, by having the actual vehicle registration number the same as your callsign is obviously ‘exclusive’, or at least it was before the DVLC got on the bandwagon by offering these numbers for sale at exorbitant prices.

However, please remember those poor G0 series callsign holders who will never get a chance for this so-called ‘exclusivity’ due to there being no G0xxx formatted DVLC licence numbers. Similarly GM, GW, etc. would also miss out.

Never mind, I know of a chap near me who has called his house G0...I would like to do the same but my YL won’t let me! Excellent publication, keep up the good work.

Jon Kessel G7RWH
Boscastle
Cornwall

Practical Wireless, December 1998
**Top Band**

**Dear Sir**

I read in the September 1998 issue of *Practical Wireless* that David Perry G4YVM of Salisbury was particularly interested in top band: 1.8MHz, for which he’d like to see more references.

I am a Radio Amateur myself (GM3VOX) and am also a professional in electronics (now specifically interested in Radio Astronomy designing). I built an RSGB article design ‘Top Two’ transmitter (10W) including a voice modulator to another RSGB design article. This home-brew transmitter has been tuned up by me, the 1.8MHz being v.f.o. tuneable and the 144MHz being a crystal frequency.

I suspect that the circuitry could be obtained from the RSGB archives. London. I am prepared to sell mine, with a power unit, but a p.a. power unit variable in voltage from, say, 150-350V, offering up to 100mA, would be required to permit tuning up. High voltage transistors are now easily and cheaply available.

I built the top two transmitter for use on the Oscar 6 satellite, but this was delayed several years. If this top two transmitter is of interest to any licensed Radio Amateur, I am prepared to sell it, with power unit, for £250. It would still require the PA variable voltage power supply mentioned above, however.

As there is a considerable interest in both 1.8 and 144MHz, I thought the subject might merit the publication of this letter.

**Tony Thomson GM3VOX**

108 Tannemhill Drive, Calderwood 12, East Kilbride, Glasgow G74 3HT

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**Practical Wireless, December 1998**

I should say now, that I am not yet a licensed amateur. However, I have been involved with radio since about 1980 at the age of 15, via CB. Gradually, I became interested in short wave listening and borrowed my uncle’s Yaesu FRG-7 receiver. This opened up the world of Amateur Radio to me and I have been hooked ever since.

Having finally realised my education and academic aspirations, I am fully committed to taking the RAE, which I hope to do either this December or next March. However, the point I’m making is that once I have passed the RAE, I will still be unable to join those on the 3.5MHz net to whom I have listened for a very long time with eager anticipation of the time when I may ‘rag chew’ with the best of them!

I attended the Blackwood and District Amateur Radio Rally at Oakdale Comprehensive School on Sunday 4th November, and was surprised how well it would be – at the decline in popularity of what was once a very well attended ‘convention’. Many of the people attending the event were, shall we say, not getting any younger and the average age being around the late 40s mark, with only a very few in their early 30s such as myself.

I think the Radio Society of Great Britain (RSGB) and the United Kingdom Radio Society (UKRS) should be asking themselves why? Even the UKRS stand, advertising themselves as a young, enthusiastic and forward looking alternative to the RSGB was manned by a 60 or so year old and another fellow in his 40s. Is this hobby exclusive to retired people with the under 60s deemed to be young upstarts? I sincerely hope not!

Returning to the issue of the cost of the Morse test. Does an ability to receive and send Morse code make you a better operator than those who merely possess a pass in the RAE?

Personally I think not.

The RAE is an imposing prospect in its own right. It requires many hours of careful study for those of us not well versed in electrical theory and this should be all that is required for access to the h.f. bands. The RAE has already provided knowledge of how the bands are allocated, so the operators will retain from straying onto telegraphy only portions of the band being worked.

Knowledge of Morse does not add to this appreciation of the amateur band plan in anyway!

In my opinion, if the hobby and enjoyment of all things radio is to survive into the millennium, both the RSGB and the UKRS must put their heads together and take a good long look at how Amateur Radio can be promoted and encouraged in the future.

Simply, it’s my belief that the RAE should remain as it is. We all need to understand how our radios work and how we may inadvertently cause nuisance and irritation to our neighbours through poor installations which cause EMC problems.

Personally, being of a musical disposition, my Morse ability isn’t bad and with practice it will no doubt improve sufficiently to achieve 12 w.p.m., but why? New-comers will no doubt ask the same question and may be put off from attempting the RAE, reasoning that once passed, they will still be denied world contact, being instead relegated to a relatively short range system with the odd contact now and then if the propagation is good or someone happens to be mobile and opens their local repeater.

They will, instead, probably nip down to the local ‘cyber cafe’ and jack into the net, make contact anywhere in the world via video conferencing and actually see the other person for around £2 for an hour’s chat.

Also and probably more importantly, why aren’t true CB enthusiasts encouraged or invited to attend amateur radio clubs and societies? Radio is radio after all. So why be elitist at the expense of the hobby? Many amateurs (who may now not admit to it) made their way into the hobby via an introduction to radio from CB.

The millennium is looming and technology is racing to provide us all with increased access to world-wide communication and information. So how does the RSGB and UKRS aim to promote Amateur Radio to prospective licensees and keep the hobby alive and healthy into the next century?

**Kevin Dawson**

Gwent

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**Editor’s comments: Another good selection of letters and opinions this month readers. But please bear in mind that by keeping yours as short and concise as possible...means we’ll have room to provide even more interesting reading on these very popular pages.**

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**Letters Received Via The ‘Internet’**

Many letters intended for ‘Receiving You’ now arrive via the ‘Internet’. And although there’s no problem in general with E-Mail, many correspondents are forgetting to provide their postal address. I have to remind readers that although we will not publish a full postal address if we are asked to do so, we require it if the letter is to be considered. So, please don’t forget to include your full postal address and calligraphy along with your E-Mail hieroglyphics. All letters intended for publication on this page must be clearly marked ‘For Publication’.

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Editor
In an event that mirrored history, Princess Elettra - daughter of Guglielmo Marconi - visited the Isle of Wight for the first time on August 31st. The Princess was happy to be at Osborne House on the Isle of Wight where her father had spent so much time and where, 100 years earlier, he had helped Queen Victoria make broadcasts to her son, the Prince of Wales, on board the Royal Yacht.

A marquee was erected on the site of Osborne Cottage and it was from here that the Princess, with the help of Douglas Byrne G3KPO (on the right of the Princess in the picture), who played the part of the operator) and Peter Botterill, sent messages by Morse to Queen Victoria, who played the part of the Princess in the picture), who played the part of the historic venture and the Princess, with the help of Douglas Byrne G3KPO (on the right of the Princess in the picture), who played the part of the operator) and Peter Botterill, sent messages by Morse (c.w. and NOT spark!) to Rod Burman on the historic tall ship, Sedov, which is moored in Portsmouth harbour.

Peter Botterill (on the left of the picture) constructed an authentic copy of Marconi’s first spark transmitter from Marconi’s original plans and it really is a shame that he couldn’t use it. Still, although the messages were conveyed on a modern set, everything else was extremely authentic. Everybody got into the spirit of the historic venture and dressed up in authentic Victorian attire and played the parts of several people who were present at the original event.

**THE DIGITAL REVOLUTION?**

With the increase in publicity over the ‘Digital Revolution’ in both TV and radio, the News desk here at PW has received a number of interesting press releases from the BBC concerning their successes in this field and some information on digital products that will soon become available. The coverage map is an updated version which has been sent to all retailers who stock digital radios and shows who can receive BBC digital radio broadcasts.

There are five manufacturers who have already produced digital radio for use in the car but the BBC are keen to encourage manufacturers to produce home hi-fi units. Three UK manufacturers have announced that they are developing digital radio hi-fi tuners for use in the home.

**Arcam** have announced their launch of a digital radio tuner (DRT) - the Arcam Alpha 10. DRT priced at an astonishing £799 and is designed in collaboration with Roke Manor Research using their DAB Gold Card - a hi-fi component that can be easily added to an existing hi-fi system. Initial production begins in late October and full production should start in January.

**Cymbol** have launched their C-DAB I Tuner this month! It’s a digital radio tuner which includes a high-quality DAC board and a four line display for all data and text information. Full production has already begun and tuners will be available late November/early December.

Another company, **Meridian**, is looking to launch an upgrade to its existing f.m. tuner in early 1999 to provide reception for both DAB and f.m.

Still on the subject of Digital Radio, the BBC have recently won an award for: ‘Most Innovative Radio Broadcaster’ for its work in Digital Audio Broadcasting (DAB), at the International Broadcasting Convention in Amsterdam. The Judge stated that the BBC was the ‘unequivocal winner’.

**MORE & MORSE...**

One look at our letters page this month will tell you that the debate over whether the Morse test should still be valid or not is very much at the forefront of Amateur Radio politics at the moment. It is, therefore, probably very topical for Waters & Stanton to be promoting two new Morse code related products from MFJ.

First up is the MFJ-414 Classroom Morse Code Tutor. If you are one of the Radio Amateurs who does feel that it is still worth taking the Morse test and are considering having a go, then this Morse Tutor, W & S state, has all the necessary features: memory keyer; h.f./v.h.f. interface; l.c.d. readout; 1000 character store; computer and printer ports - to name but a few. It costs just £189.95 and is in stock at Waters & Stanton now.

Of course, if you’re really serious, there’s always the MFJ-554 Classroom Morse Practice Oscillator. Why not make it a pair? This also has all you need in a Morse Practice Oscillator, says Waters & Stanton. Pure sinewave, adjustable volume control, tones 400-1000Hz again to name only a few. The MFJ Morse Practice Oscillator costs just £79.95 and is also in stock now.

Waters & Stanton also bring us news of other products from MFJ. With the countdown to the millennium being on everyone’s minds at the moment, a new clock which gives the time, year, month & day might be handy. The MFJ-118 and the MFJ-119
are two different clocks. The MFJ-118 is an hour clock (batteries only) which has both 12 and 24 hour clock and gives you the year, month and day. Waters & Stanton say that you can also choose the language you would like: English, Spanish, German or French. The MFJ-118 costs £28.95.

The MFJ-119 is a calendar clock, Waters & Stanton say that it has a large l.c.d., 12 or 24 hour clock, day, month, date, and temperature. It costs slightly more than the MFJ-118 at £48.95. Waters & Stanton say that you can get more details by calling their Dealer Hotline on Tel: (01702) 203353.

Still with Waters & Stanton, they are also promoting the new GB-3 Tri-band Base Antenna.

They claim that it is suitable for all current solder systems including hot-plat, infra-red vapour phase and dual wave and it will, apparently, withstand a temperature profile of 260° for 20 seconds without degradation.

Also available from Easby Electronics are their new SM diodes which they say have ultra fast recovery times. For more information on either product, you can contact Ian Hepworth at Easby Electronics, Gallowfields Trading Estate, Richmond, North Yorkshire DL10 4TQ. Alternatively, you can telephone them on (01748) 850555.

**CUSHCRAFT’S NEW DIRECTIONAL PATCH ANTENNA**

The communications and antennas specialists - Cushcraft - have recently introduced a PCS/DCS & ISM Band linearly polarised dual patch antenna series. The beauty of this antenna series, according to Cushcraft, is that they are of a low profile design making it ‘an ideal choice for discreet antenna installations’. Applications for these antennas, therefore, could include industrial complexes, office environments, shopping malls, parking garages, airports, hospitals and campus settings and many, many more say Cushcraft.

Designed for the following frequency bands: 1850-1990, 1710-1880 and 2400-2500MHz, these new Directional Patch Antennas consist of a high quality etched copper circuitry which, Cushcraft say, aims to “substantially improve the reception and transmission of communication signals”.

The antennas are said to provide a minimum of 12dBi gain with nominal 66 by 25’ half power beamwidth for the 1850-1990 and 2400-2500MHz frequency bands and a nominal 64 by 26’ half power beamwidth for the 1710-1880MHz frequency band, with...

**MINIATURE MEGGIT 3315**

As you can see from the photograph supplied by Easby Electronics, it is easy to see why they claim that these are the smallest SMD trimmers ever seen. Featuring a very small outline package, the Meggit 3315 is particularly well suited to surface mounting and hybrid systems according to Easby Electronics.

**AMATEUR RADIO CLUB SPECIAL**

Boston’s Hundred & Fifty On Line

On the weekend of September 12/13, Boston in Lincolnshire celebrated 150 years of their railway and in order to celebrate in style, a special event station - GB4BR - was set up on the railway station itself.

A senior conductor for Central Trains, Selwyn Auty G3JRY, set up GB4BR with the help of other people from the British Railway’s ARS and, altogether, they made some 150 contacts with 18 countries. There were also a number of other things to see that weekend, with many displays and shows along the railway theme.

Congratulations on the 150 years of the railway and let’s hope there are many more years still to come.

**Reddish Radio Rally Report**

Peter Knowles has been in touch with us to say what a wonderful turn-out they had at the Annual Reddish Radio Rally which was held at St. Mary’s Church Hall in Reddish, Stockport on September 12. It is always good to hear that radio rallies are still going strong and that they are still getting a good turnout.

Peter reported that with all the usual home-brew ‘goodies’ and radio components there were new additions to the Rally this year. These came in the form of the first computer stall to ever appear at the Rally manned by Mark M1CYW (seen in the photo). Also new was a visit from Dave Wilson G70BW and his wife Keith Wilson M1CNY who manned a stand for the FM Repeater Group (Western). With all this going on, there was something for everyone!

**A Big Thankyou!**

The members of Central Lancashire Amateur Radio Club (CLARC) have been in touch with the PW news desk with a wish to express their thanks to all amateurs and s.w.l.s who helped to make GB350BOP such a success!

The operators at CLARC inform us that they made over 4000 contacts and worked over 146 countries over the course of the whole event which took place between May 24 and August 17. On July 18 they were on the station at Flag Market in Preston which was attended by the Mayor of Preston, Councillor Rose Kinsella.

The callsign was clearly well received and their publicity officer tells us that they had some encouraging comments such as “a refreshing change from normal special events” and “a history lesson on air”. CLARC would also like to say thankyou to Martin Lynch & Sons who sponsored their QSL cards.

*Fig. 1 left to right: Alan Floyd G3PHQ, Brian Boulton G0UTJ (Chairman of CLARC), Mayor and Mayoress of South Ribble Borough Council: Councillor Jim Owen & Mrs Joan Owen, Brian Birkby G0NEI (President of CLARC), Karen Simmons G0LB and G0GVA handling the pile-up.*
an impedance of 50Ω and a v.s.w.r. of 1.5:1. Cushcraft also say that each patch antenna combines excellent r.f. performance with a discrete and stylish antenna housing which are easy to mount in many challenging situations.

For more details and prices, you can contact the Cushcraft Corporation on Tel: 603-627 7877 or FAX: 603-627 1764.

MARK SHEPHERD - YOUNG AMATEUR OF THE YEAR

The 1998 Young Amateur of The Year Award has been won by Mark Shepherd from Brighton. Mark who holds the callsigns MOAGO and G7WHL was conferred the honour and the awards that accompany it, including a cheque for £300 from the Radiocommunications Agency (RA) and an invitation to a conducted tour of the RA's Monitoring Station near Baldock in Hertfordshire at a ceremony at the Radio Society Of Great Britain's HF Convention at Old Windsor on Sunday 11th of October.

Mark has done a great deal to raise the profile of Amateur Radio - particularly at Brighton College where the 17-year old is a student. He's been the Secretary of the school radio club for three years, is a GB2CW broadcaster and is also active in the RAF Cadet Force (Air Training Corps) where he teaches radio communication skills to cadets.

The 1998 Runner Up in the YAOTY award is 16-year old Peter Evans MOBOO from Orpington in Kent. He received a £50 cheque from the RA and also receives a conducted tour of the Baldock Monitoring station.

ONE HUNDRED YEARS - CELEBRATION DINNER

One hundred years of 'Amateur' Radio was celebrated by a special dinner held on the evening of the first day of the newly-relocated 'Leicester' Show - held for the first time at the Castle Donington venue. The dinner - attended by distinguished friends and guests of the hobby was an enjoyable evening organised by the RSGB at the Donington Thistle Hotel and hosted by the Society's General Manager Peter Kirby G0TVW.

The event - despite the importance of the celebration was not well supported by the Amateur Radio Fraternity. However, for those who did attend - including myself and Tex Swann G1TEX, invited by the RSGB and representing Practical Wireless - were entertained by good company, had an interesting time and heard several varied speeches - and in one case a particularly inspiring challenge - by the Amateurs invited to speak during the evening.

'Top of the table' speeches came from none other than Louis Varney G5RV himself who - despite losing his notes - provided a splendid series of 'off the cuff' memories dating back to the 1930s. It even included one of G5RV's original rigs from the period which Louis assured us was "still in working order"!

Ian Poole G3YWX provided a brief 'guided talk' illustrating the passage of the history of the hobby before the 1997 Young Amateur of the Year Emma Constantine 2E1BVJ held the attention of the audience with a well written speech announcing ‘Emma's Challenge’. The challenge (further details in PW later) sets the task for any group or individual to produce a practical ‘phone’ project for the Novice for under £40. An interesting challenge indeed!

The President of the French Amateur Radio Society Jean-Marie Gaucheron F3YP also addressed the gathering and we were all thoroughly entertained by the RSGB columnist John Hall G3KVA’s nonchalantly delivered humour where no personality escapes the ‘verbal sword’. But joking apart...it was good to see John fully recovered from a relatively recent serious illness although it was a great shame that there weren't more people in the audience to enjoy the evening and John's 'dead-pan' delivery service!

So, here's to the next 100 years - with all the challenges we're yet to encounter!

Rob Mannion G3XFD.
PRACTICAL WIRELESS QRP COMPETITION AWARD PRESENTATIONS

Oldham Told "Em....We Won! Anyone who can remember the old advertising slogan: "I told them...Oldham" (it helped sell car batteries for many years) will understand the jubilant cry from the operators of the Oldham Radio Club's G1ORC/P's station when they learn the group came first in this problem! (See page 16 for the 'real results'). The Oldham Radio Club are pictured receiving the coveted winner's cup at the new 'Leicester' Show on September 26th of 1998, and also their prize Alinco DJ-190 from Mike Devereux G3SED of Nevada Communications, who kindly donated the prize.

Wafflers From Wales
The "North Wales Wafflers" GW0NWR/P - last year's winners - came second in 1998. Always a closely fought friendly 'battle' for the group - they are shown being congratulated by the Editor minus their prize at the presentation of the show. We couldn't get the prize in the photograph because it was an 11 metre high mast kindly donated by Bob Keyes GW4IED of Key Solar Products, who chose a mast because they already have a full range of Bob's products from previous year's wins.

Keith's 'Stereo' Pair!
The PW El/GI Trophy was won this year by Peter Lowrie GI7JYK/P and as he won it in the inaugural year of 1997 - He's now got a 'stereo pair' of trophies for his mantelpiece in Northern Ireland. Peter is seen photographed at the show receiving the award from me - as I'd threatened to withhold it as he did not let us have a photograph of him receiving the award in 1997! It was a very closely fought contest between Peter and Paul Martin EI2CA - and I'm very pleased to continue sponsoring the friendly aspect of competitions between Amateur Radio friends in EI and GI as I strongly value the friendship between the different nations within our group of Islands. So, I look forward to next year's event with interest!

ROB'S RED FACE & APOLOGIES!
I'm afraid that it's very much a case of 'Rob's Red Face' this year. There was a real 'comedy of errors' at the various presentation ceremonies (they all seemed to arrive at once and I got the various parties for the 'Club Spotlight', QRP Contest, etc., all mixed up!) and although our much valued QRP Contest Adjudicator Dr. Neill Taylor G4HLX and family were within earshot of the presentation - I was so busy arranging everything, I forgot them and Neill was left out of the photographs...despite all his hard work throughout the year arranging everything. So I'm afraid that I have to publicly apologise for my unintentional rudeness Neil. We do appreciate all your hard work - let's hope next year we can arrange the photocalls separately and that I can remember which one I'm arranging!

So, congratulations everyone you've all done extremely well although the Editor is the only one who definitely scored 'below par' this year. Oh well...perhaps I'll get better at arranging it all next year!

Rob Mannion G3XFD

Practical Wireless, December 1998
Practical Wireless 144MHz QRP Contest 1998

Leading Standing

Overall Winners
Oldham Radio Club
North Wales Wafflers

Runners Up
North Wales Wafflers

Leading Single Operator
David Hewitt
Tony Crake

Leeds & District ARS

Leading Fixed Station
G4LAD

Leading English Station
Oldham Radio Club
North Wales Wafflers

Leading Welsh Station
GM0CLN/P

Leading Scottish Station
G1YYK/P

Leading N. Ireland Station
Peter Lowrie

Leading Eire Station
Paul Martin

Leading stations using a single antenna

Table of Results

Practical Wireless, December 1998

We are aware that an unfortunate error occurred in the corrected tables here.

Table of Results

Practical Wireless 144MHz QRP Contest 1998

Pos. Callsign Points Pos. Callsign Points
1 G1ORCP 5216 36 GV0FICP 870
2 GV0WNP 5456 37 M4IADRP 940
3 GM4WNP 5526 38 G4LICP 626
4 G7ICP 4530 39 GV0TNC 806
5 G4WOUP 4460 40 G1TJXCP 767
6 G8BICP 3880 41 M1BUICP 710
7 GV0IUP 3422 42 G0FELP 732
8 GV0ZCP 3316 43 G4AYCP 720
9 G3RIK/P 3150 44 G4TJCP 720
10 G4WPDP 2772 45 G7TJCP 720
11 G8DDYP 2756 46 G3MAUP 720
12 G1WUP 2675 47 M4AYBP 720
13 G4YCP 2675 48 G0KJUP 702
14 G1PSICP 2469 49 GV0WICP 592
15 G8WCL/P 2413 50 G0ULR 533
16 G4BICP 2134 51 G7TJXCP 530
17 G4WCL/P 1948 52 G1JGCP 468
18 G5DUP 1850 53 G7TJRC 462
19 E1GCA/P 1702 54 G3HICP 462
20 G8BPICP 1680 55 G5VEXCP 456
21 G4ARUP 1675 56 G7DUP 452
22 G4RSEP 1674 57 G3IHCP 451
23 G4VUWP 1601 58 G4TPUA 440
24 E19KCP 1482 59 G4QUP 440
25 G52ICP 1408 60 G6VRICP 418
26 G4WKP 1343 61 G4XICP 408
27 G1MIDG/P 1339 62 G4CUP 385
28 G4HRSP 1314 63 G4DZCP 240
29 D4VYLC/P 1250 64 G4CHNCP 216
30 G8AXL/P 1177 65 G8PBP 180
31 G4AKUP 1109 66 G5VEXCP 160
32 MOAIXCP 1058 67 G4BICP 144
33 GALAD 1071 68 G7PAUA 126
34 G6ICRP 974 69 G4ELICP 92
35 G6VUP 886 70 G7TJUP 42

Checksheets were gratefully received from:

G7IJOUP/P in square IO63 and G6CRUP/P in square J001

Table of Results

Leading multi-operator stations

Table of Results

Leading operator stations

Table of Results

Leading stations in each locator square

DON'T FORGET

The 17th PW 144MHz QRP Contest will take place on Sunday 20th June 1999.
As Chairman of the panel of adjudicators, Rob Mannion G5XFD presents the results of the 1998 Practical Wireless & Kenwood Electronics ‘Club Spotlight’ Club Magazine Competition.

Following the suggestions from last year’s entrants, we’re introducing a new feature to the results this time and each entrant will automatically receive a personal photocopy of the adjudication sheet so that they can see the comments their magazine drew from the panel of judges. In this way, the adjudicators hope to encourage everyone, not just those who are successful.

Now in its third year, the magazine competition has attracted entries from outside the UK — including one in a foreign language. The foreign language — you might have thought — would have been a barrier to achieving a good result... but as you’ll read later it certainly wasn’t the case!

Adjudicating Panel

Unfortunately, the adjudicating panel lost one of its founding members during the run-up to the start of final judging when Donna Vincent G7TZB was appointed to a new post as Editor of her own magazine. So, I had to take the decision to replace her before the ‘PW side’ of the judging took place by appointing Tex Swann G1TEX, PW’s Technical Projects Sub-editor and staff photographer.

Appointing Tex G1TEX to replace Donna was an appropriate action because he’s been a club magazine Editor himself and is active in the Poole Club (which did not enter the competition). He joined Jim Bacon G3YLA, David Barlow G3PLE, Dave Wilkins G6HY, and myself on the ‘local clubs’ section and we were joined by the Chairman of the Salisbury Club Jerry Pennell G0WHE.

National Category Winners

The ‘National’ Club category is open to those Amateur Radio clubs which cover more than ‘local’ areas. And of course... there’s nothing to stop a club from overseas joining in the fun — which they did for the first time this year! There were four entries and all came with high standard magazines.

The adjudication panel were delighted to receive entries from ‘national’ clubs in the UK — and one which is based in Holland. In fact — despite being in the Dutch language — the panel were immensely impressed by the entry and I’m pleased to announce that The ‘National’ Club winners in 1998 are the Benelux QRP Club.

Although only two of the judges can read Dutch — everyone had something really encouraging to say about Nieuwsbrief, Fig. 1, which scored 44 out of a possible 50 points. Jim Bacon G3YLA commented “I really liked this one, the print quality of the text and diagrams was very high.”

Tex Swann (one of the judges able to read Dutch haltingly) and who is also well-versed in German said,... “Excellent coverage for a QRP Club, well laid out with good diagrams...made me want to read it even though I found it hard going to read in Dutch in places. Very professionally done”. My own comments on the adjudication sheet were: “Excellent... even for the English reader. Lots to do’, lots of news and full of character and charm”.

Robert van der Zaal PA3BHK produces the magazine — it covers Holland, Belgium and Luxembourg — the ‘Benelux’ countries of course — together with four others. These include Henk PA0GHS, Veronica PA3DWA (Widow of the Benelux QRP Club’s Founder Frans PA0GG), Wim PA0WDW and Adriaan PA0ATG. Robert PA3BHK attended the Leicester Show at Castle Donnington on Saturday 26th September to collect the National Club category prize — the G2FIX Memorial Trophy — otherwise known as ‘Bert’s Bell’ in memory of Bert Newman G2FIX. Presented by the late G2FIX’s sister Hilda Rusbridge (she’d travelled from Andover), ‘Bert’s Bell’ (made by Hilda’s son-in-law and sponsored by the entire family) was gratefully accepted in the presence of many generations of the family, Fig. 2. In return Robert presented Hilda with a fresh Edam cheese — straight from Holland!

The photograph in Fig. 3, clearly shows Hilda’s delight and she thanked Robert and everyone and said she (and her family) will continue to support the competition for as long as they can because they consider it to be so important and an appropriate way to commemor ate Bert G2FIX who was a natural ‘communicator’ himself.

Other entries in the ‘National Category’ were...
District Amateur Radio Society
whose magazine Crowstalk, Fig. 4, won an excellent 49.5 points out of a maximum of 50!

Eric Tucker G3TXZ, Chairman of the C&DARS and Editor of Crowstalk is seen accepting the PW & Kenwood Electronics ‘Spotlight’ Trophy. Fig. 5, from Dave Wilkins G5SHY at the Leicester Show, accompanied by a group of enthusiastic supporters from the Society.

Dave G5SHY’s own comments on the adjudication sheet were: “A truly excellent production...congratulations”... Jim Bacon G3YLA commented “A very nice newsletter indeed, clearly set out, with sensible use of colour...in my view the best here”. David Barlow G3PLE said: “Wow - this is it - fantastic annual subs for 11 issues a year, value great, layout great - colour great - 10 points (maximum) no bother!”

“My comments were "Truly superb editorial, presentation, style and approach. Best club magazine I’ve ever seen". However, I’d like to leave the last words to Tex Swann G1TEX as they are most appropriate! Tex commented: (amongst other things) "... they deserve to win. Offer the perpetrator a job on PW - quick!" So, well done Crowborough, the adjudicators have no doubt you’ll look after and ‘treasure’ the trophy until next year!

Club Spotlight Trophy
As the PW ‘Club Spotlight’ magazine contest goes from year-to-year the standard of entries is also increasing at a great rate of knots. There were 11 entries in the ‘local club’ category this year - and the standard was supremely high.

However, despite the very high standard of the entries the adjudicators had no hesitation in awarding the first prize to the Crowborough & District Amateur Radio Society whose magazine Crowstalk, Fig. 4, scored 45.5. and the Cheltenham Amateur Radio Association scored 44.5 along with the Yeovil Amateur Radio Club who also scored 44.5. Congratulations!

The Cayman Amateur Radio Society ZF1A (Yes - the ‘Exotic DX’ Cayman Islands) scored a very creditable 43.5 for their fascinating entry. Well done!

Last year’s winners Cockenzie & Port Seton scored 43, followed by North Ferriby United Amateur Radio Society (East Yorkshire - formerly ‘Humberside’) scored 41.5. A special mention must be made for the ‘one man band’ produced magazine Flightpath (Flight Refuelling Amateur Radio Society) which scored 41 points because of the tremendous efforts of the severely disabled Editor, Trevor Taberner GOUGS suffered a severe stroke some years ago and has difficulty in walking, writing and speaking - but still manages to produce Flightpath. An inspiration to us all so the adjudicators thought. Well done Trevor!

The Wythall Radio Club were awarded 38 points for their entry, and the Warrington Amateur Radio Club scored 37.5 points. And just to demonstrate that the last is certainly not the least - the Gloucester Amateur Radio & Electronics Society’s entry was awarded 36.5 points and drew the comment “A promising newsletter with good ideas” from judge Jim Bacon G3YLA. So, hopefully... Jim’s comment will encourage their entry for 1999.

In finalising the 1998 results reports - and on behalf of the judging panel I congratulate everyone who entered. It doesn’t matter if you didn’t win - because no matter how well you scored in our competition - you are serving your club and its members. Our hobby can only go from strength-to-strength with efforts like yours. So, keep up the good work - keep sending the magazines into us for news ‘mentions’ in PW and most importantly make sure you enter next year’s competition!

High Standards
The other entries also had very high standards - and the adjudicators were impressed at the quality of editorial and design which came from (literally) ‘one man’ (person really!) band productions. Well done everyone.

Runners-Up (nobody ‘loses’ in this friendly competition!) The Wythall Radio Club scored 38 points for their entry, and the Warrington Amateur Radio Club scored 37.5 points. And just to demonstrate that the last is certainly not the least - the Gloucester Amateur Radio & Electronics Society’s entry was awarded 36.5 points and drew the comment “A promising newsletter with good ideas” from judge Jim Bacon G3YLA. So, hopefully... Jim’s comment will encourage their entry for 1999.

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For full details on the Hora C408 430MHz transceiver you can read the G0BPS Review in the May 1998 issue of Practical Wireless, back issues are available from the PW Bookstore, Tel: (01202) 659930.

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Bipolar Transistor?

Ian Poole G3YWX continues his regular series by answering the question... "What is a bi-polar transistor"?

The bipolar junction transistor is used today in vast quantities both individually as discrete components and inside integrated circuits. It's a very versatile device, found in many applications and at a wide range of frequencies. The bipolar transistor is over 50 years old now. Three scientists named Bardeen, Brattain, and Shockley working at Bell Laboratories in the USA discovered the device.

The scientific trio had been researching an idea for a field effect transistor, but they had been unable to make it work. And as they had not been able to discover why the device did not function they’d decided to follow some other lines of research. In doing this they came across the idea for the bipolar transistor, Fig. 1, and they quickly succeeded in making it work in late 1947.

Only A Week

It was only a week after their initial discovery that the team demonstrated it in front of a group of executives at Bell Laboratories. The form of device they demonstrated was a point contact transistor because it consisted of two metal contacts placed very close to one another on a pieces of n-type germanium. During the 1950s, other types of transistor based on the same principle were developed. These included the junction transistor which is 'grown' from two junctions fabricated on the same substrate.

It took some while for transistors to become generally accepted. Initially they were very expensive and their performance was poor. However, as the beginning of the 1960s transistor prices began to fall and their use rose dramatically. Now the world would not be the same without them!

The Structure

In practice, the internal structure of the transistor can be made either in a p-n-p format where an n-type region is sandwiched between two p-type regions. Alternatively it can use an n-p-n format where the central section is of p-type material, as illustrated in Fig. 2.

The centre region is called the base. It derives its name from the first point contact transistors where the centre connection also formed the mechanical 'base' for the structure.

It's essential that the base region should be as thin if high levels of current gain are to be achieved. Often it may only be about 1μm (one millionth of a metre) across.

A variety of different structures are used to make transistors today. The diagram, Fig. 3, illustrates two of the many variations that are used.

How They Work

So, let's now look at how the bipolar transistor works. And simply speaking, the transistor can be considered as two p-n junctions that are placed back-to-back. In operation, the base emitter junction is forward biased and the base collector junction is reverse biased, as shown in Fig. 4. When a current flows through the base emitter junction... a corresponding and larger current is seen to flow in the collector circuit.

To understand how the effect occurs, I'll take the example of an n-p-n transistor. (The same is found to be true for a p-n-p transistor except that holes are the majority carriers instead of electrons and the voltages are reversed).

Collector Base Junction

Now let's take a look at the collector base junction. This is reverse biased and I as I described in "What is a PN Junction" in the April 1997 issue of PW it will be remembered that the majority carriers in the n-type region are electrons and in the p-type region they are holes.

In other words in an n-type region there are free electrons that are able to move around the lattice structure of the semiconductor. Similarly in a p-type region there are free holes.

When the junction is forward biased the electrons move from the n-type region towards the p-type region and holes move towards the n-type region. Finally, when they reach each other they combine enabling a current to flow across the junction.

When the junction is reverse biased the holes and electrons move away from one another resulting in a depletion region between the two areas and no current flows. In the case of the transistor the second junction the base and emitter play a vital role.

Fig. 1: The original point contact transistor - dating back to 1947 (see text).

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In use and when a current flows between the base and emitter, electrons leave the emitter and flow into the base. Normally the electrons would combine when they reach this area however, the doping level in this region is very low and the base is also very thin. This means the most of the electrons are able to travel across this region without recombining with the holes.

As a result the electrons migrate towards the collector, because they are attracted by the positive potential. In this way they are able to flow across what is effectively a reverse biased junction and current flows in the collector circuit.

It is found that the collector current is significantly higher than the base current. The ratio of the base to collector current is given the Greek symbol β. Typically the ratio β is between 50 and 500 for a small signal transistor. This means that the current in the collector will be between 50 and 500 times that flowing in the base. For high power transistors the value of β is likely to be smaller, with figures of 20 being not unusual.

Current Amplifying

The transistor is a current amplifying device, unlike the thermionic valve and the field effect transistor (f.e.t.), both of which depend upon voltage changes to operate.

It's the amount of current flowing in the base circuit that controls the amount of current flowing in the collector circuit. And although it is a current operated device, the bipolar transistor can be used in just many applications as f.e.t.s, proving to be more suitable in many applications.
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Please mention Practical Wireless when replying to advertisements.
In the first part of the ‘Tinny Dipper’ project, I’m going to introduce you to an extremely simple and effective method of making the plug-in coil units required for the project. The plug-in coils will be fabricated from the Synthetic Resin Paper Board (SRPB) printed circuit board material I’ve recommended you to use in the past.

The ‘Tinny Dipper’ project - so called because it’s built into a Mackerel, Herring or Kipper (‘peel back the lid’ opener) is from aluminium type with the originality here because it’s been around for perhaps 30 years or so - only requires one MPF102 field effect transistor (f.e.t.) and by now you’ll be very familiar with this device! Incidentally, although I think I first saw the circuit in the ARRL Handbook in 1970 - it’s been published so many times it must be one of the most popular (and reliable) design of its type and can work with moving coils meters ranging 50μA full scale deflection (f.s.d.) to 500μA f.s.d.

The coils are extremely easy to make - but they do take time so I suggest you start making the basic units now ready for the electronic construction stages. Incidentally, the plug-in type of coil I’m introducing in this project will also feature later on in the series - in early 1999 - in use with a small valved receiver project.

The valved receiver will use the plug-in units - and they have proved so successful that I’ve managed to make a coil unit with eight (yes eight!) connections! Interested...? Just read on...you’ll be surprised just how easy and effective the coil units are.

Basic Board

By making the plug-in units from basic p.c.b. material the coil formers can become virtually standard and if you follow my instructions you should end up with the same results. The first job is to cut strips 30mm wide from the large board. (You’ll need around a dozen of these strips).

It will be to your advantage to cut the strips from the main sheet by using the file scraping/grooving method I’ve described in the previous projects using the material. This is because the file-cut edges provide a ‘chamfer’ which eases insertion into the eventual p.c.b. style ‘sliding socket connector’. (make sure you cut from the backing material towards the copper plated side of the p.c.b material).

The coils are forming a free-standing cruciform section of material. And although it’s not easy to see in the right-hand side photograph - the two sections are forming a free-standing cruciform former. If you make a fairly neat cut, the p.c.b. material will form a firm (end profile) ‘cross’ (cruciform) shape. But don’t worry if you don’t make it that neat (perhaps it ‘wobbles’ slightly?) because you can stabilise the assembly in the final stages with very small amounts of epoxy resin adhesive.

If you have access to a full size hacksaw you can gently tapping them together with a tack hammer or the back of a dust-pan brush will work) but with the slot length suggested the assembly should work extremely effectively.

Warning: Do not exceed the length of slot recommended because although a longer slot makes assembly easier - the finished result is not so stable. The measurements I’ve given are those that have proved reliable in practice.

Once you’ve tested your batch of former assemblies - it’s time to prepare the longer unit (100mm) for use as the ‘plug in’ element. The diagram, Fig. 2, shows one of these sections of material ready for assembly (see text).

Fig. 2: The prepared section In process of assembly (see text).

Fig. 1: Sections of the synthetic resin paper board (SRPB) p.c.b. material cut for use as coil formers. Both sections are 30mm wide, the longer section is 100mm long and the shorter is 55mm long. The slot in both sections is 35mm (see text for description of assembly technique).
etching in the ferric chloride (on the right) with a completed unit with a demonstration coil wound on the cruciform former. Note that the section of copper track which is to form the 'plug in' element on the right is protected by pvc masking tape (you can use ordinary insulating tape for this purpose). The shorter track to the wire anchoring point terminates with a small drill hole with a larger area or etch resist around it. The longer track, as shown in Fig. 3, goes to the top of the p.c.b. material strip where it too terminates at a wire anchoring point.

Note also that the pvc masking tape on the section awaiting etching is narrower than the earlier prototype. This is to provide a final narrower etched p.c.b. etched track to avoid the opportunity of short circuits between the unit and the main board and supports - in practice I found a 2mm gap to be adequate.

The completed coil illustrates how it looks when etched, assembled, and with the coil wound. In practice, the wire can be fixed with very small amounts of wax and/or by gently winding coloured pvc insulating tape which then also acts as a colour code identifier aid. Now it's time to look at the 'socket' end of the assembly which is to be on the main p.c.b. of the project.

Raised Contact Points

The 'socket' end for the plug-in coil bases are simplicity itself and rely on raised solder pads on the printed circuit board we're to etch onto the board. The photograph, Fig. 4, shows the basic idea demonstrated work on a piece of scrap board and a completed coil unit - with the top 'cover' of the 'socket' (a section of p.c.b. material which is held down by self-tapping screws or small nuts and bolts) removed for clarity.

The plug-in coil unit slides in between the two sections (track side facing downwards) until the 'shoulder' of the coil unit reaches the top of the main p.c.b. The two large solder pads are tinned with solder (as illustrated) so as to be 'proud' of the p.c.b. itself. These make contact with the p.c.b. tracks on the underside (represented on the demonstration board by a 'track' illustrated by dotted lines on what is of course the reverse side of the material).

With the top section of the p.c.b. acting as a restraint the naturally slightly 'springy' p.c.b. material is forced slightly upwards. And once in place, the same natural springy effect ensures that contact is maintained until the coil unit is pulled clear. I suggest that you make up a 'dummy' socket arrangement to ensure that all your coils fit snugly and that there's no short-circuiting. The experience won't be wasted because you'll be familiar with how it works when it comes to the final assembly of the main p.c.b. - and we're now going to start the preparations by looking at how the board is prepared.

Template Time

It's template time - that is after you've got hold of the empty tin to use as an external casing for the project. (If you don't like tinned fish - you can always buy a tin and donate the contents to someone in the family who does. However, my Labrador, Mandy, shares my love of tinned fish...as did our cat Ginger. So, you shouldn't find it too difficult to get hold of a tin if you've got pets and none of your family like tinned fish!)...I turn the deadly serious issue of food tins...I crimp them together. This re

Interfaces toT

...In preparation, details.

Fig. 5: Prepared p.c.b. section (copper side up) to provide lid and eventual 'chassis' for the 'Tiny Dipper'. See text for preparation details.

Fig. 3: Completed prototype plug-in coil unit (left) showing coil wound over cruciform former unit. Plug-in section (right) ready for etching. Note pvc masking (2mm in from edge of board) to provide final copper track 'plug-in' contacts, and etch resist tracks for coil connections. (See Text).

Fig. 4: How the 'plug in' coils worked. A demonstration unit made from a completed coil unit and a pieces of scrap p.c.b. material. (See Text).
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Practical Wireless, December 1998
The Reluctant DXer

John Worthington GW3COI, our reluctant DXer, describes why he will probably stick to "simple natter either on the key or the microphone" and steer clear of DX from now on.

I have never wanted to be a rare DX, but in 1988 I had to attend the birth of a grandchild and I found myself wielding the callsign VK7COI in Tasmania. What a flight! I had been to Sydney some three years before on a similar mission and knew all about jet lag and thought I knew what to expect, but the 'jet lag' symptoms on this VK7 trip made the Sydney one feel like a pleasant afternoon.

However, after a month's recuperation I set about setting up my set which I had bought with me in my hand luggage. It consisted of a Kenwood TS-120S, a mains 25A p.s.u., an a.t.u. (home brew, he added proudly), a multi-meter, a field strength meter, a Sony 76000 pocket h.f. band receiver, headphones and various bits like crocodile clips, insulation tape, small screwdrivers, side cutters, electronic keyer and microphone.

For folk planning a similar trip, I should advise them to take a three month course of body building in the UK. You have to manhandle your 'hand' luggage quite often in many types of climates and when I staggered out onto the tarmac of Hobart, there were onlookers who thought they were witnessing the homecoming of a Beirut hostage.

I had been led to believe that our quarters in VK7 was to be a pleasant bungalow overlooking the harbour with ample space for a rhombic. But in fact, it turned out to be a single storey, tin roofed pioneer's joint with no garden at all, and squeezed into a narrow street packed with similar dwellings. However, I was not dismayed as I have had QTHs that were just as bad in the UK.

Price Shaker

The first thing I did was to buy an antenna wire, the price of this was a 'shaker' which worked out at 50p per foot for electric twin flex. My tightfisted alter-ego cursed me for not having bought a length with me.

However, swallowing hard I erected - or rather 'placed' might be a better word - an '80m' and '20m' band dipoles on the same feeder with its centre on a telephone pole in the street. The 'legs' came away higgledy-piggledy (posing as telephone wires) to the house and I rehearsed my story for when the VK7 telephone men arrived. They never did come, probably because the street was a mass of mains, wire guys and phone wires, a common sight in VK.

Well, you'll want to know about all the DX I worked, or perhaps not. I'm not really a DX man as I prefer a simple natter either on the key or microphone, but in VK7 I found this simple pleasure was not available during daytime due to lack of activity. In the evenings it was not a great deal better and '80m', my favourite band, appeared as a huge stretch (3.5-4MHz) of very little except static crashes every night. It was possible to get a QS0 but I had to call 'CQ' relentlessly and search diligently as if I'd been paid handsomely. The reason for this lack of stations is simple...a lack of stations!

The Australian mainland lay hundreds of miles away and even there, as I knew from my Sydney days, you had to work at it to get a QSO. The VKs have a c.w. net every Sunday morning in order to drum up stations, but in VK7 I found this simple pleasure was not available during daytime due to lack of activity. In the evenings it was not a great deal better and '80m', my favourite band, appeared as a huge stretch (3.5-4MHz) of very little except static crashes every night. It was possible to get a QS0 but I had to call 'CQ' relentlessly and search diligently as if I'd been paid handsomely. The reason for this lack of stations is simple...a lack of stations!

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73 from Dave G4KQH, Technical Manager.
November 14: The SAMS '98 Computer & Electronics Show is to be held in the Bingley Hall, Staffordshire Leisure Centre, Westminster Road, Stafford (A518 Stafford-Uttoxeter Road), signposted from junction 14 on M6,itus shuttle from Stafford Railway Station). Doors open 1000 to 1600. Admission for adults is £3, children under 14, 50p, Concessions, OAPS, RSGB Members, Student Card, U840, £2. (Advance Tickets £2 plus s.a.e.). There will be masses of free parking, a licensed bar from 1100 and refreshments, meals and a café/bar. A great day out! Sharon Alward, Sharward Promotions, Knightsdale Business Centre, 30 Knightsdale Road, Ipswich, Suffolk IP4 3JJ, Tel: (01473) 741533, Fax: (01473) 741361 or e-mail: services@sharward.co.uk

November 19: The London Amateur Radio Society are holding their traditional radio rally at a new venue, two miles N/V of Rochdale Town Centre on the A660 Rochdale to Edenfield Road at Cutgate. Look for the orange arrows. Talk-in on S22. There will be components, vintage radio and junk. More information from Rochdale & DAR, John G7OAI on (01760) 376204 or (0973) 689077 or E-mail: johnG7OAI@wich.net

December 5: The Rochdale & Distinct Amateur Radio Society is to be held at the Pudsey Civic Centre (Dawson's Corner). There will be all the usual traders. Doors open at 1100 (1030 for any disabled visitors). There will be a talk-in, a licensed bar, etc. John Mortimer M1CAI on (01943) 876086 or Malcolm Robertson G7VCK on Leeds 0113-225 3379.

*December 13: The Leeds & District Amateur Radio Society is to be held at the Pudsey Civic Centre (Dawson's Corner). There will be all the usual traders. Doors open at 1100 (1030 for any disabled visitors). There will be a talk-in, a licensed bar, etc. John Mortimer M1CAI on (01943) 876086 or Malcolm Robertson G7VCK on Leeds 0113-225 3379.

January 17: The Oldham ARC Mobile Rally is to be held at the Queen Elizabeth Hall, Civic Centre, West Street, Oldham, Lancs. Doors open at 1100 (1030 for disabled visitors). The event features the usual traders and a Bring & Buy stall. Morse tests are available on demand. Talk-in on S22 via GB4ORC commencing at 0730. There will be coffee and refreshments and free parking, (01706) 846143 or 0161-652 4164.

February 7: The 14th Essex Amateur Radio Society Radio Rally is to be held at the Paddocks, Long Road, Canvey Island, Essex. The Paddocks is situated at the end of the A130. Doors open at 1030. Features include Amateur Radio, computer and electronic component exhibitors, Bring & Buy, RSGB Morse testing on demand (two passport photos required), home-made refreshments, free car parking with space outside main doors for disabled visitors. David G4UVR on (01268) 697978.

February 14: The 14th Northern Cross Rally is to be held at Thorns Park, Enfield Road, Wakefield. There is one large hall, just out of town on the Horbury Road. Easy access from M1 junctions 39 & 40 - well signposted and with a talk-in on 2m and 70cm. Doors open 1100 (1030 for disabled visitors and Bring & Buy). John GOTBY on (01924) 893321 or packet GOTBY@GB7INRG. E-mail rally@waveg.demon.co.uk or visit the web page at http://www.waveg.demon.co.uk/rally/

February 21: The Barry Amateur Radio Society Radio & Computer Fair has changed its venue. The new and improved venue will be held at the Holmview Leisure Centre, Skomer Road, Barry. Facilities include lounge bar, catering and parking. Admission is £1.50 and doors open at 1000 for disabled visitors and 1030 for general public. Brian GW0PUP on (01222) 832753 combined telephone and FAX number.

March 21: The Bournemouth Radio Society are holding their 12th Annual Sale at Kinson Community Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth. Doors open at 1030 and close at 1630. Talk-in from G18RS on 2m S22. There will be Amateur Radio and Computer Traders, clubs and specialised groups, excellent refreshments and a Bring & Buy. Admission is just £1. More details from Olive or Frank Goodger, 66 Selkirk Close, Merley, Wimborne, Dorset BH21 1TP. Telephone on (01202) 887721.

May 9: The Drayton Manor Radio & Computer Rally is to be held at Drayton Manor Park, Fazeley, Tamworth, Staffs on the A4091. The main traders will be in four marquees with a large outside traders flea market. There will also be a Bring & Buy stall, local clubs and special interest stands. Open from 1000 onwards. Trader information from Norman on 0121-422 9787, other information from G6DRN on 0121-443 1189. Papers please.

May 18: The Ripon & DARs are pleased to announce that the Northern Mobile Rally will take place at the Great Yorkshire Showground. There will be all the usual stalls, talk-in, Bring & Buy, free car park, disabled access, etc. Details on (01765) 640229 or E-mail M1BDZeAOL.COM

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

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

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Practical Wireless, December 1998
Carrying on the Practical Way

Christmas festivities can be a tricky time for the radio constructor. In the midst of the cold turkey, old films and wider family bonding, thoughts soon stray to the haven of the workshop! All this free time and a soldering iron laying cold in its holder does seem an awful waste. But what about family duty? 'Being present' can be a pressing requirement at such times!

Perhaps a compromise could be found? Saying: "I'm just slipping into the workshop to make something for the children/grandchildren" can sometimes work.

It may also be possible to include a project for yourself with a little novelty for the children. To this end...this month I am suggesting a novelty item for the family together with what I could call a 'left-overs project' - something which uses up the bits.

Who's First Switch

The first idea - 'The Who's First' switch project is something like the electronic equivalent of 'Snap.' There are also of course other games and quizzes when being the first to respond gains the advantage.

Sometimes, even often - with children, there are times when there can be doubt or conflict over who responded first. This little circuit is a priority indicator which shows who is the first of two players to push a button.

The project might be used in a variety of games or even form a game of its own by being a reaction time indicator. It could become its own game by using a signal or command at which the two players must push a button. The circuit will then show who pressed their button first.

The circuit is shown in Fig. 1, and is very simple. Each transistor is a light emitting diode (l.e.d.) driver circuit. If either of the transistors conduct current, the l.e.d. in that collector circuit will light. So, now let's look at what happens when a button is pressed.

Positive Bias

If the left button is pushed closed, positive bias is applied, via a series resistance to the base of the left transistor. The transistor then conducts and the l.e.d. illuminates. The positive bias is taken from the collector of the right transistor. The same would happen to the right transistor if the right push button were closed.

However, if the left button is pressed first and held down and then the right push button is pressed, the right hand side l.e.d. will not illuminate. This is because the right transistor is conducting. Therefore either one of the buttons by being pressed first can prevent the other button illuminating its l.e.d.

If the two buttons are pressed quickly in succession, the first button to close the switch will light its own l.e.d. So, it's in this way the circuit acts as a priority indicator.

In practice, the value of the series resistors in the base of the transistors is set low enough to enable the bias to switch the transistor and high enough to reduce glowing through leakage in the l.e.d. on the other side. The value given does give a slight glow in the other l.e.d., but the difference is great enough to make it quite clear which button 'wins'.

My Version

My version of the project was built on a small piece of perforated plain matrix board ('perf-board') with the l.e.d.s (on full lead length) sticking out above the board, as shown in Fig. 2. I mounted the prototype in a small ABS plastic box.

The holes for each l.e.d. were reamed out so that the diodes would form a push-fit and hold the circuit board in place. (The push buttons I used were surplus types for keyboard applications).

A PP3 battery would not fit in the box so the supply leads, with a snap-on connector, are brought through a hole...
in the outside of the case. This does mean that a switch is not required and to apply power the PP3 connector is simply snapped on to the battery.

**Time For Yourself?**

Having built a project for the family, why not take up a little more time in the workshop building something for yourself? I suggest this because sometimes it's fun to build up a circuit from bits and pieces found in the junk box!

The diagram, Fig. 3, shows the circuit of a small amplifier made from a collection of items I had to hand. I often buy items at radio rallies thinking that they will come in useful one day. One such item was a small flat 8011 loudspeaker. It has lain unused for several years. Then I recalled a small discrete audio amplifier circuit that I have used in the past for simple receivers that have an output impedance of something like 80Ω.

The circuit of the audio amplifier uses very few parts to give a useful amount of gain. The first two stages are npn/pnp 'complimentary pair' of transistors. It happened to have lots of BC182 and BC212 transistors but many other combinations would do the job.

Other choices include BC318/BC321, BC319/BC322, BC414/BC416, etc. Try what you have as most pairs of npn/pnp transistors would probably work.

I built up the circuit on a piece of perf-board using the parts I had in stock. Some of the electrolytics were tantalum bead capacitors. If I had the value in tantalum bead types, I used them to reduce the space requirement as it's really not critical. Remember to be careful about the polarity of the polarised capacitors and that the second transistor is a pnp type used 'upside-down'.

The little surplus loudspeaker worked well with the amplifier. A long way from hi-fi but an acceptable little circuit. I built my amplifier into another ABS plastic box, Fig. 4, and as there was enough space to contain the speaker and a PP3 battery as a supply, I added a small on/off switch and a 3.5mm jack socket on the input.

**Many Applications**

The amplifier could be used for many applications and one possible job is an audio signal tracer. To do this I made up a small probe: just a piece of wire on the centre of a 3.5mm plug and a lead with a crocodile clip connected to the outer sleeve.

The plug-in probe allows the amplifier to be applied to a circuit to check if any audio signal is present. The project cost me nothing to build because I had everything to hand. The loudspeaker is an odd type but there are plenty of miniature speakers around this impedance listed in the mail order catalogues or to be found of component traders tables at radio rallies and higher impedance speakers are often found in older scrap radios.

So, there you have them! Two little projects, both useful in their own ways and a fair excuse to attend the workbench during Christmas. Have a happy and peaceful time!

**PW**, Practical Wireless, December 1998
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There is a lot that has changed from the other callbooks of years gone past. The callsigns are much more compact allowing for an improvement in quality and colour photographs have been used for the first time. A must for any Radio Amateur, the RSGB Yearbook should be top of your Christmas list!

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**Errors & Updates**

Sources, 'Sinks' And Electromotive Forces, p45 September 1998 PW.

Geoffrey Billington, G3EAE, contacted us and asked us to make the following additions and changes to his article that appeared on pages 45 and 46 of the September 1998 issue of PW. In his letter, G3EAE wrote:

1) The words '...but as a source of e.m.f.,' occur in bold type in the section 'Alternating Current Conventions'. These words are not mine and were added without my approval. I should like readers to ignore them.

2) The graph in Fig. 5: does not match the reference made to it in 'Alternating Current Conventions'. The red curve correctly shows the e.m.f. lagging on the current, whilst the whilst the text states that the voltage across the coil leads the current and refers the reader to the graph. This is confusing.

3) Again in the section headed 'Alternating Current Conventions' there is an editorial note. Whilst not wanting to take issue with these comments I should like to point out that in the case of a series circuit, the phases of the voltages across the different circuit components is most conveniently expressed relative to the current as a common standard of reference.

4) There are a few minor misprints. The worst is the use of an asterisk (**) instead of a plus (+) sign in the formulas at the top of page 46."

Geoffrey Billington G3EAE
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Practical Wireless, December 1998
Ever since I was a student at radio school many years ago I have continued to be puzzled by two unanswered questions. The first question is: Why, apparently, has so little research been carried out on alternate ways of coupling electromagnetic energy to space? Since the inception of radio, we’ve used nothing other than conventional resonant and travelling wave antennas.

One general, if fundamentally unsatisfactory, answer to the first question is that if a solution to a technical problem is found to provide acceptable utility in practice this does tend to inhibit further investigation, even if the solution is neither particularly elegant or efficient.

A good example of the premise mentioned, is the incandescent light bulb. They work - even if they tend to produce more heat than light. It’s only recently that the need to conserve energy has resulted in the development of low-energy electric lamps.

Second Question

The second question is: Exactly how is oscillatory energy, generated in a conventional circuit and then coupled to an antenna, translated into a radio wave travelling away at the speed of light? What is the precise sequence of events that achieves this transformation? It is now well over 100 years since James Clerk Maxwell developed the equations which showed that ‘wire-Less’ communication was possible. Why, therefore, has so little work been carried out on alternative forms of antennas which might provide more elegant and efficient ways of coupling electromagnetic energy to space?

In answer to the second question, it has to be said that the mathematical explanations normally advanced are of considerable complexity and do not admit of simple visualisation. However, some comments made in print by Maurice Hately GM3HAT have helped me to form something more of a coherent picture.

The Beginning

But to begin at the beginning and to suppose that we have an efficient resonant horizontal dipole for 3.7 MHz, erected high enough to be considered to be in ‘free space’. It will have a length of about 40m and application of the usual formula suggests an inductance of about 86μH. In free space the intrinsic capacitance for quarter wave resonance either side of its centre will be about 86μF.

An air-cored coil with an inductance of 86μH should, even if made from thin wire, have a high Q, possibly up in the hundreds. Yet an average dipole only has a Q of between 10 and 15 - I’ll assume a value of 10. Admittedly a small, diameter coil would have a lower Q than a short wide diameter coil of the same inductance and a long thin wire antenna is the ultimate in long ‘thin’ coils.

But a reduction of Q by factor of 10 seems to imply some subtle difference between the behaviour of distributed inductance and capacity and the lumped constant values. Is it possible that the desired radiation resistance lowers the Q and flattens the response in a similar way to resistance in a lumped constant tuned circuit? Do both ‘resistances’ constitute an energy drain?

We also have to think about a few more relevant constants, such as the impedance of free space which is normally stated to be 120p or 377Ω. But again the travelling wave impedance of a wire conductor is between 800 and 1000Ω - so some form of transformation is required if the antenna is to be matched to the impedance of space.

Resonant Dipole

A resonant dipole will certainly have some points along its length where the impedance is actually 377Ω. But will an effective match to space be achieved if matching is effected at a few very limited points? If the antenna is supplied with power from a transceiver through a properly matched feedline there will be the usual magnetic and electric fields rising and falling in, around and on to the wire. This gives rise to standing waves and the so called near field.

A view is frequently advanced that most of the energy supplied to an efficient antenna must in fact be ‘radiated’ - else where does it go? What in effect has happened so far is a transfer of energy from the antenna to the near field, local to the antenna, accompanied by various forms of loss during the process.

Such losses will include a coupling factor, possibly magnetic hysteresis and electric dielectric losses, together with the continued resistance loss in the copper caused by the current flowing to maintain the standing wave and ‘near field’.

No Plane Waves

So far, however, we have not arrived at the point where a ‘plane wave’ (a wave able to travel away from the vicinity of the antenna at the speed of light) has been produced. A ‘plane wave’ is usually considered to become evident at a distance of three to five wavelengths from the antenna.

One other question remains: What has happened between the near, or induction fields and points somewhere further away where the plane wave is in evidence? After all, in a radio wave the electric and magnetic fields are in phase, whereas in a standing wave pattern they are 90° out of phase.

Carrier Particle

In modern physics the carrier particle of electromagnetic energy is the photon. So on the basis of wave-particle duality, is a radio wave a well organised shower of photons? Is this a situation where the Schrödinger wave functions for each of billions of photons will finally result in a plane wave being established in a statistical sense?

The hypotheses, put forward by GM3HAT, touch on my original questions in a practical manner by attempting, in the face of some opposition, to formulate an alternative way of coupling radio energy to space. However, I have at least convinced myself that his method has some merit.

Maurice Hately’s hypotheses contain two predictions. One is that the initiation of the plane wave from a dipole takes place in a relatively thin but circular interaction zone at a distance of 1/2 from the antenna centre. This zone is where the phase and other relationships become correctly ordered to start the formation of the wanted wave. Inevitably, in that formation process there will be some further transient loss as the plane wave becomes organised.

The second prediction, made by Maurice, is that a 1/2 dipole has a Q of 10 because the proportion of the power that was originally applied to the antenna, and that becomes evident in the plane wave, is only a relatively small part of the stored energy. If this is shown to be the
case, is there a possibility that we can by-pass some of this seemingly long-winded process?
For example, could the applied energy be 'persuaded' to move directly to the interaction zone without the intervention of induction fields and standing waves? After all with the antennas presently in use, there's no particular attention given to 'matching to space'. Instead the antenna system is left to achieve whatever coupling efficiency can be effected in a more or less random manner.

The Hately approach is to split output power equally between two suitable antenna elements having provided ±45° phasing to provide synchronism and orthogonality so, synthesising the Poynting radiation vector directly. Again the mathematics of this process is by no means simple, but the system does seem to have potential for saving both power and space.

I do not pretend (even to myself) that the description is either precise or complete. There are still far too many unanswered questions. Perhaps this is why antennas are so fascinating. And even with all the computer analysis and the introduction of quantum physics, achieving greater efficiency from any particular antenna is still something of a 'black art'.

However, if any reader feels that any of my approach to 'moving waves' is mistaken or inaccurate then here's an opportunity to tell me, and other readers, where I am mistaken and to put forward your own views.

Indeed, if there is anyone out there who can throw real light on this subject I am sure that I am not the only person who would welcome further enlightenment.

Useful Ideas

Two useful ideas have arisen from my experiments with Maurice Hately's theories and practice. Maurice has concentrated on electrically small antennas for operation where there are space limitations. My approach has been to Can the Hately system be advantageously applied to full size resonant antenna systems? In my opinion, the answer appears to be yes.

The illustration of Fig. 1 shows the layout of two narrow delta loops one horizontal and one vertical, which, when excited using a Hately phasing device produce on-air receive reports at least 3dB better than any other single or multi antennas I have tried. The main reports are derived from OSOs with GW4CNM (Anglesey) and GMOIJV (Orkney) with whom I make daily contacts.

The circuit of Fig. 2 is a simplified phasing arrangement which should be a suitable replacement for the proprietary Hately device for anyone who wishes to try splitting power between two similar antenna elements. At the same time it provides quadrature phasing of ±45° between the two. Correct adjustment should result in a near 50Ω impedance for the transceiver. With some configurations a little help may be required from an a.c. The simplified arrangement does not have the reliable matching and multi-band ability of the Hately unit.

For me there is little doubt that the Hately System can provide a modest improvement over other full size antennas. I have found it to be particularly useful at low frequency when considering the height restrictions affecting most Radio Amateurs.

I acknowledge that erecting twin full size loops requires a lot of effort, wire and feeder. However the system can be applied to any pair of similar antennas, erected in close proximity. Two full size 3.5MHz doublets, Fig. 3, can be excited in the Hately manner and at the same time compressed into a ground area of about 12x18m. In this configuration they showed the same degree of advantage over other compressed antennas that I have tried as that achieved with the two delta loops.

In his 'Capacitor Dipoles' Maurice Hately has used what amounts to a capacitor balun at the centre feedpoint. I've shown a modified p-network matching unit, in Fig. 4, which incorporates a capacitor balun in the output capacitor position. Both antennas have a common terminal in the earth return.

In use, either capacitor pair may be connected to the antenna output connector and the remaining capacitor pair connect to the other antenna. This circuit provides the facility for feeding balanced lines without the disadvantages of the traditional Inductive balun.

Useful References.


*Originally two separate magazines Electronics World and Wireless World, the two are now combined into Electronics World and Wireless World.
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<td>DR-430</td>
<td>Mobile 70cm</td>
<td>£220</td>
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<td></td>
<td>DJ-G5</td>
<td>2M/70CM handle</td>
<td>£237</td>
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<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
<th>PRICE</th>
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<tbody>
<tr>
<td>PCR 1000</td>
<td>Computer driven receiver.</td>
<td>£249</td>
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<tr>
<td>IC-2710H</td>
<td>Top of the range true dual band mobile.</td>
<td>£395</td>
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<tr>
<td>IC-T22E</td>
<td>2m handle 5W.</td>
<td>£155</td>
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<th>MODEL</th>
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<tr>
<td>FT-847</td>
<td>The new mobile base. DSP HF 2m-70cm 50MHz.</td>
<td>£1495</td>
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<tr>
<td>FT-VK 1R</td>
<td>VHF/UHF Handle. Micro small.</td>
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<tr>
<td>FT-100</td>
<td>HF 6m/2m/70cm extra small mobile. Information to follow.</td>
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Call now on 01922 417829 phone & fax and ask for Kevin
John Goodall
GOSKR takes a look at another interesting unit from MFJ's Starkville - Mississippi - factory in the USA. This month it's a loop antenna and associated control unit.

The only connection to the control unit, Figs. 3 and 4, is the standard 50Ω coaxial cable supplying r.f. to the loop. The d.c. power, as required for the capacitor motor, is fed through the coaxial cable. In operation the control unit can be powered from either its own internal batteries (not supplied), or an external, 9–15V d.c. source (a nominal 13.8V) which is supplied.

Extremely Small
The loop antenna, for the bands on which it may be used, is extremely small and is ideally suited for those radio enthusiasts who have limited space. These will include flat dwellers or those who must use the loft for all their "aluminium"!

Actually, the loop antenna is so small (approx. 1m dia.) it can comfortably be mounted vertically or horizontally...but don't be fooled by its size! (The mounting hardware supplied with the antenna allows for either method of operation).

Price of the system - I think it's low for what you get - does not reflect the high quality and effective control. However, a word of caution at this point: Because the antenna generates very strong electromagnetic fields, this fact should be taken into account if it's used indoors, as it could cause interference particularly in household wiring. Be careful also of the potentially dangerous situation with the high localised level of r.f. to anyone fitted with Medical Electronic Implants - Pacemakers and the like. And although I come into this category myself - I acted sensibly, operated safely away from the loop itself and suffered no ill effect whatsoever.

* John describes himself as being a 'bionic man' as he's one of the very few people in the UK fitted with an electronic unit placed directly...
into his body and working via electrodes into the spinal column. It's designed to help overcome very high levels of pain due to spinal injuries and partial paraplegia and helps him lead an extremely active life as I can testify! He's an inspiration to us all.

Editor.

Control Box
Connecting the loop antenna to the control box couldn't be easier. Simply connecting the standard 50Ω cable between the two is all that is required. The low power, low current required for operation of the loop, is fed through the coaxial cable and the distance between the two is irrelevant.

The power source for the control box can be either eight AA sized cells mounted internally, as already briefly mentioned, or by a non-grounded (separate) supply of 9 to 15V dc. (The MFJ – 1315X, 240V a.c. to 12V d.c. unit being the ideal mains supply according to the manufacturers.

The controls on the front panel of the small control box or ‘Head’ as referred to in the instructions, are simple but effective. A row of seven push buttons to the top of the control operate the On/Off of the unit; Hi/Lo Power setting; Lamp On/Off; two buttons for frequency control Fine Tuning – Up/Down and two buttons for Auto Band Select – Up/Down.

There's also a small, twin cross needle v.s.w.r./power meter located to the left of the front panel. And from experience, I found that tuning is simple once I'd have got used to the automatic operation of the unit.

Testing The Unit
Once connected and switched on, I first followed the instructions for testing the unit and the loop antenna. This is simply achieved by toggling between the Auto Band Select, Up and Down, with the respective light emitting diode (i.e.d) switching off (non-illuminated) on reaching the maximum Down frequency and similarly with the maximum Up frequency when the respective i.e.d. illuminates. After this process is completed the loop is left set for the highest frequency.

Next, r.f. power on the desired band is applied, and pressing the Down Auto Band Select will start the loop's motor-driven capacitor to tune down frequency. This will stop when it reaches the frequency of the transceiver, giving an audible warning. Releasing the Down button will stop the audible warning. An i.e.d. for Up or Down will then illuminate and the respective button should be pressed accordingly.

The tuning on the loop is very sharp indeed. But practice will dictate how smoothly and quickly you can reduce the v.s.w.r. to a minimum for the frequency in operation.

On The Air
However, once on air it is surprising how quickly and efficiently the unit can be used, I was amazed at how simple it was to operate. I operated mainly on 7MHz, with a later excursion to 21MHz - and the results were very good indeed using s.s.b. at around the 100W level. (The loop is rated at 150W d.c.).

On 7MHz I worked stations all over Europe, down as far as Italy (during the day) and as close as The Netherlands on s.s.b. Most signal reports were at the readability 5 and strength 7 (5&7) level - although I should point out that I gave them reciprocal reports because they were at the same level.

Up on 21MHz I found the loop was less 'sharp' to tune and I worked some European and one or two American stations on s.s.b. with ease and good reports. And quite frankly - bearing in mind the size of the antenna and the fact it was erected in the loft space of my bungalow - the results were in my opinion - exceptional!

Altogether it was an interesting experience. I really do think this form of antenna can provide an alternative for anyone stuck for space or with planning problems. And I look forward to the next time I get my hands on this loop - or should I just forget to send it back?

My thanks go to Waters & Stanton Electronics PLC of 22 Main Road, Hockley, Essex SS5 4QS, Tel: (01702) 206835, Fax: (01702) 205843, for the loan of the review unit which is available from them at £349 plus £7 P&P. The alternative Model 1786 (covering 10 to 30MHz) is also available and costs £229 plus £7 P&P.

Practical Wireless, December 1998
Gerald Stancey G3MCK shows that the mathematics behind the L-network is very straightforward by showing how to design two a.t.u.s. It's easier than you think!

**Basic Circuit**

The basic circuit and the most usual representation of the L-network is shown in Fig. 1. As shown it matches two resistive loads with the state that R1 is less than R2. The network is reversible, that is either R1 or R2 can be the input.

The reactances of L and C are given by the following equations:

\[ \frac{1}{\omega L} = \frac{1}{\omega R_1} \]

\[ \frac{1}{\omega C} = \frac{R_2}{\omega R_1} \]

Conversion of reactances to their respective capacitance or inductance values is by the well-known formulae:

\[ L(\mu H) = \frac{X_L}{2 \pi f} \]

\[ C(\mu F) = \frac{10^6}{2 \pi f X_C} \]

These simple equations can be easily solved using either a basic calculator or a slide rule. Frequently, radio handbooks give charts for converting reactance to either capacity or inductance.

An alternative configuration for the L-network is shown in Fig. 2. The equations which give the values of XL and XC are virtually identical to

**Fig. 1:** The 'L-match' circuit, which works best when R2 is of higher impedance than R1.

**Fig. 2:** The alternative 'L-match', this time R2 should ideally be of lower impedance than R1.

**Fig. 3:** The 'L-match' in use on an end-fed antenna. (See text).

**Fig. 4:** If using this layout to reduce the static build-up on an antenna, then an additional impedance XR may be needed to get maximum output.

**Fig. 5:** If the load has reactance (+j20Ω) then this must be 'tuned' out with the 'opposite' component reactance (-j20Ω).

**Fig. 6:** An alternative is to incorporate the load reactance (+j20Ω) into the matching components so, reducing their values and losses.

**Fig. 7:** Changing the layout of the 'L-match' can lead to a reduction of components and losses (C1 and C2 combine to give a component (C) with a smaller capacitance).
those given in Fig. 1. However in this case the value of \( X_L \) and of \( X_C \) are given by:

\[
X_L = \frac{Q \times R_1}{Q}
\]

\[
X_C = \frac{R_2}{Q}
\]

There are circumstances where the configuration of Fig. 2, is the better of the two, as we shall see in a later example. But let's now use these equations to design two a.t.u.s for use with a transceiver which requires a resistive load of 50Ω.

**End-Fed**

Let's first consider an a.t.u. for an end-fed half-wave. Let us start with our assumptions. We already know that \( R_1 = 50Ω \) and a good impedance value to assume for the impedance at the end of a half wave is 2500Ω. Hence \( R_2 = 2500Ω \) resistive.

Applying the equations given for Fig. 1, we get

\[
Q = \sqrt{\frac{2500}{50}} - 1
\]

\[
X_C = \sqrt{\frac{50}{1}}
\]

\[
X_L = \frac{Q}{\sqrt{15.9}} = 16.2μH.
\]

If the a.t.u. is to be used on 3.5MHz, these reactance values convert to 127pF and 15.9μH. To allow scope for adjustment, 150pF and 20μH would be appropriate values.

Life is a series of judgements and an advantage of this design is that one side of the tuning capacitor is earthed making construction very easy. However there is no d.c. path to earth from the antenna. Hopefully, you will not operate when there is any thunder about but it is not unknown for antennas to collect high static charges which in this case will have no earth path by which they can bleed away.

This problem of build-up of static can be resolved by making the a.t.u. to the circuit which is shown in Fig. 2. I leave you to do the calculations yourself but the answers are \( X_C = 130pF \) and \( X_L = 16.2μH \).

The a.t.u. in use, as shown in Fig. 3, is adjusted by adjusting \( L' \) and \( C' \) to give unity s.w.r. As there are only two variables this circuit is very suitable for amateur use where the correct settings can be found by trial and error. Indeed if the values of capacity and inductance were large enough it would be quite feasible to adjust the a.t.u. merely by trial and error.

However, having some idea of the correct settings for \( C' \) and \( L' \) will make the job a lot faster. A refinement is to put an r.f. ammeter in the circuit at position "Y" in Fig. 3. The correct settings for \( L' \) and \( C' \) are those which give the maximum current reading on the r.f. ammeter with an acceptable s.w.r. on the coaxial cable from the r.f. input.

In this example I've assumed a resistive load of 2500Ω but what if this is not the case? What if there is a reactive component in the load? In both of these cases everything is not quite so simple. The load does not differ greatly from 2500Ω so you should be able to adjust \( C' \) and \( L' \) to give a match.

However if excessive reactance is present in the load, it may be necessary to tune it out by adding series capacitance or inductance to the antenna as shown in Fig. 4. The amount of reactance (shown as \( X_R \) in Fig. 4) that's needed in this case will be a matter of trial and error. An r.f. current meter is used to show the level of antenna current.

However, in the next example, we will look at more scientific ways of dealing with the problem of a more reactive load.

**Acceptable Match**

Many amateurs will find that on 3.5MHz, a dipole will only give an acceptable match to 50Ω coaxial cable over part of the band. To get full band coverage some sort of matching unit is needed to ensure that the rig looks at a load of 50Ω. At one time these units were called 'line flatteners'. Note: they will only give a resistive load for your rig; they will NOT alter the s.w.r. on the line.

Again you need to know values for \( R_1 \) and \( R_2 \) so you start by finding the impedance at the end of the coaxial cable in the shack. You could use a bridge that measures reactance and resistance directly, or you could estimate it from a Smith Chart. But for this example let's assume that the impedance is 20Ω resistive in series with an inductive reactance of 20Ω, which may be written as (20+j20Ω).

Start by ignoring the reactance! Then we can say that \( R_1 = 30 \) and \( R_2 \) (at the input socket) = 50Ω. Using configuration 1, we calculate \( X_C = 61.8Ω \) and \( X_L = 24.3Ω \). We now have to consider the reactive component of the load. This can be handled either by 'tuning' it out or by allowing for it in the design.

To tune the reactance out all we need to do is to add a capacitor of 200 reactance in series with the load to give the a.t.u. shown in Fig. 5. The other solution is to reduce the inductive reactance of the calculated L to 4.3μH (24.3-20) to allow for the inductive component of the load. This can be done by adjusting \( R_1 \) and \( R_2 \) to give a match. Alternatively we could use configuration 2 as is shown in Fig. 6. This is a better solution as we don't introduce an extra component with its extra cost and losses.

If the a.t.u. is to be used on 3.5MHz, \( R_1 = 30 \) and \( R_2 \) (at the input socket) = 50Ω. Using configuration 1, we calculate \( X_C = 61.8Ω \) and \( X_L = 24.3Ω \). We now have to consider the reactive component of the load. This can be handled either by 'tuning' it out or by allowing for it in the design.

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Alternatively we could use configuration 2 as is shown in Fig. 7. In this case the compensating capacitor \( C_2 \) can be incorporated into \( C_1 \) and so, enable the use of a smaller value capacitor \( C_1 \) for this component (the total reactance is the sum of two 'j' values).

Adopting this method could be helpful if you are making the a.t.u. from junk box components.

**Quality Components**

Always use good quality components with adequate voltage ratings. Even when using moderate powers the voltage present at the end of a half wave can be quite high. A roller coaster inductor is a good choice for the inductor but a tapped coil can be used as the tuning of these circuits is usually very flat.

Note that if you are using a tapped coil remove the power before changing the tap!

Some idea of the inductance of either a coil, 'a' is the radius of the coil and 'b' the length with the dimensions in inches. If you wish, you can use a metric measurements formula, but the numbers are not so convenient to use and the diameter of many coil formers is still specified in inches.

**Summary**

For clarity and simplicity I chose to show how to design an L-network when one of the terminations is a 50Ω resistive load. However, virtually any two impedances can be matched, either or both of them having reactive components. The design procedure is as I have shown. First calculate the network values for matching the resistive components. Then either Incorporate or 'tune-out' the reactive components. Selecting the correct configuration, that is Fig. 1 or Fig. 2, may make it easier to incorporate the reactive components onto your design. I hope that I have shown that the L-network is very easy to design and to construct. Having only two variables it is ideally suited for amateur use where the optimum settings can be easily obtained by trial and error. However a little attention to the design can save a lot of time when it comes to adjusting the a.t.u. It can also help you to understand and solve the problem in those instances where 'my antenna won't load'.

Practical Wireless, December 1998
Dennis Wood  
G3EAY found that the variometer isn't dead - it can still prove to be an effective element in an antenna tuner.

When I was building myself a loading and 'tuning' unit for my long wire antenna, I found that I required a 40-turn coil tapped every turn (to make it easy to adjust). I found this coil a little difficult to make and as to where I would find a switch for it! A roller coaster unit was also out of the question.

Whilst mulling over the problems I'd set myself, I read an article on variometers used in the Second World War and how they performed. I decided that this was the ideal solution and to make one out of up-to-date, easily available materials for use in place of the tapped coil.

Basically a variometer consists of two coils, with one coil fitted inside the other. The inner coil should be similar to the outer coil and able to rotate through 180°. This rotation allows the two coils to interact to give a range of inductance, from \((L_1 + L_2)\) to \((L_1 - L_2)\), created by rotating the inner coil.

I thought that this would be the nearest thing to a continuously variable coil and so it turned out to be. I have called it an experimental variometer because I have not the equipment to measure inductance and \(Q\) but in practice it seems to function like the desired 40-turn tapped coil and I am delighted with the results.

No Special Tools

No special tools are required, just a pair of scissors or tenon saw and nails, the nails are held in locking-jaw pliers and made red hot to bore suitable holes in the plastic bottles used. As can be seen in the photographs I used two plastic bottles originally 'on loan' from my wife.

An 85mm diameter bottle was used as the former for the outer coil. The inner, rotating coil, was wound on a 60mm bottle. Both bottles were cut to size with scissors but a tenon saw could be used. Leave the bottoms of the bottles intact as this increases the strength.

Fix the first turns with vinyl bond cement, leave to set before continuing winding and the turns are less likely to fall off. (Have several cut pieces of sticky tape handy to hold wires in place temporarily). I used white coated standard wire for both coils and wound 20 turns on each former, reasoning that \((L_1 + L_2) = 40\) turns.

The rod controlling the rotation of the inner coil was made from glass fibre material (g.r.p.) as used in construction of kites, but wooden dowelling will do. Coat both coils with vinyl bond cement, as this also increases the constructional strength of the completed coils.

All holes were made with a suitable size red-hot nail (held in pliers heated over a gas flame until hot enough, but please take care during the procedure). The rotating rod is held in position by sliding on tight fitting pvc tubing. I also fitted two washers at each end.

When winding, don't be too concerned about the bottle formers tending to flatten out, as when coil is completed, reshaping is possible. Wire the two coils in series as per the photograph and adjust the wire tails of the inner coil so that 180° rotation is satisfactory.

The variometer took me two hours to make and seems to work extremely well, although I think a slow motion drive would be an asset. I am about to build an a.t.u. of the p-tank unit type and will use this variometer in place of the tapped coil.
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For those of you that came to the new Leicester show at Donington (and so many of you did ever held for Amateur Radio. Despite disaster on the Friday (someone didn’t put a shitling in booking for next year before they had even finished. If you missed it in '9

**Donington - V**

**For those of you that came to the new Leicester show at Donington (and so many of you did ever held for Amateur Radio. Despite disaster on the Friday (someone didn’t put a shitling in booking for next year before they had even finished. If you missed it in '9**
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So, sit back and relax - but get that cheque book and pen out - we guarantee that you will want at least one of these books!

### Book PROFILES

**Simple Low-Cost Wire Antennas For Radio Amateurs.**

*William Orr & Stuart D. Cowan.*

For those of you who are looking to build a better antenna and want an efficient, yet economical, system you need look no further than Orr & Cowan’s comprehensive handbook: *Simple Low-Cost Wire Antennas For Radio Amateurs.*

Perhaps you are just one of those Radio Amateurs who likes to keep themselves up-to-date with all the new, cheaper techniques which may help you in your quest to have the best antenna. Whatever kind of Radio Amateur you are, this book will no doubt make an interesting read. As the very experienced authors Orr & Cowan state, the antenna is a very important part of your station - although you might well have a very good transmitter but what is it without a decent antenna? In this 188 page handbook, you will find everything you need to build a low-cost wire antenna.

The book has some fascinating chapters, such as: ‘Sugar-Coated Antenna Fundamentals’; ‘Radio Waves And The Nature Of Things’; ‘Work DX With An “Invisible” Antenna’ and ‘A Universal HF Antenna System’. Well illustrated with diagrams, circuit boards and black and white photos, we feel that it would make an informative read - you could be planning your New Year projects on Christmas Day with this book! **Recommended.**

**Antenna Toolkit (with CDROM).**

*Joseph J. Carr.*

Intended for the radio enthusiast - whether you are a Radio Amateur, listening hobbyist or radio science observer - if you want to build and use antennas, then this book would be an adequate information source for you. With the added bonus of a CDROM, this Antenna Toolkit could be just the book you are looking for. There’s no doubt that you’ll recognise the name, because Joe Carr has written many definitive books on antennas and this one is his latest. All of the antennas in this book are wire antennas which are "easy to install", "easy to get working properly" and they are "cheap"!

There is quite a bit of technical material to wade through, as Joe Carr readily admits, but unless you wish to become a professional antenna engineer, you will only need to follow a few of the simple guidelines in the book to get good results.

The free CDROM with this book is Microsoft Windows-based antenna software and will calculate the critical lengths and other parameters of the antennas described in the book when the user selects the antenna type and sets the frequency. Also included is a Windows freeware package from the ‘Voice Of America’ organisation called VOACAP, which is an h.f propagation predictor.

With sections covering from ‘Antenna basics’ to ‘Limited space antennas’, ‘Large loop antennas’ and ‘Wire array antennas’, you should be able to find what you need. **Recommended.**


*Joseph J. Carr.*

Claimed as being ‘The World’s Favourite Antenna Book’, Joseph J. Carr’s Practical Antenna Handbook (Third Edition), is all that you would expect from this experienced author. Even if you haven’t seen a copy of the other editions, you will probably have heard of Joe Carr. Some have deemed this handbook as “the antenna builder’s bible”!

As has come to be expected from Joe Carr, this edition of Practical Antenna Handbook would be helpful to novices and experts alike. With new additions such as wire antenna construction methods, antenna modelling software (minNEC, WinNEC), antennas for radio astronomy, antennas for Radio Direction Finding (RDF) antenna noise temperature this is a truly totally updated handbook.

Once again well-illustrated with diagrams and circuits it’s the sort of book you probably couldn’t do without - keep it in your library, or store it in your toolbox - but keep it somewhere very handy! **Highly Recommended.**

With the new year quickly approaching - yet again - there is a special launch price on this new World Radio TV Handbook 1999 - up until the 31st December it is only £19.50 from PW Book store.

Following its usual high standard, the World Radio TV Handbook is packed full of all the information you need on radio and television anywhere in the world! Completely updated, it is one of the most extensive handbooks around.

One of the main attractions of this book, is that it has more than 350 pages of international radio station listings with a graphical guide to English programmes, along with world-wide TV station contacts and addresses.

There are also new listings for clandestine stations, broadcaster Web sites and E-mail addresses and updated data on what is available in short wave receivers and accessories. Basically, everything you need to know about where to find and how to receive every radio and TV station you can think of - worldwide! You will also find specially commissioned articles by radio experts covering topics such as technical information and recommended programmes.

You could be of the first people to order this comprehensive handbook, this 'must-have' guide to broadcasting. You could be the first to receive it as it does not go on general release in Europe until 14th December 1998. Highly recommended.

RSGB Yearbook 1999.
Edited by Mike Dennison.

This completely updated callbook includes the UK and Irish Republic callsigns. Altogether, there are 60 000 callsigns in this very handy reference book - we here at PW find it invaluable at times - and it has 144 pages of revised and updated information with a new colour section.

There's a lot that has changed from the other callbooks of years gone past. For starters, the callsigns are much more compact allowing for an improvement in quality and colour photographs have been used for the first time.

As it is with the Call Seeker 1999 CDROM (see profile), it has its flaws, as any telephone book or listing of information does. Sometimes you just can't find that particular callsign and not everyone is in it; but it is nevertheless an essential reference book for any Radio Amateur. Highly Recommended.

Call Seeker 1999 CDROM.

The RSGB is the latest in a long line of organisations to produce their literature in both book form and on CDROM. This CDROM is probably easier to use than the RSGB Yearbook, except that you’d have to boot up your computer every time you needed to use it - if you’ve got a computer that is!

We would strongly recommend this CDROM to anyone who has a computer as something to go hand-in-hand with the RSGB Yearbook therefore, when you are using the computer and need to look up a callsign from a name, or the name from a callsign you can simply load the CD and search for it. If you are not using the computer, however you can revert to the RSGB Yearbook.

Again, the PW team think that most readers would agree that the way the old RSGB Callbook worked wasn’t always the simplest and therefore the CDROM will solve a number of problems. You can go by callsign, surname or postcode and when it works well, it works well but sometimes you will have difficulty with certain callsigns and not everyone’s callsign is in there. Recommended.

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A Whole New World In Two Years
The Story of a Novice

Mark Haynes 2E0APH gives an entertaining account of how he became interested in Amateur Radio, took the Novice Course and Morse test and all in two years! If you are young or old and thinking of beginning the hobby this account should help you to make the final decision.

The Novice Exam was taken in the President's Room at RSGB Headquarters with all the past RSGB Presidents watching over!

I t was August 1995. My family were in a Britannia Airbus 36 000 feet somewhere over France on our return flight from a holiday on the Costa Brava. I was looking out of the window and, amongst various things, crossing my mind was the fact that on the following Friday evening, I was commencing the Novice Licence Course at the QTH of G4OBE in Enfield, North London. Although I had watched my father operate his station for many years, it did seem rather complicated to understand at times and I wasn't sure that I'd make it to being licensed. But, the desire was there and I was determined.

My father had often talked about Radio Amateurs being the 'salt of the earth', which I really didn't understand, but I must say that it became plain once I got settled in on the course. Robert Snary G4OBE and his family are wonderful hosts and I was really made to feel at home. I always looked forward to the mid-way tea break when Robert would always come out with amusing stories of his various experiences with the hobby.

A Friend In Need...
Another student on the course was Andy who became 2E1EQP and has since gone on to obtain 2E0APD. He has become a great friend and a source of encouragement.

After half-way through the course, we had a mock examination and this was a sad evening for me as Andy did very well, but a lot of my answers were wrong which made me rather depressed. For a few minutes I was thinking "to hell with it!", but when Robert had finished marking the papers, the 'old man' (G3WRO), who thought he'd be clever and do the paper himself also, apparently, made some silly errors. So, I then began to feel better again.

When I took the examination at RSGB Headquarters, it was quite an experience. We took the paper in the President's room, where there are photographs on all four walls of past Presidents of the Society going back many years.

I began to realise how unique this wonderful world of Amateur Radio is. All of these people, at some stage, sat their examination and went on to enjoy their hobby and now it was my turn. If possible, I was determined to do well.

Andy was the first out and I remember thinking "I hope he has passed as it would be great to have my first QSO with him as we had done the course together". At the end, we were all in the RSGB reception discussing the questions and our answers and coming away with mixed feelings as to whether we had done well.

The First QSO
Both Andy and I passed first go and we were delighted. The first QSO was made and it was a great feeling! QO was made and it was a great feeling! On the day my licence arrived, my father arrived home from work and I told him my callsign - 2E1ERN. There was a big grin on his face and he said that was a very significant callsign. I then learned of G3ERN, who is now a silent key but was apparently a very well known amateur and lived in my home town of Harlow for many years. My father used to have many QSOs with him on 'Top-band' in the 1960s and 70s.

In the next few months, I became more and more interested in c.w. and went on to pass the Morse test. My current callsign - 2E0APH - was Issued on 1st October 1996. My activities are QRP on 3.5 and 26MHz and simplex repeater work on 430MHz.

I can honestly say that I prefer to run 3W c.w. than run 100W using my father's callsign under supervision, because there is so much sense of achievement when you can call CO with very low power and then hear a distant station under the ORM coming back to you.

I have set up a Radio Club at my school in Sawbridgeworth and we are teaching Morse and are gradually getting a worthwhile station together. There are so many facets to this wonderful hobby that makes it unique, but one thing that really gives me a buzz, is working through the UK repeater network. As an example of this, over the last couple of years we have spent a week at Easter in a caravan park in Cornwall.

QSO In Cornwall
When we first went to Cornwall in 1996, I had only had my licence for a few weeks. On the way down to the West Country, as we proceeded, various repeaters gradually became easier to access.

As an example, GB3TD in Swindon. I talked to my friends in that area, which is normally only possible in lift conditions from home. Then, when we reached our destination, there was GB3CH on Caradon Hill, which was end-stop from our caravan.

Many new friends were made. Also the 144MHz repeater GB3WD on Dartmoor which I could work through using my father's callsign under supervision.

We have since been back to the same place in Easter 1997, October 1997 and Easter 1998 and it's lovely talking to the old friends again every time we go back. When we arrive, Mum and Dad go into Tavistock to get the groceries for the week. Dad and I keep in touch on 430MHz and, for bedtime reading material, Dad calls in the book shop for the current issue of PW. Great!

As I have put it for the heading: 'A Whole New World In Two Years'. I am really enjoying my Amateur Radio. My father recently showed me a book World At Their Fingertips by the late John Claricoats GB6CL, where the last words are "Amateur Radio - the greatest of all scientific hobbies". It's true! If there is anyone of any age reading this, contemplating taking up the hobby, take my advice - go for it! You will be greatly rewarded!

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Phil Cadman G4JCP is bathed in a gentle green phosphorescent glow this month as he looks after the 'wireless shop'. But don't worry, the page is not radioactive...Phil's only looking at 'magic eye' indicator valves!

Autumn greetings, fellow thermionic followers! Welcome to my final column of 1998, and as you might guess, I've long considered thermionic valves to be magical. This might seem rather fanciful but there really are such things as 'magic' valves....I know because it says so in the valve manuals and I'm making them the subject of this month's column!

Actually, the valves in question should be referred to as electron ray tubes but they're more commonly known as 'magic eyes'.

Electron ray 'tubes' first came into use in the mid-1930s as visual tuning indicators in receivers incorporating automatic volume control (a.v.c.) circuitry. Their a.v.c. action caused such receivers to exhibit an apparent broadening of tuning which made it difficult for unskilled users to correctly tune in a station.

Previously, inexpensive radios had used a specialised form of neon lamp as a cheap tuning indicator but something better was clearly needed. Not unexpectedly, manufacturers were reluctant to use the obvious solution - a costly moving coil meter - in all but their most expensive sets.

In 1935, in answer to the problem, the Radio Corporation of America (RCA) introduced the 6ES. It became known as a 'Magic Eye' tube, a description no doubt coined by some imaginative marketing person. (Can anyone out there in vacuum-land confirm this?)

**Fluorescent Screen**

Basically, the 6ES is a small cathode-ray tube which has a tiny fluorescent screen or target. A control or deflection electrode is positioned between the cathode and the fluorescent target. By making this deflection electrode less positive than the target, so electrons moving between the cathode and the target are deflected, and a shadow appears on the fluorescent screen.

Realising that there was no suitable varying voltage in a superhet receiver able to drive the deflection electrode, RCA incorporated an amplifier triode in the same envelope as the indicator. This triode, plus a resistor or two, allowed the indicator to be driven directly from the receiver's a.v.c. line.

Unfortunatley, the 6ES could only cope with a small range of a.v.c. voltages and so a new version, the 6G5, was introduced. This tube incorporated a vari-mu (meaning literally 'variable gain') triode which allowed it to handle significantly greater a.v.c. voltages.

Later indicators introduced by RCA were the 6N5 (specifically for battery sets) and the 6U5. All these tubes had 6-pin bases and produced a fan-shaped shadow on a circular target positioned at the end of the tube.

**British Eye**

The first British magic eye tube, the Y63, was introduced by the Marconi-Osram Valve Co. (M-DV) in 1937. It was electrically equivalent to the American 6U5 but had an International Octal base.

Later came the Y61, Y62, Y64 and Y65. I wonder why the '63 was the first in the series and not the '61? Strange that! Also in 1937, Mullard introduced their TV4 and TV6, equivalents of Philips' side-contact AM1 and EM1. Mazda made the AC/ME and ME920, both of which had 7-pin bases, and the Mazda octal-based ME41 and ME91. At the end of 1949 Mullard introduced the EM34, a popular octal-based indicator which found its way into many radios of the 1950s.

With the advent of miniaturisation all-glass indicator tubes appeared. The first of these was the EM80. This too had a fan-shaped shadow but the fluorescent screen was viewed from the side of the tube rather than from the end.

Similar examples were the later types EM81 and EM85 - the valve in Fig. 1 is an EM81. Interestingly, miniature indicator tubes were very much a European phenomena with the Americans copying us (for a change).

**Final Development**

In 1956 the final development in the successful saga of the magic eye tube took place with the introduction of the EM84 and EM87. These indicators were unique in that the fluorescent screen was deposited on the inside of the glass envelope rather than on part of the metallic structure within the tube.

The diagram, Fig. 2, shows the difference between the circular, metallic targets of the early tubes (above) and the linear, 'on-glass' target of the EM84/EM87 (below, see text and Fig. 6).

**Theory And Elements**

Let's now look at the theory and main elements of an electron ray tube, Fig. 3. On circuit diagrams and in valve

**Fig. 1: The EM81 'Magic Eye' indicator valve. Note that this valve uses an internal metal fluorescent screen (see text).**

**Fig. 2: Diagram showing the difference between the circular, metallic targets of the early tubes (above) and the linear, 'on-glass' target of the EM84/EM87 (below, see text and Fig. 6).**

**Fig. 3: The main elements of a 'magic eye' valve, illustrating a basic indicator valves' internal connections (see text).**
data books the common cathode, triode grid and triode anode are usually denoted by the letters k, g and a respectively.

The value of the resistor R3 in Fig. 4 is 10k ohms. The deflection electrode will, therefore, be at the same potential as the target and so have no effect on the electrons as they flow from the cathode to the target. Under these conditions the whole of the target will glow.

As the grid is made less negative, current through the triode will increase and thereby lower the voltage on the deflection electrode (due to the voltage dropped across R3). As the deflection electrode becomes increasingly negative with respect to the target, the electron stream will be deflected in proportion and less of the fluorescent target will glow.

When the grid reaches the same potential as the cathode maximum voltage will be developed across the anode load resistor (R3 in Fig. 4). The deflection electrode will, therefore, be at the same potential as the target and so have no effect on the electrons as they flow from the cathode to the target. Under these conditions the whole of the target will glow.

The visible effect is a shadow which appears to fall across the grid, such that no significant current flows in the triode, then no voltage will be developed across the anode load resistor (R3 in Fig. 4). The deflection electrode will, therefore, be at the same potential as the target and so have no effect on the electrons as they flow from the cathode to the target. Under these conditions the whole of the target will glow.

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The visible effect is a shadow which appears to fall across the target. The shadow's size will vary in sympathy with the voltage on the grid of the triode.

**Significant Differences**

Apart from the obvious physical differences between the various magic eye tubes there can be a significant electrical difference. (This was due to the characteristics of the amplifier triode).

The first magic eye tube had a reasonably linear characteristic. That is, the size of the shadow varied in direct (though inverse) proportion to the negative voltage on the grid.

Unfortunately, the a.v.c. voltage generated by even a very high impedance, cathode follower, as shown in Fig. 4, was used to control the bias voltage of the triode. As the negative voltage on the grid increased, the gain of the triode decreased, thus slowing the rate at which the voltage on the deflection electrode changed.

Visually, the indicator appeared to become progressively less sensitive as the shadow got smaller. Now it took a much larger a.v.c. voltage to remove the shadow completely making it just as easy to tune in strong signals as weak ones.

**Practical Applications**

The most common use for magic eye tubes is their raison d'être - indicating signal strength in superhet receivers. Here, the triode grid is usually taken directly to the receiver's a.v.c. line and the common cathode connected to h.t. negative. Alternatively, if the receiver uses what is known as delayed a.v.c., the grid might be fed from the audio detector diode.

Just to fool you, depending on how the set's designer has arranged the detector and a.v.c. stages, the magic eye's cathode might be connected to the cathode of the first audio amplifier. It might even be tapped part way up the bias resistor of the output valve. You have been warned!

Magic eye tubes became incredibly popular as audio level indicators in domestic tape recorders. They provided a fast and reliable means of indicating those last few decibels before over modulation occurred.

Mullard's EM87, Fig. 6, is a specific application employing a demountable 'on glass' fluorescent screen to provide a very sensitive, linear response to changes in the audio input. A small DC grid bias is fed from an a.v.c. line which is wired so that the fluorescent screen displays negative grid voltage. The grid is operated at or near ground potential while the target will be at 200 to 250V. The triode anode is fed from the same supply as the target and via a resistor.

**Radio Amateurs Use**

Radio Amateurs, amongst others involved in electrical engineering, found several uses for magic eye tubes. They were sometimes used as modulation indicators in amateur 'phone (a.m.) transmitters.

The indicators were also popular in test equipment; resistance and capacitance bridges frequently used them to indicate 'balance'. Their high input impedance, immunity to overload and sheer simplicity, made them particularly attractive in this type of application.

Finally, how's this for ingenuity? There's at least one design of grid dip oscillator that uses a magic eye tube. The triode is used in the oscillator circuit and the deflection electrode is wired so that the fluorescent screen displays the 'dip'! I bet the designer even used a second hand valve!

Talking of hands, my watch tells me it's time to vacate the premises. So, merry Christmas, happy New Year, and cheerio until it's my turn 'in the shop' again. Please send your comments and letters to me either via the PW offices, via E-mail to phil@oldpark.demon.co.uk or direct to: 21, Scotts Green Close, Scotts Green, Dudley, West Midlands DY1 2DX. See you all in 1999!
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Practical Wireless, December 1998
The First Practical Detector of Radio Waves

The Coherer

Charles Miller, one of our resident ‘Valve & Vintage’ authors, takes a look at the story behind the Coherer with some interesting historical facts.

The coherer was the first really effective practical detector of radio waves. When Heinrich Hertz began to investigate the latter, his transmitter consisted of no more than a glorified induction coil capable of producing electrical sparks and the receiver was even simpler, being merely a miniature spark gap across which tiny sparks occurred in unison with those at the transmitter.

The range of the transmitter was minimal and the receiver inefficient but this did not matter, because Hertz’s aim was not to develop a new means of communication but to win a prize offered by his university professor for a successful investigation into James Clerk Maxwell’s theories concerning radio waves.

For a number of years, scientists appeared to treat radio as a subject of pure research and didn’t grasp the commercial possibilities of being able to send messages without the need for wires. When they did get around to considering this aspect they thought in terms of sending Morse code signals, the dots and dashes easily being obtained by simply interrupting the operation of the induction coil.

Increasing the range was just a matter of building bigger and better spark generators and the Victorians were good at electrical machines. What was lacking was a sensitive detector that would be able to reproduce the dots and dashes of Morse code signals either audibly or visibly. Necessity being the mother of invention, along came the coherer. (See Fig. 1).

Sir Oliver Lodge the “True Father of Radio”?

Morse code signals either audibly or visibly. Necessity being the mother of invention, along came the coherer. (See Fig. 1).

Oliver Lodge

As is often the case with new developments no one person can claim all the credit but the man who perfected the Coherer was the British scientist Sir Oliver Lodge. I think it’s he who truly deserves to be called the “father of radio” rather than Marconi, who was more the adoptive father.

(Much more deserves to be said on this subject!). During the course of experiments with various kinds of detector, Sir Oliver had noticed that two metal surfaces separated from each other by a very small air gap tended to stick together or ‘cohere’ when affected by wireless waves from a spark transmitter. This led to ‘coherer’ being adopted as the generic term for all sorts of detectors working on this basic principle.

Following on from Sir Oliver, a Frenchman called Brantly made a coherer consisting of a glass tube containing granules of an alloy of 95% nickel and 5% silver, held between two silver plugs. At rest, the device had a high resistance between the plugs but when a signal from a spark transmitter arrived the resistance fell sharply. If, for instance, you connected an electric bell and a battery in series with the thing, the lowered resistance (when a wireless signal arrived) would cause the bell to ring.

Unfortunately, there was a snag. Once the Ni/Ag granules in the Brantly coherer had stuck together they stayed that way, so the
Electric bell would have continued ringing indefinitely. The only way to stop it was to administer a light tap on the coherer with a handy implement, such as a cricket bat or housebrick, which made it 'de-cohere'. This process being a little too tedious if long messages were to be received, the 'self-clouting coherer' was developed.

Old For New?
A good example of old technology being adapted for a new purpose, the 'self-clouting coherer' employed the works of an ordinary electric bell less the contact breaker and gong, the little hammer that usually hits the latter being aligned to 'thwack' the glass tube whenever the operating coils were energised. The coherer was wired between the antenna and earth terminals (with the necessary tuning coil) and in addition was connected in series with a battery and a relay. The relay contacts in turn were in series with a larger battery and a telegraphic sounder, as used for ordinary wired telegraphy. (As shown in Fig. 2).

In the absence of a radio signal, with the resistance between the plugs in the coherer high, the relay and sounder remained at rest. On the arrival of a signal the coherer resistance dropped, the relay operated and the sounder sounded as good sounders should sound. The coils of the modified bell were wired in parallel with those of the sounder so that as soon as it had registered a dot or dash the little hammer struck the glass tube and 'de-cohered' the Ni/Ag granules.

It's said that the response of this set-up was good enough for reasonably fast Morse signals to be received but there were drawbacks, the most obvious of which was the necessity for an exact balance to be obtained between getting the little hammer to do its work effectively without being over-enthusiastic and shattering the glass tube. In addition the coherer was prone to spurious responses caused by unwanted nearby transmissions and 'atmospherics'.

In the search to obviate the problems, alternative types of coherer were developed. Sir Oliver Lodge found that he could use ordinary iron filings between steel plugs at a considerable saving in cost over the Branly silver and nickel-silver combination. The sensitivity was excellent and the resistance range was impressive - from several thousands of ohms at rest down to a few hundred when a signal was received.

Incidentally, one of the coherers found its way into the South Kensington Science Museum and more than 60 years after it was made, still worked as well as ever when demonstrated in a television programme. Unfortunately, it still had physically to be de-cohered.

Other Inventors
Other inventors took up the challenge of making a fully automatic self-decohering detector. In America an experimenter called Stone made one which was employed for a while by the US Army Signal Corps. Using carbon granules sandwiched between steel plugs, it duly self-decohered and was robust, but it suffered from poor sensitivity.

In Italy a certain Naval Officer Lt. Salari pointed the way to future developments by replacing granules, either metal or carbon, with a single drop of mercury between steel plugs. The Italian Navy coherer, as it became known, was fully self-decohering but failed to become popular.

It was left to Sir Oliver Lodge to produce the definitive automatic coherer, which featured a small clock-work driven, edge-sharpened disc mounted above a little bath containing mercury, on the surface of which floated a thin film of oil. The disc formed one terminal of the coherer and the mercury bath the other, and in the absence of a wireless signal the resistance between them was high, due to the intervening oil film. On the arrival of a signal the oil film broke down and the resistance fell sharply, only to rise again as the disc rotated and the oil film was restored.

The automatic device was built for Sir Oliver by Alexander Muirhead, a master mechanic long established in making telegraphic equipment and was made to exceptionally high standards. It was sold commercially and, abandoning Stone, the US Army Signal Corps became an early and satisfied user of what it described as equipment "having beautiful workmanship and extreme reliability".

The Lodge coherer was never bettered and was superseded only when the thermionic valve was perfected. As to what Marconi thought about it - well, that's another story!

PW
To round off PW's year celebrating 100 years of Amateur Radio - 'Davey' L. D. Davey-Thomas G3AGA looks back at the history of the pioneering Marconi station at Poldhu on Cornwall's Lizard peninsula.

Fig. 1: The Poldhu antenna system as planned and originally erected for the Atlantic tests in 1901 - wrecked by a storm in September of that year.

There can be few radio enthusiasts who, at some time or other, have not read the story of Guglielmo Marconi and the early days of 'wireless'. How, at only 20 years of age, he began his experiments in Italy and developed a system of 'wireless telegraphy' with a range of a few kilometres, a system which he offered to the Italian government only to have it rejected. How, in 1896, he came to Britain where he was well received, prospered and soon set up the Marconi Wireless Telegraph Company.

Towards the end of the 1890s 'wireless' was under development in several countries. There was intense commercial rivalry to build systems which could supplant the wire and cable telegraph circuits then in use. Most scientists and engineers of that era, knowing that 'wireless waves' were akin to light waves, believed that these waves always travelled in straight lines and would not follow the curvature of the earth. Communication beyond the horizon would therefore be impossible.

However, Marconi had never subscribed to the 'straight lines' theory and the range of his equipment had been increased from a few kilometres in 1896 to well over 100 by 1899.

**Across The Atlantic**

In 1900 Marconi persuaded the board of the Marconi Co. that it should be possible to send signals across the Atlantic - a bold gamble which, if it succeeded, would confirm the Marconi Co. as the world leader in this new technology.

Marconi decided that he needed an unobstructed path to launch his signals across the Atlantic and in July 1900, together with R. N. Vyvyan and the Secretary of the Marconi Co. he came to Cornwall and selected two sites to be used for the "great experiment" which, by the way, was carried out in some secrecy.

The sites selected were both on the Lizard Peninsula, one at Poldhu for the high power transmitter site and the other at Bass Point for a low power monitoring station to be used during the development of the former. (Both these sites are now the property of the National Trust). Incidentally, Poldhu is situated some 10km north of the Lizard Point, near the village of Mullion while Bass Point is at The Lizard itself.

Work began on both sites in the autumn of 1900 and the first tests were carried out at Poldhu in January, 1901 - no mean feat when you consider that the transmitter, designed by Sir Ambrose Fleming, was at least 100 times more powerful than any spark transmitter which had ever been built. This transmitter consisted of two Poulsdon arcs in series running at 20kV and it has been estimated that the output was some 10kW. Marconi stated that the wavelength as 366 metres, although there were no accurate means of checking wavelength at that time.

The first long distance test took place in February 1901 between Poldhu and Crookhaven in south west Ireland, a distance of some 360km, using a temporary antenna at Poldhu, because the main system had not yet been built. (This planned main system consisted of 20 masts, each 65m high, in a circle 65m in diameter).

In his book R. N. Vyvyan* (chief site engineer) recalls how he warned that the design of the planned antenna system was mechanically unsafe due to the planned guying arrangement but he was overruled. Once the buildings at Poldhu had been completed Vyvyan was dispatched to Cape Cod, Massachusetts in the USA, to supervise the construction of a similar station, to be used in the "great experiment".

* Wireless Over Thirty Years by R. N. Vyvyan.

Almost as soon as the same main antenna system had been set up at Cape Cod it could be seen that the structure was unstable. Vyvyan informed the Company of the danger, but before anything was done a violent storm on the 27th September, 1901, brought down the newly erected masts at Poldhu. Fortunately there were no injuries or damage to equipment but a few weeks later the masts at Cape Cod also came crashing down, wrecking the station building and narrowly missing Vyvyan himself!

**Temporary Antenna**

Marconi decided to press ahead with a modified experiment using a temporary antenna system at Poldhu. This consisted of two 50m masts (salvaged from the original wrecked antenna system) with a rope slung between them. To the rope was attached a "fan" of 54 wires.
Since it was impossible to repair the damage at Cape Cod quickly Marconi decided to take receiving equipment to St. Johns, Newfoundland, where he and his party arrived on 5th December 1901.

The story of the success of the experiment, the famous 'three dots' transmitted from Poldhu which were first received at 1230pm local time on 12th December, 1901, is well documented. Less well known is the fact that the experiment had to be cut short when the rival Anglo-American Telegraph Co., which held the monopoly of telegraph communications in Newfoundland, forced Marconi to close down.

The Canadian government (Newfoundland was not part of Canada at that time) immediately invited Marconi to construct a station on the east coast of Canada and even offered financial assistance. This led to the building of a station at Tablehead near Glace Bay.

In February 1902, Marconi carried out range tests using receiving equipment on board the SS Philadelphia in the Atlantic. Signals from Poldhu were received at 1100km by day and 3100km at night - an effect not previously noted.

In the summer of that year the Italian government loaned Marconi a fine naval vessel, the Carlo Alberto, for further tests in the Baltic and the Mediterranean. Poldhu could always be received at night but day ranges seldom exceeded 800km. The station continued to be used for tests and in 1902 the old 50m masts were replaced by four wooden towers each 70m high.

Teething Troubles

The Glace Bay station was completed in October 1902 but there were teething troubles and the first official message was not received at Poldhu until 20th December 1902, although contact had been established several days earlier. Experimental work continued at the station until 1908.

In 1905 Poldhu took its place as a commercial station and with ships at sea, transmitting news and weather information for mariners. This role was maintained until the outbreak of the First World War in August 1914.

During the First World War, Poldhu continued to provide a reliable service for shipping, especially for trans-Atlantic convoys. By night it transmitted war bulletins and other official notices.

After 1918 the station continued as a Marconi commercial station until June 1922 when, due to the obsolescence of the equipment, commercial operation ceased. The site then became the Marconi Company's research and development centre.

Short Waves

Although the part played by Poldhu in the 1901 tests is well known, few people appreciate its importance in the development of short wave communication. Prior to 1920 little interest had been shown by professional radio engineers in wavelengths of less than 200m because it was believed that only long wavelengths and high power could deliver reliable communications over great distances.

Marconi appears to have been interested in the short waves as early as 1916 and experiments were conducted by C. S. Franklin and Captain Round for the Marconi Co. in 1920. Additionally, in 1921/1922 a group of amateurs organised tests between the USA and Britain to see if they could bridge the Atlantic on a wavelength of 200m. The tests (which were 'one-way') proved successful. In December 1923 short-wave two-way contact was made, by amateurs, between the USA and France. This achievement was largely ignored in commercial circles but Marconi set up a series of tests in 1924 using a transmitter located at Poldhu and a receiving station on board his yacht, Elettra.

The wavelength used at first was 97 and later reduced to 32m. Results were impressive, especially when, in September 1924, signals were received at great strength on board the Elettra off the coast of Syria, a distance of some 3800km.

As part of the short-wave tests work was in progress to develop 'beam' antenna systems as a means of improving signal strengths and reliability. Early efforts to concentrate radio signals in one direction had used the Beverage, rhombic or 'V' antennas, all of which needed to be many wavelengths long in order to achieve useful gain and directivity. (For example, the antenna at the long wave station at Caernavon in North Wales during the 1920s was 1.5km long!).

Poldhu, under C. S. Franklin's direction, was used to evaluate various beam systems energised by a 20kW transmitter, designed by Franklin. It was used to communicate with the Elettra at sea and with other Marconi Company stations world wide.

Imperial Network

In the early 1920s, the British Government decided to implement the Imperial Network (originally proposed by Vyvyan in 1908). This was a network of radio stations to link the parts of the then far-flung British Empire. The contract was awarded to the Marconi Co., which proposed to use the short wave beam system developed at Poldhu.

The Imperial Network proved a great success, meeting and exceeding its targets for transmission speed and reliability. Much of the success of the network stemmed from the research and development work carried out at Poldhu.

Pioneer work carried out under Franklin's direction included a parabolic reflector system, in-line arrays on a...
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Conveyed across the Atlantic by wireless telegraphy. From which were transmitted the first signals ever received in New York for five hours in each twenty four.

In May 1924 good quality radiotelephony was received from Sydney, Australia, from an improved transmitter at Poldhu. In the same year a commercial service was opened with Cape Town, South Africa on a wavelength of 92 metres. Needless to say, beam antennas were used on both occasions.

Franklin was also the first to advocate the use of a coaxial feeder to drive antenna arrays as an alternative to the commonly used open wire feeders. Much of the success of the Imperial Network stemmed from the research work carried out at Poldhu. Incidentally...Franklin also developed the oscillator which bears his name and remains one of the most stable variable frequency oscillators (v.f.o.) known to radio engineering.

During the recession in the 1930s the Marconi Co. decided to dispense with Poldhu because its continuation solely as a Research and Design centre could no longer be justified, partly on account of its remoteness and somewhat inhospitable location. The station finally closed down in 1933.

**Commemorative Pillar**

The site remained derelict for several years but in 1937 the Marconi Co. decided to dispense with Poldhu because its continuation solely as a Research and Design centre could no longer be justified, partly on account of its remoteness and somewhat inhospitable location. The station finally closed down in 1933.

**Apparatus In Museum**

Some of the apparatus used in the early days at Poldhu is now in the museum of the Institute of Electrical and Electronic Engineers in London. Today, the famous site has been returned to grazing land.

**Radio Basics November - Errors & Up-Dates**

Unfortunately, the annotated photograph in the November issue shows the connections for L2A wrongly. The correct connections are as shown in the reproduced illustration. However, most readers who contacted me on this error (fortunately) were able to complete the project by referring to the circuit diagrams. I've also heard from readers who were confused regarding the winding of L3 and L4 and I apologise for not making it clear to readers (bearing in mind the series is aimed at less experienced constructors) that they have to be multi-layer (wound in layers) to achieve the required number of turns. Sorry for the confusion caused.

Rob Mannion G3XFD.
If you want to get the best results from your antenna, it needs to be impedance matched to the receiver. If there is a mismatch, then not all of the signal energy will be transferred to the receiver, and signals will be weaker than they could be. An ATU (antenna tuning unit) should be used to correct the antenna mismatch and so improve reception. A well designed receiving ATU will also reduce signal levels away from the desired frequency, and so help reduce noise and interference too. Both these benefits are proved by the Howes CTU8 and CTU9 tuners. Fully guaranteed and backed by our expert technical advice service, these ATUs are an excellent way to improve your reception.

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Amateur Radio in China

WV must have been mad to have booked a holiday in Beijing in December 1996, but we did! After we investigated the charts of temperatures and found them to be typically between 10°C and freezing, my wife Jan bought long thermal underwear for us both. Very fetching I can tell you!

Once the novelty of the underwear had worn off, I started to think about the possibility of meeting up with some of the Beijing amateur population and (maybe) operating one of their stations during our visit. With a busy sightseeing schedule and even with an XYL as understanding as Jan, I didn’t believe that I would be able to operate for more than a few hours, although the prospect of meeting some 'real' Chinese people appealed to us both.

Chinese Contacts

I contacted Roger G3LOP who had attended the Beijing DX Convention in October 1995 and he gave me a FAX number for the Chinese Radio Sports Association (CRSA). I duly sent a FAX to their Secretary General, Mr Chen Ping BA1HAM and received a reply after some time requesting that I send them a copy of my passport and UK licence together with US$5, upon receipt of which they would issue an Operator’s Certificate for Visitors. They also gave me an E-mail address for Mr Yao Shun BZ1LUV, President of the Tsing Hua University Amateur Radio Club station BY1QH. They also kindly sent an E-mail to Shun to introduce me.

I sent the documents by return and arranged to contact the CRSA when in Beijing to pay the fee. I also sent an E-mail to Shun, which was very promptly acknowledged giving a telephone number to contact him when we arrived. As I wasn’t sure which, if any day I would be active, advance publicity was difficult, but I did try to pass the word round the UK DX community beforehand.

We arrived in Beijing at about 0600 local time on 17th December after a nine hour direct flight from Heathrow. It was dark and bitterly cold, but we were soon whisked off down a back lane or hutong near the junction of Yongdingmendong Road and Tiantandong Road, opposite Models under the State Sports Commission of China and is extremely complex, because only the main streets in Beijing have names. The five storey building is shared with the administrations of the Sports of Aeronautics and Models under the State Sports Commission of China and is back a lane or hutong near the junction of Yongdingmendong Road and Tiantandong Road, opposite the International Tennis Centre.

However, I was sure the taxi driver had taken us to the right place when I spotted the large array of h.f. antennas of a building. Jan and I were greeted by Mr Wang Xinmin BA10K, Deputy Secretary General of CRSA, who introduced us to Chen and his delightful assistant Miss Cao Huilong.

My Operator's Certificate was already made out. I paid my S5 and was then invited to operate. I declined this kind offer as I had planned only to talk to Chen and Wang about the current state of Amateur Radio in China during this visit and we were planning to visit the nearby Temple of Heaven afterwards.

Membership Increase

The CRSA now have a membership of over 6000, an increase of some 3000 since 1994. Apart from about 110 club stations, there are now about 500 home stations, 26 of which are in Beijing. But only about 50 or 60 of these hold licences with h.f. privileges, the remainder being v.h.f. only. Prior to 1992, only club stations were permitted, but it is now official policy to encourage the setting up of home stations. However, many operators do not speak English well and prefer to talk to each other on 144MHz.

Equipment is a major difficulty as individual wages are very small. The CRSA has been very helpful in supplying equipment, both via the home stations and by direct purchase by the CRSA. There is also an equipment fund which is used to support DXpeditions and to help with the costs of operating stations.

I had arranged to meet Chen and Wang on Friday 20th December after a nine hour direct flight from Heathrow. It was dark and bitterly cold, but we were soon whisked off to the Shangri-La Hotel and settled in. The hotel really is five star and probably the best I've ever stayed in.
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Continued from Page 63

unbelievably low by Western standards and the cost of imported, Japanese transceivers consequently is prohibitively high. There is some surplus military equipment of 1960s vintage which can be modified and some home brew kits available. All must then be submitted to the Radio Regulatory Commission for checking prior to use.

The club station of the CRSA, BY1PK, is housed in the same room as BY1BJ, the club station of the Beijing RSA (see Fig. 1). The equipment was mainly donated by Japanese, Canadian and US people and consisted of a TS-50 -1000, an Icom IC-781, Kenwood TS-11A, TS-81B, TS-870 and TS-940S with HL-200A and Drake L4B amplifiers along with many peripheral items such as power meters, TCNs and rotators. There are a variety of antennas on the roof, including several yagis and caged dipoles, but I understand that they suffer badly from TVI problems.

OS Ling China

Unfortunately, Chinese club stations suffer from the same problems as do many club stations worldwide. Many enthusiastic operators and no-one responsible for, or prepared to deal with, the incoming OSL cards. Chen explained that when there were only a few club stations in China, these were a major problem. There is no OSL bureau in Beijing and with the sharp Increase in the number of active stations, a huge backlog has accumulated at the CRSA. A bureau is being organised, but it is a low priority. The mounting air fare is relatively expensive at about five Yuan - equivalent to a five kilometre taxi ride.

Chen recommends DXers to OSL, the individual station’s address direct with IRCs or US Dollars. Incoming mail is claimed to be fairly secure from theft, but mail to BY1QH is opened by the University authorities and any currency removed. However, IRCs are safely delivered with the cards.

Chen announced that the next expedition to Scarborough Reef B50H, was being planned for April/May 1997. The CRSA have formed a liaison with a Chinese oceanographic institute who regularly visit the area and who can provide transport at sensible cost.

As arranged, Shun BZ1LUV collected me from the hotel the following day. Jan decided not to come to the University, but invited Shun and his girlfriend to come out to dinner later and show us some ‘real’ Chinese cuisine.

Shun is fluent in English, including slang! He is an engineering student specialising in fibre optics and just acquired a degree in his thesis. Looking for a job, he attended a University in England or the USA, he is in touch with 29 colleges. He was born in Guangzhou (Canton) in the south, where his father is a nuclear physicist. He also told me his name was pronounced Sean (as in Connery).

Second Largest University

Tsing Hua University is the second largest of 15 Universities in Beijing, having about 20,000 students. The Chinese name is Qing Hua, hence the BY1QH callsign. The station is located on the fourth floor of a dormitory building on the campus, with yagi, cubical-quad and wire antennas mounted on the roof (see Fig. 2). Shun occupies the room next door. Although there are 11 members of the club, only four of whom are active, I didn’t meet any of the others.

Since it is the University club station, the operators change but the equipment, antennas and location stay the same. Unfortunately, much of it is suffering from lack of maintenance of the cubical-quad for 14, 21, 28MHz had been damaged in a gale and never repaired and all of the several amplifiers were faulty for lack of spares.

Shun explained that the club only gets 1000 Yuan (about £200) per year towards its upkeep, so I was pleased to make a donation to their funds. Since returning, I’ve learned that the yagi has been damaged in another storm. Shun has promised to repair it, but they are now only working on 1.8, 3.5, 7 and 144MHz.

The h.f. rig is an Icom IC-750A, running 100W of c.w. and which has a built in electronic keyer. There was an interface problem with my trusty and well travelled VFO to make it work. I’ve never learned to use an electronic keyer and a quick look at the manual failed to tell me how to switch the keyer off, so I wounded the speed down and set the gaps wide on the Bencher paddle.

A 486 computer In the shack runs Windows and LOG-EQF as a logging program, which is the same as I use at home, although a much older version without keyboard generated c.w. I thus brought the log away with me on disk rather than paper. The Operator’s Certificate ruled that the callsign to be used should be “the home call of the holder followed by /” and the callsign of the operating station (e.g. WA1AA/BY1PK). I bent this rule slightly and used BY1QH/G3SWH.

In the five minutes practice with Bencher ‘off the air’ gave me enough confidence to turn the four element monoband yagi towards Europe and put out a CO on 14025kHz at 0640UTC at 0640UTC at 1440UTC (1440UTC). I was immediately answered by OH2BLV, followed by SP3NA. I must confess that I was looking forward to being on the end of a big pile-up, but conditions were poor, the noise level high and demand surprisingly low. I only worked 56 stations in the first hour, with just less than half being Japanese.

The first G was Fred G4BVP at 0832UTC, following up an earlier Packet Cluster spot by ONSUK. A few more Gs followed before the band began to die at local sunset, being completely dead by 0930UTC. I then wanted to try 10MHz, but Shun has no antenna, so we moved on to 7000kHz with a drifting dipole facing north. The first CO produced a pile-up of Japanese and I worked 67 stations in a matter of about 40 minutes. Unfortunately, time was running out as I’d promised Jan that we would be back between 1800 and 1900 local time. Shun’s Finnish girlfriend Marike arrived promptly at 1830 and I had to close down with 182 QSOs in the log after a total of three and three quarter hours operating.

Marike also speaks excellent English and is studying anthropology and learning Mandarin, the main Chinese dialect. The three of us went back to the Shangri-La to collect Jan and go for a drink whilst I got changed.

Authentic Cantonese?

Shun took us to an authentic Cantonese restaurant where Jan and I caused great consternation by asking for forks (see Fig. 3). We had a wonderful meal with century eggs, jellyfish, chicken soup, aubergines and several delicious but unidentified dishes, all carefully selected by Shun so as not to offend our Western palates and washed down with Chinese beer.

The bill for the four of us was about £25. Despite a Master Card sign clearly displayed in the window, the staff refused point blank to take mine, so I paid cash. We parted at about 2200 and took a taxi back to the hotel after one of the most memorable days of the holiday.

Special QSLs have been printed and are available either direct (G3SWH OTHR in any callback) or via the RSGB bureau. (See Fig. 4).

Qualifications in China

Qualifications for an amateur licence in China consists of a written examination on Regulations, procedures and technical matters leading to three classes of licence: Class 1 - requiring Morse code at 20 characters per minute (approx. 4 wpm) and allowing full h.f. privileges and 500W.

Class 2 - requiring Morse code at 50 characters per minute (approx 10 wpm) with limited h.f. privileges and 100W.

Class 3 (h.f.) - requiring no Morse code, having h.f. privileges and a 3W power limit.

There is also a Class 4 licence for SWLs only.

Callsign prefixes designate the class of licence held, e.g. BA is Class 1, BD is Class 2 and BG is Class 3. The letters ‘BY’ designates a club station and ‘BZ’ is for the personal operator of the operating station. There is no written power limit for club stations, but this is normally less than 1.5-2kW.

The country is split up into ten geographical call areas on the same principle as the USA. e.g. ‘I’ is the Beijing municipality - an area the size of Belgium; ‘4’ is Shanghai and the east coast; ‘7’ is in the south and ‘9’ is Tibet and the west.

Fig. 2: Yagi, cubical-quad and wire antennas mounted on the roof of Tsing Hua University B1QYH.

Fig. 3: Eating Out! Phil G3SWH and his wife Jan visit a Cantonese Restaurant with Shun BZ1LUV and his Finnish girlfriend, Marike.

Fig. 4: Phil G3SWH’s QSL card.

Thanks! My thanks are due to my wife Jan, to Mr Chin Ping and the staff of the Chinese Radio Sports Association and to Yao Shen of the Tsing Hua University’s club station, without whose help this operation would not have been possible.

Continued on Page 64

Practical Wireless, December 1998

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Safer Soldering

In the July 1998 issue of PW there was an article titled 'Safer Soldering' by Walter Farrar G3ESP in which Walter described a home-brew soldering iron stand to give you somewhere safe to put the soldering iron down when not in use. Along that vein, I've had letters from both Chas Reynolds GW3IPT and Michael Turnbull G7PWL both outlining exactly the same improvement on Walter's idea.

Both Chas and Michael suggest putting another switch with a 1N4007 diode in parallel, in line with the live connection to the iron, as shown in Fig. 1. The switch, which is a 'push-to-break' type is mounted on an arm that supports the soldering iron when it's not in use.

The action of this new combination is to put the diode in circuit when the soldering iron isn't being used, thereby reducing the power of the iron. Reducing the power of the soldering iron (by removing one half-cycle of the mains power) has the effect of reducing the damaging effect of overheating that these simple iron types are prone to.

When the overheating is reduced the tip lasts longer and doesn't stick in the barrel of the soldering iron heating element. I've lost count of the number of simple soldering irons I've had to discard with this fazing. In use, you just need to wait a few more seconds to allow the bit to come up to temperature before using the soldering iron.

Well done both of you for that simple, but elegant idea. And I have to add that I would have had trouble deciding which one of you should get this month's prize PW Book Voucher, other than Chas went just a little bit further in his modification. Have a look at the picture of Fig. 2, where you will see a photograph of the soldering iron sent in by him.

Chas has turned his into a complete soldering station, with not only his version of the soldering iron control box, but the soldering iron rests on an (power switching) arm with a safety shroud made from a short length of copper pipe. Also on the unit is a solder reel holder, a damp sponge holder and a small tin of tip cleaning flux. The ultimate in home-brew solder stands I would say.

To soldering iron

---

Fig. 2: Chas GW3JPT has produced a complete soldering station as shown here.

Back To The Valves

Now it's time to return to the comparison between semiconductors and valves. Back in the August 1998 issue of E-i-A, there was a question asked if semiconductors could be used to replace some or all of the valves in a CR100 receiver? Part of the answer was provided by an article in QEX and in Short Wave Magazine in the past and I started to outline the way valves work in the October issue of E-I-A. Now to go further!

As described on pages 59 and 60 (October 1998 PW, valve work on the attraction, towards the positive anode, of a cloud of electrons from a heated cathode element connected to the negative side of the power supply. And, like semiconductors, there are many types of valve available although there's no equivalent of the npn-style of operating as there is in semiconductors. Valves are simply classed as the number of elements involved (cathode, grids and anode total).

Simple Diode

The simplest is the Diode which has only a cathode and an anode, and like a semiconductor diode current flows in one direction only. The only controlling influence on the current flow, is that the anode should be more positive than the cathode for current to flow. I've not shown the diode in the symbols of Fig. 3, but imagine the triode on the left hand side without the grid inside.

Chas has turned his into a complete soldering station, with not only his version of the soldering iron control box, but the soldering iron rests on an (power switching) arm with a safety shroud made from a short length of copper pipe. Also on the unit is a solder reel holder, a damp sponge holder and a small tin of tip cleaning flux. The ultimate in home-brew solder stands I would say.

Adding a controlling grid (g1) gives a degree of control over the amount of current flowing (see p59 Oct '98 PW. Adding this new grid turns our diode into a Triode (three elements), now both anode-cathode voltage and grid-cathode voltage can vary the current flowing through the valve.

Adding a further grid (g2) the triode produces the Tetrode (four elements). This grid was added in an attempt to reduce the effect that the anode-cathode voltage had on the current flowing in the valve. It worked, after a fashion, but created a curious negative resistance curve in the valve characteristics, which could make the designer's job very difficult.

After a little head-scratching by the scientists, another grid (g3) was added into the valve to remove the negative resistance effect present in the tetrode, turning the valve into a Pentode. The pentode has a high and stable gain, works over a wide frequency range and is, in 'straight' valve terms the simplest 'ultimate amplifying' valve.

There are two symbols shown for the pentode, one with g3 internally connected and, on the far right, the pentode with the connection to g3 brought outside the valve. The internal connection is common in many pentodes as it is usual to connect g3 to the cathode in many circuits anyhow.

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Fig. 3: Circuit symbols for various valves (see text).

There are other valves with as many as six grids, in between the cathode and anode, but these fullfil special purposes such as signal mixers and display devices. However, I do not propose to go into those devices just yet.

Equivalent Circuits

Let's now look (in general terms) how the valve and semiconductor circuits are equivalent. In Fig. 4 you can see the circuits of simple amplifiers. On the left is a junction f.e.t. and on the right is a triode valve circuit. As you can see they are remarkably similar, they differ only in the valve has a supply voltage of around 250 volts as opposed to the f.e.t.'s much lower supply of 12V.

The amplifiers shown in Fig. 4 have the common feature that the input signal (the gate of the f.e.t. and g1 of the valve) directly control the current through the device. Shown in Fig. 5 are the broadly equivalent amplifiers with a dual-gate f.e.t. on the left, and a pentode based amplifier on the right. In spite of the voltage differences, don't they look similar?

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Curve And Points

Now let's have a look at using the curves to work out gains and operating points, and for this exercise I'm going to
Look at the valve amplifier of Fig. 4, using typical valve voltage/current (v/a) curves. I shall start by assuming a supply voltage of 250V. On the anode v/a curves shown in Fig. 6, I’ve marked the voltage of 250V. On the anode v/a curves. I shall start by assuming a supply amplifiers.

Now turning to the grid voltage/current: .Rl

\[ \text{V-I.R} = \frac{1}{2.5 \text{mA}} \]

it when 2.5mA flows through it: because I 25V must be generated across anode load resistor 121 should have, immediately I know what value the 2.5mA through the valve. Now looking graphically at what the gain might be in Fig. 7, I’ve shown the quiescent operating point of the grid-cathode voltage (I shall assume that the effect of the bypass capacitor Ck is enough to keep this ‘constant’ to a.c., and I’ll show a 1V peak-to-peak (p-p) signal swing on the grid.

Tracing the corresponding points on the current axis of Fig. 7, shows a range of 2-3mA in absolute terms, which you then transfer to the anode v/a graphs. Plotting the 2-3mA points on the anode v/a graph, show corresponding values of 150 and 100V respectively. So, from graphical methods the gain of this amplifier stage is around 500V out for a 1V signal (this we can write just as 50, or as 50V/V).

The actual gain of our valve amplifier isn’t quite 50, because we haven’t taken the ra figure of the valve into consideration. The ra (or dynamic anode resistance) of the valve appears effectively in parallel with the load resistor Rk, as shown in Fig. 8. Now if we take this into account the effective load resistor Reff is much lower.

I have estimated that the ra of a valve with the curves shown here would be about 100kΩ (explained on page 59 Oct ’98 PW) and so the gain will be lower because Rreff is lower than RL (Rreff will be around 33kΩ, lowering the gain to around 33). As triodes have lower values of ra than pentodes (or tetrodes), that’s why they also have lower overall gain figures and more distortion.

For this technique to be anywhere near accurate you must have some idea of the parameters of the valves you are dealing with and these may be found in manufacturer’s data sheets. As these are difficult to find we have to make do with the minimal information that is available in the form of valve data books, such as the series Radio Valve Guides.

There are five books In The Radio Valve Guides series along with a comprehensive equivalents book in the Handbook Of Radio TV Industrial & Transmitting Tube And Valve Equivalents books. In these small books may be found a large amount of valve data very cheaply. I can thoroughly recommend them to you for inclusion in your library.

Two From Tooley

As it’s nearly Christmas, and many of you may be contemplating buying yourself a new computer (perhaps someone has promised you one) you may be looking round to see what can be done with it. After all the needless worry of ‘should it be used as a teaching aid or as a reference library. I’ve had the opportunity recently to play with some CDROMs from Matrix Multimedia that can be both reference and teaching aid. Two of the CDROMs are by Mike Tooley who is well known as an author of electronic reference books and electronic projects. I took time to look at Digital Electronics, and Paris Gallery & Electronic Circuits & Components, both of which really need a reasonably well specified IBM PC (or clone) with a CDROM player (obviously) and a sound card. They both run on the bottom end specification PCs available today.

The programs install easily and quickly leaving you with a ‘point-and-click’ interface that is pleasant and simple to navigate around with. In Parts Gallery & Electronic
From the Babani stable comes two books, one by R. A. Penfold, the other by Owen Bishop on the practical side of the hobby. Owen Bishop’s Getting Started in Practical Electronics is almost 190 pages of advice, good ideas and general building techniques and projects. The first third of the book deals with ‘The Essentials Of Electronic Construction in five chapters. The second ‘half’ of the book details some 30 projects to build, helping you to put theory into practice. This is an excellent beginner’s book.

From the prolific Penfold pen (word processor?) comes Electronic Project Building For Beginners. This book is in many ways complimentary to Owen Bishop’s book, as it deals with the practical side of building a project. It details the recognition of components, what tools do you need and how to use them effectively. Although there are projects within the book they take ‘a back-seat’ to the methods of building them. This is also an excellent beginner’s book.

The Maplin Electronics Catalogue is a common sight in newagent’s shelves, and from Newnes come a book, Power Supply projects, bearing the Maplin name. The book features four sections called Laboratory Power, Chargers, Inverters and Miscellaneous. There are p.s.u. for all needs including a valved amplifier p.s.u. If you were at the Leicester rally recently then you should find the fluorescent tube inverter useful. With the Maplin name to this book there should be no problem with components.

This is as much as I have room for this month so, let me now turn to the subject of Tex’s Conundrum.

**Missing Winner**

I had a FAX from the excited ‘missing’ winner of Tex’s Conundrum No 3. The FAX was followed up by a letter from Flavio Kiosi PU3AMB in Brazil, apologising for his poor English. My congratulations on winning Flavio. I’ve passed your Book token on to Michael, hold on your behalf, until you decide which book you would like to get from the PW Book Service.

Now for a tedious conundrum to keep you occupied during the Christmas holiday. This one is courtesy of Frank Whitehead G4MLL who sent it in. The circuit shown in Fig. 9 is, as Frank drew it, but I’ve redrawn it, Fig. 10, to make it a bit simpler to understand. The question, as posed by Frank, is: What is the total resistance between points A and B if each of the 12 resistors is 390Ω?

Oh by the way Frank, I think I should tell you that you have to provide the specimen answer for the readers! As it’s a bigger question, I think that I will tell you that you have to provide the specimen answer for the readers! As it’s a bigger question, I think that I will make the closing date for this one by first post January 6 1999. See you in the next issue of E-i-A.
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Please use the form to send your ad in or write it neatly on a postcard so 'Your Attention Please' above.

OSWISH COURT, STATION APPROACH, BROADSTONE, DORSET BH18 8PW

 Diary or pad, g.p.s., C68 Buyer contact, Tel: 01300 244637

 VHF amplifiers which include one output power amplifier, also many valves. Tel: 01300 244637 for details.

 Vertical f.t. antenna Sandringham, Not bands: 10, 12, 15 and 17 MHz, 40, 80 and 160m, never used, three months old, superb condition, cost £70 no offers, prefer buyer to collect. Tel Tom 01300 244637 or Aynsley 01425 241732. GTH 01300 244637.


 Your Name and a如有 is required for the correct address.

 Poor power supply for WRG-501X receiver, model 200W output. 144MHz

 Yaesu FT-747GX h.f. and c.w

 Pane FT -7360 transceiver. 144/430MHz with 880MHz, evenings.

 Yana FT -50 MM. 50MHz. multi-mode, boxed manual, good condition, £145 Tel: 1018291.

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 Your Name, please

 Please use this form to send your ad in or write it neatly on a postcard so 'Your Attention Please' above.

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 Please Insert this advertisement in the next available issue of Practical Wireless.

 For Sale

 Wanted

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 CONTACT DETAILS FOR ADVERT.

 Please only write in the correct details you wish to publish your ad, ie, do you want your name & address, or just your telephone number?

 Your ad, you decide!

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 Practical Wireless, December 1998

 14th or 30th or throughout standard and must be written by Diplomate. Write to Dave, 5 Atton Cottage, Wonersh, Wokingham RG40 4ST.

 124 SYG set wanted by private collector, also model 800S. Recent set. Good condition. No internal parts. £20 or swap.

 144MHz hand-held, may be cheap. I.e. 622 or similar, needs no power supply.

 Tel: 101903169576.

 1012861 678584


 Wanted

 J WANTED

 124 Spy set wanted by private collector, also Sony 2001. 7600 or Realistic Zane M18E11015821662183

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 Please use this form to send your ad in or write it neatly on a postcard so 'Your Attention Please' above.
Amateur Radio Communications Ltd
38 Bridge Street, Earlestown, Newton-le-Willows, Merseyside WA12 9BA

We are the largest stockists of both new and secondhand amateur radio equipment in the north of England - fact not fiction! Our company boasts a full time service department authorised by all the major suppliers.

When you buy from us you have complete peace of mind!

HF TRANSCEIVERS

ICOM IC-706
MkII DSB
New model. DSP. HF transceiver the size of a dualband mobile. It's looking for a rig you can't live without, your first choice.

NEW HF MODELS ON THE MARKET

KENWOOD TS-570D
New updated version of the TS-570D, but complete with enhanced features at an affordable price.

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NEW RRP £369
• 2m & 70cms
• 50W/30W • Detachable header • Packet 10000 box ready • 100 memory channels
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New on the market
ICOM T-8 TRIPLEBANDER
Another first from Icom! This compact handy unit enables you to operate on 2m/70cms, plus bandwidth ready and many more features. The first to use a lithium battery pack which means you can charge it when you like.

PHONE FOR ARC PRICE

ANNOUNCEMENT!
JUNK SALE FRIDAY 27th & SATURDAY 28th NOVEMBER

Due to a clearance in our service department, we are able to offer a massive selection of surplus equipment, components, cable, etc., sold as seen - all at giveaway prices! Don't miss out on the bargains, come along and see us on that weekend.
The period between September 21-23 saw some of the best tropo conditions experienced for many years on the v.h.f., u.h.f. and microwave bands. The tropospheric enhancement intensified, particularly for paths in northern England and Scotland. Both the 144 and 144MHz bands and it would have greatly benefited both stations if this practice had been adopted.

The 144, 430MHz and 1.3GHz antennas at the QTH of DK5KK.

The enhanced tropo conditions were detected when he heard co-channel interference on a BBC Radio 4 Band II f.m. transmission whilst driving home from work. A quick listen on the 144MHz band at his home QTH revealed the station of GM4CXM working many stations in Sweden. David immediately put his portable 144MHz system into the car and headed off to a local high-spot south of Edinburgh.

David’s portable kit consists of a Trio TR9130 transceiver, 100W solid-state amplifier, a Morse keyer and digital voice recorder along with an 8 -element Yagi and a 6m mast. David says that this is nothing special but it is very easy to set up quickly and possesses enough power and sensitivity to work most of what is available when conditions are up. The rig and ancillaries are built into a portable rack to allow for instant set-up without having to call for power cables. When conditions are up. The rig and ancillaries are built into a try to work into the Isle of Man (GD). On the following evening, September 23, Colin operated from his home QTH (IO85) with an Icom IC-275E, 25W portable set-up consisting of a Trio TR9130 transceiver, 80W and a 14 -element MET Yagi attached to the car roof-rack. He reports that he made dozens and dozens of contacts with stations situated in DL, OZ, SM and SP. The longest distance QSOs made on the 144MHz band were with SP3UCU (IO92 at 1418km), SP3SFN (IO82 at 1363km) and SP2FAX (IO83) at 1352km.

During the same period GM7TKA also aired his call sign making very similar contacts. Both stations heard SP2OFW (IO93) which would have been one of those really good events indeed stronger than the multitude of German stations calling. The opening was still going on when he had to leave the portable location three hours later. Back at the home QTH (IO85) David could still hear OZ and SM stations peaking 50. On the following evening GM4WLL heard OK1AGE/P (IO70) on the 430MHz band but couldn’t raise him. However many Scandinavian stations continued to be worked on the 144MHz band for the following two evenings. David gleefully reports that this was one of those really good events that still brought a smile to his face a week after it was all over!

Colin Smith GM4CNL also decided to head for the hills during the evening of September 22, accompanied by his friend GM7TKA. Colin’s portable set-up consists of a Trio TR9130 transceiver, 80W and a 14-element MET Yagi attached to the car roof-rack. He reports that he made dozens and dozens of contacts with stations situated in DL, OZ, SM and SP. The longest distance QSOs made on the 144MHz band were with SP3UCU (IO92 at 1418km), SP3SFN (IO82 at 1363km) and SP2FAX (IO83) at 1352km.

During the same period GM7TKA also aired his call sign making very similar contacts. Both stations heard SP2OFW (IO93) which would have been their fairest distance contact (1437km) but the Polish station was very busy trying to work into the Isle of Man (GD). On the following evening, September 23, Colin operated from his home QTH (IO85) with an Icom IC-275E, 25W and a 14 -element Yagi. Contacts on the 144MHz band included DD0VF/P (IO60), OK1AGE/P (IO70) and OK2UF/A (IN89).

Allan Duncan GM4ZUK was yet another Scottish station who decided it would be more productive to operate from a portable location. He used his contest site In locator IO86 which at 450m a.s.l. has an excellent take-off in all directions. Allan uses a Kenwood TS-950 transceiver which conveniently runs 40W on the 144MHz band and 30W on the 430MHz band. It also has the 1.3GHz module fitted which produces 40W output. Operating as GM4ZUK/P he used a 13-element Cushcraft Yagi on 144MHz, a 17-element NBS Yagi on 430MHz and a 23- element PFFT Yagi on 1.3GHz.
During his first evening of operation on September 22 he made a total of 103 c.w. contacts on the three bands. Conditions were excellent. Highlights on the 1.3GHz band included OK1VMS (JO70), four OZ stations, three SM stations as well as some good DL and PA stations. On the 430MHz band it was a similar situation, contacts including OK1AGE, OK1VMS, S1EPO, S2PFAX and many other stations in mainland Europe.

Allan was also active from the same site on the following evening, September 23, with even better results. Strangely, he also made the same number of QSOs as in the previous evening, a total of 103 spread across the three bands. Conditions were tremendous to eastern Europe with 29 contacts being made into the Czech Republic on the 144MHz, 430MHz and 1.3GHz bands, some over 1600km away. On the 144MHz band the best DX of the evening was OE3LFA (INBB) at 1581km. Another foray was made on September 24 and although only 11 contacts were made it did include two with LY2WR (KO24) on the 144MHz and 430MHz band over a path of 1742km. Truly an excellent evening.

In a packet radio report Ray James GM4CXM (I075) mentioned that although he missed the start of the opening on September 21, he was very pleased in seeing good contacts in western Scotland on September 22-23. Ray runs 400W from a 3CX800A7 amplifier into a pair of 16-element Yagis and as a consequence he was able to work much DX on the 144MHz band. It was obvious that propagation was best into Germany with 42 QSOs being made with that country but only 11 into Holland and three with Belgium.

Contacts were also made into Scandinavia, ten with Sweden, nine in Denmark and two with Norway.

Nigel Booth M1DKN (who last time I recall wrote in as an s.w.l. - congratulations on the new callsign Nigel!) reports that v.h.f. conditions were also good for inter-UK working just prior to the big event. Over the weekend of September 19-20 he noticed that the G83VHF beacon was pounding in at 599 instead of the normal signal he receives at the S1 level. Nigel lives in Norwich (J002) and uses an Icom IC-290E transceiver running 25W into a 5-element Yagi. He reports initial QSOs on the 144MHz band with stations in locator squares IO82, IO91, IO92, JO01 and JO02. Nigel wishes it mentioned that he is trying to gain points for the RSGB 144MHz Squares Award and the RSGB Countries and Counties Award. So if you hear him on please give him a call.

BACK SCATTER

Reports have still been received regards the large-scale auroral opening on August 27. As reported last time, back-scatter signals were heard in Scotland around 0800UTC with the main event in the UK taking place between 1300-1800UTC with a much smaller phase between 2015-2310UTC. Beam-heading from central England on the 144MHz band ranged between 40-70 degrees (signifying a good aurora) with contacts being made with stations located in DL, F, HA, HB9, I, LA, LY, OK, OZ, PA, SM, SP, YL, YU and 9A.

David Johnson G4DHF (IO92) has sent an update to his report given last month mentioning that, in total, he made some 80 c.w. QSOs on the 144MHz band during the aurora. In addition to contacts previously mentioned he also worked into Switzerland contacting the stations of HB9BQ (IN37), HB9DFG (IN37) and HB9QG and into Italy with I17Q (I35), I2W (IN45). Stations in southern France including FBSC (IN27), FBOP (IN26) and FAB8MB (IN04) were also contacted. These contacts are relatively rare during an aura as many of these stations are located towards the southern limit of what is normally expected for this type of propagation.

In simplistic terms the maximum distances that can be worked are approximately 1000km to the south and north and 2000km to the east and west. These distances are actually contained within an imaginary oval boundary situated around your specific QTH. Sometimes you may hear references to the boundary - which indicates the theoretical maximum distance achievable from your location. All this goes some way to explain why you are more likely to make contacts into Hungary, Poland and the ex-Russian republics and hardly ever into the south coast of France and northern Spain.

As proof of this, the vast majority of contacts made by G4DHF were located in eastern Europe. Around 20 QSOs were made with stations in Croatia, Czech Republic, Hungary, Poland and Yugoslavia. A little further afield were contacts made with the Lithuanian stations of LY2SA (KO13), LY2WKR (KO24) and LY3ED (KO14) and YL3AC (KO26) in Latvia.

David Davids GM4WLL was testing out a newly acquired Yaesu FT-290R MkII transceiver (for use in the car) when he heard a German station on the s.s.b. calling frequency. His signal was "tone - A and a quick listen around the 144MHz band showed several other strong auroral signals. Grabbing his "portable emergency opening kit" David immediately drove to the elevated location near his home QTH on the Pentland Hills (IO85). Fortunately the band was still well open to DL, F, ON and PA by the time he had assembled the station. From 1530UTC he then worked a number of countries using c.w. before switching to s.s.b. This resulted in a mini pile-up which sounded like a wall of white noise. By 1800UTC the event was fading out but by that time GM4WLL had made 31 QSOs with stations in six countries.

AMAZING AURORA

Carsten DG1ELE (IO31) reports that the aurora on August 27 was the biggest he had ever experienced at his QTH. He uses a Tio TS-700G transceiver with Mutelk replacement front-end, a 300W amplifier and a 12-element Yagi. Operating exclusively on s.s.b. he made contacts with stations in G, GD, GM, GW, DL, LA, OZ and SM. His UK contacts included G4DIE (IO81), G8TYG (IO82), G1SHM, G4ZVA, G8HD5, G8XVI, M1AUX (call in IO83), G4KNN (IO93), M1BPRG (IO74), GM4WLL/P (IO85), GM70ON (IO75) and GW8BLR (IO71).

Another German station known to have been active during this event was JF30O (JF30O) who made c.w. contacts with G0EVT (IO93), G0MII (IO91), G3JPW (IO83), G4DHF (IO92), G4HGI (IO84), G4SWX (IO92), GM1XCH (IO85), GW4CT (IO73) and GM4WLL/P.

Chris HB9DVF (IN37) mentioned that despite using a group of four 7-element Yagis he doesn't hear many auroras in his part of Scotland. However on August 27, between 1330-1600UTC, he made c.w. contacts with eight Dutch, 17 German and the stations of G3IMV (IO91), G3PNO (the editor of the RSGB's Microwave Newsletter), G4DHF, G4GWSX and GM1XDO.

Even more pleased was Mario I1TQ who reports that this was the only fourth aurora he has heard at his QTH (IN35) since 1979. Mario uses a Kenwood TS-850 h.f. transceiver, an SSB Electronics LT25 transverter driving an amplifier running a Two-4CX250B amplifier and into 18-element K2Y (IN35). From 1530-1645UTC he contacted G3IMV, G4DHF, G4GWSX and a number of DL stations.

Finally a report from Vidas LY2SA (KO14). He uses an Icom IC-422 H transceiver, a 300W amplifier and a 16-element KLM Yagi at 15m above ground. A total of 84 contacts were made with stations in 17 countries with his best DX being G3M0NAI (IO75) at 1742 km. He thought that the aurora was really fantastic and he looks forward to the next big event.

Interestingly, the aurora on August 27 coincided with an event when the Earth's upper atmosphere was bathed briefly by an invisible burst of gamma and X-ray radiation. According to researchers at Stanford University there is the very powerful to strike Earth from beyond the solar system, had a significant effect on Earth's upper atmosphere. This was the first time that a change in the
Earth's environment has been traced to energy from a distant star.

Umran Inan, professor of electrical engineering at Stanford and head of the research group that observed the atmospheric disturbance, reports that it was as if night was briefly turned into day in the ionosphere. (The ionosphere is the portion of the atmosphere between 60 to 80km in altitude that plays an important role in radio communications and of course in auroral back-scatter propagation).

In an effort to space agency scientists, the radiation reaching Earth had an intensity slightly less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarkable impact on the ionosphere. Umran Inan said that it was amazing that such a burst could produce ionisation levels similar to those produced by the sun. The wave of radiation emanated from a newly discovered type of star called a magnetar. A magnetar is a special kind of neutron star, which is the collapsed core that is left behind when a massive star explodes. It is extremely dense, weighing more than the sun but squeezed into a ball less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarkable impact on the ionosphere. Umran Inan said that it was amazing that such a burst could produce ionisation levels similar to those produced by the sun. The wave of radiation emanated from a newly discovered type of star called a magnetar. A magnetar is a special kind of neutron star, which is the collapsed core that is left behind when a massive star explodes. It is extremely dense, weighing more than the sun but squeezed into a ball less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarkable impact on the ionosphere. Umran Inan said that it was amazing that such a burst could produce ionisation levels similar to those produced by the sun. The wave of radiation emanated from a newly discovered type of star called a magnetar. A magnetar is a special kind of neutron star, which is the collapsed core that is left behind when a massive star explodes. It is extremely dense, weighing more than the sun but squeezed into a ball less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarkable impact on the ionosphere. Umran Inan said that it was amazing that such a burst could produce ionisation levels similar to those produced by the sun. The wave of radiation emanated from a newly discovered type of star called a magnetar. A magnetar is a special kind of neutron star, which is the collapsed core that is left behind when a massive star explodes. It is extremely dense, weighing more than the sun but squeezed into a ball less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarkable impact on the ionosphere. Umran Inan said that it was amazing that such a burst could produce ionisation levels similar to those produced by the sun. The wave of radiation emanated from a newly discovered type of star called a magnetar. A magnetar is a special kind of neutron star, which is the collapsed core that is left behind when a massive star explodes. It is extremely dense, weighing more than the sun but squeezed into a ball less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarkable impact on the ionosphere. Umran Inan said that it was amazing that such a burst could produce ionisation levels similar to those produced by the sun. The wave of radiation emanated from a newly discovered type of star called a magnetar. A magnetar is a special kind of neutron star, which is the collapsed core that is left behind when a massive star explodes. It is extremely dense, weighing more than the sun but squeezed into a ball less than that of a dental X-ray. Both gamma rays and X-rays cause ionisation directly by stripping electrons from atoms and leaving them electrically charged. Nevertheless the burst had a remarka
Abergele in Gwent, who has been busy on 14MHz s.s.b. this month. Among Brian's contacts are included 8Q7DJ (Maldives Islands) at 1825, VU2PAI (India) at 2000, FP/NSPD (St. Pierre & Miquelon Islands) at 1700, JA6ZPR (Japan) at 1727, as well as Y11HK (Iraq) at 0500, and CO8DC (Cuba) at 2038UTC.

THE 18MHz & 21MHz BANDS

Also located in Gwent is Bev West GW0OSQ, a well known local low power enthusiast. Operating solely on the 18MHz band using s.s.b., Bev caught up with 9K71OW (Kuwait City, JIJ3LT (Japan) DU1KT (Philippines) at 1500, plus CA2GU (Chile), KP4ZQ (Puerto Rico) at 0600UTC, HL2DNN (South Korea) and finally BD4RE (South Korea). Not bad for a few watts and a home-brewed cubical-quad antenna Bev! I am literally green with envy!

Dave GW0WVF had a peep at the 21MHz band and hooked up with ZD8T (Ascension Island) at 1920 with HLOY (South Korea) the following morning at 1145UTC.

Carl Mason GW0YSW of Skeven in West Glamorgan used 70W of c.w. to work UAOFDX (Asiatic Russia) at 0813, H11CG (South Korea) at 0828, and SV8/SMDXT (Parlois Island) at 1018UTC.

Don G3NFO lists 21MHz s.s.b. contacts with A411Z (Oman), BD4DW (China) QSL via PO Box 040-088, Shanghai, People's Republic of China, HS0/G3NOM (Thailand), and 9M2TW (Western Malaysia).

A single 21MHz contact comes from our all-c.w. man Ted Trovellew G2HKU on the Isle of Sheppey in Kent who lists a QRP 3W contact with special event station ZG2FX (Gibraltar) at 2000UTC QSL via G3RFXL.

THE 24 & 28MHz BANDS

On the other hand Ted G2HKU has certainly been active on the 24 and 28MHz bands of late. He lists 24MHz contacts with 4Z5LF (Israel), HFOPOL (South Shetland Islands), EARCN (Canary Islands), ZPSKO (Paraguay), K6HTV (west coast Japan), 9M2TO (Western Malaysia) and PY2OW (Brazil) all at around 1500, while the 28MHz band provided Ted with two contacts in the shape of T5LA (Central African Republic) at 1600, and QY3QNN (Faroe Islands) at 1900UTC.

Carl GW0YSVS had a go at the 24MHz band this month too and hooked up with 9K2KR (Kuwait) at 1312. Also logged were HFOPOL (South Shetland Islands) at 1330 QSL via SP3BGC, T5LA (Central African Republic) at 1911 QSL via PA3DAX, and EA8TB (Canary Islands) at 1010UTC.

The c.w. mode was the way for Sean Gilbert on the 28MHz band this time around, gaining his contacts with KP4TF (Puerto Rico) at 1116, K1RM (USA) at 1400, PV5LB (Brazil) at 1509, HFOPOL (South Shetland Islands) at 1523, and OH0SMSXT (Aaland Island) at 2247UTC.

Finally for this month, Don G3NFO lists 24MHz s.s.b. contacts with AP2WAP (Pakistan) QSL via IN3VZ, DU1KT (Philippines), ZF2WPZ19 (Cayman Islands), 6W1QV (Senegal), and 9Y4GR (Trinidad & Tobago), 28MHz provided him with TUXZ (Ivory Coast), CX6ABZ (Uruguay), CE3/N4EZ (Chile), and FSSPL (St Martin Island).

SIGNING OFF

Well, judging by your reports it seems that amateurs who are new and relatively new to the hobby will be enjoying themselves immensely over the coming months and years, particularly on the higher frequency bands. It's all happening, conditions are on the up!

THANKS FOR ALL YOUR REPORTS, COMMENTS AND INFORMATION WHICH HELP ME TO MAKE YOUR COLUMN WHAT IT IS. AS USUAL, REPORTS AND INFORMATION (AND PHOTOGRAPHS - PLEASE!) BY THE 15TH OF EACH MONTH. CHEERIO FOR NOW, AND GOOD DX!

Leighton GW0LB1

DATA SCAPE

ROGER J. COOKE G3LDDI
TEL: (01508) 570278
E-MAIL: rjcooke@FreeNet.co.uk
PACKET: G3LDDI @ G8/3LI.DJ.435.G8.B.EU

THIS MONTH SEES THE BEGINNING OF OUR NEW COLUMN WRITTEN BY ROGER COOKE G3LDDI, WHO HAS TAKEN OVER FROM MIKE RICHARDS G4WNC. ROGER G3LDDI WILL BE TAKING YOU THROUGH THE INTERNET FROM BEGINNING TO END. AS HE IS ALSO A BEGINNER, THE COLUMN SHOULD HELP THOSE OF YOU WHO ARE A LITTLE 'INTERNET SHY'.

WELL, it's great to be back! I shall hopefully be inundated with E-mails, packet messages and telephone calls with all sorts of information and pictures to fill this column! The format is new to me, possibly to you (at least some of it might be) and the learning curves can be steep.

I am new to the Internet scene myself, so shall be taking a look at how to get started, what to do, the cost and so on. In this way, it might help some of you to base that step to 'surf the Web', or merely to send and receive E-mails.

I shall also be covering the amateur side of data which, in my opinion, is the most important out of the lot. So, please keep me updated on what YOU are doing. Your columnist needs YOU! My output is directly proportional to YOUR input!

UPDATE

I have been busy updating the BBS here. I decided to upgrade from FBB 5.15c to 7.00g and this presented me with a few problems. However, I have now cured most of them, but one still remains and it looks as though it will have to stay that way.

My users who Winpack as their terminal program reported that they were unable to upload mail and download mail, in compressed format, in the same session. This problem cannot be overcome and the only solution is for all Winpack users to click on their Mail/Mail Options box and tick the "Use Split Sessions" box. Users should also ask their sysop to set the flag in their user file and they should also request the expert status to prevent a multiple line log-in.

In practice, FBB 7.00g looks completely different to previous versions and takes a while to get used to. Another small problem is that the NEWDOC server locks up occasionally. I have opened two separate windows to provide me with permanent monitoring. Fig. 1 shows the new version up and running.

E-MAIL

I have resisted joining the Internet until recently, mainly because I did not have a "real" need for it and because I was
so busy answering mail on the packet network. I did not want to add to the already quite heavy mail-load each day! However, a free system appeared and I was tempted!

My Internet Service Provider (ISP) is FreeNet. This allows me to use the E-mail service and also access to Internet, completely free - with the exception, of course, of the telephone bill! I can also have 5Mb of Web pages, so that is another challenge. As soon as I get some spare time, I shall design my own Web page.

The modem I am using is an external type, a US Robotics Sportster Flash. There is a whole range of modems and it really boils down to how much you are willing to spend. Once connected to the telephone line, a range of possibilities present themselves. I also use the software that came with this particular modem, called SUPERVOICE. This allows me to set up a voice-mail system as well as a landline type BBS for large file transfer. It also allows the user to set up various individual directories and BBS, with DATA, FAX, and VOICE capabilities.

For E-mails and accessing the server, or ISP, I use Pegasus Mail, which allows me to compose my mail off-line, queue it and send it all in one session. Once connected to FreeNet, and having had my password verified, I invoke Pegasus Mail and click on the appropriate icon, which then uploads and downloads all in one session. Normally this takes no longer than two minutes, depending on the size and amount of mail of course.

The Pegasus Window is shown in Fig. 2. There are various options within the program, such as distribution lists, address books, signature files, and these can evolve with experience of using the program.

I use Netscape for Internet access, shown in Fig. 3 and, providing you are very aware of the amount of time that can slip by, using the Net can be very interesting. Prior knowledge of just what you are after can help keep the costs down, as can arranging to use Internet at the right time. Weekends are best, just 1p per minute on BT, followed by evenings at 1.5p per minute and lastly - to be avoided - daytime at 4p per minute.

Competition is becoming fierce with Internet Providers.

Fig. 2: The Pegasus Window.

Dixons Store Group, the high street retailer, has launched a free Internet access called Freeserve, in conjunction with the backbone provider Energis. One of the pioneers in free Internet access, X-Stream, already claims over 95,000 members after only seven months of operation.

There are no catches to these free services, but the technical support lines can be expensive. For example, Dixons charge £1 per minute on the help-line! Freeserve have really up-staged BT-Click+, the newly-launched non-subscription service from BT. Here again, hidden charges come into play. The BT service charges an extra 1p a minute for every minute on-line, plus 50p per minute for their help-line. Other retailers are trying to jump on the bandwagon. Tesco have just introduced their Internet service, but charge £8.50 per month for the privilege! Gateway is considering offering a similar service although the proposed charge, if any, is not known. Obviously this is a very lucrative market to enter, building a potential marketing database that could be sold off at a later date. Retailers see it as a sure way to attract new customers.

Let's assume you sign up with Freeserve, the Dixons service. They make profit from the telephone charges. On a 4p per minute standard rate call, BT takes 0.641p. The rest is divided between BT and the Freeserve consortium. The support line will also yield a large profit. Pity we do not have a similar telephone charging system to the USA where all local calls are free! Then it really would be a free service.

One telephone company is offering a whole weekend connected to the Internet for 1p. (If you know who that is, please let me know!). So, you 'pays your money and you takes your choice'.

MATRIX SWITCH

I've heard that RSD Communications Ltd are looking at producing a very nice Intelligent Audio/Video Matrix switching box (remote control operated as well as partially automatic), with some goodies such as ZCD to get rid of audio switch clicks, own volume control and adjustable video level control, onscreen display, etc. Other audio effects (sim surround, spacial, 3D etc) could also be added.

The unit would look after all the gear that some people have these days. Nicam Stereo TV, VCR, satellite receiver etc. If you are interested in such a device then give John A. Ross a ring on (01786) 450572.

COMPUTER INTERFACE

The computer interface problem has been with us since the use of the old BBC B machine and possibly earlier. In those days it really was bad, the CPU clock speed was low and it produced 'birdies' all over the place. Harmonics were rife and, of course, the BBC B was produced in a plastic box - just about the worst thing that could have been used! However, Amateur Radio operators were not considered when this machine was produced. Obviously with digital signals, harmonic content will be high and the interference will vary/change in frequency according to the various data rates as software is executed. But, at least the modern PC is now usually built into a metal cased box. If your PC is a proprietary brand name, it should meet certain specifications regarding interference. However, most amateurs build their own machines these days and certain precautions should be taken.

The usual thing to do in an amateur installation is to physically separate the radio gear from the computer gear as much as you can. It's also preferable to have two earth systems, one for the radio and one for the computers. Make sure all the interconnection cables are screened and a liberal sprinkling of ferrite rings on all peripheral equipment should be used.

The radio gear should be fed with coaxial if possible and the antenna should be as high as possible. (This would apply anyway!) I use two earth systems, both are six foot copper pipes, one for the radio gear and the other for the PC equipment. So far, I have not needed anything else at all.

At my QTH, h.f. is practically clear of the odd birdie, although I do get more on v.h.f. However, none seem to cause problems with the Saigne, or BBS system and area, in general, not strong enough to worry about. Providing these normal precautions are taken,
interference problems should be negligible with modern computers.

**NEW LIFE FOR OLD**

Upgrading the central processing unit (CPU) can be a less traumatic way of obtaining a fast machine than splashing out on a new motherboard etc. Evergreen Technologies have an MXP pro upgrade 200MHz CPU for £89, excluding VAT.

Upgrading a four or five year old computer can give it new life for a few more years.

Installation is reasonably straightforward, (if you can afford the down-time!). I must admit that I am always very nervous about upgrading my BBS or Saltgate machines. Because they are running 24 hours a day. Mr. Murphy usually pays a visit!

To upgrade, put the install disk into the floppy drive, start the machine and this then runs the install program, which in turn determines if a BIOS upgrade is required. The BIOS information is saved to a file so that you can return to the original chip if you want to. The computer’s performance is then measured. This gives a measure of integer arithmetic performance that’s proportional to the clock speed, measured in Drystones.

Assuming that the PC can be upgraded, all that remains then, is to replace the chip and adjust the clock-speed of the bus that the motherboard uses. Switch on and check the performance. You should find that the performance has increased considerably, depending on the CPU replaced of course!

If you are interested in finding the list of UK distributors, try www.evertech.com/ (See Fig. 4).

**DIGITAL CAMERAS**

Digital camera devices seem to be catching on now with the latest from Nikon - the Coolpix 900. It has an impressive 1.3 million pixels, allowing it to take images at 1,280 x 960 resolution. However, some of the earlier ones are quite presentable and Peter Hunter

GrG SZ called here one day and took a few pictures in and around G3LDI. I don’t know what model he has, but the picture in Fig. 5 is pretty clean and shows his author sitting at the Library machine, typing this article!

THAT’S ALL FOR THIS MONTH. ANY INFORMATION TO ROGER COOKE. SEE DETAILS AT THE TOP OF THE COLUMN.

**AUSIE ORACLE**

LETTERS AND REQUESTS FOR TOPICS YOU’D LIKE COVERED TO ME PLEASE.

CHRIS EDMONSON VK3CE, BOX 1 YARRA ROAD, WONGA PARK, VICTORIA 3115, AUSTRALIA

E-MAIL: vk3ce@ibsa.com.au


Day from Downunder! Gee whiz, I really do feel sorry for you lot! We’ve had a dreadfully bitter winter here way South in Melbourne. It actually got down to 1.8° C one night. Brrr! And now you race headlong toward another chilly winter. For your sake, I hope you get the sunny 24° C we had one astonishing mid-Winter’s day.

Oh well, we’re only 24 hours away and there’s lots of room for one or two more. We always leave the porch lights on, you know and keep a cold tinny or stubby in the fridge.

What’s more, the satellite service isn’t affected, no simplex channels are taken up... in fact, the effect is pretty minimal.

What we do have there, is a lot of repeater links and one of the two 430MHz fast-scan ATV repeater input channels (one is 444.250MHz; the one on 426.250MHz will be ‘off limits’).

After giving the matter a good deal of thought (in my Editorial Comments column for the November issue) I have given the cautious nod to the proposed use of the band (not that I have any say in it at all, of course!) because of a few things. Firstly, the spectrum people guarantee the band’s return to its owner on 1 January 2001 - which effectively quashes our very real concerns for the band’s immediate future.

Second, I reckon a bit of co-operation with the ‘Powers That Be’ is a good thing and reflects well on us as a group. Third, if we don’t smile and act graciously, they’ll simply take it from us anyway, but with no suggestion of future co-operation.

The Olympic radio system sounds quite intriguing. What a shame we won’t be able to listen to any of the traffic, though - it’s all digital!

I ran the full message from the Australian Communications Authority (ACC) verbatim in the November issue of my magazine Radio and Communications. However, for PW readers my colleague in the Broadstone office in Dorset have abstracted the main features of interest for you. (Sorry we didn’t have room for it in full Chris, Editor).

Here it comes: “A message to Amateur Radio Operators from the Australian Communications Authority regarding the 2000 Olympic and Paralympic Games and the operation of the Olympic Radio Network (ORN).”

The principle focus of the meetings between the ACC, has been to develop radio frequency arrangements that will enable a high quality ORN with minimum negative impact. An important focus has been to ensure that any inconvenience caused to Amateurs due to the operation of the ORN within the band 431-432.070MHz is minimised. Both the Department of Defence and the ACA have confirmed that the ORN will cease operation on 31st December 2000.
The ORN will be a distinct trunked radio network especially created to support the staging of the Games. Telstra has been contracted to implement the ORN and is now planning the installation and support of the network on behalf of the Sydney Organising Committee for the Olympic Games (SOCOG).

The SOCOG committee has selected a trunked land mobile system using Motorola's 'Astro' as the basis of the network. Astro is a four level f.m. QPSK digital trunked land mobile technology closely related to Motorola's SmartZone trunking system. SmartZone is a proven technology already providing the basis of the NSW Government Radio Network (GRN).

In order to adequately service the administrative, command, control and other functions central to the staging of the Games, the ORN will require a capacity of at least 200 channels.

Provisional planning and modelling is still being performed to determine exact channel limits, however the following arrangements are likely to be close to the final operating arrangements for the ORN. It will be in operation for the period 31st March 1999 to 31st December 2000 to accommodate the period of the Games and the extensive SOCOG lead up test event schedule. Location of the ORN is expected to be confined to the Sydney basin, the spectrum to be used is bounded within the following frequency limits derived from 6.25kHz from the lower and upper channels planed:

Base receive 421.00625 - 421.98125MHz, paired with base transmit 428.0667 - 429.04175MHz, with a transmit/receive split of 7.0625MHz.

Base receive 424.300625MHz to 426.81875MHz, paired with base transmit 429.08125 - 431.89375MHz, with a transmit/receive split of 5.075MHz.

Three blocks of frequencies will be used within the ORN. On a trunked radio site, only channels from within the same block will be in use. This arrangement ensures that intermodulation products up to the seventh order are avoided in all blocks. However, interference between the blocks, up to 15th order intermodulation products will be avoided. Channel width will be 12.5kHz.

The Motorola Astro equipment to be used for the ORN is fully programmable over the range 403-433MHz and the hand-held and base transceivers can all transmit and receive on any channel in that range. The transmit/receive sense of the ORN has also been chosen to further minimise the potential for interference. Motorola's Astro equipment is available in three frequency ranges, namely: 403-433MHz; 439-470MHz and 450-489MHz.

Of these three ranges, the range 403-433MHz is considered most suitable for operation of the ORN because the equipment can be reused for GRN use after the Games are over. Within this range the segments below 420MHz are already substantially occupied in Sydney by the GRN and other services. Therefore the only viable spectrum that will support the 200 channels or more required for the ORN is the upper range from 420-433MHz.

The Olympic Radio Network and the WIA: The Olympic Games to be held in Sydney in 2000 will be a most spectacular event and the eyes of the world will be focused on it. The Sydney Organising Committee for the Olympic Games (SOCOG) and its many associated bodies have an awesome task in preparing for the Games. The special requirements for this major event cover every aspect of human resources and modern technology.

With such a complex of people and facilities to manage, the SOCOG and other Olympic committees need a communications network which is totally reliable with 100% availability throughout the period covered by the many Games events. Such a network is being established and one of the key components is the ORN.

In conjunction with Telstra - an Australian telecommunications organisation, SOCOG have selected the Motorola 'Astro' trunked land mobile system for the ORN. This equipment operates over a range of frequencies which includes the (Australian) Amateur Radio 70cm band. (In Australia) The 420 to 450MHz band is allocated to Radio Amateurs on a secondary basis with the agreement of the Department of Defence who have primary use of this part of the radio spectrum.

When the WIA heard of the plan to use frequencies in the 70cm band for the ORN, we contacted the Australian Communications Authority, ACA, to express our concern at the possible loss of this popular band. Reacting to the WIA's concern, the ACA arranged a series of meetings attended by the various parties to determine an arrangement whereby the needs of the ORN could be fully met with a minimum of disruption to the traditional use of the 70cm by Radio Amateurs. I am pleased to say that this objective will be achieved although there will be some restrictions placed on the Radio Amateur's use of the lower portion of our band during the period of the Games and the year proceeding them.

As Radio Amateurs we should feel pleased that we can contribute to the success of the Olympic Games in 2000. The temporary loss of some of our privileges is a small price to pay for being seen to be part of the team.

We have been recognised by SOCOG as a totally responsible body of citizens which enhances our reputation in Australian Society. The WIA in taking this initiative has once again shown the benefit of a national body capable of representing the needs of all Radio Amateurs at the highest levels.

Peter Naish, VK2BPN
Federal President, Wireless Institute of Australia.

THE GOOD NEWS

The good news is that none of the arrangement will impact on European amateurs in any way of course - unless they're tuning to VK to visit the games and plan to use low 430MHz frequencies! But I thought I'd tell you all about it this time to show how co-operation with government authorities can sometimes help us to resolve unanswered questions.

The 430MHz band has been under a very real cloud for years. Here we are, sitting smack dab on a 30MHz slab of the most desirable commercial spectrum there is, with just 13000 or so active amateurs nationally to occupy it! Were we worried, with thousands of spectrum-hungry commercial users lining up to pounce on the band? You bet we were!!

I need hardly remind you of what happened last year to the hapless amateurs in Guatemala, who lost any access whatever to the entire 430MHz band, quite literally overnight. They didn't even get a chance to say goodbye to the spectrum...!

Our amateur resources should be guarded and jealously protected from greedy commercial interests... but there are times when a little careful co-operation can reap handsome dividends!

I look forward to meeting up with you again next quarter. Until then, I wish you and yours the very best for a happy and safe Christmas and look forward to chatting again in 1999.

Please feel free to write or E-mail me, but please understand that I put Radio and Communications together on my own and sometimes simply don't have the chance to respond to mail as quickly as I might like to.

73 Chris VK3CE
With the loss of the, now-closed, Granby Hall as a venue, the Leicester Amateur Radio Show in September was held at a fresh site - Castle Donington International Exhibition Centre. Among the regular exhibitors was the Leicester Repeater Group (LRG) so, before a major power failure plunged the place into near-darkness, I managed to pick up the LRG's latest newsletter, LENS and an update on the group's 1.3GHz Amateur TV repeater GB3GV.

ATV repeater GB3GV is very much the work of keeper, David Payne G8OBP. Repeater transmit, receive and basic logic functions adopt fairly standard circuitry, but this repeater also transmits a cycling display of currently 16 colour pictures while in beacon mode. These have been scanned in from photos onto the hard disc and then loaded onto a 7Mb RAM disc for transmission.

The Leicester Repeater Group would like to see a lot more ATV activity through GB3GV. Keeper Dave has many ideas for future additions. For example, a site camera, a v.f.t. facility, maybe a 10GHz input channel too. But all this takes time and money, so an increase in repeater use by local ATV operators would make such an expansion easier to justify.

**FOCAL POINT**

**REPORTS & INFORMATION TO:**

GRAHAM HANKINS GBEMX
11 COTTSBROOK ROAD
ACOCKS GREEN
BIRMINGHAM
B27 6JE

E-MAIL: graham@gank.demon.co.uk

PACKET: GBEMX @ GB7SOL

**THIS MONTH GRAHAM GBEMX BRINGS YOU ALL THE UP-TO-DATE ATV NEWS ALONG WITH AN UPDATE OF THE INTERNATIONAL ATV CONTEST WHICH TOOK PLACE ON 12 & 13 SEPTEMBER 1998 HIGH UP ON THE MENDIP HILLS.**

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**INTERNATIONAL ATV CONTEST**

Boosting on-air activity is one of the objectives of an ATV contest and the most recent, the 'International', took place over the weekend September 12/13. Like all Amateur Radio contests, the objectives were to encourage activity on the ATV bands and see how antennas, transmitters and receivers performed.

After a two-year break, the Severnside ATV Group had decided to resurrect its portable TV repeater GB3GV. Keeper Dave has many ideas for future additions. For example, a site camera, a v.f.t. facility, maybe a 10GHz input channel too. But all this takes time and money, so an increase in repeater use by local ATV operators would make such an expansion easier to justify.

The International ATV Contest began at 1900 hours UTC. After only a few minutes a local station called in and the Severnside ATV Group Contest station G7ATV/P was in business. Viv was on the 144MHz 'talk-back' microphone while Ivar, Ian and Ross looked after the multitude of switching.

Lots of switching is involved. A contest vision transmission consists of a numerical group of four non-consecutive digits which the receiving station has to resolve, then add together and reply with the sum (there is a tendency here to see '10 as 'ten' Instead of '1'). A different set of four digits is necessary for each band used. If the sum is correct, a valid exchange is logged. Scoring also involves signal strength (picture quality P0 to P5) and distance.

So, operators at contest station G7ATV/P had to establish initial contact on 144MHz-tz, note callsign and location, time of establishing contact, establish first band (or only band) for a vision exchange and then note all this in the contest log sheet for the band, select correct four digits for the band to be used, rotate antennas and select appropriate transmit and receive, select transmit or receive function according to whatever had meanwhile been agreed as a first direction via the 144MHz link, then attempt an exchange in vision, send or accept a exchange report, make a note of that report and contest serial number on the log sheet. Then do everything the other way round.

As the ATV contest progressed into the evening, the 'elevation' adjustment on the 3cm dish proved its worth whenever G7ATV/P was attempting an exchange on 10GHz. Some stations that were unresolved, even when the rotated direction was spot-on, became PS (top quality) after just a couple of degrees of elevation or depression adjustment. Even though most of the equipment was 'homebrew', the only failure was a commercial 144MHz linear amplifier.

**IN THE BEGINNING**

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**THE END IS NIGH**

On Sunday, as the time approached the end of the contest, I counted that G7ATV/P had achieved eleven contacts on 10GHz, five on 2.3GHz, 18 on 1.3GHz and eight on 70cm. The contest was called the 'International' and, in previous years, G7ATV/P had 'worked' continental ATV stations in the early hours of the Sunday morning. But, none were apparent to the team this time.

The International ATV contest closed at 1300 UTC. The Group considered that their substantial efforts had been worthwhile because, apart from the G7ATV/P score, the station had provided pictures to parts of Wales and to home-based stations that never normally received an ATV signal. The team is now eagerly waiting to see the contest results.

**WELL THAT'S ALL FROM ME THIS TIME - AND FOR THIS YEAR KEEP SENDING YOUR ATV NEWS AND REPORTS TO ME PLEASE, DETAILS AT THE TOP OF THE COLUMN. A HAPPY CHRISTMAS AND NEW YEAR TO EVERYONE, 73S AND, OF COURSE, PS!**

Graham GBEMX
BROADCAST

REPORTS AND INFORMATION TO ME PLEASE.

PETER SHORE
C/O PW EDITORIAL OFFICES,
ARROWSMITH COURT,
STATION APPROACH,
BROADSTONE
DORSET
BH11 8PW

E-MAIL: petershore@wppublishing.ltd.uk

THIS MONTH, PETER SHORE
BRINGS YOU MORE NEWS
ON THE BROADCAST BAND,
THIS TIME INCLUDING SOME
INTERESTING INFORMATION
ON THE PEOPLE BEHIND
WHAT YOU HEAR.

A ll change please! The BBC went through one of its periodic personnel upheavals in September, this time involving the international radio arm, the World Service.

Sam Younger, the Managing Director, was replaced at a couple of hours notice by Mark Byford, the Director of Regional Broadcasting and, according to press reports, a ‘Birt apparatus’. Younger, who had been head of World Service for the past three years, was reported as leaving ‘to pursue other interests’, a standard wordsmith-ed phrase that most other interests, a standard

World Service for the past three years, has started some people thinking about a crusade to save this last remaining Western European language service from the BBC.

As the world slides further towards economic recession, it is worth keeping an ear to the international services of countries which are particularly caught up such as Russia and Japan. Is it an interesting exercise to compare coverage of the financial situation on these services with the domestic media in the UK - maybe there’s even a secondary school project or a university thesis in there if you’re of that age?

TROUBLED TIMES

As I write this article it looks as though the situation in the Former Yugoslavia is about to erupt, with the threat of NATO air strikes against the Serbian military. There seems to have been appalling atrocities committed, and it’s not easy to work out exactly what’s going on in that troubled part of the world. However, you can still hear Radio Yugoslavia from Belgrade, daily in English at 0430-0500 on 5.98 and 11.87MHz, 1830-1900 on 6.10 and 9.72MHz and at 2100-2130 on 6.10 and 6.185MHz.

Voice of Russia in English to Europe:

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<tr>
<td>1700-1800</td>
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NHK Radio Japan in English to Europe:

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<tr>
<td>0500-0600</td>
<td>7.230</td>
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<td>0600-0700</td>
<td>9.795, 7.230</td>
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<tr>
<td>1700-1800</td>
<td>7.110</td>
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<tr>
<td>2100-2200</td>
<td>9.725</td>
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Keep an ear on the BBC World Service frequency of 1296kHz. The transmitter is located at Orfordness on the East Coast and the antenna is tightly focused on Eastern Europe, particularly Poland and so on. However, there are rumours that Merlin Communications, the company formed by the management buy-out of World Service transmission, is about to hire the transmitter out to foreign stations. A Belgian station, VT4, has been noted on 1296kHz with test transmissions, and these can only possibly have originated from the Orfordness sender.

It is unclear whether British law permits a foreign station to beam its programmes from the UK to an overseas target on the medium wave band (clearly it is possible on short wave - look at the relays for NHK Radio Japan, the Voice of America and so on from former BBC World Service sites), so an interesting situation could develop.

There is now quite a lot of down time on the 1296kHz transmitter following the cutbacks in direct transmission of most BBC World Service language services to central and eastern Europe, so anything could happen!

Radio Iraq International is on the air with English to Europe at around 2100 on variable 11.785MHz for an hour. There is a repeat of the broadcast at 0300 for the Americas on the same frequency which seems to carry all Iraq’s international radio services including French at 2030 and German at 2000.

Another station with variable frequency usage is the Voice of Azerbaijan. The station has English at 1700 on variable 9.165MHz, followed by Russian on the same channel.

Radio Tajfel International - formerly known as the Voice of Free China - is on the air with English (with some relays continuing via WYFR in Florida, USA) at: 0200-0300 on 5.95, 9.68, 11.74, 11.823 and 15.345MHz; 0700-0800 on 5.95MHz: 1100-1200 on 7.445kHz; 1200-1300 on 9.61 and 7.13MHz, 2200-2300 on 17.75 and 15.6MHz.

HAPPY ANNIVERSARIES!

It’s been a year of anniversaries for international broadcasters. Radio Norway International celebrated its 50th birthday by closing down its English-language service - all 30 minutes a week of it - at the beginning of October. Radio Sweden had its 60th birthday party at an event in Stockholm on 26th October, and Radio New Zealand International reached its 50 year mark in September.

It’s good to see that most of the elder statesmen of international radio are still in reasonable health, but I do wonder how many of them will be on the air in another 50 years. By then, the ionosphere on which short wave transmission relies may well be completely taken over by a US military project called HAARP. This aims to convert the ionosphere into a ‘virtual’ military weapon by changing it with electromagnetic impulses which will allow signals to be bounced off the ionosphere at extra low frequencies to reach submarines deep in the oceans of the world. At the same time, there are over-the-horizon radar applications (remember the ‘woodypecker’ radar, now developing applications to the USA’s Department of Defense. If you hear some strange noises, you’ll know what they might be.

THAT’S ALL FOR THIS MONTH.
KEEP ME UP TO DATE WITH WHAT YOU HEAR. GOOD LISTENING.

73! Peter.
### Antennas in Action

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| 28 August |
| Hiro CB90 | 19 Dec |
| Kenwood Oscilloscopes | 24 May |
| Kenwood Power Supplies | 13 Oct |
| Mojstran Picture 1040-24 & PIC Packet 1040-24 | 15 Feb |
| Temperature Controlled Soldering Units from Voss Draper | 61 Oct |
| The Electronics Principles 5° Software package | 27 July |

**Special Prize Competitions**

| 20 June |
| RAI Competition Ten-Test 1251 & 1202 Competition | 13 Oct |

**Star Buy/Book Of The Month**

| 96 Oct |
| An RAE Students Notebook Marine VHF Operations by Michael Gale | 72 Nov |
| Practical Wireless Radios Practical Wireless Binders | 66 April |
| Radio Amateur Call Book CORDUM International & North American Listings | 60 May |
| The ARRL Handbook For Radio Amateurs The UK scanning Directory Sixth Edition | 74 Feb |
| The UK Scanning Directory Sixth Edition | 60 May |
| Understanding Basic Electronics World Radio TV Handbook 5th Edition | 10 August |

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**What Is A ...?**

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| Gunn Diode IMPATT Diode | 20 August |
| LED | 42 April |
| Pin Diode | 16 Feb |
| Tunnel Diode | 25 Oct |
| Bipolar Transistor | 20 Dec |

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